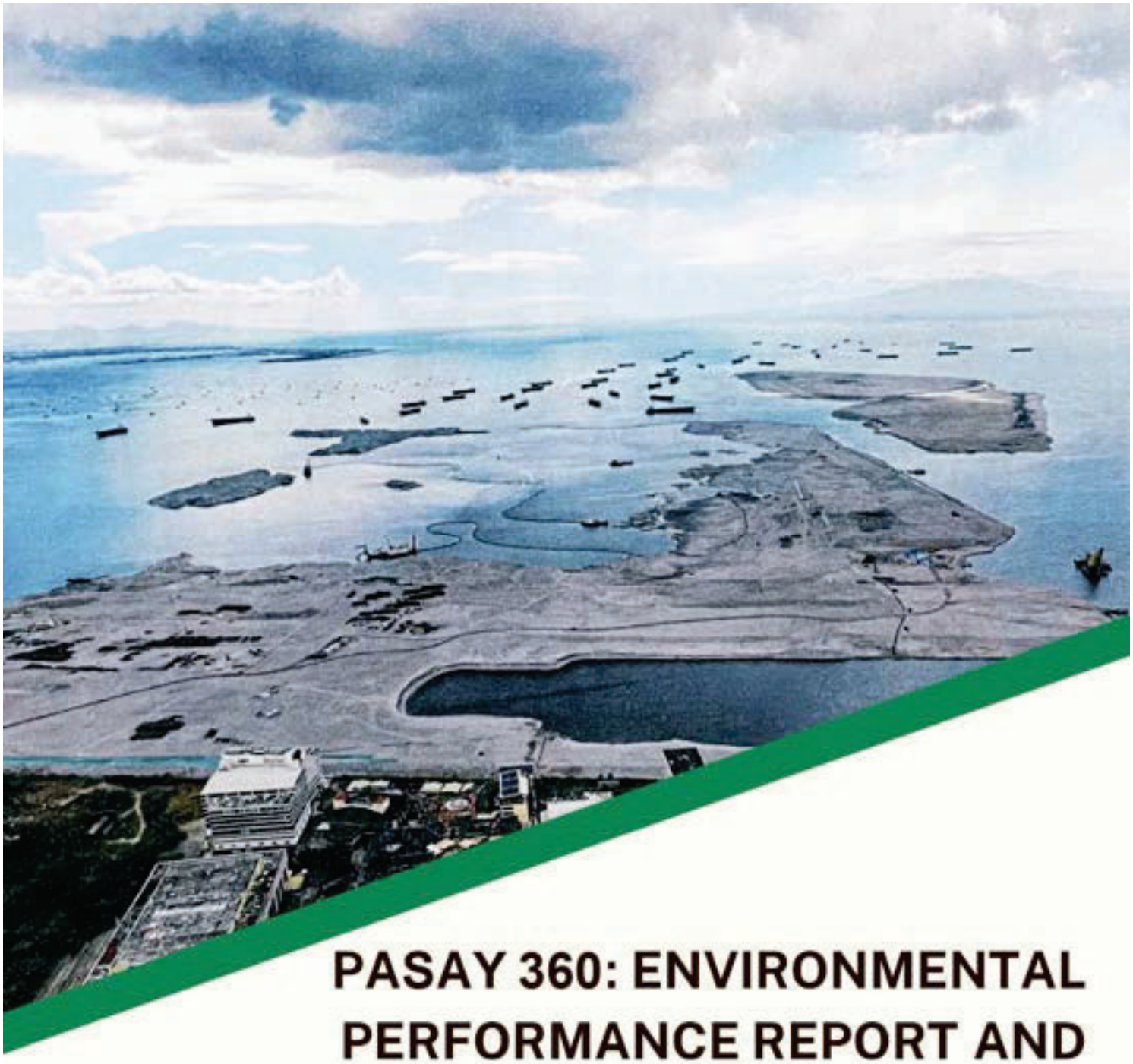


PASAY 360: ENVIRONMENTAL PERFORMANCE REPORT AND MANAGEMENT PLAN

FINAL REPORT

NOVEMBER 2024

Submitted by:

CITY GOVERNMENT OF PASAY

For the amendment of the ECC issued for Pasay 360 (ECC-CO-1601-0003)

EXECUTIVE SUMMARY

ES.1 PROJECT FACT SHEET

The Pasay City Government or the "City" through its Joint Venture (JV) partner, the SM Smart City Infrastructure and Development Corporation (SM SCIDC), intends to reconfigure the physical layout of its Project referred to as "reclamation and horizontal land development of three hundred sixty (360) hectares" or the "360-hectare Reclamation Project" (the "Pasay 360" Project) under the original ECC (ECC-CO-1601-0003). The Project is described in the ECC as follows:

> "The project shall cover the reclamation and horizontal land development of three hundred sixty (360) hectares along the Coast of Manila Bay, City of Pasay. The project is bounded by the coordinates as listed in its Environmental Impact Statement (EIS).
>
> The proposed project will include construction of major/primary internal access roads and bridges, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems."

The reconfiguration of Pasay 360 aims to enhance water circulation and mitigate potential flooding. This Environmental Performance Report and Management Plan (EPRMP) provides the summary of the Project's implementation of its environmental management measures, and the updates on the potential impacts and management plan based on the planned reconfiguration. In compliance with EMB CO's directive as provided in its letter dated 24 January 2024, the EPRMP includes:

- Sketch Plan based on the final landform of the 360-Hectare Pasay Reclamation Project;
- Hydrodynamic Modelling Study for the proposed land reconfiguration and adjacent reclamation projects;
- Flooding Impact Study; and
- Philippine Reclamation Authority (PRA) Board Resolution No 5864, series of 2024.

Project Fact Sheet

Project Name	360-hectare Reclamation Project (Pasay 360 Project)
Project Location	Along the waters of Manila Bay in Barangay 76, Pasay City, Metro Manila, Philippines
Nature of Project	3.3 Reclamation and Other Land Restoration Projects greater than 25 hectares
Project Capacity/Size	360 hectares
Project Components	Reclamation islands • Island A: ± 60 ha (600,000 sq. m.) • Island B: ± 153.5684 ha (1,535,684 sq. m) • Island C: ± 146.4316 ha (1,464,316 sq. m.) Major/primary internal access roads and bridges, vertical containment structure, wave deflector, water channels, fill materials, among others. Support facilities such as drainage systems, electricity, water supply

	and pollution abatement facilities involving wastewater treatment systems. Horizontal Development such as open spaces, parks, access bridges and the inter-island connecting roads and bridges, drainage systems (temporary drainage during construction, storm drainage system, individual and/ or centralized treating system(s)). Temporary Support Facilities such as Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets, among others. (See next table for the Summary of the Proposed Modifications)	
Area Clearance	AC-NCR-2019-003 issued by DENR Central Office on 15 August 2019	
ECC Application	Amendment of ECC-CO-1601-0003 issued by DENR EMB Central Office on 24 October 2017	
Project Proponent:	Pasay City Government or the "City"	
Joint Venture Partner	SM Smart City Infrastructure and Development Corporation	
Office Address of the Project Proponent:	City Government of Pasay Pasay City Hall F.B. Harrison Street, Pasay City	
Contact Person/ Designation:	Atty. Severo Cañete Madrona Jr. City Legal Officer	Atty. Leah Quiambao JV Managing Head Raymond Cabanilla, EnP JV Pollution Control Officer
Contact Information:		
EPRMP Preparer:	Planning and Development Research Foundation, Inc. (PLANADES)	
Office Address of the Preparer:	SURP Building, E. Jacinto St., University of the Philippines-Diliman Quezon City, Philippines 11101	
Contact Person/ Designation:	Jose M. Regunay, PhD Team Leader/ Environmental Management Specialist	
Contact Information:		

Summary of the Proposed Modifications

The summary of proposed modifications is shown in the next table. The Project location is shown in **Figure ES-1** while the schematic / site plan including the temporary support facilities is shown in **Figure ES-2**.

Components	Specifications	Details (Subject to Final Engineering)	Components	Specifications	Details (Subject to Final Engineering)
EIS 2017 (Based on the Approved ECC)			**EPRMP 2024**		
Components of Land Use (Total Land Area = 360 has)			Same		
***Roads and Open Spaces**	30% of total area or 108 has.	To be based on final master plan. Master Plan needs to incorporate LGU's option of utilizing the entire 60 has. for majority of its partial share, balance at the 300 has. land Initial estimate of 15,120,000 square meters of building gross floor area	Same		
Developable Land @ 70 % = 252 hectares			Same		
Share of Government (PRA & Pasay)	30% or 75.6 has		Same		
Share of Developer	70% or 176.4 has		Same		
Islands					
• Southern Island	60 has	Estimated total perimeter length of 2,498 meters and a width of 1,156 meters at its widest point;	• Island A	±60 ha	Estimated total perimeter length: Island AB: ±5,763.28 m Island C: ±4,8923.42 m
• Northern Island	300 has		• Island B • Island C	±153.5684 ha ±146.4316 ha	
Total	360 has.		**Total**	±360 has.	
Platform elevation	4.0 m MLLW	Per PRA requirement	Same		
Water Channels	At least 200 meters Distance	To serve as buffer zone and to improve water circulation and reduce on-shore flooding. To be firmed up during the final engineering works	Water Channels	A to mainland: ±476 m B to C: ±183 m C to mainland: ±247 m	The water channels have been modified to consider the results of the Hydrodynamic Modeling Study
Accessways (Bridges, Viaducts, Roads or others as may be determined) connecting from the mainland	300 has reclamation 200 – 1000 meters 60 has reclamation 200-400 meters	To be firmed up in the Detailed Engineering Design and Final Project Masterplan	Inter-island connecting Bridges	Island A to CCP Complex (Bridge 1 and 2): ±537m Island C to MOA Complex (Bridge 3 and 4): ±305m Island C to MOA (Pedestrian Bridge 1): ±249m	To be firmed up in the Detailed Engineering Design and Final Project Masterplan **As agreed during the EIARC Meeting conducted on 30 August 2024, the detailed bridge design shall be submitted as part of the application for ECC amendment to include the bridges.**
-	-	-	Inter-island connecting Bridges Between Project Islands A and B with Island C	Island B to C (Bridge 5 and 6): ±225m	**Bridge 5** • Type: Reinforced Concrete Beam Bridge • Width: 46 mts.

					• Number of Lanes: 10 lanes (5 lanes per direction) **Bridge 6** • Type: Reinforced Concrete Beam Bridge • Width: 35 mts. • Number of Lanes: 6 lanes (3 lanes per direction)
Vertical Containment Structure	Containment wall (seawall) with estimated length of 9,614.75 linear meters around the entire reclaimed area consisting of a combination of rock mound	To be firmed up in the Detailed Engineering Design and Final Project Masterplan	Same		
Wave Deflector	Concrete with water sump	1.5 meters above the platform level	Same		
Fill Materials	100 Million cu m. fills 12 Million cu m rocks	Subject to final engineering	Same		
Support Facilities					
Drainage System	To consider using the Rational Formula $Q = 0.278\ CIA$ *	To be yet designed post ECC. In the Rational Formula **Q** = Design discharge in m^3/sec **C** = runoff coefficient which is dependent on topography, soil type and degree of development of the area **I** = rainfall intensity in m^3/hr **A**= drainage area in km^2	Drainage System (Stormwater and STP pipeline)	To consider using the Rational Formula $Q = 0.278\ CIA$ *	To be yet designed post ECC. In the Rational Formula **Q** = Design discharge in m^3/sec **C** = runoff coefficient which is dependent on topography, soil type and degree of development of the area **I** = rainfall intensity in m^3/hr **A**= drainage area in km^2 To be firmed up in the Detailed Engineering Design and Final Project Masterplan
Electricity, water and communications systems	Temporary connection with Meralco e.g. for lighting purposes, generating sets for construction works. Mobile communications	-	Same		

Wastewater treatment units	In house facilities during the Reclamation Phase (e.g. toilets in barges) Disposal through accredited waste handling entities	Use of approved portable toilets on reclaimed land.	Wastewater Treatment Units shall be part of the future ECC application of the locators and not covered in this ECC application. Wastewater Treatment Units" have been changed into Sanitation Facility		
Water supply system During Reclamation Phase	Internal sourcing by individual contractors	Mobile water tanks most likely to be used by contractors; no underground water extraction.	Same		
Street Lighting	High Pressure Sodium Lamps	To be designed	Street Lighting	To be designed	
Temporary Support Facilities					
-	-	-	Precast Yard	Length: 326 m Max width: 100m Total Area: 31,770 m²	The yard is divided into an office area, prefabrication area, CBM storage area, and other functional areas
-	-	-	Site Office	The site office is made up of steel insulated cabins.	This site office, along with the offices located in the precast yard, will be used as a work space for the general use of site personnel
-	-	-	Rock Stockpile	The size of the four rock stockpile areas are as follows: • 1 pc – 150m x 350m • 1 pc – 400m x 150m • 2pcs - 200m x 200m	The rock stockpiles will be used to store rock materials. These rock materials will be used for coastal revetments, which deflect the energy of waves and prevent erosion along coastlines.
-	-	-	Pipeline Stockpile	Area: 200m x 276m	The pipeline stockpile will store pipes for sand rehandling.
-	-	-	Material Recovery Facility and Hazardous Waste Facility	The made up of materials for the Material Recovery Facility (MRF) and Hazardous Waste Facility (4.10ft x 10.2ft x 9.8ft for HWF) are steel and galvanized iron (GI) Sheets.	The Material Recovery Facility (MRF) will include segregation, recycling, reuse and storage of solid waste which include domestic and construction wastes. The Hazardous Waste Facility will be used for temporary storage of hazardous waste for eventual disposal.
-	-	-	Concrete Block Mattress Stockpile	Dimensions: •CBM 1: 35x140m.	The concrete block mattress stockpile will be

				• CBM 2: 35x140m. • CBM 3: 35x140m.	used for storing of Concrete Block Mattresses (CBM). This CBM will be used for for channel revetments for slope protection.
-	-	-	Clinic	Area: 12.51 sqm	The site clinic allows the on-site nurse or doctor to administer the necessary first aid for the immediate treatment of injuries.
-	-	-	Movable Transferable Jetty	Capacity: upto 45 ton load capacity	The movable transferable jetty will facilitate the movement of staff and workers using water vessels around the reclamation areas.
-	-	-	Temporary Rock Wharf	The temporary rock wharf will be constructed from boulders and rock with precast mooring. There are four (4) sites where the temporary rock wharf will be located	The temporary rock wharf will be used for docking and access of Landing-Craft Tank (LCT) Barges.
-	-	-	Temporary Access Bridge Between the Mainland and Island AB	This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±476m. It has width of 9 meters and a 20 kilopascal (kpa) design load capacity. The concept-level design will progress further until the detailed design is completed.	This temporary bridge between the mainland and island AB will be used for the access of vehicles, equipment, material and personnel during the reclamation and horizontal development.
-	-	-	Temporary Access Bridge Between Island AB And C	This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±180m. It has width of 9 meters and a 20 kpa design load	The temporary access bridge between Island AB and Island C is to facilitate the access of vehicles, equipment, materials, and personnel.

				capacity. The concept-level design will progress further until the detailed design is completed.	
-	-	-	Sanitation Facility - Portalets	In house sanitation facilities includes toilets in barges and use of approved portable toilet contractor.	The portalets will be used to provide restroom facilities for the construction and office workers in the reclaimed land.
COMPONENTS NOT PART OF ECC APPLICATION			**COMPONENTS NOT PART OF ECC APPLICATION**		
Mixed Development Plans, e.g. Vertical Structures, Commercial Establishments, Offices, Theme Park, etc. to be firmed up during the final Master Planning Study and Design.			**Mixed Development Plans, e.g. Vertical Structures, Commercial Establishments, Offices, Theme Park, etc. will be specified in the Detail Architectural and Land Use Plan which will be covered by a separate Environmental Impact Assessment.**		

*In compliance with PRAAO 2019-05, at least 5% of the total area to be reclaimed shall be exclusively used for contiguous green spaces for recreational purposes that are readily accessible to the public. This is part of the 30% roads and open spaces which will consists of roads, parks, green spaces, playgrounds, recreational uses and other similar facilities and amenities. In line with the vision of being a sustainable eco-City, the Project Developer intends to provide additional greenspaces beyond the required 5% greenspace requirement.

ES.2 EIA PROCESS DOCUMENTATION

ES.2.1 EIA Team

Name	Role	EIA Preparer Registration Number	Technical Study Conducted
Dr. Tabassam Raza	Project Director	N/A	Environmental Impact Assessment
Dr. Jose Regunay	Team Leader/ Environmental Management Specialist	N/A	Land Use Baseline Study, Impact Assessment, Environmental Management Plan
EnP. Michelle Yu	Project Coordinator/ Environmental Management Associate	534	Land Use, Environmental Management Plan
Dr. Mark Anthony Morales	Reviewer	N/A	Environmental Impact Assessment
Jay Richard Siasoco	Sr. Environmental Specialist	662	Environmental Impact Assessment – Land Use
Engr. Ernesto Flores	Sr. Environmental Specialist	129	Environmental Impact Assessment – Ambient Air and Noise
Engr. Patrick Caddarao	EIA Specialist and Consolidator	315	Report consolidation
Clarence Rei Nabing	Research Associate	623	Research Assistant – Water Quality
Arnel Mendoza	Geologist	624	Geology/Geomorphology, Geohazards, Hydrology and Hydrogeology

Name	Role	EIA Preparer Registration Number	Technical Study Conducted
Jan Paolo Pollisco	Biodiversity Specialist	276	Terrestrial Ecology
Benjamin Francisco	Marine Ecologist	038	Marine Ecology
Aileen Geronimo-Siasoco, R.S.W.	Social Specialist	625	People, SDP and IEC

ES.2.1 EIA Study Schedule

Study Schedule

EIA (EPRMP) Activities		Date
Terrestrial Flora		16 and 17 April 2024
Terrestrial Fauna		16 and 17 April 2024
Water Quality Sampling		23 April 2024
Marine Ecology Survey		6 to 7 April 2024
Ambient Air Quality and Noise Sampling		24 January 2024 and 9 to 12 April 2024
People/ IEC		29 April 2024 to 18 May 2024
First EIARC meeting		30 August 2024
Second EIARC meeting		17 September 2024
Third EIARC meeting		25 September 2024
18 May 2024	FGD	Pasay Libertad Anglers Association (PLAA) – Fisherfolk Group
06 May 2024 Barangay Hall	KII	Barangay Chair Rosemarie San Miguel
06 May 2024 Barangay Hall	FGD	Barangay 76 Councilors
29 April 2024	FGD	Pasay City LGU, City Planning and Development Office, City Environment and Natural Resources Office, City Health Office, Office of the Mayor, and SM Smart City
September 3, 2024	Household Perception Survey	Fisherfolks
September 5, 2024		Residents of Barangay 76 Pasay

Study Area

The proposed updated Project reconfiguration (Figure ES-1) site location is still situated along the waters of Manila Bay within the political jurisdiction of the City of Pasay specifically under Barangay 76. The Project 360 schematic / site plan including the temporary support facilities is shown in Figure ES-2.

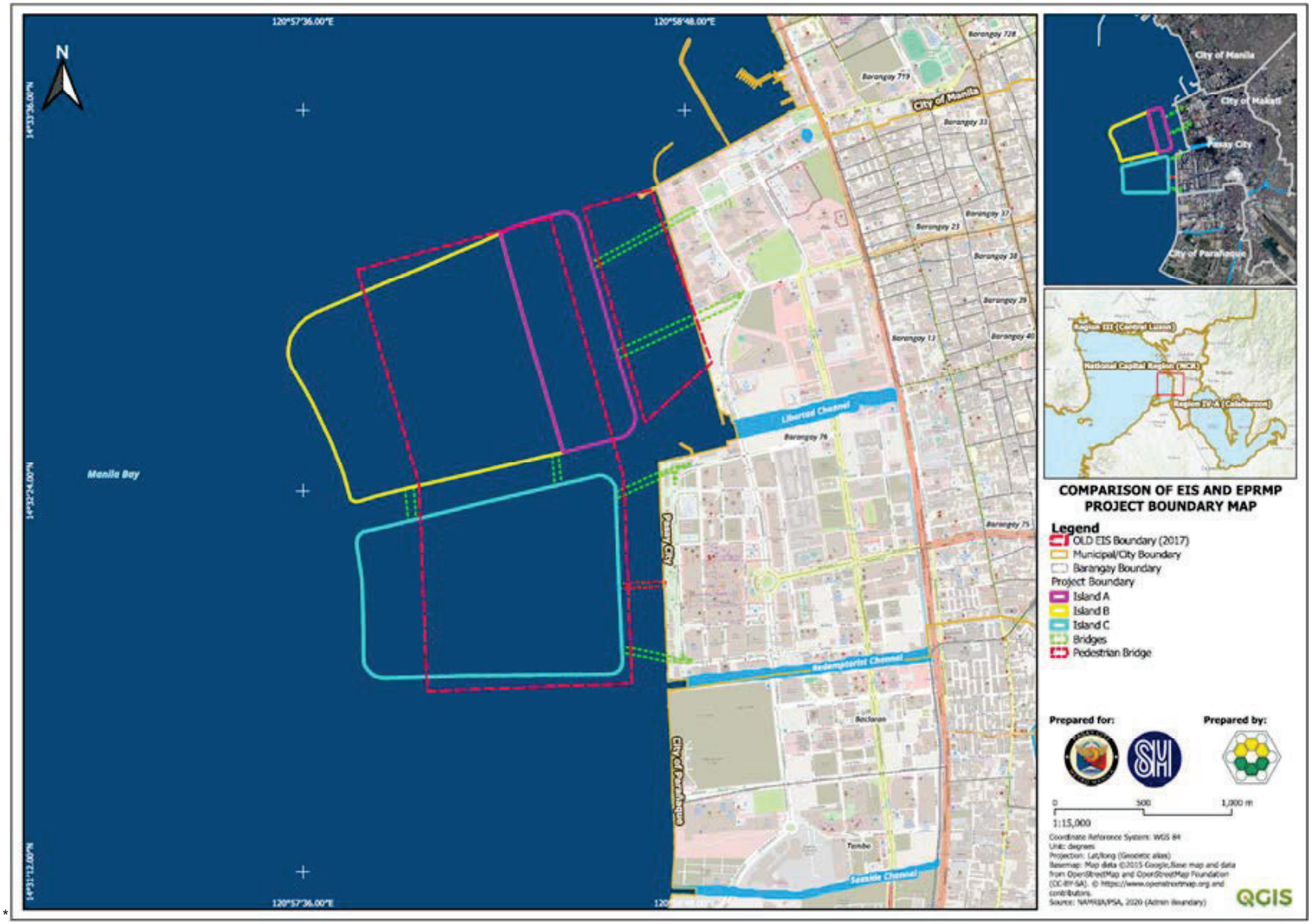


Figure ES.1 Proposed Project Boundary Reconfiguration (EIS 2017 Boundary vs. EPRMP 2024)

Source/ Reference: Open Street Map and NAMRIA/PSA, 2020

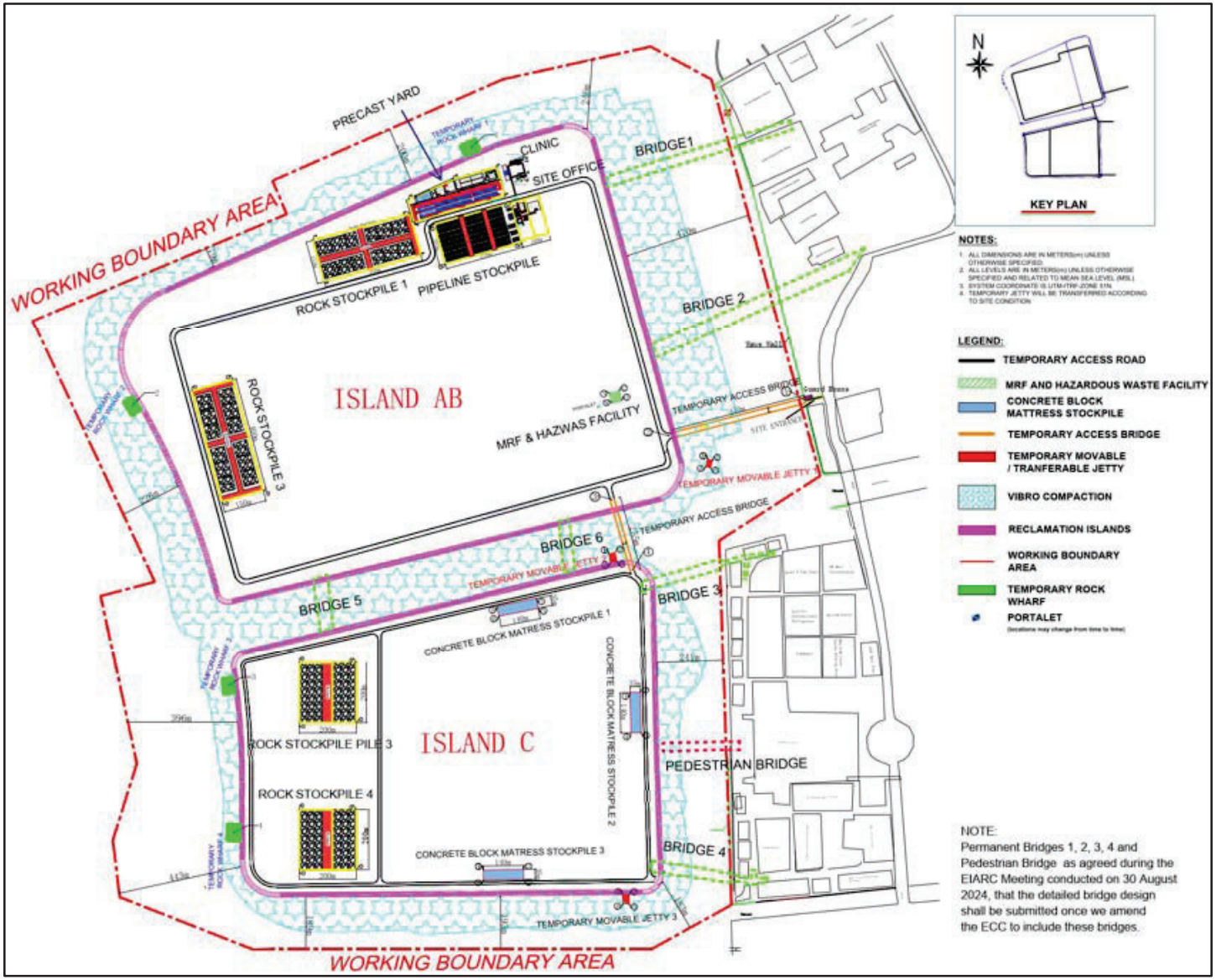


Figure ES.2 Project 360 Schematic / Site Plan including Temporary Support Facilities

Source/ Reference: Open Street Map and NAMRIA/PSA, 2020

ES.2.3 The EIA Methodology

Module	Brief Methodology
Land Use and Classification	Collection and review of the following: • Pasay City Comprehensive Land Use Plan (CLUP) for the period 2014 to 2022; • Comprehensive Land, Water and Air Use Plan (CLWAUP) 2023-2034; • Geotechnical Interpretation Report: Detailed Engineering Design Pasay and Parañaque Reclamation Development; • Engineering Geological and Geohazard Assessment Report of the Project; and • Other Secondary Data Determination of Environmentally Critical Areas (ECA) with reference to EMB Memorandum Circular (MC) 2014-005 Preparation of maps with reference to BWM, MGB, NAMRIA, PAGASA, and PHIVOLCS.
Geology/ Geomorphology/ Geohazards	
Soil and Pedology	Review of Geotechnical Investigation conducted by Universal Testing Laboratory and Inspection, Inc for the Four E-com Building at the Mall of Asia, 2013
Terrestrial Ecology - Flora	Establishment of Two (2) transect lines. Identification of terrestrial ecology species through Stratified Nested-Quadrat Method and Transect Walk.
Terrestrial Ecology - Fauna	
Hydrology/ Hydrogeology	Collection of Secondary Data and Review of the following: • Hydrodynamic and Morphology Modelling Study for Pasay and Parañaque Reclamation Development by Royal HaskoningDHV; • Pasay Reclamation Development Project (PRDP) and Parañaque Reclamation Development (PQRD) Hinterland Flood Risk Study conducted by HaskoningDHV; • EIS for the Proposed 360 Hectares Reclamation Project; and • Other Secondary Data
Water Quality	Grab sampling at 11 marine water quality station in Manila Bay, 1 drainage outfall and 1 sample taken at Libertad channel. The parameters measured are As, BOD5, Chloride, Cr^{6+}, Color, DO, Pb, Hg, NO_3-N, Oil and Grease, Phosphate, Fecal Coliform, TSS, Temp and pH.
Marine Ecology	Two methods were employed to characterize benthic habitats and validate the nature of the seabed: 1) Broad Area Manta Tows, and 2) Spot Dives to Reinforce Validation of Benthic and Substrate Condition
Climate	Collection and review of secondary data from Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA).
Air and Noise Quality	Measurement of 24-hrs TSP, PM10, SO2, NO2 and Noise at 2 sampling stations& 1-hr TSP and Noise at the 5 CMR sampling stations
Socio-economic	Conduct of Information, Education and Communication activities (IEC), Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs). Collection and Review of Secondary Data: Pasay CLUP 2023-2034 (2024); PSA; Pasay City LGU Website; and Other Secondary Data.
Environmental Risk Assessment (ERA) & Emergency Response Policy	Collection and Review of the Project's: • Environmental Emergency Response Plan; • Emergency Response Plan; and • Oil Spill Contingency Plan.
Environmental Compliance	Collection and Review of the Project Submission of the following: • Compliance Monitoring Report (CMR);

Module	Brief Methodology
Monitoring	• Self-Monitoring Report (SMR); and • Compliance Monitoring Validation Report (CMVR).

ES.2.4 Public Participation

Issues/ Concerns during EPRMP Stakeholder Consultation activities such as IEC, Household Survey, etc.)	How it was addressed in the EPRMP
Low fish species supply	Part of Section 5.1 Social Development Program (SDP) -Gender responsive livelihood/employment: • livelihood projects/enhancement, e.g. small-scale fishing, fisherman's wharf, credit program for fisherfolk • Ongoing - weekly financial assistance • Ongoing – livelihood support and clean-up drive
Disruption to their livelihood	
SM has been providing them with livelihood support (financial assistance)	Positive notes.
Monetary and grocery supplies during Christmas or when requested by PLAA	
Other work duties to augment need for income (clean-up drive)	
Pasay City LGU has been providing them support, either financially or provision of fishing materials	
Pasay City LGU is supportive of the needs of Barangay 76 and the rest of the City.	
Since Barangay 76 is a highly urbanized barangay (no urban poor community), the Barangay Chairwoman said that they do not need financial support as of the moment. All other concerns of their residents not in their terms are all forwarded to the City. However, should SM decide to help, they will welcome the provision.	Part of Section 5.1 Social Development Program (SDP)
Expressed support to the modification as it will positively affect the City, income generation and flooding prevention	Included in Section 1.2 Project Rationale
The City has been providing the needed support and services to all its residents. They call it "from womb to tomb" services. No resident will go home empty-handed or request unprovided.	Part of Section 5.1 Social Development Program (SDP)
SM has been the City's partner in providing other financial support to its residents, not only in Barangay 76 but its indirect impact barangays as well.	Part of Section 5.1 Social Development Program (SDP)
Employment Opportunities	Part of Section 5.1 Social Development Program (SDP)
Economic Growth	Part of Section 5.1 Social Development Program (SDP)
Land Expansion	Included in the generation of local benefits.
Business Expansion	Included in the generation of local benefits.
Provision of Facilities	Included in the generation of local

Issues/ Concerns during EPRMP Stakeholder Consultation activities such as IEC, Household Survey, etc.)	How it was addressed in the EPRMP
	benefits.
Tourism/Aesthetics	Included in the generation of local benefits.
Cleanliness	Included in the Waste Management Plan
Peace and Order	Considered in the assessment of threat to health and safety assessment
Effective Barangay /Government Services	Positive notes.
Additional Source of Barangay Income	Included in the generation of local benefits.
Provision of Housing	Included in the accepted SDP (ongoing negotiation for land acquisition for mainland Pasay City socialized housing)
Reliable Project	Positive notes.
Decrease in Fishing Area, Production	Discussed in Marine Ecology section
Flooding	Included in the Hydrodynamic Modelling Studies
Traffic Congestion	Included in the People – Traffic Congestion section
Security Concerns	Considered in the assessment of threat to health and safety assessment
Littering	Included in the Waste Management Plan
Earthquake	Assessed in geohazards section
Overcrowding	The reclaimed land will provide additional land area master-planned for urban development which will provide decongestion of the mainland and proper urban development within the Project
Environmental Destruction	Addressed in the Environmental Management Plan

ES.3 EIA SUMMARY

ES.3.1 Summary of Alternatives Considered in terms of Siting, Technology Selection/Operation Processes and Design

Reclamation Methodology

Among the considerations for selecting the equipment for dredging are availability, efficiency and low turbidity

Grab dredgers are designed for precision dredging, offering reduced disturbances to the marine environment compared to suction dredging methods. They minimize initial turbidity caused by bucket operations during excavation. Unlike Trailing Suction Hopper Dredgers (TSHD), which continuously suction materials, grab dredgers operate in a periodic or cyclic manner, further limiting disruption to the water column.

In terms of noise pollution, grab dredgers generate sound during the bucket's lifting and lowering operations, as well as from the engine. TSHDs, on the other hand, produce noise

from multiple sources, including the suction pipe, engine, pumping mechanism, and propulsion system, making them more likely to contribute to higher noise levels.

The Grab Dredger is the best option aside from the above-mentioned factors on the current project development due to proximity to the mainland and easier to navigate than the other dredging methodology.

For sand filling Pelican Barge and Cutter Suction Dredger and Spreader Pontoon is more environmentally friendly than THSD Rainbowing as plumes of fine sediment takes more time to settle.

Environmental Impact to "With Project" and "No Project"

Environmental Component	No Project	With Project
The Land	No more land spaces to accommodate the growing population	New land spaces will be created New open spaces and green spaces
The Water	Continuous deterioration due to urbanization and commercialization	Monitoring of water will be conducted. With this,
The Air	None	New open spaces / green spaces
The People	Urban congestion Economic stagnation	New job and business opportunities Job creation Rising tourist Continued economic expansion Better social services

Landform Options

Potential Impacts	Option 1 EIS Original Landform Configuration	Option 2 EPRMP Project Configuration
Impact in terms of compatibility with existing land use	The project site is not being used in any of the following water-based activities or projects: • As navigational lane; • As areas for significant or commercial fishing; • As port; • As a water-based settlement (e.g. boat people); • As a source of bulk water supply; and • As a source of commercial/economic supply of fish and other marine species.	
Impacts to terrestrial Ecology	• The reclamation works will be confined at sea • No threatened species were identified	

Potential Impacts	Option 1 EIS Original Landform Configuration	Option 2 EPRMP Project Configuration
Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	20-m wide channel between mainland and Island A No water channel splitting the original Island B which may not be the best option in relation to the Libertad channel	Creating of a more or less 476-meter-wide water channel between the Reconfigured Island A and Pasay City mainland/CCP Complex Area and a water channel in between the original island B, thereby allowing the better free flow of water from Libertad Channel to Manila Bay.
Impacts to Marine Ecology	• Complete absence of corals and reef associated benthic life forms across the proposed reclamation project. • No seagrass beds seen in all manta tows and spot dives • There are no mangroves in or near the proposed reclamation site. The nearest mangroves, albeit more than ±3.15 kilometers away	
	Only 2 small fishing boats observed operating in the impact area with low catch rate of 0.17 kg per fishing hour.	No fishing observed in the impact area.
Considerations to the Potential Impact of the Project to Nearby Communities		
Riverine Flooding	While there are no blockages of water channels, Original Island B is a continuous island.	The proposed reconfigured islands do not block the outlet of existing channels and there is enhancement by providing a water channel in between the reconfigured Island B and C. Reduced flood risk because of the island reconfiguration would result to a wider channel which means less obstruction.
Sedimentation and Coastal Morphology	Bed levels: -4mMSL	No additional hinterland flood risk due to the reconfiguration, having the channels at -6mMSL compared to -4mMSL as originally designed for allows for a larger sedimentation buffer
Coastal Flooding (waves):	Reduced (local) hinterland flood risk due to the reclamation Project.	Reduced (local) hinterland flood risk due to the reconfigured islands

The revised Landform Plan is consistent with Pasay City's Disaster Risk Reduction and Management Plan as it addresses the issues on flooding and storm surge. Flooding has always been a predominant problem of the City, with the root cause for flooding mainly attributable to the clogged/blocked wide water tributaries of the City that flows out to Manila Bay and the country's geographical location within the Typhoon Belt. With intense rainfall, low-

lying areas of the City may be submerged to flooding. During intense rainfall, low-lying areas of the City become susceptible to flooding. Rainwater, which traverses Estero de Paco, Estero de Pandacan in Manila and a portion of Estero de Tripa de Gallina in Makati, as well as the Redemptorist and Seaside Channels are connected to the Libertad Channel, which ultimately discharges to the Manila Bay. Under the PCDRRMP, the City should ensure that these wide waterways should have free flow of water. In line with the above the Original 300-hectare Island B will be split to Reconfigured Islands B and C, thereby creating a ±183-meter channel, which will enhance the free flow of water from Libertad Channel to Manila Bay. The new water channel will provide a much wider drainage area than the Libertad Channel itself and prevent accumulation of water discharge at the mouth of the Libertad Channel. This change in the landform has been duly illustrated in the Development History-Based Geographical Map of the PCDRRMP.

In addition to the creation of a new water channel, the recently approved revised landform further enhanced water circulation by expanding the initial ±20-meter wide channel between the mainland and the Original 60-hectare Island to ±476-meter channel. Similarly, this enhancement is consistent with the governing principles under the 2023-2025 PCDRRMP. Finally, the Revised Landform for the Project, with a final platform land elevation of at least 4 MLLW, a higher elevation than of the low-lying areas in the Pasay City mainland, may even provide for a sheltering effect, where the higher reclaimed area will serve as a barrier to protect the low-lying strip of Manila Bay from the direct impact of storm surges as identified in the PCDRRMP. Moreover, the higher final platform elevation may also reduce the risk of flooding as a result of the barrier, which may protect the existing land from overtopping of water (from waves). As such the PCDRRMP has considered the on-going reclamation projects as among Pasay LGU's strengths in relation to disaster prevention and mitigation and an opportunity for new spatial development

ES.3.2 Summary of Baseline Characterization

Module	Summary of Baseline Data
Land Use and Classification	The Pasay City Comprehensive Land Use Plan (CLUP) for the period 2014 to 2022 provided the spatial strategy to support the development intentions of the city for the plan period. The CLUP conveyed the land reclamation intentions of the Pasay City, and the Pasay 360 is within the planned unit development, special institutional zone, and parks and recreation zones of the 2016 Pasay City Zoning Map. The Pasay City is now in the final stages of updating its Comprehensive Land, Water, and Air Use Plan (CLWAUP) covering the period 2023-2034. The CLWAUP already reflects the reclamation project with SM SCIDC. The proposed project site is surrounded by waters specifically the Manila Bay, and on its right side on the mainland are built-up areas. The project site is not being used in any of the following water-based activities or projects: • As navigational lane; • As areas for significant or commercial fishing; • As port; • As a water-based settlement (e.g. boat people); • As a source of bulk water supply; and

Module	Summary of Baseline Data
	• As a source of commercial/economic supply of fish and other marine species. The nearest legislated protected area and nearest Ramsar site from the Project is the Las Piñas-Parañaque Wetland Park (LPPWP which is at ±3.15 km away. The project site is not situated in any certified Ancestral Domain.
Geology/ Geomorphology/ Geohazards	The bottom topography of Manila Bay is gently sloping from its mouth at about 1 m per km of horizontal distance. The bay is mostly shallow with an average depth of 17 m and about 64 percent of its surface has less than a 10-m depth, mainly at the northern half. The southwestern sector of the Bay is deeper with depths greater than 100 m. Spots of shallow areas, with depth of less than 5 m, are found along the coastline. The project area mainly consists of sedimentary deposits of Quaternary era. This formation is a result of erosion and re-deposition of former sediments which generally consists of unsorted fluvial and river deposits. Both the effects of climate processes and tectonic young activities caused a miscellaneous alluvium of different types, thickness and grain sizes to be formed. The subsoil is generally weak (soft or loose) with thick sequence of Quaternary alluvium made up principally of unconsolidated strata of silty and clayey sand and high plasticity clay. The Project site is located within two (2) environmentally critical areas: (1) geologic hazards and (2) water bodies.
Pedology	The geotechnical investigations/studies were used in assessing the possible subsurface conditions at the project area. The subsurface materials encountered within the 40.0 m depth of drilling can be generalized as consisting of alluvial soils underlain by weathered rocks. This subsurface condition is consistent with the geology of the area, where alluvial sediments (also referred to as Manila Deltaic deposits) are underlain by weathered tuffaceous rocks that belong to the Guadalupe Tuff Formation (GTF), the regional bedrock.
Terrestrial Ecology - Flora	Transect 1 was established along the Original Island A Reclamation Site. Transect 2 was established along the coastal area of Manila Bay in the MOA Seaside. The area was open to the public and a common spot for different activities such as biking, jogging, etc. No threatened species were identified.
Terrestrial Ecology - Fauna	A total of 23 species was observed during the primary survey. Out of all the encountered species, only one (1) was endemic to the Philippines, the Philippine Pygmy Woodpecker (*Picoides maculatus*). The majority of surveyed species belonged to migratory species, having 12 species in total or 52.17%. This was due to the area being located in a coastal area where most migratory species pass through. Moreover, Resident and introduced species amounted to 30.44% and 13.04% of the total encountered species, respectively. No threatened species were identified.
Hydrology/ Hydrogeology	The seabed bathymetry clearly indicates that the water along the coastline of Pasay City is generally shallow which ranges from 3 to 10 meters. Manila Bay is the catchment for numerous river systems that drain the surrounding land areas. In addition to the Pampanga River and Pasig

Module	Summary of Baseline Data
	River, other major rivers discharging directly into Manila Bay are: Meycauayan, Navotas-Malabon-Tullahan-Tenejeros, Talisay (Bataan), Imus (Cavite) and Maragondon (Cavite). Thus, deposition within the Bay is very active. The project does not block, impede nor disturb the drainage system from the Pasay City mainland, and thus has no impact on the occurrence of flooding in Pasay City and nearby areas. The water between the reclamation and the shore and the northern boundary of the other reclamation area provides a much wider drainage area than that of the Libertad Channel itself. Based on the Simulating Waves till Shore (SWASH) results, the new islands will result in a sheltering effect, protecting the existing mainland from direct wave impact. As a result, the flood risk of the existing land due to overtopping water (from waves) will significantly be reduced. In the existing situation without presence of the new islands, during severe storm conditions (typhoon) waves will hit the land in full force. Such waves combined with high water levels (storm surge) result in large quantities of water to overtop the coastal defense, resulting in local flooding of the nearshore areas. The proposed islands will have a positive impact on the hinterland in terms of protection against these waves. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves.
Water Quality	Based on the marine water quality results of 2024 at the Manila Bay sampling stations, all parameters are within the water quality guideline values for Class SB except that some stations have high values of fecal coliform and temperature. Noting the water quality baseline data on 2012 and 2016, high fecal coliform values were also recorded even without the Project. For SW12 at the Libertad Channel as compared with Class C water, the parameters that exceeded the WQG values are BOD, Phosphate, Fecal Coliform and Temperature. This station is located upstream of the Project and the exceedance in water quality values may be attributed with other sources in the upstream. High level of fecal coliforms were also recorded in the EIS 2016 nearest baseline station in SW12. For SW13 at the Drainage outfall, the sampling results were compared to both Class C (Freshwater) and Class C (Effluent) and the results show exceedances in BOD, Color, Phosphate, Fecal Coliform, TSS and Temperature. Note that SW12 and SW13 have no river classification and that the class of water indicated therein is for comparison only.
Marine Ecology	The 2024 surveys revealed the complete absence of corals and reef associated benthic life forms across the proposed reclamation project. Not even coral rubble or remnants of old dead corals in the impact area of the reclamation project were seen, indicating that coral animals have not been existed in the area ever since. There are no mangroves in or near the proposed reclamation site. The nearest mangroves, albeit more than 3.10 kilometers away, are found in the LPPWP. No seagrass communities were found during the two-day survey. Not even

Module	Summary of Baseline Data
	isolated patches of small algal assemblages and associated epiphytes were encountered on the seabed. Except for the presence of mussels (*Perna viridis*) and oysters (*Crassostrea sp*) in the rocky seawall along Island A, no benthic macro-invertebrates were seen in muddy seabed during manta tows, six spot dives and in sediments collected.
Climate	The project site falls under Type 1 climate. This type of climate has two pronounced seasons: • Dry from November to April; and • Wet during the rest of the year (May to October). The Project site is situated in an area traversed by 20 cyclones in 12 years (5 tropical cyclones in 3 years). Based on the Port Area Manila Synoptic Station which is ~3.6 km from the nearest project boundary, the records of rainfall near the project site show the advent of rainy seasons in the month of May, and the peak of rainy reasons on the month of August, while the wettest months are July, August and September. Predicted range of temperature change in NCR in 2050 is 1.8 to 2.1°C while seasonal rainfall change is from -38.5 to 3.7%.
Air and Noise Quality	All ambient air parameters measured in the baseline are within the ambient air guideline values. Stations A1 and A3 exceeded the noise standard limit for evening and nighttime, sources of noise mainly due to the entertainment activities, e.g. band, music and other form of entertainment, that usually start early evening up to late nighttime.
Socio-economic	Pasay is a first class, highly urbanized city with 201 barangays. Based on the 2020 census, Pasay recorded a total population of 440,656 representing 3.27% of the total population of the NCR. The direct impact barangay for this Project is Barangay 76. The population of the barangay is 19,604 in 2020. Pasay City is the so-called "travel city" because of the presence of Ninoy Aquino International Airport. Pasay City is envisioned to be a premiere city and world-class travel destination. It is strategically located on a territory where many shopping malls, hotels, restaurants, casinos, and convention centers are flourishing. The Project site is located offshore and in the proposed reclamation island. Philippine Registry of Cultural Property (PRECUP) Registered Properties and Local Cultural Properties are not located within the proposed Project. Based on the list, there are no cultural registered properties and historical markers within the 1-km buffer from the reclamation islands. The nearest PRECUP in the reclamation Island in the category of Works of National Artist is the Gloria Maris Restaurant which is approximately 500m. On the other hand, based on the list of Pasay City, the multifaceted urban tourism activities include 16 cultural and recreational attractions, 13 historical and cultural heritage spots (3 are NHCP sites), and five (5) crowd

Module	Summary of Baseline Data
	puller cultural and tourism activities. The nearest of which is the Conrad Manila categorizes as cultural and recreational attractions which is approximately 350m away from the nearest Project Boundary. The nearest historical and cultural heritage based on the City is the House of Mr. James C. Rockwell at 1155 F.B. Harrison Street. which is 1.73 km away from the nearest reclamation boundary. **Household Perception Survey to Residents of Barangay 76 Pasay (Sample Size:100)** On project awareness and acceptance, 66% are aware of the 360-hectares reclamation project. Although not all of the respondents know about the project, 95% agreed to having the reclamation project at their barangay for the reasons of perceived opportunities for employment, land expansion, financial and educational assistance, livelihood assistance, reliable infrastructure, support to vulnerable sectors, economic growth, and healthcare assistance. Other respondents mentioned of risks like decrease in fishing area, environmental destruction, flooding, traffic congestion, and overcrowding. **Household Perception Survey to Fisherfolks (Sample Size:30)** On project awareness and acceptance, 73.7% are aware of the 360-hectares reclamation project. Those who are aware have slight understanding of the project (81.8%). Although not all of the respondents know about the project, 80% or 24 respondents agreed to having the reclamation project for the reasons of perceived opportunities for employment, land expansion, financial and educational assistance, livelihood assistance, healthcare assistance, and continuance of fishing activities.

ES.3.3 Concise Integrated Summary of the Main Impacts and Residual Effects after Applying Mitigation

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Residual Impacts
Pre-construction phase	Permitting such as ECC, and PRA Board Resolution, among others)	Impact in terms of compatibility with existing land use Project Delays	Land Use	Secure applicable permits and clearances from the concerned government offices.	Minimal as long as mitigating measures are implemented
	IEC / Stakeholder Consultations	Misinformation / Lack of knowledge about the Project	People	Install project billboards. Conduct IEC campaign. Ensure coordination between Pasay City and JV.	Minimal as long as mitigating measures are implemented
	Geotechnical and Feasibility Study	Possible encroachment in the ECA such as natural hazards, flooding, storm surge, etc. Change in surface landform/geomorphology/ topography/ terrain/slope and change in sub-surface geology/underground conditions Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	Land Use	Preparation, consideration and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others to the Project Design. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines. Installation of vertical containment structure, wave deflector, vertical drains, platform elevation, Prefabricated Vertical Drain (PVD) and Surcharging methods which are part of the Soft Soil and ground improvements Implementation of a storm runoff collection/recycling system for irrigating landscape features within the lot	Minimal as long as mitigating measures are implemented

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Residual Impacts
				boundaries. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years.	
Construction Phase	Hiring of Manpower	Generation of Employment including Gender and Development and Vulnerable Sectors, and Business Opportunities	People	Prioritize hiring of local qualified workers from the direct impact area (DIA) and indirect impact area (IIA). Prioritize local contractors and local suppliers. Coordinate with the LGU's Public Employment Services Office (PESO) with regard to employment of workers/staff.	Enhancement / Positive Impacts
	Construction Phase - Reclamation Works • Dredging works (channel dredging, excavation, dredged material disposal) • Sandkey formation (dredging of sandkey, dredge material disposal, sand replacement) • Sand Filling (Formation of	Silt dispersal; Increase in Turbidity Deterioration of surface water quality Leak/Discharge of oil and/or other hazardous materials from ships and equipment	Water	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed Ensure proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase.	Minimal as long as mitigating measures are implemented

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Residual Impacts
	islands and channels, excavation) • Soil Improvement (Installation of PVDs, Surcharging, Vibro Compaction) • Reclamation Edge Structure • Construction and Installation of Concrete Wave Wall • Decommissioning of Temporary Facilities Related construction activities in temporary working areas			Monitored/ controlled loading and unloading of fill/dredged materials On-site collection and segregation of wastes; strict policy on no shipboard waste disposal at sea	
		Potential contamination with substances in filling materials	Water	Provide appropriate certifications and permits for fill material extraction activities Pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification.	Minimal as long as mitigating measures are implemented
		Potential conflict with PPA	People	Close coordination with Philippine Ports Authority (PPA) and Vessel Traffic Management System (VTMS). Proper implementation of approved Vessel Traffic Management Plan and waterways.	Minimal as long as mitigating measures are implemented
		Potential accidents causing damages to marine ecosystems during transport of dredging vessel	Water	Use of sea-worthy vessel approved by Maritime Industry Authority (MARINA), Philippine Coast Guard (PCG), and appropriate regulatory bodies. Install adequate navigational devices including early warning system. Avoid and stop transport during inclement weather. Implement Typhoon Response Plan. Comply with MARINA, PCG and international regulations. Proper training of vessel crew and personnel.	Minimal as long as mitigating measures are implemented

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Residual Impacts
	Filling of Sand keys in the reclamation area (above water level); Construction of containment structure Construction of support facilities and horizontal development Related construction activities in temporary working areas	Dust pollution emanating from open areas	Air	Conduct dust suppression activities, e.g. green net installation and water truck sprinkling or road spraying (3 times or more as needed per day during dry season)	Minimal as long as mitigating measures are implemented
		Noise pollution from the operation of heavy equipment	Air	Ensure mufflers are installed in all equipment. Conduct regular preventive maintenance servicing.	Minimal as long as mitigating measures are implemented
		Traffic density increase and Traffic-related Accidents (for both marine vessel and land vehicles)	Land People	Implement Traffic Management Plan which includes proper lane designation, speed limit, trucks deployment schedule, traffic signs, CCTV, and traffic marshals among others. Coordinate with the PCG and PPA to prevent navigational routes traffic or collision.	Minimal as long as mitigating measures are implemented
	Construction of temporary access roads/ bridges from mainland to reclaimed area and between the islands	Alteration of water flow	Water	Construction/Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges.	Minimal as long as mitigating measures are implemented

ES.3.4 Risks and Uncertainties Relating to the Findings and Implications for Decision Making

The main risks and uncertainties relating to the findings and implications for decision making are as follows:

Risks and Uncertainties	Action Plan to Prevent Risks
Permitting such as ECC, and PRA Board Resolution, among others)	Compliance with the requirements of PRA and other offices For ECC: Adheres to the comments of the EIA review committee members
Misinformation / Lack of knowledge about the Project	Conduct of continuing IEC
Possible encroachment in the ECA such as natural hazards, flooding, storm surge, etc. and Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	Preparation, consideration and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others to the Project Design. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves. All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines.
Generation of Employment including Gender and Development and Vulnerable Sectors, and Business Opportunities	Prioritize hiring of local qualified workers from the direct impact area (DIA) and indirect impact area (IIA). Prioritize local contractors and local suppliers. Coordinate with the LGU's Public Employment Services Office (PESO) with regard to employment of workers/staff.
Silt dispersal; Increase in Turbidity Deterioration of marine water quality	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximizing control possibilities and minimizing turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed Ensure proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase. Monitored/ controlled loading and unloading of fill/dredged materials

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
ES.1 PROJECT FACT SHEET 1
ES.2 EIA PROCESS DOCUMENTATION 7
ES.3 EIA SUMMARY 13

LIST OF TABLES VII

LIST OF FIGURES XII

LIST OF APPENDICES XVIII

LIST OF ACRONYMS XX

1. PROJECT DESCRIPTION 1-1

1.1. PROJECT LOCATION AND AREA 1-21
1.2. PROJECT RATIONALE 1-27
1.3. PROJECT ALTERNATIVES 1-34
1.3.1. CRITERIA USED IN DETERMINING OPTIONS 1-34
1.3.1.1. SITING 1-34
1.3.1.2. TECHNOLOGY SELECTION/ OPERATION PROCESSES 1-38
1.3.1.2.A. DREDGING TECHNOLOGY 1-38
1.3.1.2.B. SOIL STABILIZATION TECHNOLOGY 1-42
1.3.1.2.C. BREAKWATER AND BULKHEADS 1-45
1.3.1.3. RESOURCES 1-47
1.3.1.3.A. DREDGED MATERIALS 1-47
1.3.1.3.B. POWER AND WATER ALTERNATIVES 1-47
1.3.2. COMPARISON OF ENVIRONMENTAL IMPACTS FOR EACH ALTERNATIVE 1-48
1.3.3. "WITH PROJECT" AND "WITH NO PROJECT" OPTIONS 1-50
1.4. PROJECT COMPONENTS 1-52
1.4.1. MAJOR COMPONENTS 1-56
1.4.1.1. RECLAMATION PHASE 1-56
1.4.1.2. HORIZONTAL DEVELOPMENT PHASE 1-59
1.4.2. TEMPORARY SUPPORT FACILITIES 1-68
1.4.2.1. RECLAMATION PHASE TEMPORARY SUPPORT FACILITIES - OTHERS 1-113
1.4.2.2. HORIZONTAL DEVELOPMENT PHASE TEMPORARY SUPPORT FACILITIES - OTHERS 1-114
1.4.3. POLLUTION CONTROL DEVICES AND WASTE MANAGEMENT SYSTEMS 1-114
1.5. PROCESS TECHNOLOGY 1-114
1.5.1. DESCRIPTION OF THE PROCESSING/MANUFACTURING TECHNOLOGY 1-114
1.5.2. DESCRIPTION OF THE POLLUTION CONTROL DEVICES AND WASTE MANAGEMENT SYSTEM 1-119
1.5.3. DESCRIPTION OF THE OPERATIONS AND MAINTENANCE OF FACILITY 1-131

1.6. PROJECT SIZE 1-131
1.7. DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAMES 1-132
1.7.1. PRECONSTRUCTION PHASE 1-132
1.7.2. CONSTRUCTION PHASE 1-133
1.7.2.1. ISLAND RECONFIGURATION 1-133
1.7.2.1.A. CONSTRUCTION VESSELS AND VEHICLES 1-135
1.7.2.1.B. CONSTRUCTION OF ADDITIONAL SANDKEYS AND SAND FILLING 1-139
1.7.2.1.C. RECLAMATION WORKS 1-141
1.7.2.1.C.1. DREDGING WORKS 1-142
1.7.2.1.C.2. SANDKEY FORMATION 1-143
1.7.2.1.C.3. SAND FILLING 1-144
1.7.2.1.C.4. SOIL IMPROVEMENT 1-146
1.7.2.1.C.5. RECLAMATION EDGE STRUCTURES INSTALLATION 1-147
1.7.2.1.C.6. CONSTRUCTION AND INSTALLATION OF CONCRETE WAVE WALL 1-148
1.7.2.1.D. CONSTRUCTION OF TEMPORARY ACCESS 1-149
1.7.2.1.E. CONSTRUCTION OF HORIZONTAL DEVELOPMENT 1-149
1.7.2.2. OPERATIONAL PHASE 1-149
1.7.2.3. DECOMMISSIONING/ ABANDONMENT/ REHABILITATION 1-150
1.7.2.3.A. AFTER RECLAMATION WORKS 1-150
1.7.2.3.B. AFTER HORIZONTAL DEVELOPMENT 1-150
1.7.2.3.C. ABANDONMENT OF THE PROJECT 1-151
1.8. MANPOWER 1-152
1.9. PROJECT COST 1-154

2. ASSESSMENT OF ENVIRONMENTAL IMPACTS 2-1

2.1. THE LAND 2-1
2.1.1. LAND USE AND CLASSIFICATION 2-1
2.1.1.1. IMPACT IN TERMS OF COMPATIBILITY WITH EXISTING LAND USE 2-1
2.1.1.1.A. BASELINE DATA 2-1
2.1.1.1.B. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-9
2.1.1.2. IMPACT ON COMPATIBILITY WITH CLASSIFICATION AS AN ENVIRONMENTALLY CRITICAL AREA (ECA) 2-12
2.1.1.2.A. BASELINE DATA 2-12
2.1.1.2.B. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-12
2.1.1.3. IMPACT IN EXISTING LAND TENURE ISSUE/S 2-14
2.1.1.3.A. BASELINE DATA 2-14
2.1.1.3.B. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-16
2.1.1.4. IMPAIRMENT OF VISUAL AESTHETICS 2-20
2.1.1.4.A. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-20
2.1.1.5. DEVALUATION OF LAND VALUE AS A RESULT OF IMPROPER SOLID WASTE MANAGEMENT AND OTHER RELATED IMPACTS 2-20
2.1.2. GEOLOGY/ GEOMORPHOLOGY, AND GEOHAZARDS 2-23
2.1.2.1. BASELINE DATA 2-24

2.1.2.1.A. CHANGE IN SURFACE LANDFORM/GEOMORPHOLOGY/ TOPOGRAPHY/ TERRAIN/SLOPE2-24
2.1.2.1.B. CHANGE IN SUB-SURFACE GEOLOGY/UNDERGROUND CONDITIONS 2-29
2.1.2.1.B.1. GEOLOGY OF METRO MANILA 2-29
2.1.2.1.B.2. LOCAL GEOLOGY 2-31
2.1.2.1.B.3. TECTONIC SETTING 2-33
2.1.2.1.B.3.1. SEISMICITY MAP BASED ON THE UBC EARTHQUAKE CODE 2-38
2.1.2.1.B.3.2. POTENTIAL SOURCES OF EARTHQUAKE 2-39
2.1.2.1.B.3.3. ACTIVE VOLCANOES NEAR THE PROJECT AREA 2-41
2.1.2.1.C. INDUCEMENT OF SUBSIDENCE, LIQUEFACTION, LANDSLIDES, MUD / DEBRIS FLOW, ETC. 2-42
2.1.2.1.C.1. HAZARD ASSSESSMENT 2-42
2.1.2.1.C.1.1. GEOLOGIC HAZARD 2-46
2.1.2.1.C.1.2. GROUND ACCELERATION 2-48
2.1.2.1.C.1.3. VOLCANIC HAZARDS 2-66
2.1.2.1.C.1.4. HYDROLOGIC HAZARDS 2-66
2.1.2.1.C.1.4.1. FLOODING 2-66
2.1.2.1.C.1.4.2. STORM SURGE 2-69
2.1.3. SOIL AND PEDOLOGY 2-75
2.1.3.1. BASELINE DATA 2-75
2.1.3.1.A. SOIL EROSION / LOSS OF TOPSOIL/OVERBURDEN AND CHANGE IN SOIL QUALITY / FERTILITY 2-75
2.1.3.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-76
2.1.4. TERRESTRIAL ECOLOGY 2-78
2.1.4.1. BASELINE DATA 2-78
2.1.4.1.A. METHODOLOGY (EPRMP) 2-79
2.1.4.1.A.1. MONITORING STATIONS 2-79
2.1.4.1.B. TERRESTRIAL FLORAL ASSESSMENT 2-82
2.1.4.1.B.1. ESTABLISHMENT OF FLORA SAMPLING STATIONS 2-82
2.1.4.1.B.2. TRANSECT WALK 2-82
2.1.4.1.B.3. IDENTIFICATION OF FLORA SPECIES 2-82
2.1.4.1.C. TERRESTRIAL FAUNA ASSESSMENT 2-83
2.1.4.1.D. DIVERSITY INDICES 2-84
2.1.4.1.E. ENDEMISM 2-85
2.1.4.1.F. CONSERVATION STATUS 2-85
2.1.4.1.G. RESULTS AND DISCUSSION 2-85
2.1.4.1.G.1. DESCRIPTION OF ESTABLISHED TRANSECT LINES 2-85
2.1.4.1.G.1.1. TRANSECT 1 – RECLAMATION AREA 2-85
2.1.4.1.G.1.2. TRANSECT 2 – MOA SIDE 2-86
2.1.4.1.G.2. TERRESTRIAL FLORA 2-87
2.1.4.1.G.2.1. ABUNDANCE OF TERRESTRIAL FLORA 2-88
2.1.4.1.G.3. TERRESTRIAL FAUNA 2-90
2.1.4.1.G.3.1. ABUNDANCE OF SPECIES RICHNESS 2-90
2.1.4.1.G.3.2. DIVERSITY AND EVENNESS INDEX 2-92
2.1.4.1.G.4. ENDECIMITY AND GEOGRAPHIC DISTRIBUTION 2-94
2.1.4.1.G.4.1. TERRESTRIAL FLORA 2-94

2.1.4.1.G.4.2. TERRESTRIAL FAUNA 2-95
2.1.4.1.G.5. CONSERVATION STATUS 2-95
2.1.4.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-95
2.2. THE WATER 2-101
2.2.1. HYDROLOGY/ HYDROGEOLOGY AND OCEANOGRAPHY 2-101
2.2.1.1. BASELINE DATA 2-101
2.2.1.2. COASTAL GEOMORPHOLOGY AND LITHOLOGY 2-104
2.2.1.3. BASELINE OF PASAY CITY DRAINAGE SYSTEM 2-107
2.2.1.4. COASTAL ENVIRONMENT 2-111
2.2.1.5. HYDRODYNAMIC AND MORPHOLOGY MODELLING CONDUCTED BY ROYAL HASKONING DHV 2-121
2.2.1.6. IMPACT ANALYSIS AND ENVIRONMENTAL 2-128
2.2.2. WATER QUALITY 2-133
2.2.2.1. DEGRADATION OF GROUNDWATER QUALITY 2-133
2.2.2.2. DEGRADATION OF SURFACE WATER QUALITY AND DEGRADATION OF COASTAL/MARINE WATER QUALITY 2-133
2.2.2.2.A. BASELINE DATA 2-133
2.2.2.2.B. EIS (2017) BASELINE DATA 2-134
2.2.2.2.C. EPRMP (2024) BASELINE DATA 2-137
2.2.2.2.D. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-154
2.2.2.2.E. MONITORING PLAN 2-161
2.2.3. FRESHWATER ECOLOGY 2-163
2.2.4. MARINE ECOLOGY 2-163
2.2.4.1. BASELINE DATA 2-163
THREAT TO EXISTENCE AND/OR LOSS OF IMPORTANT LOCAL SPECIES AND HABITAT AND THREAT TO ABUNDANCE, FREQUENCY AND DISTRIBUTION 2-164
2.2.4.1.A. 2-164
2.2.4.1.A.1. EPRMP BASELINE DATA – 2024 2-169
2.2.4.1.A.2. SURVEY METHODS AND SURVEY STATIONS 2-170
2.2.4.1.A.2.1. VALIDATION OF PRESENCE OR ABSENCE OF BENTHIC LIFE FORMS (CORALS AND CORAL ASSOCIATED FAUNA) AND TO DEFINE THE NATURE OF THE BENTHIC ENVIRONMENT .. 2-170
2.2.4.1.A.2.1.1. BROAD AREA MANTA TOWS 2-170
2.2.4.1.A.2.1.2. SPOT DIVES TO REINFORCE VALIDATION OF BENTHIC AND SUBSTRATE CONDITION 2-174
2.2.4.1.A.2.2. MANGROVES 2-175
2.2.4.1.A.2.3. SEAGRASS 2-175
2.2.4.1.A.2.4. FISHERIES 2-177
2.2.4.1.A.2.5. MACRO-INVERTEBRATES OF SIGNIFICANCE COMMERCIAL VALUE 2-179
2.2.4.1.A.3. RESULTS OF MARINE ECOLOGY ASSESSMENT 2-183
2.2.4.1.A.3.1. BROAD AREA BENTHIC CHARACTERIZATION – RESULTS OF MANTA TOW SURVEYS, SPOT DIVES AND VALIDATION DIVES ALONG MANTA TOW PATHWAYS 2-183
2.2.4.1.A.3.2. RESULTS OF FISHERIES PROFILING AND DOCUMENTATION OF TWO ACTUAL FISHING OPERATION IN-SITU 2-189
2.2.4.1.A.3.3. MACROINVERTEBRATES 2-194
2.2.4.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT 2-196
2.2.4.3. MONITORING PLAN 2-204

2.3. THE AIR 2-204
2.3.1. METEOROLOGY / CLIMATOLOGY 2-204
2.3.1.1. BASELINE DATA 2-204
2.3.1.1.A. CHANGE IN THE LOCAL MICRO-CLIMATE E.G. LOCAL TEMPERATURE 2-204
2.3.1.1.A.1. CLIMATE 2-204
2.3.1.1.A.2. TROPICAL CYCLONE FREQUENCY AND TROPICAL CYCLONE PATHS 2-205
2.3.1.1.A.3. CLIMATOLOGICAL NORMAL VALUES 2-205
2.3.1.1.A.4. CLIMATOLOGICAL EXTREME VALUES 2-205
2.3.1.1.A.5. CHANGE IN LOCAL CLIMATE 2-211
2.3.1.1.B. CONTRIBUTION IN TERMS OF GREENHOUSE GAS EMISSIONS (OR GHG MITIGATION POTENTIAL) 2-211
2.3.2. AMBIENT AIR QUALITY AND NOISE 2-215
2.3.2.1. BASELINE DATA 2-215
2.3.2.1.A. DEGRADATION OF AIR QUALITY AND INCREASE IN AMBIENT NOISE LEVEL 2-215
2.3.2.1.A.1. EIS (2017) BASELINE DATA 2-216
2.3.2.1.A.2. EPRMP (2024) BASELINE DATA 2-219
2.3.2.1.B. BASELINE DATA IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT PLAN ... 2-223
2.3.2.1.C. MONITORING PLAN 2-224
2.4. THE PEOPLE 2-225
2.4.1. BASELINE DATA 2-225
2.4.2. DISPLACEMENT OF SETTLER/S AND IN-MIGRATION 2-236
2.4.2.1. DEMOGRAPHIC PROFILE OF THE CITY OF PASAY 2-236
2.4.2.1.A. DEMOGRAPHIC PROFILE OF BARANGAY 76 – DIRECT IMPACT BARANGAY 2-242
2.4.2.2. ECONOMIC STRUCTURE 2-246
2.4.2.2.A. INDUSTRIAL 2-247
2.4.2.2.B. AGRICULTURAL 2-247
2.4.2.2.C. EMPLOYMENT 2-247
2.4.2.2.D. COMMERCE AND TRADE 2-248
2.4.2.2.E. POVERTY INCIDENCE 2-251
2.4.2.2.F. LITERACY AND EDUCATION 2-251
2.4.2.2.G. TOURISM 2-255
2.4.3. CULTURAL/LIFESTYLE CHANGE (ESPECIALLY ON INDIGENOUS PEOPLE, IF ANY) AND IMPACTS ON PHYSICAL CULTURAL RESOURCES 2-257
2.4.3.1. CULTURAL AND RECREATIONAL ATTRACTIONS 2-257
2.4.3.1.A. HISTORICAL AND CULTURAL HERITAGE AREAS 2-259
2.4.3.1.B. CULTURAL AND TOURISM ACTIVITIES 2-259
2.4.3.1.C. CULTURAL AND RECREATIONAL ATTRACTIONS 2-260
2.4.4. THREAT TO DELIVERY OF BASIC SERVICES /RESOURCE COMPETITION AND THREAT TO PUBLIC HEALTH AND SAFETY 2-263
2.4.4.1. HEALTH FACILITIES AND PERSONNEL 2-263
2.4.4.1.A. MORBIDITY AND MORTALITY 2-264
2.4.4.1.B. WATER AND SANITATION 2-266
2.4.4.2. ENERGY 2-267
2.4.5. GENERATION OF LOCAL BENEFITS FROM THE PROJECT 2-267
2.4.6. RESULTS OF PERCEPTION SURVEY 2-267
2.4.7. TRAFFIC CONGESTION 2-269

2.4.8. Impact Analysis and Environmental Management 2-269
2.4.9. Monitoring Plan 2-277

3. ENVIRONMENTAL MANAGEMENT PLAN 3-1

3.1. The Land 3-11
3.1.1. Land Use and Classification 3-11
3.1.2. Geology/ Geomorphology 3-12
3.1.3. Pedology 3-13
3.1.4. Terrestrial Ecology 3-16
3.2. The Water 3-19
3.2.1. Hydrology/ Hydrogeology 3-19
3.2.2. Water Quality 3-23
3.2.3. Freshwater Ecology 3-31
3.2.4. Marine Ecology 3-31
3.3. The Air 3-38
3.3.1. Meteorology/Climatology 3-38
3.3.2. Air Quality and Noise 3-43
3.4. The People 3-43

4. ENVIRONMENTAL RISK ASSESSMENT & EMERGENCY RESPONSE POLICY 4-1

4.1. Environmental Risk Assessment (ERA) 4-1
4.1.1. DESCRIPTIVE / QUATLITATIVE RISK ASSESSMENT 4-1
4.1.2. Safety Risks 4-1
4.1.3. Extreme Climate Events 4-3
4.1.4. Release of Toxic Substances 4-4
4.1.5. Physical risks 4-6
4.1.6. Geohazards 4-7
4.2. Emergency Response Plan 4-8
4.2.1. Offshore – emergency 4-8
4.2.1.1. Offshore emergency scenario – personal injuries 4-9
4.2.1.2. Offshore emergency scenario - fire 4-9
4.2.1.3. Offshore emergency scenario – vessel collision 4-9
4.2.1.4. Offshore emergency scenario – oil spill 4-10
4.2.2. Onshore – Construction Site Emergency 4-11
4.2.2.1. Onshore emergency scenario – Fire/ Explosion – Gas Release 4-12
4.2.2.2. Onshore emergency scenario – Medical Emergency 4-13
4.2.2.3. Onshore emergency scenario – Environmental Spill 4-13
4.3. Oil Spill Contingency Plan 4-14
4.3.1. Spill Kits 4-14
4.3.1.1. Type of Spill Kits 4-14
4.3.2. Response 4-15
4.3.2.1. Notifications and Contacts 4-15
4.3.3. Response Procedure 4-17

5. SOCIAL DEVELOPMENT PROGRAM (SDP) FRAMEWORK AND INFORMATION, EDUCATION, AND COMMUNICATION (IEC) IMPLEMENTATION 5-1

5.1. SOCIAL DEVELOPMENT PLAN / FRAMEWORK 5-1
5.2. INFORMATION, EDUCATION AND COMMUNICATION (IEC) PLAN / FRAMEWORK 5-9

6. ENVIRONMENTAL COMPLIANCE MONITORING 6-1

6.1. ENVIRONMENTAL PERFORMANCE BASED ON THE ORIGINAL ECC-COVERED ENVIRONMENTAL MANAGEMENT PLAN 6-1
6.1.1. COMPLIANCE TO ECC CONDITIONS 6-1
6.1.2. COMPLIANCE TO EMP CONDITIONS 6-3
6.1.3. COMPLIANCE TO EMOP CONDITIONS 6-29
6.1.3.1. COMPLIANCE TO AMBIENT AIR AND NOISE MONITORING 6-29
6.1.3.2. COMPLIANCE TO WATER QUALITY MONITORING 6-46
6.1.4. COMPLIANCE TO IEC CONDITIONS 6-55
6.1.5. COMPLIANCE TO SDP CONDITIONS 6-57
6.1.6. COMPLAINTS MANAGEMENT SYSTEM 6-59
6.2. SELF-MONITORING PLAN 6-60
6.3. MULTI-SECTORAL MONITORING FRAMEWORK 6-70
6.4. ENVIRONMENTAL MONITORING AND GUARANTEE FUND 6-72

7. ABANDONMENT / DECOMMISSIONING / REHABILITATION POLICY 7-1

8. INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION 8-1

9. REFERENCES 9-1

LIST OF TABLES

Table 1.1 Project Factsheet 1-2
Table 1.2 Summary of the Proposed Modifications 1-5
Table 1.3 Chronology of ECC Amendment 1-10
Table 1.4 Project Development from 2017 to 2024 1-15
Table 1.5 Sand Sources 1-18
Table 1.6 Direct and Indirect Impact Areas 1-21
Table 1.7 Comparison among Various Dredging Technology 1-38
Table 1.8 Alternatives for Soil Stabilization Methodology 1-42
Table 1.9 Summary of Various Technology Options for Soil Stabilization 1-44
Table 1.10 Power Source Alternatives 1-47
Table 1.11 Water Source Alternatives 1-48

Table 1.12 Alternatives for the Final Land Configuration..... 1-49
Table 1.13 Environmental Impact to "With Project" and "No Project"..... 1-50
Table 1.14 Summary of the Project Components (Updated)..... 1-52
Table 1.15 Inter-Island Bridges (Permanent)..... 1-61
Table 1.16 Components of the Precast Yard..... 1-73
Table 1.17 List of Hazardous Waste..... 1-82
Table 1.18 Comparative Summary of Results of Flushing Study..... 1-110
Table 1.19 List of Permits and Clearances..... 1-132
Table 1.20 Project Timeline for Island Reconfiguration Reclamation Works and Horizontal Development..... 1-134
Table 1.21 Land Construction Vehicles..... 1-135
Table 1.22 Construction Vessels and Vehicles..... 1-136
Table 1.23 Coordinates of Disposal Area outside Manila Bay..... 1-143
Table 1.24 Manpower Requirements..... 1-153
Table 2.1 Existing Land and Water Use of Pasay City..... 2-1
Table 2.2 Proposed Land Use Distribution of Pasay City CLUP (2014-2022)..... 2-2
Table 2.3 Proposed Land Use Distribution of Pasay City (CLWAUP 2023-2034)..... 2-5
Table 2.4 Proposed Land Use Distribution of Pasay City (CLWAUP 2023-2034)..... 2-9
Table 2.5 Impact Analysis and Environmental Management - Impact in terms of Compatibility with Existing Land Use..... 2-11
Table 2.6 List of Environmentally Critical Areas (ECAs)..... 2-12
Table 2.7 Impact Analysis and Environmental Management - Impact on compatibility with classification as an Environmentally Critical Area (ECA)..... 2-13
Table 2.8 Nearest Protected Area from The Project Site..... 2-15
Table 2.9 Impact Analysis and Environmental Management - Devaluation of land value as a result of improper solid waste..... 2-23
Table 2.10: Comparative EIS 2017 and EPRMP 2024 Baseline Data of Geology and Geomorphology..... 2-23
Table 2.11 Characteristics of the Different Zones based on the Studies of PHIVOLCS, et al. 2-36
Table 2.12 Hazard Assessment in the Project Site..... 2-42
Table 2.13 Areas Vulnerable to Strong Ground Shaking in Metro Manila..... 2-46
Table 2.14 Computed Ground Acceleration (using Attenuation Model of Fukushima and Tanaka) for Earthquake Magnitudes of 8.0, 7.8, 7.5, and 7.0 and Different Foundation Conditions..... 2-54
Table 2.15 Storm Surges that Affected Manila Bay..... 2-69
Table 2.16 Impact Analysis and Environmental Management - Geology/ Geomorphology 2-73
Table 2.17 Subsurface Conditions at BH-1..... 2-75
Table 2.18 Subsurface Conditions at BH-2..... 2-75
Table 2.19 Subsurface Conditions at BH-3..... 2-75
Table 2.20 Subsurface Conditions at BH-4..... 2-75
Table 2.21 Subsurface Conditions at BH-5..... 2-75
Table 2.22 Impact Analysis and Environmental Management - Pedology..... 2-76
Table 2.23: Comparative EIS 2017 and EPRMP 2024 Baseline Data of Terrestrial Flora and Fauna..... 2-78
Table 2.24 Coordinates of Each Established Sampling Plot..... 2-80

Table 2.25 The Fernando Biodiversity Scale 2-84
Table 2.26 Species Classification 2-85
Table 2.27 Summary of Result of Terrestrial Flora 2-87
Table 2.28 Checklist of Terrestrial Flora 2-89
Table 2.29 Summary of Results of Terrestrial Fauna 2-90
Table 2.30 Checklist of Terrestrial Fauna 2-93
Table 2.31 Tree Species for Consideration for the Establishment of the Green Spaces 2-97
Table 2.32 Impact Analysis and Environmental Management – Terrestrial Ecology 2-99
Table 2.33: Minor differences due to update with annual maxima from the years after 2015 (2016-2020) 2-102
Table 2.34: DWL with SLR 2-103
Table 2.35: Typhoon Surge Levels 2-103
Table 2.36 Impact Analysis and Environmental Management - Hydrology and Ocenaography 2-130
Table 2.37 Comparison of Water Quality Baseline Data from the EIS 2017 and EPRMP 2024 2-133
Table 2.38: EIS Water Quality Baseline Data (2012 and 2016) 2-136
Table 2.39 Water Quality Analysis Methods and Sampling Bottles 2-137
Table 2.40 Sampling Site Description 2-140
Table 2.41 Surface Water Quality Sampling Results (2024) 2-153
Table 2.42 Impact Analysis and Environmental Management – Water Quality 2-160
Table 2.43 EMoP – Water Quality 2-161
Table 2.44: Comparative EIS 2017 and EPRMP 2024 Marine Ecology Baseline Data 2-163
Table 2.45 Coordinates of Manta Tow Stations Surveyed for Benthic Substrate Characterization (6 April 2024) 2-171
Table 2.46 Coordinates of Spot Dive Stations Surveyed For Benthic Substrate Characterization (April 2024) 2-174
Table 2.47 Coordinates of Actual Fishing Operations of Two Gill Net Fishing Boats (April 2024) 2-177
Table 2.48 Survey Stations for Macro-Invertebrate Sampling in April 2024 2-179
Table 2.49 Results of Manta Tow Benthic Observation Across 15 Manta Tow Stations in a 9-Kilometer Pathway (April 2024) 2-184
Table 2.50 List of Fish Species Caught Along Nearshore Waters in the Vicinity of the Proposed Reclamation Site in Parañaque City Waters 2-190
Table 2.51 List of Macro-Invertebrates Encountered in Survey Stations in the Coastal Impact Area of the Project (April 2024) 2-194
Table 2.52 CSUP/CEMP identified Four Zones 2-199
Table 2.53 Impact Analysis and Environmental Management – Marine Ecology 2-202
Table 2.54 EMoP – Marine Ecology 2-204
Table 2.55 Climatological Normals recorded at Port Area, Manila Synoptic Station (1991-2020) 2-209
Table 2.56 Climatological Extremes recorded at Port Area, Manila Synoptic Station (as of 2023) 2-210
Table 2.57 Seasonal temperature increases (in °C) and rainfall change (in%) in 2020 and 2050 under medium-range emission scenario in NCR 2-211

Table 2.58 Frequency of extreme events in 2020 and 2050 under medium-range emission scenario 2-211
Table 2.59 Items to consider for each Scope of GHG Emissions 2-212
Table 2.60 Activity Data 2-212
Table 2.61 Computed Grid Emission Factors using DOE Power Statistics Data 2-213
Table 2.62 GHG Emission from Purchased Electricity 2-213
Table 2.63 GHG Emission from Fuel Consumption 2-214
Table 2.64 Impact Analysis and Environmental Management – Meteorology/Climatology 2-214
Table 2.65 Comparison of Air Quality and Noise Baseline Data from the EIS 2017 and EPRMP 2024 2-216
Table 2.66: EIS Ambient Air Baseline Data (2013) 2-217
Table 2.67: EIS Noise Baseline Data (2013 and 2014) 2-218
Table 2.68 Methods of Sampling and Analysis 2-219
Table 2.69: Measured 24-hr Ambient Air Concentrations of TSP, PM_{10}, SO_2 and NO_2 (µg/Ncm) 2-221
Table 2.70 24-hr Ambient Noise Level Monitoring Results (dBA) 2-222
Table 2.71: Primary Sources of Noise 2-222
Table 2.72 Impact Analysis and Environmental Management – Air Quality and Noise 2-223
Table 2.73 EMoP – Ambient Air 2-224
Table 2.74 EMoP – Noise 2-225
Table 2.75: Comparative Summary of Socio-Economic Condition of Pasay City 2-226
Table 2.76: Summary of IEC Activities 2-231
Table 2.77 List of Barangays in Pasay City, 2015 and 2020 2-237
Table 2.78 Household Population by Age Group and Sex in Pasay City, 2020 2-242
Table 2.79 Household Age Group by Sex, 2020 2-243
Table 2.80 Barangay 76 Ethnicity, 2020 2-244
Table 2.81 Gainful Workers Population by Sex and Occupation Group, 2015 2-247
Table 2.82 Number of MSMEs in Pasay City, 2016-2020 2-248
Table 2.83 Number of Business Registration per Barangay in Pasay City, 2018-2020 ... 2-250
Table 2.84 Number of Employment per Industry in Pasay City, 2016-2020 2-250
Table 2.85 Educational Attainment of Household Population in Pasay City (5 years old and over), 2020 2-252
Table 2.86 Enrolment in Public and Private Schools, Pasay City SY 2016-2021 2-253
Table 2.87 Public and Private School Institutions in Pasay City, 2022 2-253
Table 2.88 Public and Private School Institutions in Pasay City, 2022 2-253
Table 2.89 Public Schools Personnel and Facilities in Pasay City, 2018 and 2020 2-254
Table 2.90 City Income from Tourism Services in Pasay City, 2017-2021 2-255
Table 2.91 Annual Tourist Arrival in Pasay City, 2017-2021 2-255
Table 2.92 Pasay City Urban Tourism Activities Approximate Distance to the Project 2-256
Table 2.93 Philippine Registry of Cultural Property (PRECUP) Registered Properties and Local Cultural Properties Near the Project Site 2-260
Table 2.94 List of Health Facilities in Pasay City 2022 2-263
Table 2.95 Leading Causes of Morbidity in Pasay City, 2019-2021 2-264
Table 2.96 Leading Causes of Mortality in Pasay City; 2019-2021 2-265
Table 2.97 Water and Sanitation in Pasay City, 2017-2021 2-266

Table 2.98 Main Source of Water Supply for Drinking in Pasay City, 2015 2-266
Table 2.99 Number of Households by Source of Drinking Water, 2018..... 2-266
Table 2.100 Number of Connections and Annual Consumption by Segment in Pasay City, 2012 2-267
Table 2.101 Impact Analysis and Environmental Management – The People..... 2-274
Table 2.102 EMoP – The People..... 2-277
Table 3.1 Relevant Environmental Laws 3-1
Table 3.2 Summary of Changes from EIS 2017 EIS to 2024 EPRMP..... 3-4
Table 3.3 Tree Species for Consideration for the Establishment of the Green Spaces 3-17
Table 3.4 Comparative Summary of Results of Flushing Study 3-22
Table 3.5 CSUP/CEMP identified Four Zones 3-35
Table 3.6 Seasonal temperature increases (in °C) and rainfall change (in%) in 2020 and 2050 under medium-range emission scenario in NCR 3-38
Table 3.7 Frequency of extreme events in 2020 and 2050 under medium-range emission scenario 3-38
Table 3.8 Items to consider for each Scope of GHG Emissions..... 3-39
Table 3.9 Activity Data..... 3-40
Table 3.10 Computed Grid Emission Factors using DOE Power Statistics Data..... 3-40
Table 3.11 GHG Emission from Purchased Electricity 3-41
Table 3.12 GHG Emission from Fuel Consumption 3-41
Table 3.13 Impact Analysis and Environmental Management – Meteorology/Climatology 3-42
Table 3.14 Environmental Management Plan 3-49
Table 3.15 Supplemental Environmental Management Plan for the Construction and Decommissioning of the Temporary Support Facilities 3-74
Table 4.1: Risk Screening Matrix..... 4-1
Table 4.2 Summary Matrix of Safety Risks 4-2
Table 4.3 Seasonal temperature increases (in °C) and rainfall change (in%) in 2020 and 2050 under medium-range emission scenario in NCR 4-3
Table 4.4 Frequency of extreme events in 2020 and 2050 under medium-range emission scenario 4-3
Table 4.5 Identified Scenarios and Potential Impacts of Extreme Climate Events (Safety) . 4-3
Table 4.6 Identified Scenarios and Potential Impacts of Extreme Climate Events (Physical) 4-4
Table 4.7 Recorded and Potential Hazardous Waste During Project Implementation 4-6
Table 4.8 Summary Matrix of Physical Risks..... 4-7
Table 4.9 Types of Oil Spill Kits 4-15
Table 4.10 External Contact List..... 4-16
Table 5.1 Social Development Programs from 2022 to 2024 5-3
Table 5.2 EMB CO duly Accepted Social Development Plan/Framework 5-6
Table 5.3 IEC Campaigns from 2022 to 2024..... 5-10
Table 5.4 IEC Plan/ Framework Based on the EMB CO duly Accepted IEC Plan 5-12
Table 6.1: Compliance to ECC Conditions (2021 to 2024)..... 6-4
Table 6.2: Compliance to EIS EMP Conditions (2022 to 2024)..... 6-20
Table 6.3: EIS Environmental Monitoring Plan for Ambient Air..... 6-30
Table 6.4: EIS Environmental Monitoring Plan (2017) 6-31
Table 6.5: EIS Ambient Air Baseline Data (2013)..... 6-34

Table 6.6: CMR Ambient Air Monitoring Stations 6-35
Table 6.7: CMR Results of Ambient Air Monitoring 6-36
Table 6.8: EIS Environmental Monitoring Plan for Noise 6-37
Table 6.9: EIS Noise Baseline Data (2013 and 2014) 6-38
Table 6.10: CMR Noise Monitoring Stations 6-39
Table 6.11: CMR Results of Noise Level Monitoring (2021 to 2024) 6-40
Table 6.12: EIS Environmental Monitoring Plan for Water Quality 6-47
Table 6.13: EIS Water Quality Baseline Data (2012 and 2016) 6-49
Table 6.14: CMR Water Quality Station – C1 6-50
Table 6.15: CMR Water Quality Station – B1 6-50
Table 6.16: CMR Water Quality Station – B2 6-51
Table 6.17: CMR Water Quality Station – B3 6-51
Table 6.18: CMR Water Quality Station – M1 6-52
Table 6.19: CMR Water Quality Station – M2 6-52
Table 6.20: CMR Water Quality Station – M3 6-53
Table 6.21: CMR Water Quality Station – OF1 6-53
Table 6.22: CMR Water Quality Station – OF2 6-54
Table 6.23: CMR Water Quality Station – OF3 6-54
Table 6.24: Generic IEC Plan/Framework (EIS 2017) 6-55
Table 6.25: Compliance to EIS 2017 Generic IEC Plan/Framework 6-56
Table 6.26: Preliminary Social Development (SDP) Plan/Framework (EIS 2017) 6-57
Table 6.27: Compliance to EIS (2017) SDP Plan/Framework 6-58
Table 6.28: Complaints Management 6-59
Table 6.29: Summary of EMoP Changes from 2017 EIS to 2024 EPRMP 6-61
Table 6.30: Environmental Monitoring Program (Updated for EPRMP) 6-64
Table 6.31: MMT Composition 6-70
Table 6.32: Compliance to MMT (2022 to 2024) 6-71
Table 8.1 EMP Management Roles and Responsibilities 8-4

LIST OF FIGURES

Figure 1.1 Proposed Project Boundary Reconfiguration (EIS 2017 Boundary vs. EPRMP 2024) 1-4
Figure 1.2 Proposed Project Boundary Reconfiguration (EIS 2017 Boundary vs. EPRMP 2024) 1-14
Figure 1.3 Project Vicinity Map 1-23
Figure 1.4 Project Geographic Coordinates Approved by the Philippine Reclamation Authority (PRA) 1-24
Figure 1.5 Project Site Aerial Photo 1-25
Figure 1.6 Nearest Protected Area 1-26
Figure 1.7 EIS Configuration 1-29
Figure 1.8 Suggested channels through the ECC islands configuration 1-29
Figure 1.9 Velocity Magnitude Modelled at Pre-Development 1-30

Figure 1.10 Velocity Magnitude Modelled at Post Development 1-30
Figure 1.11 Channel Bed Levels Between the Reconfigured Islands will be Maintained at a Level 4m Lower Than the Current Channels 1-31
Figure 1.12 Flushing Study Results for the Island Reconfiguration 1-32
Figure 1.13 SWASH Wave Penetration Results for the Island Reconfiguration 1-32
Figure 1.14 Reconfigured Islands and Main Flow Directions 1-36
Figure 1.15 Channel Bed Levels Between the Reconfigured Islands will be Maintained at a Level 4m Lower Than the Current Channels 1-37
Figure 1.16 Sediment Plume Results 1-41
Figure 1.17 Water Channels with Approximate Distance 1-57
Figure 1.18 The Wave Deflector Conceptual Specifications 1-58
Figure 1.19 Conceptual Map Showing the Proposed Parks and Open Spaces 1-60
Figure 1.20 Conceptual Maps Showing the Possible Primary and Secondary Roads, Vehicular and Pedestrian Bridges 1-62
Figure 1.21 Inter-Island Bridge Landing Points 1-63
Figure 1.22 Conceptual Bridge Details 1-64
Figure 1.23 Inter-Island Bridge Schematic/ Site Plan (Bridge 5 and 6) 1-65
Figure 1.24 Conceptual Stormwater Drainage System 1-67
Figure 1.25 Conceptual Design of the Proposed Road Network within the Development . 1-68
Figure 1.26 Project 360 Schematic / Site Plan including Temporary Support Facilities 1-70
Figure 1.27 Temporary Working Areas 1-71
Figure 1.28 Precast Yard Schematic / Site Plan 1-75
Figure 1.29 Site Office Layout 1-77
Figure 1.30 Rock Stockpile Schematic / Site Plan 1-79
Figure 1.31 Pipeline Stockpile Schematic / Site Plan 1-81
Figure 1.32 Location of Materials Recovery Facility and Hazardous Waste Storage 1-86
Figure 1.33 Concrete Block Mattress Schematic / Site Plan 1-88
Figure 1.34 Clinic Schematic / Site Plan 1-91
Figure 1.35 Movable Transferable Jetty front, Vertical and Side View and Elevation 1-94
Figure 1.36 Movable Transferable Jetty Schematic / Site Plan 1-95
Figure 1.37 Rock Wharf Cross Section View 1-97
Figure 1.38 Rock Wharf Schematic / Site Plan 1-98
Figure 1.39 Contract of Lease 1-99
Figure 1.40 DPWH Letter of No Objection 1-100
Figure 1.41 Temporary Access Bridge Between the mainland and Island AB (L: 476m between the mainland and Island AB & L: ±255m between Island AB and C) Schematic / Site Plan .. 1-103
Figure 1.42 Temporary Access Bridge Between the mainland and Island AB (L: 476m between the mainland and Island AB) Concept-level Design 1-104
Figure 1.43 Temporary Access in the CCP Leased Area and DPWH Area Site Layout ... 1-105
Figure 1.44 Temporary Access Bridge Between Island AB and C Schematic / Site Plan 1-108
Figure 1.45 Temporary Access Bridge Between Island AB and C Concept-level Design 1-109
Figure 1.46 Location of Portalets 1-112
Figure 1.47 Simplified Flow Sheet/Diagram for The Reclamation Works 1-118
Figure 1.48 Snippets from IADC: The art of screening: Effectiveness of silt screens 1-122
Figure 1.49 Sediment Plume Results 1-127

Figure 1.50 Typical Cross Section of Revetment 1-140
Figure 1.51 Simplified Flow Sheet/Diagram for The Reclamation Works 1-141
Figure 1.52 Sailing Route to Disposal Area Outside Manila Bay 1-142
Figure 1.53 476m Channel Treatment 1-145
Figure 2.1 Existing Land Use Map of Pasay City (CY 2022) 2-3
Figure 2.2 Proposed Land Use Map of Pasay City (CY 2016-2022) 2-4
Figure 2.3 Proposed Land Use Map of Pasay City (CY 2022) 2-6
Figure 2.4 Land Cover Map 2-7
Figure 2.5 Open Street Map 2-8
Figure 2.6 Nearest Protected Area 2-17
Figure 2.7 Nearest CADT to the Project Site 2-18
Figure 2.8 Pasay City Proposed Land Use Map Showing the Reclamation Projects of Pasay City with Approved ECC 2-19
Figure 2.9 Physiographic Map of Metro Manila 2-26
Figure 2.10 General Topography of the Project Area and its Vicinities 2-27
Figure 2.11 Coastal Landscape of Pasay City – Land Classification 2-28
Figure 2.12 General Geology of Pasay City and its Vicinities 2-30
Figure 2.13 Geologic Map of Metro Manila 2-32
Figure 2.14 Seismic Zone Map of the Philippines 2-35
Figure 2.15 Distribution of Earthquake Generators in the Philippines 2-37
Figure 2.16 Seismic Map of the Philippines based on the UBC Earthquake Code from NSCP 2-38
Figure 2.17 Position of the Project Area with Respect to the West Valley Fault 2-40
Figure 2.18 Location of the Project Area with Respect to Mount Pinatubo and Taal Volcano 2-44
Figure 2.19 Geohazard Assessment Points 2-45
Figure 2.20 Ground Shaking Map of Metro Manila 2-47
Figure 2.21 Intensity Map of July 1990 Earthquake 2-48
Figure 2.22 Ground Acceleration in Soft Soil 2-50
Figure 2.23 Ground Acceleration in Medium Soil 2-51
Figure 2.24 Ground Acceleration in Hard Soil 2-52
Figure 2.25 Ground Acceleration in Rock 2-53
Figure 2.26 Sites of Historical Liquefaction in Metro Manila 2-56
Figure 2.27 Liquefaction Potential in Metro Manila 2-57
Figure 2.28 Liquefaction Potential Areas within the Vicinity of the Project Area 2-58
Figure 2.29 Tsunami Prone Areas in the Philippines 2-62
Figure 2.30 Tsunami Map of Manila Bay 2-63
Figure 2.31 Tsunami Hazard Map of Pasay City 2-64
Figure 2.32 Tsunami Scenario Based on M8.3 Earthquake 2-65
Figure 2.33 Flood Susceptibility and Flood Risk Map 2-68
Figure 2.34 Map of the Storm Surge (Yolanda Strength) 2-71
Figure 2.35 Location of Flora Sampling Stations and Transect Lines 2-81
Figure 2.36 Stratified Nested-Quadrat Method 2-82
Figure 2.37 Transect Walks 2-83
Figure 2.38 Established Plots along Transect 1 2-86
Figure 2.39 Established Plots along Transect 2 2-87

Figure 2.40 Abundance of Terrestrial Flora 2-88
Figure 2.41 Terrestrial Flora Photos Taken During the Survey (2024) 2-89
Figure 2.42 Abundance of Terrestrial Fauna On-site 2-91
Figure 2.43 Abundance of Terrestrial Fauna per Transect 2-92
Figure 2.44 Species Richness of Terrestrial Fauna per Transect 2-92
Figure 2.45 Diversity Index of Terrestrial Fauna per Transect 2-93
Figure 2.46 Terrestrial Fauna Photos Taken During the Survey (2024) 2-94
Figure 2.47 Geographic Distribution of Terrestrial Flora 2-95
Figure 2.48 Residency of Terrestrial Fauna 2-95
Figure 2.49 Suggested Mangrove Species 2-98
Figure 2.50 Bathymetry Near the Project Area 2-101
Figure 2.51 Hydrodynamic Modelling – Comparison 2017 – 2024 2-102
Figure 2.52 Wave output locations from 2017 (purple) and from 2024 (black) 2-104
Figure 2.53 General Morphology and Bathymetry of Manila Bay 2-106
Figure 2.54 Libertad – Tripa de Gallina Drainage System 2-110
Figure 2.55 Observed Tidal Heights (m) in Manila Bay for January 2010 2-113
Figure 2.56 Comparison of Observed and Modeled Tidal Heights (m) - (black and red lines, respectively) 2-115
Figure 2.57 Predicted Flow Velocity Filed Under Amihan Wind Condition 2-116
Figure 2.58 Predicted Flow Velocity Field Under Windy Condition (Habagat) 2-117
Figure 2.59 Predicted Wave Direction (shown in arrows) and Significant Wave Heights (shown as contours, in meters) during Storm Event for the Existing Coastal Configuration 2-119
Figure 2.60 Predicted Wave Direction (shown as arrows) and Significant Wave Heights (shown as contours, in meters) during Storm Event, with the Reclamation Project 2-120
Figure 2.61 Report Structure and Outputs for Design Purposes 2-122
Figure 2.62 Original and Reconstructed Tidal Signal 2-126
Figure 2.63 Residual Tidal Signal 2-126
Figure 2.64 Original and Reconstructed Tidal Signal After Adjustments To The Original Timeseries 2-126
Figure 2.65 Residual Tidal Signal After Adjustments to the Original Timeseries 2-127
Figure 2.66 Linear Sea Level Rise Trend at Manila Bay derived using UTide 2-127
Figure 2.67 Water Quality Baseline Stations in 2012 and 2016 2-135
Figure 2.68 Water Quality Sampling Stations (2024) 2-139
Figure 2.69 Sediment Plume Results 2-158
Figure 2.70 The Proposed 360-Hectare Reclamation Project in Pasay City Waters in Manila Bay Source: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024 2-166
Figure 2.71 Results of Manta Tows and Spot Dives in 2014 Showing Silt, Sand, Mud and Bits of Shellfish Carapace in the Seafloor of the Proposed Pasay 360 ha Reclamation Area 2-167
Figure 2.72 Seabed Spot Dives Results in Five (5) Survey Points During the Previous Study Conducted in February 2020 2-168
Figure 2.73 Spot Dives with Scuba and Manta Tow Survey in Contiguous Observation Pathways (April 2024) 2-171
Figure 2.74 Manta Tow Observation Pathways Surveyed for Benthic Life Form and Substrate Characterization (6 to 7 April 2024) 2-172

Figure 2.75 Map Showing Manta Tow Survey Stations Investigated in the previous study (13 to 14 August 2014) 2-173
Figure 2.76 Manta Tow with Tuck Dive (Left) and Diver with Underwater Torch for Spot Divers in Turbid Waters (April 2024) 2-174
Figure 2.77 Location of Spot Dives Stations (April 2024) 2-176
Figure 2.78 Actual Fishing Operations of Two Small-Scale Fishermen 2-177
Figure 2.79 Location of Actual Fishing Documentation for Sampling of Catch Composition and Catch Per Unit Effort (CPUE) (April 2024) 2-178
Figure 2.80 Location of Sampling Stations for Macro-Invertebrates (April 2024) 2-181
Figure 2.81 (April 2024 Fishing Structures Map) 2-182
Figure 2.82 Substrate Composition Across Ten (10) Manta Tows and Six (6) Spot Dive Stations 2-183
Figure 2.83 Substrate in the Seabed Seen During Manta Tows and Spot Dives were Completely Comprised of Silt and Mud 2-184
Figure 2.84 Substrate in the Seabed Seen During Spot Dives (April 2024) 2-186
Figure 2.85 Results of Spot Dives in Six Stations Revealed Substrate Comprise of 100% Silt and Mud (2024) 2-188
Figure 2.86 Small-scale Fisherman 2-190
Figure 2.87 Stationary Fishing Gears (April 2024) 2-191
Figure 2.88 Common Species of Fish Caught During Actual Fishing Documentation (April 2024) 2-192
Figure 2.89 Results of Actual Fishing Documentation in a Map Showing Locations (April 2024) 2-193
Figure 2.90 Macro-invertebrates found in the rock seawall of SM Mall of Asia (April 2024) .. 2-194
Figure 2.91 Macro-invertebrates Found in the Rocky Seawall of SM Mall of Asia (April 2024) 2-195
Figure 2.92 Climate Map of the Philippines 2-206
Figure 2.93 Tropical Cyclone Frequency Map of the Philippines 2-207
Figure 2.94 Nearest PAGASA Synoptic Station 2-208
Figure 2.95 Ambient Air and Noise Sampling Station Map 2-220
Figure 2.96 Photo Documentation of IEC Activities 2-234
Figure 2.97 Photo Documentation of Household Survey (3 and 5 September 2024) 2-235
Figure 2.98 Age-Sex Pyramid of Household Population in Pasay City 2-237
Figure 2.99 Household Marital Status, 2020 2-246
Figure 2.100 Business License Renewal and New Registration in Pasay City 2-249
Figure 2.101 PRECUP Registered Properties and Local Cultural Properties 2-262
Figure 3.1 Suggested Mangrove Species 3-19
Figure 3.2 Snippets from IADC: The art of screening: Effectiveness of silt screens 3-25
Figure 3.3 Sediment Plume Results 3-29
Figure 4.1 Summary of Response Guide for Oil Spill Scenario 4-17
Figure 4.2 Environmental Emergency Procedures during Leakage 4-18
Figure 4.3 Environmental Emergency Procedures during Land Spill of any Hazardous Material 4-19
Figure 5.1 Social Development Strategy Vision 5-1
Figure 5.2 Social Development Strategy Vision 5-2

Figure 5.3 Draft Final Strategic IEC Plan..... 5-10
Figure 6.1 Water Quality EIS and CMR Monitoring Stations..... 6-48
Figure 6.2 Proposed EMoP Stations (Air&Noise) 6-68
Figure 6.3 Proposed EMoP Stations – Water Quality Stations 6-69
Figure 8.1 Environmental Unit / Organizational Chart for the Project Implementation..... 8-3

LIST OF APPENDICES

Appendix A Proof of Authority Over the Project Site

- A.1 Memorandums of Agreement ("MOA") between Philippine Reclamation Authority ("PRA") and the City Government of Pasay ("Pasay City") on which the total land area to be reclaimed is 360 hectares.
- A.2 Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc (60 and 300 ha)
- A.3 Area Clearance: AC-NCR-2019-003
- A.4 ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017
- A.5 BFAR Authorization to implement the Comprehensive Coastal and Sea Use Plan
- A.6 PRA Board Resolution Series of 2024

Appendix B Sworn Statement Accountability of The Proponent

Appendix C Sworn Statement of Accountability of The Preparers

Appendix D Project Geographic Coordinates Approved by PRA

Appendix E Geotechnical Studies

- E.1 Geohazard Assessment (HazardHunterPH)
- E.2 Geotechnical Interpretation Report

Appendix F Water Quality Laboratory Certificates

Appendix G Ambient Air and Noise Report

Appendix H Graphs Results of Manta Tow Benthic Observations Pathways (April 2024)

Appendix I Project Environmental Monitoring and Audit Prioritization Scheme

Appendix J Hydrodynamic Modelling Study

Appendix K Flooding Impact Study

Appendix L DENR EMB Letter Dated 21 Jun 2024 – Submission of EPRMP and Pasay City Endorsement of Response to JV Partner for the Submission of EPRMP

Appendix M Proof of SMR and CMR Submissions

- M.1 SMR and CMR Submissions
- M.2 SMR and CMR Annex Download Link

- M.3 Pasay Authorization to the Contractor

Appendix N Proof of EPRMP Public Participation

Appendix O Permits and Clearances
- O.1 Hazardous Waste Generator's Certificate
- O.2 LLDA Clearance
- O.3 PCG approved Oil Spill Contingency Plan
- O.4 Permit to Operate of Generator Sets
- O.5 Special Waste Permit to Dump/ Discharge Waste &/ OR Other Matter

Appendix P Sediment Plume Modelling

Appendix Q Household Perception Survey

Appendix R EPRMP Checklist

Appendix S Turbidity Management Plan

Appendix T Supplemental Information Report

- Annex A - Email from EMB re Supplemental Information for the 360-Hectare Pasay Reclamation Project and Acknowledgement Receipt for the First Submission of the Supplemental Information Report
- Annex B - Supplemental Information Report Version 2 Submission to DENR EMB on 21 October 2024
- Annex C - Proof of Authority Over the Temporary Access Road
  - CCP Contract of Lease
  - DPWH Letter of No Objection
  - CHEC Letter to DPWH
- Annex D - Flushing Study: Verification of Flushing Time for Pasay 360 Temporary Access Bridges

LIST OF ACRONYMS

AAS	Atomic Absorption Spectrophotometry
AD	Activity Data
AED	Automated External Defibrillator
AI	Additional Information
ALS	Alternative Learning System
APCD	Air Pollution Control Device
APSI	Air Pollution Source Installation
APSE	Air Pollution Source Equipment
BFAR	Bureau of Fisheries and Aquatic Resources
BFP	Bureau of Fire and Protection
BMB	Biodiversity Management Bureau
BPLO	Business Permit and Licensing Office
BOD	Biochemical Oxygen Demand
CADC	Certificate of Ancestral Domain Claim
CADT	Certificate of Ancestral Domain Title
CCO	Chemical Control Order
CCP	Cultural Center of the Philippines
CCTV	Closed-circuit Televisions
CHO	City Health Office
CDM	Clean Development Mechanism
CEMP	Coastal Ecosystem Management Plan
CENRO	Community Environment and Natural Resources Office
CPDO	City Planning and Development Office
CHEC	China Harbour Engineering Company
CHED	Commission on Higher Education
CJVA	Contractual Joint Venture Agreement
CLWAUP	Comprehensive Land, Water and Air Use Plan
CLUP	Comprehensive Land Use Plan
CMCI	Cities and Municipalities Competitiveness Index
CMR	Compliance Monitoring Report
CMVR	Compliance Monitoring Validation Report
CON	Contractor

COT	Certificate of Treatment
CPH	Census of Population and Housing
CPT	Cone Penetration Test
CPUE	Catch per unit effort
CSD	Cutter Suction Dredger
CSR	Corporate Social Responsibility
CSUP	Coastal and Sea Use Plan
CSTF	Centralized Sewage Treatment Facility
CSWD	City Social Welfare and Development
DAO	DENR Administrative Order
dBA	Decibels
dbh	Diameter at breast height
DED	Detailed Engineering Design
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DOF	Department of Finance
DHSUD	Department of Human Settlements and Urban Development
DIA	Direct Impact Area
DMC	DENR Memorandum Circular
DOH	Department of Health
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
E-NIPAS	Expanded National Integrated Protected Areas System
ECA	Environmentally Critical Areas
ECC	Environmental Clearance Certificate
EGGAR	Engineering Geological and Geohazard Assessment Report
EGF	Environmental Guarantee Fund
ENRO	Environment and Natural Resources Office
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EKG	Electrocardiogram
EMB	Environmental Management Bureau

EMMoP	Environmental Management and Monitoring Plan
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
ERA	Environmental Risk Assessment
ERDB	Ecosystems Research and Development Bureau
EPRMP	Environmental Performance Report and Management Plan
ERC	Environmental Response Committee
ERP	Emergency Response Plan
ERT	Emergency Response Team
ES	Elementary School
EU	Environmental Unit
EQPL	Environmental Quality Performance Levels
FGD	Focused Group Discussion
FIES	Family Income and Expenditure Survey
GAA	Government Appropriations Act
GD	Geographic distribution
GD	Grab Dredger
GES	General Effluent Standards
GHG	Greenhouse Gas
GRM	Grievance Redress Mechanism
GSIS	Government Service Insurance System
GSQP	Government Seabed Quarry Permit
GTF	Guadalupe Tuff Formation
HAB	Harmful Algal Bloom
HAP	Hazardous Air Pollutant
HAT	Highest Astronomical Tide
HDPE	High Density Polyethylene
HIV	Human Immunodeficiency Virus
HPV	Human Papillomavirus
HS	High School
HSE	Health Safety and Environment
HW	Hazardous Waste
IEC	Information, Education and Communication
IMP	Impact Management Plan

IIA	Indirect Impact Area
IP	Indigenous People
IPCC	Intergovernmental Panel on Climate Change
IRR	Implementing Rules and Regulation
ISF	Informal Settler Families
ISM	International Safety Management
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
JV	Joint Venture
KI	Key Informant
KII	Key Informant Interview
KSK	Kabalikat sa Kabuhayan
KSCC	Kwan Sing Construction Corporate
LBE	Land Based Equipment
LED	Light-emitting Diode
LGBTQIA+	Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex Asexual
LGU	Local Government Unit
LLDA	Laguna Lake Development Authority
LONO	Letter of No Objection
LPPCHEA	Las Piñas-Parañaque Critical Habitat and Ecotourism Area
LPPWP	Las Piñas-Parañaque Wetland Park
LUC	Local Universities and Colleges
MAMSL	Meters above mean sea level
MARINA	Maritime Industry Authority
masl	meters above sea level
MBSDMP	Manila Bay Sustainable Development Master Plan
MC	Memorandum Circular
MCCRRP	Manila-Cavite Coastal Road and Reclamation Project
MDP	Master Development Plan
MENRO	Municipal Environment and Natural Resources Office
MERALCO	Manila Electric Railroad and Light Company
MGB	Mines and Geosciences Bureau
MHO	Municipal Health Office
MMLW	Mean Lower Low Water

MMT	Multi-Partite Monitoring Team
MMR	Meet-me rooms
MOA	Memorandum of Agreement
MOA	SM Mall of Asia
MOO	Manual of Operations
MRF	Materials Recovery Facility
MSME	Micro, Small and Medium Enterprises
MWSS	Metropolitan Water and Sewerage System
NAAQGV	National Ambient Air Quality Guideline Values
NAAQS	National Ambient Air Quality Standards
NAMRIA	National Mapping and Resource Information Authority
NCCA	National Commission for Culture and the Arts
NCR	National Capital Region
NE	North East
NEDA	National Economic and Development Authority
NGEF	National Grid Emission Factor
NGO	Non-Government Organization
NHA	National Housing Authority
NHCP	National Historical Commission of the Philippines
OAA	National Oceanic and Atmospheric Administration
OCM	Overhead, Contingencies. and Miscellaneous
OSCA	Office for Senior Citizens Affairs
OSH	Occupational Safety and Health
OSHC	Occupational Safety and Health Center
OSHS	Occupational Safety and Health Standards
NOAA	National Oceanic and Atmospheric Administration
NOAH	Nationwide Operational Assessment of Hazards
NGP	National Greening Program
NPCC	National Pollution Control Commission
NRM	Non-Rebreather Masks
NSCP	National Structural Code of the Philippines
NTCARW	Notice to Commence Actual Reclamation Work
NTM	Notice to Mobilize
NTP	Notice to Proceed

ODS	Ozone-Depleting Substances
OHSMP	Occupational Health and Safety Management Plan
OP	Office of the President
OPMS	Online Permitting Monitoring System
OPMBCS	Operational Plan of Manila Bay Coastal Strategy
ORP	Oxidation Reduction Potential
OSCP	Oil Spill Contingency Plan
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PAGCOR	Philippine Amusement and Gaming Corporation
PAO	Presidential Administrative Order
PAR	Philippine Area of Responsibility
PaST	Paleontological Statistics
PB	Pelican Barges
PC	Pasay City
PCATA	Pasay City Alliance of Tourism Advocates
PCB	Polychlorinated Biphenyls
PCDRRMP	Pasay City Disaster Risk Reduction Management Plan
PCG	Philippine Coast Guard
PCGH	Pasay City General Hospital
PCL	Priority Chemical List
PCO	Pollution Control Officer
PCR	Physical Cultural Resources
PD	Presidential Decree
PEMAPS	Project Environmental Monitoring and Audit Prioritization Scheme
PEISS	Philippine Environmental Impact Statement System
PENRO	Provincial Environment and Natural Resources Office
PESO	Public Employment Service Office
PHCC	Pasay Harbor City Corporation
PFZ	Philippine Fault Zone
PGA	Peak Ground Acceleration
PSWD	Provincial Social Welfare and Development Office
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PICC	Philippine International Convention Center
PLAA	Pasay Libertad Anglers Association

PLANADES	Planning and Development Research Foundation, Inc.
PNCC	Philippine National Construction Corporation
PMB	Philippine Mobile Belt
PNP	Philippine National Police
POPCEN	Census of Population
PPA	Programs, Projects and Activities
PPA	Philippine Ports Authority
PPE	Personal Protective Equipment
PQRD	Parañaque Reclamation Development
PRA	Philippine Reclamation Authority
PRDP	Pasay Reclamation Development Project
PRECUP	Philippine Registry of Cultural Property
PSA	Philippine Statistics Authority
PSP	Paralytic Shellfish Poisoning
PTO	Permit to Operate
PTTC	Philippine Trade Training Center
PUD	Planned Unit Development
PVD	Prefabricated Vertical Drain
PWD	Person With Disability
RA	Republic Act
RHU	Rural Health Unit
RIDF	Rainfall Intensity Duration and Frequency
RMS	Regulatory Management System
ROS	Roads and Open Spaces
ROLA	Result of Laboratory Analysis
RROW	Road Right-of-Way
SA	Semi-Annual
SCEMP	Sustainable Ecosystem Management Plan
SDMP	Social Development and Management Program
SDP	Social Development Plan
SEF	Special Education Fund
SM SCIDC	SM Smart City Infrastructure and Development Corporation
SMR	Self-Monitoring Report
SNS	San Nicholas Shoal

SOLAS	Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
SPES	Special Program for Employment of Students
SSC	Suspended Sediment Concentration
SSEN	Safety, Security and Environmental Numbering (SSEN)
SSS	Social Security System
STP	Sewage Treatment Plant
SUC	State Universities and Colleges
SW	South West
SWAN	Simulating Waves Nearshore
SWASH	Simulating Waves till Shore
TA	Total Area
TCIC	Take Care I Care
TCLP	Toxicity Characteristic Leaching Procedure
TESDA	Technical Education and Skills Development Authority
TMP	Turbidity Management Plan
TSD	Treatment Storage and Disposal
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
TUPAD	Tulong Pang Hanapbuhay Para sa Ating Disadvantaged Workers
UBC	Uniform Building Code
UDHO	Urban Development and Housing Office
UFI	Union des Foires Internationales
UNESCO	United Nations Educational, Scientific and Cultural Organization
UP NOAH	University of the Philippines Nationwide Operational Assessment of Hazards
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UFI	*Union des Foires Internationales*
UTI	Urinary Tract Infection
UTide	Unified Tidal Analysis and Prediction Functions
UXO	Unexploded Ordinance
VAT	Value Added Tax
VTMS	Vessel Traffic Management System
WBCSD	World Business Council for Sustainable Development

WRI	World Resources Institute
WSP	Waste Service Provider
WTCA	World Trade Center Association
WTCMM	World Trade Center Metro Manila
WTP	Waste Treatment Plant
WQG	Water Quality Guidelines
WVFS	West Valley Fault System

1. PROJECT DESCRIPTION

Background

The Pasay City Government or the "City" through its Joint Venture (JV) partner, the SM Smart City Infrastructure and Development Corporation (SM SCIDC), intends to reconfigure the physical layout of its Project referred to as "reclamation and horizontal land development of three hundred sixty (360) hectares" or the "360-hectare Reclamation Project" (the "Pasay 360" Project) under the original ECC (ECC-CO-1601-0003). The Project is described in the ECC as follows:

> *"The project shall cover the reclamation and horizontal land development of three hundred sixty (360) hectares along the Coast of Manila Bay, City of Pasay. The project is bounded by the coordinates as listed in its Environmental Impact Statement (EIS).*
>
> *The proposed project will include construction of major/primary internal access roads and bridges, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems."*

The reconfiguration of Pasay 360 aims to enhance water circulation and mitigate potential flooding. This Environmental Performance Report and Management Plan (EPRMP) provides the summary of the Project's implementation of its environmental management measures, and the updates on the potential impacts and management plan based on the planned reconfiguration. In compliance with EMB CO's directive as provided in its letter dated 24 January 2024, the EPRMP includes:

- Sketch Plan based on the final landform of the 360-Hectare Pasay Reclamation Project (Appendix D);
- Hydrodynamic Modelling Study for the proposed land reconfiguration and adjacent reclamation projects (Appendix J);
- Flooding Impact Study (Appendix K); and
- Copy of the Philippine Reclamation Authority (PRA) Board Resolution No 5864, series of 2024 (Appendix A.6)

To provide technical assistance in the joint venture, the SM SCIDC has engaged the services of the Planning and Development Research Foundation, Inc. (PLANADES) for the preparation of the EPRMP for submission to the EMB. PLANADES will likewise provide assistance during the technical review of the EPRMP by the EMB EIA Review Committee.

Table 1.1 Project Factsheet

Project Name	360-hectare Reclamation Project (Pasay 360 Project)	
Project Location	Along the waters of Manila Bay in Barangay 76, Pasay City, Metro Manila, Philippines	
Nature of Project	3.3 Reclamation and Other Land Restoration Projects greater than 25 hectares	
Project Capacity/Size	360 hectares	
Project Components	Reclamation islands • Island A: ± 60 ha (600,000 sq. m.) • Island B: ± 153.5684 ha (1,535,684 sq. m) • Island C: ± 146.4316 ha (1,464,316 sq. m.) Major/primary internal access roads and bridges, vertical containment structure, wave deflector, water channels, fill materials, among others. Support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems. Horizontal Development such as open spaces, parks, access bridges and the inter-island connecting roads and bridges, drainage systems (temporary drainage during construction, storm drainage system, individual and/ or centralized treating system(s)). Temporary Support Facilities such as Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets, among others.	
Area Clearance	AC-NCR-2019-003 issued by DENR Central Office on 15 August 2019	
ECC Application	Amendment of ECC-CO-1601-0003 issued by DENR EMB Central Office on 24 October 2017	
Project Proponent:	Pasay City Government or the "City"	
Joint Venture Partner	SM Smart City Infrastructure and Development Corporation	
Office Address of the Project Proponent:	City Government of Pasay Pasay City Hall F.B. Harrison Street, Pasay City	
Contact Person/ Designation:	Atty. Severo Cañete Madrona Jr. City Legal Officer	Atty. Leah Quiambao JV Managing Head Raymond Cabanilla, EnP JV Pollution Control Officer
Contact Information:	09998813054 scmadrona@gmail.com	leah.quiambao@smsmartcity.com mon.cabanilla@smsmartcity.com
EPRMP Preparer:	Planning and Development Research Foundation, Inc. (PLANADES)	
Office Address of the Preparer:	SURP Building, E. Jacinto St., University of the Philippines-Diliman Quezon City, Philippines 11101	
Contact Person/ Designation:	Jose M. Regunay, PhD Team Leader/ Environmental Management Specialist	
Contact Information:	jmregunay@gmail.com	

The sworn statements of the proponent and the preparer can be found in Appendices B and C, respectively.

Summary of Proposed Modifications

The summary of the proposed modification is presented in Table 1.2.

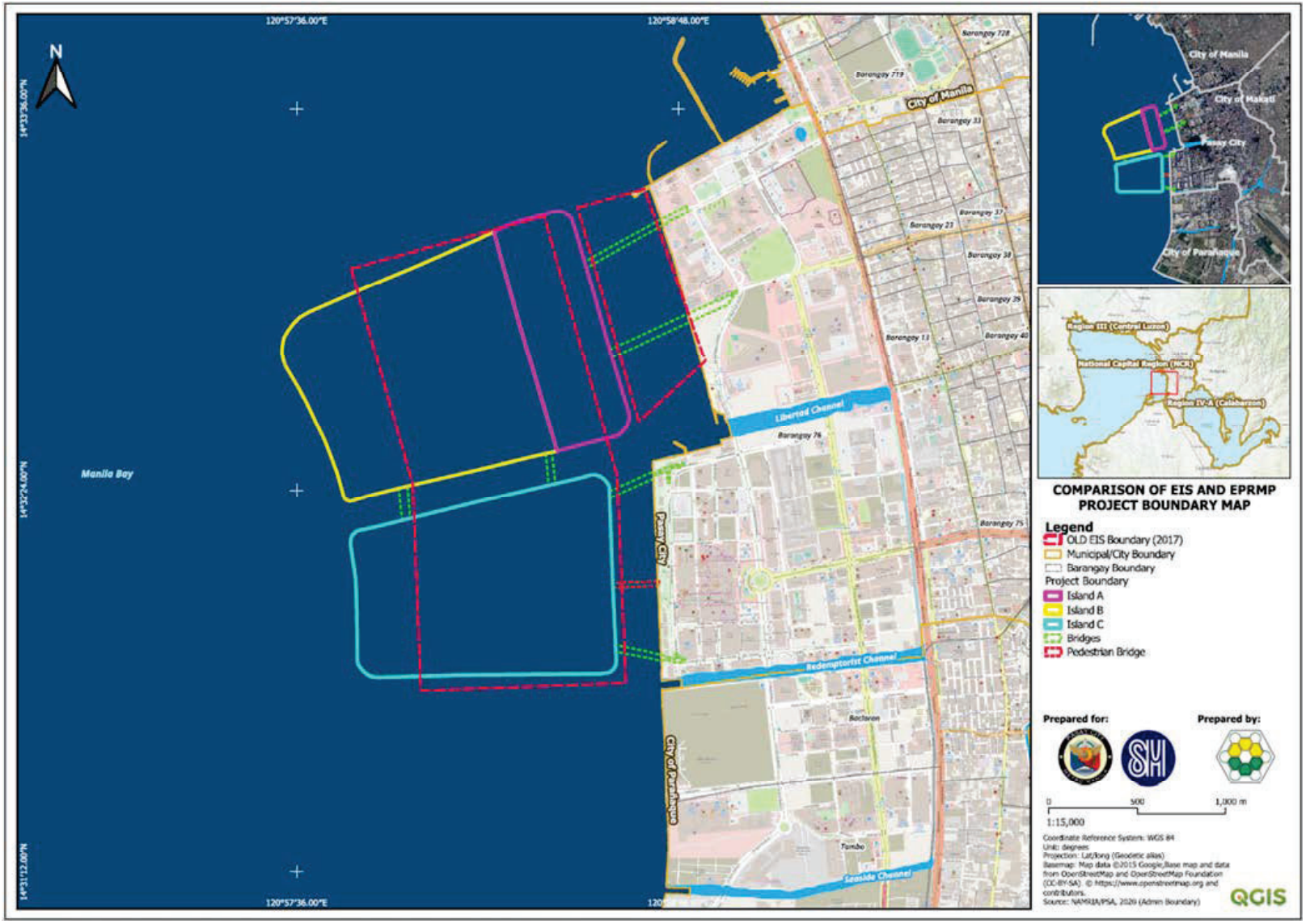


Figure 1.1 Proposed Project Boundary Reconfiguration (EIS 2017 Boundary vs. EPRMP 2024)
Source/ Reference: Admin Boundary (NAMRIA/PSA, 2020)

Table 1.2 Summary of the Proposed Modifications

Components	Specifications	Details (Subject to Final Engineering)	Components	Specifications	Details (Subject to Final Engineering)
EIS 2017 (Based on the Approved ECC)			**EPRMP 2024**		
Components of Land Use (Total Land Area = 360 has)			Same		
***Roads and Open Spaces**	30% of total area or 108 has.	To be based on final master plan. Master Plan needs to incorporate LGU's option of utilizing the entire 60 has. for majority of its partial share, balance at the 300 has. land Initial estimate of 15,120,000 square meters of building gross floor area	Same		
Developable Land @ 70 % = 252 hectares			Same		
Share of Government (PRA & Pasay)	30% or 75.6 has		Same		
Share of Developer	70% or 176.4 has		Same		
Islands					
• Southern Island	60 has	Estimated total perimeter length of 2,498 meters and a width of 1,156 meters at its widest point;	• Island A	±60 ha	Estimated total perimeter length: Island AB: ±5,763.28 m Island C: ±4,8923.42 m
• Northern Island	300 has		• Island B • Island C	±153.5684 ha ±146.4316 ha	
Total	360 has.		**Total**	±360 has.	
Platform elevation	4.0 m MLLW	Per PRA requirement	Same		
Water Channels	At least 200 meters Distance	To serve as buffer zone and to improve water circulation and reduce on-shore flooding. To be firmed up during the final engineering works	Water Channels	A to mainland: ±476 m B to C: ±183 m C to mainland: ±247 m	The water channels have been modified to consider the results of the Hydrodynamic Modeling Study
Accessways (Bridges, Viaducts, Roads or others as may be determined) connecting from the mainland	300 has reclamation 200 – 1000 meters 60 has reclamation 200-400 meters	To be firmed up in the Detailed Engineering Design and Final Project Masterplan	Inter-island connecting Bridge	Island A to CCP Complex (Bridge 1 and 2): ±537m Island C to MOA Complex (Bridge 3 and 4): ±305m Island C to MOA (Pedestrian Bridge 1): ±249m	To be firmed up in the Detailed Engineering Design and Final Project Masterplan **As agreed during the EIARC Meeting conducted on 30 August 2024, the detailed bridge design shall be submitted once we amend the ECC to include the bridges.**
-	-	-	Inter-island Bridges Between Project Islands A and B with Island C	Island B to C (Bridge 5 and 6): ±225m	**Bridge 5** • Type: Reinforced Concrete Beam Bridge • Width: 46 mts. • Number of Lanes: 10 lanes

					(5 lanes per direction) **Bridge 6** • Type: Reinforced Concrete Beam Bridge • Width: 35 mts. • Number of Lanes: 6 lanes (3 lanes per direction)
Vertical Containment Structure	Containment wall (seawall) with estimated length of 9,614.75 linear meters around the entire reclaimed area consisting of a combination of rock mound	To be firmed up in the Detailed Engineering Design and Final Project Masterplan	Same		
Wave Deflector	Concrete with water sump	1.5 meters above the platform level	Same		
Fill Materials	100 Million cu m. fills 12 Million cu m rocks	Subject to final engineering	Same		
Support Facilities					
Drainage System	To consider using the Rational Formula Q = 0.278 CIA *	To be yet designed post ECC. In the Rational Formula **Q** = Design discharge in m^3/sec **C** = runoff coefficient which is dependent on topography, soil type and degree of development of the area **I** = rainfall intensity in m^3/hr **A**= drainage area in km^2	Drainage System (Stormwater and STP pipeline)	To consider using the Rational Formula Q = 0.278 CIA *	To be yet designed post ECC. In the Rational Formula **Q** = Design discharge in m^3/sec **C** = runoff coefficient which is dependent on topography, soil type and degree of development of the area **I** = rainfall intensity in m^3/hr **A**= drainage area in km^2 To be firmed up in the Detailed Engineering Design and Final Project Masterplan
Electricity, water and communications systems	Temporary connection with Meralco e.g. for lighting purposes; generating sets for construction works. Mobile communications	-	Same		
Wastewater treatment units	In house facilities during the Reclamation Phase (e.g. toilets in barges)	Use of approved portable toilets on reclaimed land.	Wastewater Treatment Units shall be part of the future ECC application of the locators and not covered in this ECC application.		

	Disposal through accredited waste handling entities		Wastewater Treatment Units" have been changed into Sanitation Facility		
Water supply system During Reclamation Phase	Internal sourcing by individual contractors	Mobile water tanks most likely to be used by contractors; no underground water extraction.	Same		
Street Lighting	High Pressure Sodium Lamps	To be designed	Street Lighting	To be designed	
Temporary Support Facilities					
-	-	-	Precast Yard	Length: 326 m Max width: 100m Total Area: 31,770 m^2	The yard is divided into an office area, prefabrication area, CBM storage area, and other functional areas
-	-	-	Site Office	The site office is made up of steel insulated cabins.	This site office, along with the offices located in the precast yard, will be used as a work space for the general use of site personnel
-	-	-	Rock Stockpile	The size of the four rock stockpile areas are as follows: • 1 pc – 150m x 350m • 1 pc – 400m x 150m • 2pcs - 200m x 200m	The rock stockpiles will be used to store rock materials. These rock materials will be used for coastal revetments, which deflect the energy of waves and prevent erosion along coastlines.
-	-	-	Pipeline Stockpile	Area: 200m x 276m	The pipeline stockpile will store pipes for sand rehandling.
-	-	-	Material Recovery Facility and Hazardous Waste Facility	The made up of materials for the Material Recovery Facility (MRF) and Hazardous Waste Facility (4.10ft x 10.2ft x 9.8ft for HWF) are steel and galvanized iron (GI) Sheets.	The Material Recovery Facility (MRF) will include segregation, recycling, reuse and storage of solid waste which include domestic and construction wastes. The Hazardous Waste Facility will be used for temporary storage of hazardous waste for eventual disposal.
-	-	-	Concrete Block Mattress Stockpile	Dimensions: •CBM 1: 35x140m. • CBM 2: 35x140m. • CBM 3: 35x140m.	The concrete block mattress stockpile will be used for storing of Concrete Block Mattresses (CBM).

					This CBM will be used for for channel revetments for slope protection.
-	-	-	Clinic	Area: 12.51 sqm	The site clinic allows the on-site nurse or doctor to administer the necessary first aid for the immediate treatment of injuries.
-	-	-	Movable Transferable Jetty	Capacity: upto 45 ton load capacity	The movable transferable jetty will facilitate the movement of staff and workers using water vessels around the reclamation areas.
-	-	-	Temporary Rock Wharf	The temporary rock wharf will be constructed from boulders and rock with precast mooring. There are four (4) sites where the temporary rock wharf will be located	The temporary rock wharf will be used for docking and access of Landing-Craft Tank (LCT) Barges.
-	-	-	Temporary Access Bridge Between the Mainland and Island AB	This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±476m. It has width of 9 meters and a 20 kilopascal (kpa) design load capacity. The concept-level design will progress further until the detailed design is completed.	This temporary bridge between the mainland and island AB will be used for the access of vehicles, equipment, material and personnel during the reclamation and horizontal development.
-	-	-	Temporary Access Bridge Between Island AB And C	This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±180m. It has width of 9 meters and a 20 kpa design load capacity. The concept-level design will progress further until the	The temporary access bridge between Island AB and Island C is to facilitate the access of vehicles, equipment, materials, and personnel.

				detailed design is completed.	
-	-	-	Sanitation Facility - Portalets	In house sanitation facilities includes toilets in barges and use of approved portable toilet contractor.	The portalets will be used to provide restroom facilities for the construction and office workers in the reclaimed land.
COMPONENTS NOT PART OF ECC APPLICATION			**COMPONENTS NOT PART OF ECC APPLICATION**		
Mixed Development Plans, e.g. Vertical Structures, Commercial Establishments, Offices, Theme Park, etc. to be firmed up during the final Master Planning Study and Design.			**Mixed Development Plans, e.g. Vertical Structures, Commercial Establishments, Offices, Theme Park, etc. will be specified in the Detail Architectural and Land Use Plan which will be covered by a separate Environmental Impact Assessment.**		

*In compliance with PRAAO 2019-05, at least 5% of the total area to be reclaimed shall be exclusively used for contiguous green spaces for recreational purposes that are readily accessible to the public. This is part of the 30% roads and open spaces which will consists of roads, parks, green spaces, playgrounds, recreational uses and other similar facilities and amenities. In line with the vision of being a sustainable eco-City, the Project Developer intends to provide additional greenspaces beyond the required 5% greenspace requirement.

Status on the City Ordinance to Related to Fisheries and Coastal Management

On the BFAR 19 December 2022 Letter (**Appendix A.5**), the office hereby acknowledges the receipt of the Coastal and Sea Use Plan which was submitted by the City thru a letter dated 10 October 2022 re: "Submission of the Enhanced Pasay City Coastal and Sea Use Plan Pursuant to the Memorandum of Agreement (MOA) Between BFAR and the City Government of Pasay (Pasay LGU) dated 12 October 2022". It states that "*The City of Pasay's Comprehensive Coastal and Sea Use Plan outlines the plan's primary objectives, which include economic development, coastal development, rational use of natural resources, landscape and seascape protection and rehabilitation, and protection of national heritage. The provided plan also includes the scientific basis for the zoning. Even though coastal reclamation gives new land for industrial, commercial, or residential use, it has been viewed as the most underlying cause of the degradation and loss of coastal ecosystems. Reclamation has several effects on coastal environments, including the loss of biodiversity and the value of ecosystem services, as well as changes to the variety of coastal landscapes. The CSUP showed that these effects were also considered. However, continuous monitoring and evaluation should also be included in the plan and must be strictly implemented*".

Initially, there are no registered fisherfolks in Pasay City due to minimal marine life and no formal request for recognition made to Pasay LGU. Through the efforts of the City and its JV Partners, it has been determined that it is best to help organize the fisherfolks that park their boats in the Pasay-Libertad Channel. To improve their welfare, the City opted to facilitate the adoption of the Pasay City Fisheries Ordinance. The City initiated the organization of these fisherfolks and their registration under the Registry of Fisherfolks (FishR) of the Bureau of Fisheries and Aquatic Resources (BFAR). This initial registration is part of the requirements to create a Fisheries Ordinance.

The Fisheries Ordinance is currently being drafted in consultation with these identified and registered fisherfolks. This is consistent with the requirement of the Fisheries Code. The Fisheries Ordinance. Upon finalization of the Fisheries Ordinance, this will be duly adopted by the Sanggunian.

Chronology of ECC Amendment

The chronology of ECC amendment for the Pasay 360 is presented in Table 1.3.

Table 1.3 Chronology of ECC Amendment

Letter Date	Activity	Reference Matter
24 October 2017	EMB issued ECC-CO-1601-003 for Pasay 360. The Project consisted of two islands: Island A (60 hectares) and Island B (300 hectares) in the Manila Bay within the territorial jurisdiction of Pasay City.	2017 ECC
01 September 2020	Pasay City wrote to the EMB seeking clarification or certification from the latter that the application for additional 30 hectares as well as the breaking up of the islands for water circulation improvement in the Libertad Channel is being processed as a minor ECC amendment.	30-has
07 October 2020	EMB wrote to Pasay clarifying that the additional 30-hectare reclamation is a minor ECC amendment, but will still require an EIS amendment.	390-has
19 August 2021	PRA issued Resolution No. 5371, Series of 2021 approving the improvement/enhancement of government land share of 30 hectares in the 300-Hectare Pasay City Reclamation Project, which represents an additional 10% of the original project area. The 30-hectare enhancement will be utilized to answer for the Roads and Open Spaces (ROS) requirement of the Government's share in the project.	390-has
14 October 2022	EMB advised Pasay City to coordinate with the PRA to confirm that the proposed 30-hectare enhancement is in accordance with the PRA's approved Rationalization Plan.	390-has
19 October 2022	Pasay City requested for confirmation with the PRA on whether 30-hectare enhancement is part of PRA's Rationalization Plan.	390-has
05 December 2022	In a letter to Pasay City, PRA confirmed that the additional 30-hectare enhancement is part of the reference points for the PRA's Rationalization Plan, where the configurations of the Manila and Pasay Reclamation Projects were adjusted to avoid any overlap between the projects.	390-has
05 January 2023	Pasay City responded to the EMB's 14 October 2022 letter, confirming that the 30-hectare enhancement is consistent the PRA's Rationalization Plan.	390-has
10 May 2023	EMB confirmed the inclusion of the 30-hectare enhancement to PRA's Rationalization Plan and requested for Additional Information for the proposed amendment to the ECC.	390-has
18 May 2023	Pasay City responded to the EMB's request for Additional Information in its letter dated 10 May 2023, complying with the additional documents requested by the EMB for the amendment of the ECC.	390-has
02 June 2023	Pasay City submitted the Environmental Monitoring Plan, also in response to the EMB's request for Additional Information.	390-has
26 June 2023	Pasay City, through Office of the City Legal Officer, wrote to EMB CO submitting the IMP with additional refinements for the 30-hectare enhancement.	390-has

Letter Date	Activity	Reference Matter
31 October 2023	Pasay City wrote a letter to DENR Secretary to propose the enhancement of the Pasay 360 landform to accommodate a 300-meter-wide water channel (a take-off from discussions with DENR during task force review) between the reclamation island and the Pasay City mainland/CCP Complex area to enhance water circulation and further mitigate the impact of flooding, thereby promoting environmental protection.	300-meter channel
10 November 2023	SM SCIDC forwarded the technical coordinates of the Revised Landform Plan to Pasay City and requested for approval by the Sangguniang Panlungsod.	300-meter channel
14 November 2023	Pasay City, through Sangguniang Panlungsod Resolution No. 6762, Series of 2023, approved the Revised Landform Plan.	300-meter channel
13 November 2023	Pasay City wrote a letter to PRA requesting for its approval of the 300-meter wide channel revised landform and its endorsement to DENR and OP	300-meter channel
28 November 2023	The PRA Board of Directors approved the change in the landform by virtue of Resolution No. 5864, Series of 2023, which was endorsed to the DENR and the Office of the President.	300-meter channel
24 January 2024	EMB recognized that the reconfigured landform as approved by the PRA was already covered by the EIA Study conducted for the issuance of the ECC in 2017 and allowed Pasay City to proceed with the reclamation activities as proposed, subject to the submission of the EPRMP based on the PRA-approved Reconfiguration and other documents/studies. *** The EMB in its letter dated 24 January 2024 allowed the implementation of the Project based on the revised landform. The EMB's instruction in its 24 January 2024 states: "We **recognize that the reconfigured landform** as approved by the PRA, and **the area has been already** covered by the Environmental Impact Assessment (EIA) Study conducted. In this regard, **you may proceed with the reclamation activities as proposed** but you are hereby required to submit the Environmental Performance Report and Management Plan (EPRMP) to this Office for the amendment of the ECC based on the approved reconfiguration..." In the same letter, the EMB recognized that: "The reconfiguration **includes the following activities:** a) Sand consisting of a portion of the Current Island A will be removed and transferred to the Current Channel between the Current Island A and Island B, thereby creating the 300-meter wide Reconfigured Channel between the Reconfigured Island A and Pasay City mainland/CCP Complex area. All of the sand removed from a portion of the Current Island A will be placed only on the above-mentioned Current Channel.	300-meter channel

Letter Date	Activity	Reference Matter
	b) Splitting of the Current Island B of the Project to create the Reconfigured Islands B and C and a channel in between, allowing the free flow of water from Libertad Channel to Manila Bay." EMB's letter referred to the PRA-approved land reconfiguration of Pasay 360 and the activities which involves the removal and transfer of the sand from the Current Island A to create a channel between Island A and the Pasay City mainland, and the splitting of Current Island B to allow the free flow of water from the Libertad Channel to Manila Bay. Given a plain reading of the EMB's instruction, it allowed Pasay City to proceed with reclamation activities as proposed since the area of the reconfigured land form (near-shore areas of Pasay municipal waters) was already covered in the EIA Study for the 2017-approved ECC.	
07 March 2024	SM SCIDC wrote to Pasay City to request for a meeting with the EMB to discuss the ECC Amendment. Pasay City endorsed the Environmental Management Plan to update the EMB of the actual adverse environmental impacts at the Project site and provide appropriate mitigation measures, which have significantly changed since the approval of the ECC in 2018.	300-meter channel
08 March 2024	Pasay endorsed SM SCIDC's request for meeting with the EMB to discuss the ECC amendment of the Proposed Land Configuration	300-meter channel
25 March 2024	Pasay City submitted to PRA for approval the adjusted Indicative Technical Description of the Revised Landform Plan, which reflects the widening of the channel between Island A of the Project and the Pasay City mainland/CCP Complex area from 300 meters to 476 meters to further improve water circulation (first request).	476-meter channel
08 April 2024	Pasay letter to PRA confirming that 30-has enhancement will no longer push through.	390-has
21 June 2024	EMB responded to Pasay City's letter dated 07 March 2024 in the request for a meeting to discuss the amendment of the ECC, reiterating that the EPRMP be submitted before meeting with the EMB for the amendment of the ECC.	476-meter channel
28 June 2024	Pasay City followed up on the PRA Board's approval of the adjusted technical description (second request).	476-meter channel
04 July 2024	Pasay letter to PRA confirming that 30-has enhancement will no longer push through	390-has
04 July 2024	Pasay City notified DENR-EMB that its private joint venture partner is in the process of updating the EPRMP, and that the submission will already include the measures presented in the EMP.	476-meter channel
30 July 2024	EMB acknowledged the 4 July 2024 letter of Pasay City with a reminder that the EPRMP should be based on the Development Masterplan, Detailed Engineering Design and	476-meter channel

Letter Date	Activity	Reference Matter
	Dredging and Reclamation Methodology that were approved by the PRA.	
05 August 2024	Pasay City endorsed the updated EPRMP to the EMB and requested for a meeting to discuss the EMB amendment.	476-meter channel
12 August 2024	Pasay City followed up on the approval of the adjusted technical description (third request).	476-meter channel

Proof of Authority over the Project Site

Pasay 360 Project:

The proof of authority over the project site of the proponent are the following:

- Memorandums of Agreement ("MOA") between Philippine Reclamation Authority ("PRA") and the City Government of Pasay ("Pasay City") on which the total land area to be reclaimed is 360 hectares (**Appendix A.1**).
- Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc. (**Appendix A.2**)
- Area Clearance: AC-NCR-2019-003 (**Appendix A.3**)
- ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017 (**Appendix A.4**)
- The CLUP and its Zoning Ordinance which identify the development of new coastal reclamation areas supporting the goals of Pasay City
- BFAR Authorization to implement the Comprehensive Coastal and Sea Use Plan (**Appendix A.5**)
- PRA Board Resolution of 2024 (**Appendix A.6**)

Purpose of the Reconfiguration

The project boundary in the 2017 EIS and the proposed reconfiguration in this EPRMP are presented in Figure 1.2. The summary of project reconfiguration including its components is shown in Table 1.2.

The proposed project reconfiguration of the 360-hectare Pasay Reclamation Project located along the coast of Manila Bay aims to enhance the water circulation and further mitigate the impact of flooding. The following activities included for the reconfiguration are:

1. Sand installed from the 2017-approved 60-hectare island A (hereinafter referred to as "Original Island A") will be removed and transferred to the proposed reconfigured Islands A and B (hereinafter referred to as "Reconfigured Island A" and "Reconfigured Island B"), thereby creating a more or less 476-meter-wide water channel between the Reconfigured Island A and Pasay City mainland/CCP Complex Area.

2. The splitting of the 2017-approved 300-hectare Island B (hereinafter referred to as "Original Island B") of the Project to create the Reconfigured Islands B and C will feature a water channel in between, thereby allowing the free flow of water from Libertad Channel to Manila Bay.

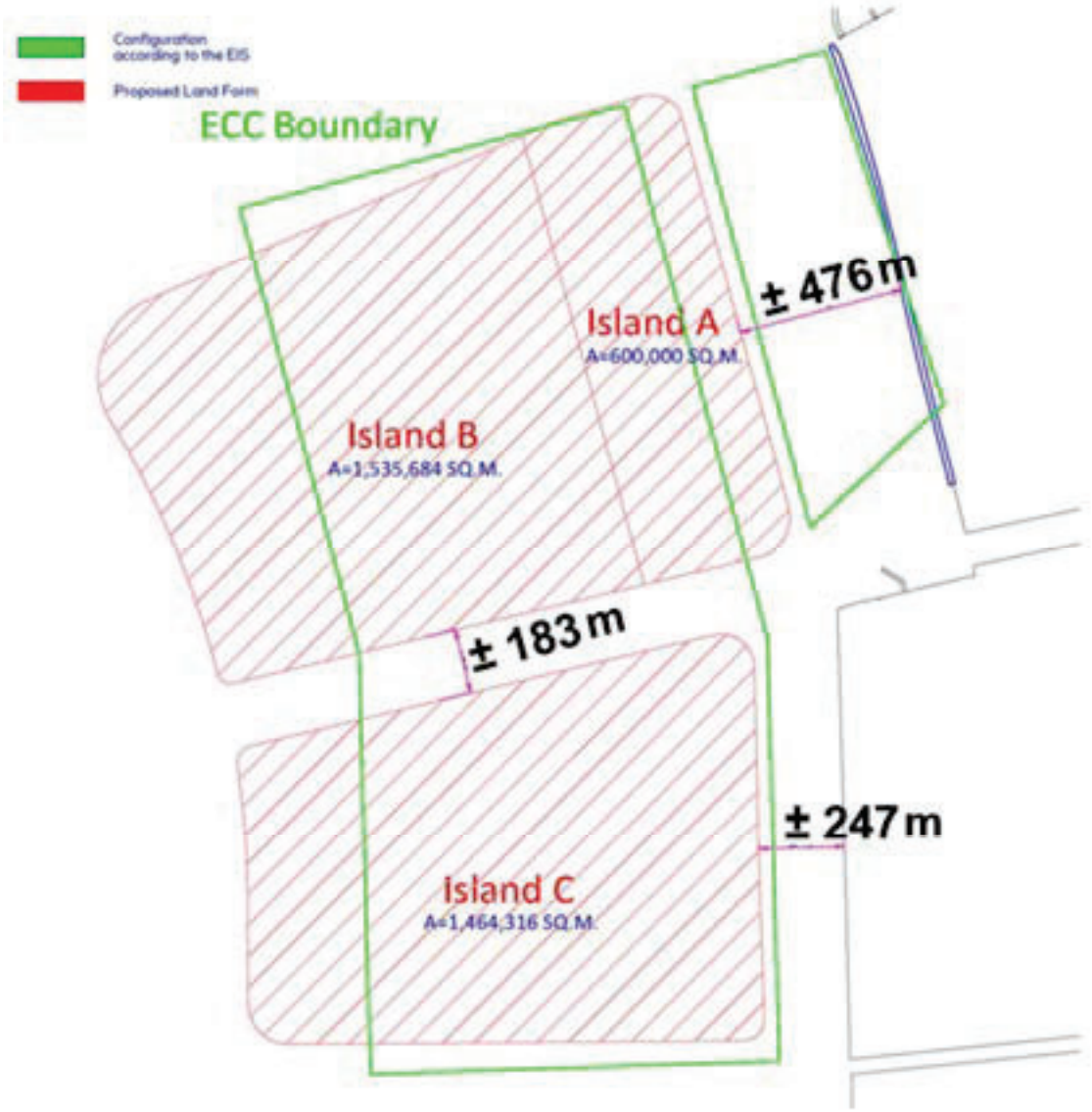


Figure 1.2 Proposed Project Boundary Reconfiguration (EIS 2017 Boundary vs. EPRMP 2024)

Status of the Project / Project Accomplishments

Status of Reclamation Works

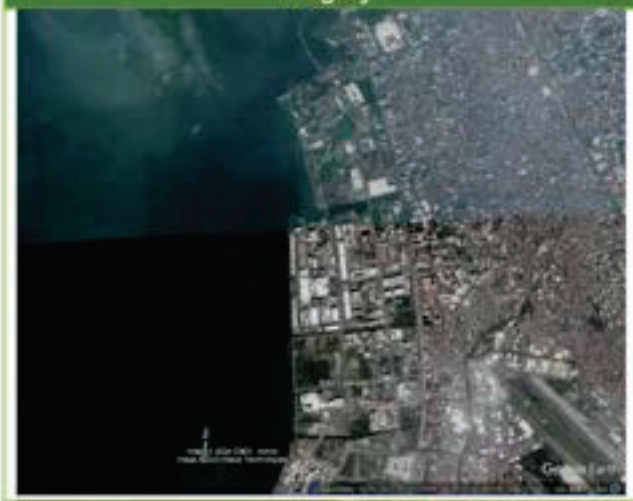
Upon awarding the Design and Build Contract for the 360-hectare Reclamation Works, the Contractor commenced engineering, related data gathering, and site investigation activities in November 2020.

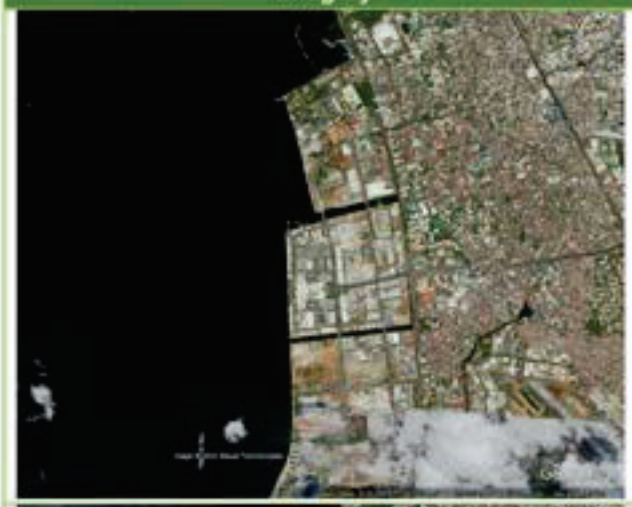
By July 2023, the original island A has reached the 1.5m MLLW. However, the reclamation project was suspended in August 2023 which lasted for nearly three months until it was lifted in November 2023. The Contractor immediately remobilized its resources and as of August 2024, a total of 12,891,237 m3 (97.71%) out of 13,193,502 m3 of dredged materials has already been completed on the sandkey. Based on the BOQ, Island B sandkey dredging is completed, while for Island A, the remaining part of the groyne area remains to be dredged.

The total cumulative quantity delivered to the site as of August 24 is 50,849,904 m3 (survey volume) (52.36%) out of 97,109,199 m3. Similarly, the installation of Prefabricated vertical drains (PVDs) at Island A and B has reached 5,380,407 and 6,950,774 linear meters, respectively, totaling 12,331,181 (20.72%) out of 59,488,362 linear meters. Vibro-compaction works for islands A and B have reached 1,966,503m3 and 1,616,535m3, respectively.

The project development imagery from 2017 to 2024 is shown in Table 1.4.

Table 1.4 Project Development from 2017 to 2024

Imagery	Remarks
	Image Date: 10-Oct-2017 • Reclamation site activities: o No site activities yet
	Image Date: 26-Sep-2018 • Reclamation site activities: o No site activities yet

Imagery	Remarks
	Image Date: 20-Apr-2019 • Reclamation site activities: o No site activities yet
	Image Date: 06-Sep-2020 • Reclamation site activities: o No site activities yet
	Image Date: 29-Oct-2021 • Reclamation site activities: o Offshore Cone Penetration Test (CPT) on sandkey on Island A o Dredging of Navigational Access o sandkey Dredging Island B • Actual Progress: 7.25%

Imagery	Remarks
	Image Date: 19-Jul-2022 • Reclamation site activities: o Offshore Cone Penetration Test (CPT) on Sandkey on Island A, B, C o Dredging of Sandkey on Island A, B & C. o Filling of Sandkey on Island A o Filling of Sand on Island A • Actual Progress: 10.28%
	Image Date: 14-Mar-2023 • Reclamation site activities: o Offshore Cone Penetration Test (CPT) on Sandkey on Island A, B, C o Filling of Sandkey on Island A, B & C. o Filling of Sand on Island A, B, o Filling of Sand on Channel A/B o Onshore Pre-CPT on Island A. o Installation of Settlement Plates and Monitoring Instruments on Island A. • Actual Progress: 25.20%
	Image Date: 07-Feb-2024 • Reclamation site activities: o Filling of Sandkey on Island C. o Filling of Sand on Island B & C o Filling of Sand on Channel A/B o Marine Vibro Compaction Island A and Island B. o Onshore Pre-CPT Island B. o Installation of Settlement Plates and Monitoring Instruments on Island B. o Prefabricated Vertical Drain (PVD) Installation on Island B o Dredging/Rehandling of 476m Channel. o Rehandling of Sand from Stockpile Chanel A/B. • Actual Progress: 44.42%

The specific source of fill materials and approximate volume and/or mass which was used in the reclamation is summarized in Table 1.5.

Table 1.5 Sand Sources

Source	Sand supply % by Volume	Remarks
Zambales	92%	Ongoing
Mindoro	2%	No operation since Aug 2024
PRA2000- SNS	6%	No operation since Feb 2023
Total	**100%**	

Status of Social Development Plan (SDP)

The SDP of the Project is anchored on the existing vision and plans of Pasay City as a sustainable eco-City. The SDP provided plans, programs and activities (PPAs), such as their livelihood, health, education, and the environment. The SDP of the Project is summarized below and discussed in Section 5.1 and 6.1.5.

- Based on the DENR EMB letter dated November 07, 2022, the submitted SDP Plan is duly accepted. This plan has been updated for the EPRMP (2024)
- Programs and Activities which include Health, Housing and Urban Settlements, Education, Employment and Livelihood, and Social Welfare are based on the submitted updated Social Development Plan for the Pasay Reclamation Projects (Pasay 360 and Pasay 265) to EMB Central Office on 01 June 2024. All Projects are initially identified to be part of Government Appropriations Act (GAA) funding of the City of Pasay but can also be in partnership with other institutions.
- The SDP Programs are currently being implemented by the Proponent. JV Partner supplements SDP PPAs of the Proponent through different activities. Some of the implemented SDPs include Three (3) livelihood activity of PESO, facilitation of SSEN of PLAA fisherfolks with PCG on the renewal of 45 boats, job fairs, provision of medicines, among others to Pasay City constituents.

Status of IEC Plan

The Information, Education and Communication's (IEC) main goal of the Project is to create awareness by disseminating information about the Project and gather issues and concerns to further improve the Project's implementation and compliances. The IEC Plan of the Project is summarized below and discussed in Section 5.2 and 6.1.4.

- Based on the DENR EMB letter dated November 07, 2022, the submitted IEC Plan is duly accepted. This plan has been updated for the EPRMP (2024).
- The IEC Plan is currently being implemented. Conducted IECs from 2022 to present include the Pasay City LGU employees, Barangay Officials, SK officials, Pasay City General Hospital, Newly elected barangay officials, SK Youth leaders of 201 Pasay Barangays, Regular meetings with neighboring hinterland locators (e.g. Sofitel, Seascape, Lime Hotel), BPLO, Pasay City Alliance of Tourism Advocates, Travel City Youth Scholars, PLAA fisherfolk and MMT.

Legislative and Statutory Framework

There are a number of policies and plans that provide the context for Project 360, and should be taken into consideration in the reclamation and development works, as follows:



Source: Supreme Court of the Philippines, 2008

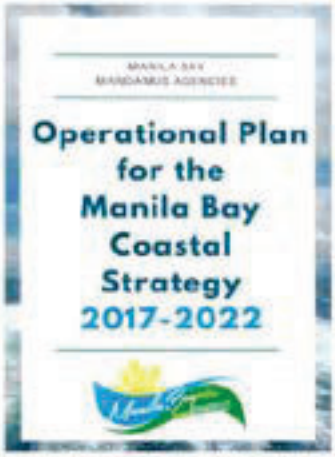
The Mandamus (G.R. 171947-48) directs 13 government agencies to clean up, rehabilitate, and restore and maintain Manila Bay's waters to SB level – fit for swimming, skin-diving, and other forms of contact recreation.



Source: NEDA, 2020

The Manila Bay Sustainable Development Master Plan (MBSDMP) aims to provide the needed guidance and framework for the holistic developmental activities in the Manila Bay.

MBSDMP envisions a Manila Bay that is clean, rehabilitated, and conserved, and waters are restored and maintained- making them fit for swimming, skin-diving and other forms of contact recreation; allowing for growth of fish populations and effective protection both fish populations and wildlife.



Source: Department of Environment and Natural Resources, 2017

A comprehensive environmental management framework that contains outcomes and a series of action programs to manage and conserve the coastal resources of Manila Bay.

The ultimate goal of the Operational Plan for Manila Bay Coastal Strategy 2017-2022 is "Manila Bay cleaned-up, rehabilitated, and preserved, and its waters restored and maintained at SB level"



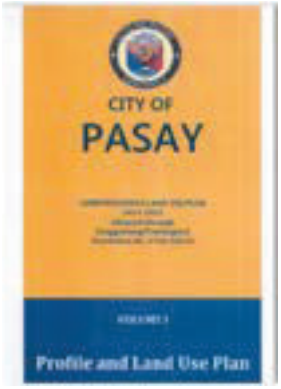
ADMINISTRATIVE ORDER NO. 16

EXPEDITING THE REHABILITATION AND RESTORATION OF THE COASTAL AND MARINE ECOSYSTEM OF THE MANILA BAY AND CREATING THE MANILA BAY TASK FORCE

Source: Official Gazette, 2019

Presidential Administrative Order (PAO) No. 16 of 2019: Expediting the Rehabilitation and Restoration of the Coastal and Marine Ecosystem of the Manila Bay and Creating the Manila Bay Task Force.

PAO No. 16 orders the convergence if national agencies and LGUs in the Manila Bay Region, and the active participation of the private and public stakeholders, are necessary to facilitate the robust and integrated implementation of all rehabilitation and restoration efforts at the Manila Bay.



Source: Pasay City, 2023

The Comprehensive Land Use Plan (CLUP) of Pasay City encompasses the planning for all the land and water resources found on the surface, below and above the surface of the land and waters of Pasay City. The Plan is currently being updated to reflect changes in the area, and the new aspirations of the city for the period 2023-2034.

The CLUP and its Zoning Ordinance identifies the development of new coastal reclamation areas supporting the goals of Pasay City.

ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) OF THE PROJECT 360

ECC-CO-1601-0003 covers the reclamation and horizontal land development of 360 hectares along the coast of Manila Bay, City of Pasay based on the two-island configuration of Project 360.

The ECC provides all commitments, mitigating measures and monitoring requirements, especially those contained in the Environmental Impact Statement (EIS), particularly in the Environmental Management and Monitoring Plans (EMMoPs) as approved by the EMB to minimize any adverse impact to the environment throughout the project implementation.

The joint venture of the Pasay City and the SM SCIDC is proposing for the reconfiguration of Project 360 to improve water circulation and further mitigate flooding in the adjoining mainland. As directed by the EMB, the proposed reconfiguration will require the amendment of ECC-CO-1601-0003 subject to the submission and approval of the EPRMP.

1.1. PROJECT LOCATION AND AREA

The proposed updated project reconfiguration site location is still situated along the waters of Manila Bay within the political jurisdiction of the City of Pasay. The project site is located near Coconut Palace, Sofitel Plaza, GSIS, Office of the Senate, Mall of Asia Complex, Redemptorist Channel and Libertad Channel as shown in Figure 1.3. The project geographic coordinates as approved by the Philippine Reclamation Authority (PRA) are presented in **Appendix D**. Aerial Photo of the proposed project site is also shown in Figure 1.5.

Project Site Accessibility

From the capital city of the Philippines, Manila the Project site near SM MOA can be reached by land travel via Padre Burgos Ave, Roxas Boulevard/R-1 at J.W. Diokno Blvd to Seaside Blvd. Approximate Travel time is 30 minutes. Then from SM MOA the planned of access is shown in Figure 1.3. For air travel, the nearest airport is the Manila International Airport Terminals 1 to 3 which are approximately 4km from the Project site. From the airport, the site can be accessed through land transportation vehicles. Approximate travel time is 18 to 30 mins.

The plan for access to the project site (Figure 1.3) indicates proposed bridges connecting the following major roads (Vicente Sotto St., Diokno Blvd., Seaside Blvd., and Coral Way) to the Project site. The islands within the project will also be interconnected with each other. Accessways (bridges, viaducts, roads or others as may be determined.) from the mainland and inter-island shall be finalized through the Detailed Engineering Design and Final Masterplan with the approval of PRA.

Direct and Indirect Impact Areas

The EPRMP study was based on the assessment of the direct and indirect impact areas of the proposed Project as shown in Table 1.6.

Table 1.6 Direct and Indirect Impact Areas

Impact areas	Remarks	Approximate Buffer from the Project Boundary
Direct Impact Areas (DIA)	*In terms of biophysical impact:* The waterways and aquatic resources along the coast of Pasay City that will be directly affected by the project due to the change of land formation from water to land	- *Channel at the East of Project area including Libertad and Redemptorist Channels* - *Coastal water of Pasay City 500 meters West of the project site* - *Coastal waters of Pasay City North of the project site* - *Coastal waters of Pasay City South of the project site*
	In terms of socio-economic impact (local hiring and generation of local benefits):	- *Barangay 76*
	Potential impact to natural hazards (i.e. storm surge, flooding, and tsunami):	- *Coastal area of Barangay 76 including Libertad and Redemptorist Channels*
Indirect Impact Areas (IIA)	*In terms of socio-economic impact (local hiring and generation of local benefits):*	- *Remaining Barangays of Pasay City*

Nearest Protected Area

The nearest legislated protected area and nearest Ramsar site is the Las Piñas-Parañaque Wetland Park (LPPWP) which is 3.15 km away from the nearest project boundary. Additional discussions were provided in **Section 2.1.1**.

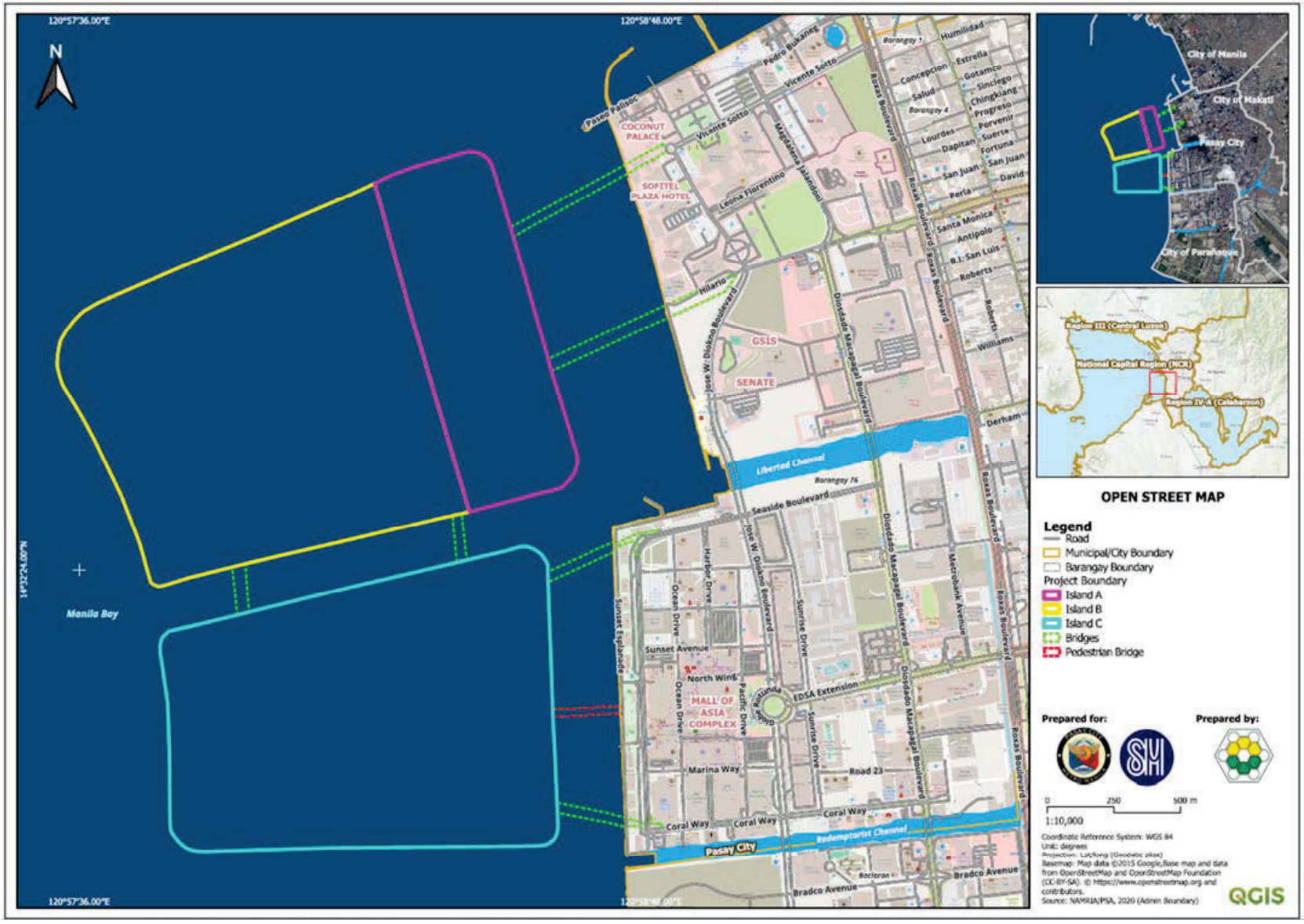


Figure 1.3 Project Vicinity Map
Reference/Source: Open Street Map and NAMRIA/PSA, 2020

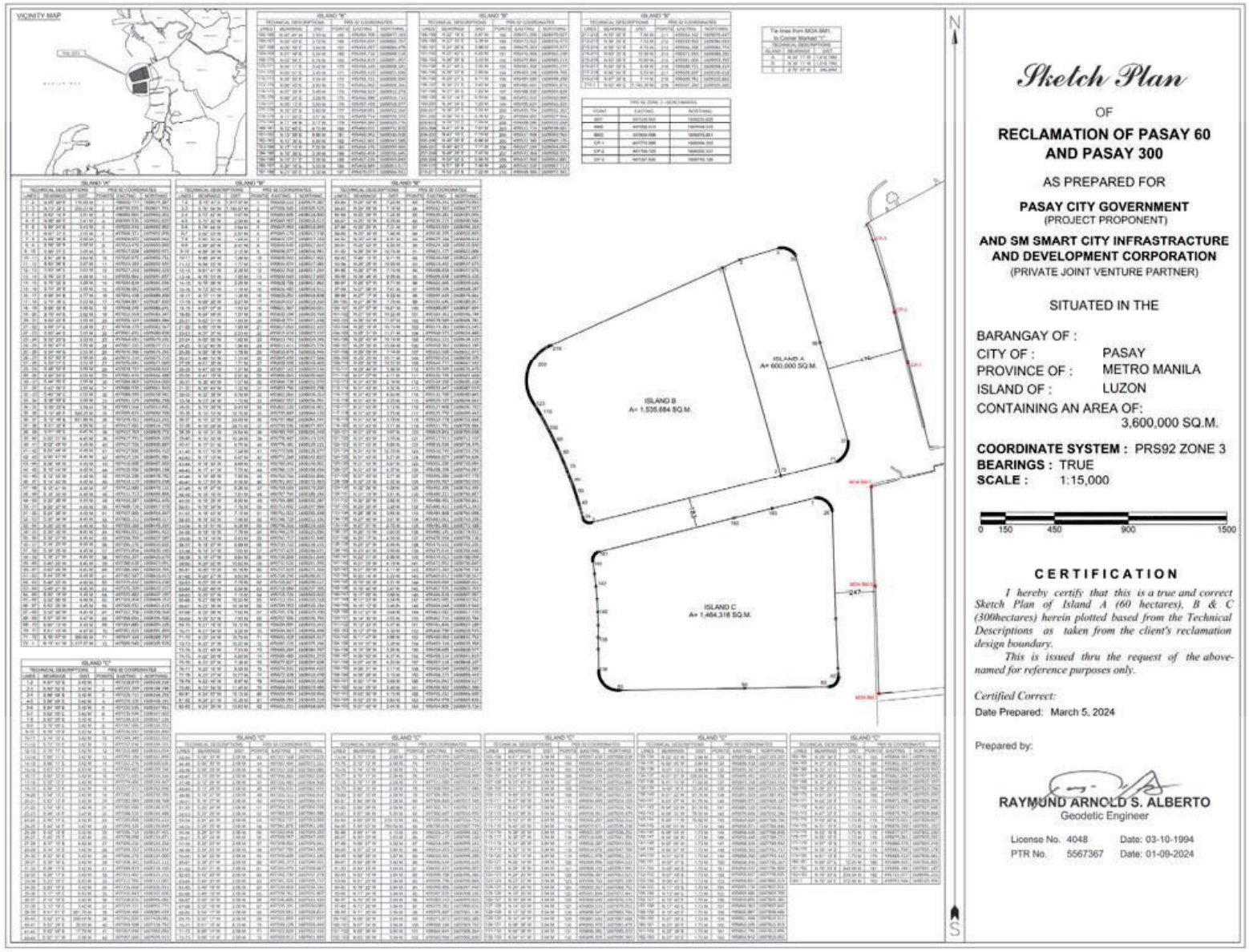


Figure 1.4 Project Geographic Coordinates Approved by the Philippine Reclamation Authority (PRA)

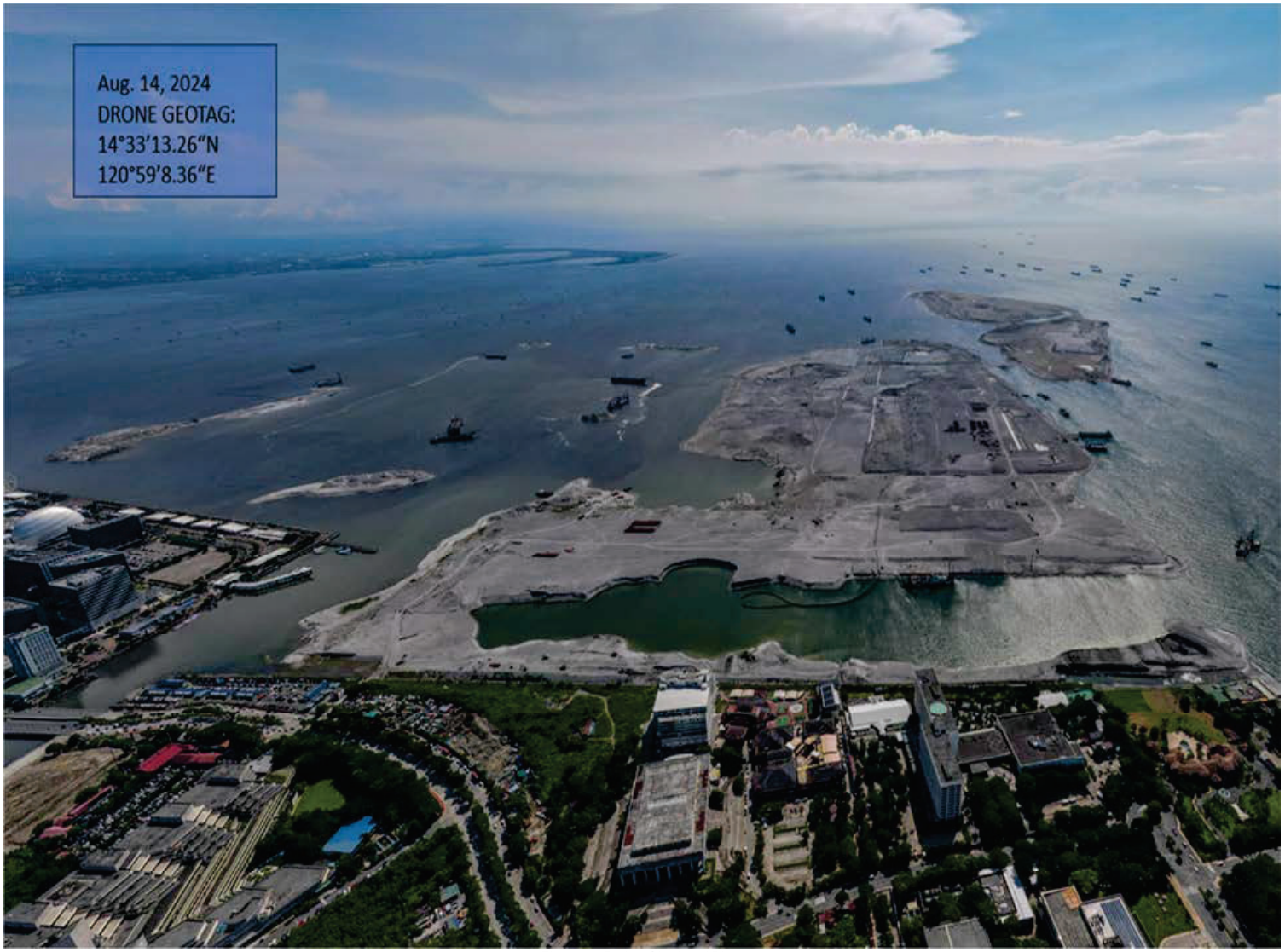


Figure 1.5 Project Site Aerial Photo

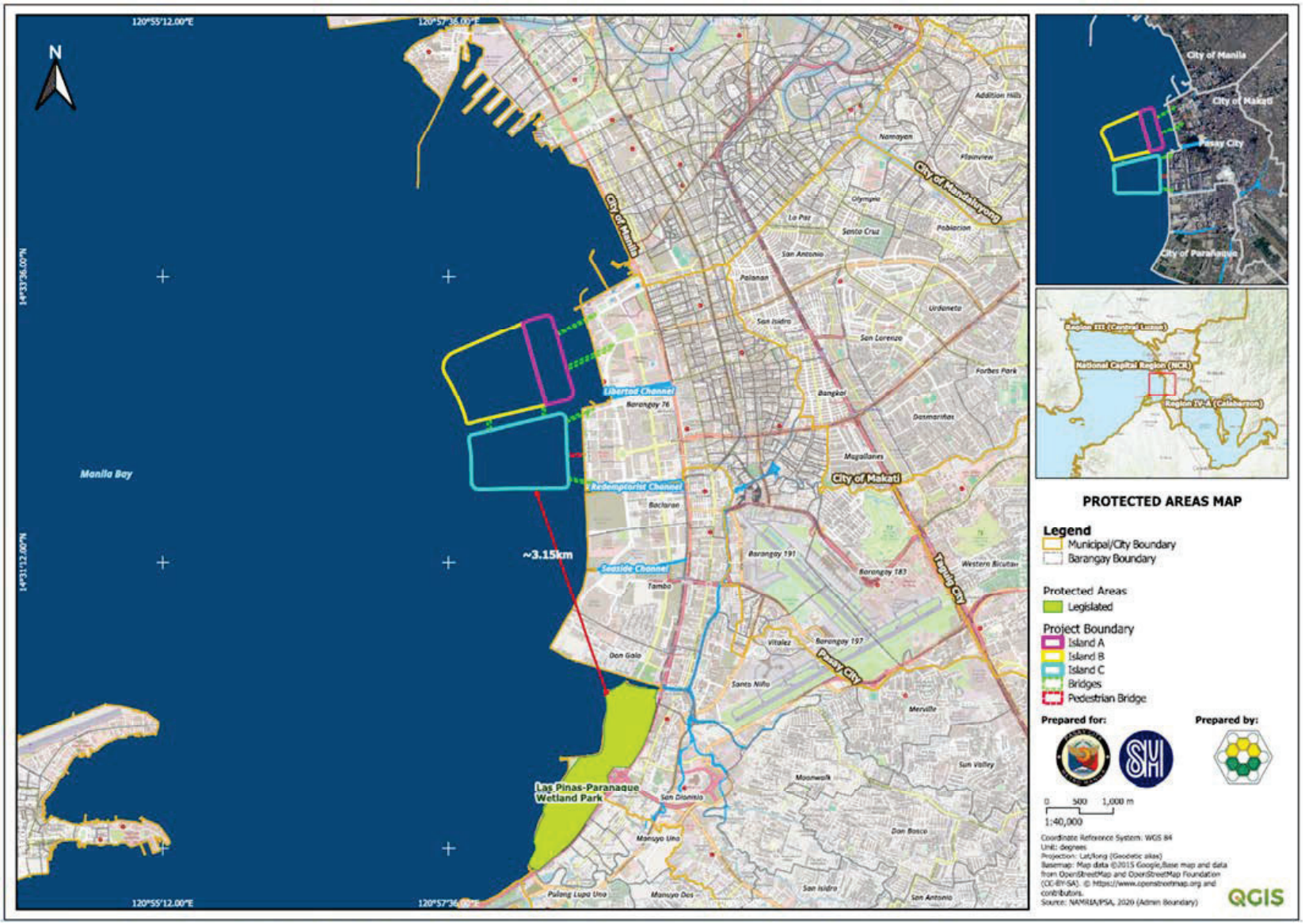


Figure 1.6 Nearest Protected Area
Source/Reference: Open Street Map, DENR, 2020 / Geoportal PH

1.2. PROJECT RATIONALE

Pasay City, as the host of the country's premiere domestic and foreign airports, is the Philippines' main gateway to the world and its 7,641 islands. With its strategic location and role as the country's main gateway, the City bears the problems associated with expanding economic activities and population growth which result into urban congestion.

In terms of land area, Pasay City ranks as one of the smallest in Metro Manila, measuring barely 18.64 sq. km. More than half of its area (or 9.5 sq. km) is occupied by the airport complex for which Pasay derives no revenue for the use of the land by the National Government.

With its small and shrinking land space, Pasay City is besieged by acute land scarcity and congestion. To address the problem of urban congestion, Pasay City has opted to harness the potentials of its territorial waters for land reclamation at no financial cost to the government. Thus, it has embarked on its 360-hectare reclamation project.

Under the Memorandums of Agreement ("MOA") between Philippine Reclamation Authority ("PRA") and the City Government of Pasay ("Pasay City"), the total land area to be reclaimed is 360 hectares. Seventy percent (70%) of the total land area will be devoted to mixed land use while the remaining thirty percent (30%) will be devoted to open space development.

The Project will create hundreds of thousands of job opportunities including those from fishing communities. Moreover, the Project will spur economic activities and generate for the National Government and the City Government of Pasay billions of pesos in public revenues, which can be devoted to public services.

Prior to the implementation of the Project, the Philippine Government, through the PRA, is already expected to earn revenues of over Php 1 Billion by way of reclamation fees and charges. The Project is also projected to generate thousands of job and business opportunities during the vertical and horizontal construction period when buildings, roads, and other infrastructure facilities will be built.

After the construction of the Project, and once the Project is developed as new environment-friendly residential and commercial centers, thousands of new jobs and business opportunities will be created. The City will earn additional revenues in terms of property and business taxes, while the National Government will derive additional income taxes from the new businesses established, new employment opportunities generated, and more. The revenues that the City and National Government will receive can then be devoted to improving and expanding social services.

Project 360 Reconfiguration Rationale

The Project aims to enhance the water circulation and further mitigate the impact of flooding. The following activities included for the reconfiguration are:

1. Sand installed from the 2017-approved 60-hectare island A (hereinafter referred to as "Original Island A") will be removed and transferred to the proposed reconfigured Islands A and B (hereinafter referred to as "Reconfigured Island A" and

"Reconfigured Island B"), thereby creating a more or less 476-meter-wide water channel between the Reconfigured Island A and Pasay City mainland/CCP Complex Area.

2. The splitting of the 2017-approved 300-hectare Island B (hereinafter referred to as "Original Island B") of the Project to create the Reconfigured Islands B and C will feature a water channel in between, thereby allowing the free flow of water from Libertad Channel to Manila Bay.

Rationale Based on the Regional/ Local Economic Development

Pasay LGU presented before the House Committee on Ways and Means last November 2023 that its Pasay Reclamation Projects (which include both the Pasay 360-hectare reclamation project and its adjacent Pasay 265-hectare reclamation project) are projected to create economic multipliers, and generate millions of jobs and billions of revenues by way of income and value-added taxes for the national government, and real property taxes and business taxes for the City.

The National Government will receive for both projects 4.8 Billion in PRA regulatory fees, 1.1 Billion in PRA Social and Environmental Fund and 162.4 Million in PRA Supervision Fee. Billions of pesos will also be paid to the National Government and the local government for the extraction of sand to be used in the reclamation projects.

The Pasay Reclamation Projects are projected to generate billions in Real Property Taxes and local business taxes for the benefit of Pasay LGU and its residents. Similarly, billions worth of income taxes and VAT will be generated for the National Government. All of these can be used for public purpose such as for sustainable social and environmental purposes. Indeed, Pasay LGU has committed that 25% of the local public revenues that will be generated from the project will be used for environmental purposes while 50% is to be used for social services.

Through this Pasay 360 project alone, Pasay LGU and the National Government will receive 51% or around 183.6 hectare of the reclaimed land at no cost.

The reclaimed lands could generate investments for vertical and commercial development of up to Php 1.5 Trillion, based on PRA estimates. These will in turn create business opportunities that will generate millions of jobs not only for Pasay residents, but also for the nearby cities and provinces.

Rationale Behind Distance Between Island B and Island C

The original layout as per the 2017 EIS is shown in Figure 1.7. As recommended by AECOM (SM Reclamation Master Development Plan Report, AECOM, January 2016), based on hinterland flood risk studies, it was recommended to have an additional channel passing through the 300 hectares island. In Section 4.2.1.2 of the said AECOM report, strategies to mitigate impacts of hinterland flooding are discussed:



Figure 1.7 EIS Configuration
Source: EIS Pasay 360 (2017)

- To ensure that the development will cause no interference to flood flow from inland canals and rivers, a canal is designed and located in between the existing hinterland and the new islands. This large canal is designed to have a flood capacity that is higher than the combined flood flows of Libertad Channel, Channel 1 (Redemptorist) and Channel 2 (Seaside), Figure 1.8.

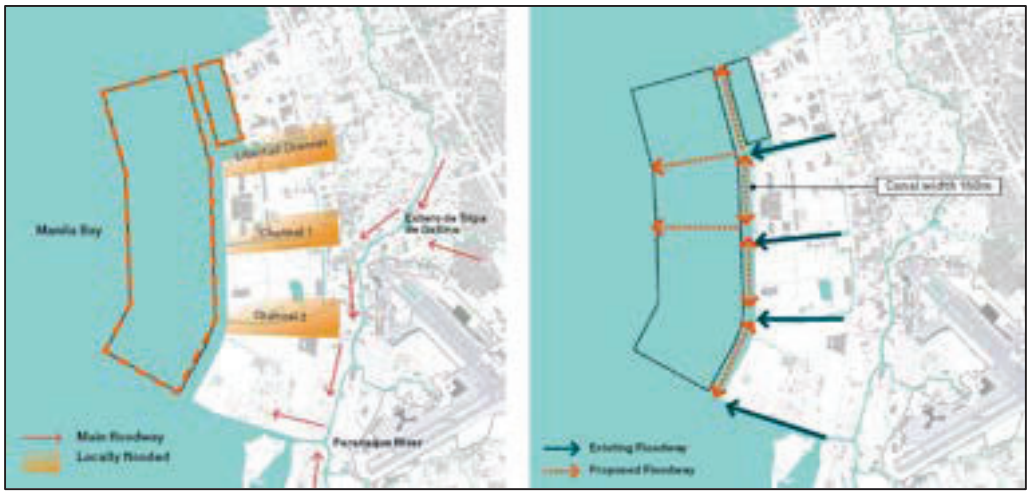


Figure 1.8 Suggested channels through the ECC islands configuration
Source: SM Reclamation Master Development Plan Report, AECOM, January 2016

- Moreover, waterways within the site are designed to provide proper connections between the three existing inland channels and the open sea. There are two main waterways between the islands that are designed such that they can be considered as extensions of Libertad Channel and Channel 1 (Redemptorist) towards the open sea. These two main waterways are designed to have a larger width than the width of the inland channels to provide higher flood flow capacity.
- Scenarios were modelled to examine the impacts of the new islands on hinterland flooding. The modelling results shown in Figure 1.9 and Figure 1.10 show that the designed waterways between the new islands and the 150m-wide canal between the existing hinterland and the new islands will provide more than enough capacity for the

flood flow discharged from Libertad Channel, Channel 1 (Redemptorist) and Channel 2 (Seaside).

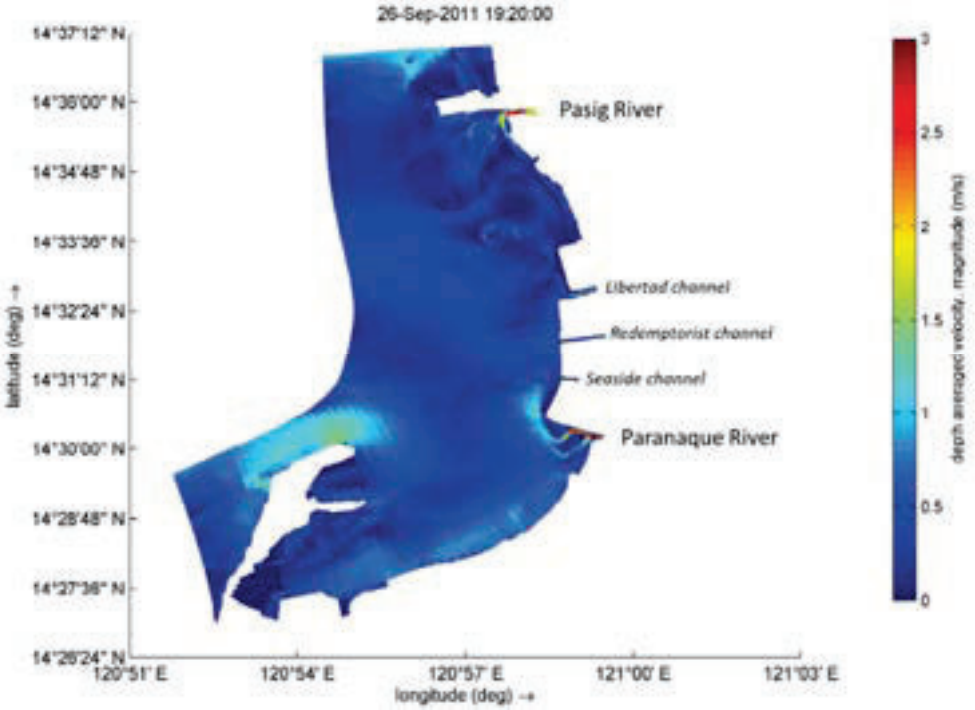


Figure 1.9 Velocity Magnitude Modelled at Pre-Development
Source: SM Reclamation Master Development Plan Report, AECOM, January 2016

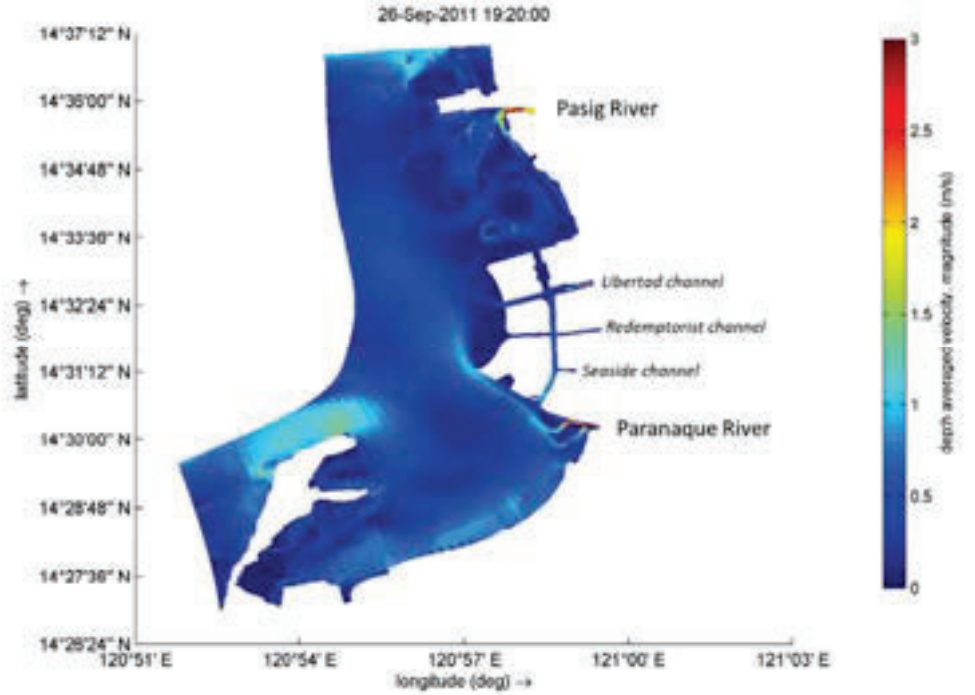


Figure 1.10 Velocity Magnitude Modelled at Post Development
Source: SM Reclamation Master Development Plan Report, AECOM, January 2016

The final reconfigured islands layout is depicted in Figure 1.11.

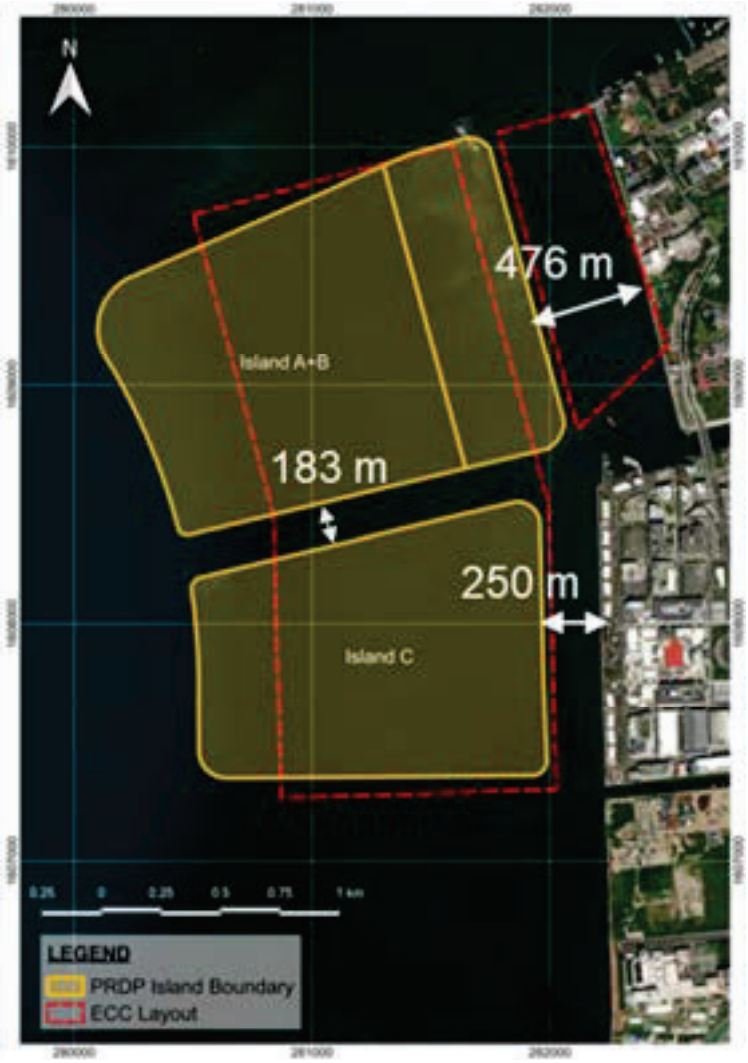


Figure 1.11 Channel Bed Levels Between the Reconfigured Islands will be Maintained at a Level 4m Lower Than the Current Channels
Source: Royal HaskoningDHV. SF1013-RHD-L1-XX-ME-X-0002-P01 (3 September 2024)

- Concluding, the main reason for creating a channel in the middle of the large 300 hectares ECC island, is to allow sufficient flow capacity for storm water that may come from Libertad Channel. From the AECOM study a channel width of 150m should be sufficient. The island reconfiguration allows for 183m width, which is more.

In 2024, a Hydrodynamic Modelling Studies was conducted by Royal HaskoningDHV. Flushing studies (Figure 1.12) were completed to assess the water quality (refreshing speed) with the island reconfiguration, concluding that a 183 m wide channel passes the water quality criteria (flushing time required is 8 days).

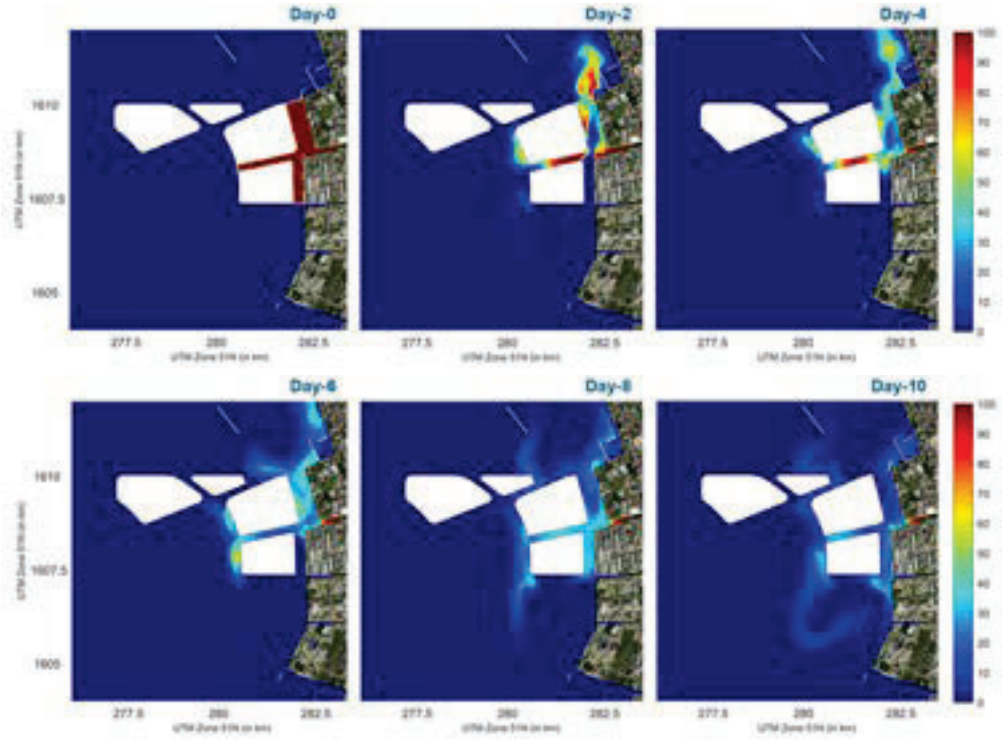


Figure 1.12 Flushing Study Results for the Island Reconfiguration
Source: Royal HaskoningDHV. Hydrodynamic Modelling Studies (28 May 2024)

SWASH wave penetration modeling (Figure 1.13) was conducted to assess the wave energy entering the channel, concluding that a channel wider than 183m would result in increased wave energy into the channel.

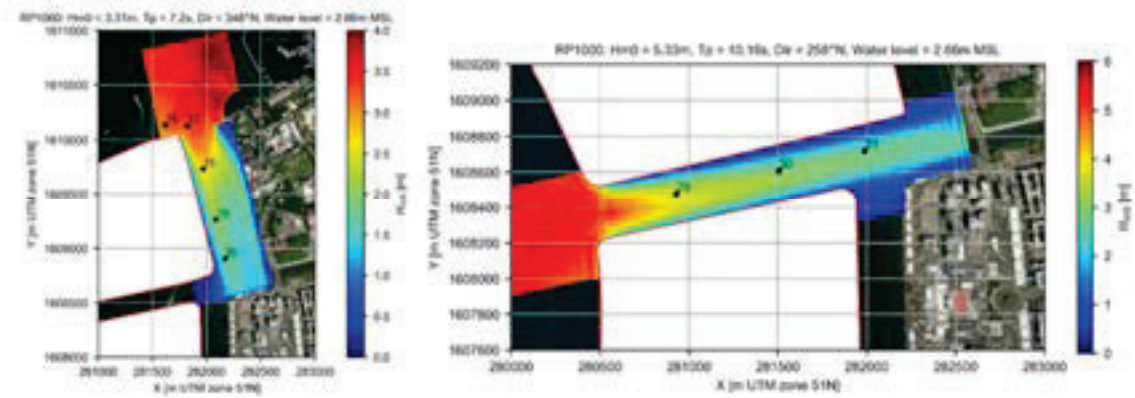


Figure 1.13 SWASH Wave Penetration Results for the Island Reconfiguration
Source: Royal HaskoningDHV. Hydrodynamic Modelling Studies (28 May 2024)

Rationale for the Establishment of the Access Ways Between Islands and the Inter-Island Connecting Roads and Bridges

The map showing the primary road, secondary roads, pedestrian bridge, and vehicular and pedestrian bridge is shown in Figure 1.20 in different colors. The inter-island connecting roads, pedestrian and vehicular bridges conceptual/indicative details such as length and height including the ingress and egress of these bridges are presented such as the in Figure 1.20 and Figure 1.22. These detailed specifications will be firmed up in the Detailed Engineering Design and Final Project Masterplan as part of an application for another amendment of the ECC.

The establishment of access ways between islands will:

- Provide vehicular access;
- Provide transport of materials; and
- A dedicated pedestrian bridge for the people.

Without the bridges and access bridge, the islands will be hanging in Manila Bay and the only access is via public boat which is absent at the Project Site.

Design of the Project is in Accordance with the Disaster Risk Reduction Plans of the City of Pasay

The Revised Landform Plan is consistent with Pasay City's Disaster Risk Reduction and Management Plan (DRRMP) as it addresses the issues on flooding and storm surge.

Flooding has always been a predominant problem of the City, with the root cause for flooding mainly attributable to the clogged/blocked wide water tributaries of the City that flows out to Manila Bay and the country's geographical location within the Typhoon Belt. With intense rainfall, low-lying areas of the City may be submerged to flooding.

During intense rainfall, low-lying areas of the City become susceptible to flooding. Rainwater, which traverses Estero de Paco, Estero de Pandacan in Manila and a portion of Estero de Tripa de Gallina in Makati, as well as the Redemptorist and Seaside Channels are connected to the Libertad Channel, which ultimately discharges to the Manila Bay. Under the PCDRRMP, the City should ensure that these wide waterways should have free flow of water.

In line with the above the Original 300-hectare Island B will be split to Reconfigured Islands B and C, thereby creating a ±183-meter channel, which will enhance the free flow of water from Libertad Channel to Manila Bay. The new water channel will provide a much wider drainage area than the Libertad Channel itself and prevent accumulation of water discharge at the mouth of the Libertad Channel. This change in the landform has been duly illustrated in the Development History-Based Geographical Map of the PCDRRMP.

In addition to the creation of a new water channel, the recently approved revised landform further enhanced water circulation by expanding the initial ±20-meter wide channel between the mainland and the Original 60-hectare Island to ±476-meter channel. Similarly, this enhancement is consistent with the governing principles under the 2023-2025 PCDRRMP.

Finally, the Revised Landform for the Project, with a final platform land elevation of at least 4 MLLW, a higher elevation than of the low-lying areas in the Pasay City mainland, may even provide for a sheltering effect, where the higher reclaimed area will serve as a barrier to protect the low-lying strip of Manila Bay from the direct impact of storm surges as identified in the PCDRRMP. Moreover, the higher final platform elevation may also reduce the risk of flooding as a result of the barrier, which may protect the existing land from overtopping of water (from waves). As such the PCDRRMP has considered the on-going reclamation projects as among Pasay LGU's strengths in relation to disaster prevention and mitigation and an opportunity for new spatial development.

1.3. PROJECT ALTERNATIVES

1.3.1. CRITERIA USED IN DETERMINING OPTIONS

The consideration for this project involves the siting, technology selection, and resources alternative as discussed in this section.

1.3.1.1. SITING

The Project is consistent with the Pasay City's Comprehensive Land Use Plan ("CLUP") and Pasay City Sangguniang Panlungsod Resolution Nos. 2925, s. 2012 (60ha) and 3049, s.2013 (300ha) ratifying the Contractual Joint Venture Agreements ("CJVAs") for the 300- and 60-hectare reclamation and horizontal development projects (Collectively known as "Pasay 360").

As discussed in the foregoing, the Pasay City government has no other viable alternative and thus enter into an agreement with the PRA - the government instrumentality mandated to regulate reclamation, and create environmentally sustainable reclaimed land - which determined the technical, financial and environmental viability of the reclamation site. The PRA issued its Notice to Proceed on 28 August 2019 and Notice to Commence Actual Reclamation Works on 5 November 2020. The PRA further authorized the reconfiguration of the Pasay 360 Project on 28 November 2023.

There are also no issues in respect of land classification since the site is consistent with the CLUP of the City. Further, the City itself approved the proposed project. There are also no Indigenous People in the site/region and hence the matter of ancestral domain is not germane to the Project.

Options Considered

The City of Pasay has no other options considered in respect of site selection due to the following reasons:

- Locating the project onshore is not viable for the following reasons:
    - Outside of the City of Pasay, the City Government has no authority to establish projects;
    - Lack of funds for the City to acquire onshore lands;
    - Difficulty of consolidating a project of this size in one contiguous site; and
    - Attendant serious problems, including traffic congestion.
- The site is consistent with the Boulevard 2000 Plan.
- It is within the coastline of Pasay City, making access thereto highly desirable.

- Through agreements with PRA and the prospective agreement with the project developer, Pasay will enjoy a rare opportunity to acquire land for development without cost to the City.

The proposed Project site is also not being used in any of the following water-based activities or projects:

- As navigational lane;
- As areas for significant or commercial fishing;
- As port;
- As a water-based settlement (e.g. boat people);
- As a source of bulk water supply; and
- As a source of commercial/economic supply of fish and other marine species.

Site Selection in Terms of Vulnerability/Susceptibility to Natural Hazards

- Although the Metro Manila Region in general and the reclamation site in particular are prone to natural risks/hazards, there exist engineering interventions to address such hazards.

- Further, it is significant to note that the proposed reclamation project is in fact an extension of the various reclamation projects such as the Mall of Asia (MOA) complex. Establishments/areas adjacent to the project site have incorporated engineering design factors and have not, to date, experienced episodes of natural disasters.

- On the other hand, other factors/parameters such as site selection in terms of vulnerability/susceptibility to Liquefaction, Ground Shaking, Ground Rupture, and Earthquake induced Landslides Volcanic eruptions, rain-induced landslide storm surge, tsunami, and flooding as well as extreme climatologic conditions are discussed in **Section 2.1.2.4**.

<u>Landform Considerations to the Potential Impact of the Project to Nearby Communities</u>

The reconfiguration was supported by an extensive analysis performed by Royal HaskoningDHV on the Impact on Hinterland Flood Risk Study dated 03-May-2024. A summary of analysis and conclusions is provided herewith.

Possible impacts from the presence of the reconfigured islands on hinterland flood risk are:

1. Riverine Flooding
2. Sedimentation and Coastal Morphology
3. Coastal flooding

Riverine Flooding:

- The proposed reconfigured islands do not block the outlet of existing channels
- The channels between the reconfigured islands are aligned and widened to enhance the discharge capacity from the hinterland.
- The islands are offset from the hinterland with a channel varying in width from 250m to 470m.
- The combined discharge capacity of all these channels is much larger than the capacity of the existing hinterland channels

Findings: Reduced flood risk because of the island reconfiguration would result to a wider channel (Figure 1.14) which means less obstruction.



Figure 1.14 Reconfigured Islands and Main Flow Directions
Source: Royal HaskoningDHV. SF1013-RHD-L1-XX-ME-X-0002-P01 (3 September 2024)

Sedimentation and Coastal Morphology:

- The existing hinterland channels have a bed level at approximately -2mMSL.
- The widened channels between the reconfigured islands are designed with bed levels increased from -4mMSL to -6mMSL
- The widened channels will be maintained at a bed level 4m below the existing hinterland channels (Figure 1.15)

Findings: No additional hinterland flood risk due to the reconfiguration, having the channels at -6mMSL compared to -4mMSL as originally designed for allows for a larger sedimentation buffer

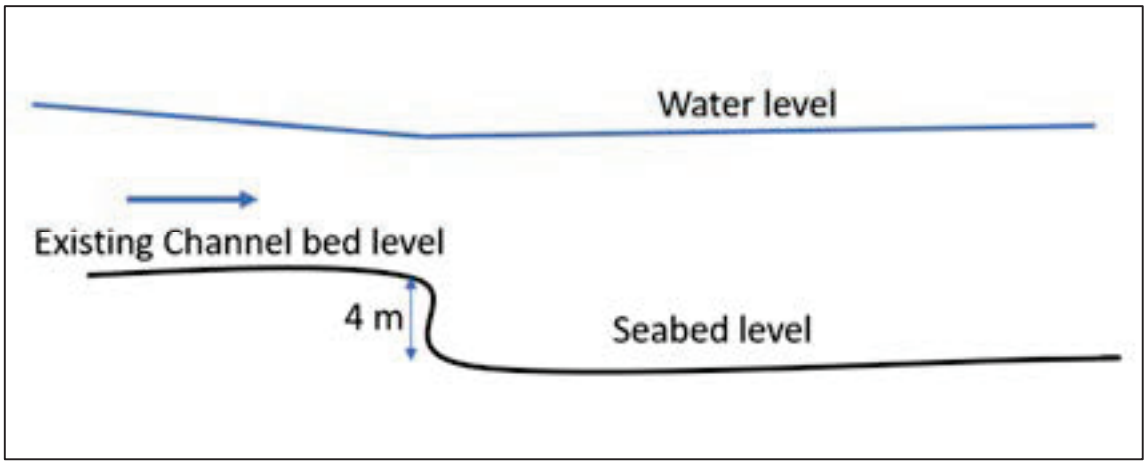


Figure 1.15 Channel Bed Levels Between the Reconfigured Islands will be Maintained at a Level 4m Lower Than the Current Channels
Source: Royal HaskoningDHV. SF1013-RHD-L1-XX-ME-X-0002-P01 (3 September 2024)

Coastal Flooding (waves):

- Without the reconfigured islands typhoon waves will hit the land in full force.
- Such waves combined with high water levels (storm surge) result in large quantities of water to overtop the coastal defense resulting in local flooding of the nearshore areas.
- The proposed islands will protect the existing land from direct wave impact

Findings: Reduced (local) hinterland flood risk due to the reconfigured islands.

The final reconfigured islands layout based on the hydrodynamic modelling studies (Appendix J) is depicted in the Project Rationale Figure 1.11 which concludes that the main reason for creating a channel in the middle of the large 300 hectares ECC island, is to allow sufficient flow capacity for storm water that may come from Libertad Channel. From the AECOM study a channel width of 150m should be sufficient. The island reconfiguration allows for 183m width, which is more.

In 2024, a Hydrodynamic Modelling Studies was conducted by Royal HaskoningDHV. Flushing studies (Figure 1.12 of the Project Rationale) were completed to assess the water quality (refreshing speed) with the island reconfiguration, concluding that a 183 m wide channel passes the water quality criteria (flushing time required is 8 days).

1.3.1.2. TECHNOLOGY SELECTION/ OPERATION PROCESSES

1.3.1.2.A. DREDGING TECHNOLOGY

A general comparison of the various dredging technology/equipment is shown in Table 1.7. Based on this table, and to meet the requirements for a mobile dredging equipment that will also dredge and transport the fill/borrow materials to the reclamation site, the trailer dredger and grab dredger appears to be the most logical choice. Among the considerations for selecting the equipment for dredging are availability, efficiency and low turbidity

Grab dredgers are designed for precision dredging, offering reduced disturbances to the marine environment compared to suction dredging methods. They minimize initial turbidity caused by bucket operations during excavation. Unlike Trailing Suction Hopper Dredgers (TSHD), which continuously suction materials, grab dredgers operate in a periodic or cyclic manner, further limiting disruption to the water column.

In terms of noise pollution, grab dredgers generate sound during the bucket's lifting and lowering operations, as well as from the engine. TSHDs, on the other hand, produce noise from multiple sources, including the suction pipe, engine, pumping mechanism, and propulsion system, making them more likely to contribute to higher noise levels.

The Grab Dredger is the best option aside from the above-mentioned factors on the current project development due to proximity to the mainland and easier to navigate than the other dredging methodology. For sand filling Pelican Barge and Cutter Suction Dredger and Spreader Pontoon is more environmentally friendly than THSD Rainbowing as plumes of fine sediment takes more time to settle.

Table 1.7 Comparison among Various Dredging Technology

Dredging Technology	Bucket Dredger	Grab Dredger	Backhoe Dredger	Suction Dredger	Cutter Dredger	Trailer Dredger	Hopper Dredger
Dredging sandy materials	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dredging clayey materials	Yes	Yes	Yes	Yes	Yes	Yes	No
Dredging rocky materials	Yes	No	Yes	No	Yes	No	No
Anchoring wires	Yes	Yes	No	Yes	Yes	No	Yes
Maximum dredging depth [m]	30	>100	20	70	25	100	50
Accurate dredging possible	Yes	No	Yes	No	Yes	No	No

Dredging Technology	Bucket Dredger	Grab Dredger	Backhoe Dredger	Suction Dredger	Cutter Dredger	Trailer Dredger	Hopper Dredger
Working under offshore conditions possible	No	Yes	No	Yes	No	Yes	Yes
Transport via pipeline	No	No	No	Yes	Yes	No	No
Dredging in situ densities possible	Yes	Yes	Yes	No	Limited	No	No

Previously, a methodology using large Trailing Suction Hopper Dredgers (TSHDs) in combination with spray pontoons was proposed for the project. The actual methodology being adopted now is the use of Pelican Barges (PBs) which have a reduced production of sediment, and more PBs are being deployed. Another relevant difference is the sand source, where the current sand source contains much less fines compared to the initially anticipated sand source. Further, the adopted reclamation methodology prioritizes the creation of the now existing sand bunds around the Project area. These sand bunds rise from the seabed and extends to the surface which serves as the best containment structure for turbidity / siltation especially if compared to the ineffective silt curtains which only covers the surface and risks navigational safety.

Sediment Plume Modelling Results

The comparison of maximum SSC (suspended sediment concentration) from 1-month simulation between the two scenarios are shown in Figure 1.16 (in kg/m^3) for all meteorological conditions.

From the figures it is visible that the dispersion area of the sediment plume is significantly larger and higher with the TSHD method compared to the Pelican Barge method. Although the Pelican Barges will cause a more continuous influx of suspended sediments (due to the longer discharge time). The sediment plume is mainly reduced due to the coarser sand (less fines), which are sourced by the Pelican Barges.

In can also be observed that wind influences the sediment plume development, as the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the port area, whilst in the NE monsoon the main direction of the plume is towards the south.

This wind effect becomes better visible when changing the scale of the images to mg/l, as shown in Figure 1.16. In this Figure 1.16, 50 mg/l is selected as the maximum limit value. This is to represent the maximum suspended sediment concentration in the Class SB water body, based on the Water Quality Guidelines and General Effluent Standard of 2016 issued by Department of Environment and Natural Resources (DENR). Both scenarios show that >50 mg/l of sediment plume can spread widely along the coastline.

Presenting the results using a mg/l scale has some disadvantages in our specific case:

1. Inside Manila Bay suspended sediment concentrations are in the range of 30-50 mg/l already (along the nearshore areas around MOA). In the rainy season such values can become 100 mg/l or more when heavy rains cause significant river outflow containing high levels of suspended sediments.
2. The main goal of the sediment plume assessment is to visualize the difference between the two methods suggested and sand sources used. The sediment plume model relies upon selected input and calculates based on certain settlement velocities what the sediment plume may be. The smallest particles (less than 4 µm) have a settlement velocity set in the model of 0.0 m/s which means they are assumed to always remain in suspension. This is a conservative approach, for two reasons:

a. Actual settlement velocity of such particles will be slightly more than 0.0 m/s, so they will settle over time;
b. The finest particles (less than 30 µm) are flushed out first during the dredging process. Generally leaving 5% fines, however ranging in size between say 20 – 63 µm. This distinction is not made in the sediment plume modelling, which assumes the 5% fines ranges in particle size between 0 and 63 µm.

3. More assumptions are made for this sediment plume model, which are justified by the defined goal of the sediment plume modelling. And as we are interested in the biggest impact from the reclamation works, meaning the highest concentrations produced, which are in the order of 10 – 30 kg/m³, the results are best shown to the kg/m³ scale.
In summary, for the goal of this assessment the best approach is to show sediment plumes with a scale using kg/m³. Using mg/l will result in a too conservative and detailed plume which does not reflect reality.

For completeness the results with the mg/l scale are shown in Figure 1.16.

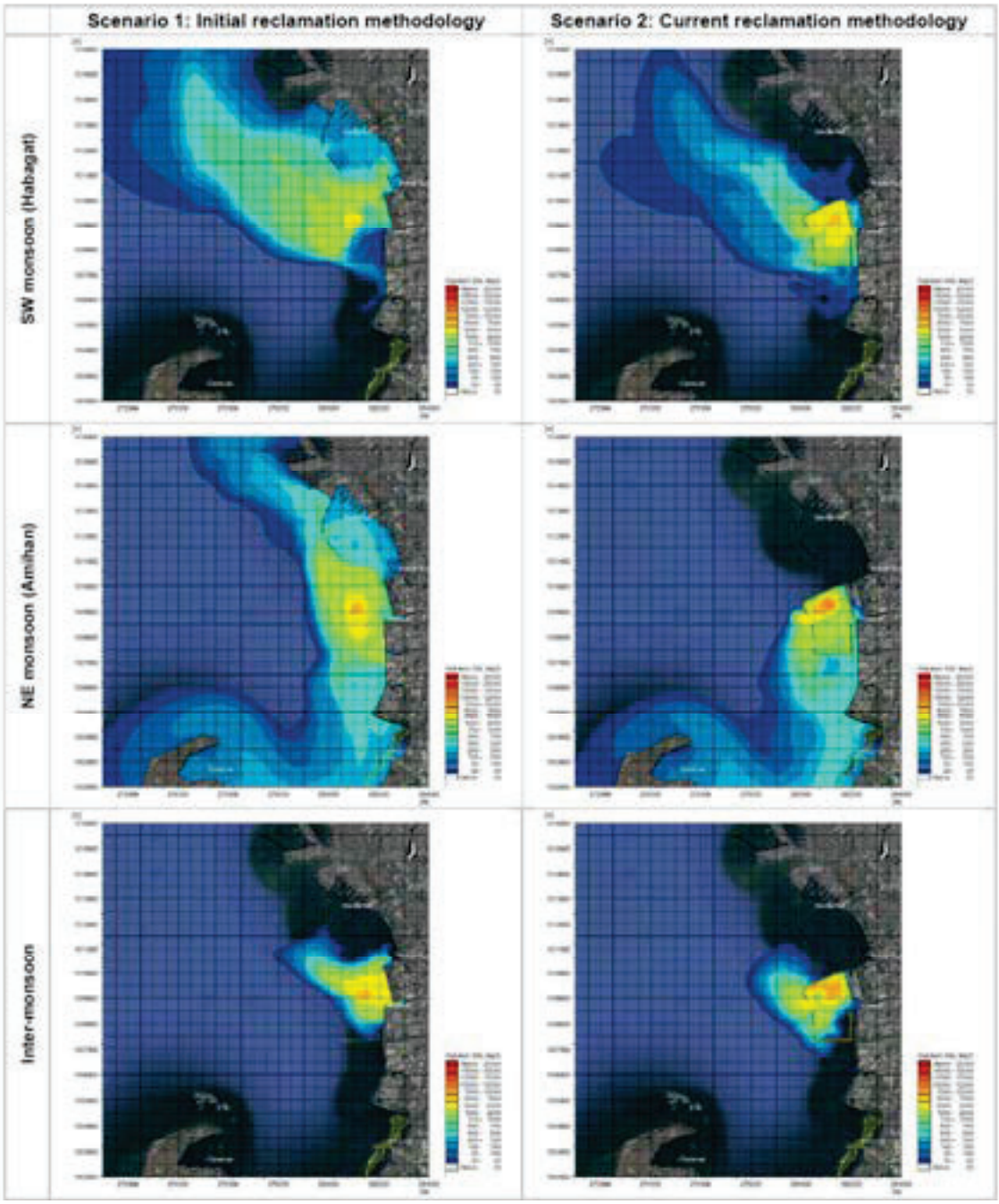


Figure 1.16 Sediment Plume Results
Source: Royal HaskoningDHV, Sediment Plume Modelling (September 2024)

The sediment plume assessment of RoyalHaskoningDHV based on the Sediment Plume Modelling (**Appendix P**) leads to the following general conclusions:

Primary conclusions

- The purpose of this assessment is to show the difference in sediment plume between the two identified construction methods (Scenario 1 and Scenario 2). Due to the limitation on the accuracy of input and model computations, the sediment plume images using a kg/m³ scale are more reliable for showing the expected extent of the sediment plume.

- Scenario 2 of sand filling with 6 Pelican Barges and a sand source with 5% fines content, will result in a reduced dispersion area if compared to Scenario 1 with 1 TSHD and 15% fines content.
- The suspended solids concentrations induced in Scenario 2 are approximately 50% of the suspended solids concentrations induced in Scenario 1.
- In the current situation (Scenario 2) bunds are already in place around large part of the outer contours of the islands. As most of the sand placement is done within those bunds, the higher concentrations of the sediment plume are well contained.

Secondary conclusions

- When considering very low suspended solids concentrations, such as those stipulated in the Water Quality Guidelines and General Effluent Standard of 2016, the plume can be seen to spread over larger areas; however, the plume will mainly attach to the shore.
- Wind has an effect, mainly on the smallest suspended sediments. As low concentrations of suspended solids remain in suspension for a long period of time and the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the west, whilst in the NE monsoon the main direction of the plume is towards the south.

1.3.1.2.B. SOIL STABILIZATION TECHNOLOGY

Soil stabilization is the key to a successful reclamation methodology. It is common knowledge in all reclamation projects that settlement or ground subsidence will occur not only due to the consolidation of the fill but also due to the settlement of the original underlying soil itself. It is also a fact that the rate and amount of settlement are highly dependent on the type of the original ground stratification. Further, depending upon the results of the detailed investigation of the available burrow pit areas, relatively poor soil may sometimes have to be utilized on some portion of the project site due to other considerations outside of the technical requirements thereby making some parts of the reclaimed land of low grade. Several methods of soil stabilization have been studied for the project. These include the following:

Considering availability of technology and equipment, several methods of soil stabilization have been studied for the project. These methods are described as follows:

All the above-described methods are to be first evaluated based on technical considerations such as applicability to the project area with the type of soils as to be determined during the final geotechnical investigation, available equipment required, particularly the type and capacity and the characteristics of the newly reclaimed land as to load carrying capacity prior to stabilization. Cost evaluation will necessarily be considered also.

Table 1.8 Alternatives for Soil Stabilization Methodology

Alternatives	Methodology	Evaluation
Option 1 Embankment or Surcharge Methods	A volume of soil is placed over the reclaimed land to be improved. The weight of the surcharge will force out the escape of the entrapped water within the voids of the saturated underground soft soil thereby	Preliminary calculations with about 5-meter-high embankment indicated approximately 5 years to attain full consolidation. This is too long a period of time to wait for the utilization and disposal of buildable

Alternatives	Methodology	Evaluation
	inducing settlement at an accelerated rate.	areas not taken into account, yet the length of construction time required for the development of the site in terms of provision of roads, utilities, etc.
Option 2 Sand Drain Piles Plus Surcharge	This method involves the construction of vertical sand piles at certain spacing down to the bottom of the soft soil layer in question to allow the drainage of pore waters when the weight of the surcharge is imposed over the subject area. With the accelerated escape of the water from the voids within the soils, settlement is induced at a very much faster rate that if surcharge is used only without providing vertical drainage pathways. The subject area can therefore be made usable at a very much earlier date	Under this method, the sand drain piles may not be continuous if improperly installed in addition to the fact that they are very much susceptible to shear failure during the planning of the surcharges. Further, the equipment required is usually heavy and requires good construction surface which is not available yet on a newly reclaimed land. This was demonstrated by the experience of the Philippine National Construction Corporation (PNCC) during the ground improvement of the Financial Center Area in the Manila-Cavite Coastal Road and Reclamation Project (MCCRRP).
Option 3 Sand Composer Piles Plus Surcharge	This method function is similar to sand drains except that the composer piles can also serve later as vertical columns that will allow the stabilized land to support bigger loads. In the construction process, the sand composer piles are compacted vertically and laterally. Because of the later compaction that will be induced on the adjacent soft soils, pore water pressures will be increased accordingly. When the surcharge is finally placed over the subject area, the pore waters will be forced out to escape through the voids of the sand composer piles thus accelerating the settlement very much faster than the natural consolidation process.	The system is vulnerable to the same problems as the sand drain piles. In addition, during the process of compacting the piles vertically and laterally, the system can easily be clogged with fine within the soil. Should this happen, resistance to flow of pore waters can become high thus requiring higher surcharge or embankment.
Option 4 Well Point Plus Sand Drain Piles	This is the use of well point equipment to dewater the soil down to the desired depths. The series of riser pipes are installed down to the reach of the pipes around the perimeter of the area to be stabilized. These risers are then	Well Point System Plus Sand Drain Piles—In addition to having the same problems as the sand drain piles, the presence of soil-laden water with high salinity is a potential source of problems for maintenance of the equipment.

Alternatives	Methodology	Evaluation
	connected to the horizontal head piles attached to a powerful pump that will drain out all the water within the soil. Continuous pumping is required to maintain the drawdown of the underground water level. For very impervious soils, the provision of sand drain piles is also necessary to shorten the time of area is no longer necessary since the dried soil serves as the surcharge for the underlying soft soil layers.	
Option 5 Dynamic Compaction	This method involves the use of huge weights to be dropped by a crane over the area to be improved. The impact transmitted to the underlying soft soils builds up the pore water pressures within them and thus forces out the escape of the pore water to the surface.	The equipment required are huge and heavy that the newly reclaimed unconsolidated ground may not be able to support. Provision of matting and grillages is costly and very inconvenient every time equipment position transfer is executed. The methods are not very effective as proven by the test conducted by the PNCC for stabilization of the First Neighborhood Unit.
Option 6 Vertical Drains Plus Surcharge	This method functions exactly the same as the Sand Drains Plus Surcharge Method. The only difference is that with this system, the sand drain piles are replaced with the vertical drains which are manufactured for the purpose in the form of wicks or strips and made of non-degradable materials. The core consists of ducts where water can flow upwards and wrapped around with very porous sheeting through which water can enter the core. The wick comes in various trademarks and designs but more or less uniform in the overall dimensions. For ease in handling and installation, the wick comes in coils.	Under this method, the vertical drains have high breaking strength and reinforce the soil in tension. Various types of drains are commercially available that a specific type of drain can be chosen to be exactly consistent with the actual permeability of the soil. Equipment required to install the drain is very light and can easily be supported by the newly reclaimed land. The rate of flow within the drain is higher, thus less height of surcharge is required. From the economic viewpoint, the surcharge can be eliminated if good dredge fill materials are available. Upon completion of the reclamation, the dredge fill itself will function as the surcharge.

Based on the above discussion, Vertical Drains Plus Surcharge method is the most feasible for the Project. A summary table citing the various options for soil stabilization technologies is shown in Table 1.9.

Table 1.9 Summary of Various Technology Options for Soil Stabilization

Technology Aspect	Decision Parameters	Evaluation/Remarks
Embankment or Surcharge	Very long timetable	Not feasible
Sand Drain Piles Plus Surcharge	Engineering problems	Not attractive
Sand Composer Piles Plus Surcharge	Engineering problems	Not attractive
Well Point System Plus Sand Drain Piles	Maintenance problem	Not attractive
Dynamic Compaction	Very heavy equipment required	May not be suitable when land not yet consolidated
Vertical Drains Plus Surcharge	Various types commercially available	Most likely option

Source: Pasay 360. EIS 2017

1.3.1.2.C. BREAKWATER AND BULKHEADS

The project involves, as one of its major components, the construction of main and secondary bulkheads of varying depths to retain the fill. These marine protection structures are planned to favorably enhance the existing physical environment at the project site; thus, the selection of their structural type becomes a major consideration. Therefore, in the design of these structures, the following factors were taken into account:

1. Foundation conditions have a significant influence on their settlement and stability and, therefore, on the type of structure.

2. Exposure to waves and related oceanographic conditions which control their geometry.

3. Availability of construction material to be used including costs which are significant determinants on the economic feasibility of the type of the structures chose.

Considering the above factors, two (2) general classifications of bulkheads are required for the reclamation area as dictated by the extent of their exposure to oceanographic conditions. These are the main bulkheads which are directly exposed to wave actions and the secondary bulkheads with less exposure to wave attacks. Foundation conditions have the same bearing on both, and therefore not considered in classifying the structures. The factors associated with soil will, however, be very important considerations in the selection of structure type to adopt for both classes of the bulkheads.

Main Bulkheads

As to the type of structure, two (2) alternatives were considered for the bulkheads, namely: the rock mound type and the walled steel pipe piles.

Other structural types of bulkheads in addition to the two (2) chosen alternatives above were also considered such as the cellular and double steel sheet pile wall construction with tie rods and walling to reduce flexural stresses and increase stability. These were ruled out at the initial stage of the technical evaluation due to:

1. The type of the structure will be very susceptible to damage due to differential settlement considering that the first 4 to 5 meters of the seabed consists of very poor materials with very low shear resistance.

2. The tie rods and dead men will require substantial open space that may pose problems during the development of the area due to obstructions.

3. Probability of damage during the construction stage is high especially during the southwest monsoon when the structures are not yet filled up with dredge fills.

On the other hand, both alternatives considered are very reliable under very severe sea conditions as proven by experience on similar projects abroad, notably in Japan. Unlike sheets piles, walled steel pipe piles can be designed as free cantilevers and therefore can be driven down to firm foundation thus eliminating settlement problems. For the rock mound type, settlement is not foreseen to be critical since the structure can undergo considerable settlement without sustaining damage. In terms of construction, walled pipe pile bulkhead is very much superior to the rock mound type which normally takes considerable time to build. Technically, both alternatives can, therefore, be adapted to the project. However, the final choice was made in favor of the rock mound bulkhead after evaluation of their costs. The superiority of the later in terms of shorter construction time can be nullified by the fact that will appropriate procedure and technologies, reclamation can be done even without the area already enclosed by the bulkheads.

Secondary Bulkheads

For the design of the secondary bulkheads, it appears that the upper portion just above the high waterline be made sloping for aesthetic reasons. This requirement is very advantageous from an engineering standpoint. With the finished grade at Elev. +4.0 and the high water at Elev. 1.00 meter, a minimum reduction in the height of 2.00 meters was made possible resulting to substantial reduction in lateral pressure due to the dredge fill. The use of cantilever sheet piling now becomes attractive considering less stringent requirements for embedment. However, upon evaluation of their costs, this alternative appears too costly and therefore, another alternative was considered – the rock revetment type.

The design details of the rock revetment type of bulkhead are based on standard dimension which will be firmed up in the detailed engineering design stage.

As in the case of the main bulkhead, stability was also the prime consideration in the design of the secondary bulkhead. A rock revetment type turned out to be the best alternative. Similarly, in order to solve the stability of the rock revetment, it also was apparent to remove the very soft upper soil layer averaging about 6 meters and replacing it with a much better selected dredge fill preferably sandy material with higher shear resistance. The solution will result with the soft soil completely removed and the new selected dredge fill seating on a hard soil layer, thus assuring stability of the revetment.

1.3.1.3. RESOURCES

1.3.1.3.A. DREDGED MATERIALS

The alternative option involving the resources to be tapped is principally focused on the source of the fill materials and rocks. The best options include the following resources:

- **San Nicholas Shoal (SNS)**
  - Conditions of the ECC being applied for by PRA for the SNS dredging project.
  - Cost consideration.
  - Agreements and restrictions/guidelines from PRA.
  - Quality in respect of the requirements of the project based on engineering works including final geotechnical investigation.

- **Zambales Rivers**
  - Suitability with respect to quality.
  - Transport considerations.
  - Cost considerations.
  - Permitting/Clearances consideration.

- **Others - To be evaluated**
  - The various options are to be evaluated and the appropriate selection will depend partly on the following:
    a) The filling requirements based on the final engineering works
    b) Cost
    c) Transport consideration and
    d) Permitting/clearances requirements.

The fill material will be sourced from the San Nicolas Shoal located directly west of the proposed reclamation project. The fill material is expected to be essentially of the same quality as the material used in the existing reclamation projects within the project site. The major roads where the main utilities for drainage, water, electricity and telephone lines are reserve and will be stabilized more effectively to protect these utilities from the damaging effects of large differential settlements that could be expected in this type of developmental projects.

1.3.1.3.B. POWER AND WATER ALTERNATIVES

During the dredging/reclamation works, electrical power will be required by sea craft and equipment (e.g. pumps) on board and will be on board these sea crafts. Water supply by the vessel/barge crews will also be on board. Power during construction will be sourced from gensets only (Table 1.10). There will be no underground water extraction. The power and water alternatives are presented on the table below.

Table 1.10 Power Source Alternatives

Project Activity	Alternative 1 Electric Service Provider	Alternative 2 Best Option - Generator
During Reclamation	Not available.	Movable. No required connections.

Project Activity	Alternative 1 Electric Service Provider	Alternative 2 Best Option - Generator
During Horizontal Development	Not available.	Movable. No required connections.

Table 1.11 Water Source Alternatives

Project Activity	Alternative 1 Best Option - Water Delivery	Alternative 2 Water Tanks	Alternative 3 Maynilad
During Reclamation	No connection or pipelines needed Periodic delivery	Need to fill up every week	No connection or pipelines yet
During Horizontal Development	No connection or pipelines needed Periodic delivery	Need to fill up every week	No connection or pipelines yet

1.3.2. COMPARISON OF ENVIRONMENTAL IMPACTS FOR EACH ALTERNATIVE

Reclamation Methodology

Among the considerations for selecting the equipment for dredging are availability, efficiency and low turbidity

Grab dredgers are designed for precision dredging, offering reduced disturbances to the marine environment compared to suction dredging methods. They minimize initial turbidity caused by bucket operations during excavation. Unlike Trailing Suction Hopper Dredgers (TSHD), which continuously suction materials, grab dredgers operate in a periodic or cyclic manner, further limiting disruption to the water column.

In terms of noise pollution, grab dredgers generate sound during the bucket's lifting and lowering operations, as well as from the engine. TSHDs, on the other hand, produce noise from multiple sources, including the suction pipe, engine, pumping mechanism, and propulsion system, making them more likely to contribute to higher noise levels.

The Grab Dredger is the best option aside from the above-mentioned factors on the current project development due to proximity to the mainland and easier to navigate than the other dredging methodology.

For sand filling Pelican Barge and Cutter Suction Dredger and Spreader Pontoon is more environmentally friendly than THSD Rainbowing as plumes of fine sediment takes more time to settle.

Landform Options

The main difference to the environmental impacts of the landform alternatives considered for This Project is presented in Table 1.12.

Table 1.12 Alternatives for the Final Land Configuration

Potential Impacts	Option 1 EIS Original Landform Configuration	Option 2 EPRMP Project Configuration
Impact in terms of compatibility with existing land use	The project site is not being used in any of the following water-based activities or projects: • As navigational lane; • As areas for significant or commercial fishing; • As port; • As a water-based settlement (e.g. boat people); • As a source of bulk water supply; and • As a source of commercial/economic supply of fish and other marine species.	
Impacts to terrestrial Ecology	• The reclamation works will be confined at sea • No threatened species were identified	
Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	20-m wide channel between mainland and Island A No water channel splitting the original Island B which may not be the best option in relation to the Libertad channel	Creating of a more or less 476-meter-wide water channel between the Reconfigured Island A and Pasay City mainland/CCP Complex Area and a water channel in between the original island B, thereby allowing the better free flow of water from Libertad Channel to Manila Bay.
Impacts to Marine Ecology	• Complete absence of corals and reef associated benthic life forms across the proposed reclamation project. • No seagrass beds seen in all manta tows and spot dives • There are no mangroves in or near the proposed reclamation site. The nearest mangroves, albeit more than ±3.15 kilometers away	
	Only 2 small fishing boats observed operating in the impact area with low catch rate of 0.17 kg per fishing hour.	No fishing observed in the impact area.
Considerations to the Potential Impact of the Project to Nearby Communities		
Riverine Flooding	While there are no blockages of water channels, Original Island B is a continuous island.	The proposed reconfigured islands do not block the outlet of existing channels and there is enhancement by providing a water channel in between the reconfigured Island B and C. Reduced flood risk because of the island reconfiguration would result to a wider channel which means less obstruction.

Potential Impacts	Option 1 EIS Original Landform Configuration	Option 2 EPRMP Project Configuration
Sedimentation and Coastal Morphology	Bed levels: -4mMSL	No additional hinterland flood risk due to the reconfiguration, having the channels at -6mMSL compared to -4mMSL as originally designed for allows for a larger sedimentation buffer
Coastal Flooding (waves):	Reduced (local) hinterland flood risk due to the reclamation Project.	Reduced (local) hinterland flood risk due to the reconfigured islands

The summary of environmental for the no Project and with project option is presented on the table below.

Table 1.13 Environmental Impact to "With Project" and "No Project"

Environmental Component	No Project	With Project
The Land	No more land spaces to accommodate the growing population	New land spaces will be created New open spaces and green spaces
The Water	Continuous deterioration due to urbanization and commercialization	Monitoring of water will be conducted. With this,
The Air	None	New open spaces / green spaces
The People	Urban congestion Economic stagnation	New job and business opportunities Job creation Rising tourist Continued economic expansion Better social services

1.3.3. "WITH PROJECT" AND "WITH NO PROJECT" OPTIONS

If the project does not proceed, the City will not be able to mitigate the worsening urban congestion brought by population growth, rising tourist influx, and continued economic expansion of the City.

Under this scenario, the City may not be able to address the urgent need for more land spaces to accommodate new residential and commercial developments, and public facilities such as schools, health centers, government centers, and other public spaces will remain. Such failure to address these urgent needs may ultimately lead to economic stagnation, the deterioration of the quality of life in the City – leading to urban decay.

If the project is not pursued, the City and the National Government will also lose the opportunity to secure the projected economic benefits from the project, specifically the following:

1. Billions in national government revenues by way of reclamation fees and charges to be paid to PRA.

2. Revenues from income and other taxes for the National Government and from business and property taxes for the City and National Government:

    - In 2015 alone, the City Government of Pasay collected about P 3.2 billion in real property taxes and business/work permits, from the Mall of Asia reclaimed area.

    - Initial studies show that Pasay City can collect Php 26 Billion and Php 36 Billion in real property taxes from the 265-hectare and 360-hectare reclamation projects, respectively. On top of the real property taxes, the City can collect at least P35 Billion in local business taxes from locators in the reclaimed land.

    - Initial studies show that over the 30-year life of the projects, the Pasay 265 project is estimated to generate total taxes of Php 50.6 Billion while the SM 360 Project is expected to generate Php 68.9 Billion, in real property taxes, local business taxes, and corporate income taxes.

3. New land for the City and the National Government, covering a total area of at least 108 hectares of roads and opens spaces, and 75.6 hectares of reclaimed land for possible sale or lease.

On the other hand, if the Project is not undertaken, the people of Pasay and nearby cities may lose the benefits of new job and business opportunities, and better social services. To be more specific:

1. The City has committed to devote at least 50% of real property income from the reclaimed area for social services, livelihood, and pro-poor programs such as:
    i. School and healthcare facilities and services;
    ii. Medical, burial, educational assistance;
    iii. Financial assistance to barangays and to victims of fire and other calamities;
    iv. Balik-Probinsiya Program;
    v. Social pension and senior citizens' welfare;
    vi. Cash gifts and financial and emergency relief assistance;
    vii. Medical missions and emergency relief programs;
    viii. Livelihood programs and so on.

2. The creation of thousands of jobs and business opportunities is projected during the vertical and horizontal construction period of buildings, roads and other infrastructure facilities, and more jobs and business opportunities, once the Projects are developed and in full commercial operation. For example, the existing Mall of Asia Complex and Solaire Resort and Casino, both built on reclaimed land, directly provide more than 10,000 jobs in 2014.

1.4. PROJECT COMPONENTS

Summary of Project Components

The major components are reckoned from the scope of Construction Phase of the project which include activities to attain at least 4.0 meters MLLW final elevation of reclaimed land for 300 hectares and 60 hectares and Horizontal Developments/Works which shall include roads, bridges and support facilities which are discussed further under the Project Components as tabulated in Table 1.14.

Table 1.14 Summary of the Project Components (Updated)

Components	Specifications	Details (Subject to Final Engineering)
Components of Land Use (Total Land Area = 360 has)		
***Roads and Open Spaces**	30% or total area or 108 has.	To be based on final master plan.
Developable Land @ 70 % = 252 hectares		
Share of Government (PRA & Pasay)	30% or 75.6 has	
Share of Developer	70% or 176.4 has	
Islands		
• Island A	±60 ha	Estimated total perimeter length: Island AB: ±5,763.28 m Island C: ±4,8923.42 m
• Island B • Island C	±153.5684 ha ±146.4316 ha	
Total	360 has.	
Platform elevation	4.0 m MLLW	Per PRA requirement
Water Channels	A to mainland: ±476 m B to C: ±183 m C to mainland: ±247 m	The water channels have been modified to consider the results of the Hydrodynamic Study
Inter-island connecting Bridges Between Project Islands A and B with Island C	Island B to C (Bridge 5 and 6): ±225m	**Bridge 5** • Type: Reinforced Concrete Beam Bridge • Width: 46 mts. • Number of Lanes: 10 lanes (5 lanes per direction) **Bridge 6** • Type: Reinforced Concrete Beam Bridge • Width: 35 mts. Number of Lanes: 6 lanes (3 lanes per direction)
Vertical Containment Structure	Containment wall (seawall) with estimated length of 9,614.75 linear meters around the entire reclaimed area consisting of a combination of rock mound	To be firmed up in the Detailed Engineering Design and Final Project Masterplan
Wave Deflector	Concrete with water sump	1.5 meters above the platform level
Fill Materials	100 Million cu m. fills 12 Million cu m rocks	Subject to final engineering

Support Facilities		
Drainage System (Stormwater pipeline and STP pipeline)	To consider using the Rational Formula Q = 0.278 CIA "	To be yet designed post ECC. In the Rational Formula **Q** = Design discharge in m^3/sec **C** = runoff coefficient which is dependent on topography, soil type and degree of development of the area **I** = rainfall intensity in m^3/hr **A**= drainage area in km^2
Electricity, water and communications systems	Temporary connection with Meralco e.g. for lighting purposes; generating sets for construction works. Mobile communications	-
*Waste water treatment units	In house facilities during the Reclamation Phase (e.g. toilets in barges) Disposal through accredited waste handling entities	Use of approved portable toilets on reclaimed land. *Wastewater Treatment Units shall be part of the future ECC application of the locators and not covered in this ECC application. Wastewater Treatment Units" have been changed into Sanitation Facility
Water supply system During Reclamation Phase	Internal sourcing by individual contractors	Mobile water tanks most likely to be used by contractors; no underground water extraction.
Street Lighting		To be designed
Temporary Support Facilities		
Precast Yard	Length: 326 m Max width: 100m Total Area: 31,770 m^2	The yard is divided into an office area, prefabrication area, CBM storage area, and other functional areas
Site Office	The site office is made up of steel insulated cabins.	This site office, along with the offices located in the precast yard, will be used as a work space for the general use of site personnel
Rock Stockpile	The size of the four rock stockpile areas are as follows: • 1 pc – 150m x 350m	The rock stockpiles will be used to store rock materials. These rock

	• 1 pc – 400m x 150m • 2pcs - 200m x 200m	materials will be used for coastal revetments, which deflect the energy of waves and prevent erosion along coastlines.
Pipeline Stockpile	Area: 200m x 276m	The pipeline stockpile will store pipes for sand rehandling.
Material Recovery Facility and Hazardous Waste Facility	The made up of materials for the Material Recovery Facility (MRF) and Hazardous Waste Facility (4.10ft x 10.2ft x 9.8ft for HWF) are steel and galvanized iron (GI) Sheets.	The Material Recovery Facility (MRF) will include segregation, recycling, reuse and storage of solid waste which include domestic and construction wastes. The Hazardous Waste Facility will be used for temporary storage of hazardous waste for eventual disposal.
Concrete Block Mattress Stockpile	Dimensions: •CBM 1: 35x140m. • CBM 2: 35x140m. • CBM 3: 35x140m.	The concrete block mattress stockpile will be used for storing of Concrete Block Mattresses (CBM). This CBM will be used for for channel revetments for slope protection.
Clinic	Area: 12.51 sqm	The site clinic allows the on-site nurse or doctor to administer the necessary first aid for the immediate treatment of injuries.
Movable Transferable Jetty	Capacity: upto 45 ton load capacity	The movable transferable jetty will facilitate the movement of staff and workers using water vessels around the reclamation areas.
Temporary Rock Wharf	The temporary rock wharf will be constructed from boulders and rock with precast mooring. There are four (4) sites where the temporary rock wharf will be located	The temporary rock wharf will be used for docking and access of Landing-Craft Tank (LCT) Barges.
Temporary Access Bridge Between the Mainland and Island AB	This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±476m. It has width of 9 meters and a 20 kilopascal (kpa) design load capacity. The concept-level design will progress further until the detailed design is completed.	This temporary bridge between the mainland and island AB will be used for the access of vehicles, equipment, material and personnel during the reclamation and horizontal development.
Temporary Access Bridge Between Island AB And C	This temporary bridge will be constructed through sand filling with concrete pavement as	The temporary access bridge between Island AB

	carriageway and slope protection (rocks and geotextile). The length is approximately L= ±180m. It has width of 9 meters and a 20 kpa design load capacity. The concept-level design will progress further until the detailed design is completed.	and Island C is to facilitate the access of vehicles, equipment, materials, and personnel.
Sanitation Facility - Portalets	In house sanitation facilities includes toilets in barges and use of approved portable toilet contractor.	The portalets will be used to provide restroom facilities for the construction and office workers in the reclaimed land.
COMPONENTS NOT PART OF ECC APPLICATION		
Accessways (Bridges, Viaducts, Roads or others as may be determined) connecting from the mainland	Island A to CCP Complex (Bridge 1 and 2): ±537m Island C to MOA Complex (Bridge 3 and 4): ±305m Island C to MOA (Pedestrian Bridge 1): ±249m	To be firmed up in the Detailed Engineering Design and Final Project Masterplan **As agreed during the EIARC Meeting conducted on 30 August 2024, the detailed bridge design shall be submitted once we amend the ECC to include the bridges.**
Mixed Development Plans such as Vertical Structures, Commercial Establishments, Offices, Theme Park, etc. will be specified in the Detailed Architectural and Land Use Plan which will be covered by a separate Environmental Impact Assessment.		

* In compliance with PRA AO 2019-05, at least 5% of the total area to be reclaimed shall be exclusively used for contiguous green spaces for recreational purposes that are readily accessible to the public. This is part of the 30% roads and open spaces which will consists of roads, parks, green spaces, playgrounds, recreational uses and other similar facilities and amenities. In line with the vision of being a sustainable eco-City, the Project Developer intends to provide additional greenspaces beyond the required 5% greenspace requirement.

1.4.1. MAJOR COMPONENTS

1.4.1.1. RECLAMATION PHASE

The reclamation phase will include the construction of three islands, revetment, water channels, vertical containment structure, wave deflector and related components.

Islands

The Project covers the reclamation and horizontal land development of three hundred sixty (360) hectares along the Coast of Manila Bay which is composed of three islands:

- Island A: ± 60 ha (600,000 sq. m.)
- Island B: ± 153.5684 ha (1,535,684 sq. m.)
- Island C: ± 146.4316 ha (1,464,316 sq. m.)

The water channels as shown in Figure 1.17 has the following approximate distance:

- Island A to Mainland: ± 476 m
- Island B to C: ± 183 m
- Island C to Mainland: ± 247 m

The final platform land elevation is at least 4 m MLLW, as required between Pasay LGU and PRA.

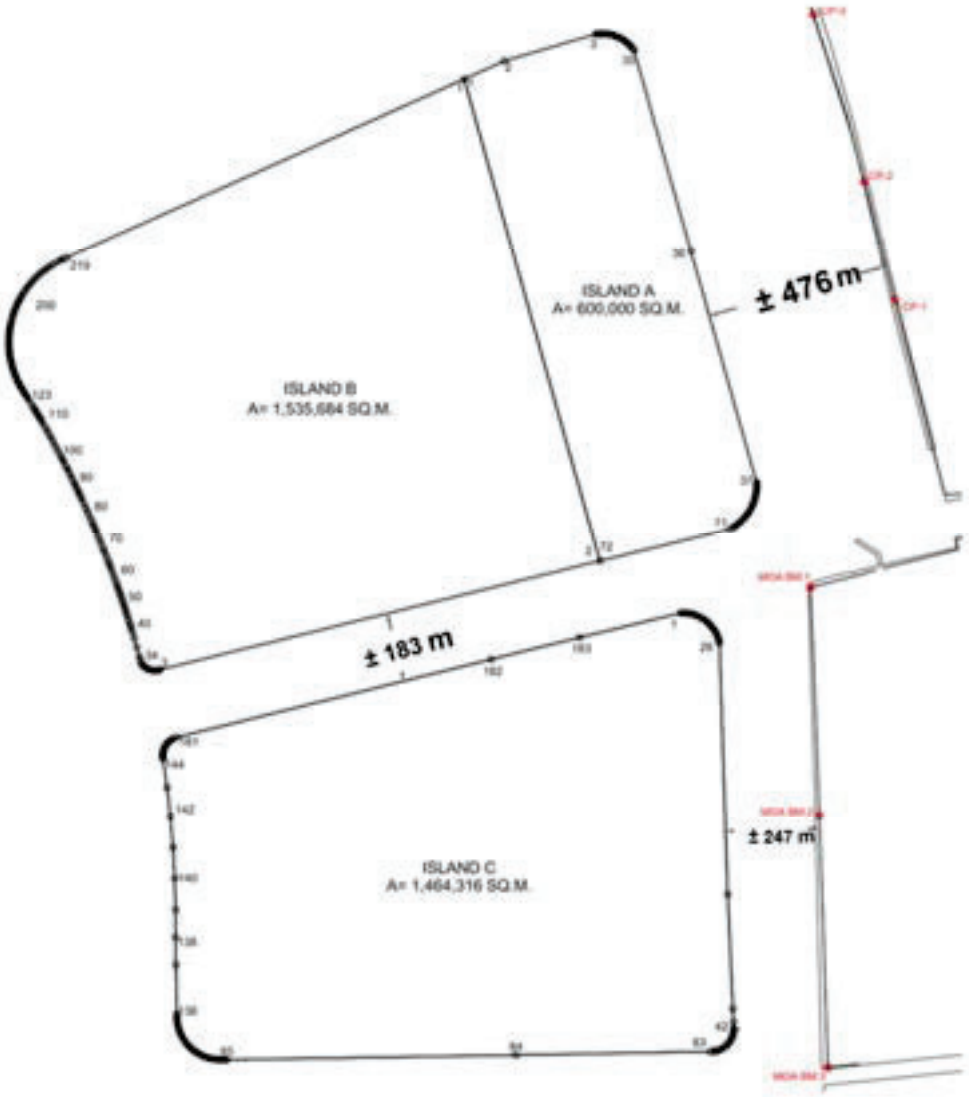


Figure 1.17 Water Channels with Approximate Distance

Vertical Containment Structure

Vertical containment structure will be constructed to prevent soil erosion. The proposed vertical containment structure consists of a double steel sheet pile structure (front and anchor wall) tied together with a tie rod. The containment wall (seawall) has an estimated length of 9,614.75 linear meters around the entire reclaimed area consisting of a combination of rock mound which will be firmed up in the Detailed Engineering Design and Final Project Masterplan.

Wave Deflector

The wave deflector is around 1.5 meters above the platform level. The wave deflector and breakwater will still have to be determined and designed. The conceptual specifications are illustrated Figure 1.18.

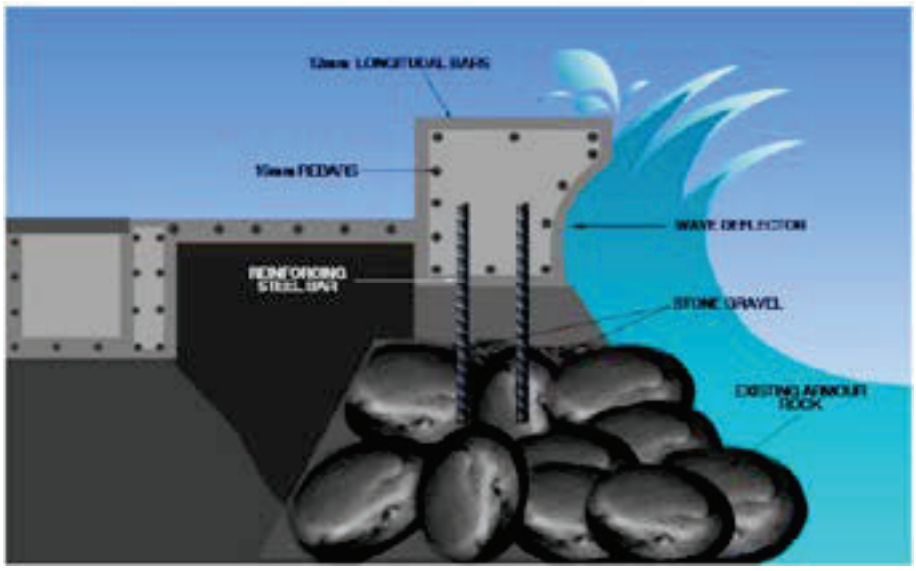


Figure 1.18 The Wave Deflector Conceptual Specifications

The materials specification for the wave deflector will be of steel and stone/rock construction as shown above. The concave-shaped deflector will be made of steel with reinforcing bars for structural support.

Fill Materials

The fill materials is estimated at 100 Million cu m fills 12 Million cu m rocks which is subject to final engineering.

General Specifications for the Fill Materials

- All materials used for fill shall be free of rock boulders, wood, scrap materials, organic matters and refuse.
- These should not have high organic content.
- Not more than 10 percent by weight shall pass the No. 200 sieve (75 microns). Maximum particle size shall not exceed to100 mm diameter.
- Maximum particle size shall not exceed 75 mm.
- Shall be capable of being compacted in the manner and to the density of not less than 95%.
- Shall have a plasticity index of not more than 6 as determined by AASHTO T 90.
- Shall have a soaked CBR value of not less than 25 % as determined by AASHTO T 193.

General Specifications for Rocks

- Rocks should be angular, hard, durable and not likely to disintegrate in seawater, Minimum unit weight is 2,650 kg/cu.m. on dry basis.
- Rocks of the primary cover layer should be sound durable and hard and should be fee from laminations, weak cleavages and undesirable weathering.
- Following test designations should be complied with
- Apparent Specific Gravity ASTM C-127
- Abrasion ASTM C-131

1.4.1.2. HORIZONTAL DEVELOPMENT PHASE

The horizontal development will include construction of major/primary access roads and bridges, open spaces, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems. It is recognized that most of these are to be constructed after reclamation works are completed. It is therefore provided under the Memorandums of Agreement between the PRA and Pasay City for the 300-hectare and 60-hectare reclamation projects that plans and documents for Horizontal Development Works such as the Detailed Engineering Design, plans for major roads including utilities, Site Development Plan, Land Use Plan, Land Allocation Plan, Geotechnical Investigation Report, detailed construction schedule, and other engineering studies shall be submitted to PRA within eighteen (18) months from completion of the land reclamation works.

Figure 1.19 shows the possible location and boundaries of project area, parks and open spaces and proposed buffers.

Open Spaces

In compliance with PRA AO 2019-05, at least 5% of the total area to be reclaimed shall be exclusively used for contiguous green spaces for recreational purposes that are readily accessible to the public. This is part of the 30% roads and open spaces which will consists of roads, parks, green spaces, playgrounds, recreational uses and other similar facilities and amenities. In line with the vision of being a sustainable eco-City, the Project Developer intends to provide additional greenspaces beyond the required 5% greenspace requirement.



Figure 1.19 Conceptual Map Showing the Proposed Parks and Open Spaces

Inter-Island Connecting Bridges

The map showing the primary road, secondary roads, pedestrian bridge, and vehicular and pedestrian bridge is shown in Figure 1.20 in different colors. The inter-island connecting roads, pedestrian and vehicular bridges conceptual/indicative details such as length and height including the ingress and egress of these bridges are presented such as the in Figure 1.20 and Figure 1.22. These detailed specifications will be firmed up in the Detailed Engineering Design and Final Project Masterplan as part of an application for another amendment of the ECC.

It has to be noted that Permanent Bridges 1, 2, 3, 4 and Pedestrian Bridge as agreed during the EIARC Meeting conducted on 30 August 2024, that the detailed bridge design shall be submitted once we amend the ECC to include these bridges.

Bridge 5 and 6 on the other hand is included in this ECC application. The details of these bridges are as follows:

Inter-Island connecting Bridge Between Project Islands A and B with Island C - Middle (Bridge 5)

- Type: Reinforced Concrete Beam Bridge
- Width: 46 mts.
- Number of Lanes: 10 lanes (5 lanes per direction)

Inter-Island connecting Bridge between Project Islands A and B with Island C - Middle (Bridge 6)

- Type: Reinforced Concrete Beam Bridge
- Width: 35 mts.
- Number of Lanes: 6 lanes (3 lanes per direction)

The permanent Inter-Island Connecting Bridges Between Project Islands A and B with Island C (Bridge 5 and 6) landing points are shown in Figure 1.21 while the schematic / site plan is shown in Figure 1.25.

The Inter- Island bridges geographic coordinates is shown in Table 1.15.

Table 1.15 Inter-Island Bridges (Permanent)

Bridge	Technical Specifications/ Description	No.	Latitude	Longitude
Middle (Bridge 5)	Connects Islands A/B and C Length: ±225mts. Width: ±46mts.	1	14°32'24.20262"N	120°57'55.28187"E
		2	14°32'24.56739"N	120°57'56.79045"E
		3	14°32'18.56213"N	120°57'57.35853"E
		4	14°32'18.19665"N	120°57'55.85003"E
Middle (Bridge 6)	Connects Islands A/B and C Length: ±225mts. Width: ±35mts.	1	14°32'30.91922"N	120°58'23.06119"E
		2	14°32'31.19633"N	120°58'24.20734"E
		3	14°32'25.20848"N	120°58'24.83726"E
		4	14°32'24.93820"N	120°58'23.69042"E



Figure 1.20 Conceptual Maps Showing the Possible Primary and Secondary Roads, Vehicular and Pedestrian Bridges

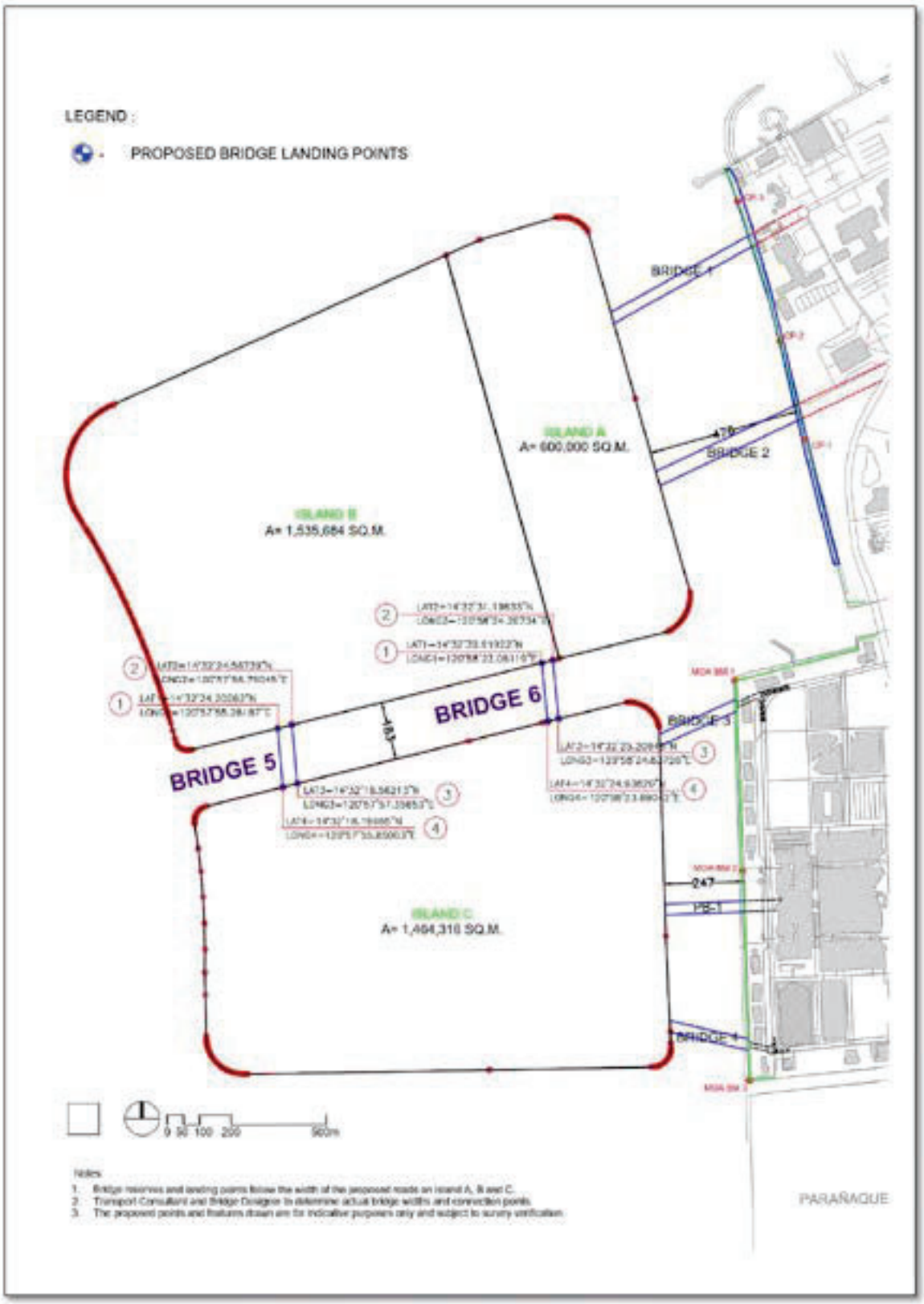


Figure 1.21 Inter-Island Bridge Landing Points

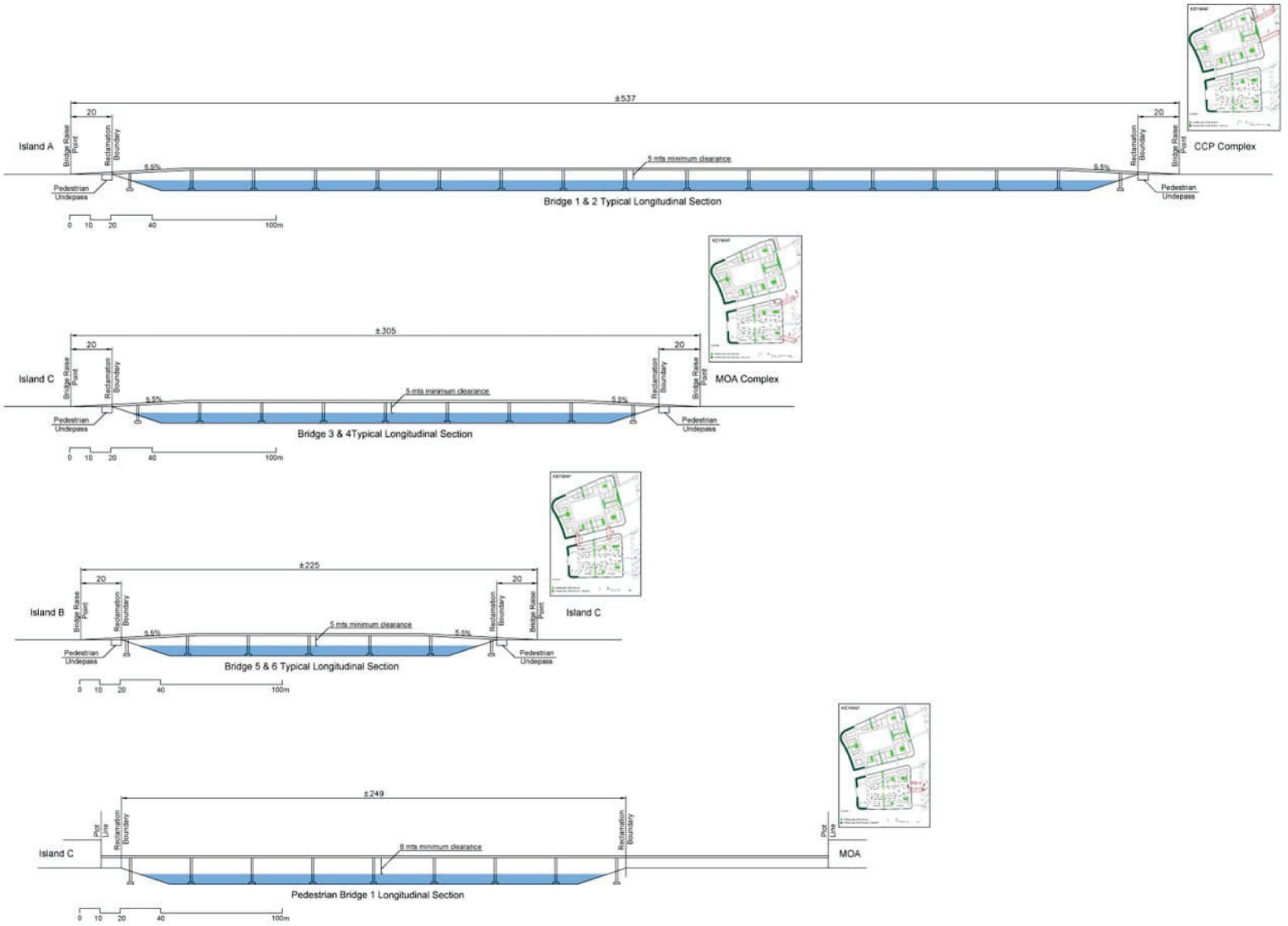
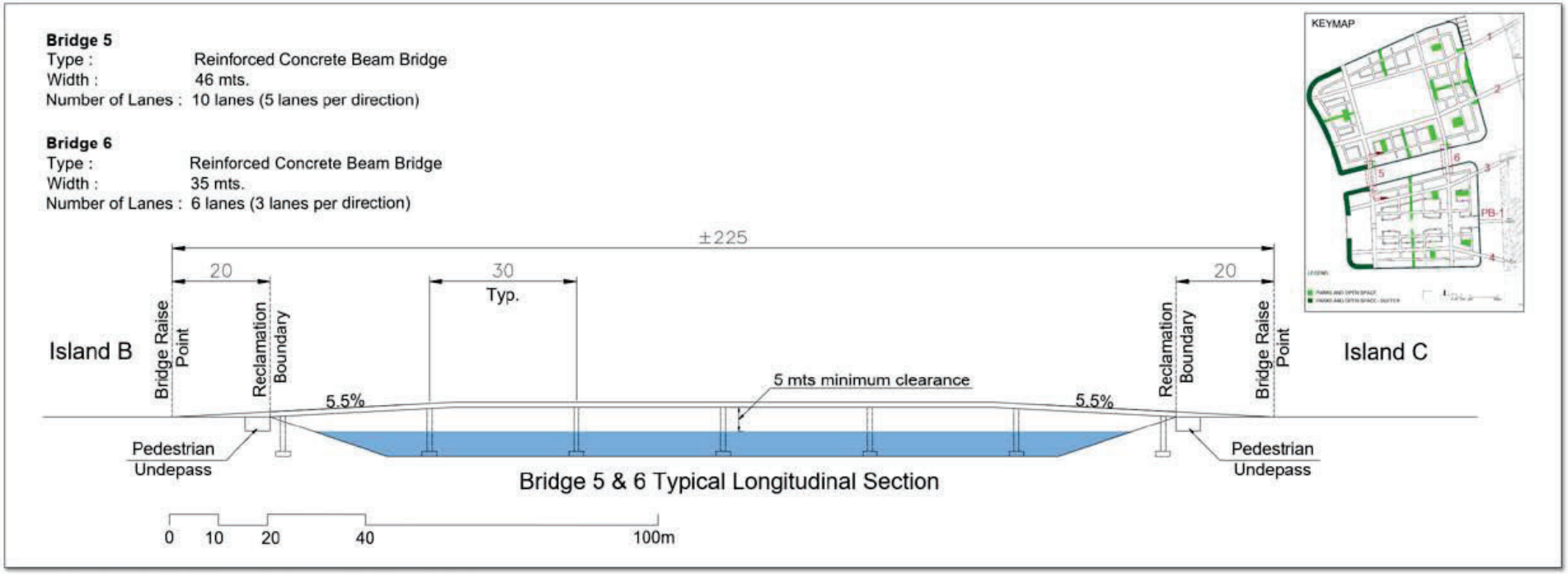


Figure 1.22 Conceptual Bridge Details



Note: To be firmed up in the Detailed Engineering Design and Final Project Masterplan

Figure 1.23 Inter-Island Bridge Schematic/ Site Plan (Bridge 5 and 6)

DRAINAGE SYSTEM

1. Temporary Drainage During Construction

Due to the sand's highly permeable nature, stormwater will percolate through it during the reclamation project. This natural filtration process allows the stormwater to be cleaned before it eventually discharges into the sea. The use of such a highly permeable material ensures that stormwater is discharged efficiently, reducing the risk of flooding and minimizing environmental impact through sand filtration.

2. *Storm Drainage System*

Stormwater drainage shall be constructed as part of the horizontal development and will likely be underground concrete culverts.

The Stormwater Management for the reclamation project focuses on stormwater networks, flood risk management, and hydrology analysis. The primary goal of the stormwater drainage system is to safely convey, collect, and divert runoff from roads and pedestrian areas into the designated drainage system, preventing flooding within the development.

This system manages natural surface runoff, surface drainage from paved or artificially impervious surfaces, excess rainwater, stormwater, kitchen water, bath/shower water, and similar types of water. All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines.

The conceptual storm drainage system (Figure 1.24) includes gullies, U-channels, manholes, pipes, box culverts, and outfalls. Stormwater will be collected by gullies or U-channels with grating covers and transported via pipes or box culverts.

The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years. According to BS EN 752 Part 4 Table 2, the runoff coefficient ranges from 0 to 1, depending on the pavement type. For this project, a coefficient of 0.9 will be used for roads and buildings due to their impermeable nature, and a coefficient of 0.2 for green areas due to their permeable nature. A rainwater tank will be installed before each outfall, with overflow stormwater being discharged directly into the sea. Storm drainage manholes will be made of reinforced concrete with manhole covers 800mm in diameter.

The design will ensure drainage and stormwater collection along the entire road system. To address environmental concerns related to disposing of storm runoff directly into Manila Bay, the proponent will implement a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. This system may include swales instead of concrete/PVC drainage pipes, allowing infiltration, constructing cisterns for storage, and similar initiatives. The conceptual design of the proposed road network within the development is presented Figure 1.25.

Appropriate engineering interventions, such as installing cast iron grills along gutters and curbs, will minimize, if not eliminate, conditions like siltation, debris, scouring, and other factors that may impede the free flow of stormwater to designated drainage lines and cause flooding within the development. Porous materials such as grass/turf pavers, paving blocks, or similar materials will be used in areas fronting the sea and along the proposed linear forest to encourage infiltration and reduce surface runoff.

Stormwater System

Reinforced Concrete Stormwater Drain

Conventional Drainage System - Box Drains/Culverts, Flow By Gravity

- Runoff from all land uses conveyed by proposed grading to stormwater gravity network.

Note:

- Drainage at Green Buffer to be discharged directly into sea as part of the wave overtopping drain. Hence, catchment area of green buffer excluded in the drainage system
- Open space/ Park and pedestrian street/easement included in the drainage catchment.

Advantages:

- Economical
- Box section drain are having grater capacity, allowing flow of larger water volume
- Simple construction
- Variety of shapes
- Longer lasting life span
- Easier installation of bedding and backfill
- Lesser or no ground clearance requirement
- No effect in weaker soil
- The concrete floor strength allows for water direction to be changed in case of expected larger amount of water
- Shorter segments are easier to maintain
- Made of concrete or RC (Reinforced Concrete)



Drain Grating - Road



RC Stormwater Drain

Legend

Box Drains

Discharge Point



Figure 1.24 Conceptual Stormwater Drainage System

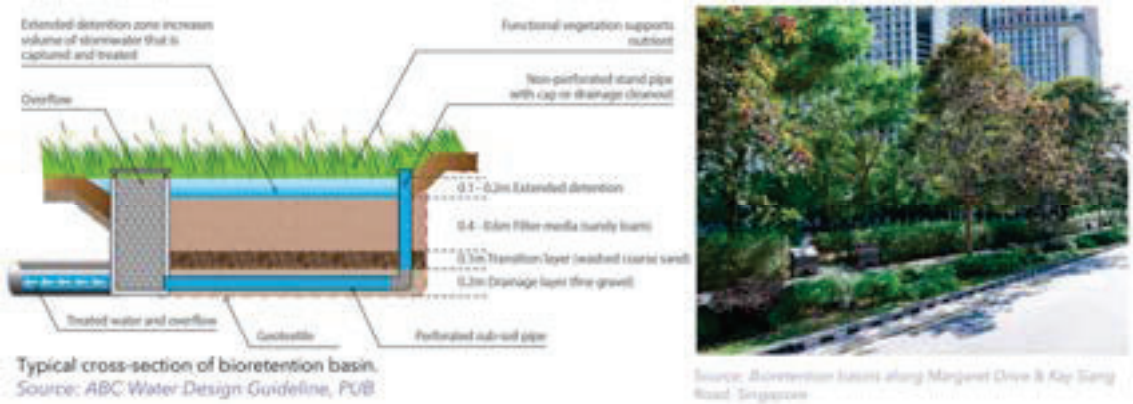


Figure 1.25 Conceptual Design of the Proposed Road Network within the Development

Individual and/ or Centralized Treating System(s)

Sewage will primarily come from residential, commercial, office, and hotel areas. Individual and/ or Centralized Treating System(s) will be constructed, with effluent quality meeting local environmental standards. Sewage lift stations will be built as needed. Sewage pipes will be made of HDPE drainage pipes, SN8 as per BS EN 13476, or RCC pipes, Class 120 as per BS 5911-1. Sewage manholes will be made of reinforced concrete with manhole covers 800mm in diameter.

Individual and/or centralized treating system(s) are proposed for construction at Islands A, B, and C. According to Operational Plan of Manila Bay Coastal Strategy (OPMBCS). All new sources of discharges / wastewater effluent must comply with DENR SB Classification (bathing & contact recreation) hence there will accordingly be proposing a centralized treatment facility and combined or separate sewerage system to address all the sources of water pollution during the Operations Phase of the Project.

Other Horizontal Development Works

Other horizontal development works, such as power and water, electricity, and other pollution abatement facilities, shall be included in the final DED and master development plan.

1.4.2. TEMPORARY SUPPORT FACILITIES

As part of the reclamation and horizontal development construction methodology there will be temporary offices and temporary construction facilities (Figure 1.26) such as Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets, among others.

Temporary Working Areas

During the construction phase, temporary work areas denoted by red dash-dot line in are considered for the use of the following works, namely:

- Revetment Works, as denoted by the pink dash-dot line, involve placing concrete mattresses at the edge of the island. These mattresses are then set in place to prevent erosion and provide wave protection incoming from the open sea. Accordingly, the revetment works will require performing off-shore activities as the construction methodology.
- Rehandling of Sand works for Old Island A, will be needed to widen the channel in between the front of CCP hinterland and Island A. The current existing sand from the particular area would be transferred within the boundaries of the new Island Boundary.
- Construction of Bridges connecting the hinterlands (CCP and Mall of Asia Complex) and connecting the Islands AB and C of the project. This will be denoted by an orange dash-dot line and would serve as the mode of access from the hinterland towards the reclamation project during the Construction phase to transport materials and personnel.

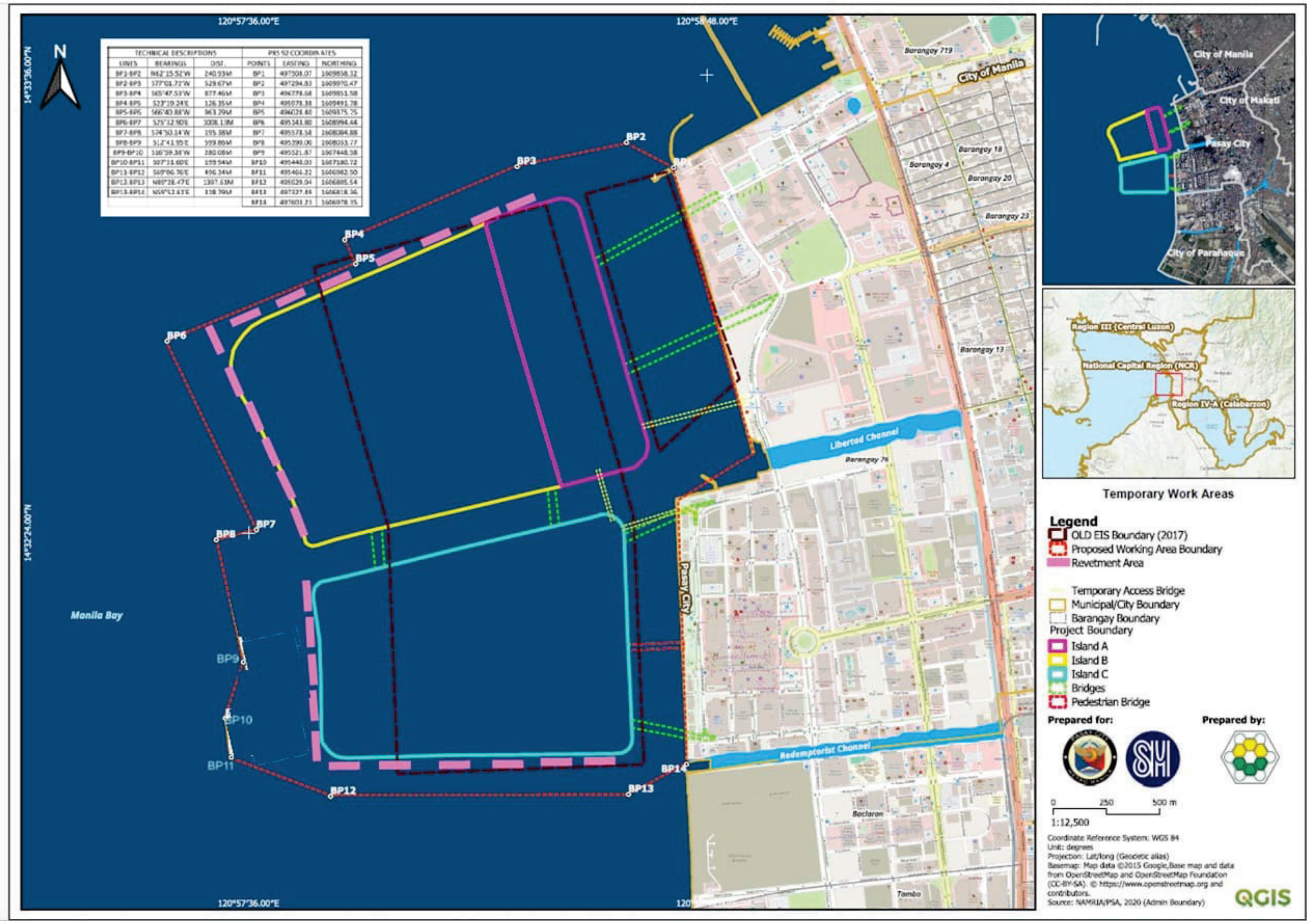


Figure 1.26 Project 360 Schematic / Site Plan including Temporary Support Facilities

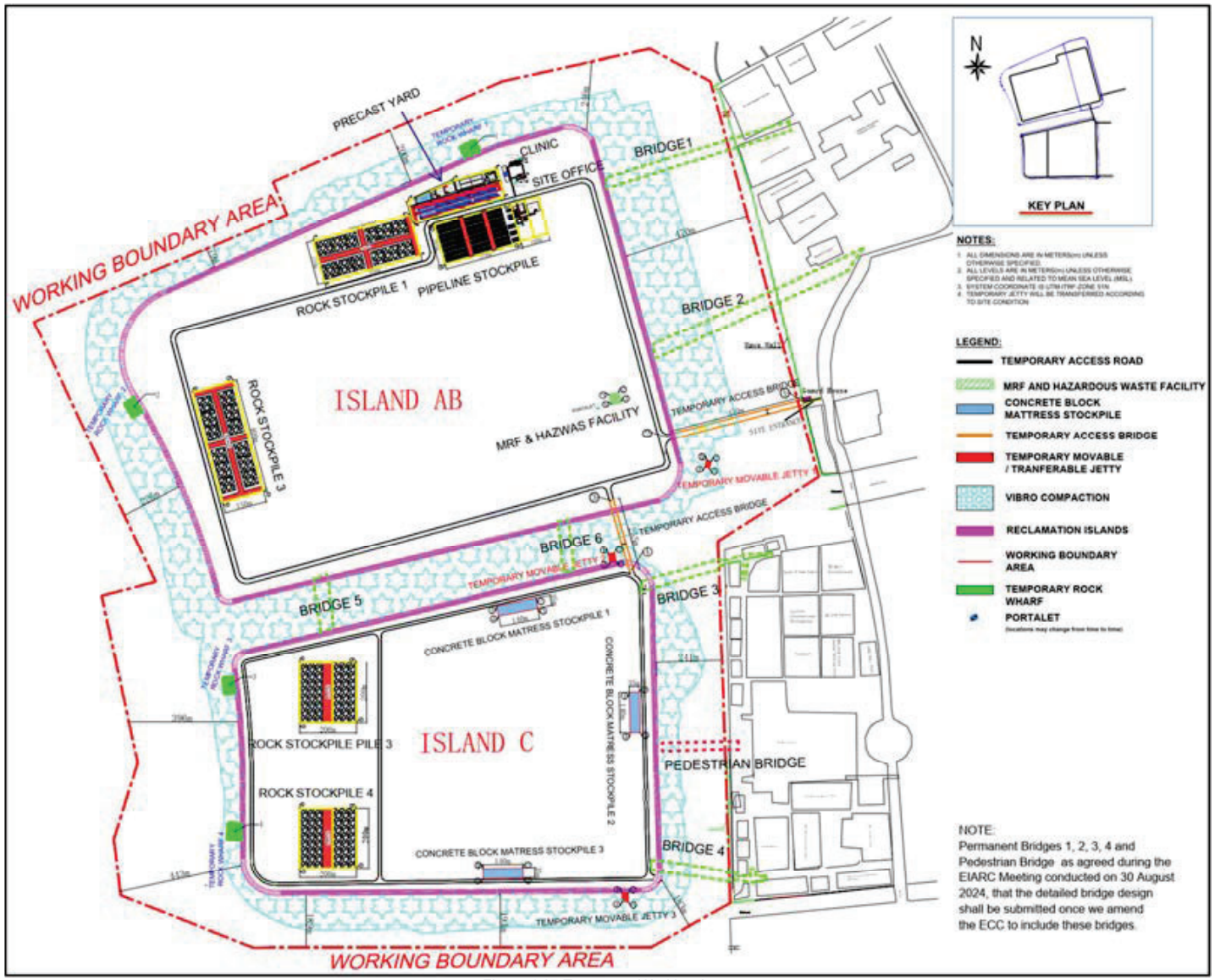


Figure 1.27 Temporary Working Areas
Source/ Reference: Open Street Map and NAMRIA/PSA, 2020

Precast Yard

Purpose

The precast yard's function is primarily to prefabricate Concrete Block Mattresses (CBM) for channel revetments for slope protection. It also serves functional areas for the office, worker's rest area, geotextile processing, equipment parking, and material storage.

Description of Activities

Construction

The precast yard construction activities are as follows:

- Steel fence installation
- Placement of small rocks as a base for the construction of the workshop yard
- Installation of precast concrete bedding
- Mould delivery on site
- Installation of steel railing for gantry cranes
- Lifting Beam
- Concrete trial
- Prefabrication of Concrete mattress

For site offices, this includes placement of containers in designated areas.

Decommissioning

The decommissioning of the precast yard and its subcomponents will involve the following:

- Removal of offices and all equipment and facility
- Pullout of containers (prefab cabins for site offices)
- Breaking of concrete base and hauling of debris from site to a designated dumping area
- Site clean-up

Technical Specifications

The total length of the precast yard (workshop yard) is 326m, the maximum width is about 100m, and the total area is 31,770m^2, the yard is divided into an office area, prefabrication area, CBM storage area, and other functional areas as shown in Figure 1.28. It is planned to be built on the north side of Island AB, near the temporary rock jetty and 50 meters away from the reclamation boundary. The material specification of most of the precast yard subcomponents is concrete bedding with steel railing for gantry cranes and enclosed by a steel fence. The list of the precast yard subcomponents is presented in Table 1.16.

Table 1.16 Components of the Precast Yard

Components	Description/ Specifications
Prefabricated Area	The prefabricated area is 280m long and 33m wide. There are four production lines, each with 30 prefabricated pedestals. The single block mattress size is L*W=6.32m*2.92m. Individual pedestals are set up according to the block mattress size. Each pedestal is equipped with a set of block mattress bottom molds, allowing the prefabrication to accommodate up to 120 pieces of block mattresses. Flooring: 10cm *C25 concrete. Fences are set up on both sides of the prefabrication area. Two gantry cranes with a 15 T lifting capacity, a 33-meter span, and a 9-meter lifting height are planned. Track beams will be installed on both sides, and the gantry crane track will be 33 meters wide.
CBM Storage Area	Three storage areas are set up: • Area A : length 56m, width 13m, and total area of 728m^2 • Area B : length 56m, width 9m, and total area of 504m^2 • Area C : length 26m, width 32m, and total area of 832m^2 The stacking height shall not exceed 2 meters.
Geotextile processing area	Includes a geotextile storage area, processing area, and processed geotextile storage area. Used for geotextile sewing and processing. The dimensions are 100m x 32m
Generator Placement/ Power Distribution:	Flooring: 20cm *C25 concrete Power consumption plan: Utilization of one 200 kW generator for primary power, supplemented by a 50 kW and a 20-kW generator for backup.
Access Road	There are two horizontal roads in the workshop area: Access 1 is a gravel road, 9 meters wide, and a double lane; Access 2 is located in the prefabrication area, with a concrete road, 6 meters wide, and a single lane. There is also a pedestrian walkway.
Water Tanks	Three water tanks for curing water, each made of steel plates with a capacity of 20m^3, are set up for curing water used in concrete mattresses
Fuel Storage Tank (Diesel)	The 6m × 6m fuel storage area located at least 15 meters away from the generator, separated by caution / danger tape. Fuel tanks and storage area will be bundled with at least 110% of the storage capacity of the largest tank.
Precast Yard Site Office	Flooring: 20cm *C25 concrete Steel Insulated cabin with aircon.

Components	Description/ Specifications
	Used as work space for site personnel. Approximately 40m long and 30m wide, accommodating on-site offices, warehouse, meeting rooms, and workers' rest area. All rooms are constructed as assembled box-type cubicles, which are procured externally and then placed on the site.
Geotextile processing area	Includes a geotextile storage area, processing area, and processed geotextile storage area. Used for geotextile sewing, and processing. The dimensions are 100m x 32m
Maintenance area and Material storage area	It includes equipment maintenance, parking areas, material storage areas such as chemical storage for paint, oil, grease and spray cans for precasting.

*C25 concrete is the specification of the concrete to be used for the flooring with 20 cm thickness.

The schematic / site plan including the technical geographic coordinates of the precast yard are shown in Figure 1.28.

PRECAST YARD		
S/N	LATITUDE	LONGITUDE
1	14°33'8.05"	120°58'6.39"
2	14°33'10.40"	120°58'11.60"
3	14°33'11.85"	120°58'16.63"
4	14°33'8.62"	120°58'17.61"
5	14°33'5.60"	120°58'7.13"

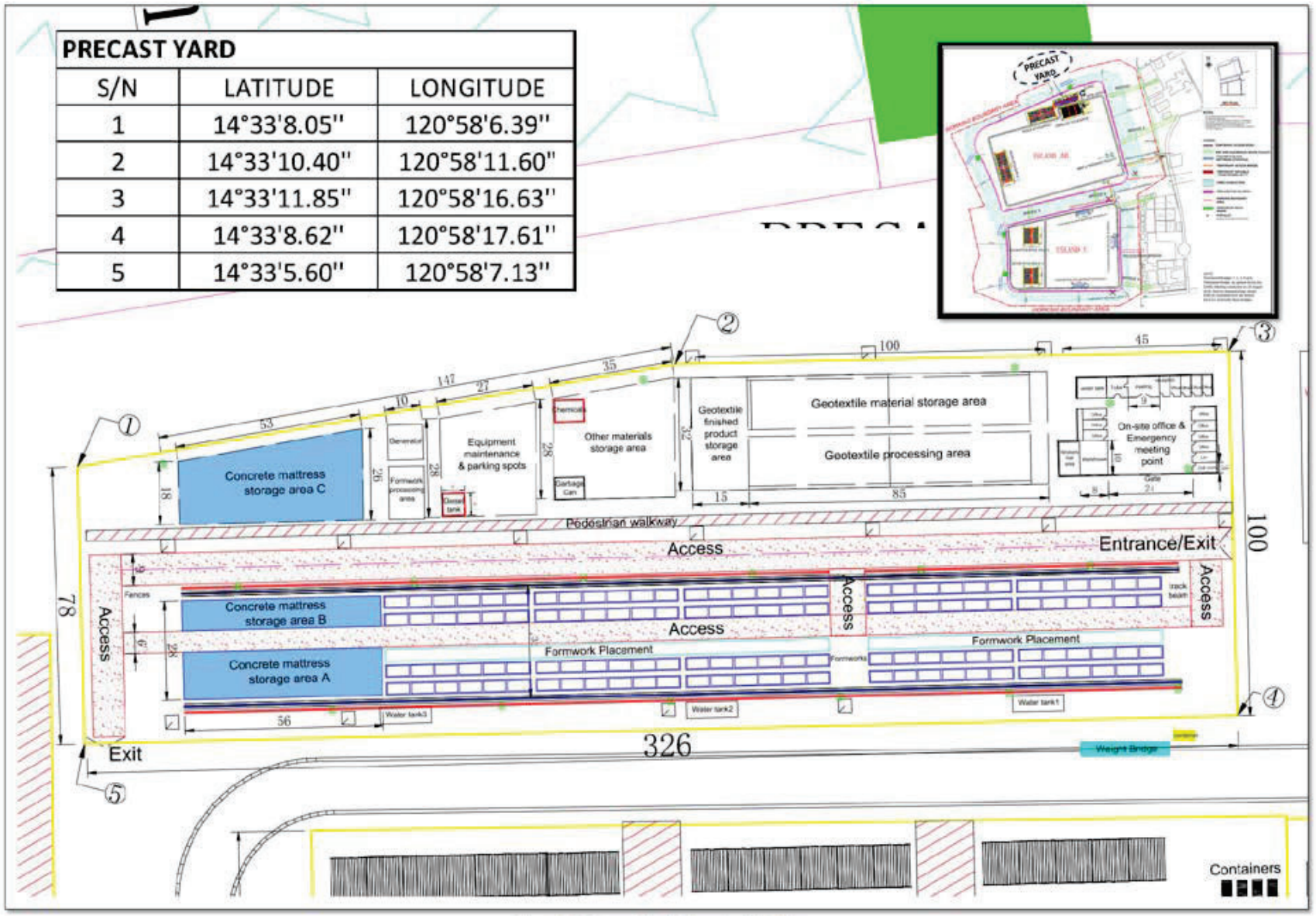


Figure 1.28 Precast Yard Schematic / Site Plan

Site Office

Purpose

This site office, along with the offices located in the precast yard, will be used as a work space for the general use of site personnel.

Description of Activities

Construction

The establishment of site office include clearing of the location and placement of office containers (prefabricated cabins) on designated area.

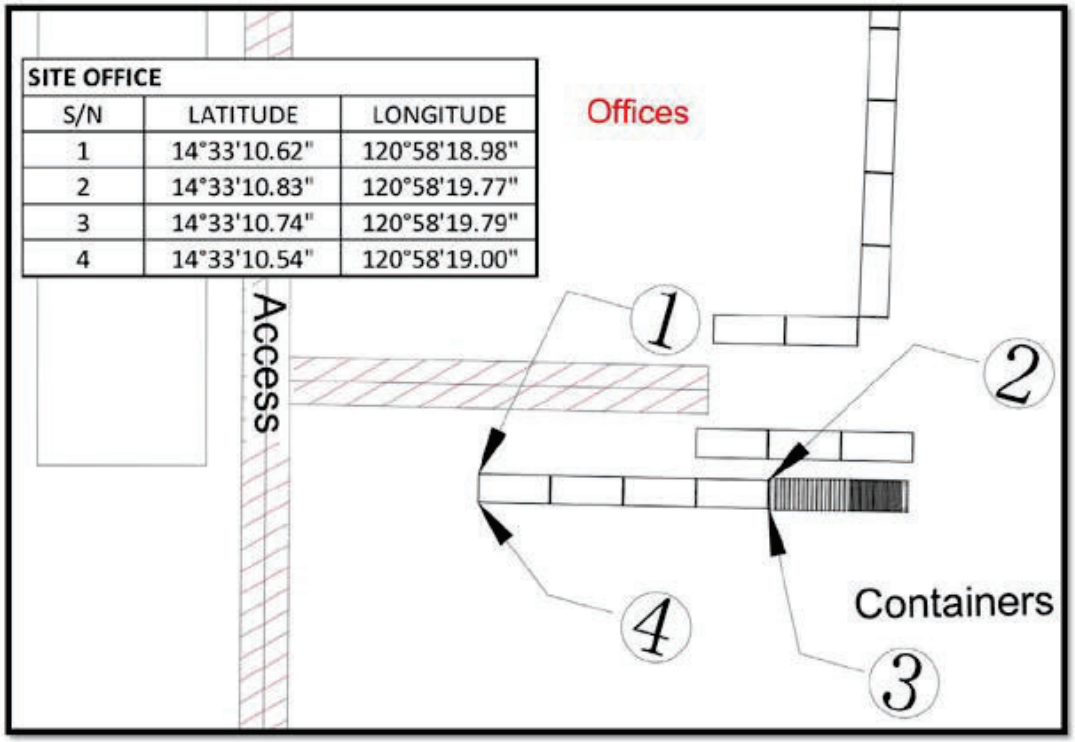
Decommissioning

The decommissioning activity include pull-out of office containers (prefabricated cabins) and site clean-up.

Technical Specifications

The site office is made up of steel insulated cabins. Air conditioning units will be installed in the site office containers.

The schematic / site plan including the technical geographic coordinates of the site office are shown in Figure 1.29. The site office is located at the upper right of north side of Island AB and right side of the precast yard.



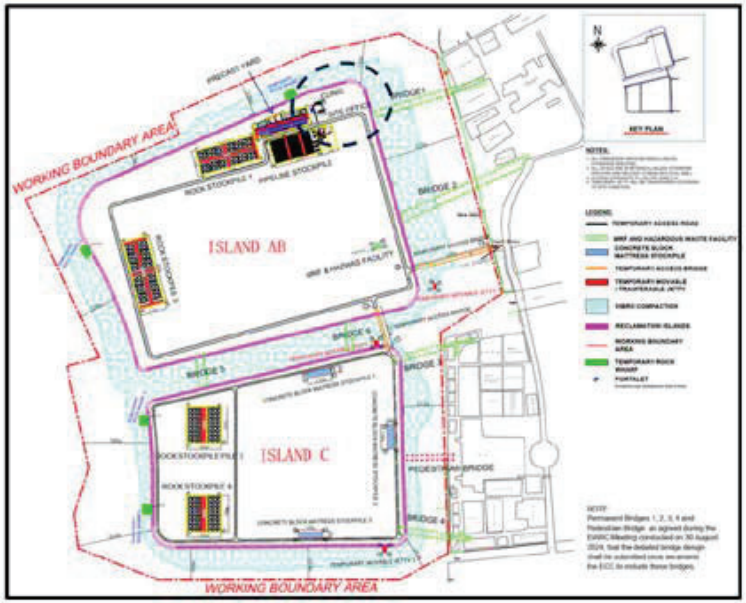


Figure 1.29 Site Office Layout

Rock Stockpile

Purpose

The rock stockpiles will be used to store rock materials. These rock materials will be used for coastal revetments, which deflect the energy of waves and prevent erosion along coastlines.

Description of Activities

Construction

The construction activities for the rock stockpile are as follows:

- Clean and clear the designated area for the stockpile
- Placing of cones to act as fence

Decommissioning

Site clean-up, removal of cones and cyclone wires that act as fence, proper housekeeping and disposal of solid and residual waste.

Technical Specifications

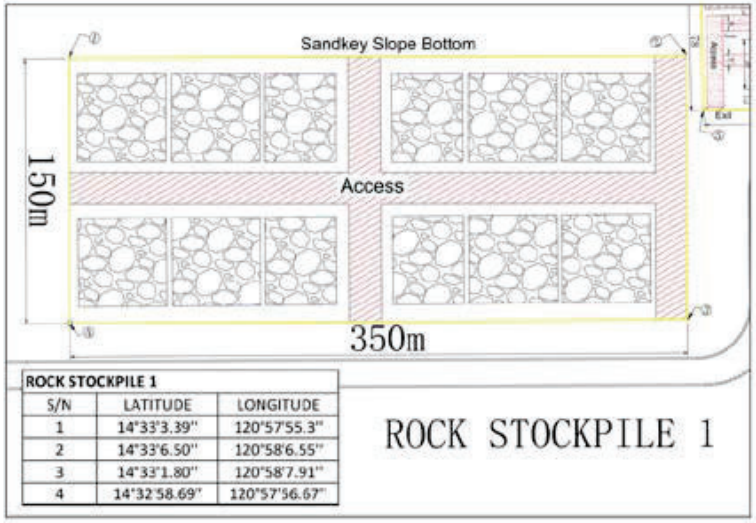
The rock stockpile is laid on sand with a soft boundary barricade, such as cones, cyclone wire fences, etc.

The size of the four rock stockpile areas are as follows:

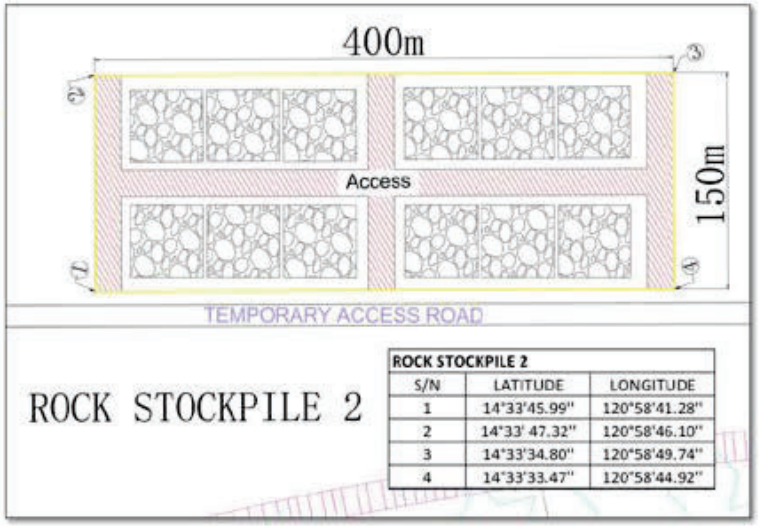
- 1 pc – 150m x 350m (See Rock Stockpile 1 in Figure 1.30)
- 1 pc – 400m x 150m (See Rock Stockpile 2 in Figure 1.30)
- 2pcs - 200m x 200m (See Rock Stockpiles 3 and 4 in Figure 1.30)

Stockpile "1" is located at the North side of Island AB. Left side of Precast Yard and Pipeline stockpile. Stockpile "2" is located on the West side of Island AB. Stockpile "3" is located at the upper west of Island C side near rock wharf 3. Stockpile "4" is located at the lower west side of Island C near wharf 4.

The schematic / site plan including the geographic coordinates are shown in Figure 1.30.

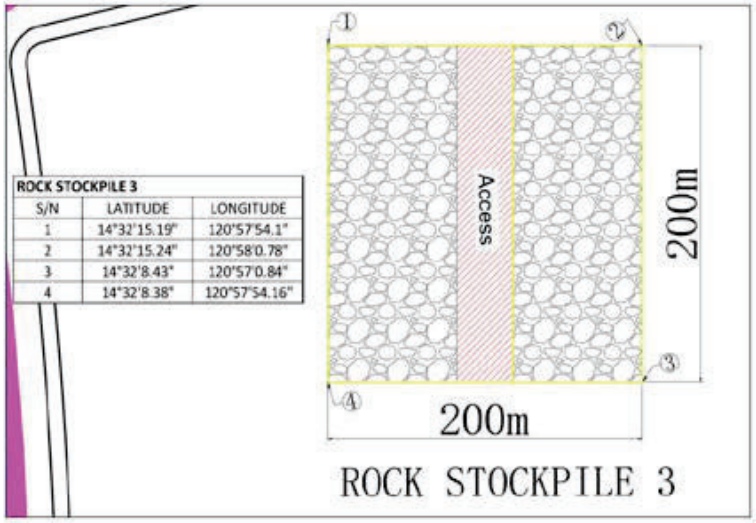


ROCK STOCKPILE 1		
S/N	LATITUDE	LONGITUDE
1	14°33'3.39"	120°57'55.3"
2	14°33'6.50"	120°58'6.55"
3	14°33'1.80"	120°58'7.91"
4	14°32'58.69"	120°57'56.67"

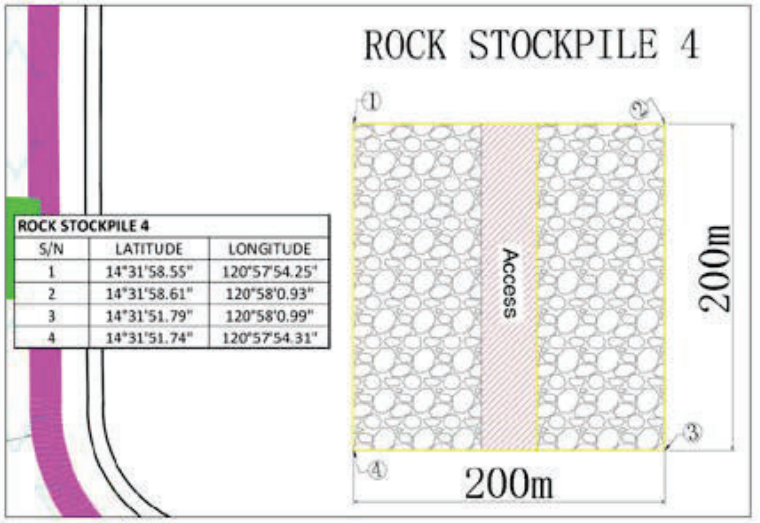


ROCK STOCKPILE 2		
S/N	LATITUDE	LONGITUDE
1	14°33'45.99"	120°58'41.28"
2	14°33' 47.32"	120°58'46.10"
3	14°33'34.80"	120°58'49.74"
4	14°33'33.47"	120°58'44.92"





ROCK STOCKPILE 3		
S/N	LATITUDE	LONGITUDE
1	14°32'15.19"	120°57'54.1"
2	14°32'15.24"	120°58'0.78"
3	14°32'8.43"	120°57'0.84"
4	14°32'8.38"	120°57'54.16"



ROCK STOCKPILE 4		
S/N	LATITUDE	LONGITUDE
1	14°31'58.55"	120°57'54.25"
2	14°31'58.61"	120°58'0.93"
3	14°31'51.79"	120°58'0.99"
4	14°31'51.74"	120°57'54.31"

Figure 1.30 Rock Stockpile Schematic / Site Plan

Pipeline Stockpile

Purpose

The pipeline stockpile will store pipes for sand rehandling. These pipes connect the CSD and sprayer pontoons used in sand reclamation activities.

Description of Activities

Construction

The construction of the pipeline stockpile will include cleaning and clearing the designated area, which is laid on level ground.

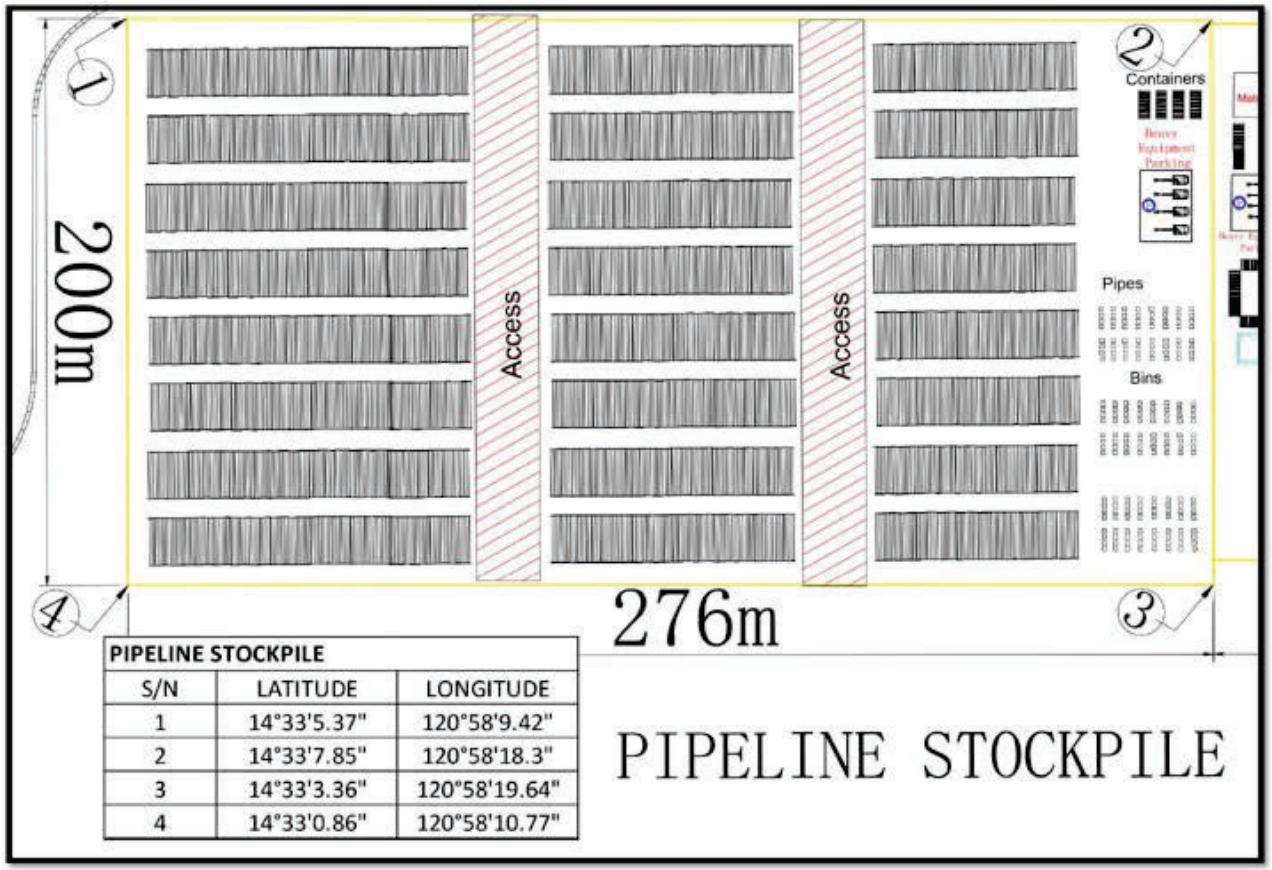
Decommissioning

The decommissioning of the pipeline stockpile includes the removal of all the pipes and site clean-up activities.

Technical Specifications

The pipeline stockpile will be laid on sand with a boundary soft barricade such as cones or cycle wires.
The pipeline stockpile size is 200m x 276m, including an access road in between.

The schematic/ site plan, which includes the technical geographic coordinates of the pipeline stockpile, is shown in Figure 1.31. The pipeline stockpile is located north side of Island AB, below the precast yard.



PIPELINE STOCKPILE		
S/N	LATITUDE	LONGITUDE
1	14°33'5.37"	120°58'9.42"
2	14°33'7.85"	120°58'18.3"
3	14°33'3.36"	120°58'19.64"
4	14°33'0.86"	120°58'10.77"

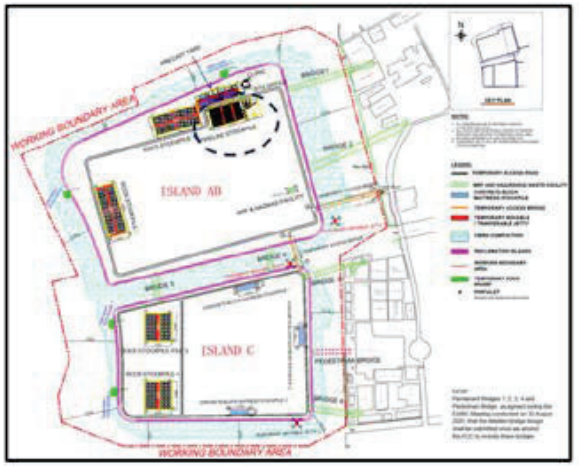


Figure 1.31 Pipeline Stockpile Schematic / Site Plan

Material Recovery Facility (MRF) And Hazardous Waste Facility

Purpose

The Material Recovery Facility (MRF) will include segregation, recycling, reuse and storage of solid waste which include domestic and construction wastes.

The Hazardous Waste Facility will be used for temporary storage of hazardous waste for eventual disposal.

Description of Activities

A waste management system is already being practiced for the Project. The on-site waste management involves process and practices used to handle, segregate, and dispose of waste materials generated on site and wastes from the sea. The collected wastes are stored and segregated in a Materials Recovery Facility (MRF) until disposal by DENR-accredited waste service providers. The MRF is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes. The MRF also has a designated hazardous waste section consisting of 3 partially closed areas for liquid and solid hazardous wastes, as shown in Plate 3-1.

The project generates various hazardous wastes (Table 1.17) such as used oil and other oily wastes, among others. The facility is designed to provide open-air ventilation to the stored hazardous waste. Secondary containment, such as drip trays, is provided inside the hazardous waste storage area for liquid hazardous wastes. Spill kits, fire extinguishers, gloves, eye protection, and hazard signages are also provided. Permit-to-transport and Certificates of Treatment are also posted in the hazardous waste storage area. Notably, for pathological/infectious waste (M501), and pharmaceuticals and drugs (M503), there exists a service agreement between CHEC and M Diagnostics Philippines Inc. This agreement outlines the responsibility for the collection, treatment, and disposal of hazardous waste.

Third-party DENR-accredited waste Service Providers, such as Vertex and RMS, are contacted to collect the solid waste for disposal in a landfill. The dredging activity on Island A includes extracting previously installed PVD materials. These extracted PVDs are stored in a temporary stockpile for drying before disposal.

Table 1.17 List of Hazardous Waste

HW No.	HW Class	Remarks
I101	Used Waste Oil	Subcontracted by RMS and/or DENR accredited TSD Facility
I102	Cooking Oil	Subcontracted by RMS and/or DENR accredited TSD Facility
I104	Oil Contaminated Materials	Subcontracted by RMS and/or DENR accredited TSD Facility
M506	E-waste (WEEE)	Subcontracted by RMS and/or DENR accredited TSD Facility

HW No.	HW Class	Remarks
L402	Waste with specific non-halogenated toxic organic chemical	Subcontracted by RMS and/or DENR accredited TSD Facility
M501	Pathological or Infectious Waste	Service Agreement with M. Diagnostics Philippines Inc. Hospital and/or clinic for medical waste disposal
M503	Pharmaceuticals and Drugs	
E501	Oxidizing Agents	Subcontracted by RMS and/or DENR accredited TSD Facility
J201	Containers previously containing toxic chemical substances	Subcontracted by RMS and/or DENR accredited TSD Facility
F601	Solvent based	Subcontracted by RMS and/or DENR accredited TSD Facility
D406	Lead Compounds	Subcontracted by RMS and/or DENR accredited TSD Facility
G704	Non-halogenated organic solvents	Subcontracted by RMS and/or DENR accredited TSD Facility



Plate 1-1 Existing Materials Recovery Facility and Hazardous Waste Storage in the Original Island A

Most active works will be at sea. All types of waste except sewage (See Section 2.12) will be properly segregated and collected by an approved waste service provider. Waste bins were painted according to waste classification and strategically placed on its designated waste management area. The contractor has secured memorandum of agreement with DENR-Accredited Sanitary Landfills for the transport of residual waste coming from foreign vessels and has secured disposal agreement with a waste management corporation to handle transport and disposal of residual waste. The onshore and offshore existing waste management practice is shown in Plate 3-2.

Chemicals that will be used in the project implementation activities will have its own storage that is segregated and stored properly. Both the chemical and hazardous waste will have its own inventory. Regular Spill Kit inspection and inventory is also currently being implemented.

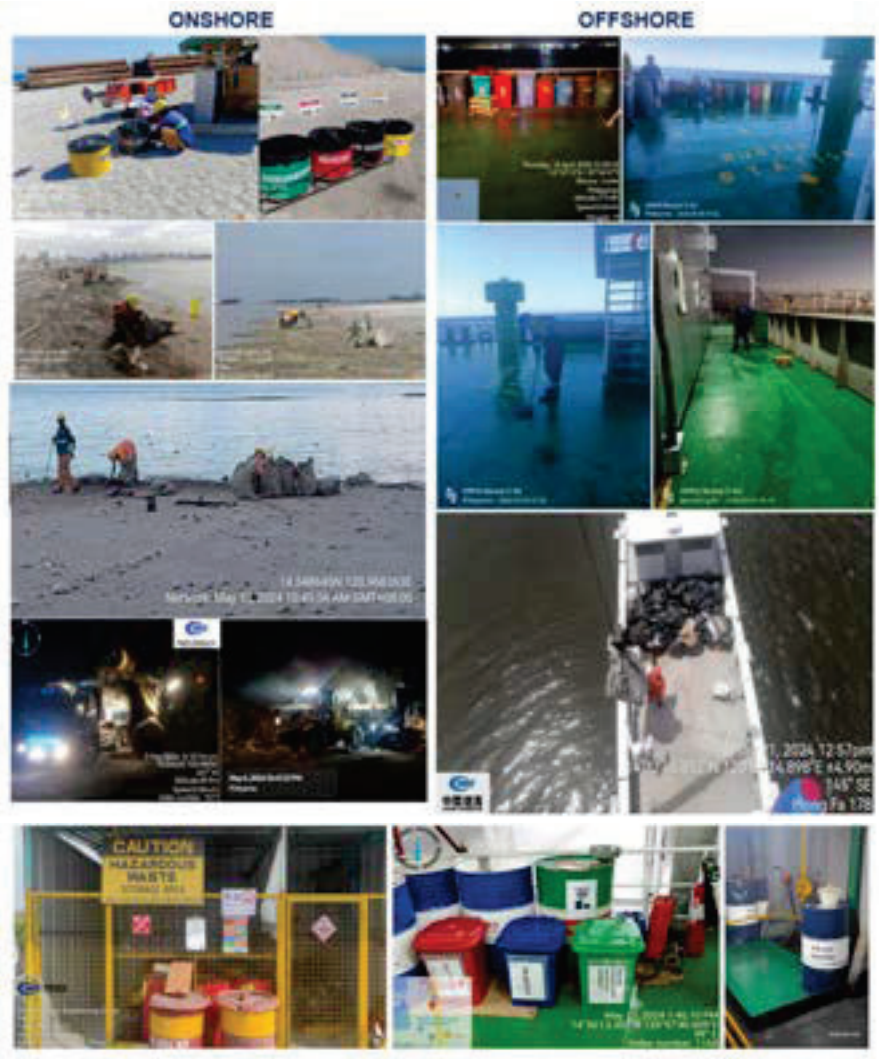


Plate 1-2 Onshore and Offshore Waste Management Practice

Construction

The MRF and Hazardous Waste Facility (HWF) include the transfer of the existing steel and galvanized iron (GI) (repurposed metal pipes) fabricated facilities from the original island A to the south east portion of Island AB (see location in Island AB, Figure 1.32).

Decommissioning

Decommissionin the MRF and the HWF will include the following:

- Site clean-up includes hauling of all residual solid and hazardous wastes through DENR accredited haulers.

- Dismantling construction equipment, such as screens, steel and galvanized iron sheets, roofing, makeshift materials, etc.

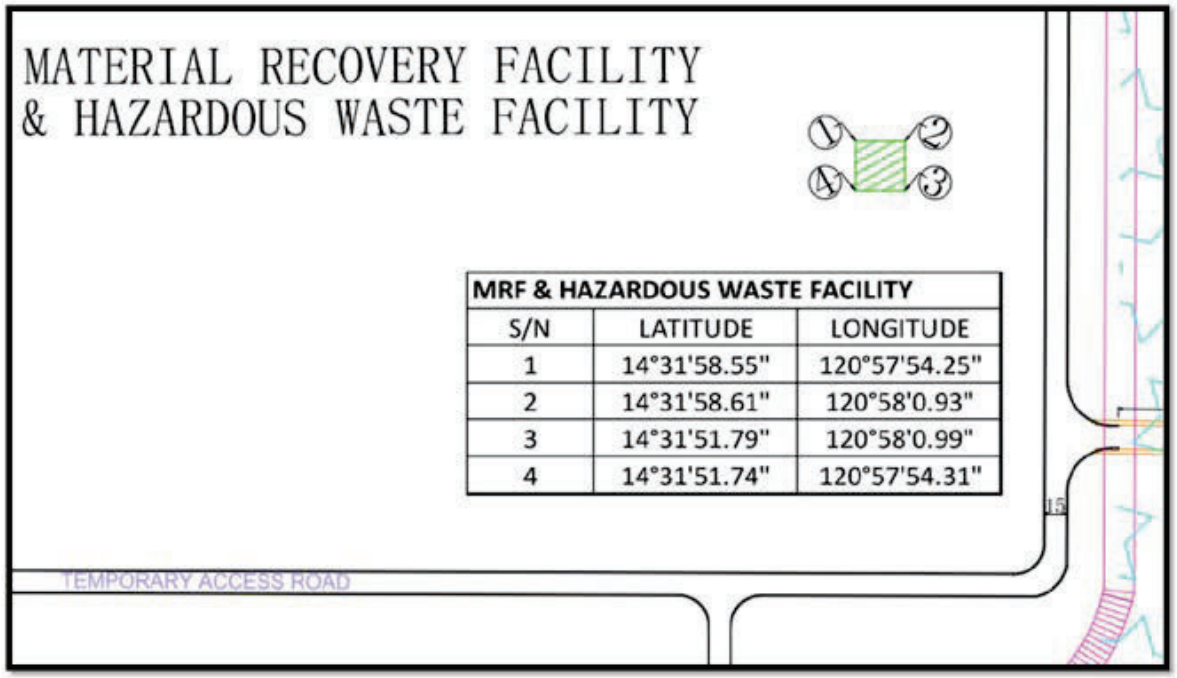
Technical Specifications

The made up of materials for the Material Recovery Facility (MRF) and Hazardous Waste Facility (4.10ft x 10.2ft x 9.8ft for HWF) are steel and galvanized iron (GI) Sheets.

The MRF and Hazardous Waste Facility lot size is approximately 41,892 sqm.

The MRF is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes. The MRF also has a designated hazardous waste section, consists of 3 partially closed areas for liquid and solid hazardous wastes.

The schematic / site plan including the technical geographic coordinates is shown in Figure 1.32.



MRF & HAZARDOUS WASTE FACILITY		
S/N	LATITUDE	LONGITUDE
1	14°31'58.55"	120°57'54.25"
2	14°31'58.61"	120°58'0.93"
3	14°31'51.79"	120°58'0.99"
4	14°31'51.74"	120°57'54.31"

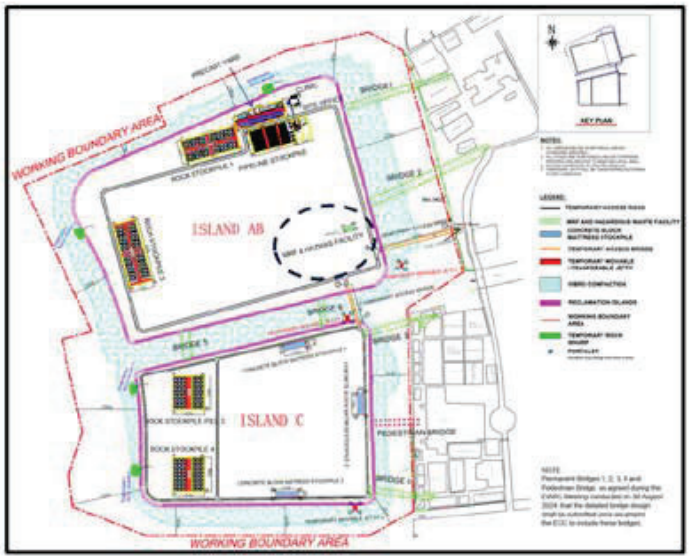


Figure 1.32 Location of Materials Recovery Facility and Hazardous Waste Storage

Concrete Block Mattress (CBM) Stockpile

Purpose

The concrete block mattress stockpile will be used for storing of Concrete Block Mattresses (CBM). This CBM will be used for for channel revetments for slope protection.

Description of Activities

Construction

The construction activities for the establishment of CMB stockpile include cleaning and clearing the designated area for stockpiles.

Decommissioning

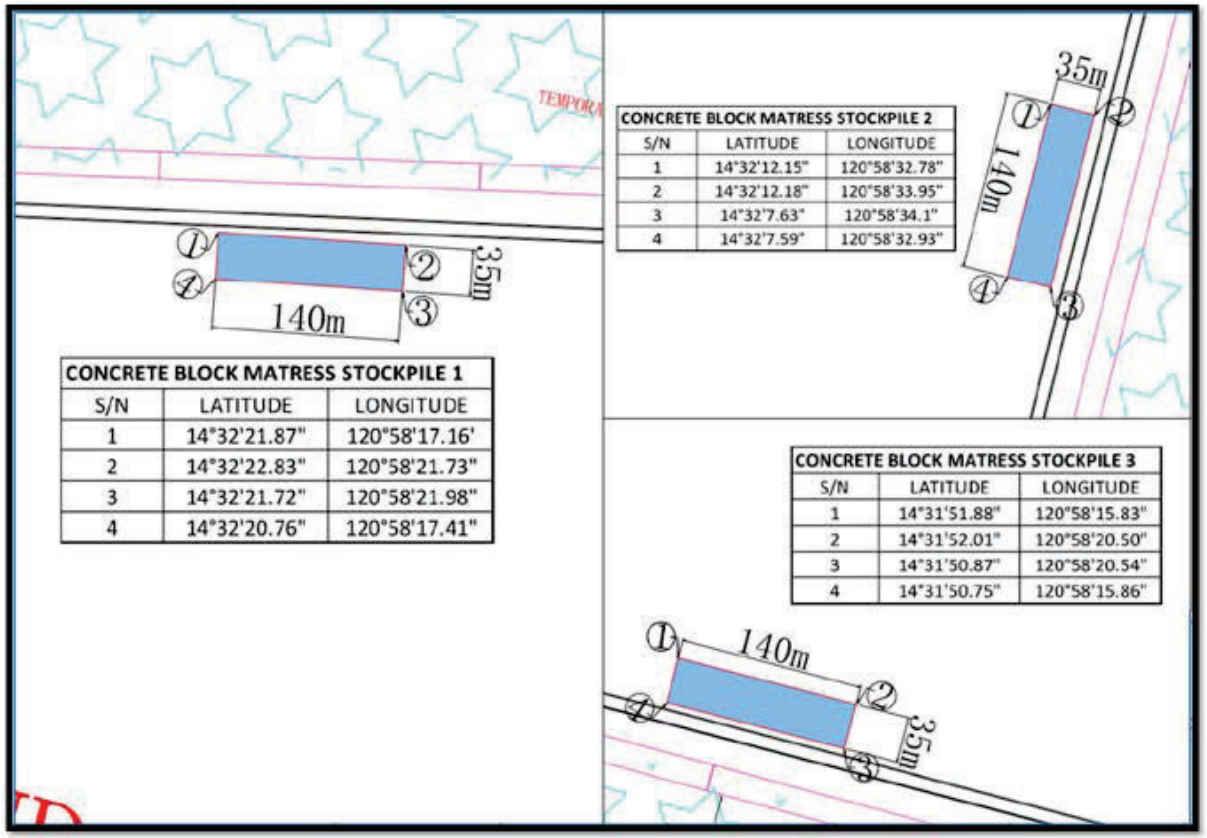
Site clean-up include removal or transfer of all CBM and clearing the site.

Technical Specifications

The concrete block mattress stockpile will be laid on sand with a boundary soft barricade. There will be three (3) CBM as follows:

- CBM 1 is located at north side of Island C. The lot dimension is 35x140m.
- CBM 2 is located at east side of Island C. The lot dimension is 35x140m.
- CBM 3 is located at south side of Island C. The lot dimension is 35x140m.

The schematic / site plan including the technical geographic coordinates is shown in Figure 1.33.



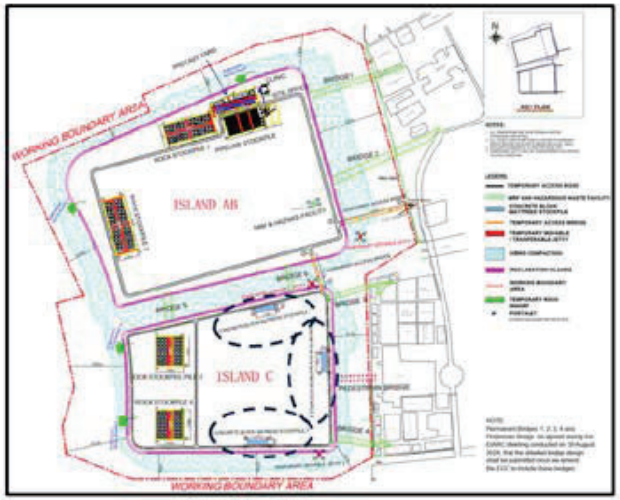


Figure 1.33 Concrete Block Mattress Schematic / Site Plan

Clinic

Purpose

The site clinic allows the on-site nurse or doctor to administer the necessary first aid for the immediate treatment of injuries.

The site clinic (Plate 1-3) is dedicated to provide accessible medical care for all staffs working on site and for visitors. The site clinic offers a comprehensive range of health services, from routine medical surveillance and providing immediate medical attention and care to various health concerns. It includes basic medicines/ kit for first aid treatment purposes, body pain and bowel problems.



Plate 1-3 Existing Site Clinic in the Project Site

Description of Activities

Construction

The installation of the clinic involves clearing the site and the transfer/placement of containers in the designated area.

Decommissioning

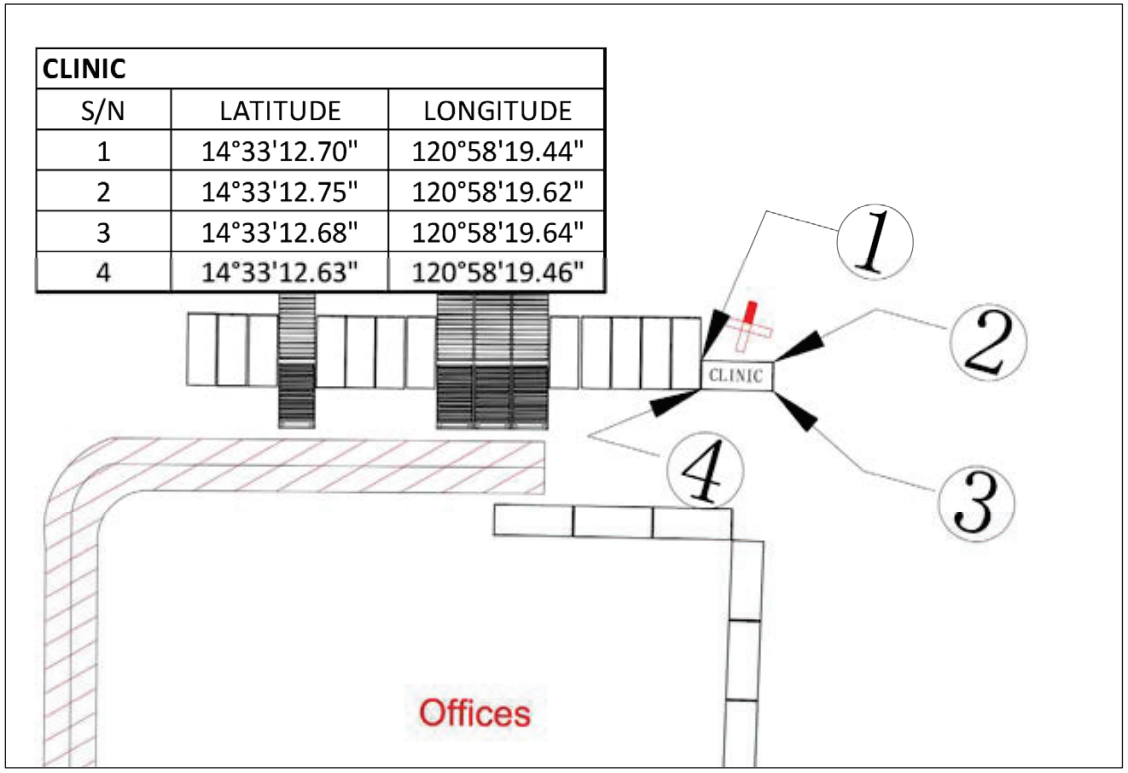
The decommissioning activity for the on-site clinic includes site clean-up, waste disposal, and the removal of containers (prefab cabins).

Technical Specifications

The site clinic is made up of steel Insulated cabin with aircon. The site clinic is approximately 12.51 sqm. Beside the clinic is a parking space for the ambulance (1), and an emergency pick-up vehicle,

The site clinic schematic / site plan including the geographic coordinates are shown in Figure 1.34. The site clinic is located at the upper right of north side of Island AB which is also at the right side of precast yard.

CLINIC		
S/N	LATITUDE	LONGITUDE
1	14°33'12.70"	120°58'19.44"
2	14°33'12.75"	120°58'19.62"
3	14°33'12.68"	120°58'19.64"
4	14°33'12.63"	120°58'19.46"



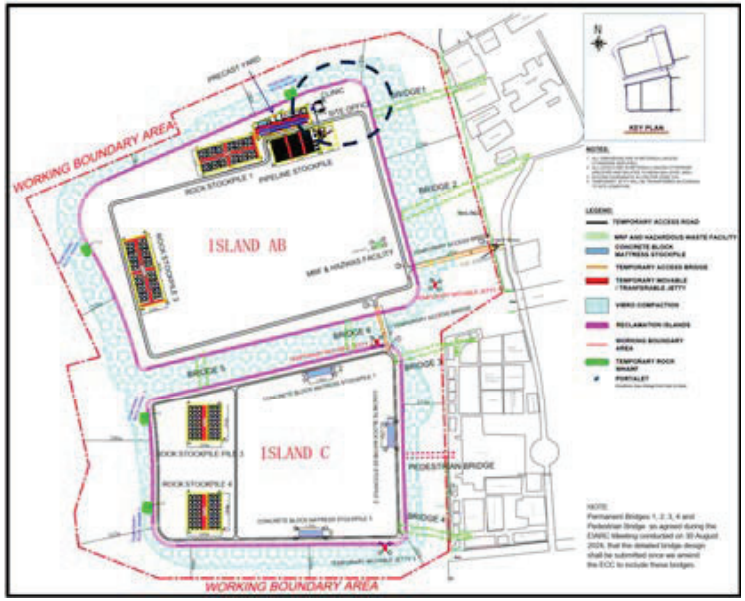


Figure 1.34 Clinic Schematic / Site Plan

Movable Transferable Jetty

Purpose

The movable transferable jetty will facilitate the movement of staff and workers using water vessels around the reclamation areas.

Description of Activities

Construction

The construction of the movable transferable jetty will include:

- Excavation and preparation of the designated area
- Fabrication of jetty and installation (such as pontoon installation, deck installation, fender and guardrail Installation) near the shore

Decommissioning

The decommissioning of movable temporary jetty will include:

- Dismantling of the Jetty Connection
- Use of excavator to pull out the Pontoon to land.
- Utilizing Land Based Equipment (LBE) to transfer pontoon to designated area/storage for future use.

Technical Specifications

The movable transferable jetty (up to 45 ton load capacity) is made up of steel pipe, plate, chain, floating tank and rubber tires. The specification of the jetty is shown in Figure 1.35.

There are two types of jetty (Plate 1-4) that will be utilized for the Project, and these are the jetty steel type and the jetty pontoon type, which is made of a High-Density Polyethylene (HDPE) hollow cylinder.

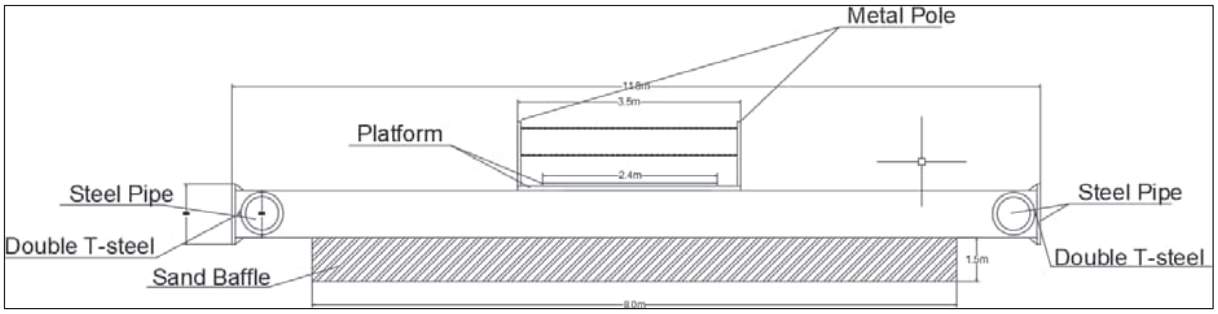


Plate 1-4 Jetty Steel Type (Left) and Jetty Pontoon Type (Right)

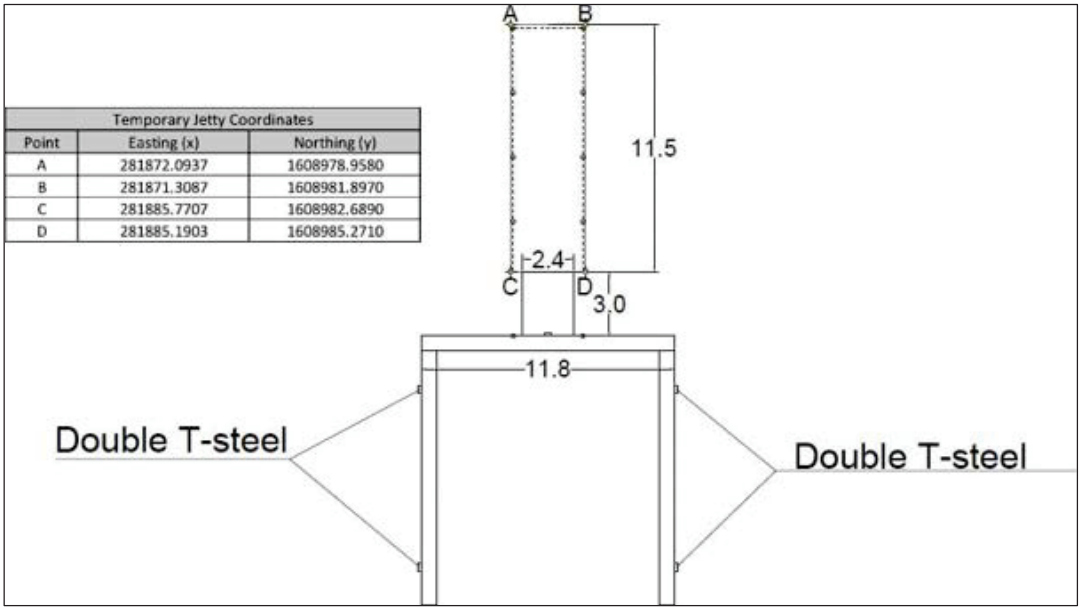
The location of the jetty are as follows:

- Jetty 1 is on the southern side of Island AB.
- Jetty 2 is at the northeastern part of Island C.
- Jetty 3 is at the southeastern part of Island C.

The movable transferable jetty front and side elevation and vertical view is shown in Figure 1.35 while the schematic/site plan, including technical geographic coordinates is shown in Figure 1.36. The jetty location, however, is not fixed and can be moved around the reclamation site.

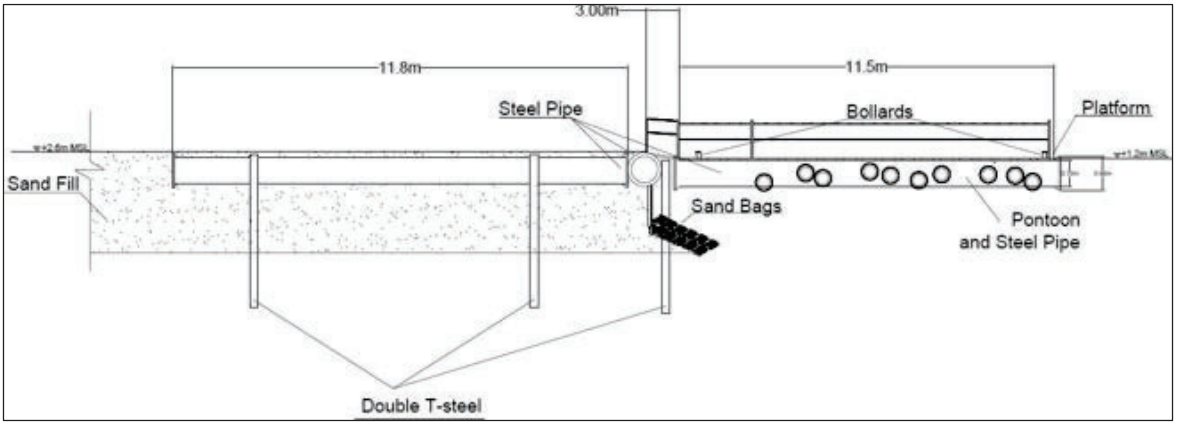


Front elevation - Temporary Jetty Steel Type



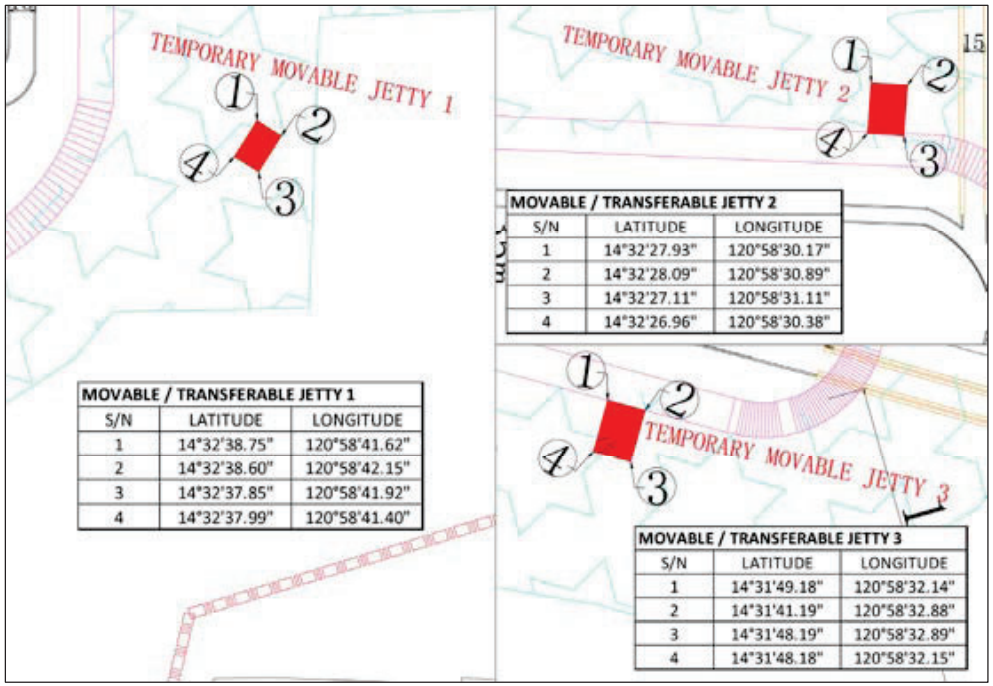
Temporary Jetty Coordinates		
Point	Easting (x)	Northing (y)
A	281872.0937	1608978.9580
B	281871.3087	1608981.8970
C	281885.7707	1608982.6890
D	281885.1903	1608985.2710

Vertical (Top) View – Temporary Jetty Steel Type



Side Elevation – Temporary Jetty Steel Type

Figure 1.35 Movable Transferable Jetty front, Vertical and Side View and Elevation



MOVABLE / TRANSFERABLE JETTY 1

S/N	LATITUDE	LONGITUDE
1	14°32'38.75"	120°58'41.62"
2	14°32'38.60"	120°58'42.15"
3	14°32'37.85"	120°58'41.92"
4	14°32'37.99"	120°58'41.40"

MOVABLE / TRANSFERABLE JETTY 2

S/N	LATITUDE	LONGITUDE
1	14°32'27.93"	120°58'30.17"
2	14°32'28.09"	120°58'30.89"
3	14°32'27.11"	120°58'31.11"
4	14°32'26.96"	120°58'30.38"

MOVABLE / TRANSFERABLE JETTY 3

S/N	LATITUDE	LONGITUDE
1	14°31'49.18"	120°58'32.14"
2	14°31'41.19"	120°58'32.88"
3	14°31'48.19"	120°58'32.89"
4	14°31'48.18"	120°58'32.15"

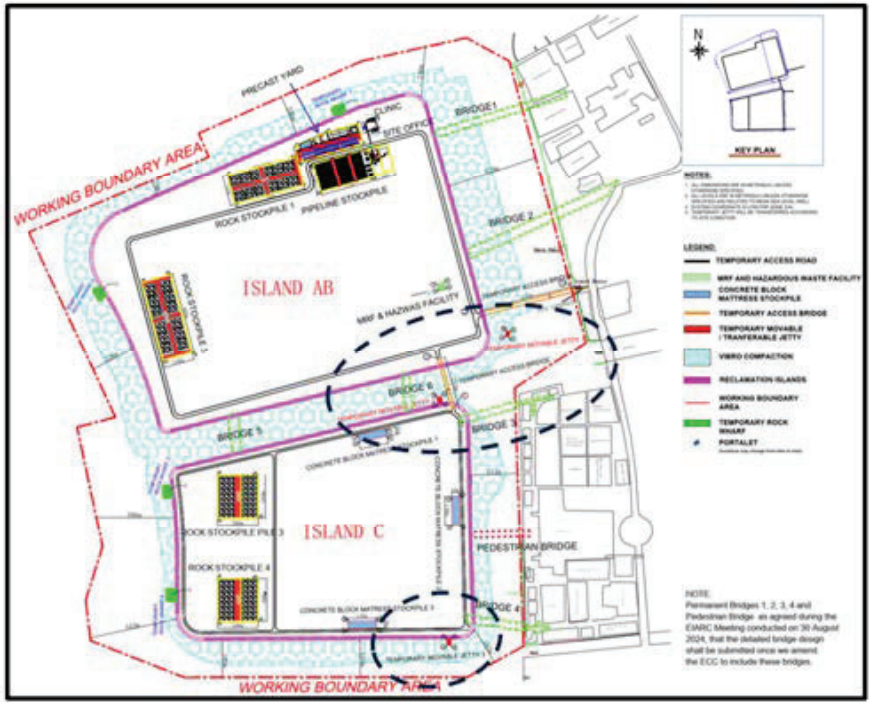


Figure 1.36 Movable Transferable Jetty Schematic / Site Plan

Rock Wharf

Purpose

The temporary rock wharf will be used for docking and access of Landing-Craft Tank (LCT) Barges. It will also be used for rock deliveries to facilitate the offloading of rocks from barges or ships. It will be built at strategic locations at the reclamation site to support marine-based logistics, ensuring efficient delivery of rocks intended for revetments.

Description of Activities

Construction

The construction activities for the installation of temporary rock wharf are as follows:

- Laying of smaller rocks or gravel to create a stable base
- Laying of geotextile to prevent soil erosion
- Installation of bigger rocks on the center and boulders on outer edge
- Backfilling and compaction
- Installation of precast mooring, barricades and safety signages

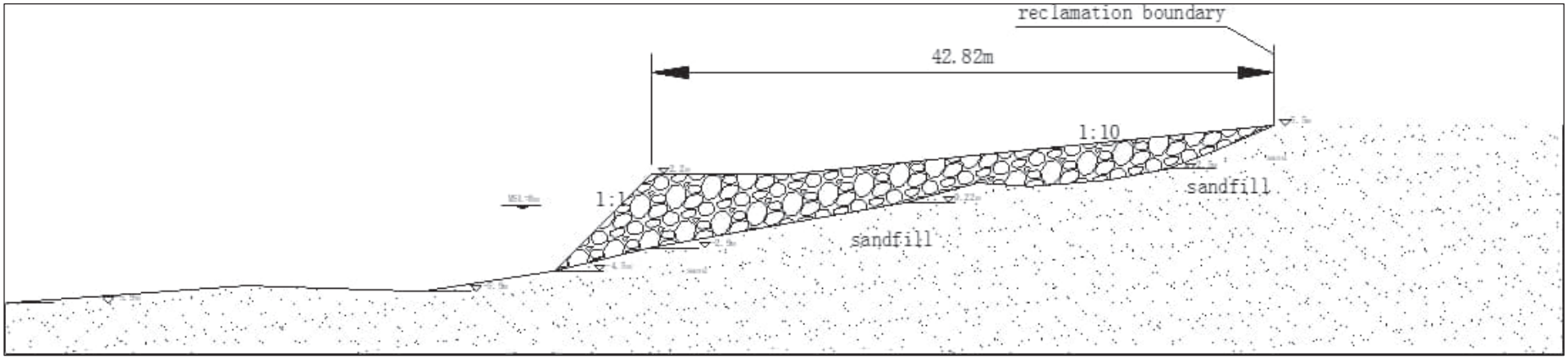
Decommissioning

The decommissioning of the temporary rock wharf will include excavation and removal of rocks, barricades, and site clean-up.

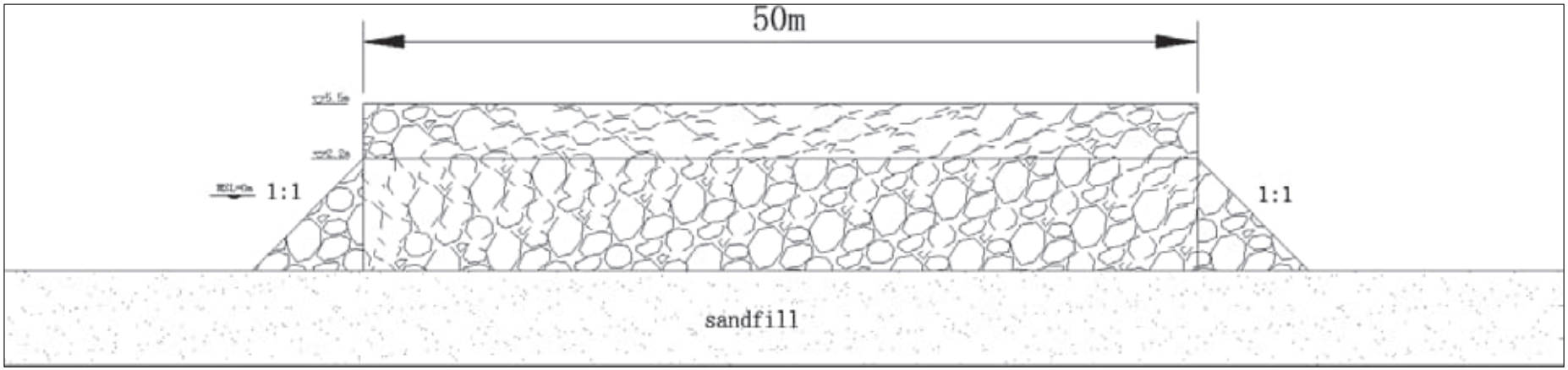
Technical Specifications

The temporary rock wharf will be constructed from boulders and rock with precast mooring. There are four (4) sites where the temporary rock wharf will be located. The rock wharf dimensions are shown in Figure 1.37.

The schematic / site plans with technical geographic coordinates are shown in Figure 1.37 and Figure 1.38.

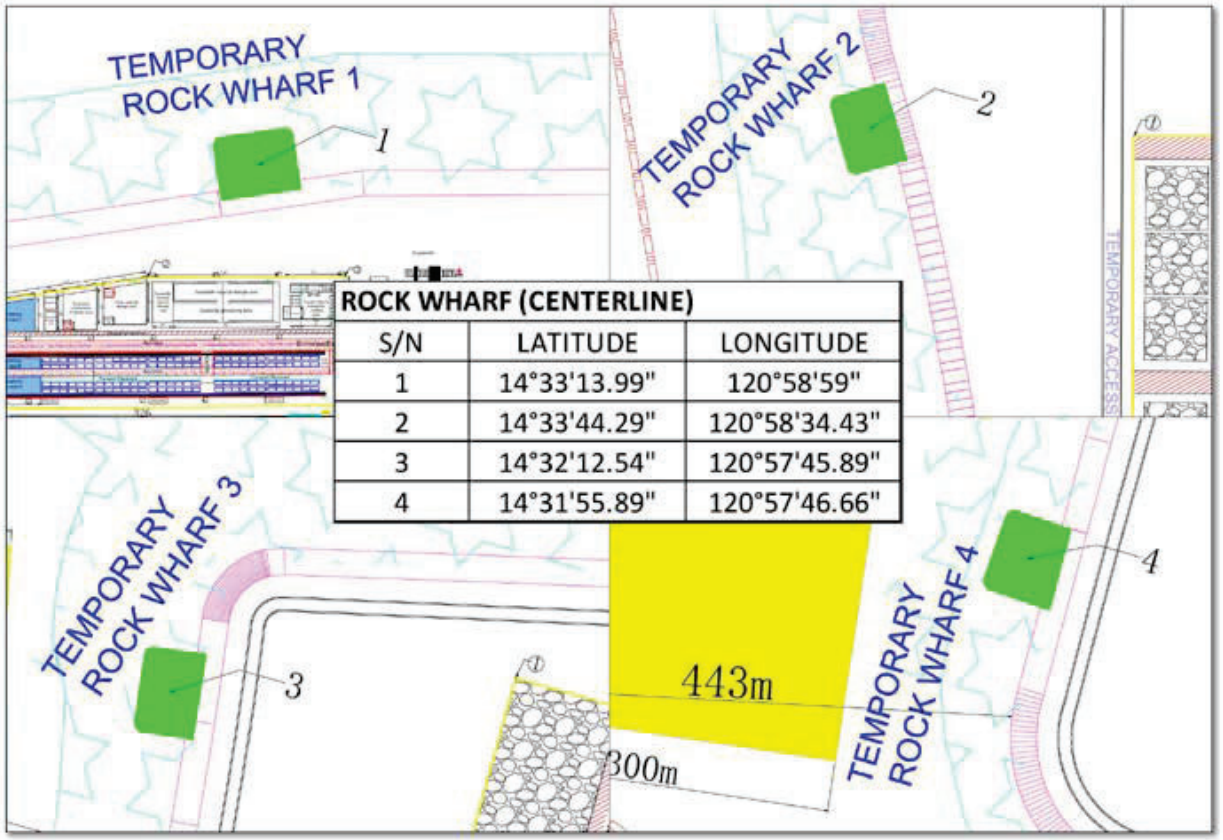


Cross-section of Wharf (AA')



Cross-section of Wharf (BB')

Figure 1.37 Rock Wharf Cross Section View



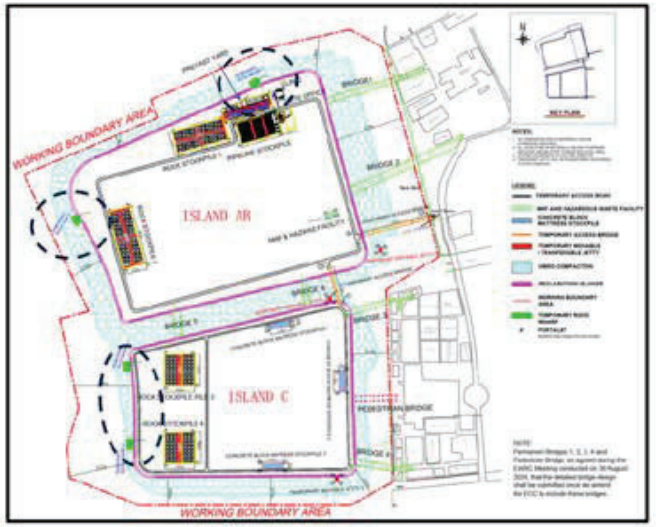
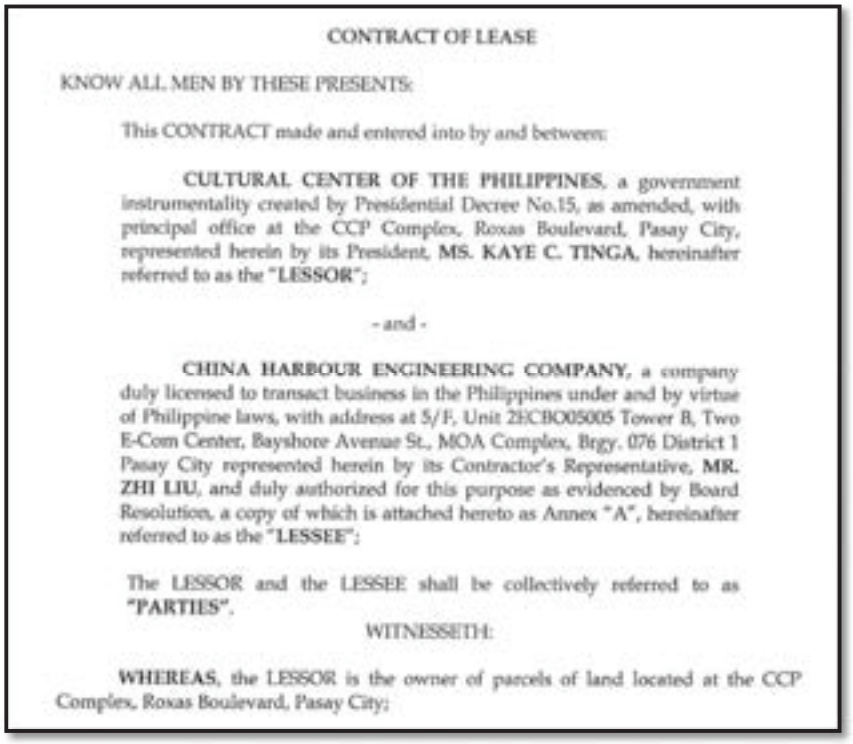


Figure 1.38 Rock Wharf Schematic / Site Plan

Temporary Access Bridge Between the Mainland and Island AB

Proof of Authority Over the Temporary Access Road

The proof of authority over the temporary access road, which is located in Barangay 76, is through the contract of lease between the Cultural Center of the Philippines (CCP) and China Harbour Engineering Company (CHEC) as shown in Figure 1.39. The CHEC is the main contractor of SM Smart City Infrastructure and Development Corporation which is the Joint Venture partner of Pasay City. The landing points in the CCP Complex are shown in Figure 1.43. This temporary access road will be connected to the DPWH area which leads towards Diokno Boulevard as shown in Figure 1.43. The DPWH issued a No Objection Letter (Figure 1.40 or Annex C of Appendix T) for the use of DPWH area for the access road. Annex C of appendix T also includes a Letter from CHEC dated 31 August 2022, the main contractor for this Project, with regard to the request for non-objection to construct and maintain a temporary access ramp/road which was granted by DPWH in its Letter of No Objection dated 8 September 2022.



CONTRACT OF LEASE

KNOW ALL MEN BY THESE PRESENTS:

This CONTRACT made and entered into by and between:

CULTURAL CENTER OF THE PHILIPPINES, a government instrumentality created by Presidential Decree No.15, as amended, with principal office at the CCP Complex, Roxas Boulevard, Pasay City, represented herein by its President, **MS. KAYE C. TINGA**, hereinafter referred to as the "**LESSOR**";

- and -

CHINA HARBOUR ENGINEERING COMPANY, a company duly licensed to transact business in the Philippines under and by virtue of Philippine laws, with address at 5/F, Unit 2ECBO05005 Tower B, Two E-Com Center, Bayshore Avenue St., MOA Complex, Brgy. 076 District 1 Pasay City represented herein by its Contractor's Representative, **MR. ZHI LIU**, and duly authorized for this purpose as evidenced by Board Resolution, a copy of which is attached hereto as Annex "A", hereinafter referred to as the "**LESSEE**";

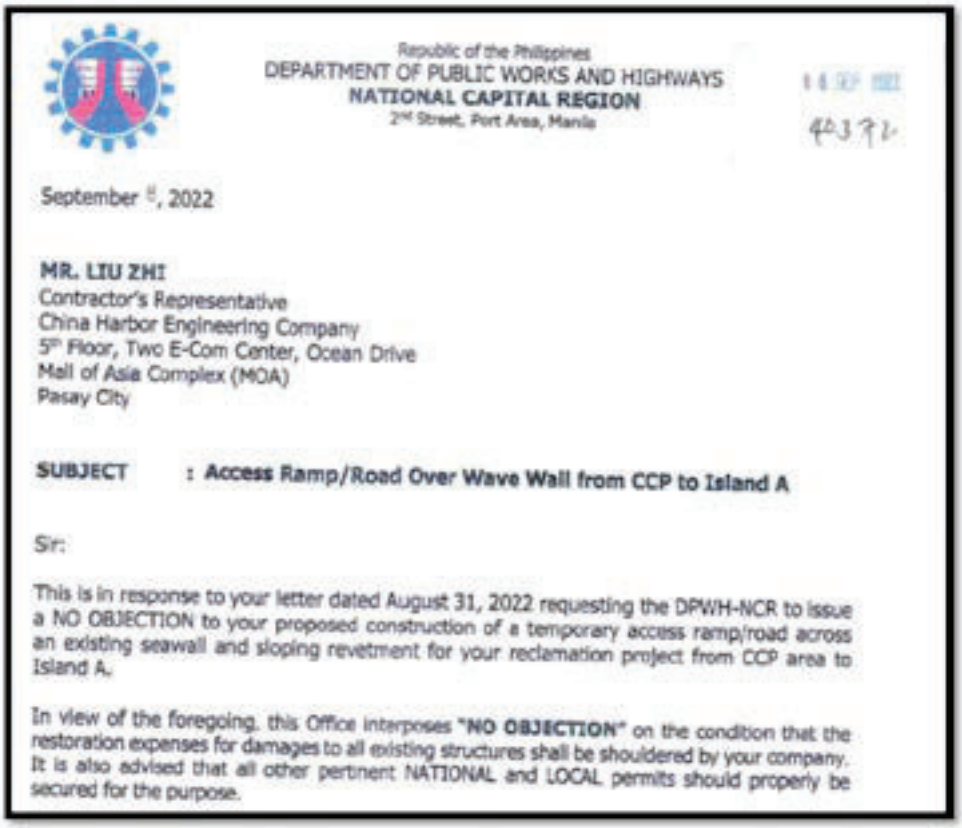
The LESSOR and the LESSEE shall be collectively referred to as "**PARTIES**".

WITNESSETH:

WHEREAS, the LESSOR is the owner of parcels of land located at the CCP Complex, Roxas Boulevard, Pasay City;

Note: Can be found in Annex C in Appendix T

Figure 1.39 Contract of Lease



Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
NATIONAL CAPITAL REGION
2nd Street, Port Area, Manila

4237

September 8, 2022

MR. LIU ZHI
Contractor's Representative
China Harbor Engineering Company
5th Floor, Two E-Com Center, Ocean Drive
Mall of Asia Complex (MOA)
Pasay City

SUBJECT : Access Ramp/Road Over Wave Wall from CCP to Island A

Sir:

This is in response to your letter dated August 31, 2022 requesting the DPWH-NCR to issue a NO OBJECTION to your proposed construction of a temporary access ramp/road across an existing seawall and sloping revetment for your reclamation project from CCP area to Island A.

In view of the foregoing, this Office interposes **"NO OBJECTION"** on the condition that the restoration expenses for damages to all existing structures shall be shouldered by your company. It is also advised that all other pertinent NATIONAL and LOCAL permits should properly be secured for the purpose.

Note: Can be found in Annex C in Appendix T

Figure 1.40 DPWH Letter of No Objection

Purpose

This temporary bridge between the mainland and island AB will be used for the access of vehicles, equipment, material and personnel during the reclamation and horizontal development. The assigned contractor is responsible for creating this temporary bridge from the mainland to Island AB to enable the smooth passage of personnel, vehicles, and materials across the channel during the construction phase from Island AB to the mainland up to the access road through Diokno Boulevard.

Description of Activities

Construction

The construction of this temporary bridge includes:

- Site Preparation
- Surcharge Elevation Adjustment
- Steel Sheet Piles (SSP) Installation
- Bailey Bridge Installation
- Slope Formation
- Geotextile Installation
- Installation of Rock Layers
- Concrete cap and Concrete Pavement

This will also involve:

- Land based excavation to modify the surcharge elevation and achieve a desired level of +4.0 meters MLLW.
- Excavate to a depth of -0.5m MSL in preparation for the installation of drainage.
- Construction of five (5) 10m-wide openings made of Steel Sheet pile (SSP) Type IV and Bailey Bridge to strategically allow the continuous and unobstructed flow of water in the area. These openings will be supported by steel sheet piles driven to retain the sand on both sides of the openings, and steel (bailey) bridges will be constructed over the openings to allow full access.
- Establishing a 1:3 side slope design for the access road to achieve an optimal design that prioritizes stability and safety.
- Installation of geotextiles and placement of sandbags along the slope to prevent erosion and improve the overall stability of the slope.
- After compaction on the road access, installation of aggregates with a thickness of 0.4 meters.

Decommissioning

The decommissioning activities include:

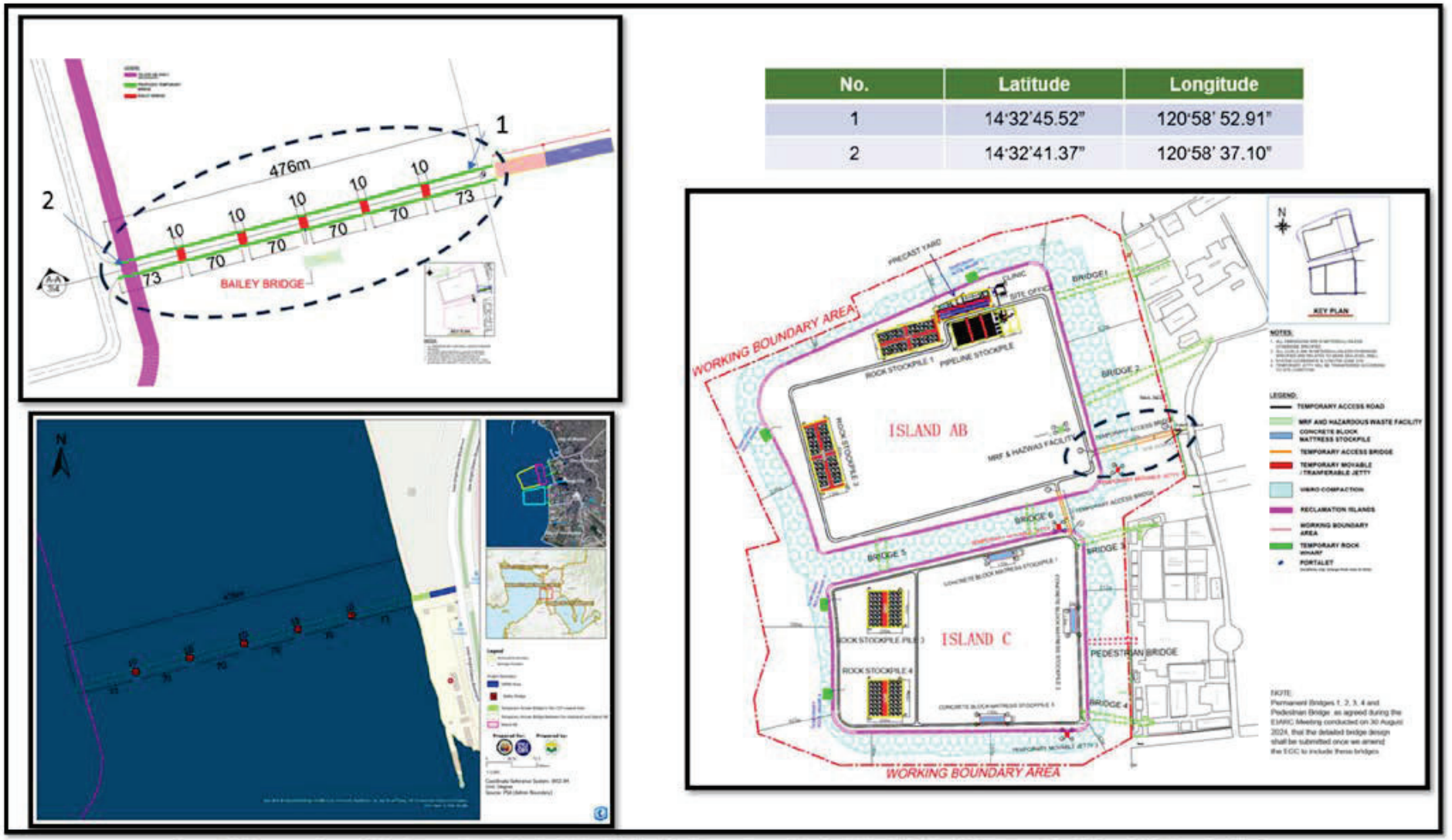
- Demolition of concrete pavement
- Removal of slope formation and protection
- Removal of sand fill and SSP
- Site clearing and clean-up activities

Technical Specifications

This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±476m. It has width of 9 meters and a 20 kilopascal (kpa) design load capacity. The concept-level design will progress further until the detailed design is completed.

This temporary bridge will be connected to the CCP Leased Area (L: 26.96, W: 8m) and DPWH Area (L: 35.94m, W: 8m). The total length of the temporary access road (CCP Leased Area and DPWH area) is 62.9 m as shown in Figure 1.43.

The schematic / site plan including the geographic coordinates is shown in Figure 1.41 and Figure 1.42. The landing points in the CCP Complex is shown in Figure 1.43. This also include the connection of the CCP Leased Area to DPWH Area and Diokno Boulevard.



No.	Latitude	Longitude
1	14°32'45.52"	120°58' 52.91"
2	14°32'41.37"	120°58' 37.10"

Figure 1.41 Temporary Access Bridge Between the mainland and Island AB (L: 476m between the mainland and Island AB & L: ±255m between Island AB and C) Schematic / Site Plan

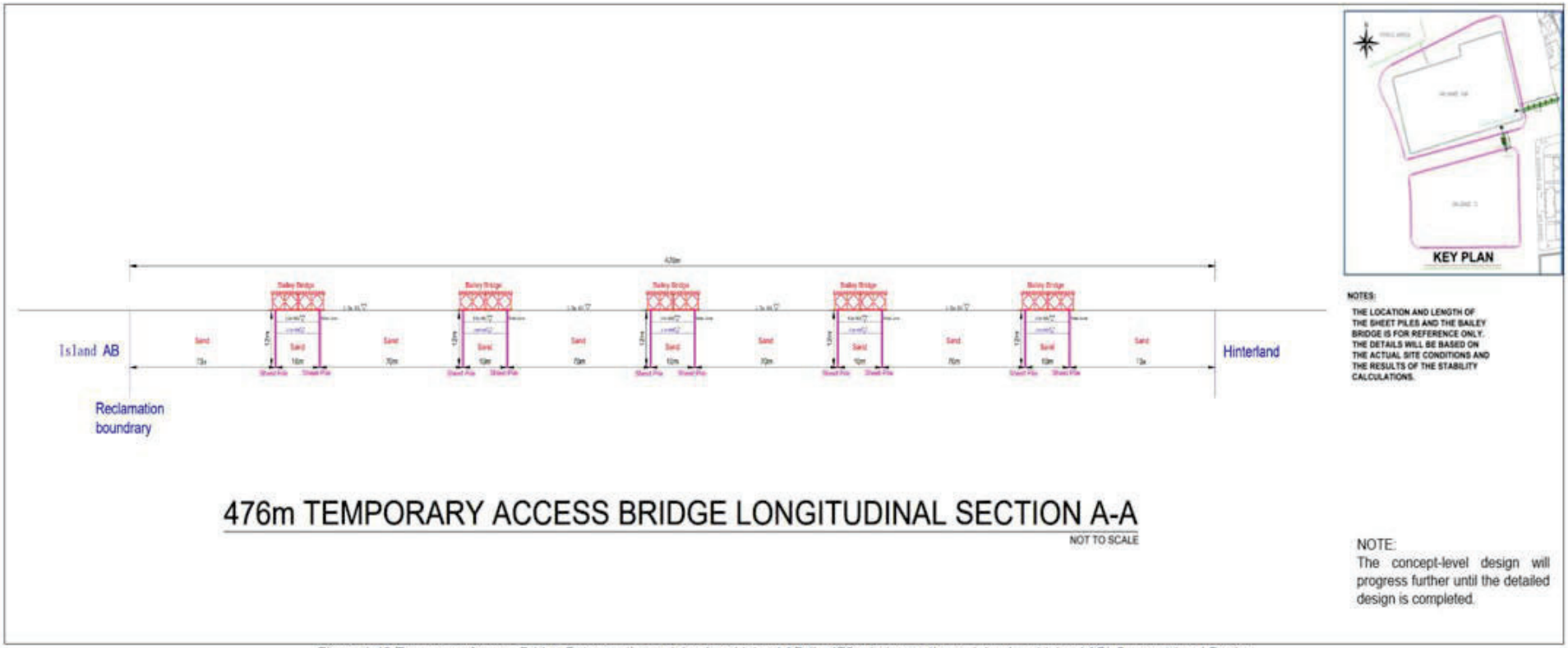


Figure 1.42 Temporary Access Bridge Between the mainland and Island AB (L: 476m between the mainland and Island AB) Concept-level Design

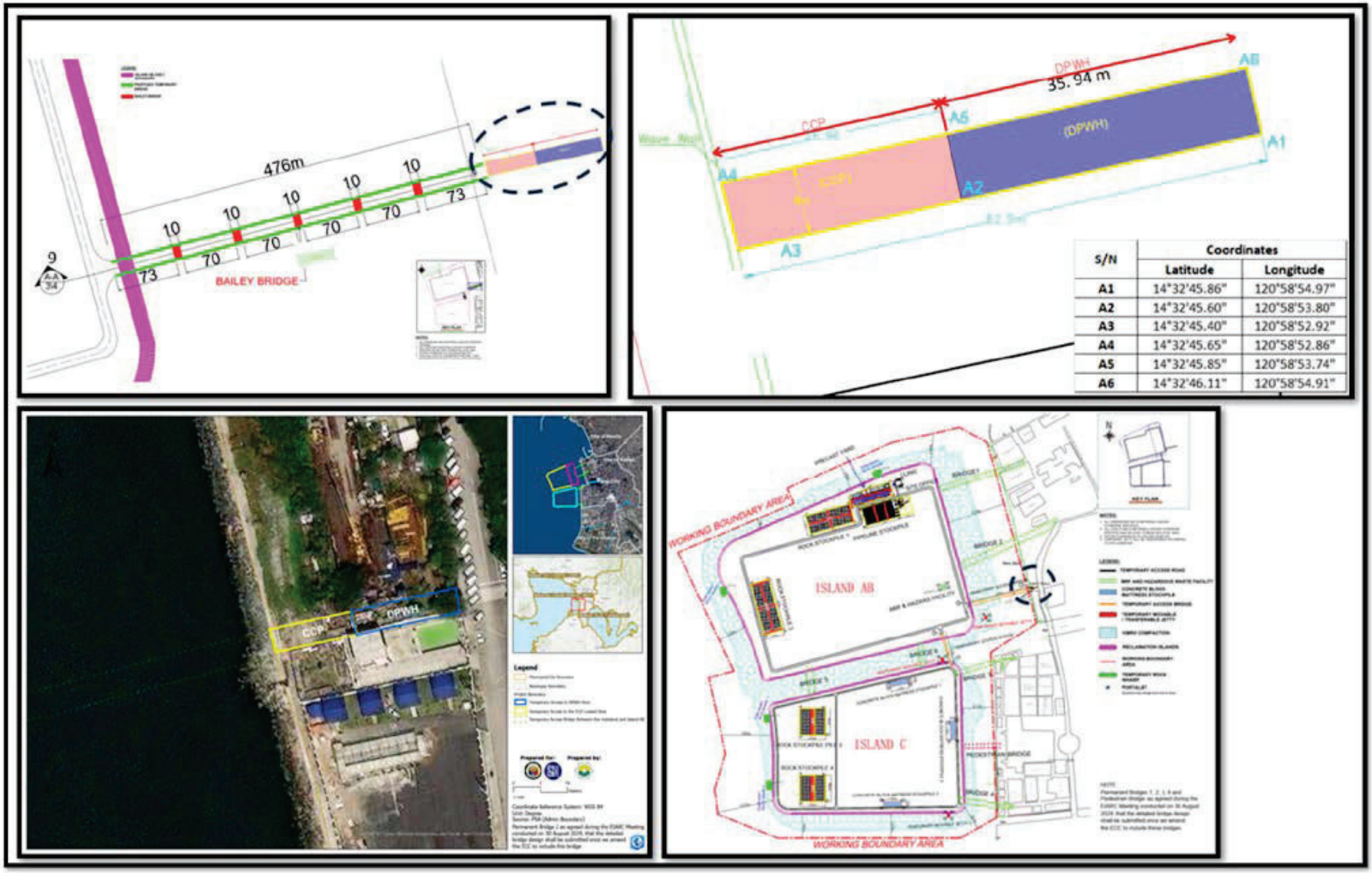


Figure 1.43 Temporary Access in the CCP Leased Area and DPWH Area Site Layout

Temporary Access Bridge Between Island AB and Island C

Purpose

The temporary access bridge between Island AB and Island C is to facilitate the access of vehicles, equipment, materials, and personnel.

Description of Activities

Construction

The construction of this temporary bridge includes:

- Site Preparation
- Surcharge Elevation Adjustment
- Steel Sheet Piles (SSP) Installation
- Bailey Bridge Installation
- Slope Formation
- Geotextile Installation
- Installation of Rock Layers
- Concrete cap and Concrete Pavement

This will also involve:

- Land based excavation to modify the surcharge elevation and achieve a desired level of +4.0 meters MLLW.
- Excavate to a depth of -0.5m MSL in preparation for the installation of drainage.
- Construction of three (3) 10m-wide openings made of Steel Sheet pile (SSP) Type IV and Bailey Bridge to strategically allow the continuous and unobstructed flow of water in the area. These openings will be supported by steel sheet piles driven to retain the sand on both sides of the openings, and steel (bailey) bridges will be constructed over the openings to allow full access.
- Establishing a 1:3 side slope design for the access road to achieve an optimal design that prioritizes stability and safety.
- Installation of geotextiles and placement of sandbags along the slope to prevent erosion and improve the overall stability of the slope.
- After compaction on the road access, installation of aggregates with a thickness of 0.4 meters.

Decommissioning

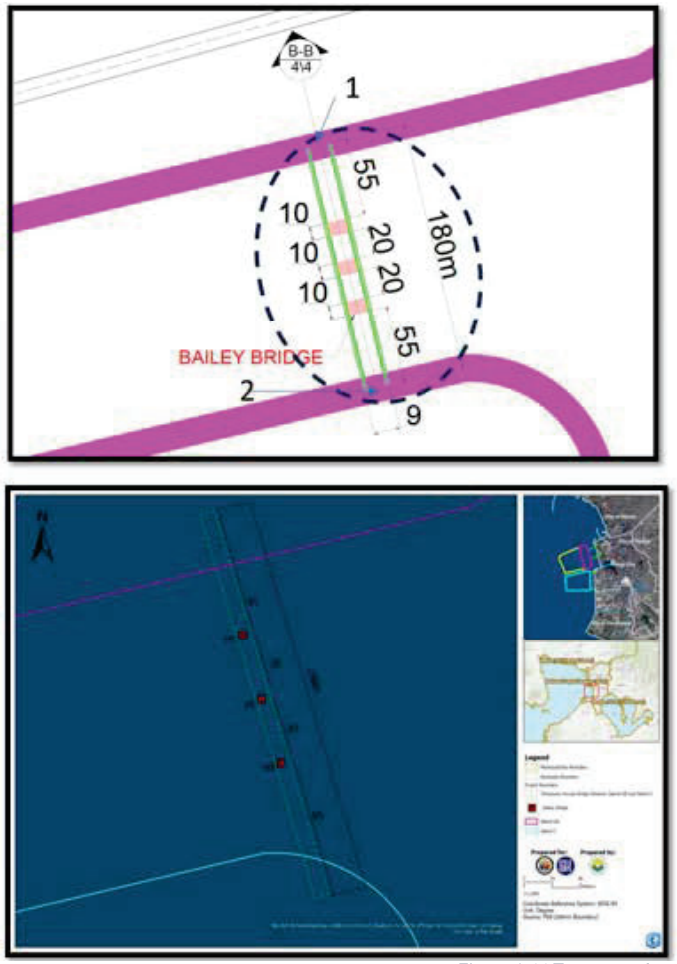
The decommissioning activities include:

- Demolition of concrete pavement
- Removal of slope formation and protection
- Removal of sand fill and SSP
- Site clearing and clean-up activities

Technical Specifications

This temporary bridge will be constructed through sand filling with concrete pavement as a carriageway and slope protection (rocks and geotextile). The length is approximately L= ±180m. It has a width of 9 meters and a 20 kpa design load capacity. The concept-level design will progress further until the detailed design is completed.

This temporary bridge is located at south edge of Island AB and North edge of Island C.
The schematic / site plan is shown in Figure 1.44 and Figure 1.45.



No.	Latitude	Longitude
1	14°32'34.09"	120°58' 30.50"
2	14°32'26.10"	120°58' 32.89"

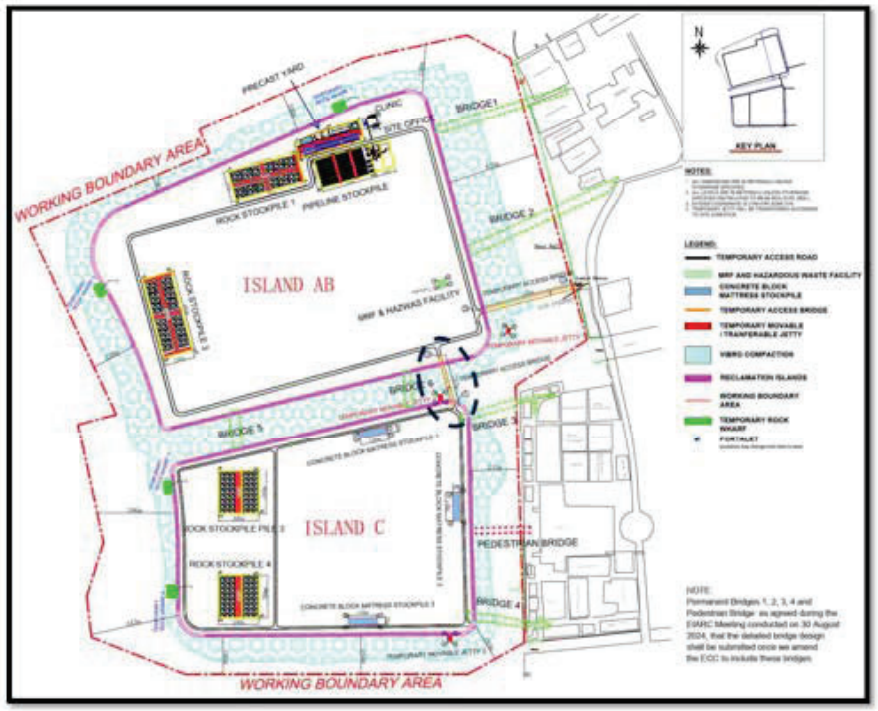


Figure 1.44 Temporary Access Bridge Between Island AB and C Schematic / Site Plan

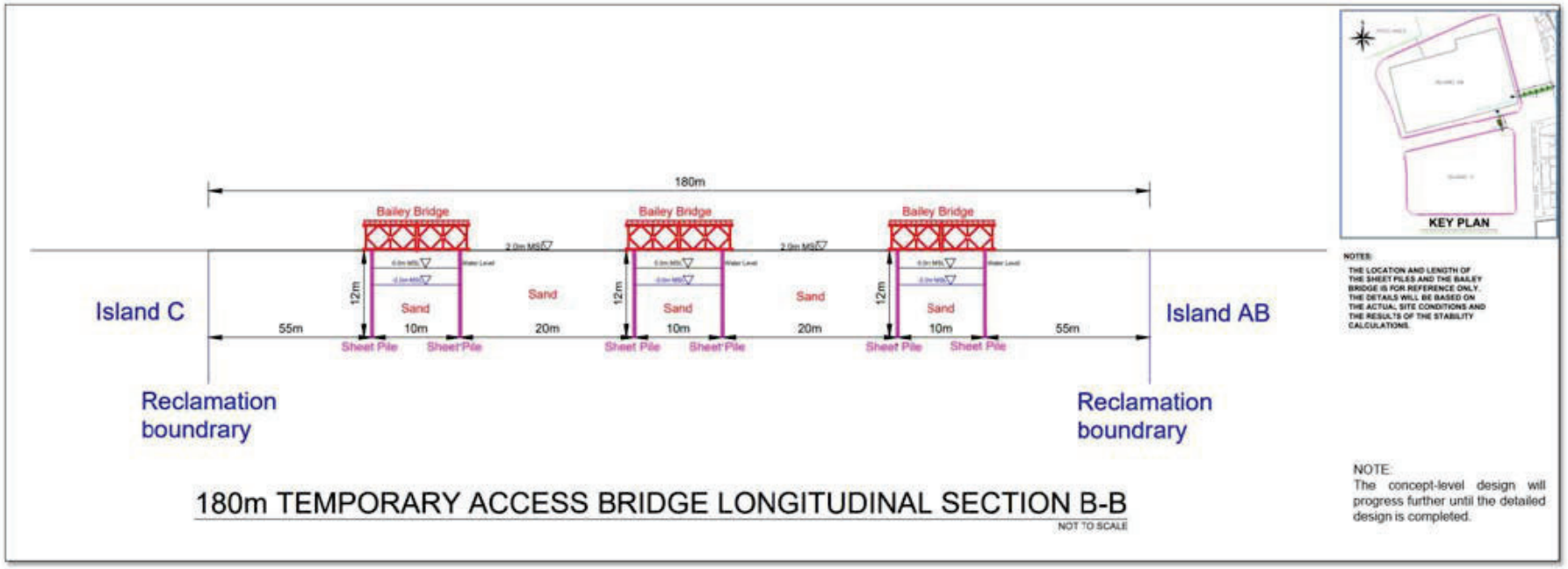


Figure 1.45 Temporary Access Bridge Between Island AB and C Concept-level Design

Additional Notes on the Temporary Access Bridges

A separate flushing study (which can be found in Annex D of Appendix T) was conducted to verify the impact of the proposed temporary access bridges on water circulation during the construction phase. The following are the temporary access bridges considered:

1) The 476m wide temporary access bridge in the north-south (N-S) channel connecting island AB with the hinterland and
2) The 180m wide temporary access bridge in the east-west (E-W) channel connecting islands AB and C.

The key findings of the study are as follows:

- During the rainy season, water moves quickly through the N-S and E-W channels, clearing out in less than 4 days. This means the temporary access bridges do not hinder the water flow.
- In the dry season, water in the larger N-S channel moves at an acceptable rate, fully refreshing in 10 days. The E-W channel takes slightly longer at 11 days. However, it should be noted that the E-W channel will be situated far from the existing land, and no developments have yet been constructed on the islands. Temporary water quality issues in that channel would not cause hindrance and can easily be mitigated through constant monitoring and cleaning of the water channels in case of excessive algal bloom.
- Considering that this is only a temporary condition during a construction stage of approximately 18 months, we can conclude that the proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-S channel (476m wide), still allow an adequate water exchange in between the islands.

Table 1.18 below provides a comparative summary of the flushing study results regarding the impact of the two temporary bridges on water circulation.

Table 1.18 Comparative Summary of Results of Flushing Study

Project activities	Layout	Flushing Time	Remarks
During Construction	Updated Pasay 360 Island A&B and C (470m wide channel and all channel bed levels at -6m MSL) + proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-Schannel (476m wide)	Day-10 to 11	Acceptable (for temporary condition)
Post Construction	Updated Pasay 360 Island A&B and C (470m wide channel and all channel bed levels at -6m MSL) + PHCC Island A and B	Day-8	Acceptable

Sanitation Facility - Portalets

Purpose

The portalets will be used to provide restroom facilities for the construction and office workers in the reclaimed land.

Description of Activities

Construction

The activities will include preparing site for portalets, delivery and installation of portalets.



Plate 1-5 Sanitation System

For sewage disposal management, regular maintenance and weekly disposal is conducted by authorized service providers. Sewage from the portalets is siphoned and directed to an accredited Sewage Treatment Plant (STP), where it undergoes the treatment process. The STP will then issue a certification as proof of acceptance and treatment of wastes, validating the proper and environmentally responsible handling of sewage disposal within the framework of established agreements and regulations

Decommissioning

The decommissioning will involve siphoning, pull-out of portalets and site clean-up where these portalets were located.

Technical Specifications

In house sanitation facilities includes toilets in barges and use of approved portable toilet contractor. The disposal is through accredited waste handling entities as shown in Plate 1-5. The installation of portlets will follow the Requirement per Occupational Safety and Health (OSH), which is 1 portalet:20 manpower (1:20).

Location of Portalets

The location of portalets is shown in Figure 1.46.



Figure 1.46 Location of Portalets

1.4.2.1. RECLAMATION PHASE TEMPORARY SUPPORT FACILITIES - OTHERS

Materials Handling

The materials handling facilities of relevance to this type of project is the trailer dredger which will haul the fill materials from the envisioned sources which could come from San Nicholas Shoal, Zambales, Mindoro, and other available source of fill materials. The potential sources of the requirements for rocks have yet to be determined but initially these shall be sourced from Rizal and Bataan Provinces. Barges will be used for the transport at sea of these materials.

Accommodation

Accommodation for on vessel/barge personnel will be at the sea crafts. There may not be a need for provisions for accommodation on the reclaimed land during soil stabilization, but this will be decided on by the contractor.

Power and Water

During the dredging/reclamation works, electrical power will be required by sea craft and equipment (e.g. pumps) on board and will be on board these sea crafts. Water supply by the vessel/barge crews will also be on board. Power during construction will be sourced from gensets only. There will be no underground water extraction.

For power and telecommunications, an underground duct bank system will be prepared to accommodate future utility service providers for power cables and fiber optic lines to serve the locators. Water pipes will also be installed underground for water supply, while stormwater drainage will utilize an underground box culvert system. The sewerage system will include decentralized STP (Sewage Treatment Plant) as per locator basis, which the locator must comply with the Philippine influent and effluent standards to meet local government regulations. Additionally, a utilities plot will be reserved for service providers to develop related utility buildings, such as substations, water treatment plants, meet-me rooms (MMR), and other facilities.

Power and Water Demand During Reclamation:

- Temporary Power Demand: Approximately 350,000 kWh per month, supplied by power generators.
- Temporary Water Demand: Approximately 1,000 m^3 per month, by delivered to the site.

Telecommunications

Telecommunications will largely be through the mobile cellphone system.

Pollution Control Facilities

Pollution Control Facilities such as Sanitation Facilities, Materials Recovery Facility and Hazardous Waste Storage are discussed in Section 1.4.3.

1.4.2.2. HORIZONTAL DEVELOPMENT PHASE TEMPORARY SUPPORT FACILITIES - OTHERS

Power and Water

Temporary facilities to provide power and water requirement shall be installed at the project site. During the horizontal development construction stage, the estimated power and water demand is:

- Temporary Power Demand: Approximately 500,000 kWh per month, supplied by power generators.
- Temporary Water Demand: Approximately 2,000 m³ per month, by delivered to the site.

Site Office, Accommodation and Storage areas

Temporary shelter and or office for the workers and storage areas during horizontal development will be established within the reclamation islands.

Telecommunications

Telecommunications will largely be through the mobile cellphone system.

Pollution Control Facilities

Pollution Control Facilities such as Sanitation Facilities, Materials Recovery Facility and Hazardous Waste Storage are discussed in Section 1.4.3.

1.4.3. POLLUTION CONTROL DEVICES AND WASTE MANAGEMENT SYSTEMS

The pollution devices and waste management systems are discussed in Section 1.5.2.

1.5. PROCESS TECHNOLOGY

1.5.1. DESCRIPTION OF THE PROCESSING/MANUFACTURING TECHNOLOGY

PRA-approved Dredging and Reclamation Methodology

The PRA certified that the City and its joint venture partner had fully complied with the conditions of the Notice to Proceed (NTP), and Notice to Mobilize (NTM)/ Notice to Commence

Actual Reclamation Work (NTCARW). This includes the Pasay City submitted PRA-approved Dredging and Reclamation Methodology for the project.

The EPMRP remains consistent with this PRA-approved Dredging and Reclamation Methodology. This is because the change is only on the landform. The technology, equipment, and process will remain the same. Even the process of transferring sand from the original island A to the reconfigured island A and B will use the same dredging and reclamation technology and methodology.

Method / Technology

The project involves land reclamation of approximately 360 hectares earmarked for various types of developments. The project's reclamation will be accomplished through hydraulic dredging from borrow pit areas offshore of the site as filling with burrow materials. About 97.10 million cubic meters of sand fill materials must reclaim the areas up to the finished grade at an average elevation of 4.0 meters Mean Lower Low Water (MLLW) and further discuss below.

According to National Oceanic and Atmospheric Administration (NOAA), “dredging” is described as the removal of sediments and debris from the bottom of lakes, rivers, harbors, and other water bodies.

The proposed project involves land reclamation of approximately 360 hectares. The reclamation of the project will be accomplished through a combination of **hydraulic dredging** from borrow pit areas offshore of the project site is filling with burrow materials.

The said dredging can be undertaken either hydraulically or mechanically but as mentioned the proposed project will use hydraulically type of dredging. Hydraulic dredging is a floating dredge or pump by which water and soil, sediment, or seabed are pumped, either on board for sifting, as for clams or oysters before they are discharged overboard, or through a series of floating pipes for discharge on shore.

Hydraulic digging makes use of the erosive working of a water flow. For instance, a water flow generated by a dredge pump is lead via suction mouth over a sand bed. The flow will erode the sand bed and forms a sand-water mixture before it enters the suction pipe. Hydraulic digging is mostly done in cohesion less soils such as silt, sand and gravel. The transport of the dredged soil can be done by hydraulically or mechanically too, ether continuously or discontinuously. Continuous transport can be undertaken through a pipeline or conveyor belts while discontinuous transport can be done via grab, ship or vehicles.

Deposition of soil can be done in simple ways by opening the grab, turning the bucket or opening the bottom doors in a ship. Hydraulic deposition happens when the mixture is flowing over the reclamation area. The sand will settle while the water flows back to sea or river.

Dredging equipment can have these functions integrated or separated.

The choice of the dredger for executing a dredging operation depends not only on the above-mentioned functions but also from other conditions such as the accessibility to the site,

weather and wave conditions, anchoring conditions, required accuracy and other consideration such as economics.

Volume of Works

The proposed project will involve an approximately 112 million cubic meters of dredge fill and burrow materials are required to reclaim the areas up to the finished grade at an average elevation of 4.0 meters MLLW. This total volume does not include the allowance for subsidence of the original ground once overlain with the hydraulically placed fill materials. Filling materials will most likely be obtained from the off shore borrow area at San Nicholas Shoal, Zambales, Mindoro, and other available source of fill materials.

General Description/Methodology of the Reclamation Process

The above discussions focus on the soil stabilization stage while that below deal with the activities prior to soil stabilization. The dredging process generally involves the following:

1) Removal of soft unsuitable materials at the seabed by dredging.
2) Deposit of the dredged materials at a suitable area to be pre-approved.
3) Sourcing of a good sand form from the nearest source within Manila Bay by using dredgers and depositing the hydraulic sand fill at the reclamation site. The sand fill will be first subjected to chemical tests to ascertain suitability and absence of toxic elements.
4) Continuation of the depositing of the hydraulic sand fills to cover an area that will allow the installation of equipment for sheet still piling.
5) Driving of steel sheet piles at the boundaries of the reclamation property to enclose the reclamation.
6) Sourcing of the hydraulic fill from a nearby and suitable area and depositing the same at a designated area by pumping and spraying.
7) Dredging of the excess selected hydraulic fill material beyond the property line defined by the steel sheet piles and pumping and spraying inside the reclaimed property.
8) Level the reclamation area to the desired finished grades and slopes using earthmoving equipment
9) Installation of Breakwater.
10) Soil stabilization as previously described.

Description of construction activities (horizontal development)

The horizontal development activities are intended to prepare the reclaimed land for use of the prospective locators, principal use of which are the construction of buildings, stores, offices and similar vertical structures. The horizontal development works or activities shall be subject to final detailed engineering design, final master plan and approval of PRA.

The major construction works involve:

- Construction of road network Installation of street lightings
- Construction of main drainage culverts
- Installation of electrical lines and connections
- Installation of water lines and connections
- Installation of communication lines

The soil stabilization may take a minimum of one (1) year and during this period the main activities involve are

- Maintenance of the reclaimed land
- Security of the premises

Inclusion of flowsheets/diagram for the operations and the anticipated rates of inputs wastes and recycle streams

Flow sheets/diagrams for the reclamation work. This is illustrated in Figure 1.47**.**

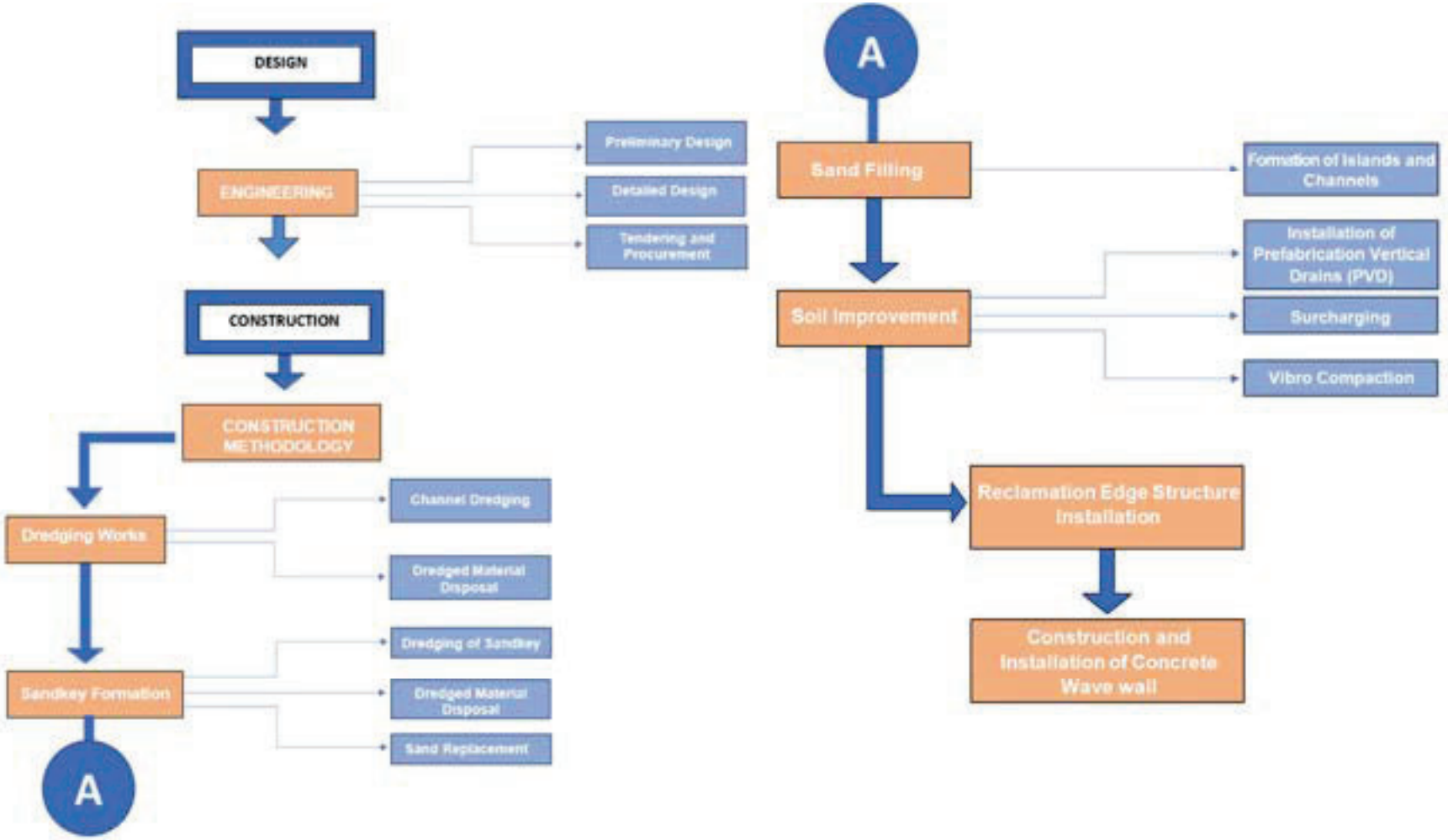


Figure 1.47 Simplified Flow Sheet/Diagram for The Reclamation Works

Description of Island Reconfiguration Activities

The island reconfiguration, which will widen the channel between the Project and the Pasay City mainland to ±476 meters, will require the excavation of sand in the existing ditch and Original Island A to expand the width of the channel to 470-490 meters, to deepen the channel to -6.0m MSL and to change the length of the island to ±1.3 kilometers.

Contractor is to commence with the execution of sand transfer and excavation of channel works.

Construction of Additional Sandkeys and Sand Filling

The construction activities include construction of additional sandkeys by dredging and filling activities. The dredging will focus on excavating the sandkey trench base, which forms the groundwork for the construction of the additional sandkeys. Moreover, the sideslope construction of the trench base will adhere to a 3V:1H ratio for optimal stability.

Dredge Materials

Sand
The dredged materials from the existing sandkey primarily consist of sand. Furthermore, these materials hold potential for reuse as backfill material for backfilling the sandkey and also as backfill material for the island's new boundaries. However, these dredged materials will be thoroughly examined and surveyed to assess their direct suitability for reuse as backfill material.

Mixture of Sand, Clay, and Silt
On the other hand, the dredged materials resulting from dredging the additional sandkey and the adjacent area of the existing sandkey are expected to comprise a mixture of sand and SU1/SU2, primarily characterized by their soft and silty clay composition. Given this mixture, the extracted materials from this area are evidently unsuitable for reuse as backfill material.

Dredged materials will be transported to disposal area by self-propelled or non-self-propelled hopper barges. Upon completion of loading the split barge, the vessel navigates to the designated disposal site. Upon arrival at the disposal area, the hull of the barge is parted, allowing the discharge of the dredged material into the sea. Subsequently, the vessel closes and returns to the site to repeat the same process. Methods for disposal of the material have been based on a location outside of Manila Bay and the Contractor investigated the alternative designation of the dumping area closer to the Project site.

1.5.2. DESCRIPTION OF THE POLLUTION CONTROL DEVICES AND WASTE MANAGEMENT SYSTEM

A comprehensive Waste Management Plans for solid, hazardous wastes, and sewage are strictly implemented in in the Project.

Wastewater

This will essentially be generated by personnel on board the sea crafts (dredging vessels and rock haulage barges) which are self-contained having their individual toilet and waste collection facilities. Wastewater will be discharged through third-party waste treaters.

In house sanitation facilities includes toilets in barges and use of approved portable toilets in the reclaimed land. The disposal is through accredited waste handling entities as shown in Plate 1-6. Use of approved portable toilets on reclaimed land.



Plate 1-6 Sanitation System

For sewage disposal management, regular disposal is conducted by authorized service providers. Sewage from the portalets is siphoned and directed to an accredited Sewage Treatment Plant (STP), where it undergoes treatment process. The STP will then issue a certification as proof of acceptance and treatment of wastes, validating the proper and environmentally responsible handling of sewage disposal within the framework of established agreements and regulations.

Turbidity Control

The Grab dredgers are designed for precision dredging, offering reduced disturbances to the marine environment. They minimize initial turbidity caused by bucket operations during excavation and operate in a periodic or cyclic manner, further limiting disruption to the water column. Intercepting Channels shall be installed within the project area to prevent storm runoff from washing across exposed soil surface.

The construction of Pasay 360 islands may cause an increase in suspended sediment in the environment during construction, due to the wash out of fine sediment during the reclamation process. This increase in suspended sediment is referred to as a sediment plume. Those plumes are transported with the flow and by wind effects. An increased suspended sediment concentration during construction can lead to environmental effects for sensitive receivers, such as the Las Piñas mangrove area.

To reduce as much as possible the increase in suspended sediments, or in other words to reduce the increase in turbidity, the following measures are taken:

- Sand is being sourced from borrow areas generally containing coarser sand with low fines content
    - Larger particles settle faster resulting in reduced turbidity levels
    - Low fines (these are the smallest sand particles) means reduced turbidity levels

- Creating a sheltered (bunded) area wherein material is placed (outer contours of the islands are created first) in which suspended sediments will be contained, reducing the spreading of increased turbidity
- Material is placed in a more controlled manner within the project boundaries:
    - Controlled placement by barges (less water in the mix results in the sand to drop faster to the seabed)
    - Controlled placement by spreader pontoon (placement happens near the water line, reducing creating particles to get into suspension)
- Rehandling of material, for example as required for the removal of Island A (creating the 476m wide channel), happens sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising risk of increased turbidity levels
- Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded
- A detailed Turbidity Management Plan (Appendix S) is being followed

For this specific project using silt screens is inefficient, causes logistical challenges and poses safety risks:

- Open sea conditions with waves and currents makes it difficult to keep a silt screen in placeSilt screens will hinder the equipment (vessels) working at Site, resulting in:
- Complex and ineffective placement of sand hence longer construction duration
- Safety hazard, risk of collisions and reduced manoeuvring space in case of emergency
- Silt screens may not provide a good solution for controlling turbidity, as they cannot be kept in place over the entire water column, as the water depth is ranging from 5 to 20m in the project area
- The size of the reclamation is enormous, with sand placement going on simultaneously in multiple locations. It is almost impossible to have silt screens preventing increased turbidity from such a large area

The challenges of using silt screens are not new, reference is made to literature available online: “IADC: The art of screening: Effectiveness of silt screens”.



CONCLUSIONS

This article aims to treat the effectiveness of silt screens in an integral way. Main insights on silt screen effectiveness are:

- Hanging silt screens in an open configuration do not achieve a significantly positive performance in mitigating the potential environmental impact of suspended sediment, regardless of local flow conditions and silt screen geometry.
- Silt screen effectiveness must be rated with a reference effectiveness parameter (comparing the situation with and without silt screen), not with an inflow effectiveness parameter (comparing downstream with upstream of the silt screen) as has always been done up to now.
  Hanging silt screens often have a positive inflow effectiveness, but this study shows that in the case of a current, even with a positive inflow effectiveness, it would have been better to have no hanging silt screen at all. The reference effectiveness is not positive.
- Flow contraction underneath hanging silt screens actually leads to enhanced erosion if erodible bed material is available.
- Silt screens in an open configuration give rise to a significant amount of horizontal flow diversion, which counteracts the intended use of silt screens as a vertical current deflector.
- Adaptive management strategies are a viable alternative to the application of silt screens.

The conclusion of this study is that hanging silt screens in an open configuration, as often applied in present-day dredging practice, are not effective in reducing the environmental impact of dredging projects.

The recommendation is to integrate the insights about silt screen effectiveness as described here in the decision making process regarding mitigation of potential environmental impact of suspended sediments, using a receptor-based approach and adaptive management strategies. Relying solely on silt screens, even when local conditions ensure that their effectiveness is negligible (or even adverse), hinders progress in the protection of the marine environment.

Figure 1.48 Snippets from IADC: The art of screening: Effectiveness of silt screens
Source: M. Radermacher et.al. The Art of Screening Effectiveness of Silt Screens. https://www.iadc-dredging.com/wp-content/uploads/2017/02/article-the-art-of-screening-effectiveness-of-silt-screens-terra-et-aqua-132-1.pdf

Sand Bunds as Turbidity Control Measures

Sand bunds (Plate 1-7) act as temporary physical containment structures, preventing the spread of sediments beyond the influence areas of the reclamation site. Strategically placed along the periphery of the project site, it rests over the sandkey and extends above the water level up to 2.0m high (min.); they trap suspended sediments within the enclosed area, reducing the likelihood of these particles drifting into surrounding water bodies. By containing the sediments, the bunds help maintain water clarity in nearby areas.

During land reclamation, the movement of water can stir up sediments, causing turbidity to spread. Sand bunds slow down the flow of water and reduce current velocities within the enclosed area. This reduction in water movement allows sediments to settle more quickly, minimizing the volume of suspended particles in the water. The calmer water within the bunded area encourages fine particles to settle at the bottom, thereby reducing turbidity.

In summary, sand bunds are an effective measure to control turbidity during land reclamation by providing physical containment, reducing water flow, promoting sediment settlement, and protecting nearby marine ecosystems. Their strategic placement at key locations ensures minimal environmental impact and helps comply with regulatory requirements for water quality.



Plate 1-7 Sand Bunds

Sediment Plume Modelling

The construction of PRDP (Pasay 360 hectares) islands will cause a temporary increase in suspended sediment in the environment during construction, due to the wash out of fine

sediment during the reclamation process. The increase in suspended sediment here is referred to as sediment plume. Those plumes are transported with the flow and by wind effects across the adjacent area within Manila Bay. An increased suspended sediment concentration during construction can lead to environmental effects for sensitive receivers, such as ports, beaches, and mangrove areas.

Previously, a methodology using large Trailing Suction Hopper Dredgers (TSHDs) in combination with spray pontoons was proposed for the project. The actual methodology being adopted now is the use of Pelican Barges (PBs) which have a reduced production of sediment, and more PBs are being deployed. Another relevant difference is the sand source, where the current sand source contains much less fines compared to the initially anticipated sand source. Further, the adopted reclamation methodology prioritizes the creation of the now existing sand bunds around the Project area. These sand bunds rise from the seabed and extends to the surface which serves as the best containment structure for turbidity / siltation especially if compared to the ineffective silt curtains which only covers the surface and risks navigational safety.

Results

The comparison of maximum SSC (suspended sediment concentration) from 1-month simulation between the two scenarios are shown in Figure 1.49 (in kg/m³) for all meteorological conditions.

From the figures it is visible that the dispersion area of the sediment plume is significantly larger and higher with the TSHD method compared to the Pelican Barge method. Although the Pelican Barges will cause a more continuous influx of suspended sediments (due to the longer discharge time). The sediment plume is mainly reduced due to the coarser sand (less fines), which are sourced by the Pelican Barges.

In can also be observed that wind influences the sediment plume development, as the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the port area, whilst in the NE monsoon the main direction of the plume is towards the south.

This wind effect becomes better visible when changing the scale of the images to mg/l, as shown in Figure 1.49. In this Figure 1.49, 50 mg/l is selected as the maximum limit value. This is to represent the maximum suspended sediment concentration in the Class SB water body, based on the Water Quality Guidelines and General Effluent Standard of 2016 issued by Department of Environment and Natural Resources (DENR). Both scenarios show that >50 mg/l of sediment plume can spread widely along the coastline.

Presenting the results using a mg/l scale has some disadvantages in our specific case:

1. Inside Manila Bay suspended sediment concentrations are in the range of 30-50 mg/l already (along the nearshore areas around MOA). In the rainy season such values can become 100 mg/l or more when heavy rains cause significant river outflow containing high levels of suspended sediments.

2. The main goal of the sediment plume assessment is to visualize the difference between the two methods suggested and sand sources used. The sediment plume model relies upon selected input and calculates based on certain settlement velocities what the sediment plume may be. The smallest particles (less than 4 µm) have a settlement velocity set in the model of 0.0 m/s which means they are assumed to always remain in suspension. This is a conservative approach, for two reasons:

a. Actual settlement velocity of such particles will be slightly more than 0.0 m/s, so they will settle over time;
b. The finest particles (less than 30 µm) are flushed out first during the dredging process. Generally leaving 5% fines, however ranging in size between say 20 – 63 µm. This distinction is not made in the sediment plume modelling, which assumes the 5% fines ranges in particle size between 0 and 63 µm.

3. More assumptions are made for this sediment plume model, which are justified by the defined goal of the sediment plume modelling. And as we are interested in the biggest impact from the reclamation works, meaning the highest concentrations produced, which are in the order of 10 – 30 kg/m³, the results are best shown to the kg/m³ scale.
In summary, for the goal of this assessment the best approach is to show sediment plumes with a scale using kg/m³. Using mg/l will result in a too conservative and detailed plume which does not reflect reality.

For completeness the results with the mg/l scale are shown in Figure 1.49.

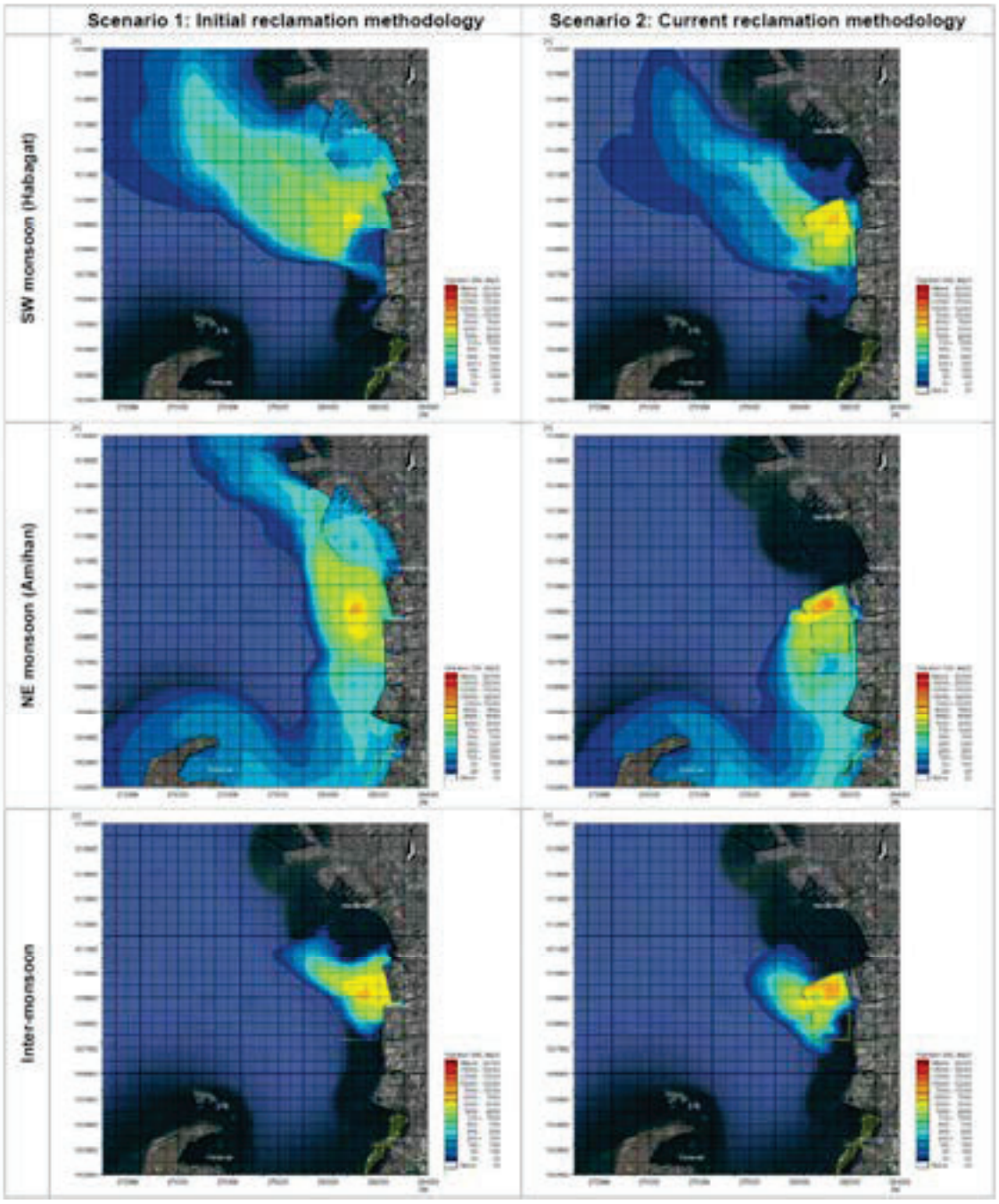


Figure 1.49 Sediment Plume Results
Source: Royal HaskoningDHV, Sediment Plume Modelling (September 2024)

The sediment plume assessment of RoyalHaskoningDHV based on the Sediment Plume Modelling (**Appendix P**) lead to the following general conclusions:

Primary conclusions

- The purpose if this assessment is to show the difference in sediment plume between the two identified construction methods (Scenario 1 and Scenario 2). Due to limitation

on accuracy of input and model computations, the sediment plume images using a kg/m³ scale are more reliable for showing the expected extent of the sediment plume.
- Scenario 2 of sand filling with 6 Pelican Barges and a sand source with 5% fines content, will result in a reduced dispersion area if compared to Scenario 1 with 1 TSHD and 15% fines content.
- The suspended solids concentrations induced in Scenario 2 are approximately 50% of the suspended solids concentrations induced in Scenario 1.
- In the current situation (Scenario 2) bunds are already in place around large part of the outer contours of the islands. As most of the sand placement is done within those bunds, the higher concentrations of the sediment plume are well contained.

Secondary conclusions

- When considering very low suspended solids concentrations, such as those stipulated in the Water Quality Guidelines and General Effluent Standard of 2016, the plume can be seen to spread over larger areas; however, the plume will mainly attach to the shore.
- Wind has an effect, mainly on the smallest suspended sediments. As low concentrations of suspended solids remain in suspension for a long period of time and the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the west, whilst in the NE monsoon the main direction of the plume is towards the south.

Air Pollution Control Device (APCD)

The sea crafts will have their individual smokestacks to serve as equivalent APCD which will be connected to the exhaust of the pump engines.

Materials Recovery Facility

Solid waste management involves proper segregation of both on-shore and off-shore wastes (Plate 1-8). Contractor, as part of their Social Development Program, hires local cleaners for clean-ups of coastal wastes. During off-shore operations, the Waste Service Provider operates their own vessel capable to collect wastes from our operational vessels.

On-site waste management involves process and practices used to handle, segregate, and dispose of waste materials generated on site and wastes from the sea. The project disposes a significant volume of waste monthly. The majority of these wastes are collected from the Project shores through the company's clean-up efforts. These collected wastes are stored and segregated in the MRF until disposal by DENR-accredited waste service providers. The MRF is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes.

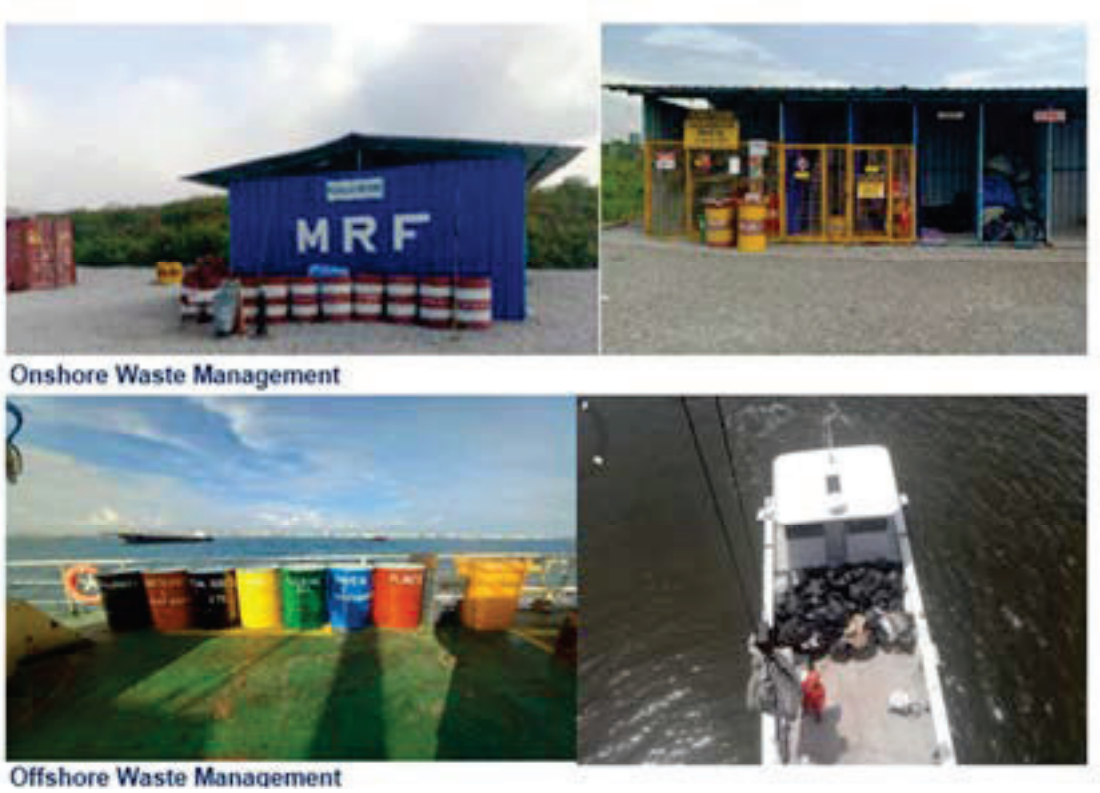


Plate 1-8 Existing Materials Recovery Facility

Disposal of Collected Waste from the Sea and Extracted Prefabricated Vertical Drain (PVD)

On average, the collected waste from the sea in the Project is about 25 m^3 per day. To comply and maintain cleanliness around the project site, The contractor started an initiative in cleaning up waste from the sea. This is conducted by hiring locals as cleaners on a regular basis.

Solid waste collected during coastal clean-up schedules are transferred to temporary garbage stockpiles. A 3rd party DENR-Accredited Waste Service Providers (WSP), such as Vertex and RMS, are contacted to collect the solid wastes for disposal to landfill. The dredging activity on Island A includes extraction of previously installed PVD materials. These extracted PVDs are stored in a temporary stockpile for drying before disposal.



Plate 1-9 Existing Clean-up Activities from the Waste Collected from the Sea and Disposal of Extracted PVD Materials

Hazardous Waste Storage

The MRF also has a designated hazardous waste section (Plate 1-10), consists of 3 partially closed areas for liquid and solid hazardous wastes. The project generates various hazardous wastes such as used oil and other oily wastes e.g., contaminated rags and gloves. The facility is designed to provide open-air ventilation to the stored hazardous waste. Secondary containment, such as drip trays, is provided inside the hazardous waste storage area for liquid hazardous wastes. Spill kits, fire extinguishers, gloves, eye protection, and hazard signages are also provided.

Safety Data Sheets (SDS) are posted in the MRF containing all the necessary safety information regarding the wastes stored. Necessary permits are secured prior to disposal of

hazardous wastes. Permit-to-Transport and Certificates of Treatment are also secure. DENR-accredited hauler will collect the hazardous wastes and transport it to a DENR-accredited TSD Facility. Certificate of treatment will be released 45 days after hauling.



Plate 1-10 Existing Hazardous Waste Storage in the Project Site

Other Wastes

The perceived relevant wastes for the proposed project are silts. Silts are the solid wastes from the dredging of undesired seabed materials. Other type of wastes is deemed not applicable for this type of project since no appreciable amount of garbage or solid wastes will be generated from the activities involved.

1.5.3. DESCRIPTION OF THE OPERATIONS AND MAINTENANCE OF FACILITY

The maintenance facilities for the Project are located outside the Project site premises which include bunk house, vehicle washing facility, vehicle maintenance services, change oil machineries, among others that are outsourced.

1.6. PROJECT SIZE

The Total Project Area is 360 ha (3,600,000 sq. m.) which is composed of three islands:

- Island A: ±60 ha (600,000 sq. m.)
- Island B: ±153.5684 ha (1,535,684 sq. m)
- Island C: ±146.4316 ha (1,464,316 sq. m.)

The other project component size and specification are presented in Section 1.4 Project Components

1.7. DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAMES

1.7.1. PRECONSTRUCTION PHASE

The preconstruction activities for the island reconfiguration include updating of the environmental impact assessment by the preparation of this EPRMP in order to secure an amended ECC, securing necessary clearances to PRA and other concerned government offices.

List of Permits and Clearances

The list of project related permits and clearances obtained for the Project is listed in Table 1.19.

Table 1.19 List of Permits and Clearances

Number	Name	Permit and Clearances/ Resolutions	Date Issue	Date Expiry
ECC-CO-1601-0003	Pasay City Government	Environmental Compliance Certificate (10 December 2015)	24-Oct-2017	
AC-NCR-2019-003	Local Government Unit – City of Pasay	Area Clearance for the Proposed 360-Hectare Pasay Reclamation Project	15 August 2019	
PC-25c-2022-01608		LLDA Clearance	1 Dec 2022	
OL-GR-NCR-76-043595	China Harbour Engineering Company	Hazardous Waste Generator Registration Certificate	Feb 15, 2023	
PTO-OL-NCR-2023-01783	China Harbour Engineering Company	Permit to Operate Air Pollution Source and Control Installations	22 Feb 2023	22 Feb 2028
PCG-2023-OSCP-030	China Harbour Engineering Company	PCG Approved Oil Spill Contingency Plan (OSCP)	19 October 2023	19 October 2026
PTO-OL-NCR-2023-09576	Pasay City Government (Pasay Reclamation Project)	Permit to Operate Air Pollution Source and Control Installations	30 June 2024	30 Oct 2028
PTO-OL-NCR-2024-05926	Pasay City Government (Pasay Reclamation Development Project – China Harbour Engineering Company)	Permit to Operate Air Pollution Source and Control Installations	30 June 2024	30 June 2029

Number	Name	Permit and Clearances/ Resolutions	Date Issue	Date Expiry
Varies Per Dump/ Discharge	China Harbour Engineering Company	Special Waste Permit to Dump/ Discharge Waste &/ OR Other Matter		

1.7.2. CONSTRUCTION PHASE

The various dredging and reclamation activities are described in the previous sections (Section 1.4 and section 1.5) while additional discussions are presented in this section.

1.7.2.1. ISLAND RECONFIGURATION

The island reconfiguration, which will widen the channel between the Project and the Pasay City mainland to ±476 meters, will require the excavation of sand in the existing ditch and Original Island A to expand the width of the channel to 470-490 meters, to deepen the channel to -6.0m MSL and to change the length of the island to ±1.3 kilometers.

Table 1.20 Project Timeline for Island Reconfiguration Reclamation Works and Horizontal Development

Project Activities	2017	2022				2023				2024				2025				2026				2027				2028			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Pre-construction																													
ECC Issuance (ECC-CO-1601-0003)																													
EPRMP Preparation for ECC Amendment																													
Construction Phase																													
Reclamation (Island Reconfiguration)																													
Horizontal Development																													
Decommissioning Phase of Temporary Facilities for Reclamation Works																													
Decommissioning Phase of Temporary Facilities for Horizontal Development																													
Operation Phase (not part of ECC)																													

1.7.2.1.A. CONSTRUCTION VESSELS AND VEHICLES

The following construction vessels and vehicles is to be mobilized to execute the construction works. A photo and brief description of these is presented in Table 1.22.

- Primary Marine Vessels (Grab Dredger, Spreader Pontoon, Pelican Barge, Cutter Suction Dredger (5 CSD) and Split Barges;
- Various marine auxiliary equipment (tugs, multicast, anchor boat, etc.); and
- Land Based Equipment (LBE) units (Table 1.21).

Table 1.21 Land Construction Vehicles

No.	Project	Equipment	Type	Quantity
1	Temporary road	Dump truck	20m³	2
		Excavator	30t	3
		Excavator	20t	1
		Road roller	10t	1
		Boom truck	10t	1
2	Pipeline and materials relocation	Crawler crane	100t	2
		Loader	3.5m³	5
		Flatbed truck	12m	5
		Mobile crane	50t	2
		Excavator	30t	4
		Excavator	20t	2
		Dump truck	20t	5
		Bulldozer	sd32	1
		Hydraulic Breaker	20t	1
3	Vibro-Compaction	Vibroflot with Crawler Crane	55t-130t	1
		CPT Rig	-	1
		Loader	3.5m³	1

Table 1.22 Construction Vessels and Vehicles

No.	Marine Vessels	Description
Primary Marine Vessels		
1	**Grab Dredger (GB)**  	The mechanical GD consists of a crane mounted on a barge, and excavated material is generally deposited into independent hopper barges situated alongside. GD consists of two grab jaws, forming approximately a half cylinder in closed position.
2	**Cutter Suction Dredger**  	A cutter suction dredger is a floating pontoon equipped with powerful engines, high-capacity centrifugal pump(s), strong winches, a spud system and a pipeline system that is able to excavate continuously in a wide range of soil types and delivery dredged materials to a designated disposal area via pipeline. The cutter suction dredger moves in an arc pattern from starboard to portside and back to starboard around a central working spud by pulling on one of side anchors. After the completion of a full swing the dredger moves forward on her spud system and starts a new cut. Depending on the pumping distance, a combination of submerged and onboard pumps is used to dredge and pump the material to the reclamation area.
3	**Pelican Barge**	The Pelican Barge is a multifunctional vessel that integrates dredging, transportation, and sand discharge capabilities. These self-propelled ships

No.	Marine Vessels	Description
		are suitable for navigating both deep and shallow seas, equipped with the ability to load sand into their own hoppers using centrifugal pumps and suction pipes. Each ship is furnished with a suction pipe equipped with a high-pressure flushing device, which penetrates the seabed during dredging to draw sand material into the pipe for discharge into the hopper.
4	**Spreader Pontoon** 	A spreader pontoon comprises a series of pipelines connected to a pontoon for material transport and an outflow head controlled by winches, wires, and anchors for positioning. It is utilized in conjunction with a dredger to discharge dredged material underwater in a controlled manner. The spreader pontoon features a trumpet-shaped outflow head, facilitating the installation of thin layers of material in a controlled manner.
Auxiliary Vessels		
1	**Survey Vessel**	During the removal of soft soil, a survey vessel will be present to assist in monitoring and verification of progress of the work.
2	**Crew Transfer Vessel**	A support vessel will be allocated to the dredging spread for the purpose of crew transfers and logistics, providing additional support where necessary. This will be locally sourced or rent, to be operated by Contractor's personnel.
3	**Additional Support – Multicat/ anchor boat/tugboat** 	Multicat/anchor boat/tugboat will be allocated to assist the Grab Dredger (GD) in a variety of tasks, such as positioning the GD and offering logistical support when necessary. A multicat/anchor boat is recognized for its versatility as an all-purpose vessel, equipped with winches on a flat deck
4	**Split Barge** 	For the purpose of material storage and handling, split barges will be utilized in conjunction with the grab dredgers during dredging works. These will sail to the disposal area once fully loaded and will be operated by Contractor's personnel.

No.	Marine Vessels	Description
Land Based Equipment		
1.	**Excavator** 	An excavator is frequently utilized in dredging works to perform excavation and material removal. Equipped with a specialized dredging bucket or attachment, the excavator can efficiently scoop and lift sediments or sand. The reach of the excavator's arm enables dredging at greater depths, making it suitable for areas where precision and control are essential for effective material extraction.
2.	**Wheel Loader** 	A wheel loader is a piece of equipment with a lift arm and bucket, a versatile heavy equipment widely utilized in construction and various industries for material handling and earthmoving tasks. With a hydraulic couple system, different attachments can be changed quickly for example bucket, pallet forks or pipe clamp. Wheel loaders are used for the following activities: • Transport of pipelines; • Excavation and levelling works; and • Loading of trucks.
3.	**Dump Truck / Articulated Dump Truck** 	Dump trucks are employed to transport dredged or excavated materials from the project site to designated areas.

1.7.2.1.B. CONSTRUCTION OF ADDITIONAL SANDKEYS AND SAND FILLING

The construction of additional sandkeys for the reconfigured islands' works will be executed on a 24-hour-a-day, 7-days-a-week basis.

The Sandkey Dredging include:

- Dredging at Edge 2 – Northern of Island AB at the old channel
- Dredging at Edge 3 – Southern of Island AB at the old channel
- Dredging at Edge 5 – North-eastern corner of Island C

The Sandkey Filling include:

- Sand filling by Pelican Barge
- Sand filling by Cutter Suction Dredger
- Sand filling by Spreader Pontoon

Other portions of the Islands will have vibro-compaction treatment to ensure the stability of the revetment. The typical cross section of the revetment is shown in Figure 1.50.

.

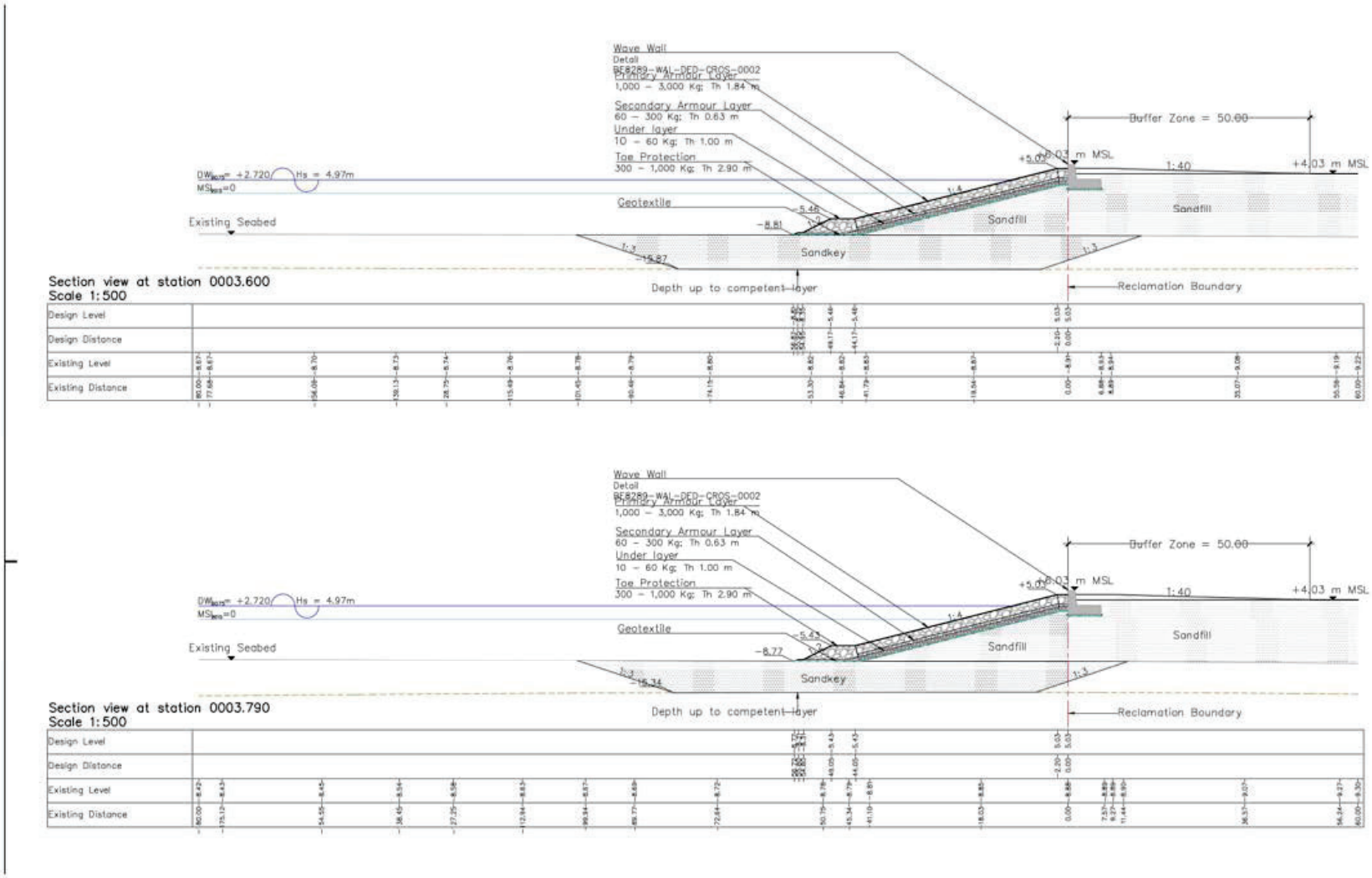


Figure 1.50 Typical Cross Section of Revetment

1.7.2.1.C. RECLAMATION WORKS

The reclamation works for the Project is summarized in Figure 1.51.

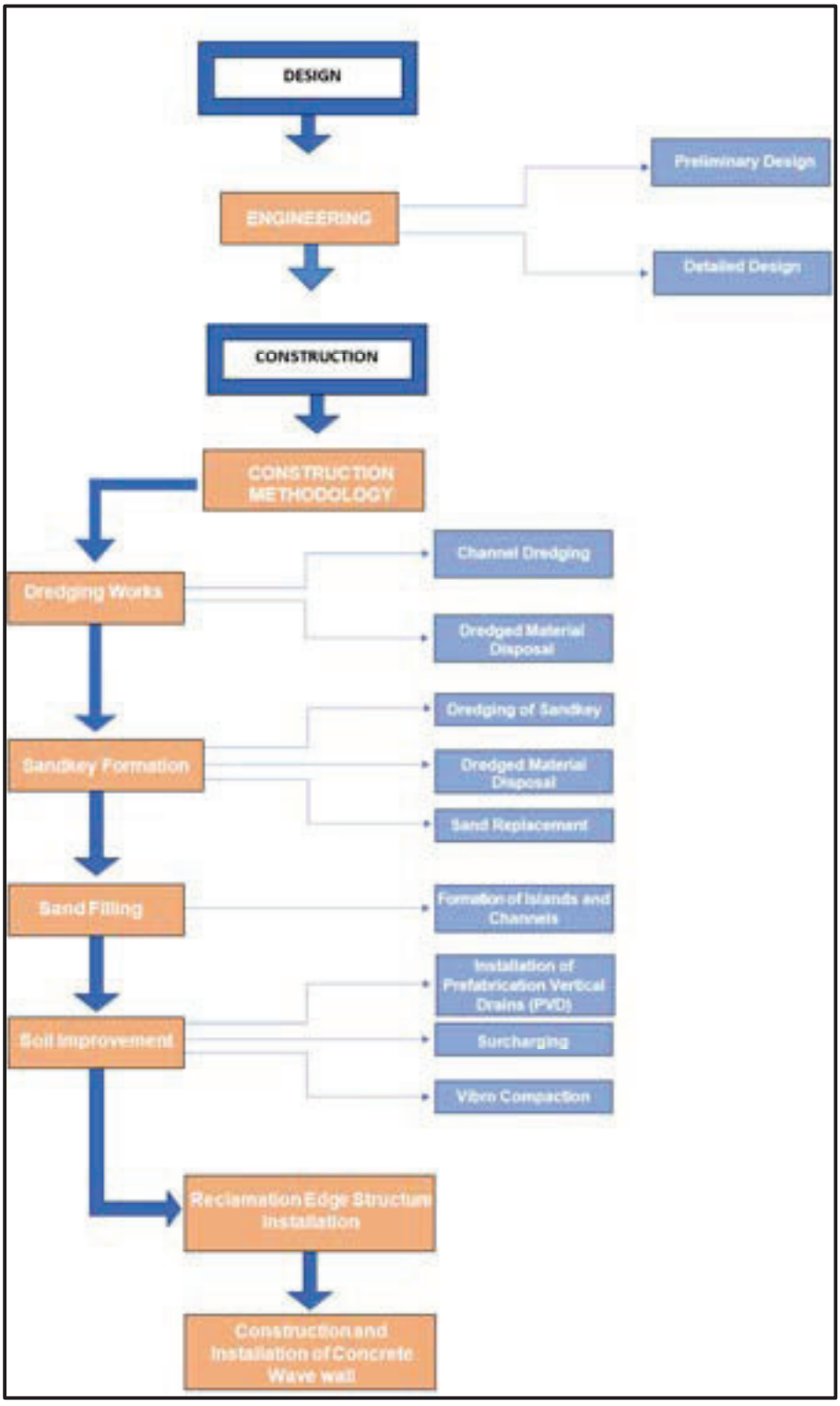


Figure 1.51 Simplified Flow Sheet/Diagram for The Reclamation Works

1.7.2.1.C.1. DREDGING WORKS

Channel Dredging

At the onset of the reclamation, dredging was carried out for the access channel and turning basin to provide access for the jumbo/medium Trailer Suction Hopper Dredger (TSHD) going to the project location or work area. The turning basin was intended to provide a maneuvering room and operate two TSHDs simultaneously while continuing to fill the island without obstructing the access for the other TSHD to enter the project. This activity has been completed before this ECC amendment.

Dredged Material Disposal

The dredging process consists of loading (dredging), transporting (sailing full), discharging, and sailing empty. Once loaded, the TSHD or through self-propelled hopper barges (in tandem with Grad Dredger) will sail to the disposal area. At the disposal area, the TSHD will open its bottom doors to dump the dredged material, after which she will sail back to the Site to repeat the same process. In the case of hopper barges, upon arrival at the disposal area, the hull of the barge is parted, allowing the discharge of the dredged material into the sea. Subsequently, the vessel closes and returns to the site to repeat the same process.

Methods for disposal of the material have been based on a location outside of Manila Bay and the Contractor investigated the alternative designation of the dumping area closer to the Project site, the location and coordinates (Table 1.23) of the dumping areas are shown in Figure 1.52. For each of the disposal a “Special Waste Permit to Dump/ Discharge Waste &/ or Other Matter” is being secured from the PCG prior to disposal (Appendix O.5).

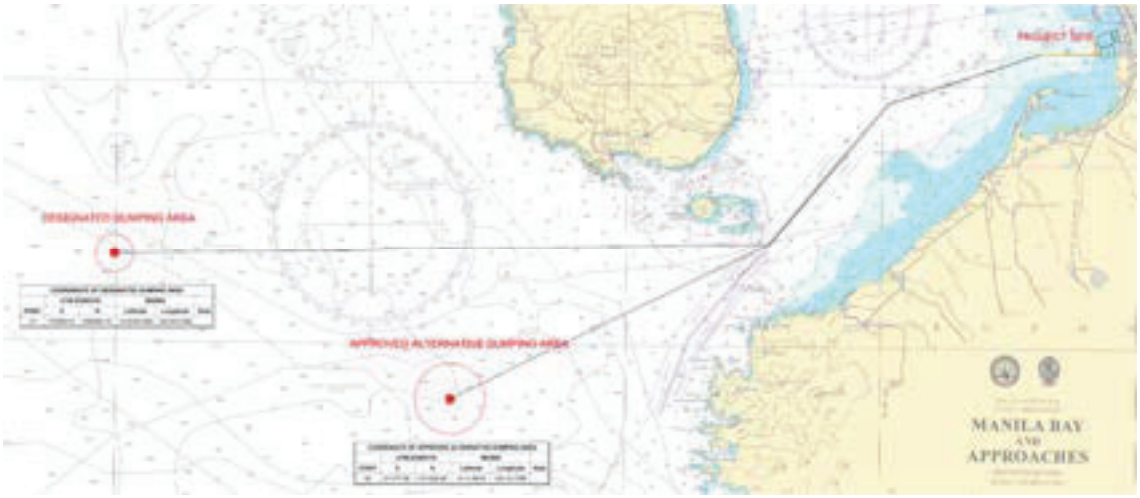


Figure 1.52 Sailing Route to Disposal Area Outside Manila Bay

Table 1.23 Coordinates of Disposal Area outside Manila Bay

POINT	DESCRIPTION	UTM ZONE 51N		WGS '84			
		Easting	Northing	Latitude		Longitude	
		[m]	[m]	[dd°mm'ss.ss]		[dd°mm'ss.ss]	
1	Designation Dumping Area	176369.44	1586690.74	14°19'60.00"	N	120° 0'0.00"	E
2	Alternative Designation Dumping Area	211777.85	1571292.88	14°11.891"	N	120° 19.776"	E

Disposal of dredged material from Access Channel has been completed before this ECC amendment. However, the project still utilizes the above dumping area to dispose of dredged materials from sandkey formations.

1.7.2.1.C.2. SANDKEY FORMATION

Dredging of Sandkey

At the specified edges of the reconfigured islands where an existing sandkey is situated, a grab dredger will be used to dredge the sandkey to the required dimensions of the design. For grab dredgers (GD), both the method of anchoring and the accuracy of the bucket positioning system play an important role in determining the effectiveness of the dredger. It is important to determine the location of each 'grab' using a positioning system to ensure adherence to the design requirements. This also aids the dredge master in determining the location of the following 'grab' after re-positioning.

A specialized dredging monitoring system equipped on-board controls the dredger, which is linked to the main positioning system. The survey system provides the operator of the dredger with all relevant information regarding the location and exact depth of the grab. The excavation by the grab dredgers is tailored to the bathymetry of an area and required dredge depth, and as such will be carried out in a sequence of various predetermined zones, strips, and layers. The size and number of 'grabs' is determined following the excavation depth and soil stability.

To prevent disturbance to the existing sandkey during dredging at the interface of the existing sandkey and the additional sandkeys, a layered step-by-step construction process is recommended. Excavation should proceed layer by layer until it reaches the designated layer elevation, effectively controlling the amount of excavation. Continuous monitoring of the stability of the existing sandkey during the excavation process is observed to avoid sliding.

Dredged Material Disposal

Dredged materials will be transported to the disposal area by self-propelled hopper barges at the dumping area as described above.

Sand Replacement

Sandkey filling using a pelican barge can also be employed for extending the filling operations to reach the final design level. The pelican barge, in particular, utilizes a conveyor belt system that effectively extends its reach above shallow waters and onto land. This system enables the barge to transfer and place fill materials in a controlled manner, ensuring precision and efficiency in the completion of the sandkey filling process. Alternatively, sandkey filling by Cutter Suction Dredger (CSD) connected to the spreader pontoon via a floating pipeline will also be employed.

To elaborate on the sand-filling procedure involving a Cutter Suction Dredger (CSD) linked to a spreader pontoon through a floating pipeline, the CSD will be navigated to the assigned site. Upon reaching the designated position, it will be connected to the shoreline using both floating and shore-based pipelines. An anchor boat or anchor handling vessel will aid in connecting the floating pipelines. Following this, the dredge cutter head will lay down to the proper position based on water depth, the spreader pontoon is utilized to receive sand fill material from the CSD via a floating pipeline. Once the cutter suction dredger has linked up with the spreader pontoon through a floating line, in conjunction with a shoreline and floating line setup. The bow connection line can be retrieved directly by a designated support vessel.

In the initial phase, sand-filling tasks are undertaken using the Pelican Barge. However, if the water depth is too shallow for the Pelican Barge to access, the CSD+ spreader pontoon method will be employed for sand-filling construction instead.

1.7.2.1.C.3. SAND FILLING

Formation of Islands and Channels

- 476m Channel Between Hinterland and Existing Island A:
  A channel between the hinterland and the old Island A will be established, by excavating and deepening the existing ditch to a width of 476 meters, a channel depth of -6.0m MSL, and a length of approximately 1.3 kilometers. The works to commence with the execution of sand transfer and excavation of channel works as shown below and outlined as follows:
    - Zone 1 – Dredging -6.0m by Cutter Suction Dredger
    - Zone 2 – Dredging to the original seabed by Grab Dredger and Land-based equipment
    - Zone 3 – Land-based excavation to 0m MSL and sea-based excavation by small CSD to -6.0m MSL with a slope of 1:4
    - Zone 4 – Moving of sand above 0.0m MSL into the sea by Land-based equipment
    - Zone 5 - Construction of 476m Temporary Access



Figure 1.53 476m Channel Treatment

- Sand Placement at reconfigured islands will comprise the following stages:
    - Where sufficient water depth is available, discharging of reclamation sand using a spreader pontoon with CSD or pelican barge by conveyor is performed horizontally by layers of predefined thickness. This controlled placing method avoids mixing sand with the soft top layer of the existing seabed as much as practically possible and reduces the probability of local instabilities in the top layer significantly. The layer thicknesses will be determined by local conditions and therefore different across areas. For the determination of the layer thickness, reference is made to the Settlement and Stability Monitoring Manual. In areas where sufficient water depth is available and where the soil at sea bed is competent (zero or negligible thickness of soft soil), such as sandkeys, deeper areas, or areas verified by soil investigation, controlled dumping. The methods of controlled dumping via the bottom doors or controlled discharge via the suction pipe may be applied to filling works in the previously dredged pits and the sandkeys. Regardless of what method is adopted, care will be taken to ensure the stability of side slopes.

    - When the water depth at a location is too shallow for the spreader pontoon or for the pelican barge to operate in, several options will be considered, such as working with tide, pump ashore, and transfer by the cutter suction dredger, the choice for the most suitable and convenient option will be made in the field. The shallow areas are further heightened until an initial platform level by transfer through the cutter suction dredger and the shore pipeline (pump ashore method). As the level of the reclamation increases, land-based equipment will spread and level the discharged material on shore, extending the land pipeline system. Temporary bunds will be made with earth-moving equipment and delivered dredge material if required. The temporary bunds will be installed along the perimeter of the reclamation area, and locations of the weir boxes will be determined in the operational phase after installation of the PVDs since the location will be chosen based on the occurred settlement to ensure natural run-off towards

the weir box. Suitable temporary drains/ outlets will be installed at the perimeter bund to minimize the material loss out of the reclamation boundary during reclamation operations.

- After and during the finalizing of the installation to the initial platform level, existing temporary containment bunds and outlets will be raised, and pelican barges plus cutter suction dredgers will continue to discharge material ashore until reach the required level. The final reclamation level will be achieved by re-handling the sand from the construction slopes, future channels, and flats.

1.7.2.1.C.4. SOIL IMPROVEMENT

Installation of Pre-fabricated Vertical Drains (PVD)

The reclamation will predominately be placed on soft soils with a thickness of up to 25 m. Soft soil improvement works in the form of prefabricated vertical drains (PVDs) are designed as part of the Detailed Engineering Design.

PVDs will be installed in Islands A, B, and C in a triangular grid with various spacings. The PVDs will be installed from a flat and stable working platform at a level just above the Highest Astronomical Tide (HAT). The elevation of the working platform will be approximately +1.5m MSL to avoid flooding the working area during PVD installation. PVDs will be installed up to Soil Unit 3 (SU3). The PVD spacing and installation level are set per workbox of 50 x 50m. The extent of the PVD installation area is limited by the sand key inner bottom contour as detailed in the Detailed Engineering Design.

The main principle of PVD installation is the insertion of a hollow steel mandrel, enclosing the PVD, into the ground. A PVD roll will be placed in the roll holder attached to the stitcher. The PVD is guided to the top of the stitcher and, via rollers, into the mandrel. At the bottom of the mandrel, the end of the PVD is connected to an anchor plate or similar arrangement. At a marked position, the operator lowers the mandrel into the subsoil. The anchor material ensures the bottom closure of the mandrel. When the required depth is reached, the mandrel is pulled up. The anchor material is utilized by the ground- and water pressure in the cohesive subsoil ensuring that the PVD end will remain at the installation depth. The PVD is cut at the working platform level after complete retraction of the mandrel. Thereafter a new anchor plate is attached to the PVD. The PVD installation unit will be repositioned and the cycle will be repeated.

Surcharging

Surcharging is a vital technique in land reclamation projects, providing an effective means to ensure the long-term stability and usability of reclaimed land. By accelerating soil consolidation, surcharging mitigates the risks associated with differential settlement, ultimately contributing to the success of large-scale reclamation projects.

Based on the design parameters, the surcharge load is determined. The load must be sufficiently greater than the final load to induce the necessary consolidation. The duration of the surcharge period is from 6 to 8 months. During the surcharging process, the settlement of the land is continuously monitored using settlement plates, piezometers, and other geotechnical instruments. The progress of consolidation is tracked to determine when the desired level of settlement has been achieved. Once the soil has sufficiently consolidated and the settlement rate has attained the desired levels, the surcharge material is removed.

Vibro-compaction

Vibro-compaction can achieve favorable ground improvement through the following process: under the repeated horizontal vibration and lateral pushing force generated by the vibroflot, the surrounding sand fill will collapse into the hole by the horizontal vibratory force and lateral pushing force, and gradually liquefies, and the granule sand can be rearranged, the voids can be gradually reduced, thereby increasing the ground bearing capacity, reducing deformation, and eliminating liquefaction of the ground.

Essentially the vibroflot is a long, heavy tube enclosing eccentric weights, driven by an electric motor. The vibroflot is connected to a source of electric power and a centrifugal pump for water jetting. Extension tubes are added as necessary and the whole assembly is suspended from a crane.

In the vibro-compaction work, the vibro module is first positioned by the hoisting equipment to the vibro-compaction location which is acquired by GPS-RTK. With the electric power and water supply switched on, the vibroflot is lowered into the ground. The penetration is assisted by the vibrations and the high-pressure water jets (bottom & side water jetting).
When the required depth is reached, the water supply for bottom jetting is cut off and the vibroflot is lifted in regular steps, the lifting speed shall depend on soil characteristics and its effect on the vibro-compaction work. In the lifting, the vibroflot shall be maintained for vibrating after being lifted for a certain distance until the electric current reaches the requirement of compaction, and then repeat such lifting-maintaining cycle till the ground surface, thus vibro-compaction at the point is completed.

Due to the induced vibrations and with the assistance of gravity the granule sand is rearranged in a denser state of compaction. Due to the densification, the volume of the sand fill is reduced. Generally, the effect of the compaction becomes visible at the ground surface in the form of a cone-shaped depression as the soil particles will be re-arranged into a more stable configuration.

1.7.2.1.C.5. RECLAMATION EDGE STRUCTURES INSTALLATION

The Coastal Revetment will be constructed at the locations defined in the Detailed Engineering Drawings. The scope of work includes:

1. Removal of the temporary PVD or compaction platform (where applicable)

In the areas where a temporary PVD or compaction platform is present, the first step in constructing the coastal revetment is to remove this platform. The removal is performed by hydraulic and long-reach excavators which work from the waterline and excavate and profile the excess material along the slope.

2. Profiling of the slopes

After the removal of the temporary PVD or compaction platform or excess material and just before the geotextile installation, the rough sand slope will be profiled into its designed shape. The crest line will be made by removing or adding sand to profile the slope within the design limitations. The first step will use a small dredging barge or sand pump to the preliminary profile slope, then the slope will be profiled to the designed gradient by use of a long arm excavator equipped with a Crane Monitoring System. After the slope has been profiled within the applicable tolerances, the section will be surveyed to ensure the Works have been completed as per specifications.

3. Placement of the geotextile

After the profiling of the slopes, the geotextile will be installed once the area has been inspected and approved. The installation will be performed by marine geotextile installation barges and floating platform to the marine part, land part will be performed by excavator and manual work. Each geotextile roll consists of a section of geotextile of predetermined length. When it is completely rolled off it covers the section of the revetment up to and including the toe. The geotextile sections are installed following the sequence indicated in the method statement.

4. Placement of the various rock layers and sections.

After a section of geotextile is completed, the 1st layer of rock will be installed within 48 hours. This will be performed in such a timeframe that the slope is free of siltation before placement of the rock. Rocks, in stockpiles on the islands, are moved by earth-moving equipment toward the revetment to feed the excavators. Occasionally trucks will pass a weighbridge to evaluate their load. The sequence of rock protection will start from the slopes of the submerged section first before the exposed sections which will be carried out from the land side. The rock transportation routes between shall be maintained in a neat, orderly, and safe condition. All material deposited on and obstructing the transport route shall be removed and disposed of at an approved location. The rock revetment will be constructed based on the detailed engineering design following the steps indicated in the method statement.

1.7.2.1.C.6. CONSTRUCTION AND INSTALLATION OF CONCRETE WAVE WALL

Construction and installation of a concrete wave wall against overtopping of waves during design wave conditions will be implemented based on the detailed engineering design and according to the following scope:

- Setting out;
- Foundation works;
- Formwork installation and removal;
- Concrete pouring;
- Concrete curing;
- Concrete monitoring;
- Backfill and compaction.

1.7.2.1.D. CONSTRUCTION OF TEMPORARY ACCESS

The assigned contractor is responsible for creating a temporary access roads/ bridge/s from mainland to Project islands and between islands (temporary access roads between mainland and Island AB and Between Island AB and C) to enable the smooth passage of personnel, vehicles, and materials across the channel during the construction phase.

The methodology on the construction of Temporary Access can be found under temporary access bridge in **Section 1.4.2**.

1.7.2.1.E. CONSTRUCTION OF HORIZONTAL DEVELOPMENT

The horizontal development includes the construction of the major/primary access roads and bridges, open spaces, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems. The major activities during the construction phase are the following:

- Access road construction;
- Site preparation including earthworks, excavation, installation of onsite temporary/ support facilities;
- Electrical power installations;
- Network data installations;
- Fire hydrant network installation;
- Drainage construction;
- Delivery of construction materials; and
- Decommissioning of Temporary Facilities, among others.

1.7.2.2. OPERATIONAL PHASE

The operations phase involves the construction of buildings and structures by various locators and the operation of their activities, e.g. food stores, convention centers, movie houses, etc. This phase is not included in the scope of this EIS and in the application for an ECC.

1.7.2.3. DECOMMISSIONING/ ABANDONMENT/ REHABILITATION

1.7.2.3.A. AFTER RECLAMATION WORKS

Temporary facilities during the reclamation phase which include the temporary waste facilities and storages, construction signages, jetty, wharf, rock and pipeline stockpiles, temporary access roads/ bridge/s, from mainland to Project islands and between islands, etc. shall be maintained to give way or to be continuously reused for the horizontal development. Should there be needed to abandon or move the facilities the following shall be employed:

- Properly manage and dismantled all temporary facilities;
- Develop waste management procedures and sort materials according to types;
- Reusable materials may be sold to junk shop or donated to the community;
- All other waste shall be segregated and dispose properly;
- Solid and Hazardous waste shall be properly hauled by a DENR accredited waste haulers;
- Portalets shall be properly siphoned and collected by the siphoning contractor;
- The inventory of waste produced as well as the certificate of treatment, hauling records, manifest form, etc. shall be reported in SMR and CMR; and
- Conduct land and water restoration and rehabilitation activities, if applicable.

The Projects estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC which is to "*Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures*".

1.7.2.3.B. AFTER HORIZONTAL DEVELOPMENT

Temporary facilities during the project development stage/ construction phase which include the temporary waste facilities and storages, construction signages, jetty, wharf, rock and pipeline stockpiles, temporary access roads/ bridge/s from mainland to Project islands and between islands, and between island C and mainland, etc. shall be properly removed from the project area to give way of the project operations. During the abandonment phase of the temporary facilities, the Project Proponent as well as their contractor shall:

- Properly manage and dismantled all temporary facilities;
- Develop waste management procedures and sort materials according to types;
- Reusable materials may be sold to junk shop or donated to the community;
- All other waste shall be segregated and dispose properly;
- Solid and Hazardous waste shall be properly hauled by a DENR accredited waste haulers;
- Portalets shall be properly siphoned and collected by the siphoning contractor;
- The inventory of waste produced as well as the certificate of treatment, hauling records, manifest form, etc. shall be reported in SMR and CMR;
- Silt management and control shall be implemented during the decommissioning of temporary access road
- Conduct land and water restoration and rehabilitation activities, if applicable.

The Projects estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the

ECC which is to "*Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures*".

1.7.2.3.C. ABANDONMENT OF THE PROJECT

The project is consistent with the Pasay City long-term zoning and land use development, noting that the Proponent is the LGU itself. The Abandonment and Decommissioning Plan in general will include management plan for the projected cumulative/long term project impacts such as remediation of contaminated soil and water resources, land restoration, proper dismantling/abandonment of facilities/ equipment and other necessary activities.

Decommissioning/Abandonment/Rehabilitation

The proposed decommissioning plan envisaged in terms of the following:

- **Procedures for the decommissioning of the project components;**

  The project components are largely the reclaimed land including the infrastructures therein constructed e.g. roads open spaces, drainage culverts, electrical and water lines, etc.

- **Transport/disposal of equipment and other materials used in the plant's operation;**

  The equipment and other materials used in the reclamation and dredging works would have been returned or claimed back by the contractors.

- **Remediation of contaminated soil and water resources due to spills and leakage of chemicals and other materials used in the operation;**

  There are no spills and leakages during the process of soil stabilization and hence this aspect is not relevant.

- **Alternatives for the future use of abandoned area;**

  The proponent and its Joint Venture Partners can bid out the project to private sectors for their use.

- **Consistency with long term zoning and land use development plan of the municipality;**

- **Rehabilitation/ restoration plans, if any.**

The proposed Project including the reconfiguration is limited to the dredging, reclamation and horizontal land development. The future locators will have a separate ECC applications, EMP and EMoP for their application and compliances which is separate and independent from this

Project. The proposed reclamation Project will form islands intended to be permanent part of Pasay City land area. The reclamation island is essential to the growth and development of Pasay City which bears the problems associated with expanding economic activities and population growth which result into urban congestion.
Seventy percent (70%) of the total land area will be devoted to mixed-land use while the remaining thirty percent (30%) will be devoted to open space development. The Project will create hundreds of thousands of job opportunities including those from fishing communities. Moreover, the Project will spur economic activities and generate for the National Government and the City Government of Pasay billions of pesos in public revenues, which can be devoted to public services. Abandoning the Proposed Project may lead to unemployment, urban congestion, and decline of local benefits in the City of Pasay. Maintenance activities once it reaches its project life is more probable than abandonment.

However, should there be a need to abandon, change ownership or to rehabilitate the Proposed Project, or change in LGU land use plan, necessary permits and approval will be secured to the DENR EMB. The Proposed Project will be properly rehabilitated following the guidelines in the revised procedural manual of DAO 2003-30, Land Use Plan of Pasay City or whatever that is deemed available that is applicable at the time of decommissioning. A letter of request to relief the ECC, including the decommissioning/ abandonment/ rehabilitation plan will be prepared and submitted to DENR EMB for at least six months prior to its abandonment. Abandonment Plan in general will include management plan for the projected cumulative/long term project impacts such as:

- Remediation of contaminated soil and water resources (if any) should there be potential leakage in fuel storage, chemical storage and hazardous waste storage;
- Coordination with the LGU zoning officer regarding the proposed land and water use;
- proper dismantling/abandonment of the project components;
- Clean-up, sorting, proper disposal and hauling of Solid and Hazardous Waste via DENR EMB accredited haulers;
- Reusable materials may be donated to the community or deliver or sold to junk shops; and

Land and water restoration activities.

1.8. MANPOWER

During Construction Phase/ Reclamation Works

The proposed project will employ an estimated **1,200 to 1,500 persons** will be used during the peak construction stage (reclamation and horizontal). Priorities are given to qualified residents of the city in filling up the manpower requirements of its consultants and contractors during the construction stage of the project and of its locators. There are no known indigenous peoples in the city. The nature of the project construction and the need to work at the project site may not encourage women.

There are no known indigenous peoples in the city. The nature of the project construction and the need to work at the project site may not encourage women.

Expertise/skills needed for the dredging vessel

These personnel will be selected by the dredging/reclamation contractor in accordance with its policies and qualifications requirement. However, in general terms, following are major expertise/skills requirement.

Table 1.24 Manpower Requirements

Position	Expertise/skills needed for the dredging vessel
Vessel Master	A registered marine officer
Chief Mate	Most senior officer experienced in hopper and cutter operations
Officer-in-Charge of Navigational Watch	Experienced in sea voyages/nautical skipper
Chief Engineer	Experienced in mechanical, e.g. propelled cutter, rotating equipment e.g. pumps.
Second Engineer	Same general skills as the Chief Engineer but of lesser years of experience.
Third Engineer	In charge of maintenance and repair works. Must possess experience in repair of mechanical and electrical equipment
Others • **Piping personnel, greaser** • **First Aid Personnel** • **Cook** • **Sanitation personnel** (e.g. for garbage disposal, for cleaning of vessel facilities, etc.)	
Engineers and Inspectors	During the soil stabilization phase, engineers and inspectors will monitor the progress of the soil stabilization.
Special Construction works	Will require specific skills for the heavy equipment that will be involved, e.g. in pile driving works if such may be involved.
Pollution Control Supervisor	The vessel will designate a Pollution Control Supervisor who shall be trained with the environmental laws and regulations as well as the requirements of the Philippine Coast Guard.

During Operation Phase

Different set of personnel and employees will be hired during the operations phase. A total number of **2,116,800** employees are expected to be hired. Government offices such as the City of Pasay and the Philippine Reclamation Authority (PRA) will be leased with portions of the reclaimed land and in putting up their respective buildings and operations will be hiring government employees.

Private sector business and commercial establishments will be hiring their personnel needs separately.

1.9. PROJECT COST

Aligned with the Contractual Joint Venture Agreements (CJVAs), the estimated project cost for Raw Land Reclamation and Horizontal Development is Sixty-Four Billion and Six Hundred Million pesos (Php 64.6 Billion).

2. ASSESSMENT OF ENVIRONMENTAL IMPACTS

2.1. THE LAND

2.1.1. LAND USE AND CLASSIFICATION

2.1.1.1. IMPACT IN TERMS OF COMPATIBILITY WITH EXISTING LAND USE

2.1.1.1.A. BASELINE DATA

PASAY CITY LAND USE

Based on the proposed Comprehensive Land, Water and Air Use Plan (CLWAUP) 2023-2034 of Pasay, the city has a total land area of 1,807.67 hectares. As shown in Table 2.1, of the total land area of Pasay, around 39% or 709 hectares are used for infrastructure, transportation, and utilities purposes, 21% of 383.19 hectares for residential uses, and 18% of 330 hectares are for commercial purposes. The institutional uses account for 4% or 70 hectares while 8% are categorized as planned unit development which comprise the Airport and the Cultural Center of the Philippines hosting numerous institutional, cultural, and commercial activities that cater to higher order urban functions. The City Waters representing the coastal and marine waters of Pasay cover 4,871 hectares. The existing land use of Pasay is shown in Figure 2.1.

Table 2.1 Existing Land and Water Use of Pasay City

Use Categories	Area (in hectares)	% of Total Area
Residential	383.19	21.20
Socialized Housing	1.68	0.09
Commercial	329.89	18.25
Institutional	70.25	3.89
Special Institutional (Military Use)	56.72	3.14
Industrial	7.35	0.41
Planned Unit Development	143.42	7.93
Cemetery	5.27	0.29
Parks and Recreation	71.71	3.97
Infrastructure, Transportation, and Utilities	709.05	39.22
Water Uses (rivers and creeks)	29.14	1.61
Total	**1,807.68**	**100**
City Waters	4,871.51	100

Source: 2023-2034 CLWAUP of Pasay City, 2024

COMPREHENSIVE LAND USE PLAN 2014-2022

The Pasay City Comprehensive Land Use Plan (CLUP) for the period 2014 to 2022 provided the spatial strategy to support the development intentions of the city for the plan period. As illustrated in Figure 2.2, the CLUP already incorporated the boundaries of the city coastal waters and the land

reclamation intentions of the City. The proposed land use distribution, as indicated in the CLUP 2014-2022, is shown in

Table 2.2

Table 2.2 Proposed Land Use Distribution of Pasay City CLUP (2014-2022)

Use Categories	Area (in hectares)	% of Total Area
Residential	331.07	18.3
Commercial	306.34	17.0
Institutional	99.81	5.5
PUD	155.23	8.6
Cultural	18.93	1.0
Cemetery	4.96	0.3
Parks and Recreation	76.92	4.3
Utility Zone	485.04	26.9
Water Body	29.04	1.6
Roads	297.77	16.5
Total	1,805.11	100.0
PUD (Proposed New Reclamation)	1,047	100.0

Source: 2014-2022 CLUP of Pasay City, 2016

COMPREHENSIVE LAND, WATER AND AIR USE PLAN 2023-2034

The City is in the final stages of updating its 2014-2022 CLUP referred to as the Comprehensive Land, Water, and Air Use Plan (CLWAUP) covering the period 2023-2034. It is important to note that the CLWAUP, as shown in Figure 2.3 includes the three-island reclamation Project with SM SCIDC (Pasay 360), the two islands jointly undertaken by the City with the Pasay Harbor City Corporation, as well as other proposed reclamation islands that the City intends to carry out in the future. It also incorporates the proposed reclamation islands that the City intends to carry out in the future. Also reflected in Figure 2.3 is the proposed reconfiguration of the Pasay 360 Project which merges the two islands, and provides a ±476 meter-wide water channel between Island A and the mainland. The reconfiguration intends to enhance water circulation and mitigate potential flooding in the area.

The proposed land use distribution in the CLUP is provided in Table 2.3.

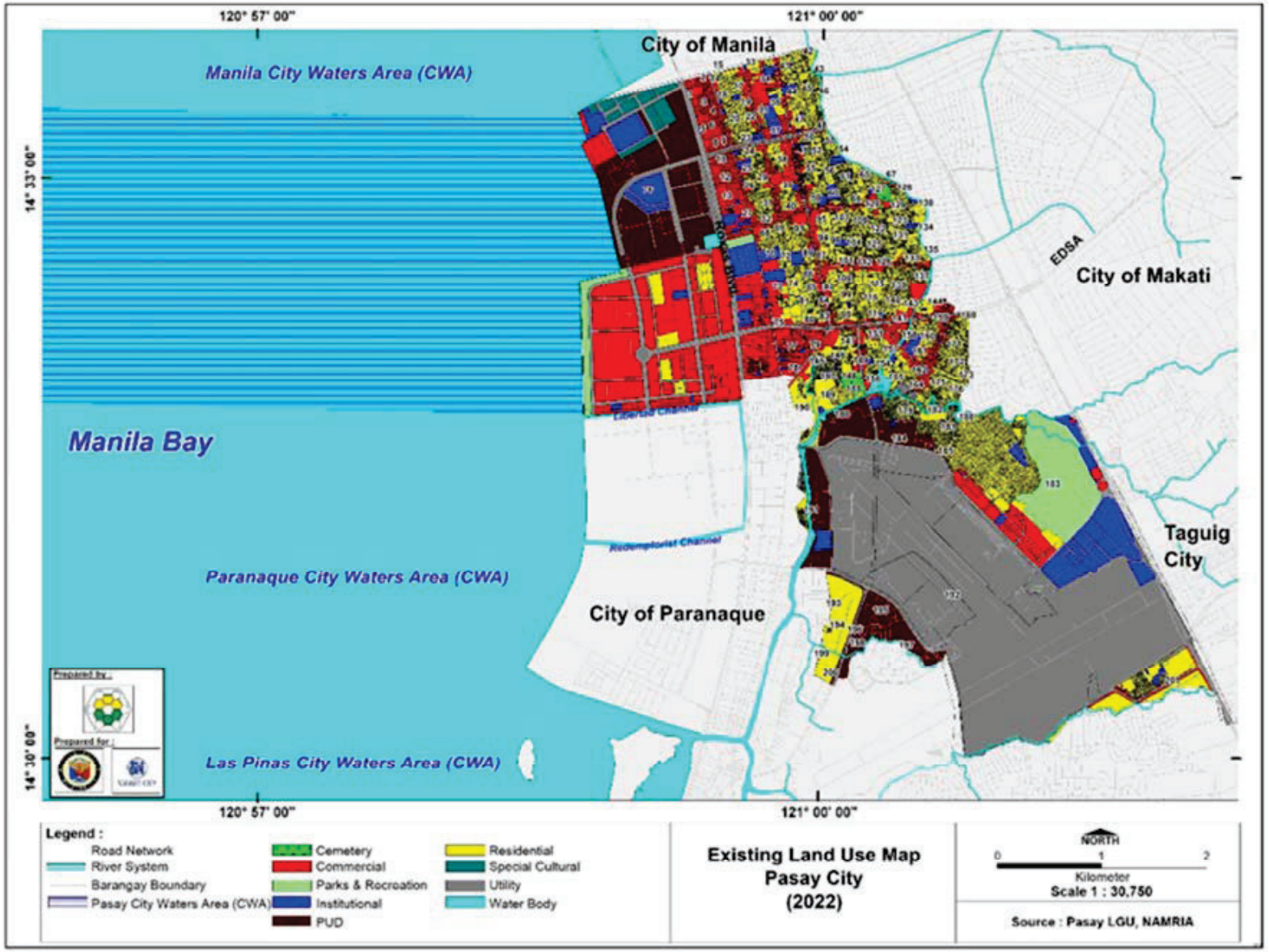


Figure 2.1 Existing Land Use Map of Pasay City (CY 2022)
Source: 2023-2034 CLWAUP of Pasay City, 2024

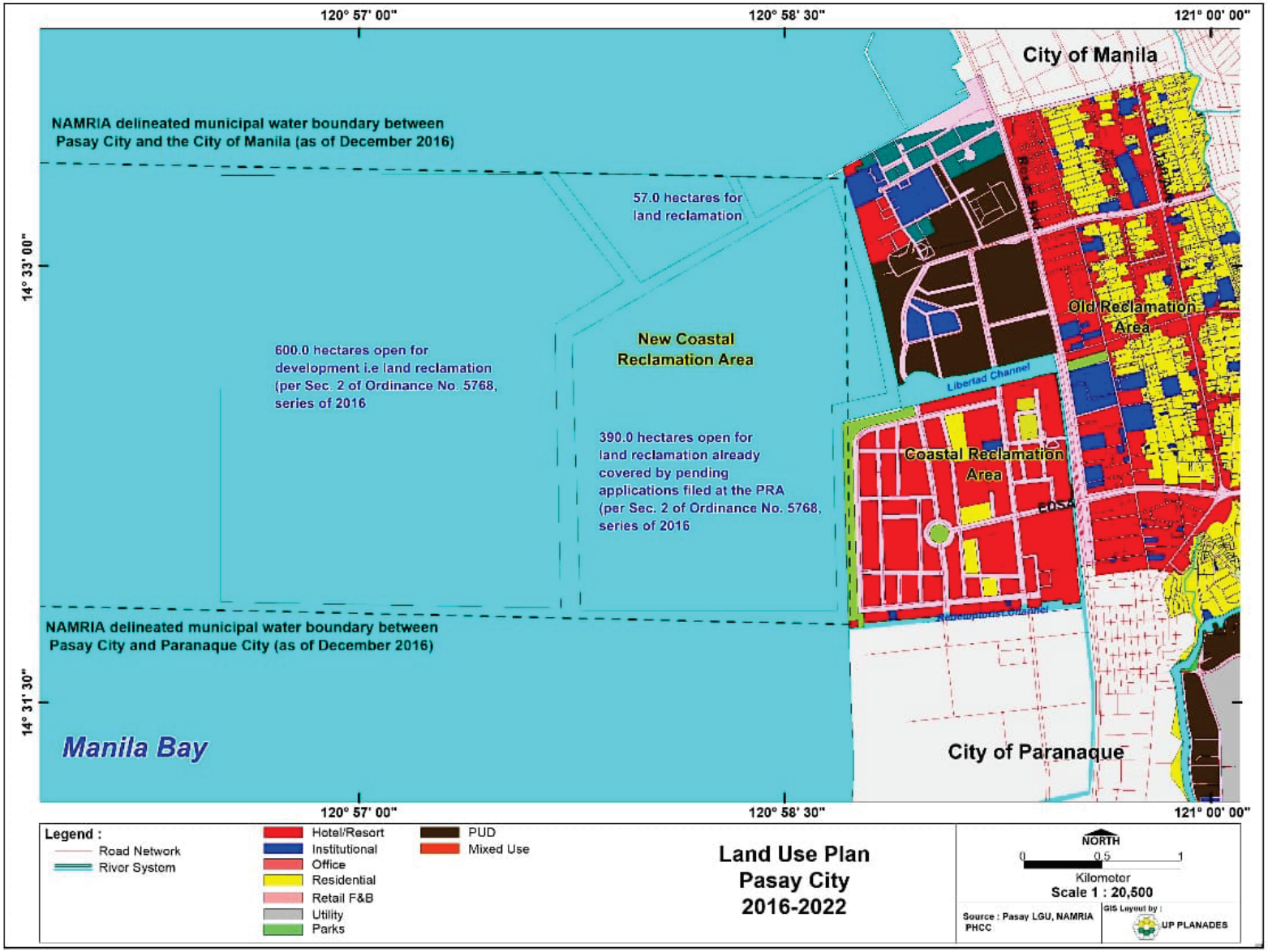


Figure 2.2 Proposed Land Use Map of Pasay City (CY 2016-2022)
Source: 2014-2022 CLUP of Pasay City, 2016

Table 2.3 Proposed Land Use Distribution of Pasay City (CLWAUP 2023-2034)

Use Categories	Area (in hectares)	% of Total Area
Residential	346.59	14.0
Commercial	389.89	15.8
Institutional	121.50	4.9
PUD	780.22	31.6
Cultural	15.91	0.6
Cemetery	5.25	0.2
Parks and Recreation	64.03	2.6
Infrastructure, Transportation and Utilities	714.39	28.9
Total Land Area	2,437.78	98.7
Rivers, Creeks and Water Channels	30.90	1.3
Total Area	2,468.68	100.0
City Waters	4,871.51	

Source: CLWAUP 2023-2034, 2024

LAND COVER

Based on the land cover map (Figure 2.4) from NAMRIA, 2020 and open street map (Figure 2.5), the proposed project site is surrounded by waters specifically the Manila Bay and on the right side are built-up areas.

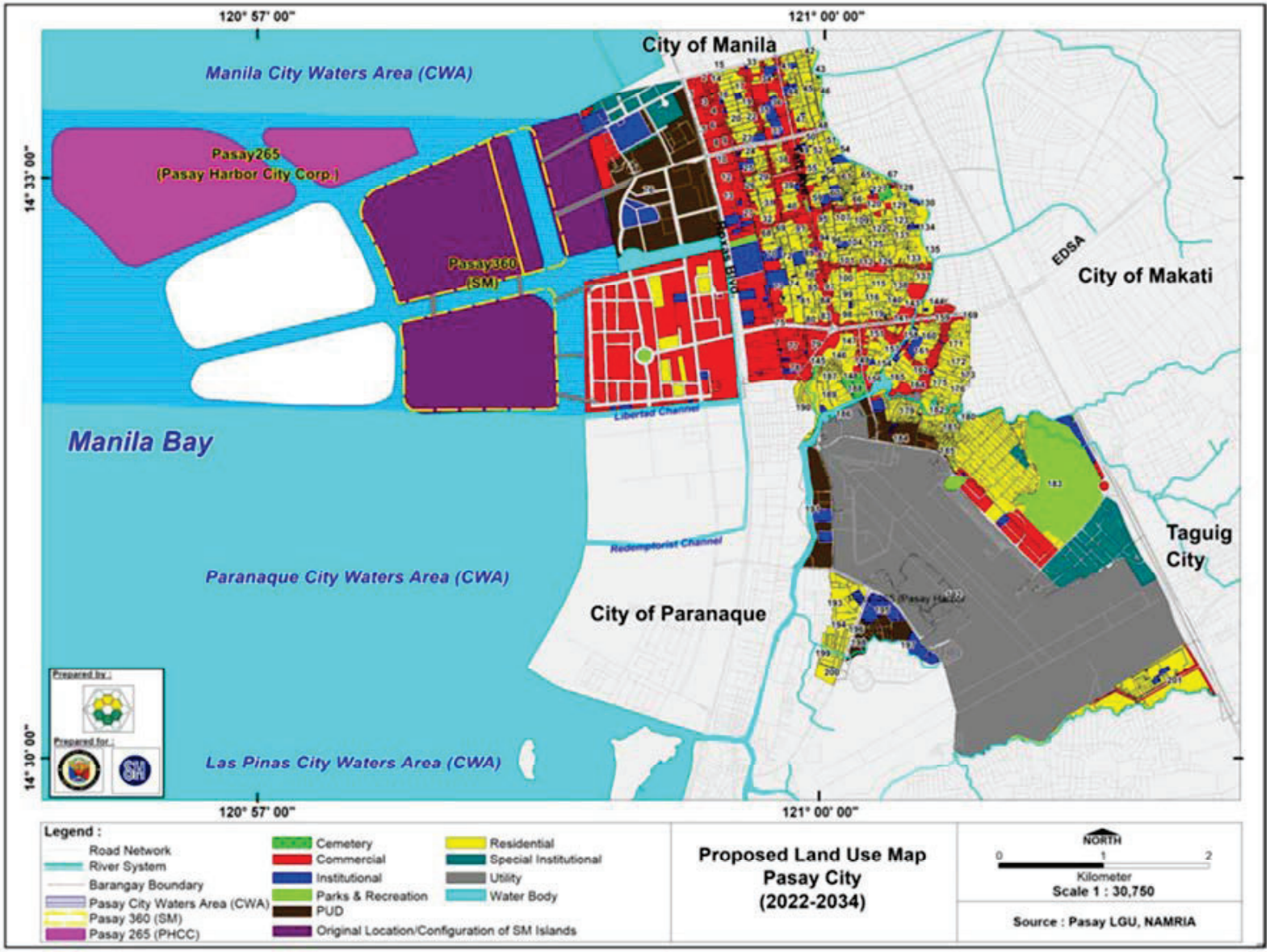


Figure 2.3 Proposed Land Use Map of Pasay City (CY 2022)
Source: 2023-2034 CLUP of Pasay City, 2024

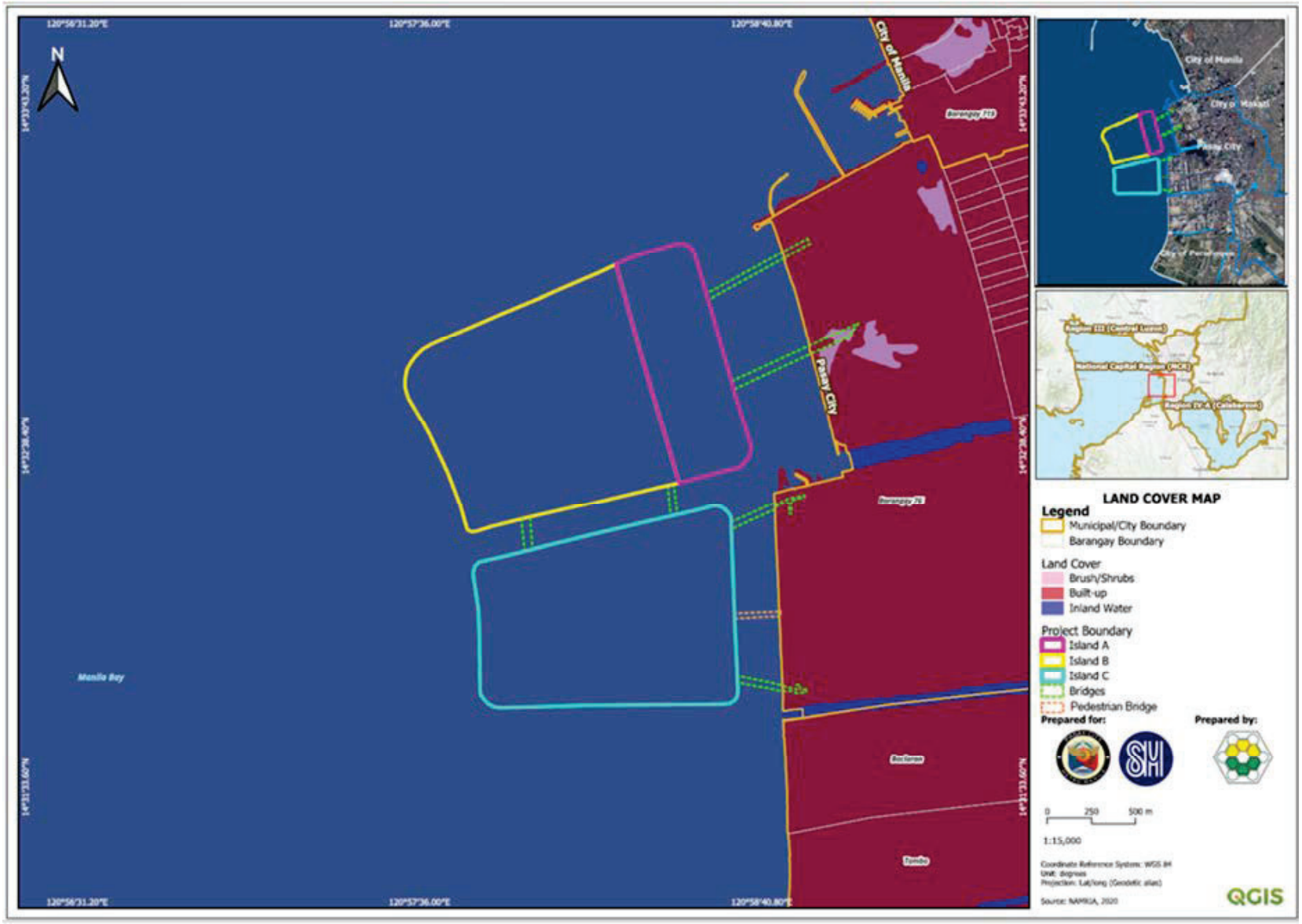


Figure 2.4 Land Cover Map
Source: NAMRIA, 2020

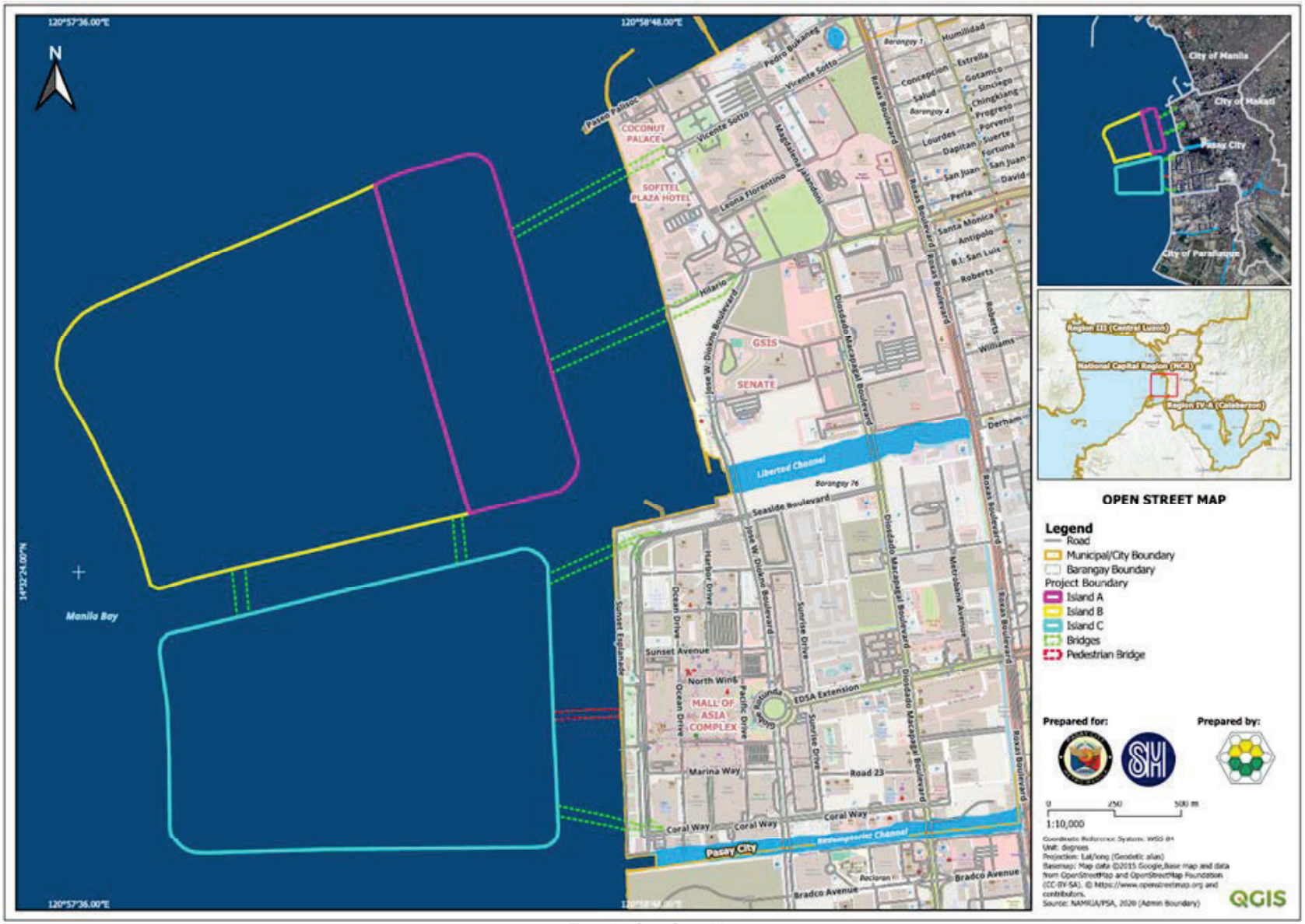


Figure 2.5 Open Street Map
Source/ Reference: Open Street Map and NAMRIA/PSA, 2020

2.1.1.1.B. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

The Pasay City-LGU is in the final stages of updating its 2014-2022 CLUP referred to as the Comprehensive Land, Water, and Air Use Plan (CLWAUP) covering the period 2023-2034. It is important to note that the CLWAUP, already reflects the three-island configuration of reclamation project with SM SCIDC including the two islands jointly undertaken by the Pasay City with the Pasay Harbor City Corporation. It also incorporates the proposed reclamation islands that the Pasay City intends to carry out in the future.

The proof of authority and compatibility over the project site of the proponent are the following:

- Memorandums of Agreement ("MOA") between Philippine Reclamation Authority ("PRA") and the City Government of Pasay ("Pasay City") on which the total land area to be reclaimed is 360 hectares;
- Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc.;
- PRA approval of the Proposed Land Form;
- Area Clearance: AC-NCR-2019-003;
- Previously issued ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017;
- The CLUP and its Zoning Ordinance which identify the development of new coastal reclamation areas supporting the goals of Pasay City; and the
- BFAR Authorization to implement the Comprehensive Coastal and Sea Use Plan.

LAND USE CHANGE ANALYSIS

As can be gleaned from Table 2.4, the total area (TA) of Pasay City will increase from the existing 1,808 hectares (as of 2022) to 2,469 hectares under the 2023-2034 CLWAUP or an increase of 37%. The increase is due to the additional lands as a result of the proposed reclamation projects of Pasay City that have been classified as PUD under the CLWAUP. Thus, the PUD use category will expand from the current 143 hectares to 792 hectares or a projected upsurge of about 452%. Correspondingly, the City Waters will be reduced by around 14% from 4,872 hectares to 4,210.51 hectares.

Table 2.4 Proposed Land Use Distribution of Pasay City (CLWAUP 2023-2034)

Use Categories	Area Covered		% Change
	Existing Land Use (2022)	Proposed Land Use (2034)	
Residential	383.19	354.28	-7.5
Socialized Housing	1.68	4.08	142.9
Commercial	329.89	361.78	9.7
Institutional	70.25	83.44	18.8
Special Institutional	56.72	56.72	0
Industrial	7.35	0	-100.0
Planned Unit Development (PUD)	143.42	791.95	452.2
Cultural	56.72	0	-100.0
Cemetery	5.27	5.27	0
Parks and Recreation	71.71	87.48	22.0

Use Categories	Area Covered		% Change
	Existing Land Use (2022)	Proposed Land Use (2034)	
Infrastructure, Transportation and Utilities	709.05	694.52	-2.1
Total Land Area	1,778.53	2,437.78	37.1
Rivers, Creeks and Water Channels	29.14	29.14	0
Total Area	**1,807.68**	**2,468.68**	**36.6**
City Waters (Manila Bay)	4,871.51	4,210.51	-13.6
Total Land and Water Area	**6,679.19**	**6,679.19**	**0**

Source: CLWAUP 2023-2034 , 2024

LAND USE ISSUES RELEVANT TO PROJECT 360

Clearly, the reclamation project of Pasay City in partnership with the SM SCIDC is now part of the overall spatial growth strategy to support the development of Pasay City. Nonetheless, there have been a number of issues raised relevant to the reclamation projects of Pasay City and its joint venture partners. Some of these land use and urban development issues relevant to Project 360 are briefly discussed below.

- Population influx due to in-migration during construction and development phases of and the eventual operation of economic activities within the reclamation islands that will result in further congestion of areas adjoining the reclamation projects and beyond.
- Increase traffic volume in adjoining and surrounding areas due to increase construction and economic activities.
- Fragmentation of aquatic connectivity between freshwater, estuarine, and marine habitats due to coastal and land developments.
- Further deterioration of marine water quality due to untreated storm drain and sewage water during reclamation project construction, development, and operations.
- Increase in GHG and other emissions from coastal developments with increased urbanization; especially GHG emissions from new developments (embodied), and from increased human settlement activities (operational). Additionally, increase in particulate matter due to increased urbanization activities.
- Increase in particulate matter and other forms of air pollution along coastal landscapes.
- Increase in solid waste and wastewater pollution along coastal landscapes.
- Coastal waters are considered as part of green spaces of urban landscapes. Reclamation projects result to decrease in open green space in coastal landscapes.
- Sea level rise threatens coastal developments and coastal human settlements.
- Dense coastal development is exposed to hazards (tsunami, storm surges, liquefaction from tidal waves, and strong winds and flooding from typhoons).
- Visual coastal/seascape intrusion and social concerns regarding the cultural heritage of Manila Bay and the historical coast
- Increased tourism along coastal areas because of changes in land use (densification, commercialization).

RECOMMENDATIONS

- A number of studies and preparation of plans have been undertaken by Pasay City together with its joint venture partner SM SCIDC as part of the compliance to its existing ECC for the reclamation projects and to address not only the above concerns and other relevant sectoral issues. These studies and plans include the following:

    - Coastal Habitats and Fisheries Study
    - Coastal and Sea Use Plan of Pasay City
    - Development Guidelines for the Sustainable Environmental Design of Reclamation Areas
    - Sustainable Coastal Environment Management Plan

  The proposals and actions specified in these studies and report should be adopted and made an integral part of the plans and strategies in the management of the reclamation areas.

- To establish proof of authority and compatibility of the project site, the following minimum requirements should be obtained:

    - Approval of the Pasay City Council and certification of land use compatibility
    - Approval of owners of the properties to be used as ingress and egress roads of proposed bridges

- Given the change in the channel width from 300m to 476m, an approval by the Philippine Reclamation Authority and a corresponding letter from the Pasay LGU should be submitted to the EMB informing the latter of the change in the channel width, and clarifying/justifying the reason/s for such change.

The environmental management plan for the identified potential impact is listed in Table 2.5. The complete EPRMP EMP table can be found in **Section 3**.

Table 2.5 Impact Analysis and Environmental Management - Impact in terms of Compatibility with Existing Land Use

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Impact In Terms of Compatibility with Existing Land Use					
Pre-Construction – Permitting	2012 to 2024	-	Secured ECC (24 Oct 2017) Secured Area Clearance (16 August 2019) Secured PRA Board Resolution (Series of 2012 and 2013, 2023)	Secure applicable updated permits and clearances from the concerned government offices	Part of permitting and development cost

2.1.1.2. IMPACT ON COMPATIBILITY WITH CLASSIFICATION AS AN ENVIRONMENTALLY CRITICAL AREA (ECA)

2.1.1.2.A. BASELINE DATA

Table 2.6 shows the Environmentally Critical Areas (ECA) categories which are applicable to the project. The EMB Memorandum Circular (MC) 2014-005 - Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System was used as reference in identifying these ECA. Overall, the project site is located within two (2) environmentally critical areas.

Table 2.6 List of Environmentally Critical Areas (ECAs)

No	ECAs	Applicability to Project	Remarks
1	Areas declared by law as national parks, watershed reserves, wildlife reserves, and sanctuaries	Not Applicable	
2	Areas set aside as aesthetic, potential tourist spots	Not Applicable	
3	Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)	Not Applicable	
4	Areas of unique historic, archaeological, geological, or scientific interests	Not Applicable	
5	Areas which are traditionally occupied by cultural communities or tribes	Not Applicable	
6	Areas frequently visited or hard-hit by natural calamities • Geological hazard areas • Flood-prone areas • Areas frequently visited or hard-hit by typhoons	**Applicable**	
7	Areas with critical slope	Not Applicable	
8	Areas classified as prime agricultural lands	Not Applicable	
9	Recharge areas of aquifers	Not Applicable	
10	Water bodies	**Applicable**	
11	Mangrove Areas	Not applicable	
12	Coral Reefs	Not Applicable	

2.1.1.2.B. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

The project site is located within two (2) environmentally critical areas as defined in the EMB Memorandum Circular (MC) 2014-005 - Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System which. The two ECAs category are (1) Areas frequently visited or hard-hit by natural calamities and (2) water bodies. The project area is prone to ground shaking hazards due to the presence of several earthquake generators.

Since the project site will be located in water that will be reclaimed, encroachment to ECA category of Natural Hazards can be mitigated through proper design and engineering.

Geotechnical Interpretation Report were prepared that includes the more detailed geotechnical marine soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor. The project also has taken into consideration the recommendations from the Engineering Geological and Geohazard Assessment Report (EGGAR) report and that the proposed reclamation project is suitable for the intended purpose and development.

The environmental management plan for the identified potential impact is listed in Table 2.5. The complete EPRMP EMP table can be found in **Section 3**.

Table 2.7 Impact Analysis and Environmental Management - Impact on compatibility with classification as an Environmentally Critical Area (ECA)

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Impact on compatibility with classification as an Environmentally Critical Area (ECA)					
Pre-Construction – Geotechnical and Feasibility Study Reclamation (construction of islands) and horizontal development (PVDs, construction of storm drainage, etc.)	2017 to 2024 2021 to 2028	Reclamation itself provides protection against storm surges and thus against floods. Flood water pathways in Pasay is NOT directed towards the project area. (Per the NOAH Project) Engineering intervention: structural and engineering designs to withstand earthquakes and liquefaction. Phil. standards	EGGAR (2017) Geotechnical Interpretation Report (2017) Hydrodynamic study (2017 and 2024) Flooding Impact Study (2024)	Preparation and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines.	Part of development cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
				Installation of vertical containment structure, wave deflector, vertical drains, platform elevation, Prefabricated Vertical Drain (PVD) and Surcharging methods which are part of the Soft Soil and ground improvements Implementation of a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years.	

2.1.1.3. IMPACT IN EXISTING LAND TENURE ISSUE/S

2.1.1.3.A. BASELINE DATA

NEAREST PROTECTED AREA

The nearest legislated and initial component protected area to the project site is shown in Figure 2.6. The legal basis for the legislated protected areas is E-NIPAS while for the initial component are proclamations.

The nearest legislated protected area and nearest Ramsar site is the Las Piñas-Parañaque Wetland Park (LPPWP) which is ±3.15 km away. It is recognized as Ramsar site by the Ramsar Convention of UNESCO due to the presence of mangrove-covered islands, shallow lagoons and coastline. A Presidential Proclamation in 2007 designated the site as a Critical

Habitat. The LPPWP has been a home to at least 5,000 migratory (47 migratory species) and resident birds. It is also known to have 11 mangrove species locally called as *Bakauan Babae, Bakauan Bato, Banalo, Bungalon, Buta-buta, Kolasi, Nilad, Pagatpat, Saging-saging* and *Tabigi*. However, because of the high saline composition of the soil in the area, only a few salt-tolerant species of herbs, grasses, and shrubs grow in the LPPCHEA's salt marshes.

Table 2.8 Nearest Protected Area from The Project Site

Protected Area	Ecosys-tem	Legal Basis	Legal Status	Category	Area (ha)	Region	Approx. Dist. to the Project Site (km)
Las Piñas-Parañaque Wetland Park (Nearest RAMSAR)	Terrestrial	E-NIPAS / E-NIPAS (RA-11038)	**Legislated**	Critical Habitat	182	NCR	±3.15 km
Luneta Park / Rizal Park	Terrestrial	Proclamation 234 s. 1955	Initial Component	National Park	16		±2.8 km
Manila Bay Beach Resort	Terrestrial	Proclamation 41 s. 1954	Initial Component	National Park	465		±1.51 km

Source: Geoportal PH, 2024

Manila Bay Beach Resort is proclaimed under the initial component of protected area under Proclamation No. 41 s. 1954 as National Park. This protected area is approximately 1.51 km away from the project boundary. Proclamation No. 41 reserves this protected area for national park purposes under the administration of the Commission on Parks and Wildlife (now Biodiversity Management Bureau).

Another initial component that is near the project site is the Luneta Park / Rizal Park which is approximately 2.8 km away. Proclamation No. 234: Reservation of Luneta National Park reserve a certain parcel of land in Manila for national park purposes under the administration of the Commission on Parks and Wildlife. The Rizal Monument honoring the Philippine national hero Jose Rizal is inside this national park.

OUTSIDE OF ANY ANCESTRAL DOMAIN

The project site is not situated in any certified ancestral domain as shown in Figure 2.7.

ADJACENT RECLAMATION PROJECT

Figure 2.8 shows the Project 360 area with respect to the proposed land use of Pasay City, and the adjacent Project 265 reclamation project of the City. At present, the Pasay 360 Project with SM SCIDC and the Pasay 265 Project with PHCC have existing ECCs. As seen on the map, the proposed reconfiguration will not encroach on the other ongoing and planned reclamation projects.

2.1.1.3.B. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

There is no possible tenurial and land issue in the Proposed Project site since the project site is not located into any tenurial instruments such as protected area, forest area, CADT, agricultural area, and other reclamation project among others. The project EIS original configuration has also obtained an Area Clearance for its reclamation component.

The project site is not being used in any of the following water-based activities or projects:

- As navigational lane;
- As areas for significant or commercial fishing;
- As port;
- As a water-based settlement (e.g. boat people);
- As a source of bulk water supply; and
- As a source of commercial/economic supply of fish and other marine species.

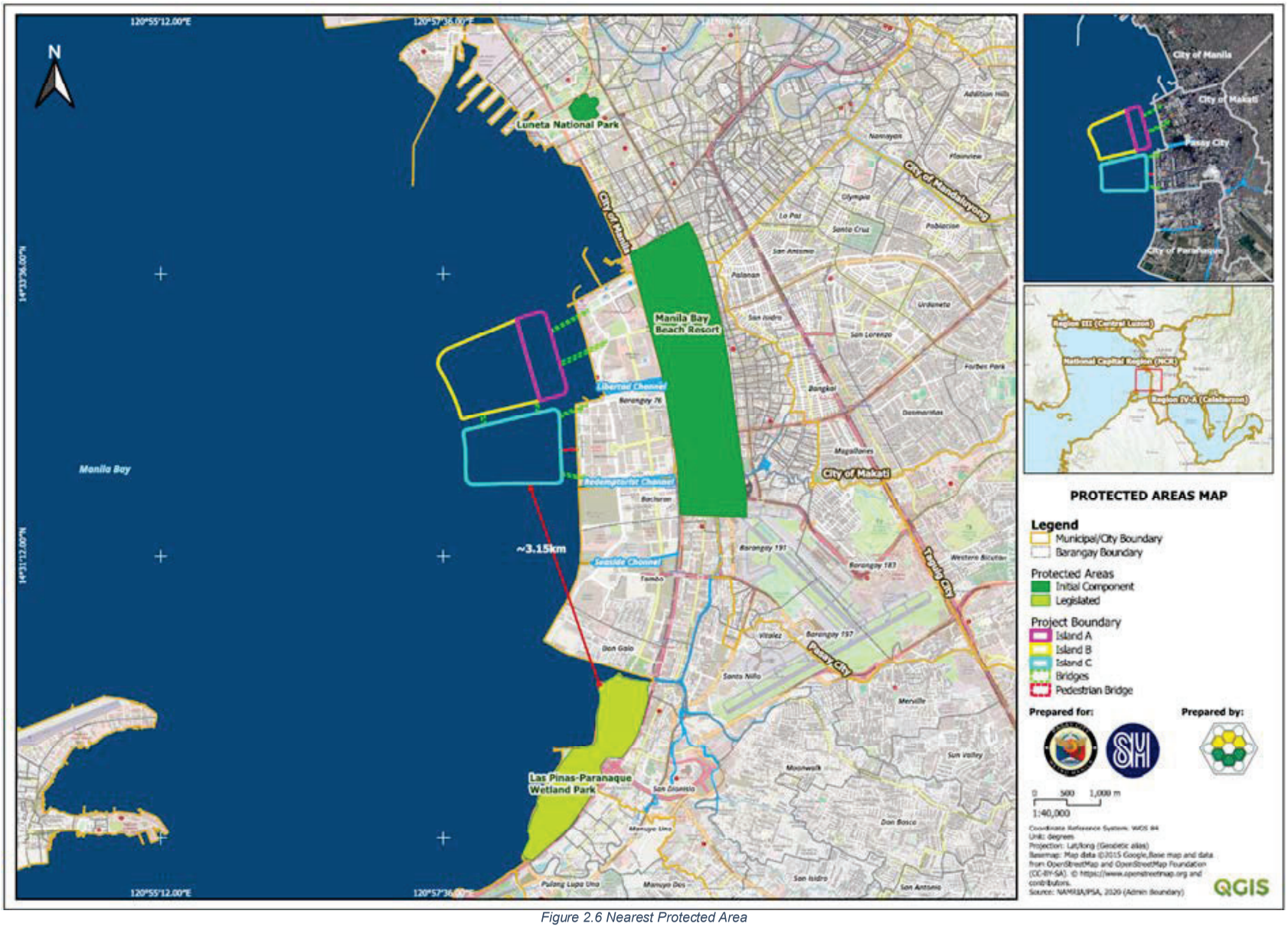


Figure 2.6 Nearest Protected Area
Source/Reference: Open Street Map, DENR, 2020 / Geoportal PH

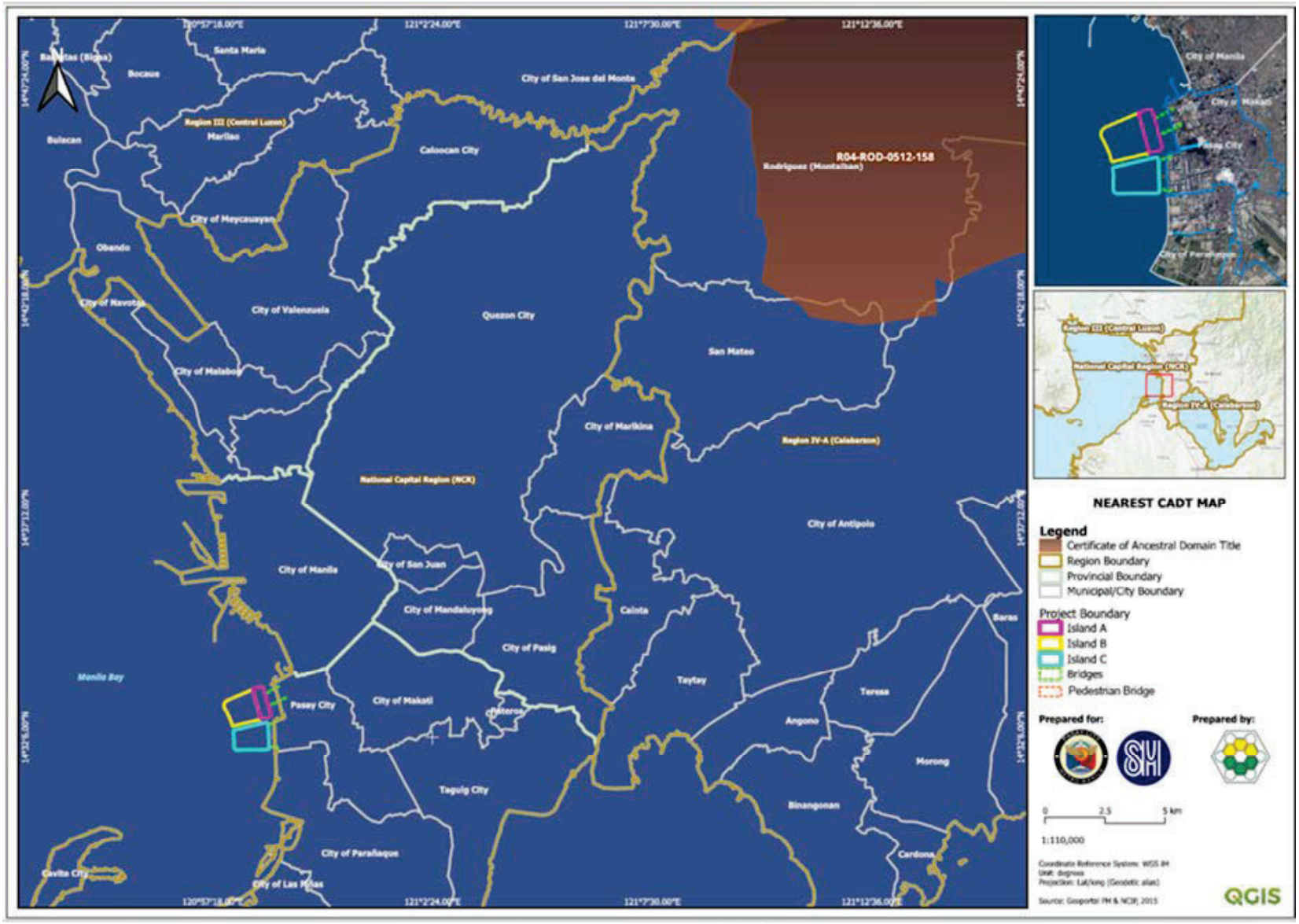


Figure 2.7 Nearest CADT to the Project Site
Source/Reference: GeoPortal PH & NCIP, 2015

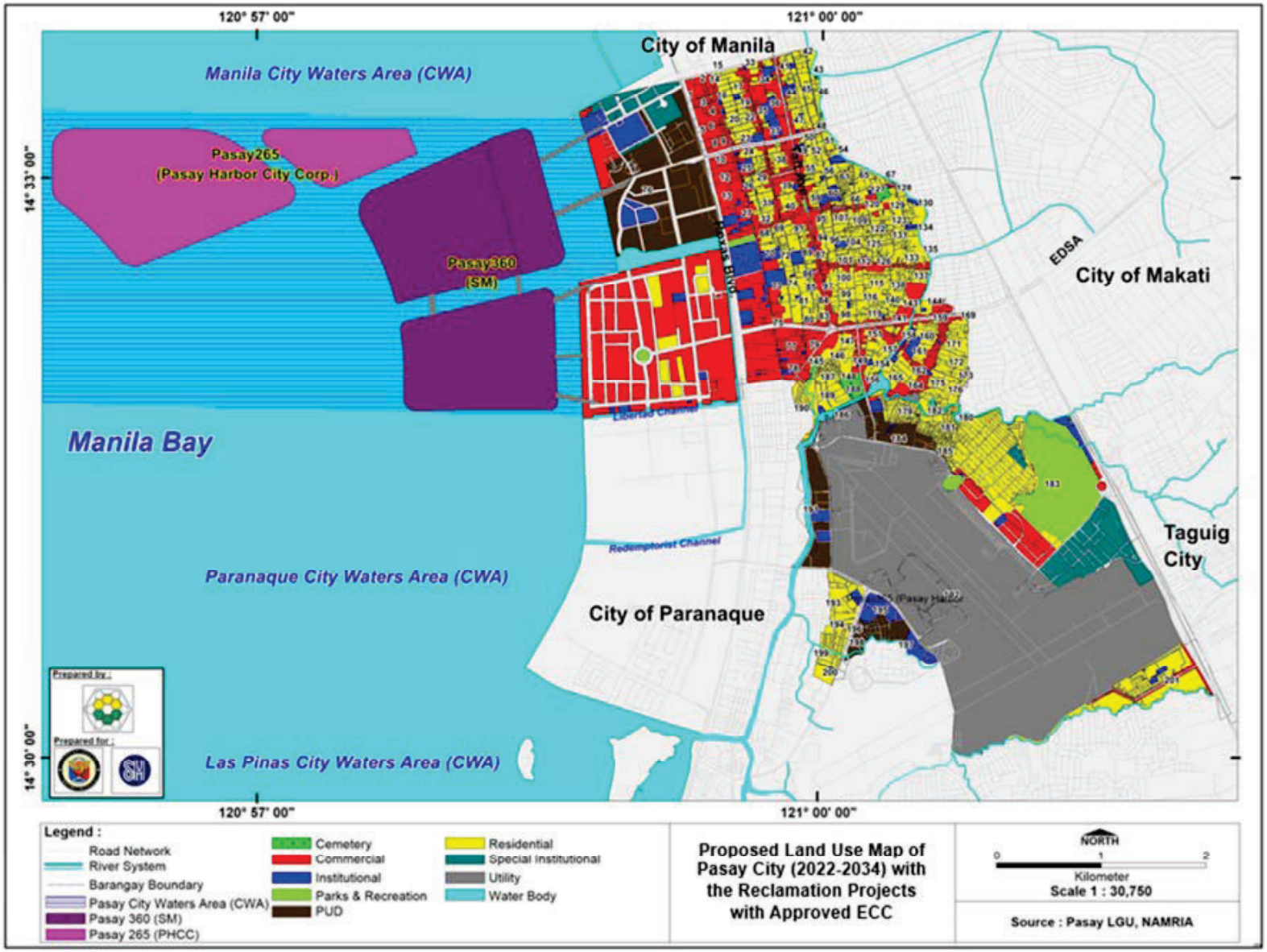


Figure 2.8 Pasay City Proposed Land Use Map Showing the Reclamation Projects of Pasay City with Approved ECC
Source/Reference: Proposed Land Use Map of Pasay City (2022-2034), Pasay LGU

2.1.1.4. IMPAIRMENT OF VISUAL AESTHETICS

Primarily because the on-going reclamation activities and proposed horizontal civil works are sea-based, Project 360 will not have notable visual impairment and intrusion impacts since there are no significant seaward landform structures. At most, the seaward concern will be the annoyance of visitors within the adjacent land areas interested in the world-famous Manila Bay sunset. However, this concern is considered to be short term and will wane once the reclamation and horizontal works are completed; if any, the development once completed will provide locals and foreign visitors alike with new vista lines, sensorial corridors and positive experiences as accentuated by Manila Bay's famous sunset and adjacent features.

The landward visual intrusion from the sea will likewise be insignificant. Once the reclamation and horizontal development are completed, it is expected that Project 360 will enhance the visual quality of the Manila Bay coastal waters and nearby land areas.

2.1.1.4.A. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

There is no possible tenurial and land issue in the Proposed Project site since the project site is not located into any tenurial instruments such as protected area, forest area, CADT, agricultural area, and other reclamation project among others. The project EIS original configuration has also obtained an Area Clearance for its reclamation component.

The project site is not being used in any of the following water-based activities or projects:

- As navigational lane;
- As areas for significant or commercial fishing;
- As port;
- As a water-based settlement (e.g. boat people);
- As a source of bulk water supply; and
- As a source of commercial/economic supply of fish and other marine species.

The splitting of the 2017-approved 300-hectare Island B (hereinafter referred to as "Original Island B") of the Project to create the Reconfigured Islands B and C will feature a water channel in between, thereby allowing the free flow of water from Libertad Channel to Manila Bay.

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

2.1.1.5. DEVALUATION OF LAND VALUE AS A RESULT OF IMPROPER SOLID WASTE MANAGEMENT AND OTHER RELATED IMPACTS

The implementation of the reconfiguration activities includes generation of solid domestic waste from the contractors, as well as accumulation solid waste from the sea which include plastic, woods and tree branches, etc. that may pose changes in the quality of the soil when not properly managed.

A waste management system is already being practice for the project. The on-site waste management involves process and practices used to handle, segregate, and dispose of waste

materials generated on site and wastes from the sea. The collected wastes are stored and segregated in a Materials Recovery Facility (MRF) until disposal by DENR-accredited waste service providers. The MRF as shown in Plate 2-1 is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes. The MRF also has a designated hazardous waste section, consists of 3 partially closed areas for liquid and solid hazardous wastes. The project generates various hazardous wastes such as used oil and other oily wastes e.g., contaminated rags and gloves. The facility is designed to provide open-air ventilation to the stored hazardous waste. Secondary containment, such as drip trays, is provided inside the hazardous waste storage area for liquid hazardous wastes. Spill kits, fire extinguishers, gloves, eye protection, and hazard signages are also provided. Permit-To-Transport and Certificates of Treatment are also posted in the hazardous waste storage area.

A 3rd party DENR-Accredited Waste Service Providers, such as Vertex and RMS, are contacted to collect the solid wastes for disposal to landfill. The dredging activity on Island A includes extraction of previously installed PVD materials. These extracted PVDs are stored in a temporary stockpile for drying before disposal.



Plate 2-1 Existing Materials Recovery Facility and Hazardous Waste Storage in the Project Site

Most active works will be at sea. All types of waste except Sewage Treatment Plant (STP) wastes will be properly segregated and collected by an approved waste service provider. Waste bins were painted according to waste classification and strategically placed on its designated waste management area. The contractor has secured memorandum of agreement with DENR-Accredited Sanitary Landfills for the transport of residual waste coming from foreign vessels and has secured disposal agreement with a waste management corporation to handle transport and disposal of residual waste. STP disposal of all vessels will be properly monitored and siphoned by an accredited hauler. A certificate of treatment for the hauling of the portalets will be secured and documented. The existing onshore and offshore waste management practice is shown in Plate 2-2.

Dredged waste materials will be disposed at an identified disposal area (Philippine Coast Guard approved/ permitted) outside Manila Bay.

Chemicals that will be used in the project implementation activities will have its own storage that is segregated and stored properly. Both the chemical and hazardous waste will have its own inventory. Regular Spill Kit inspection and inventory is also currently being implemented.

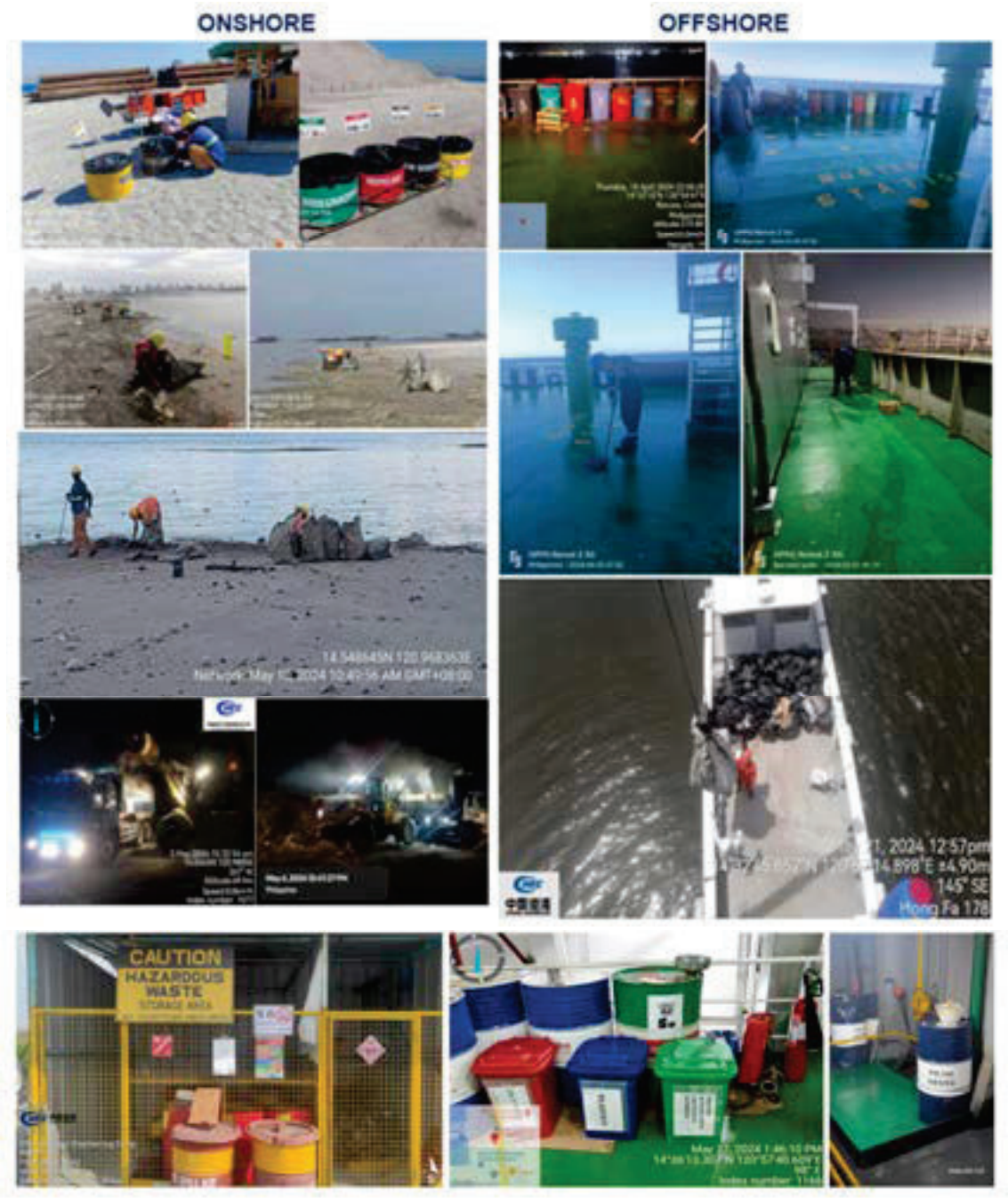


Plate 2-2 Onshore and Offshore Waste Management Practice

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.9 Impact Analysis and Environmental Management - Devaluation of land value as a result of improper solid waste

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Devaluation of land value as a result of improper solid waste					
Solid waste generation	2021 to 2028	-	Proper collection and segregation of solid waste among vessels, lay-down area and other areas within the project by an accredited third- party waste service provider		Part of construction cost

2.1.2. GEOLOGY/ GEOMORPHOLOGY, AND GEOHAZARDS

Comparative Summary of EIS 2017 and 2024 EPRMP

For the Geology/ Geomorphology and Hydrology/ Hydrogeology, there were no major differences in the EIS baseline data as the Project site is still within the impact area. Presented in Table 2.10 are the included studies used for the assessment.

Table 2.10: Comparative EIS 2017 and EPRMP 2024 Baseline Data of Geology and Geomorphology

Module	EIS 2017	EPRMP 2024
Geology/ Geomorphology Hydrology/ Hydrogeology	**EIS Baseline is SIMILAR with some additional statements in the EPRMP such as:**	• The project does not block, impede nor disturb the drainage system from the Pasay City mainland, and thus has no impact on the occurrence of flooding in Pasay City and nearby areas. The water between the reclamation and the shore and the northern boundary of the other reclamation area provides a much wider drainage area than that of the Libertad Channel itself. • Based on the Simulating Waves till Shore (SWASH) results, the new islands will result in a sheltering effect, protecting the existing mainland from direct wave impact. As a result, the flood risk of the existing land due to overtopping water (from waves) will significantly be reduced. • In the existing situation without presence of the new islands, during severe storm conditions (typhoon) waves will hit the land in full force. Such waves combined with high water levels (storm surge) result in large quantities of water to overtop the coastal defense, resulting in local flooding of the nearshore areas.

Module	EIS 2017	EPRMP 2024
	• The proposed islands will have a positive impact on the hinterland in terms of protection against these waves. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves.	
	-	Inclusion in the EPRMP: • Hydrodynamic Studies • Flood Risk Study

2.1.2.1. BASELINE DATA

2.1.2.1.A. CHANGE IN SURFACE LANDFORM/GEOMORPHOLOGY/ TOPOGRAPHY/ TERRAIN/SLOPE

Manila is divided into six (6) zones, namely, Manila Bay, the Coastal Margin, the Guadalupe Plateau, the Marikina Valley, the Laguna Lowlands and Laguna de Bay. Manila Bay is the body of water west of Metro Manila with a coastline of about 190 km spanning an area of about 1800 km^2. The low-lying flat strip of land east of Manila Bay with elevation of less than 5 meters above mean sea level (mamsl) is the Coastal Margin. This zone occupies portions of Navotas, Malabon, Valenzuela, Caloocan, Manila, Pasay, Paranaque, Las Pinas and reclaimed portions of Manila Bay. The zone that covers about 62% of the whole Metro Manila is the Guadalupe Plateau which has a total land area of 365 km^2 and an elevation of about 5-30 meters above mean sea level. West of this plateau is the Marikina Valley, another low-lying part of Metro Manila which covers about 18.5% of the total land area. To the south of Marikina Valley and along the western part of Laguna de Bay is the Laguna Lowlands which is occupied partly by the cities of Taguig and Muntinlupa. The sixth zone, Laguna de Bay is a landlocked lake with a shoreline of about 200 km and surface area of about 900 km^2. Figure 2.9 presents the Metro Manila Physiographic Map (Modified from Metro Manila Authority, 1985).

Pasay City is bordered on the north by Manila and Makati; on the south by Parañaque City; on the east by Taguig and Makati and on the west by Manila Bay.

The western part of Pasay City is level to nearly level while its southeastern part is gently sloping to gently undulating. It is characterized by coastal plains along the Manila Bay in the west and sloping areas extending in the southeast direction. Surface elevations range from 2 mamsl on the coastal plains to 24 mamsl on the southeastern part of the city. The general topography and the different bodies of surface water draining the Pasay City and its vicinities are shown in Figure 2.10.

Based on the Metro Manila Land Resource Evaluation Project of the Bureau of Soils and Water Management, the coastal landscape of the city can be divided into Active Tidal Flats and Former Tidal Flats. (Pasay City CLUP 2014-2022, 2016)

The active tidal flats with an almost flat relief have an elevation that ranges from 0 to 1.5 mamsl, sometimes reaching up to 3 mamsl. This land system has very poor drainage

characteristics. It is further characterized by low permeability, high compressibility. And possible flooding during seasonal shallow water table. Soil materials are clay, silty clay, and sandy clay loam. The parent materials of this classification are tidal mudflats with muck and peat, locally alluvial sediments.

The former tidal flats consist of areas more inland and slightly higher than the active tidal flats. They occupy the almost flat plains, backswamps and depression of the coastal landscape formed from marine and fluvio-marine deposits. Its elevation ranges from 2 to 5 mamsl. It has low to moderate permeability and has soil textures of clay to silty clay loam. It is poorly drained and prone to moderate seasonal flooding and it is highly compressible. Its parent materials are alluvial sediments, former tidal mudflats underlain by peaty and mucky materials.

Figure 2.11 presents the Coastal Landscape - Land Classification of Pasay City.

Pasay City is bounded in the West by Manila Bay and is traversed by two minor rivers that feed the Parañaque River: the Estero de Tripa and Maricaban Creek. The City lies within the Manila Bay Watershed area. The bay has a catchment of about 17,000 km^2 that is made up of eight river basins, the nearest of which to the city is the Parañaque- Las Piñas River Basin which is made up of three major rivers: the Parañaque, Las Piñas and Zapote Rivers. These river systems serve about 1,500 hectares of low-lying areas along the Manila Bay and functions as the principal drainage channels of the area (Pasay City CLUP 2014-2022, 2016).

The geomorphologic setting of these low-lying areas and the hydraulic action of Manila Bay basin and the South China Sea make Pasay City vulnerable to flooding, a condition aggravated by the inadequate capacity and poor maintenance of its drainage facilities.

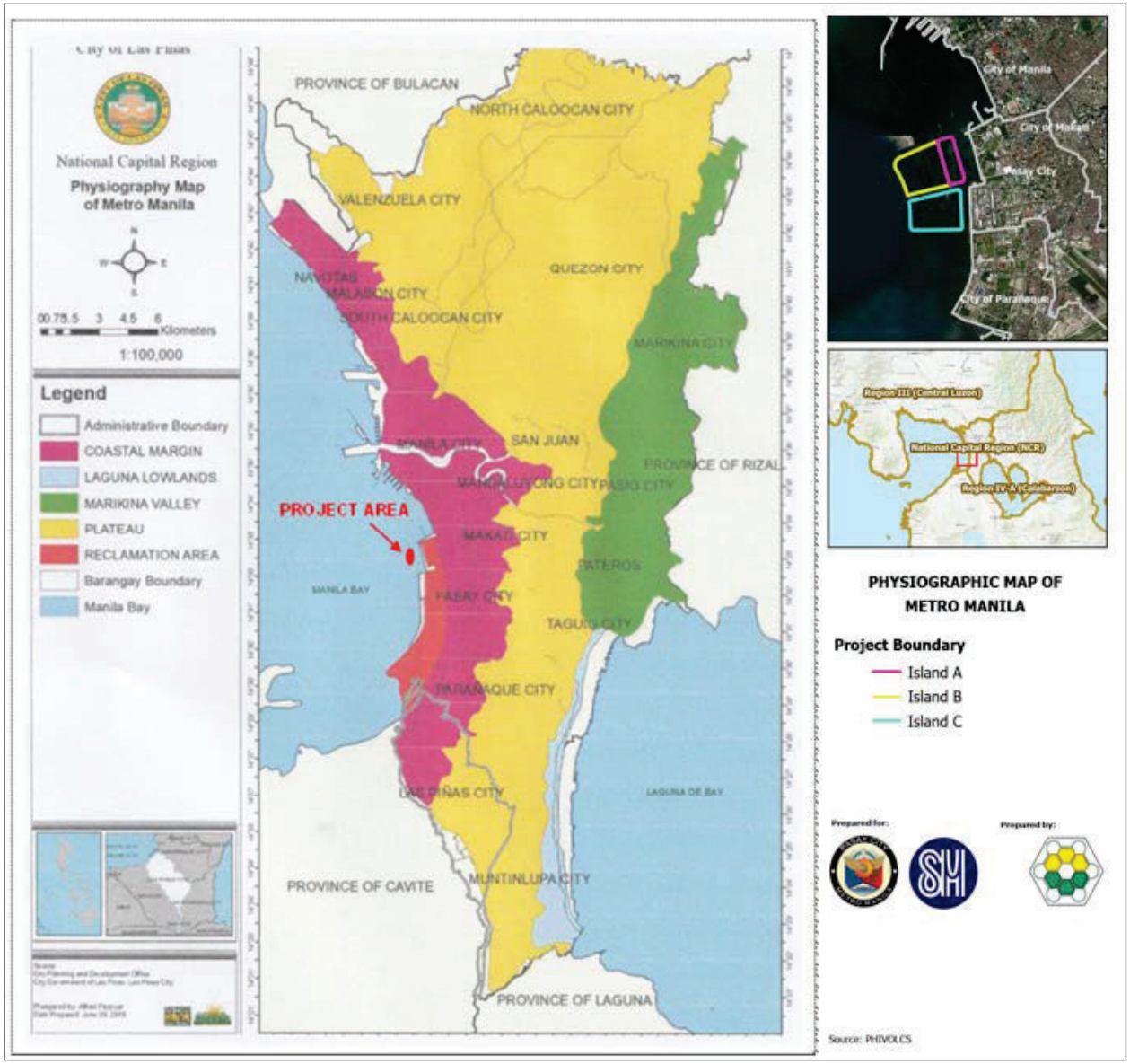


Figure 2.9 Physiographic Map of Metro Manila
Source: Modified from Metro Manila Authority, 1985

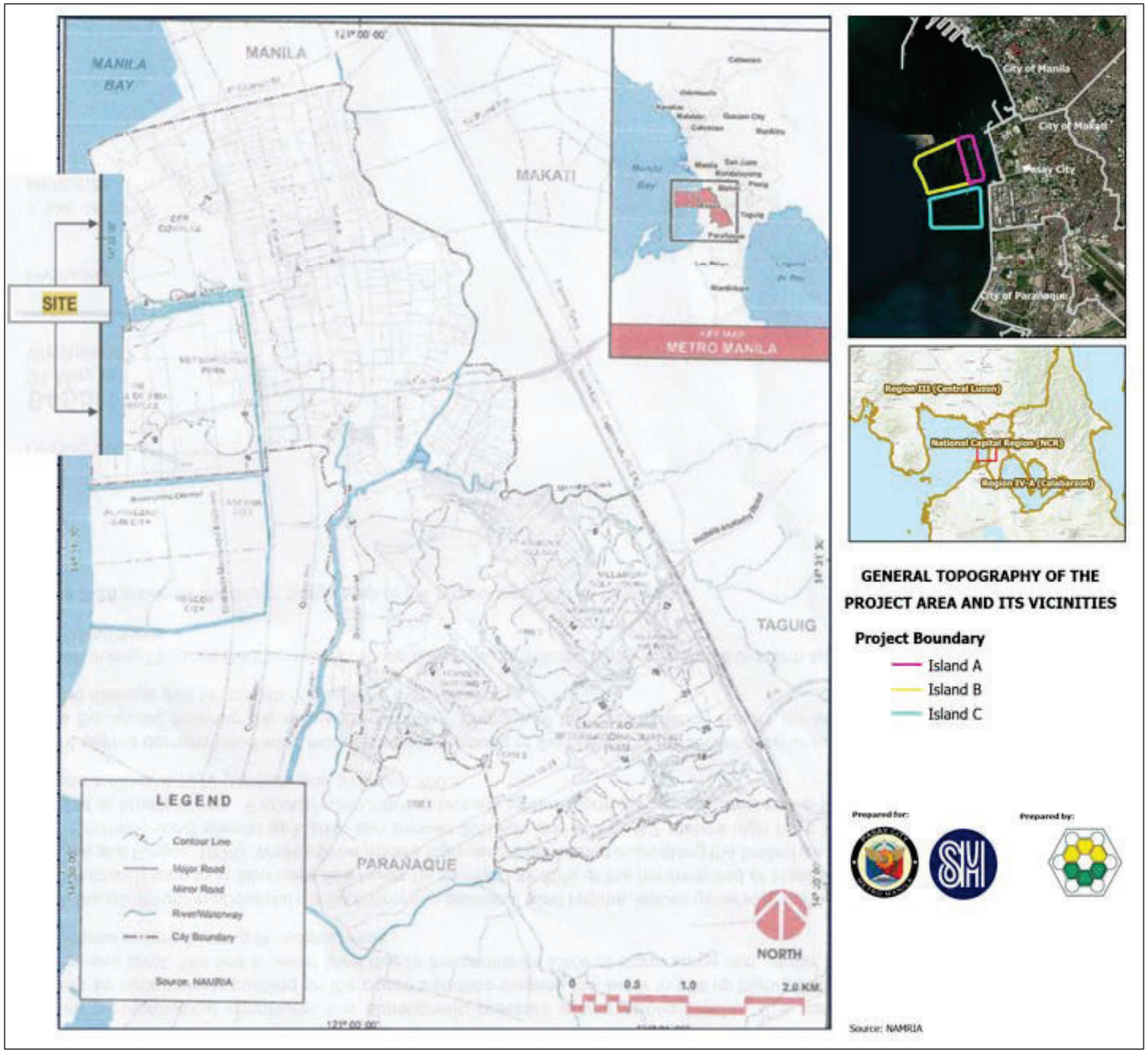


Figure 2.10 General Topography of the Project Area and its Vicinities
Source: NAMRIA , February 2007

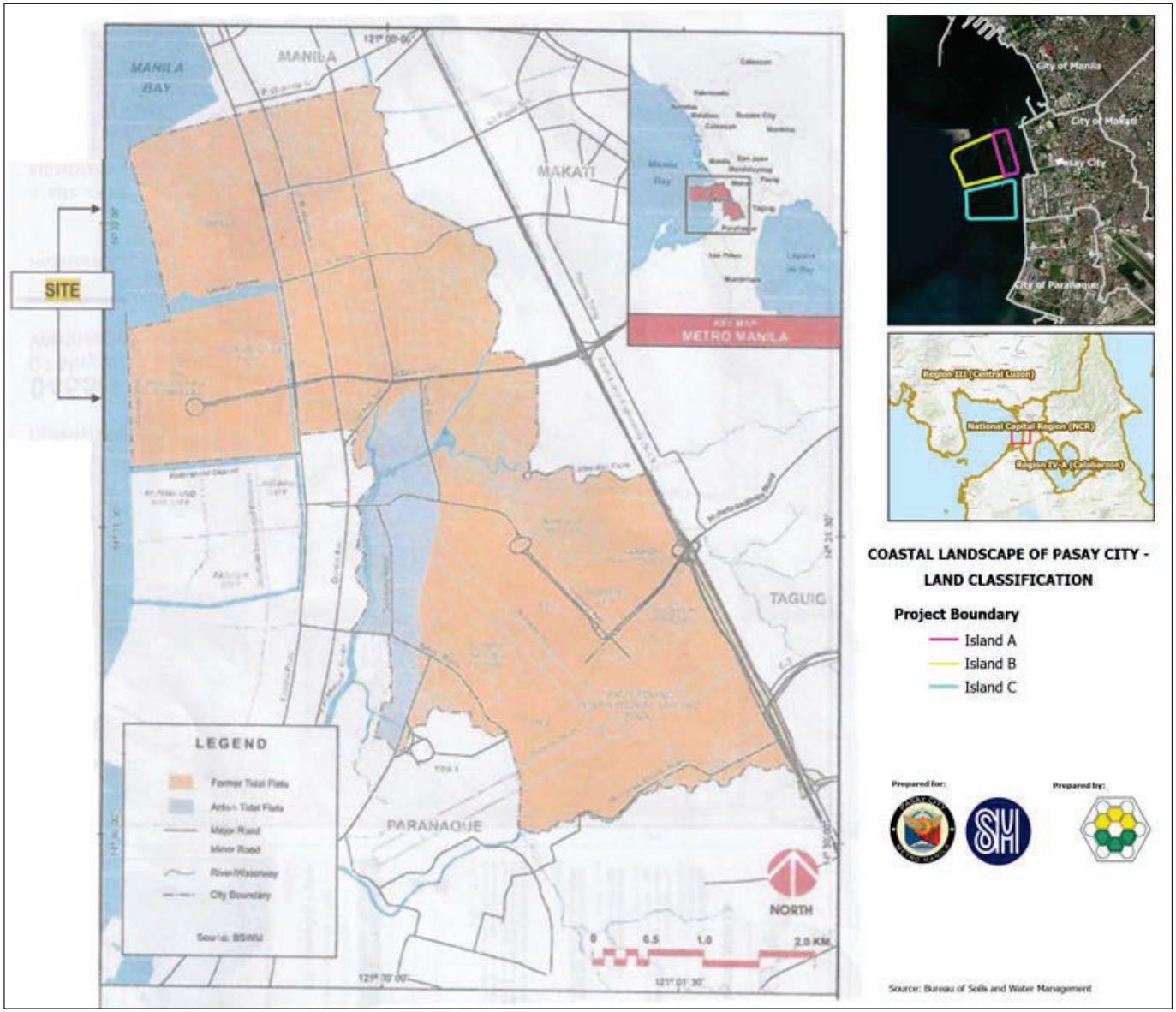


Figure 2.11 Coastal Landscape of Pasay City – Land Classification
Source: Bureau of Soils and Water Management, Pasay City CLUP 2014-2022, 2016

2.1.2.1.B. CHANGE IN SUB-SURFACE GEOLOGY/UNDERGROUND CONDITIONS

2.1.2.1.B.1. GEOLOGY OF METRO MANILA

The Guadalupe Plateau, East of Manila is underlain by the Guadalupe Formation, composed of interlayered pyroclastic flows, lahar deposit, airfall tephra, fluvio-deltaic sediments and paleosols deposited under terrestrial to partly sub-aqueous conditions.

The volcanics range from agglomerate to fine ash, while the sandstone unit grades from very fine to conglomeratic. The pyroclastic flow units are massive to moderately consolidated while the tephra deposits range from massive to thinly laminated and are well consolidated to porous. The presence of paleosols indicates time gaps in depositional events for formational units.

The flat areas near Manila Bay are underlain by unconsolidated sediments deposited during the Quaternary Period. The lithology belongs to Manila Formation named by Purser and Diomampo (1996) based on the result of subsurface investigation using borehole logs. The Manila Formation is composed of unconsolidated sequence of fluvial, deltaic and marine deposits. To the west, the Manila Formation is overlain by beach sand which blankets the coastline of Manila Bay. Further to the east, the Manila Formation overlay the Proto-Pasig Delta deposit that includes transitional, marine transgression sediments and the Modern Coastal Deposits mainly recent marine sand/silt, recent stream deposits and fill materials.

Figure 2.12 presents the Geologic Map of Pasay City and its Vicinity while Figure 2.13 presents the Geologic Map of Metro Manila.

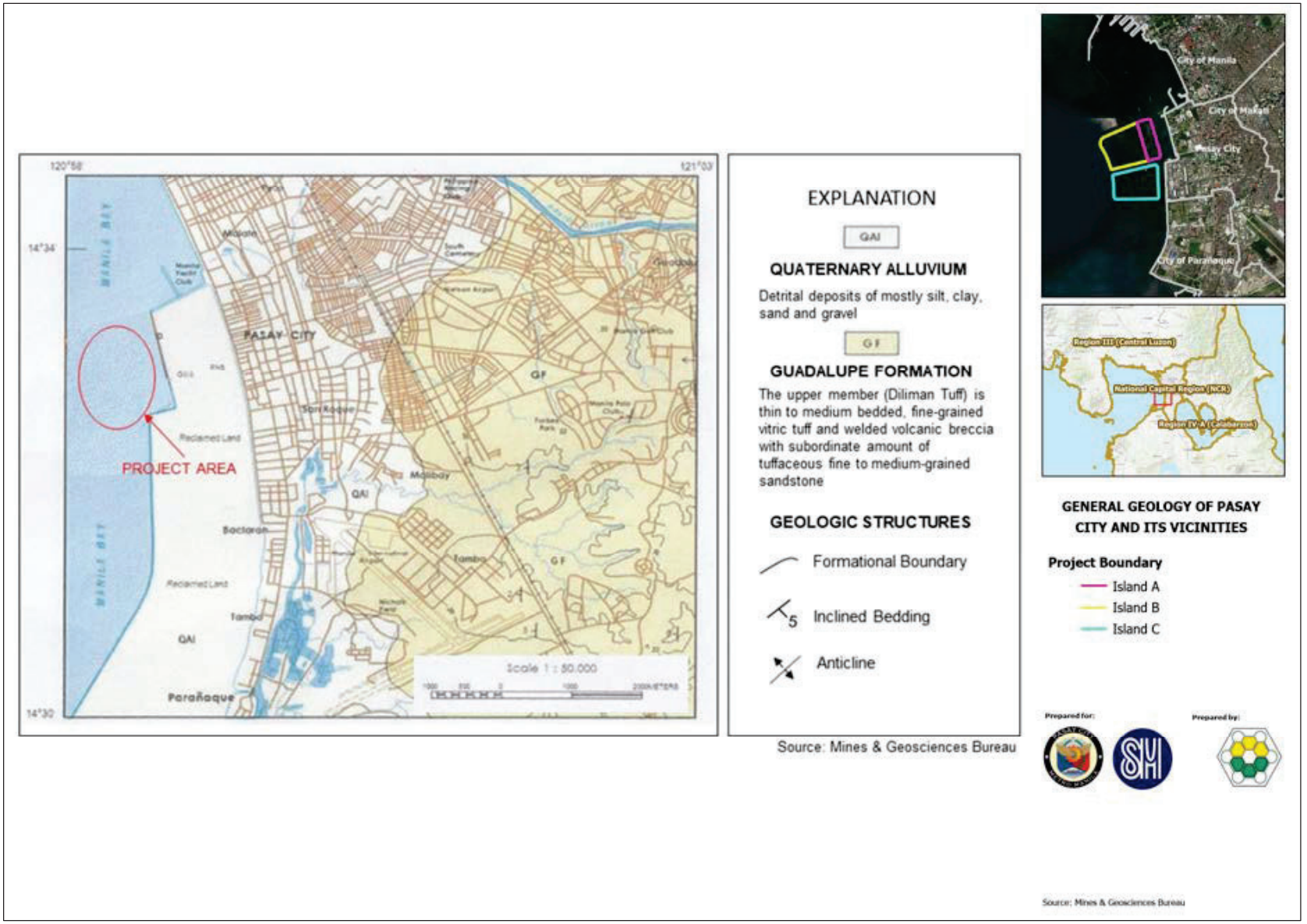


Figure 2.12 General Geology of Pasay City and its Vicinities
Source: Mines & Geosciences Bureau , 1983

2.1.2.1.B.2. LOCAL GEOLOGY

Quaternary Age of Quaternary Period of deposits underlain Pasay City and vicinities. The most dominant rock formation in the area is the Guadalupe Formation which consists of an upper member, the Diliman Tuff and a lower member, the Alat Conglomerate. Diliman Tuff, the most widespread rock in the region, consists of thin to medium-bedded, fine-grained vitric tuffs and welded volcanic breccias with subordinate amount of tuffaceous, fine to medium-grained sandstone. The tuff varies from well lithified and massive to loosely bedded. As seen from the geologic map, the beds generally strike towards north and have dips of 3° to 5° to the west.

Conformably overlying the above rock formation is the Quaternary Alluvium consisting of unconsolidated deposits of silt, clay, sand and gravel. These deposits are commonly found along stream channels, floodplains and coastal areas (Besana and Daligdig, 1993).

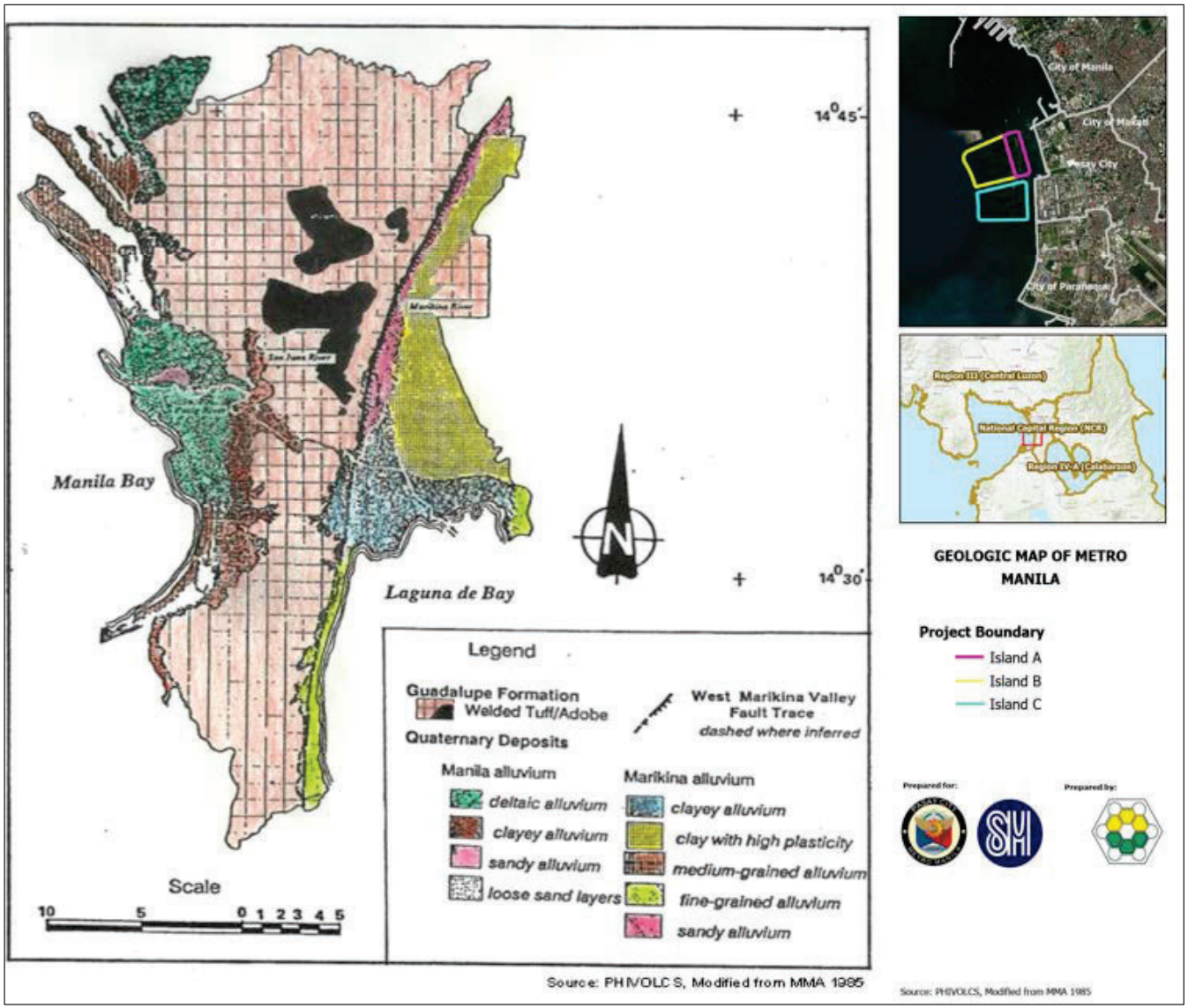


Figure 2.13 Geologic Map of Metro Manila
Source: Modified from Metropolitan Manila Authority (1985)

2.1.2.1.B.3. TECTONIC SETTING

Since the 15th century up to the present, Metro Manila and its neighboring provinces have been shaken by more than 20 major earthquakes generated from several major and minor fault systems within the archipelago (Besana and Daligdig, 1993).

The Philippine Island Chain has evolved from the collision between the Eurasian Plate, South China Sea Plate, the Philippine Sea Plate, and the Pacific Plate. The collision resulted to several subduction zones marked by oceanic trenches. The development of the archipelago was caused by the active squeezing and magma rise producing a chain of volcanoes from the remelting of the sub ducting lithosphere (Besana and Daligdig, 1993).

The Philippine Sea Plate is being subducted on the east side of the archipelago along the Philippine Trench and the East Luzon Trench. On the other side of the archipelago, the seafloor of the South China Sea Plate subducts near the west side of Luzon along the Manila Trench, producing an opposite dipping subduction zone. On the southwest, the seafloor of the Sulu Plate subducts near the west side of Negros Island along the Negros Trench and along Sulu Trench near the northwest side of Zamboanga. The Celebes Sea Plate subducts near the west side of Central Mindanao along the Cotabato Trench and in Davao Gulf along the Davao Trench.

As a result of the colliding and subducting plates, a broad zone of active deformation characterized by pronounced seismicity and volcanism runs longitudinally throughout the entire length of the archipelago. Convergence is farther absorbed by internal deformation along the Philippine Fault, a major strike-slip fault extending from Lingayen to Davao.

Metro Manila lies on the western central part of the island of Luzon within the so-called “Philippine Mobile Belt” (PMB), a mobile and highly seismic belt that transects the archipelago. The Philippine Mobile Belt, especially along the Philippine Fault Zone (PFZ), absorbs the continuing crustal plate deformation.

About one-third of the destructive earthquakes that have affected Metro Manila and vicinity were generated from the Philippine Fault Zone. The movement of the Philippine Fault Zone produced the majority of the most devastating earthquakes in the Philippine history including the 16 July 1990 earthquake event. The 1990 earthquake generated from the PFZ‟s northern segment, the Digdig Fault, was recorded at Ms 7.8 (Besana and Daligdig, 1993).

The project site is about 8.00 kilometers west of the western extension of the West Valley Fault, a geomorphologically active fault that extends southward along the Marikina Valley to Western Laguna and gradually curves towards the west as it approached the Batangas-Cavite boundary at Tagaytay Ridge. Recent investigation by PHIVOLCS along the Sucat-Muntinlupa-Alabang stretch have confirmed the existence of creep (active fault movement) along what is believed to be a step-over segment of the fault there (Rimando et al, 1995).

Other significant geologic structures in the region include the Philippine Fault Zone and its branches and Lubang Fault found between Batangas and Mindoro Island and Manila Trench found west of Luzon Island.

The Philippine Archipelago consists of several areas of rifts and opposing trench-arc systems. The latest Philippine Seismic Zone Map (Figure 2.14) in accordance to the Seismic Studies of

Torregoza, Sugito and Nojima of the Gifu University in Japan and PHIVOLCS (2002) presents 27 zones. Based on this map the project area falls under Zone 10 where the historical maximum magnitude is 7.6.

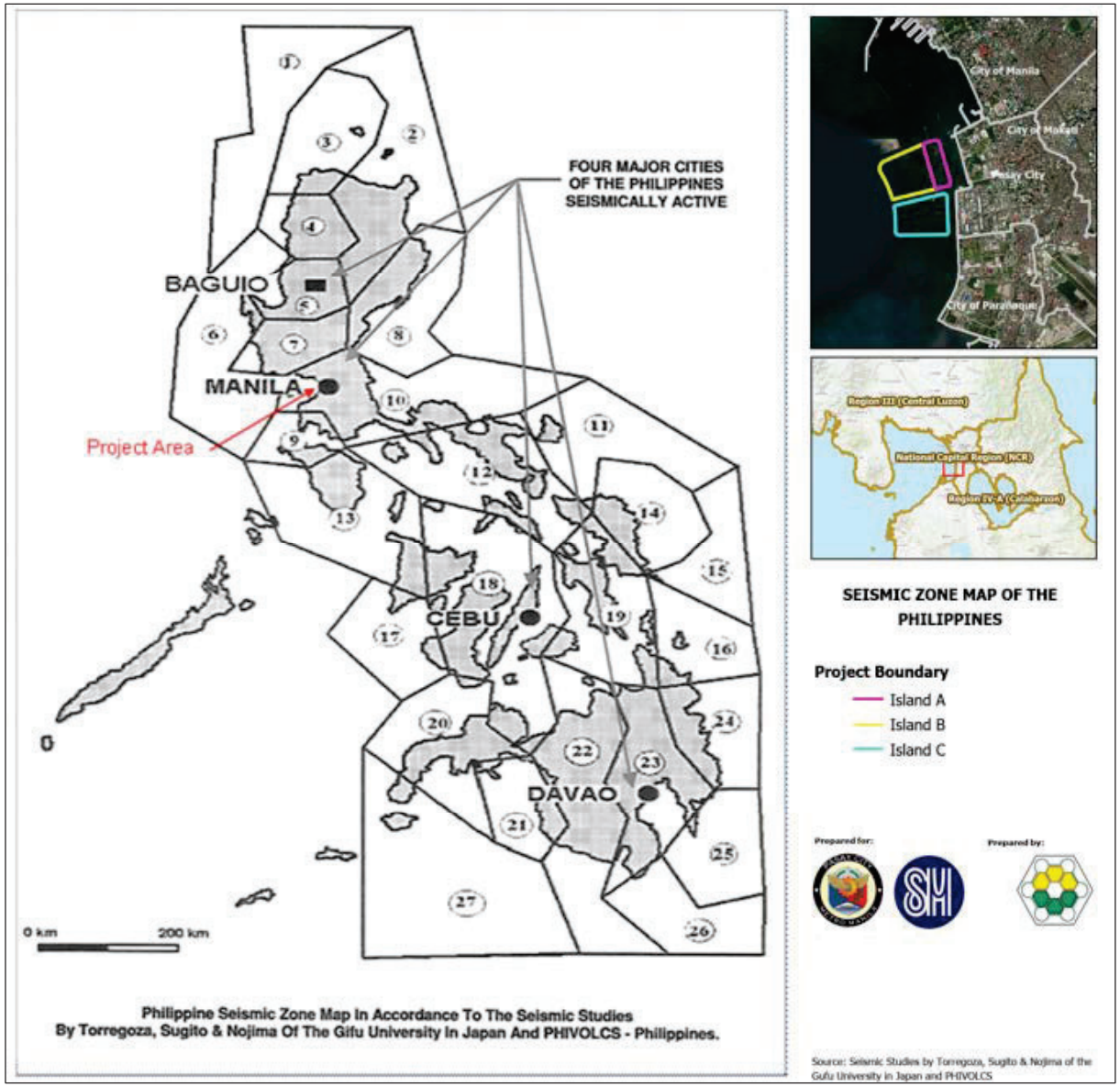


Figure 2.14 Seismic Zone Map of the Philippines
Source: Seismic Studies by Torregoza, Sugito & Nojima of the Gufu University in Japan and PHIVOLCS , 2002

Table 2.11 presents the characteristics of the different zones based on the studies conducted by PHIVOLCS and some staff of the Gifu University in Japan.

Table 2.11 Characteristics of the Different Zones based on the Studies of PHIVOLCS, et al.

Zone	Occurrence Rate per km²	b Value	Historical Max. Magnitude (Ms)
1	1.46E-05	0.940	7.3
2	1.49E-05	1.056	7.2
3	6.60E-5	1.571	6.9
4	2.94E-05	1.458	6.5
5	6.40E-05	1.431	6.6
6	1.33E-05	1.093	7.7
7	4.17E-05	1.215	7.8
8	5.96E-05	1.792	7.0
9	1.35E-04	1.489	7.7
10	6.37E-06	0.598	7.6
11	2.04E-05	1.217	7.1
12	1.23E-05	0.743	7.4
13	1.96E-05	1.043	8.3
14	8.10E-05	1.072	7.3
15	1.51E-05	1.939	6.0
16	1.38E-04	1.453	7.7
17	1.41E-05	1.353	6.3
18	6.28E-06	1.330	6.7
19	3.50E-05	1.210	7.0
20	1.17E-05	0.888	7.3
21	3.36E-05	1.074	7.9
22	1.26E-05	1.130	7.3
23	3.46E-05	1.429	7.4
24	1.04E-04	1.274	7.7
25	1.23E-04	1.301	7.3
26	3.24E-05	0.880	7.9
27	3.33E-06	1.111	6.5

Source: PHIVOLCS, 2002

The geologic setting of the Philippines makes it prone to various types of seismic-related hazards. The high level of seismicity within the Philippines, averaging about five detectable earthquakes per day, is attributed to movements caused by the interaction of major tectonic plate boundaries along the subduction zones and those generated from active faults.

Figure 2.15 shows the project area relative to the locations of major earthquake generators.

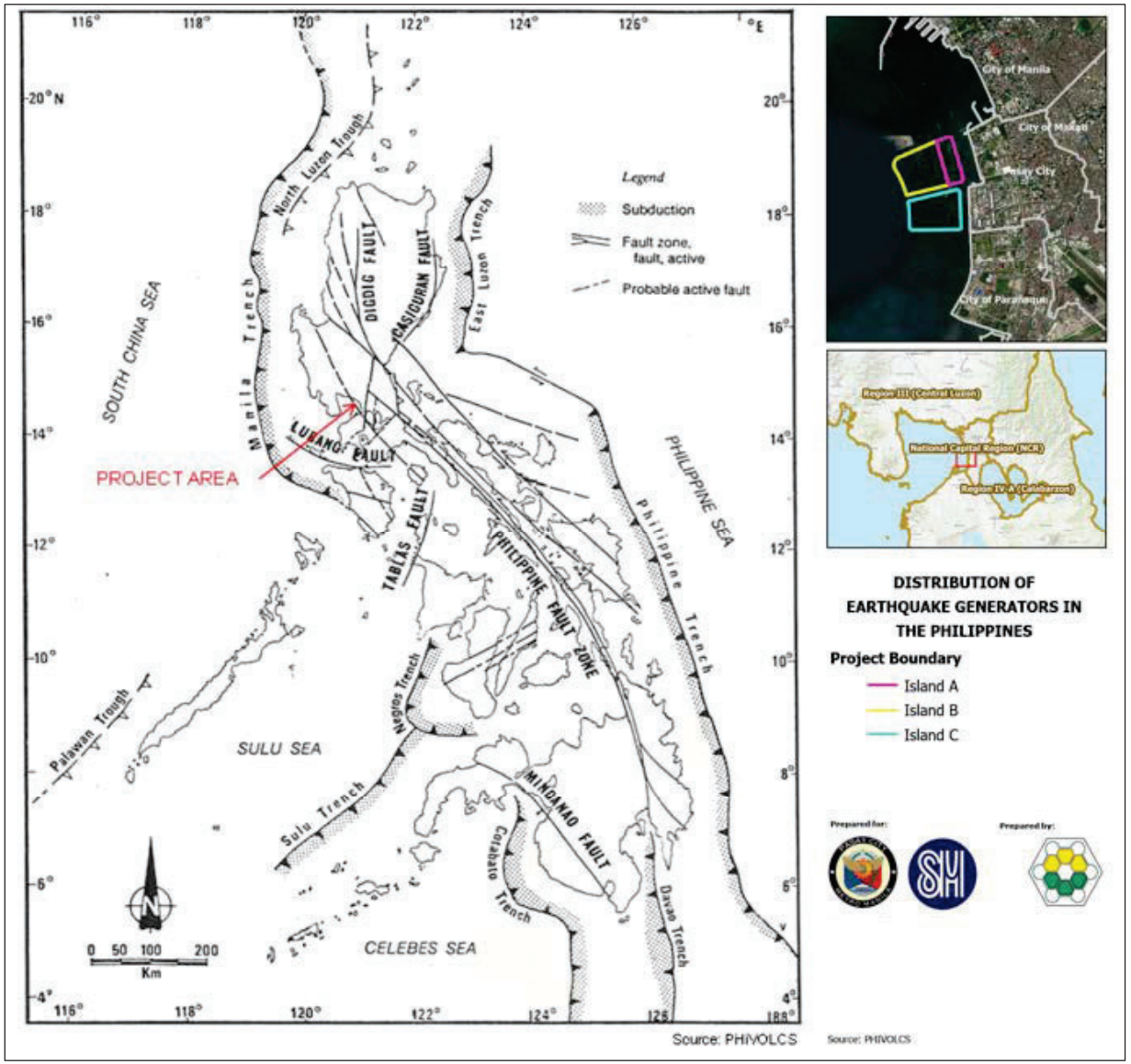


Figure 2.15 Distribution of Earthquake Generators in the Philippines
Source: PHIVOLCS , Punongbayan, 1986

2.1.2.1.B.3.1. SEISMICITY MAP BASED ON THE UBC EARTHQUAKE CODE

The Philippine Archipelago is divided into two seismic zones and majority is under Seismic Zone 4 based on the UBC (Uniform Building Code) Earthquake Code. The referenced Seismic Map of the Philippines shown in Figure 2.16 was taken from the 2015, Volume 1, 7th Edition of National Structural Code of the Philippines (NSCP).

As seen from Figure 2.16, the whole island of Luzon as well as the Visayas and Mindanao are under Seismic Zone 4 with "z" coefficient of 0.04. Seismic Zone 2 covers the provinces of Palawan (except Busuanga), Sulu and Tawi-Tawi having "z" coefficient of 0.20.

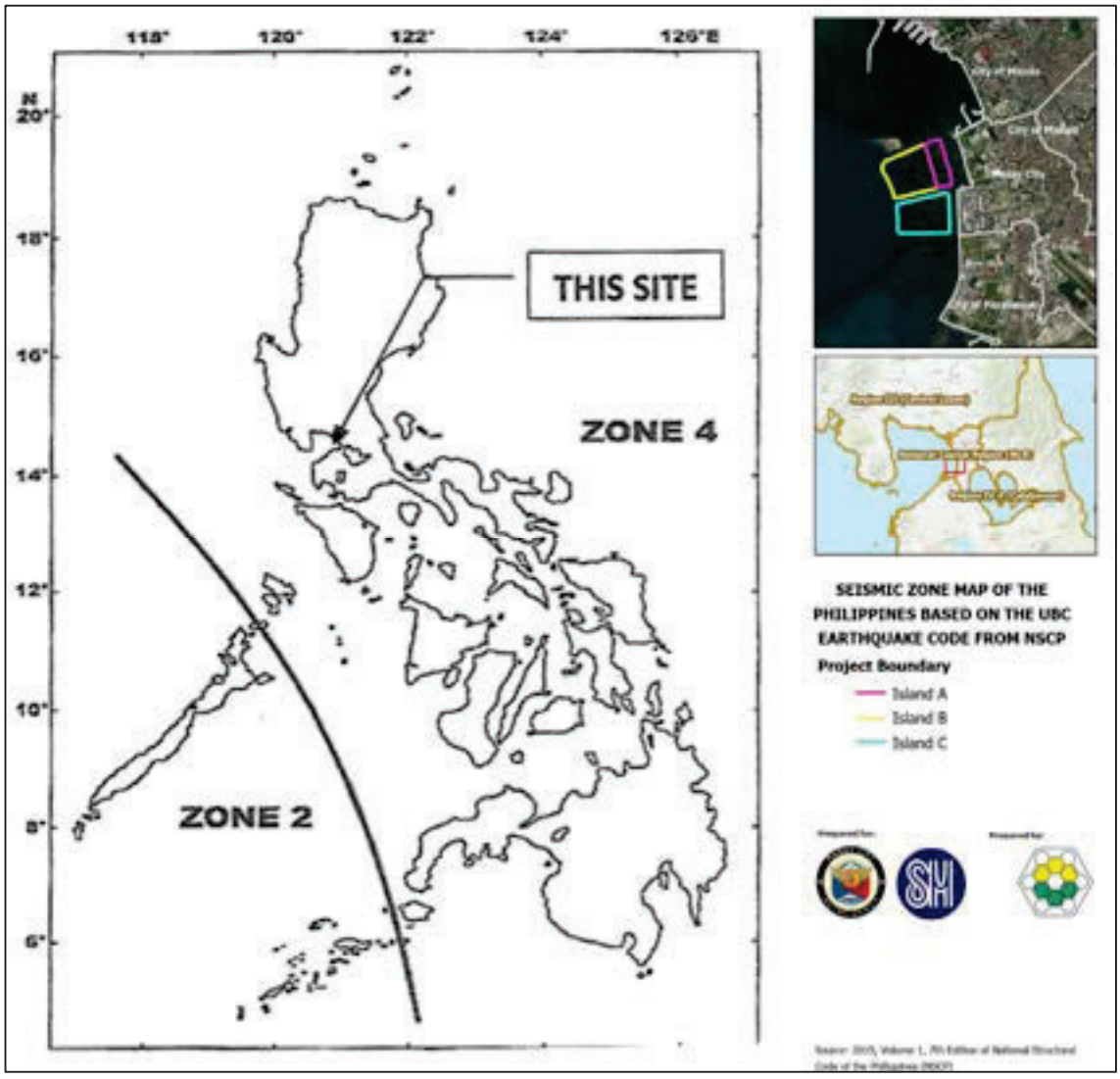


Figure 2.16 Seismic Map of the Philippines based on the UBC Earthquake Code from NSCP
Source: 7th Edition of National Structural Code of the Philippines (NSCP) Volume 1, 2015

2.1.2.1.B.3.2. POTENTIAL SOURCES OF EARTHQUAKE

Based on historical and instrumental data, the following have been identified to be the locus of major earthquakes that have significantly impacted the metropolis and nearby areas in the past: 1) West Valley Fault System, 2) Philippine Fault Zone, 3) Lubang Fault, and 4) Manila Trench.

West Valley Fault System (WVFS). The West Valley Fault System, a newly classified active fault based on recent mapping and trenching work conducted by Punongbayan and others (1990), is a potential earthquake source. Based on the Certification provided by PHIVOLCS WVFS is about 8.0 km east of the project area (Figure 2.17). Mapped extent of surface rupture associated with the WVFS is about 40 km suggesting a potential magnitude in the order of 7, although a higher magnitude of 7.5 is not unlikely as possible extensions of the fault remains to be mapped. Based on the extent of damage in Manila inflicted by the 1599, 1601, and the 1885 events, the possibility that this fault could have generated these earthquakes cannot be totally ruled out. However, no recent seismicity can be attributed to the WVFS.

Philippine Fault Zone (PFZ). Several destructive earthquakes that have impacted several localities in the country were generated from the Philippine Fault Zone, a 1,200 km long strike-slip fault transecting the Philippine archipelago. Having generated earthquakes with intensities of X (modified Mercalli Scale) within the epicenter area (e.g. 1645 & 1796 events) in the past, a future earthquake in the order of at least 7.5 from this structure is possible. The magnitude of the 1990 earthquake generated from northern segment of PFZ was 7.8. The Infanta segment of this fault is about 67 km east of the project area (Besana and Daligdig, 1993).

Lubang Fault. Lubang Fault is an active strike-slip fault and about 75 km southwest of the project area had been the source of large earthquakes in the past, notably that of 1852 and 1972. However, the periodic stress release along this structure lessens the potential for a major earthquake to come from this earthquake generator in the near future (Besana and Daligdig, 1993).

Manila Trench. Historical data indicates that the 1677 earthquake could be attributed to movements along the Manila Trench. During this earthquake, a tsunami was reported in the South China Sea. The 1863 earthquake of submarine origin is strongly indicated by the documentation of a tsunami that rocked several ships anchored in Manila Bay. Though no damage was reported along the coastal areas of Manila Bay, destruction was said to be widespread, most of which was due to strong ground shaking. A large number of structures, including most churches within Manila, Cavite, Laguna and Bulacan collapsed. Extensive fissuring, liquefaction and seiche were observed along the Pasig River. The nearest segment of this trench is about 200 km west of the project area (Besana and Daligdig, 1993).

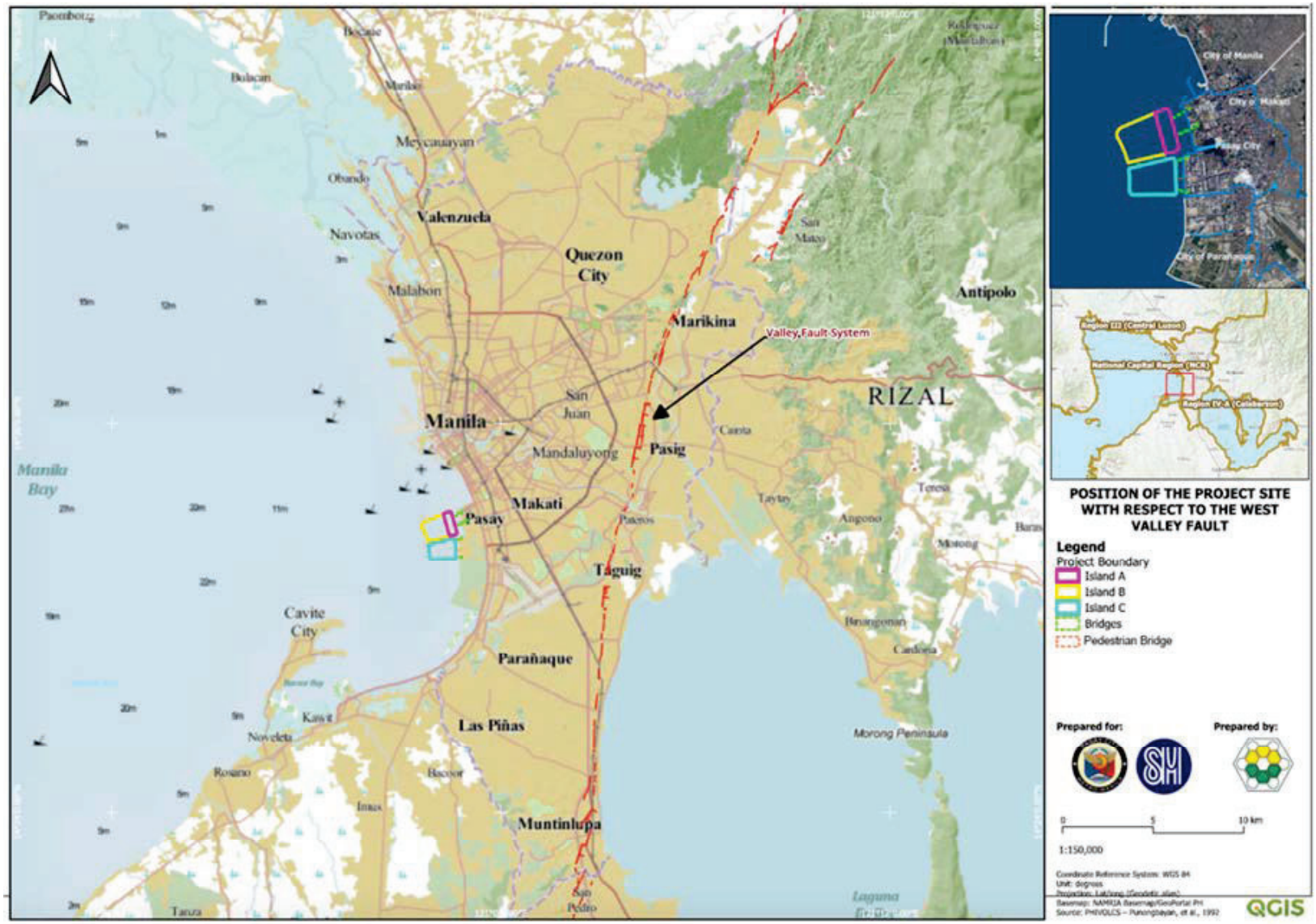


Figure 2.17 Position of the Project Area with Respect to the West Valley Fault
Source: PHIVOLCS – Punongbayan, et al., 1992

2.1.2.1.B.3.3. ACTIVE VOLCANOES NEAR THE PROJECT AREA

Mount Pinatubo

Mount Pinatubo whose highest peak is 1,749 masl prior to 1990 eruption is located about 96km northwest of the project area. The volcano is made up of Quaternary andesitic to dacitic volcanic deposits composed mainly of ashfall and pyroclastic deposits that probably originated from a number of volcanic centers near its peak. No record of historical eruptions of this volcano exists prior to its eruption in 1990. However, radiometric dating indicates that Mount Pinatubo has been active since 1.1 ka with its youngest eruption that happened 450 years ago (Besana et. al., 1993).

The 1990 eruption of Mount Pinatubo was ranked as the largest and most destructive within this century for the Philippines. The eruption affected more than 1.2 million people, left 847 casualties, 184 injured and 23 missing. Damage to properties and infrastructure was at least 10 billion pesos (Besana et. al., 1993).

The eruption produced 7-11 billion cubic meters of pyroclastic flow deposits that blanketed and devastated the upper and midsoles of the volcano. A centimeter thick of ashfall was deposited more than 30 km away from the vent. Metro Manila as well as other nearby provinces received ash showers of about 2–3 mm thickness (Besana et. al., 1993).

Taal Volcano

Taal Volcano is an island located near the center of Taal Lake in Batangas Province situated about 58 km south of the project area. Despite its diminutive height of only 311 masl, it is considered as one of the most destructive and violent volcanoes in the Philippines. Nestled within Taal Lake, this volcano has a central main vent with numerous other craters that have been the locus of its past eruptions (Besana et. al., 1993).

Taal Volcano had several catastrophic eruptions in the past. Its first recorded eruption dates back to 1572. Since then, Taal had erupted more than 30 times. Within historical times, Taal had four major devastating eruptions, in 1749, 1754, 1911, and 1965 (Besana et. al., 1993).

The 1749 eruption, though short-lived, produced a hundred million cubic meters of volcanic tephra. It devastated the whole volcanic island and nearby lakeshore areas. Undetermined numbers of people were killed in the process (Besana et. al., 1993).

The 1754 eruption lasted for six months. It completely destroyed the old settlements for Sala, Lipa, Tanauan and Taal which were formerly located along Taal Lake and were subsequently located to their present sites (Besana et. al., 1993).

During the 1911 eruption, about 1,300 people were killed while some 800 others were wounded as a result of a base surge or a rapidly expanding cloud at the base of the eruption column which was about 15 km high. The base charge devastated the whole Volcano Island and other areas across Taal Lake. The solid ejecta produced by the eruption which was

estimated to be around 80,000,000 cubic meters spread over an area of 230 km^2 while ashes spewed from the volcano reached as far as Manila (Besana et. al., 1993).

Figure 2.18 shows the relative position of the project area from Mount Pinatubo and Taal Volcano.

2.1.2.1.C. INDUCEMENT OF SUBSIDENCE, LIQUEFACTION, LANDSLIDES, MUD / DEBRIS FLOW, ETC.

2.1.2.1.C.1. HAZARD ASSSESSMENT

Table 2.12 enumerates the hazard types within the project site using the HazardHunter website (**Appendix E**) while Figure 2.19 presents the geohazard assessment points. Part of the project site are identified to experience the following hazards:

- Prone to Ground Shaking; and
- Prone to Ashfall.

Table 2.12 Hazard Assessment in the Project Site

Description	Point 1	Point 2	Point 3
Coordinates	120.97376, 14.54862	120.96715, 14.54634	120.97045, 14.53467
Seismic Hazard Assessment			
Nearest Active Fault	Approximately 9.1 km west of the Valley Fault System: West Valley Fault	Approximately 9.7 km west of the Valley Fault System: West Valley Fault	Approximately 9.1 km west of the Valley Fault System: West Valley Fault
Ground Rupture	Safe	Safe	Safe
Ground Shaking	Prone	Prone	Prone
Earthquake-Induced Landslide	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries
Liquefaction	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries
Tsunami	Area is not covered by current hazard maps	Area is not covered by current hazard maps	Area is not covered by current hazard maps
Volcanic Hazard Assessment			
Nearest Active Volcano	Approximately 59.6 km north of Taal	Approximately 59.4 km north of Taal	Approximately 58.1 km north of Taal
Nearest Potentially Active Volcano	Approximately 46.8 km northeast of Corregidor; No immediate volcanic hazard threat	Approximately 46.1 km northeast of Corregidor; No immediate volcanic hazard threat	Approximately 45.9 km east of Corregidor; No immediate volcanic hazard threat
Ballistic Projectiles	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries

Description	Point 1	Point 2	Point 3
Coordinates	120.97376, 14.54862	120.96715, 14.54634	120.97045, 14.53467
Base Surge	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries
Volcanic Tsunami	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries
Ashfall	Prone	Prone	Prone
Nearest Inactive Volcano	Approximately 37.6 km northwest of Talim (part of laguna caldera); No immediate volcanic hazard threat	Approximately 38 km northwest of Talim (part of laguna caldera); No immediate volcanic hazard threat	Approximately 37 km northwest of Talim (part of laguna caldera); No immediate volcanic hazard threat
Hydro-Meteorological Hazard Assessment			
Flood (MGB)	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries
Rain-Induced Landslide (MGB)	Area is outside administrative boundaries	Area is outside administrative boundaries	Area is outside administrative boundaries
Storm Surge (PAGASA)	Area is not covered by current hazard maps	Area is not covered by current hazard maps	Area is not covered by current hazard maps
Severe Wind (PAGASA)	Area is outside administrative boundaries (20-year return period); Area is outside administrative boundaries (500-year return period)	Area is outside administrative boundaries (20-year return period); Area is outside administrative boundaries (500-year return period)	Area is outside administrative boundaries (20-year return period); Area is outside administrative boundaries (500-year return period)
Nearest Critical Facilities			
Nearest Public Elementary School	Gotamco Es (2.1 km)	Gotamco Es (2.9 km)	Philippine School For The Deaf (2.7 km)
Nearest Public Secondary School	Philippine School For The Deaf (2.4 km)	Philippine School For The Deaf (3 km)	Philippine School For The Deaf (2.7 km)
Nearest Government Health Facility	Cuyegkeng Health Center (2 km)	Cuyegkeng Health Center (2.7 km)	Dr. Elvira M. Lagrosa Health Center (2.7 km)
Nearest Private Health Facility	Miraculous Medal Emergency Medical Clinic (2 km)	Miraculous Medal Emergency Medical Clinic (2.7 km)	San Juan De Dios Educational Foundation Inc. (2.4 km)
Nearest Primary Road Network	Roxas Blvd; Pasay City (lone District) (2.3 km)	Roxas Blvd; Pasay City (lone District) (2.9 km)	Roxas Blvd; Pasay City (lone District) (2.3 km)
Nearest Secondary Road Network	Roxas Blvd; Pasay City (lone District) (1.7 km)	Roxas Blvd; Pasay City (lone District) (2.4 km)	Roxas Blvd; Pasay City (lone District) (2.3 km)

Reference: https://hazardhunter.georisk.gov.ph/ last accessed: April 2024

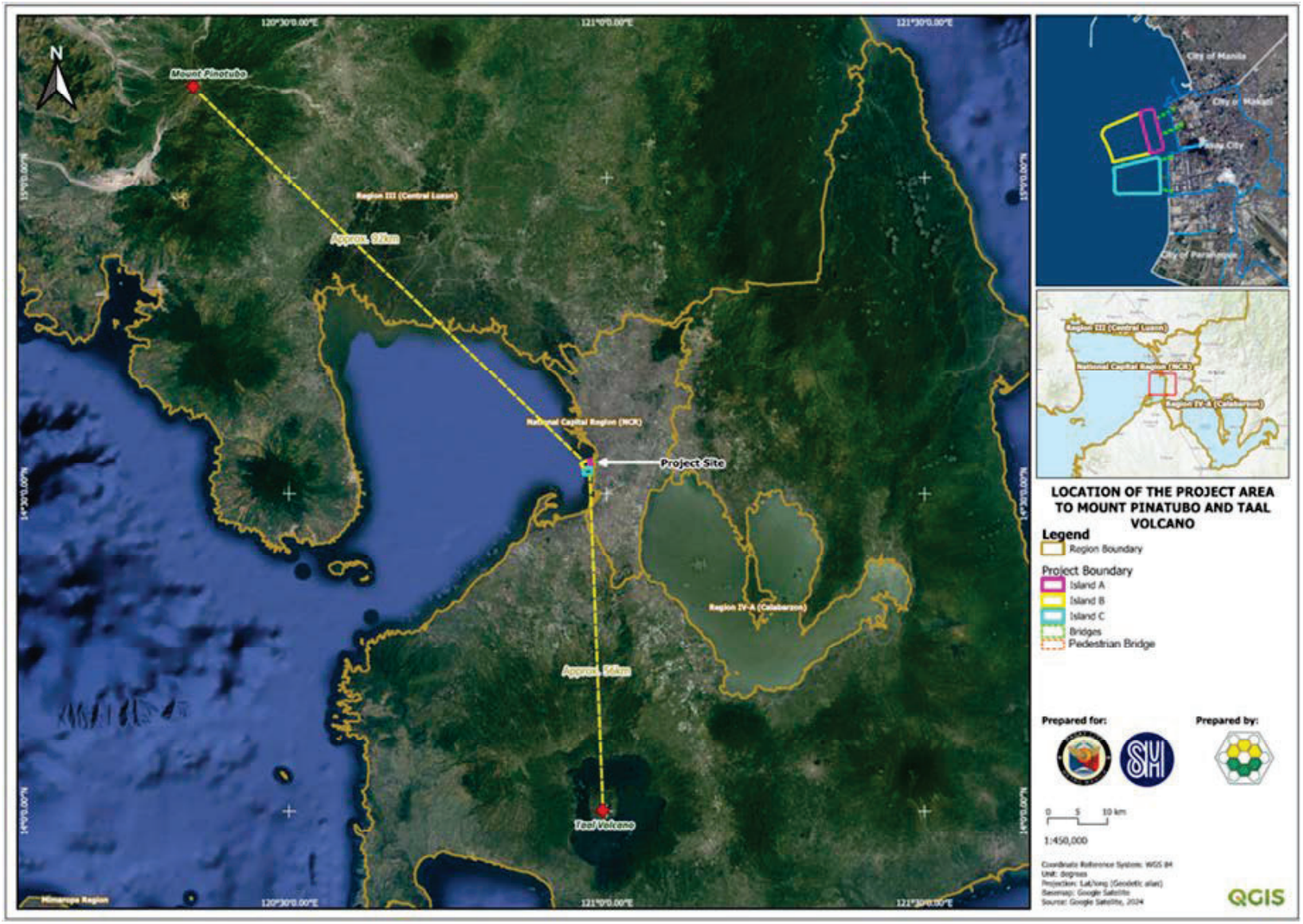


Figure 2.18 Location of the Project Area with Respect to Mount Pinatubo and Taal Volcano
Source: Google Map, 2024

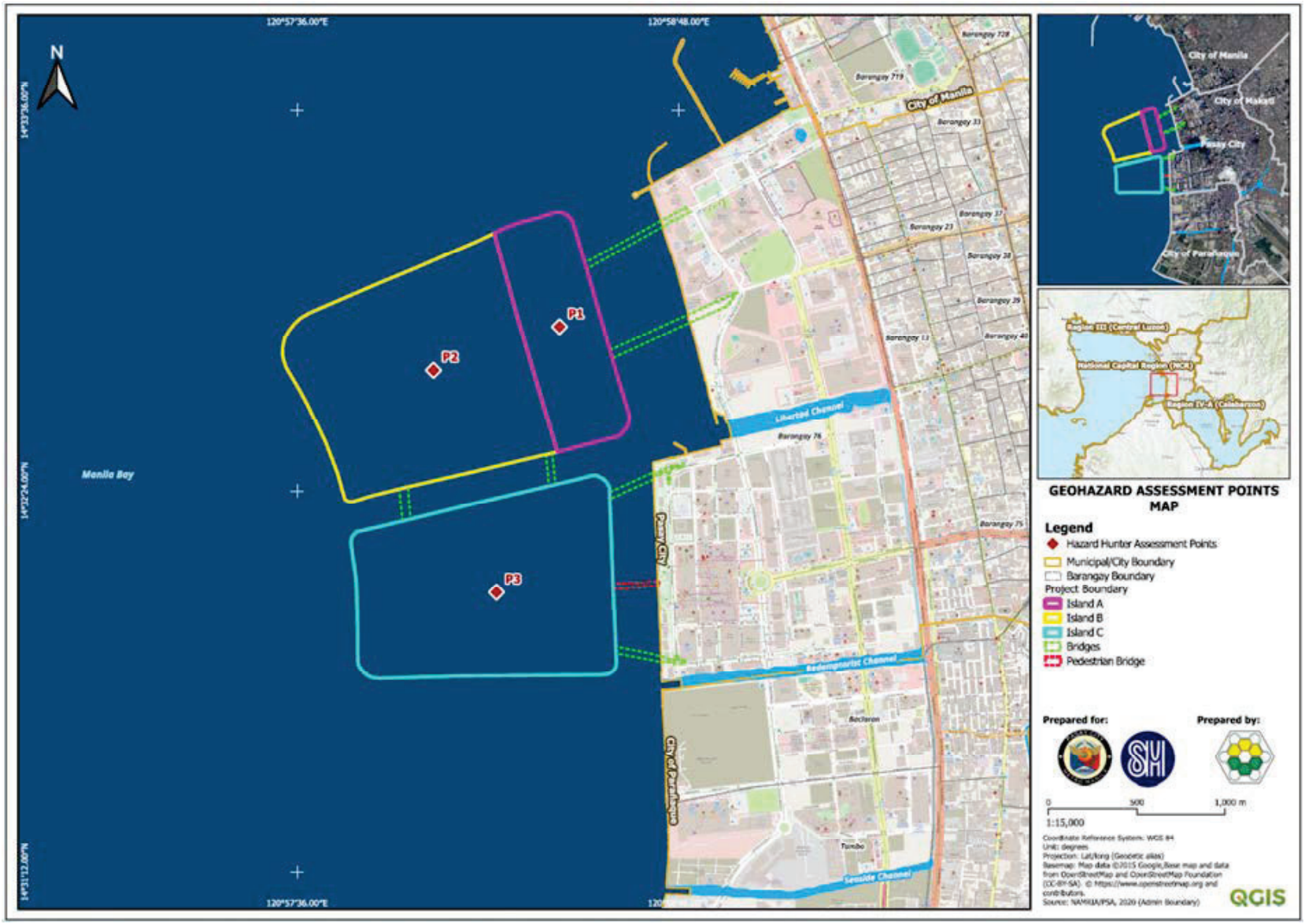


Figure 2.19 Geohazard Assessment Points
Source/ Reference: Open Street Map, Admin Boundary – NAMRIA/PSA, 2020

2.1.2.1.C.1.1. GEOLOGIC HAZARD

Seismic Hazards

Major causes of damage during earthquakes include hazards due to 1) ground shaking, 2) liquefaction, 3) landslide, 4) surface rupturing, and 5) tsunami. The first two hazards are directly related to actual ground movements while the others are mainly due to the indirect effects of the earthquake shocks.

Ground Shaking Hazard

Most of the damages incurred during earthquakes mainly result from strong ground vibrations that are caused by the passage of seismic waves from the earthquake source to the ground surface. The intensity of ground shaking is generally influenced by the magnitude of the earthquake, distance of the site from the earthquake generator, and the modifying effects of subsoil conditions. Observations of effects of large magnitude earthquakes have shown that ground shaking on bedrock is less in intensity than on areas of soft foundation made up of sediments as gravel, sand, silt and/or clay.

Table 2.13 presents the different areas Metro Manila which are vulnerable to ground shaking and within the identified zones. The zone where ground shaking is expected to be below average is more or less defined by the outline of the tuff deposit of the Guadalupe Formation which corresponds to the bedrock in Metro Manila. The areas underlain by soft and thick sequence of fine sediments will most likely experience average to above average levels of ground shaking depending on the thickness of the soft materials. Areas covered with 10 m or less of these deposits are expected to experience average levels of ground shaking while those underlain by soft materials in excess of 10 m may experience above average shaking.

Table 2.13 Areas Vulnerable to Strong Ground Shaking in Metro Manila

Possible Level of Ground Shaking	Area
Above Average	Manila proper inclusive of the reclaimed areas along Manila Bay, the municipalities of western Malabon, Navotas, eastern Pateros, Marikina (valley side) and the eastern section of Pasig
Average	Pasay City, western portion of Makati, northeastern and eastern Quezon City (within the Marikina Valley), the extreme southwestern part of Caloocan City, eastern Malabon, western section of Valenzuela, the coastal and northern portions Paranaque and Las Pinas, and the lakeshore areas of Taguig and Muntinlupa
Below Average	Areas within Diliman Plateau

Figure 2.20 presents the Ground Shaking Map of Metro Manila.

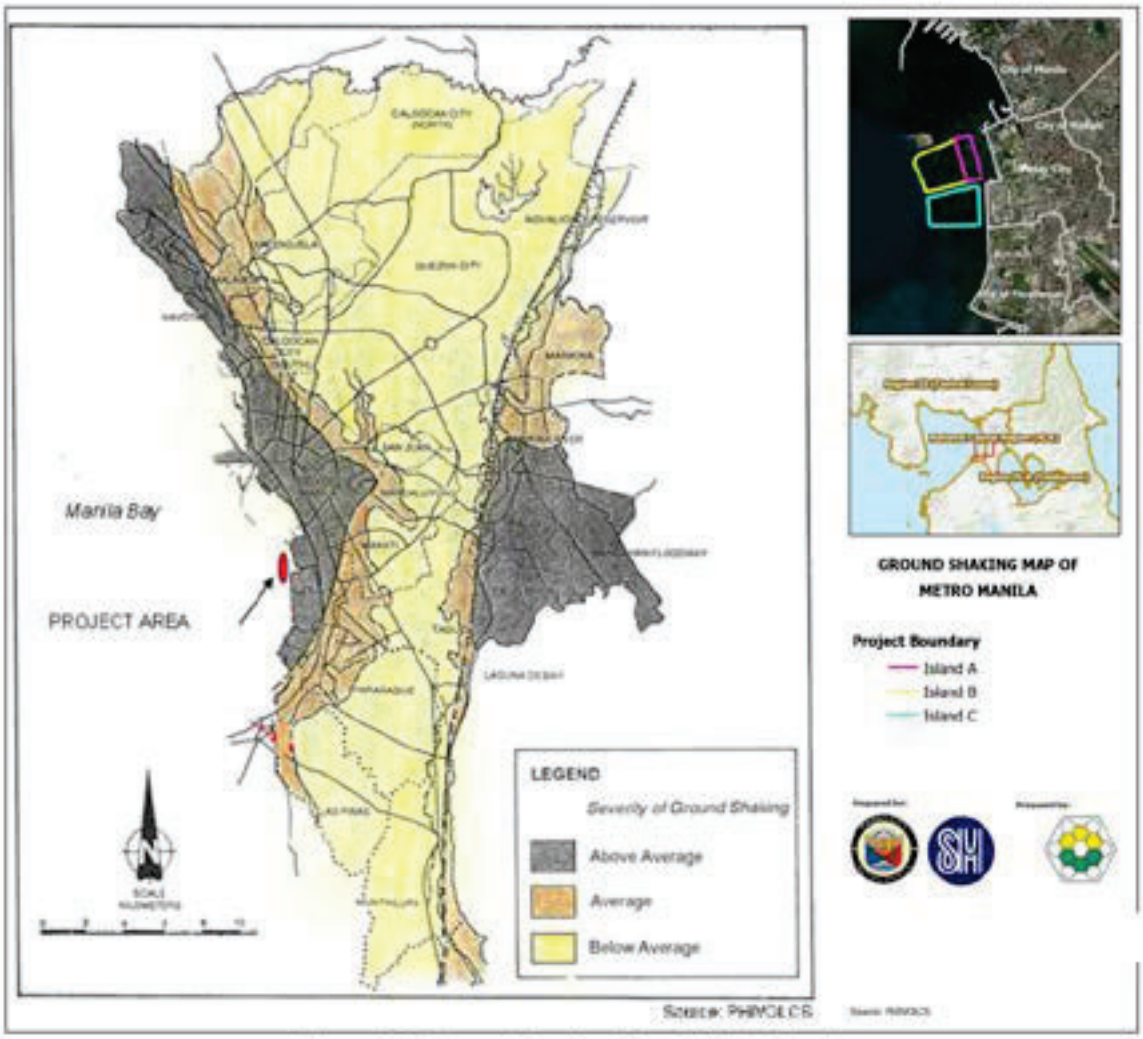


Figure 2.20 Ground Shaking Map of Metro Manila
Source: PHIVOLCS, Seismological Hazards in Metro Manila, 1993

The project area is prone to ground shaking hazards due to the presence of several earthquake generators. The site is considered as high seismic area and has a recorded and experienced intensity of VI during the July 1990 Luzon earthquake (Figure 2.21).

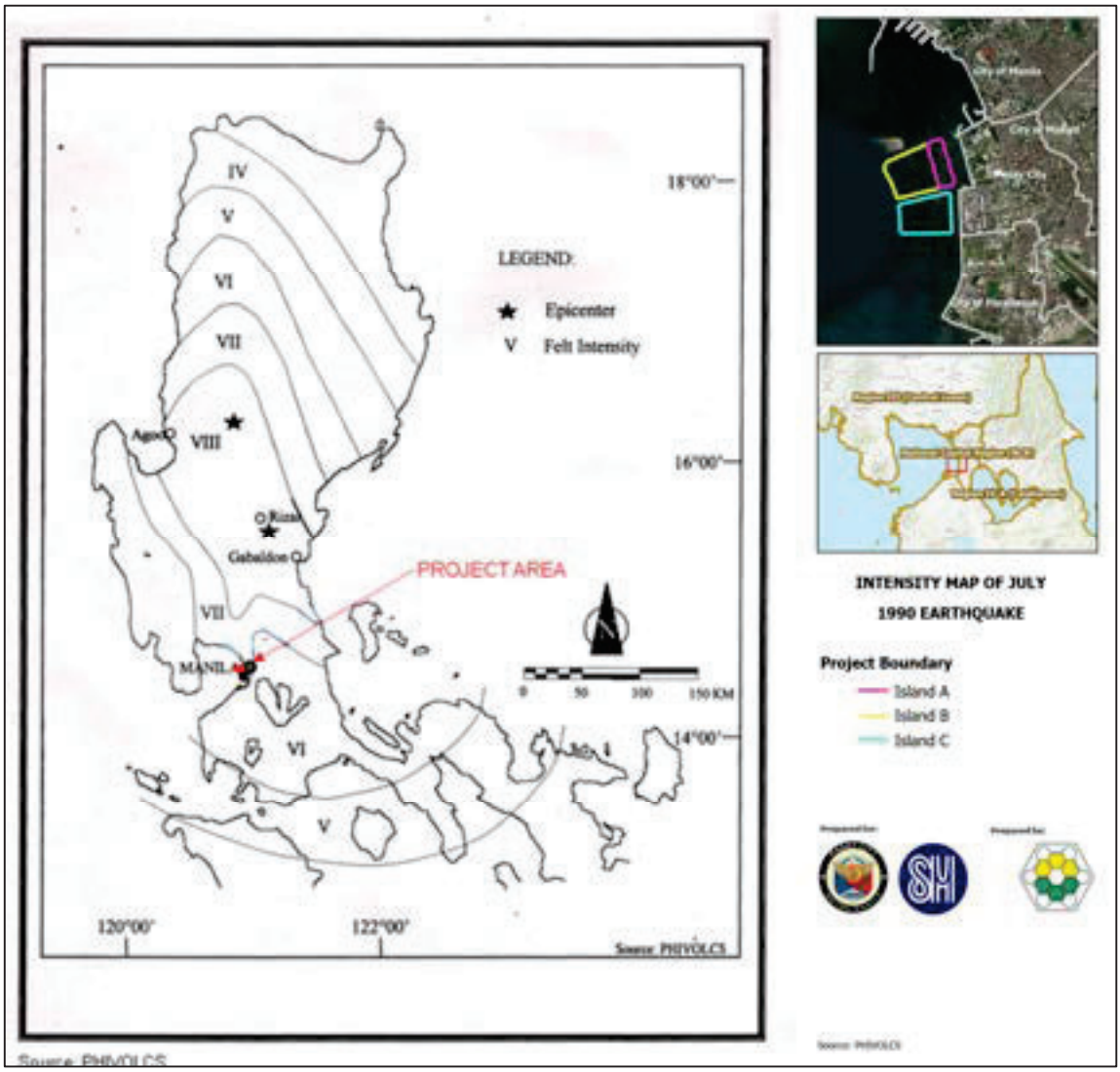


Figure 2.21 Intensity Map of July 1990 Earthquake
Source: PHIVOLCS, 1993

Surface Rupturing

Surface or ground rupturing is a result of significant movement along faults. It occurs within zones of active fault. Damage can be severe for structures directly straddling and located within a narrow zone of the active fault traces. For the 1990 Luzon earthquake, the deformation zone was within 5 m from the surface rupture. The location, pattern and style of surface faulting generally appear to occur along pre-existing active fault traces; thus, a precise delineation of these traces is very important in mitigating damages due to surface rupturing.

2.1.2.1.C.1.2. GROUND ACCELERATION

Since the Philippines is a tectonically active place with noted active faults that are usually the sources of major earthquakes, the Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the United States Geological Survey (USGS) conducted ground motion hazard mapping in terms useful to engineering design using modern probabilistic

methodology. In their study, the peak horizontal ground acceleration that have a 10% probability of being exceeded in 50 years have been uniformly estimated for rock, medium soil and soft soil site condition. Results of their study show an estimate on rock ranging from a low of 0.11g in Visayas to a high of 0.30g in the vicinity of Casiguran Fault in Eastern Luzon (Thenhaus, et al, 1994). Estimates for soft soil conditions are considerably higher and range between 0.27g for Visayas and 0.80g along the Casiguran Fault zone.

The estimated horizontal and vertical peak accelerations during an earthquake likely to occur in an area are useful information for designing buildings and other structures to withstand seismic shaking. Maps of Acceleration in Soft Soil, Medium Soil, Hard Soil and Rock are presented in Figure 2.22 to Figure 2.25**.**

In order to determine the ground acceleration that a site can experience in case of a major earthquake, the attenuation model of Fukushima and Tanaka is applied (Thenhaus et al, 1994). A design earthquake is assumed to occur at a point along the causative fault that is nearest to the site. Correction factors are then applied depending on the type of foundation material.

The attenuation model of Fukushima and Tanaka (In Thenhaus, 1994) is written as:

$$\log_{10} A = 0.41M - \log_{10} (R+0.032x10^{0.4\,M}) - 0.0034R + 1.30$$

where:

A = mean peak acceleration (cm/sec^2)

R = shortest distance between the site and the fault rupture (km)

M = surface-wave magnitude.

Correction factors are applied depending on the type of foundation material: rock, 0.6; hard soil, 0.87; medium soil, 1.07; and soft soil, 1.39.

The most logical causative fault is the Philippine Fault. It may be considered as a near-source earthquake generator. The Philippine Fault is probably the most active of earthquake generators in the country. Though presently inactive, both the West Valley Fault, the Lubang Fault and Casiguran Fault can also be considered as potential earthquake generators.

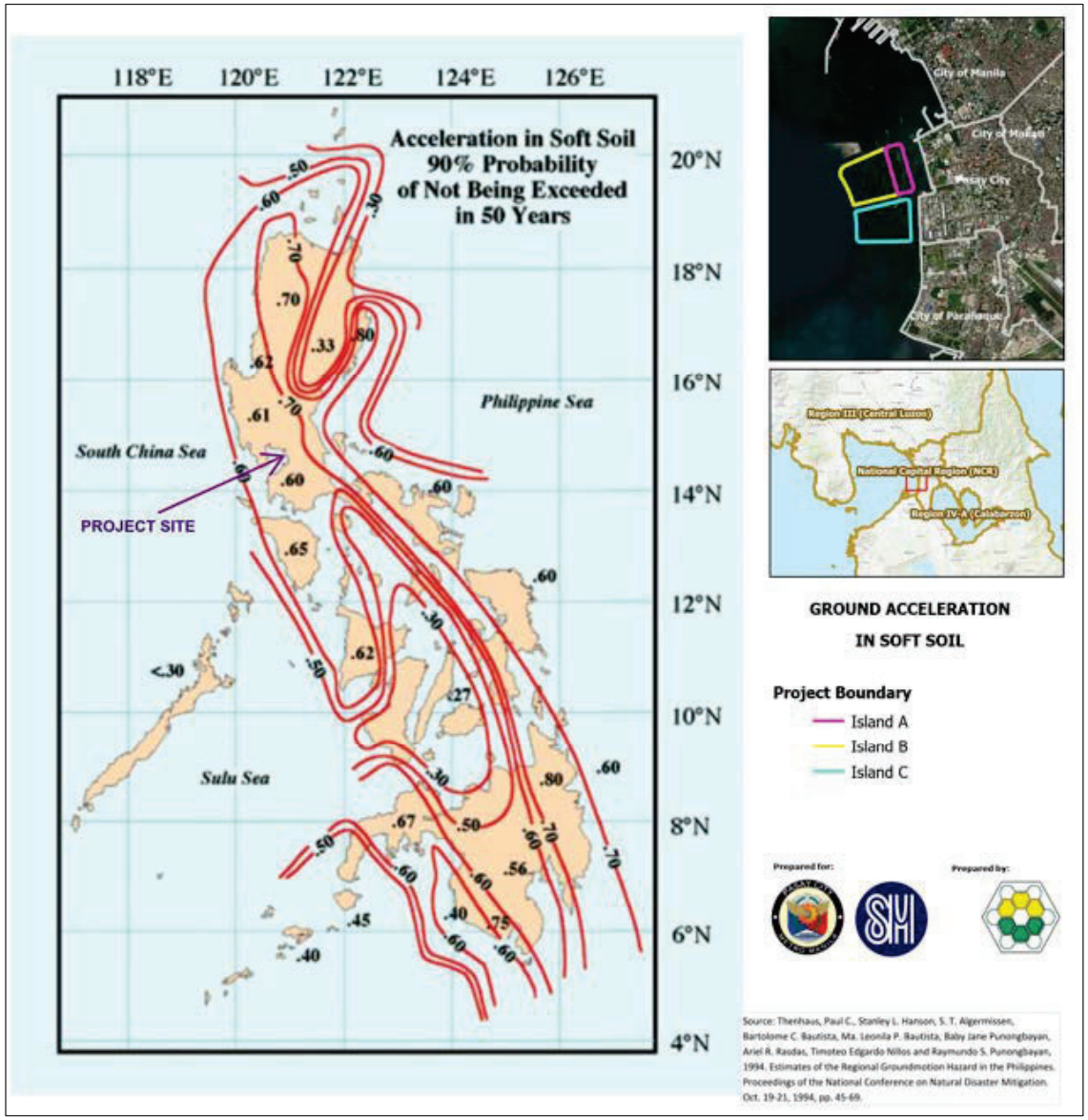


Figure 2.22 Ground Acceleration in Soft Soil
Source: Thenhaus, et. al, 1994

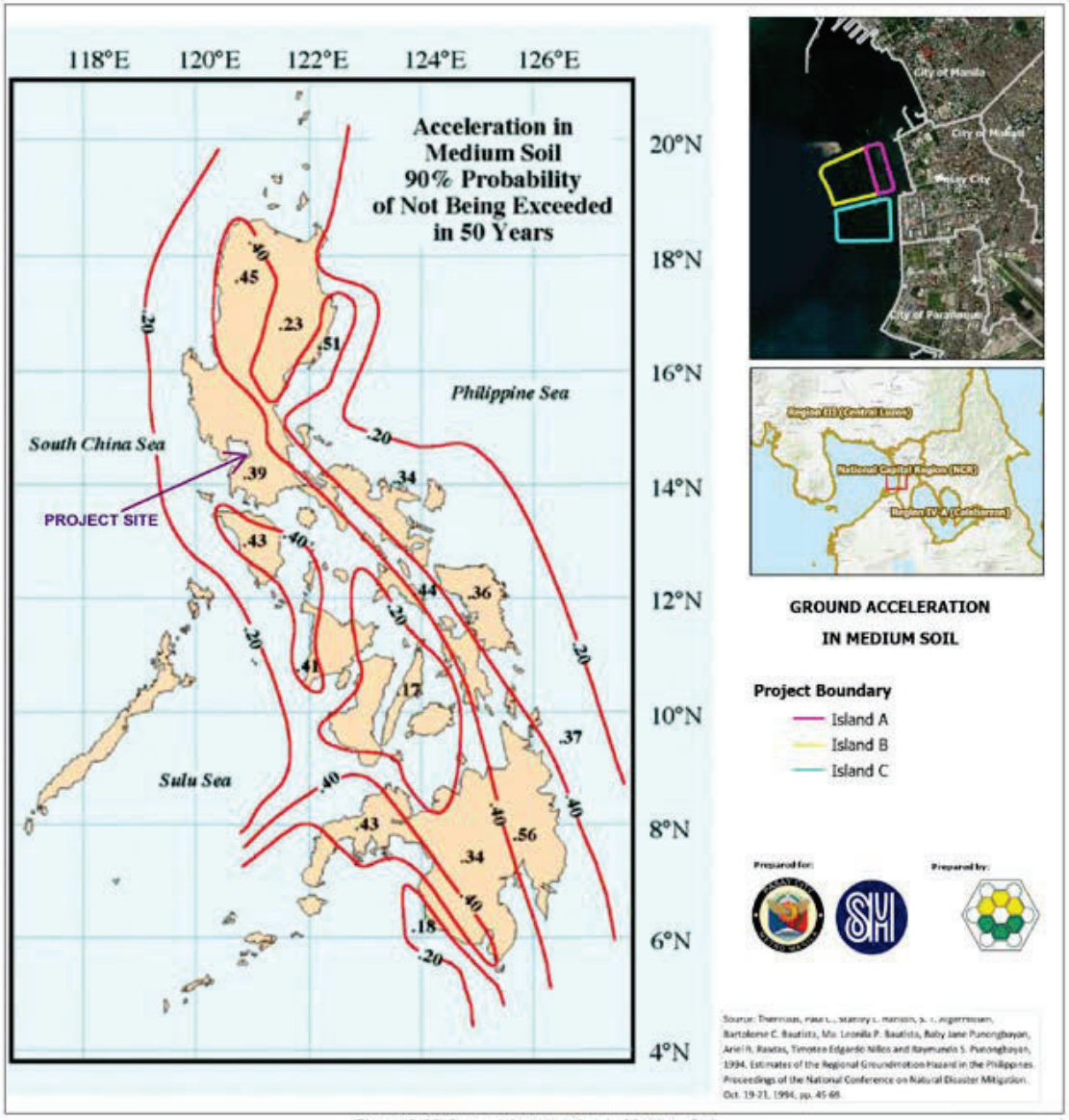


Figure 2.23 Ground Acceleration in Medium Soil
Source: Thenhaus, et al, 1994

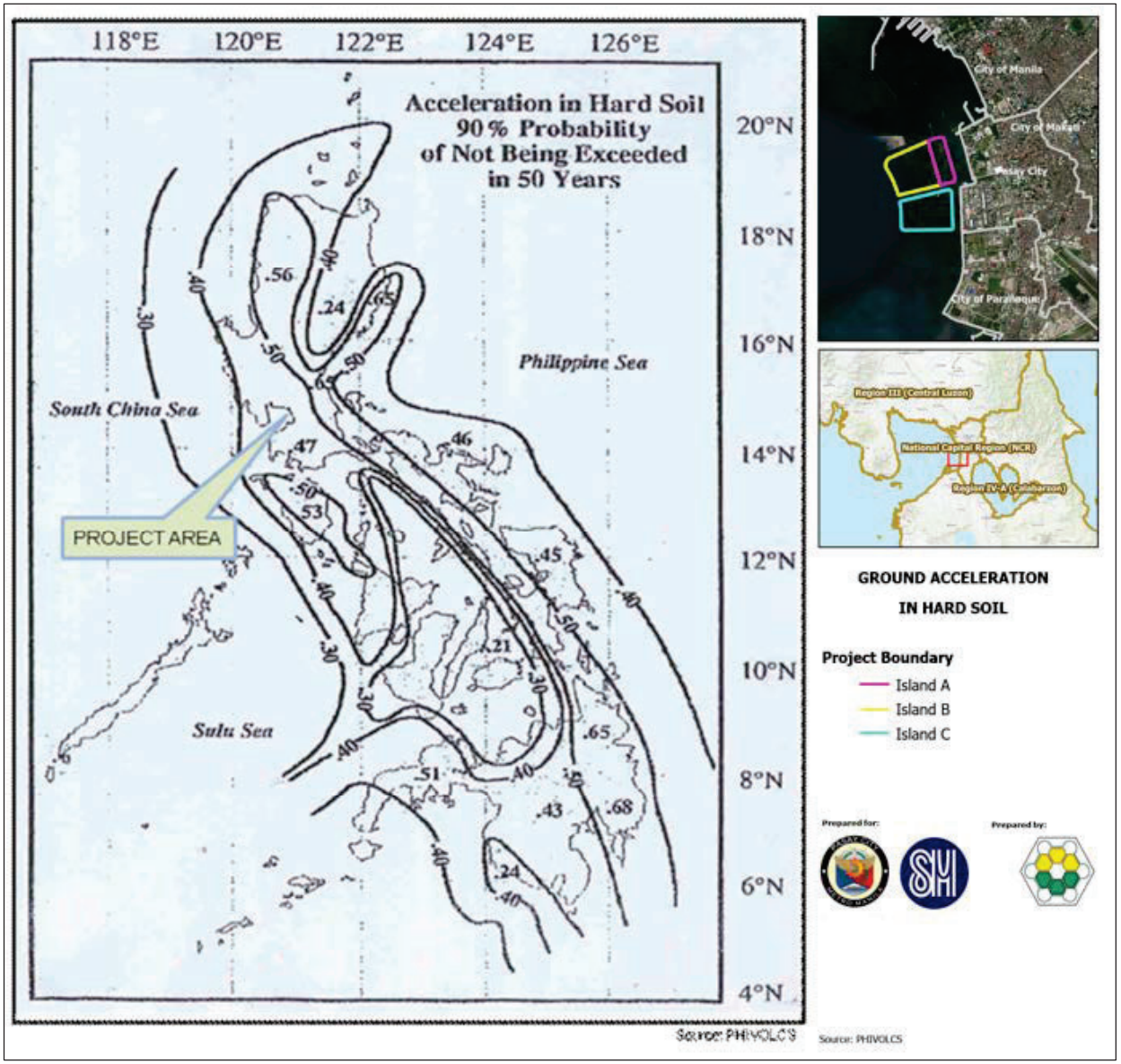


Figure 2.24 Ground Acceleration in Hard Soil
Source: Thenhaus, et al, 1994

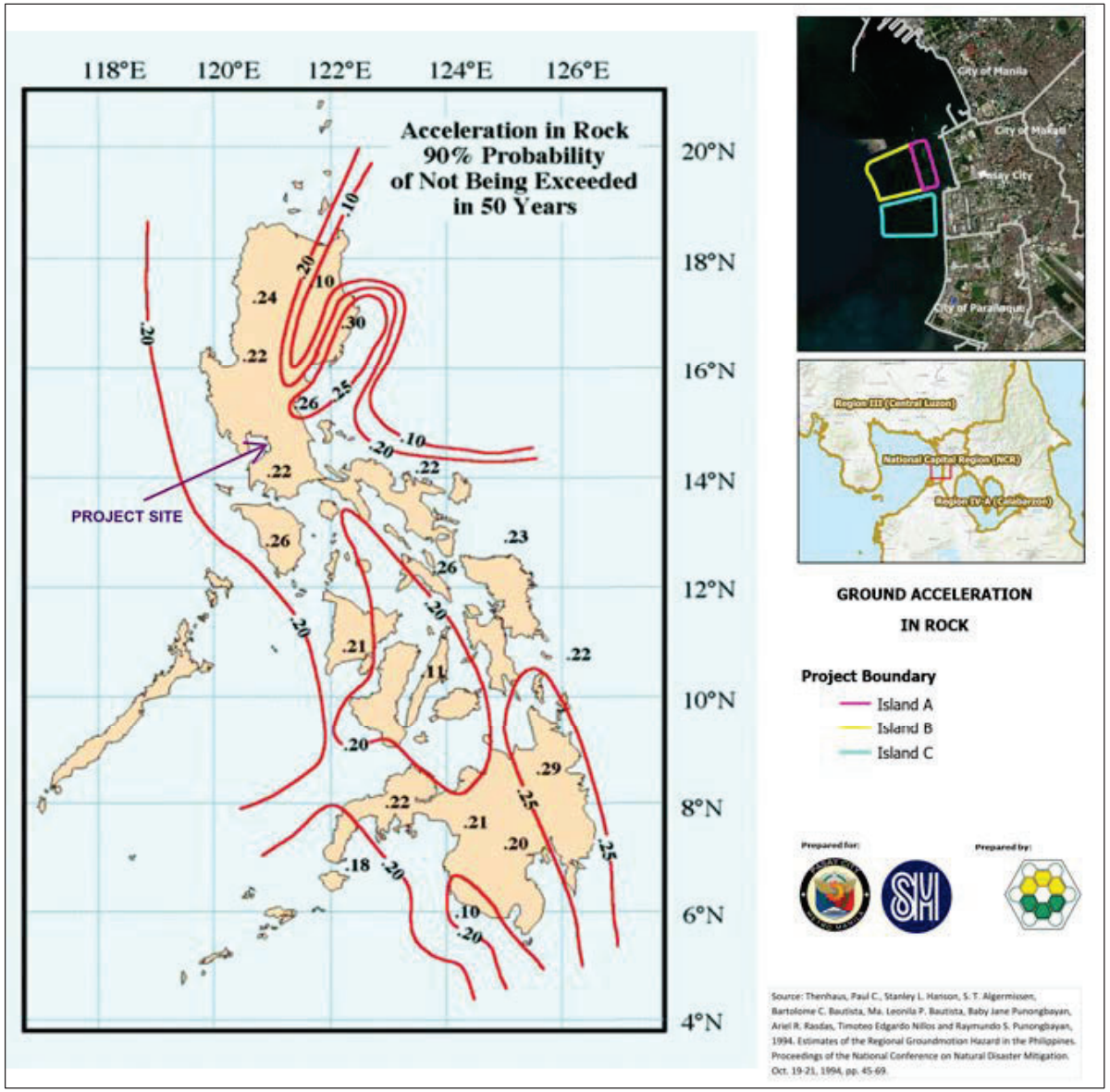


Figure 2.25 Ground Acceleration in Rock
Source: Thenhaus, et al, 1994

Design Earthquake. The Philippine Fault is such a major fault that it is capable of generating a rare magnitude 8.0 earthquake. Magnitude 7.5 or 7.8 earthquakes might be more reasonable as design earthquake.

Peak Ground Acceleration. Assuming a distance of 67 km from the project area to the Philippine Fault, peak ground accelerations are estimated for different design earthquakes (magnitudes 7.0, 7.5, 7.8, 8.0) and foundation conditions (rock, hard soil, medium soil, soft soil). Ground accelerations from earthquakes that can be generated from the West Valley Fault, Lubang Fault, and Manila Trench were also estimated. Excessively high acceleration values can be expected particularly from those earthquake generators which are relatively close to the project area.

Table 2.14 presents the Computed Ground Acceleration (using Attenuation Model of Fukushima and Tanaka) for earthquake magnitudes of 8.0, 7.8 and 7.5 and 7.0 for different foundation conditions.

Table 2.14 Computed Ground Acceleration (using Attenuation Model of Fukushima and Tanaka) for Earthquake Magnitudes of 8.0, 7.8, 7.5, and 7.0 and Different Foundation Conditions

Earthquake Generator	R	M	PGA	Rock	Hard Soil	Medium Soil	Soft Soil
West Valley Fault	8.0 km	8.0	0.528	0.317	0.459	0.565	0.734
	8.0 km	7.8	0.516	0.309	0.449	0.552	0.717
	8.0 km	7.5	0.493	0.296	0.429	0.528	0.686
	8.0 km	7.0	0.447	0.268	0.389	0.478	0.621
Philippine Fault	67 km	8.0	0.179	0.108	0.156	0.192	0.249
	67 km	7.8	0.162	0.097	0.141	0.173	0.225
	67 km	7.5	0.136	0.082	0.119	0.146	0.189
	67 km	7.0	0.098	0.059	0.086	0.105	0.137
Lubang Fault	75 km	8.0	0.158	0.095	0.138	0.170	0.220
	75 km	7.8	0142	0.085	0.124	0.152	0.198
	75 km	7.5	0.119	0.071	0.103	0.127	0.165
	75 km	7.0	0.085	0.051	0.074	0.091	0.118
Manila Trench	200 km	8.0	0.031	0.019	0.027	0.033	0.043
	200 km	7.8	0.027	0.016	0.023	0.029	0.037
	200 km	7.5	0.021	0.013	0.018	0.023	0.030
	200 km	7.0	0.014	0.008	0.012	0.015	0.020

Computation based on the Attenuation Model of Fukushima and Tanaka, 1994

Note: the distances of these earthquake generators were taken from the EIA report of the proposed 360 Hectares Reclamation Project.

Liquefaction

Liquefaction is a process that transforms the behavior of cohesion-less soil from a solid to a liquid (Seeds, 1979). It usually affects loosely-packed and water-saturated sediments. Liquefaction occurs in water-saturated unconsolidated sediment due to shaking. In areas underlain by such material, the ground
causes the grains to lose grain to grain contact, and thus the material tends to flow.

In areas underlain by loosely compacted, water-saturated fine sediments such as sand and silt, strong ground vibrations could also cause the underlying foundation to temporarily assume a semi-liquid behavior. Such process is called liquefaction. The July 16, 1990 earthquake has

opened opportunities to better understand the liquefaction phenomenon. The studies conducted by Torres and others in 1990 had identified and characterized at least three sedimentary environments that are favorable to liquefaction to take place, namely, 1) deltaic (e.g. Dagupan City and Aringay, La Union), alluvial plain (e.g. Tarlac), and sandpit environment (e.g. Agoo, La Union). Typically, these environments are characterized by the presence of thick accumulation of fine sediments that are water-saturated.

Metro Manila has suffered liquefaction in certain areas of the city in many of earthquakes that have affected it. Several occurrences of liquefaction within a certain area in Manila particularly near the vicinity of Pasig River were recorded in the past.

The identified liquefaction-prone areas have characteristically shallow water table (3 m or less) with thick (10m or more) piles of water-saturated fine sediments (sand to clayey sand). These areas are those on the shore areas of Manila including the newly-reclaimed areas, the Pasig River delta plain, the Marikina alluvial plains and those lying on the floodplain deposits and abandoned meanders of the Pasig and Marikina rivers. Various points within these areas have been subjected to liquefaction in the past and are therefore likely to be affected again in the future (Besana and Daligdig, 1993).

Liquefaction is generally accompanied by *differential settlement* as a result of withdrawal of materials beneath the ground surface. Buildings, houses and other structures built with no special engineering designs against this hazard tend to settle or sink as the underlying foundation losses strength. These structures normally remain intact though some may tilt. Sand fountaining, lateral spreading, and ground undulation which may also cause damage to roads, bridges and other infrastructures are some of the effects associated to liquefaction.

Figure 2.26 shows the sites of historical liquefaction in Metro Manila while Figure 2.27 and Figure 2.28 show the Liquefaction Potential in Metro Manila and the Liquefaction Potential Areas within the Vicinity of the Project Area.

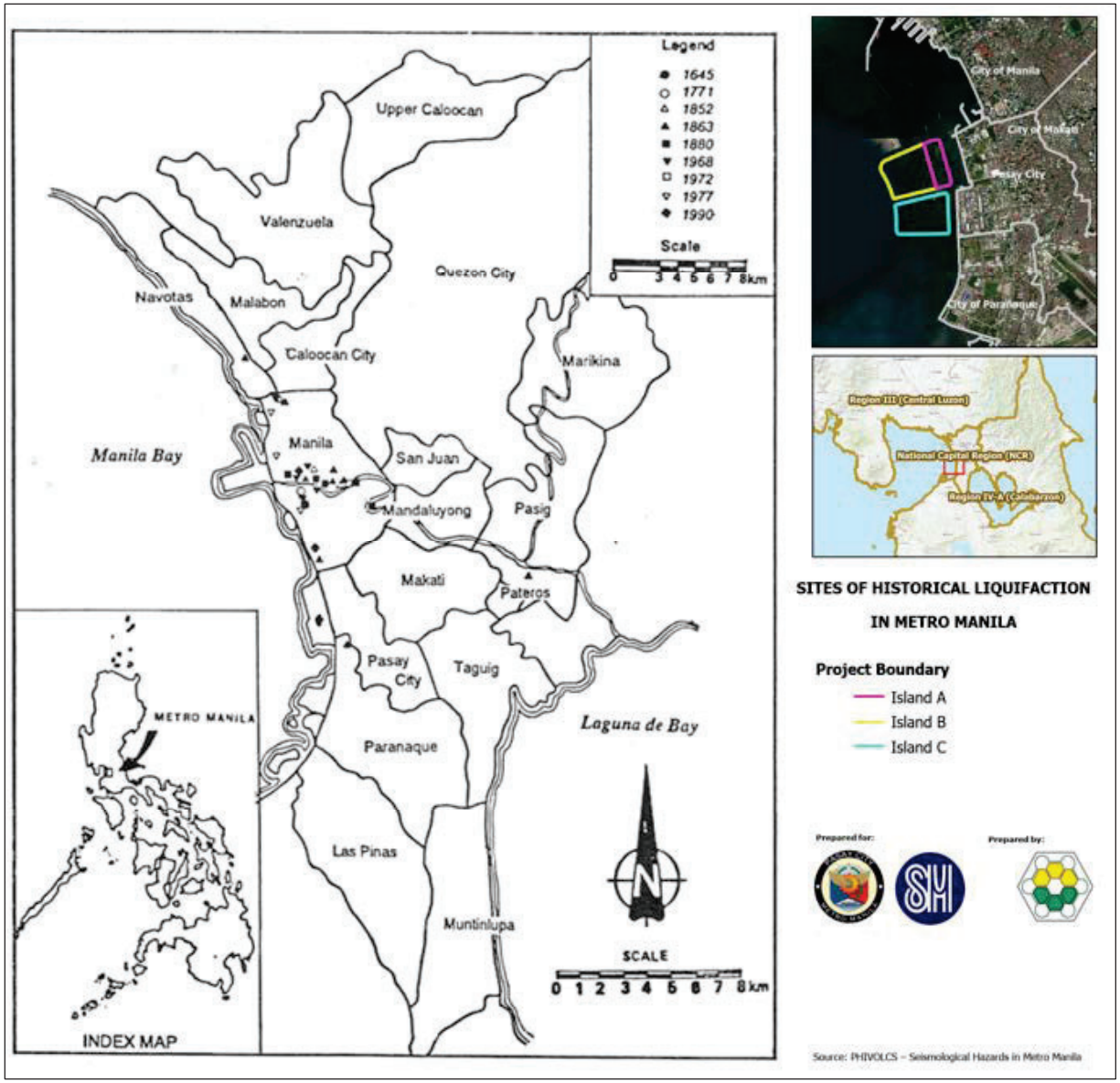


Figure 2.26 Sites of Historical Liquefaction in Metro Manila
Source: PHIVOLCS – Seismological Hazards in Metro Manila, 1993

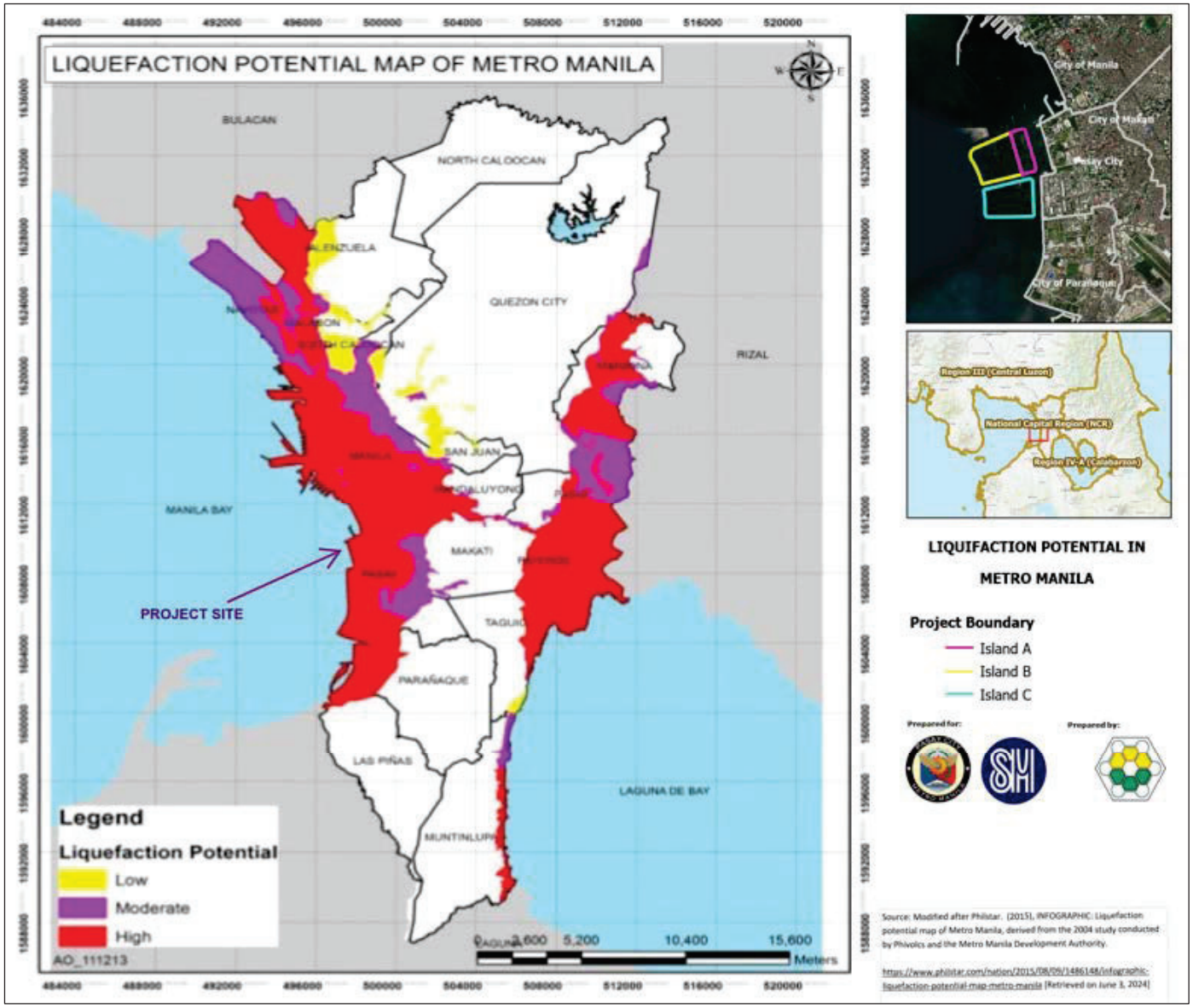


Figure 2.27 Liquefaction Potential in Metro Manila
Source: Modified after Philstar, 2015

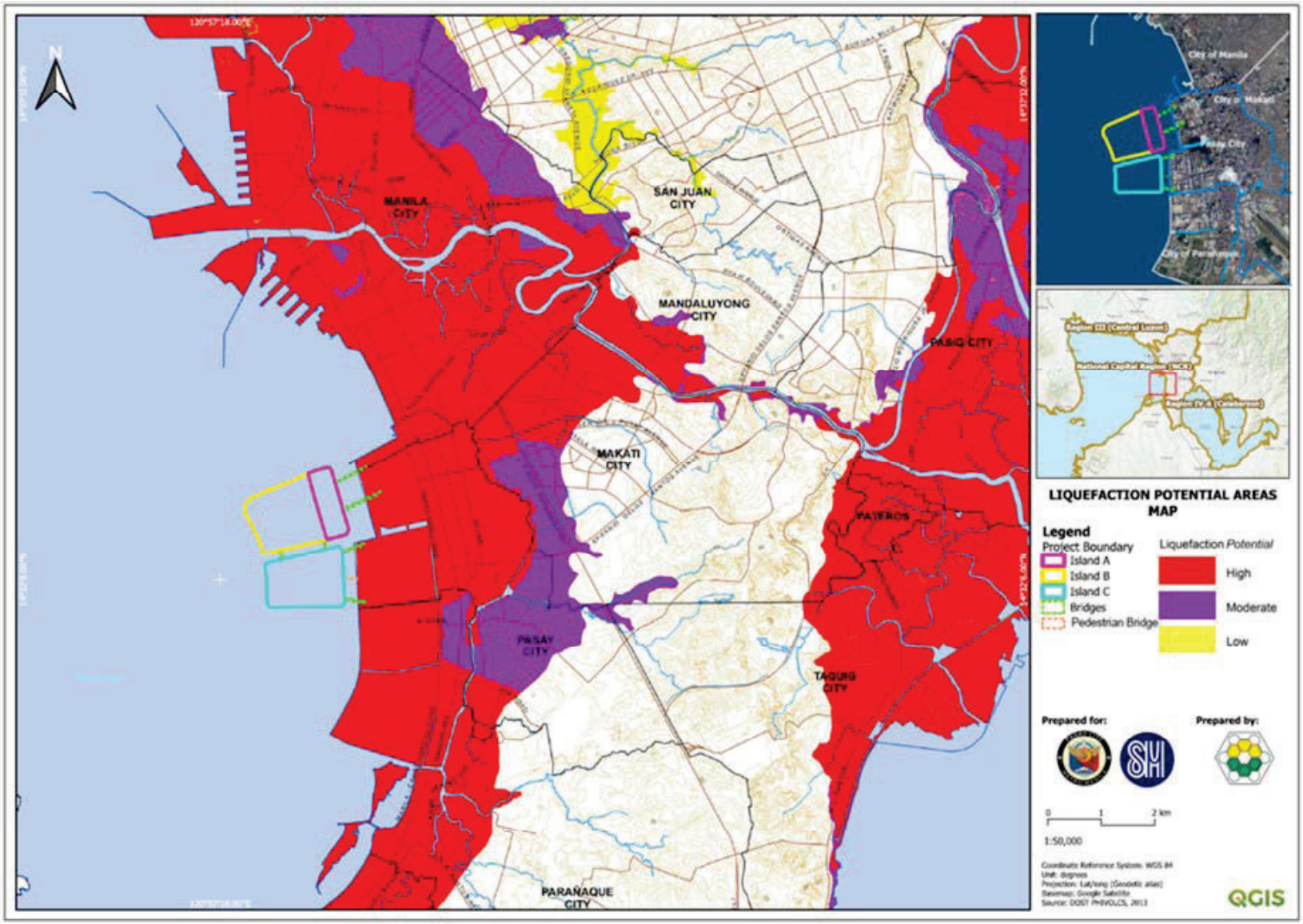


Figure 2.28 Liquefaction Potential Areas within the Vicinity of the Project Area
Source: DOST PHIVOLCS 2013

Subsidence / Settlement

Subsidence is the motion of a surface (usually, the earth's surface) as it shifts downward relative to a datum such as sea level. Land subsidence can occur in various ways during an earthquake. Large areas of land can subside drastically during an earthquake because of offset along fault lines. Land subsidence and/or differential settlement can also occur as a result of settling and compacting of unconsolidated sediment from the shaking of an earthquake.

Land subsidence which is generally attributed to excessive groundwater extraction has been experienced not only in Metro Manila but also in many neighboring countries. In geotechnology, ground subsidence or settlement reduction in volume or consolidation is conveniently thought of as having primary and secondary components where, with the exception of highly organic soil, the primary component predominates. It is caused by the gradual removal of pore water due to superposed loads or by the reduction of pore pressure itself due typically to excessive groundwater extraction.

it is important to note that the project will not undertake ground water extraction. Hence, the project will not cause or contribute to land subsidence. During the reclamation phase, there will be minimal water usage such being accounted for by the needs of the construction workers, the reclamation works being a “dry process”.

In areas of Manila where the thickness of the soft soil may be anywhere from less than ten to thirty meters, subsidence is much less because it is mainly due to secondary consolidation. Most importantly, the technology exists from reliably estimating and taking into account ground subsidence in the area proposed to be reclaimed.

During the reclamation phase whereby based on geotechnical investigation the appropriate methodology will be accordingly adopted. Soil consolidation shall be duly undertaken. The reclaimed land will necessarily have to be stabilized prior to construction of both horizontal and vertical structures during the operations phase.

Tsunami

Tsunami or giant sea waves are produced as a result of faulting under submarine conditions at shallow depths. Tsunami can also be triggered by submarine landslides, volcanic eruptions and movements along subduction zones. Areas vulnerable to this hazard are the coastal zones fronting an open sea. The edge of the cities fronting Manila Bay may be exposed to potential tsunami.

Tsunami and earthquakes can happen anytime around the Pacific Ring of Fire - from California up and around Alaska down through Japan, Taiwan, the Philippines and Indonesia.

The Philippines is no stranger to earthquakes - the Philippine archipelago was largely created by the tectonic squabble between the Eurasian and Pacific plates, forming the Philippine Plate as a distinct entity.

Tsunamis in the Philippines are extremely rare. The last significant tsunami in the Philippines occurred in the Verde Island Passage (between Batangas and Mindoro Island and affecting Puerto Galera) in 1976. The tsunami wave was minor (only 2-3 meters) when it reached land. Because tsunami in the Philippines are so rare, those who were drowned were actually opportunist beachcombers who were interested to extract goodies from the suddenly exposed deep coral pools, not realizing that the tsunami wave would follow the rapidly receding water (Besana and Dalidig, 1993)

Remarkable historical tsunamis that have affected Manila were those generated by the 1677 and 1863 earthquakes, possibly from the Manila Trench. During the 1677 event, Repetti (1946) reports of boats at sea almost submerged by waves. For the 1863 earthquake, a large wave coming from Manila Bay was reported by the same writer. Other accounts of the latter event describe a retreat of the sea and a subsequent rise in the height of incoming waves. In both cases there were no reports of any damage along the coastal areas of Manila.

The apparent low vulnerability of Metro Manila in terms of this hazard is attributed to the following factors.

1. The narrow configuration of the mouth of Manila Bay has an over-all abating effect to the incoming tsunami wave thus lessening any tsunami impact on the project area. However, coastal areas along the adjoining provinces of Cavite and Bataan near the mouth of Manila Bay are more likely to be highly-prone to this hazard.

2. The presence of the Island of Corregidor near the mouth of Manila Bay likewise tends to deflect and abate the effects of incoming tsunami waves.

3. For any moderate to strong tsunami to significantly affect Metro Manila, the earthquake source or hypocenter should be within the Manila Bay itself. Even considering a modest dip of 45° for the subducting layer of the Manila Trench, such a situation is highly unlikely as the descending tectonic slab would be too deep as an earthquake source and consequently too weak to generate a sizable tsunami.

Figure 2.29 presents the tsunami prone areas in the Philippines.

The paper of Dr. Renato U. Solidum, Jr. “Earthquake Hazards and Risk Scenario form Metro Manila and Vicinity: The Need for Whole of Society Preparedness May 20, 2015” gives the scenarios below on worst events of tsunamis in Manila Bay. Maps of the Tsunami Hazard for Manila Bay and that of Pasay City are shown in Figure 2.30 and Figure 2.31, respectively while a “Tsunami Scenario M 8.3 Earthquake from Manila Trench” is given in Figure 2.32.

From these references, the following are deduced:

- The potential of tsunamis in Manila Bay and at/near the project site may occur such as in scenarios of strong earthquakes.

- Tsunami heights of 3.5 m above mean sea level may be expected.

- An arrival time of more than 1 hour would provide time for emergency and contingency measures. It may also be noted that the coasts of Manila Bay are not directly exposed to the Sea (The South China Sea) and are well protected with the narrow entry

passage at the mouth of the bay and the Corregidor Island serving as a buffer. Hence tsunamis traveling through the Sea would tend to be dissipated.

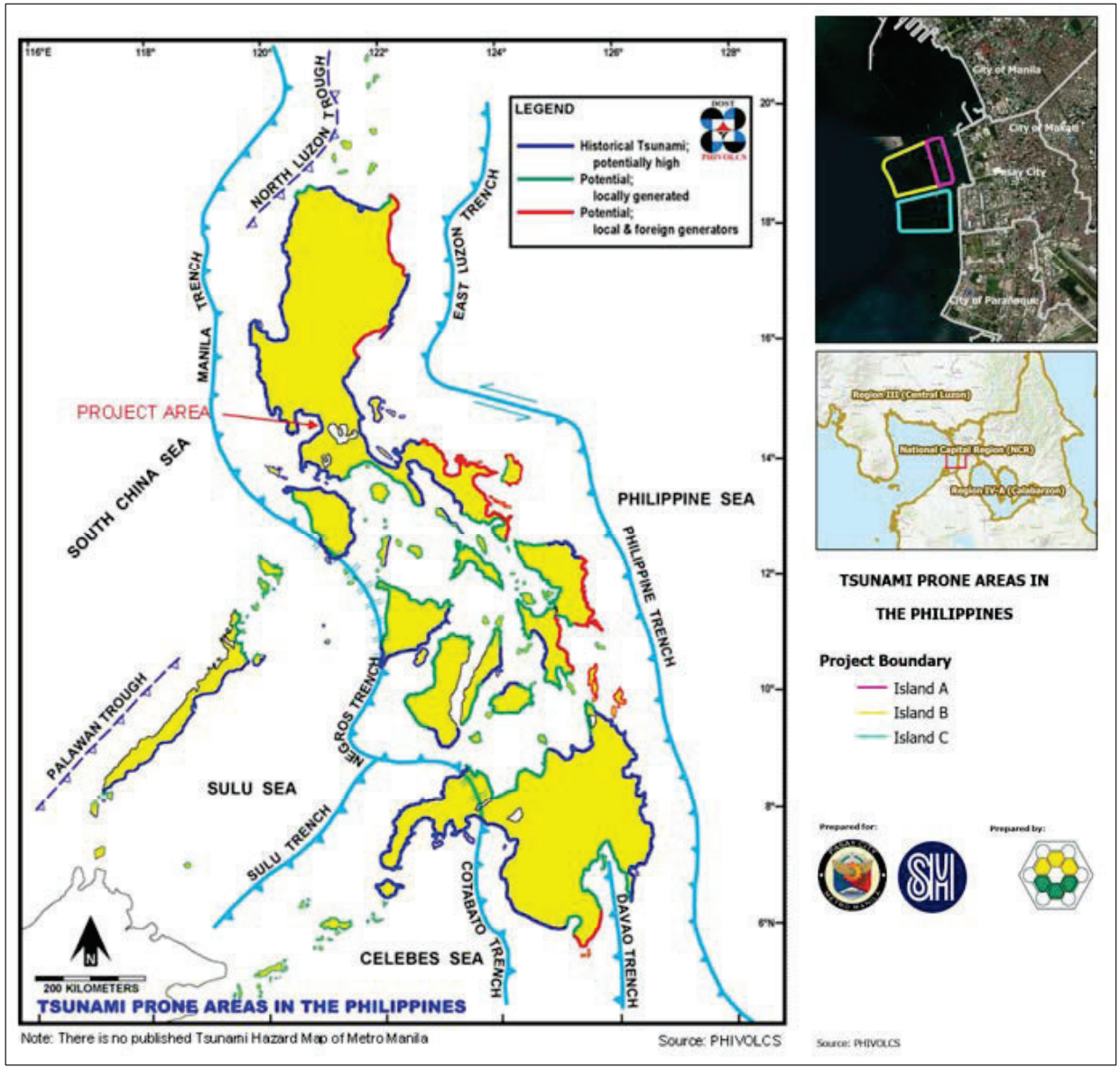


Figure 2.29 Tsunami Prone Areas in the Philippines
Source: PHIVOLCS , 1993

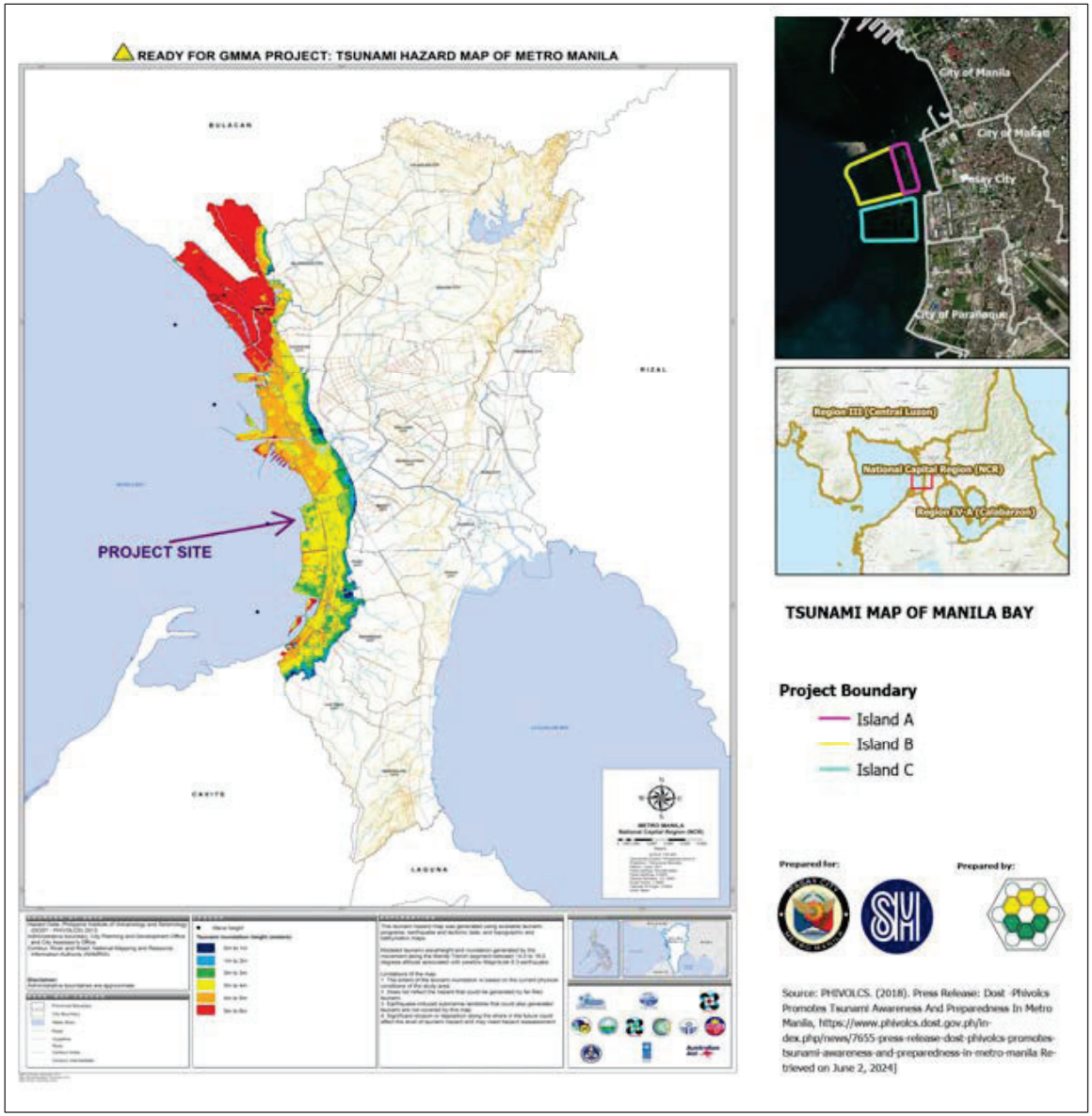


Figure 2.30 Tsunami Map of Manila Bay
Source: PHIVOLCS , 2018

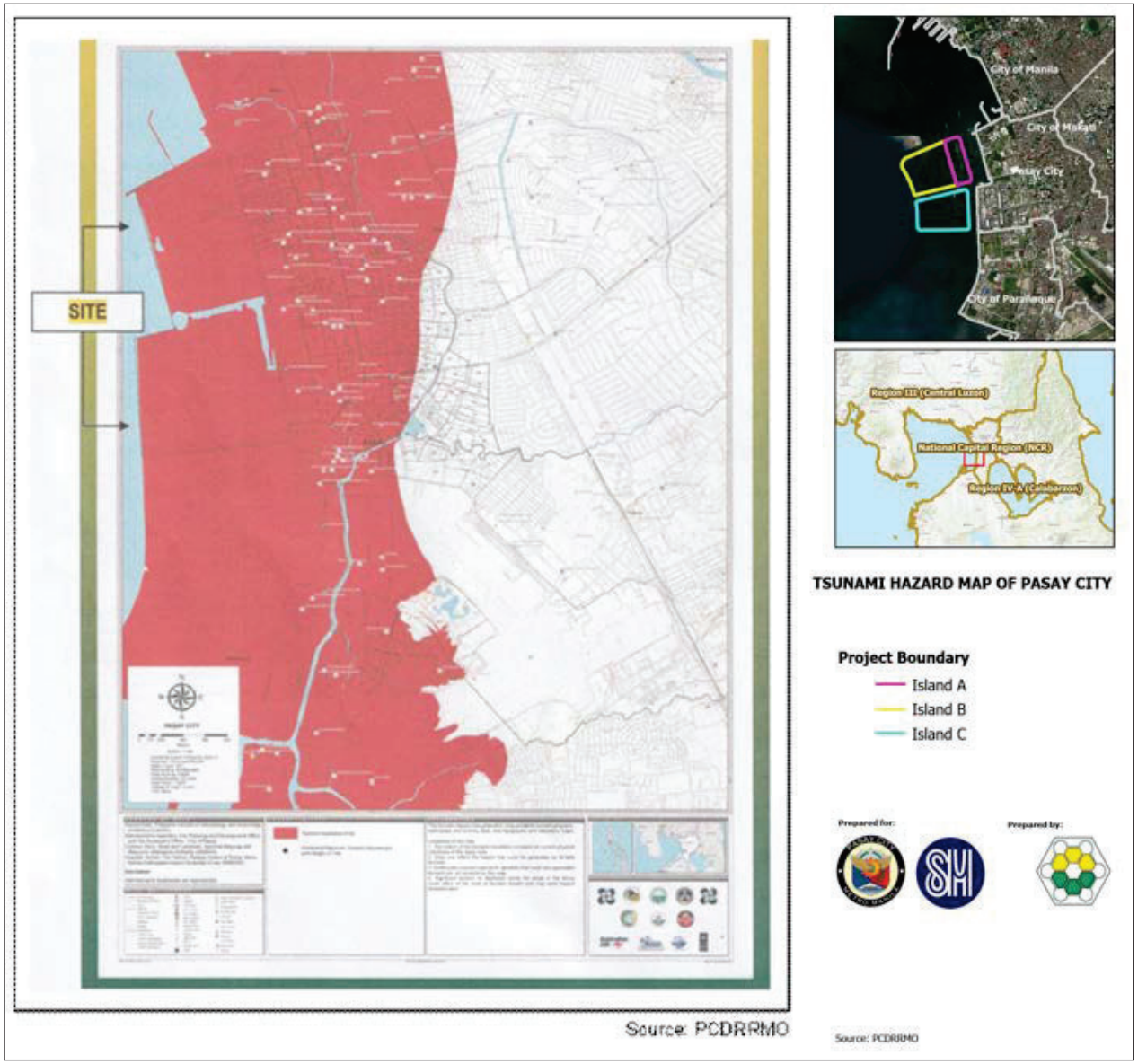


Figure 2.31 Tsunami Hazard Map of Pasay City
Source: Pasay City Disaster Risk Reduction and Management Office , 2014

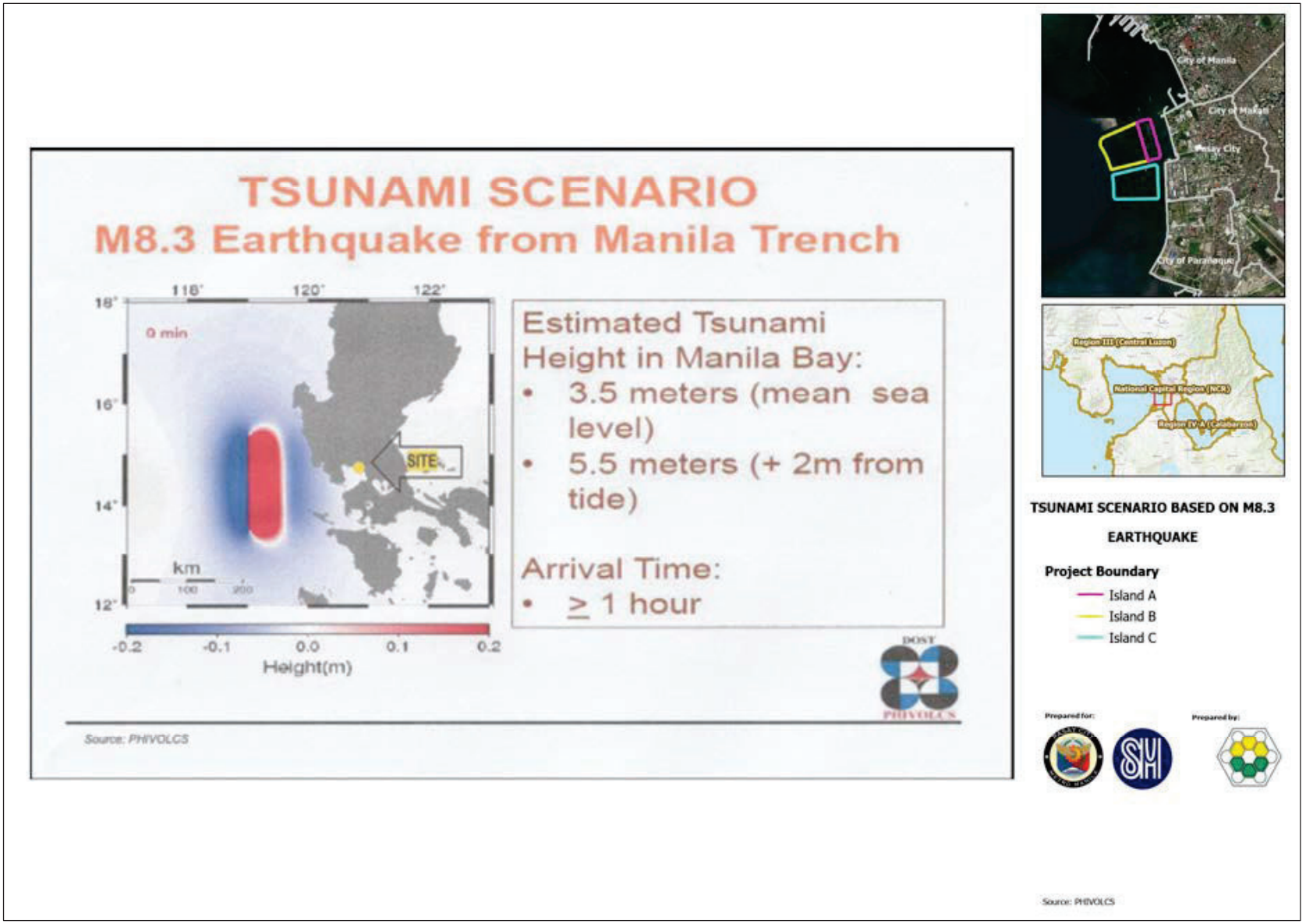


Figure 2.32 Tsunami Scenario Based on M8.3 Earthquake
Source: PHIVOLCS, and EIS for the Proposed 360 Hectares Reclamation Project, 2017

2.1.2.1.C.1.3. VOLCANIC HAZARDS

Most of the hazards associated with the eruptions of Mount Pinatubo and Taal Volcano with the exception of ashfall, are very much localized and are generally confined within the immediate vicinities of these two volcanoes (Besana et. al., 1993).

A violent eruption of Mount Pinatubo and/or Taal Volcano which may result into a base surge or a rapid expanding cloud at the base will definitely has severe effect at the areas close to them.

Only a minor quantity of ash has affected Pasay City based on the review of the extent of impacted areas from the largest eruptions of Mount Pinatubo. It is thus conceivable that should Mount Pinatubo will erupt with the same magnitude in the future, the same level of ashfall impact is expected to likely affect the island (Besana et. al., 1993).

The 1911 eruption of Taal Volcano killed about 1,300 and wounded 800 people. The solid ejecta produced by the 1911 eruption which was estimated to be around 80,000,000 million cubic meters spread over an area of 230 km^2 while ashes spewed from the volcano reached as far as Manila and nearby provinces (Besana et. al., 1993).

The 1965 eruption killed 180 people and displaced some 55,000 evacuees from the Volcano Island and nearby settlements surrounding Taal Lake. Eruption clouds rose 15 – 20 km high, depositing fine ash on downwind areas up to 80 km away. The eruption blanketed an area of about 60 km^2 with 25 cm of ash (Besana et. al., 1993).

Based on the recorded hazards associated with the eruption of Taal Volcano, the project area being 58 km away from the said volcano could only experience minor ashfall (Besana et. al., 1993).

2.1.2.1.C.1.4. HYDROLOGIC HAZARDS

2.1.2.1.C.1.4.1. FLOODING

Flooding is usually caused by heavy rains accompanying typhoons or the southwest monsoons. Flooding is a chronic problem, affecting large areas in Metro Manila, especially the low-lying areas like Pasay City. Because of the local climate condition, the city is experiencing an several flood events yearly, although only a few of these caused severe damage (Besana and Dalidig, 1993).

In Metro Manila, floodwater is usually due to excessive rainf all particularly during the months of May to November when the southwest monsoon coincides with the typhoon season. (Besana and Dalidig, 1993).

The flooding problems in Metro Manila are aggravated by rapid urbanization, inadequate or non-existent of drainage system, improper waste disposal, low river capacity and lack of maintenance, tidal transgression, reclamation activities and storm surges, squatter settlements, and constraints in the implementation of proper flood control facilities and countermeasures.

A Flood Susceptibility and Flood Risk Map is presented in Figure 2.33, The project site depicted on these maps is adjacent to low flood susceptibility and low risk to flooding areas.

The project does not block, impede nor disturb the drainage system from the Pasay City mainland, and thus has no impact on the occurrence of flooding in Pasay City and nearby areas. The water between the reclamation and the shore and the northern boundary of the other reclamation area provide a much wider drainage area than that of the Libertad Channel itself. The other cause of flood is storm surge; that could bring about flood waters from the sea. In fact, the proposed project could shelter the in-shore areas from floods. Further, flooding will not impact on the reclaimed land itself because of the high finished platform level of at least 4 MLLW.

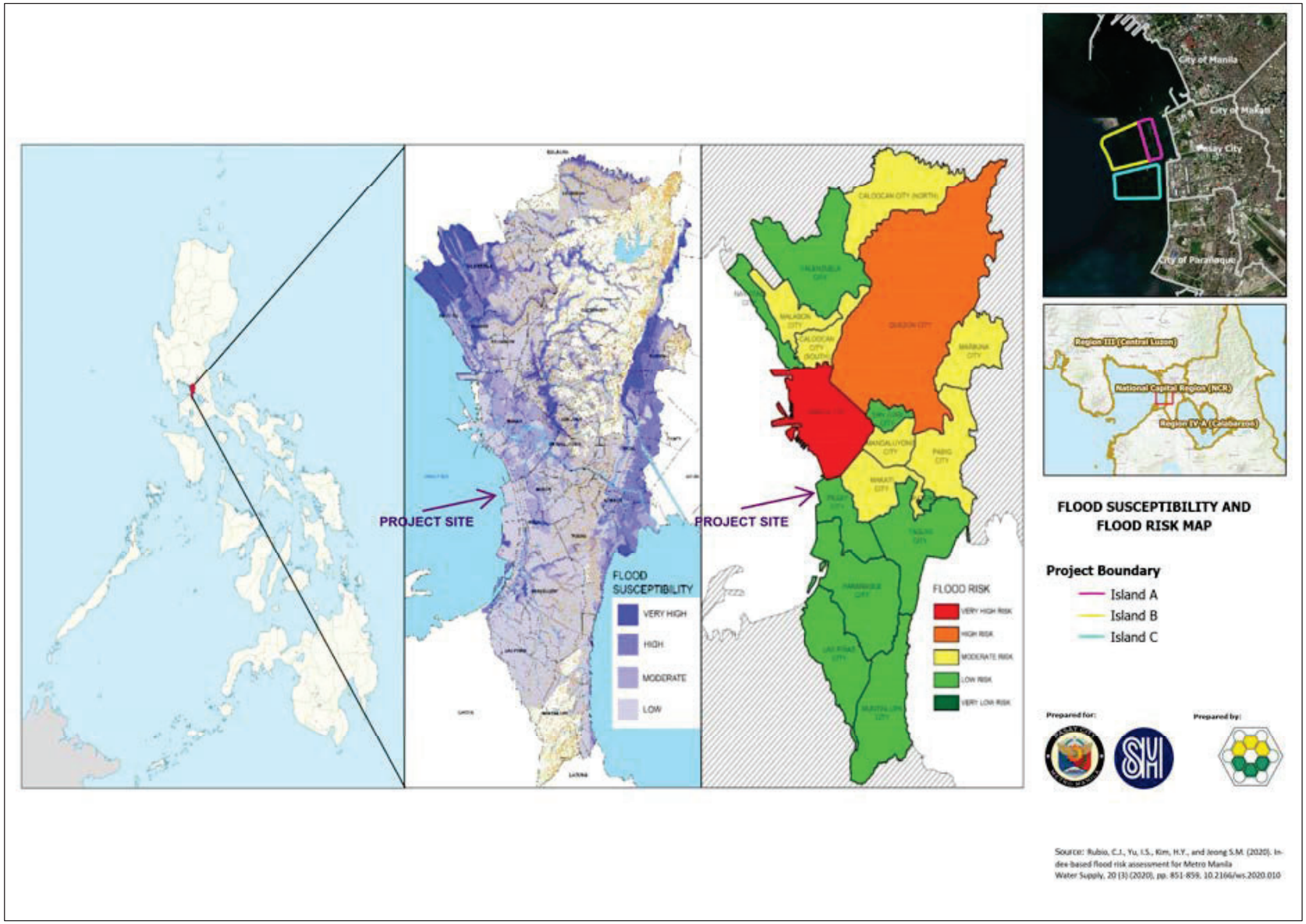


Figure 2.33 Flood Susceptibility and Flood Risk Map
Source: Rubio et al, 2020

2.1.2.1.C.1.4.2. STORM SURGE

Storm surge refers to the temporary increase at a particular locality in the height of the sea due to extreme meteorological conditions such as low atmospheric pressure and/or strong winds. It is caused primarily by strong winds pushing on the ocean's surface causing the water to pile up higher than the ordinary sea level. The rise in water level due to the combined force of storm surge and normal tides could cause severe flooding in coastal areas.

Due to the combination of coastal configuration and seasonal wind regime, waves generated during the rainy southwest monsoon also raise tide levels by as much as 80% at the northern end of Manila Bay (Siringan and Ringor, 1998). Waves three meters high can be generated even along the limited western fetch. Southerly wind speeds at Manila can exceed 220 kph and waves 3.7 meters high have been recorded at Manila's port. PAGASA unpublished records show storm surges occurred seven times between 1960 and 1972 (Rodolfo and Siringan, 2003).

Recent storms demonstrated wind induced waves breaking at the seawall of the reclamation area and Roxas Boulevard covering the strip with garbage. Portions of the seawall along Roxas Boulevard suffered damage due to consistent pounding of the waves.

As seen during Typhoon Pedring and reported other named and unnamed typhoons, Manila Bay coastline is considered highly vulnerable to storm surges and coastal floods.

Table 2.15 presents the different reported storms surges that affected Manila Bay.

Table 2.15 Storm Surges that Affected Manila Bay

Date of Occurrence	Associated Tropical Cyclone	Surge Height (m)	Affected Areas	Casualties	Damage
June 29, 1589	Unnamed Typhoon	-	Manila Bay	-	-
August 29, 1863	Unnamed Typhoon	-	Manila Bay	-	Destroyed Bagumbayan Drive due to inundation. Several houses were destroyed
September 20-26, 1867	Unnamed Typhoon	-	Manila Bay	-	17 ships were tossed onto Santa Lucia and Tondo shores
November 19, 1970	Typhoon Yoling	4	Manila Bay – Southeast	-	Destroyed $40M properties, sank 21 fishing boats
June 23-25, 1972	Typhoon Konsing	-	Manila Bay	1	Several ships were washed ashore
July 2, 1983	Typhoon Bebeng	4	Bataan and at least 10 villages	182	49,000 houses

Date of Occurrence	Associated Tropical Cyclone	Surge Height (m)	Affected Areas	Casualties	Damage
			on Manila Bay's western bank		
September 26-28, 2011	Typhoon Pedring	6	Coastal Areas of Manila Bay, Barangay San Rafael 3 and 4 in Cavite	12	Damaged the breakwater and seawall along Roxas Boulevard
October 11, 2013	Typhoon Santi	-	Manila Bay	-	-

Source: Project NOAH – Compilation of Storm Surge occurrences in the Philippines, Feb. 4, 2014

Super typhoon Yolanda reportedly was the strongest typhoon in the world to hit land wrought havoc on Tacloban City on November 8, 2013 (Reference: Storm Surges Background,: Technotrix Consultancy Services Inc., 2017 and Solidum, 2015). The said typhoon caused storm surges causing flood waters reaching to up to ten feet. This disaster event has caused unfounded fears that similar disasters might strike the coast of Manila Bay. On the other hand, it has raised awareness on impacts of storm surges/waves on coastal areas.

As to whether the proposed reclamation will in fact exacerbate a potential scenario of a storm surge resulting from a strong typhoon making landfall in the coast of Manila Bay especially in the project site or immediate environ, following are the science-based facts deemed relevant for understanding such storm surges:

- Storm surges, storm waves and similar phenomenon are site and precursor specific (e.g. typhoon). The recent Tacloban "storm surges" brought about by Super typhoon Yolanda have been irrelevantly used creating unnecessary fear on Manila Bay and the project.
- Waves/surges can occur with or without the reclamation project.
- There is no direct comparison between Tacloban and Manila Bay because:
    - The Tacloban Bay water has larger surface area than Manila Bay;
    - It has wider opening (55 km) thus allowing bigger volumes of water to enter the coastal areas;
    - It is shallower than Manila Bay (depth of almost -2 to -4 m), and hence much higher surge;
    - The funnel shape concentrates surge at Tacloban;
    - Typhoon intensity changes as the event passes over the higher topographic elevations of Luzon. The comparison is illustrated graphically in Figure 2.34.

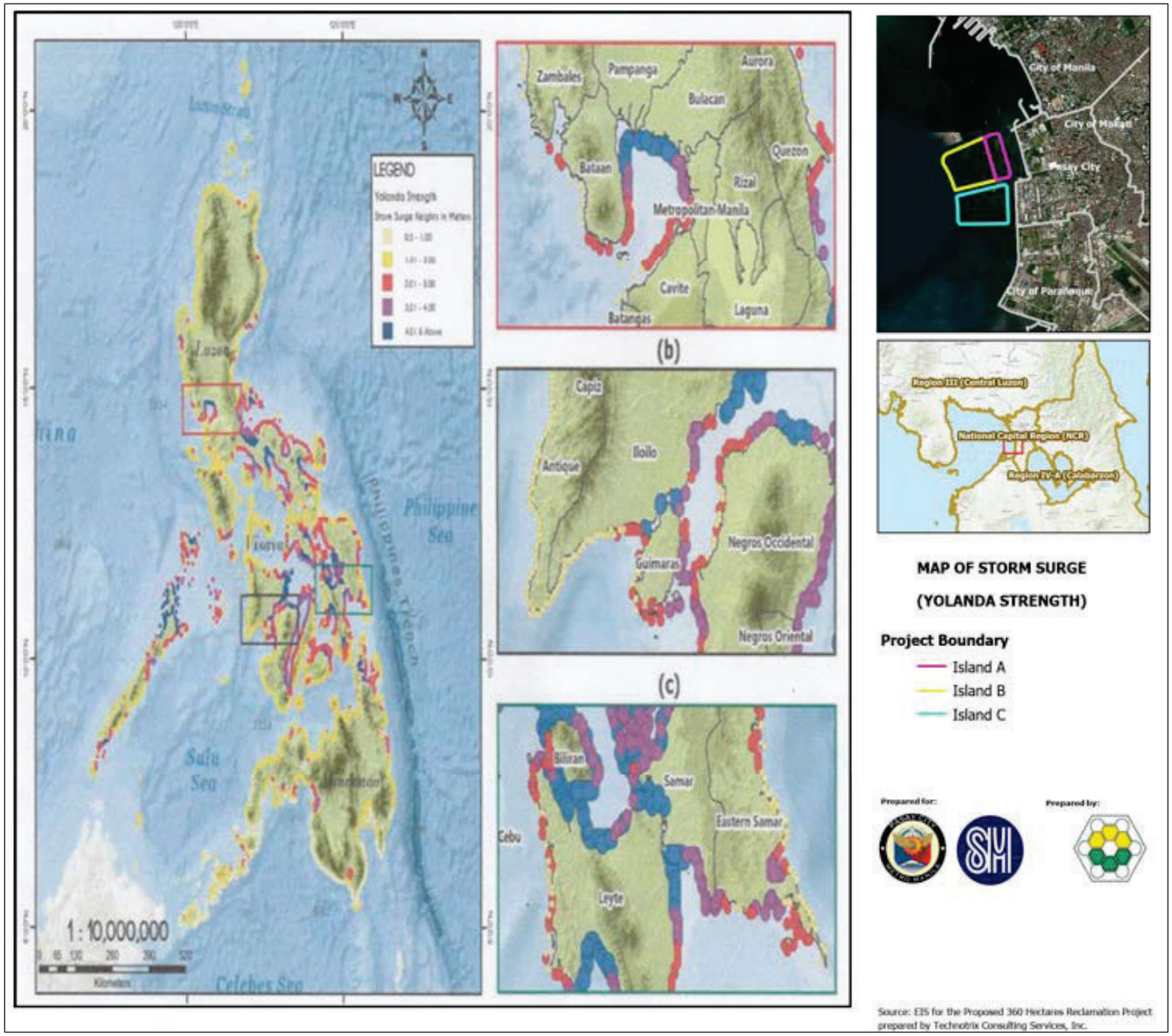


Figure 2.34 Map of the Storm Surge (Yolanda Strength)
Source: Technotrix Consultancy Services Inc., 2017 and Solidum, 2015

2.1.2.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

Change in surface landform/topography/ terrain/slope, Change in sub-surface/ underground geomorphology

The sub-surface geology will experience changes but in the nature of enhancement because of the replacement of portion of the sea bed with fill materials. The extent of which will follow the recommendations of the geotechnical investigation, hydrodynamic modelling, flood study and EGGAR.

No changes in the onshore portion as the Project is a reclamation. Only the coastal geomorphology will change due to excavations of undesirable soil materials which will be replaced by good quality sands.

Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.

It is important to note that the project will not undertake ground water extraction. Hence, the project will not cause or contribute to land subsidence. During the reclamation phase, there will be minimal water usage such being accounted for by the needs of the construction workers, the reclamation works being a “dry process”.

In areas of Manila where the thickness of the soft soil may be anywhere from less than ten to thirty meters, subsidence is much less because it is mainly due to secondary consolidation. Most importantly, the technology exists from reliably estimating and taking into account ground subsidence in the area proposed to be reclaimed. The very soft clayey silt and clay encountered at the proposed areas to be reclaimed which are of poor quality will be excavated and replaced with good quality sand. The reclaimed area will be raised to a height, above mean sea level.

Based on available geotechnical/soil investigation report, the project area is underlain by very loose to loose sand with very soft to soft silt from top to depth of 12 meters to 15 meters in some locations. From these depths the soils down to 15 meters and 16.5 meters are either hard silt or very dense gravel followed by highly fractured, weathered siltstone and/or sandstone. In its natural conditions the soils are subject to subsidence and liquefaction. The undesirable soils at the upper 15 to 16.5 meters will be excavated and replaced by good quality sand which will be subjected to compaction (including application of pre-fabricated sand drains and surcharge). During the reclamation phase whereby based on geotechnical investigation the appropriate methodology will be accordingly adopted. Soil consolidation shall be duly undertaken. The reclaimed land will necessarily have to be stabilized prior to construction of both horizontal and vertical structures during the operations phase. The reclaimed area can only be used if it has already reached the required degree of compaction. The compacted sands can already be considered as very dense sands.

The existing subsoil and fill material have been assessed for liquefaction potential through the EGGAR and DED. The existing subsoils are clay and not liquifiable. The reclamation fill is granular and is liquifiable if not improved. The construction specifications include compaction

requirements to densify the fill and prevent liquefaction. Prefabricated Vertical Drain (PVD) and Surcharging are methods part of the Soft Soil and ground improvements. These are part of the works required to accelerate consolidation, reduce residual settlement, improve geotechnical stability and reduce susceptibility for liquefaction. PVD is installed for the acceleration of the design settlements and enhance the strength of the soil by assisting in the drainage of water which allows the soil to consolidate faster. Temporary surcharge will be then placed in combination with PVD to meet the residual settlement requirement. The temporary surcharge load will further accelerate the consolidation process (SA2 2023 CMVR & Royal HaskoningDHV, DED Report, 2019).

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.16 Impact Analysis and Environmental Management - Geology/ Geomorphology

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Potential Impacts: • Change in surface landform/geomorphology/ topography/ terrain/slope • Change in sub-surface geology/underground conditions • Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.					
Pre-Construction – Geotechnical and Feasibility Study Reclamation (construction of islands) and horizontal development (PVDs, construction of storm drainage, etc.)	2017 to 2024 2021 to 2028	Reclamation itself provides protection against storm surges and thus against floods. Flood water pathways in Pasay is NOT directed towards the project area. (Per the NOAH Project) Engineering intervention: structural and engineering designs to	EGGAR (2017) Geotechnical Interpretation Report (2017) Hydrodynamic study (2017 and 2024) Flooding Impact Study (2024)	Preparation and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves All storm drainage system designs will comply with the latest editions	Part of development cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
		withstand earthquakes and liquefaction. Phil. standards		of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines. Installation of vertical containment structure, wave deflector, vertical drains, platform elevation, Prefabricated Vertical Drain (PVD) and Surcharging methods which are part of the Soft Soil and ground improvements Implementation of a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years.	

2.1.3. SOIL AND PEDOLOGY

2.1.3.1. BASELINE DATA

2.1.3.1.A. SOIL EROSION / LOSS OF TOPSOIL/OVERBURDEN AND CHANGE IN SOIL QUALITY / FERTILITY

The geotechnical investigations/studies undertaken for the Four E-com Building at the Mall of Asia adjacent to the proposed reclamation sites were initially used in assessing the possible subsurface conditions at the project area.

The said geotechnical investigation gave the following results.

Table 2.17 Subsurface Conditions at BH-1

Depth (m)	Soil/Rock	SPT N-values	Relative Density/Consistency
0.0 to 3.0	Sands (SM) and Silts (ML)	8[25]	Loose
3.0 to 13.5	Silts (ML)	2 to 14	Soft to Medium Stiff
13.5 to 18.0	Silts (ML)	[8] 26 to 30	Very Stiff to Hard
18.0 to 19.5	Silts (ML)	Refusal	Hard
19.5 to 40.0	Sandstone	Coring	Highly Fractured

Source: Geotechnical Investigation conducted by Universal Testing Laboratory and Inspection, Inc for the Four E-com Building at the Mall of Asia, 2013

Table 2.18 Subsurface Conditions at BH-2

Depth (m)	Soil/Rock	SPT N-values	Relative Density/Consistency
0.0 to 15.0	Sands (SP-SM/SM and Silts (ML/MH)	0 to 10 [20]	Very Loose to Loose Very Soft to Soft
15.0 to 16.5	Silts (ML)	Refusal	Hard
16.5 to 40.0	Siltstone	Coring	Highly Fractured

Source: Geotechnical Investigation conducted by Universal Testing Laboratory and Inspection, Inc for the Four E-com Building at the Mall of Asia , 2013

Table 2.19 Subsurface Conditions at BH-3

Depth (m)	Soil/Rock	SPT N-values	Relative Density/Consistency
0.0 to 15.0	Sands (SP-SM/SM and Silts (ML/MH)	0 to 10 [20]	Very Loose to Loose Very Soft to Soft
15.0 to 16.5	Silts (ML)	Refusal	Hard
16.5 to 40.0	Siltstone	Coring	Highly Fractured

Source: Geotechnical Investigation conducted by Universal Testing Laboratory and Inspection, Inc for the Four E-com Building at the Mall of Asia , 2013

Table 2.20 Subsurface Conditions at BH-4

Depth (m)	Soil/Rock	SPT N-values	Relative Density/Consistency
0 to 12.0	Sands (SM-SP/SM and Silts (ML/MH)	2 to 10 [49]	Very Loose to Loose Very Soft to Soft
12.0 to 13.5	Gravel (GM)	Refusal	Very Dense
13.5 to 40.0	Sandstone	Coring	Highly Fractured

Source: Geotechnical Investigation conducted by Universal Testing Laboratory and Inspection, Inc for the Four E-com Building at the Mall of Asia., 2013

Table 2.21 Subsurface Conditions at BH-5

Depth (m)	Soil/Rock	SPT N-values	Relative Density/Consistency

0 to 13.5	Sands (SM) and Silts (ML/MH)	0 to 8 [14]	Very Loose to Loose Very Soft to Soft
13.5 to 15.0	Gravel (GM)	Refusal	Very Dense
15.0 to 40.0	Siltstone		Highly Fractured

Source: Geotechnical Investigation conducted by Universal Testing Laboratory and Inspection, Inc for the Four E-com Building at the Mall of Asia, 2013

The subsurface materials encountered within the 40.0 m depth of drilling can be generalized as consisting of alluvial soils underlain by weathered rocks. This subsurface condition is consistent with the geology of the area, where alluvial sediments (also referred to as Manila Deltaic deposits) are underlain by weathered tuffaceous rocks that belong to the Guadalupe Tuff Formation (GTF), the regional bedrock.

The thickness of the alluvial layer ranges from 13.5 to 19.5 m. the soils within the upper 12.0 to 18.0 m depth are very loose to loose sands (SM) and soft silts (ML/MH) with SPT N-values ranging from 0 to 0. Transition layers (less than 2 m thick) very dense/hard soils with refusal SPT-N values (N>50) were found before the tuffaceous rocks were encountered. The soils at the transition zone are completely weathered by-products of the GTF.

Geotechnical Investigation Report

Geotechnical interpretation study has been carried out by Royal HaskoningDHV in the proposed new reclaimed land at Pasay- Parañaque area. Review was performed on the ground investigation campaign data received from geotechnical investigation by Kwan Sing Construction Corporate (KSCC) in 2016-2017 and geophysical survey by EGS in 2016.
This report attached as **Appendix E.2** updates the geotechnical interpretation study carried out in the schematic design report by taking into account the recent received data from geotechnical investigation campaign up to 9 June 2017. The geological stratigraphy beneath the site has been found to be highly heterogeneous. In particular, three main soil units and three sub-units have been defined and the geotechnical design parameters for each soil unit have been determined in this report. (Royal HaskoningDHV. GIR (2017).

2.1.3.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.22 Impact Analysis and Environmental Management - Pedology

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Soil erosion / Loss of topsoil/overburden					
Project Construction Dredging Excavation	2021 to 2026	-	Sand key dredging as part of erosion control measures is a soil replacement method which replace the soft soil by sand and that makes		Part of the Project cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Filling			the toe stable. The soft soil is dredged from the underwater center, making space for construction activities as well as water way for vessels. This process involves replacing soil up to about 30 to 40 meters deep, creating a foundation for landform. This method is especially useful in reclamation projects where the goal is to transform underwater areas into solid ground for future development. Dredged and filled materials will be properly stockpiled to avoid soil erosion or run-off.		
Change in soil quality/fertility					
Project Construction – Generation of Solid Waste during reclamation and construction of horizontal development Decommissioning of temporary facilities	2021 to 2028 2027 to 2028	Oil and lubricants (used or spent) should be collected and treated by TSD facility	All types of waste except are properly segregated and collected by an approved waste service provider Materials Recovery Facility Hazardous Waste Storage A 3rd party DENR-Accredited Waste Service Providers, such as Vertex and RMS, are contacted to collect the solid wastes for disposal to landfill. The contractor has secured memorandum of	Proper collection and segregation of solid waste among vessels, lay-down area and other areas within the project by an accredited third-party waste service provider Proper implementation of hazardous waste management plan. Collected solid waste shall be segregated and collected by a 3rd party hauler.	Part of the Project cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
			agreement with DENR-Accredited Sanitary Landfills for the transport of residual waste coming from foreign vessels and has secured disposal agreement with a waste management corporation to handle transport and disposal of residual waste.		

2.1.4. TERRESTRIAL ECOLOGY

2.1.4.1. BASELINE DATA

Comparative Summary of EIS 2017 and 2024 EPRMP Terrestrial Ecology Baseline

There were no flora and fauna assessments conducted from year 2017 to 2023 as shown in Table 2.23. In 2024, flora and fauna assessment were conducted. Although few species of flora and fauna were observed, this will serve as baseline information for future monitoring of the project area. In general, no threatened species were observed within and near the Project area.

Table 2.23: Comparative EIS 2017 and EPRMP 2024 Baseline Data of Terrestrial Flora and Fauna

Sector	EIS 2017	EPRMP 2024
Terrestrial Flora		
No. of Sampling Stations	None	Under 2 Transect Lines and 10 Sampling Stations • Original Location of Island A • MOA Seaside
Sampling Parameters	None	Abundance, Species Richness, Diversity Index, and Evenness Index

Sector	EIS 2017	EPRMP 2024
		Geographic Distribution and Conservation Status
Sampling Map	None	See **Figure 2.35**
Results	Terrestrial ecology is deemed not relevant because the reclamation works will be confined at sea.	Overall, 42 individuals were listed during the primary survey. There were 20 species recorded under 15 families. Moreover, diversity and evenness index were measured to be at H' = 1.99 and J' = 0.67, respectively. Fifty Five Percent (55%) of the 20 species were indigenous species. Exotic species was 40% and 5% were undetermined. No threatened species were identified.
Terrestrial Fauna		
No. of Sampling Stations	None	Within 2 Transect Lines • Original Location of Island A • MOA Seaside
Sampling Parameters	None	Birds were listed for the assessment
Sampling Map	None	See **Figure 2.35**
Results	None	In total, 255 Birds species were recorded under 23 species. Diversity Index is at a Low H' = 2.43, and evenness at a Very High J' = 0.78. One Endemic species was observed, which is the Philippine Pygmy Woodpecker (*Picoides maculatus*). On the other hand, 12 species were Migrant, 7 were residents and 3 were introduced species. No threatened species were identified.

2.1.4.1.A. METHODOLOGY (EPRMP)

2.1.4.1.A.1. MONITORING STATIONS

The primary survey of terrestrial flora and fauna was conducted in April 2024. Two (2) transect lines were established for terrestrial fauna. Transect 1 was situated within the Reclamation Area and Transect 2 was located along the MOA Seaside beside the coastal area of Manila Bay. On the other hand, for terrestrial flora, a total of ten (10) sampling stations were established, five (5) in each transect line. The coordinates of each established sampling

station are presented in Table 2.24 and the location of transect lines and flora sampling stations are shown in Figure 2.35.

Table 2.24 Coordinates of Each Established Sampling Plot

Station ID	Coordinates		Location
	N	E	
T1P1	14°33'14.25"N	120°58'30.4"E	Reclamation Area
T1P2	14°33'06.55"N	120°58'34.12"E	
T1P3	14°32'58.66"N	120°58'37.77"E	
T1P4	14°32'51.98"N	120°58'44.55"E	
T1P5	14°32'44.92"N	120°58'51.73"E	
T2P1	14°31'51.4"N	120°58'44.89"E	MOA Seaside
T2P2	14°32'02.7"N	120°58'44.39"E	
T2P3	14°32'11.4"N	120°58'44.1"E	
T2P4	14°32'19.39"N	120°58'43.88"E	
T2P5	14°32'27.03"N	120°58'43.48"E	

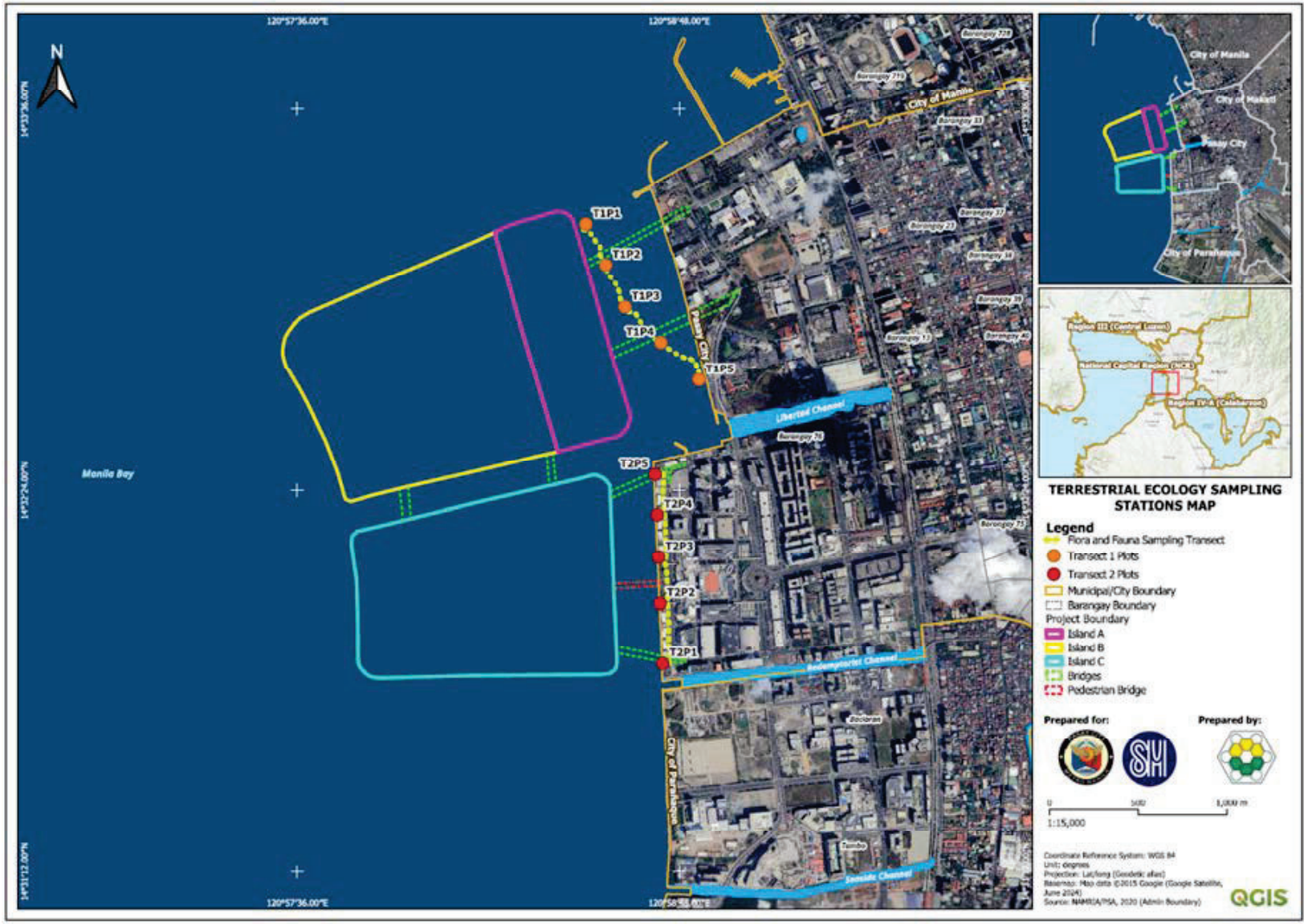


Figure 2.35 Location of Flora Sampling Stations and Transect Lines
Source/ Reference: Open Street Map, Admin Boundary – NAMRIA/PSA, 2020

2.1.4.1.B. TERRESTRIAL FLORAL ASSESSMENT

2.1.4.1.B.1. ESTABLISHMENT OF FLORA SAMPLING STATIONS

The Stratified Nested-Quadrat Method, as seen in Figure 2.36 was used in the assessment of the vegetation on the project site, where plots were established along the transect line. Dimensions of the established main plot was 10m x 10m for the assessment of the Canopy layer, listing trees with diameter at breast height (dbh) of greater than or equal to 10 cm. Inside the main plot, subplots were established to assess the intermediate and ground layers with dimensions of 3m x 3m and 1m x 1m, respectively. For the Intermediate layer, plants with dbh of greater than or equal to 5 cm but less than 10 cm were recorded. On the other hand, all plant species, with dbh of less than 5cm, found in the ground layer within the 1m x 1m plot were listed.

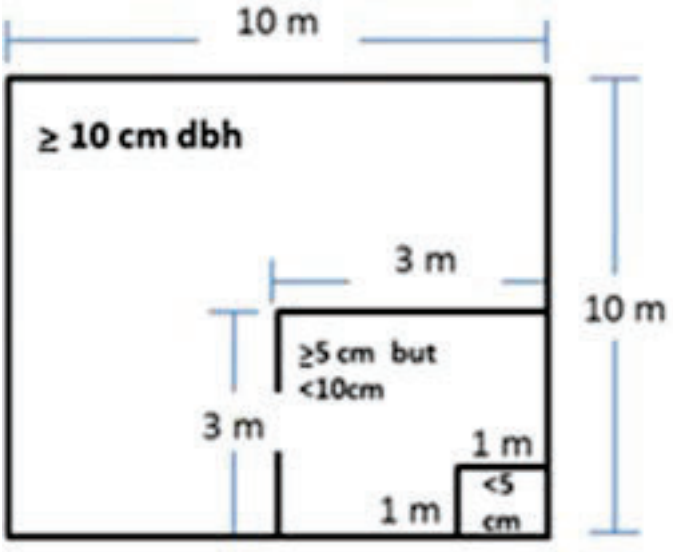


Figure 2.36 Stratified Nested-Quadrat Method

2.1.4.1.B.2. TRANSECT WALK

To improve the likelihood of encountering flora species within the study area, Transect Walk was conducted. This involved passing through an established Transect Line. Encountered species during the transect walk were recorded in order to increase the chance of flora species identification in terms of conservation status and geographic distribution. However, observed flora species was to be recorded only once and to be included in the overall discussions on species richness and computation of evenness index values.

2.1.4.1.B.3. IDENTIFICATION OF FLORA SPECIES

Identification of flora species encountered during the assessment made use of published books and other reference materials. Unidentified species, on the other hand, were recorded and photographed and were sent to the Museum of Natural History for further confirmation of identification. The Flora Malesiana, Flora of Manila[1], An Enumeration of Philippine Flowering

[1] Merrill, E. D. (2015). *A Flora of Manila*. Fb&c Limited.

Plants[2], Lexicon of Philippine Trees[3], and Leaflets of Philippine Botany[4] were some of the relevant literatures that were used. Mangrove species, on the other hand, were identified based on the Field Guide to Philippine Mangroves[5] and others.

The basis used for local names of flora species were Merrill (1922-1926) and scientific names were standardized using the local online databases such as the Co's Digital Flora of the Philippines[6]. Moreover, conservation status of listed flora species were identified using the International Union for Conservation of Nature[7] and the Updated National List of Threatened Plants and Their Categories[8].

2.1.4.1.C. TERRESTRIAL FAUNA ASSESSMENT

A transect line was established within the study area in which a transect walk, as seen in Figure 2.37, was employed. Fauna species encountered during the transect walk were identified to species level and numbers estimated as accurately as possible. Conduct of transect walk was done mostly at early morning hours (0600H-0800H) and supplemented as well during the afternoon (1500H-1700H), maximizing the encounters during the assessment.



Figure 2.37 Transect Walks

[2] Merrill, E. D. (1922). *An enumeration of Philippine flowering plants*. Bureau of printing.
[3] Rojo, J. P. (1999). *Revised Lexicon of Philippine Trees*. Forest Products Research and Development Institute, Department of Science and Technology.
[4] Elmer, A. D. E. (2009). *Leaflets of Philippine botany*. General Books LLC.
[5] Primavera, J. H. (2009). Field guide to Philippine mangroves. Zoological Society of London-Philippines.
[6] Pelser, P.B., Barcelona, J.F. and Nickrent, D.L. (2011) Co's Digital Flora of the Philippines. http://www.philippineplants.org
[7] IUCN 2024. The IUCN Red List of Threatened Species. Version 2023-1. https://www.iucnredlist.org
[8] *Republic of the Philippines Department of Environment and Natural Resources*. (n.d.). https://www.philippineplants.org/Resources/dao-2017-11.pdf

2.1.4.1.D. DIVERSITY INDICES

Biodiversity Indices were used to determine the dominance and distribution of species to be found in the area. The indices used are as follows:

Simpson's Index (D) is a measure ranging from 0 to 1, the former indicating if all taxa are equally present, or the latter, if one taxon completely dominates the community. The bigger the value of D, the lower the diversity.

$$D = \sum_{i=1}^{S} \left[\left(\frac{n_i}{N} \right)^2 \right]$$

Shannon-Weiner Index (H') is a measure of the average degree of "uncertainty" in predicting to what species an individual chosen at random from a collection of S species and N individuals will belong.

$$H' = \sum_{i=1}^{S} \left[\left(\frac{n_i}{N} \right) \ln \left(\frac{n_i}{N} \right) \right]$$

Pielou's Evenness Index (J') expresses H' relative to the maximum value that H' can obtain when all of the species in the sample are perfectly even with one individual per species[9].

$$J' = \frac{H'}{\ln(S)}$$

Paleontological Statistics (PaST v4.03) software was used in the computations of the diversity parameters and indices.

The computed values were compared to the Fernando Biodiversity Scale (1998), shown in Table 2.25.

Table 2.25 The Fernando Biodiversity Scale

Relative Values	Shannon (H') Index	Pielou (J") Evenness Index
Very High	3.5 and above	0.75 – 1.00
High	3.0 – 3.49	0.50 – 0.74
Moderate	2.5 – 2.99	0.25 – 0.49
Low	2.0 – 2.49	0.15 – 0.24
Very Low	1.9 & below	0.05 – 0.14

Source/ Reference: Fernando Biodiversity Scale (1998)

[9] *Magurran, A.E. (Ed.) (2011). Biological Diversity: Frontiers in Measurement and Assessment. Oxford University Press.*

2.1.4.1.E. ENDEMISM

Endemism indicated which flora and fauna species were endemic and non-endemic species. Endemic species were those species which can only be found on a restricted landscape, either within an island, region or country. All species were assessed based on available secondary data. Sources such as Co's Digital Flora, IUCN v2023-1, DAO 2017-11 and DAO 2019-09 were used to determine endemicity for both flora and fauna.

2.1.4.1.F. CONSERVATION STATUS

As much as possible, each recorded flora and fauna species was assessed of its conservation status based on the latest IUCN Red List, and local administrative orders such as DAO 2017-11 and DAO 2019-09. The classification of species is presented in Table 2.26

Table 2.26 Species Classification

Classification	Description
Critically Endangered Species	A species, subspecies, varieties, or other infraspecific categories facing extremely high risk of extinction in the wild in the immediate future.
Endangered Species	A species, subspecies varieties, or forma that is not critically endangered but whose survival in the wild is unlikely if the causal factors continue operating.
Vulnerable Species	A species, subspecies, varieties, or other infraspecific categories of plants and animals that is not critically endangered nor endangered but is under threat from adverse factors throughout its range and is likely to move to the endangered category in the future.
Other Threatened Species	A species not critically endangered, endangered nor vulnerable but is under threat from adverse factors such as over collection throughout its range and is likely to be moved to the vulnerable category in the near future.
Other Wildlife Species	Non-threatened species, subspecies, varieties, or other infraspecific categories that have the tendency to become threatened due to destruction of habitat or other similar causes.

Source/ Reference: DAO 2017-11 and DAO 2019-09

2.1.4.1.G. RESULTS AND DISCUSSION

2.1.4.1.G.1. DESCRIPTION OF ESTABLISHED TRANSECT LINES

2.1.4.1.G.1.1. TRANSECT 1 – RECLAMATION AREA

Transect 1 was established along the Reclamation Site. The area was still in the process of land reclamation, resulting in low abundance of flora species within. It can be observed that most of the flora species found within the Project Site were weeds and grasses since these types of plants can grow in extreme weather condition and wide variety of soil types. Figure 2.38 shows the established plots within transect 1.

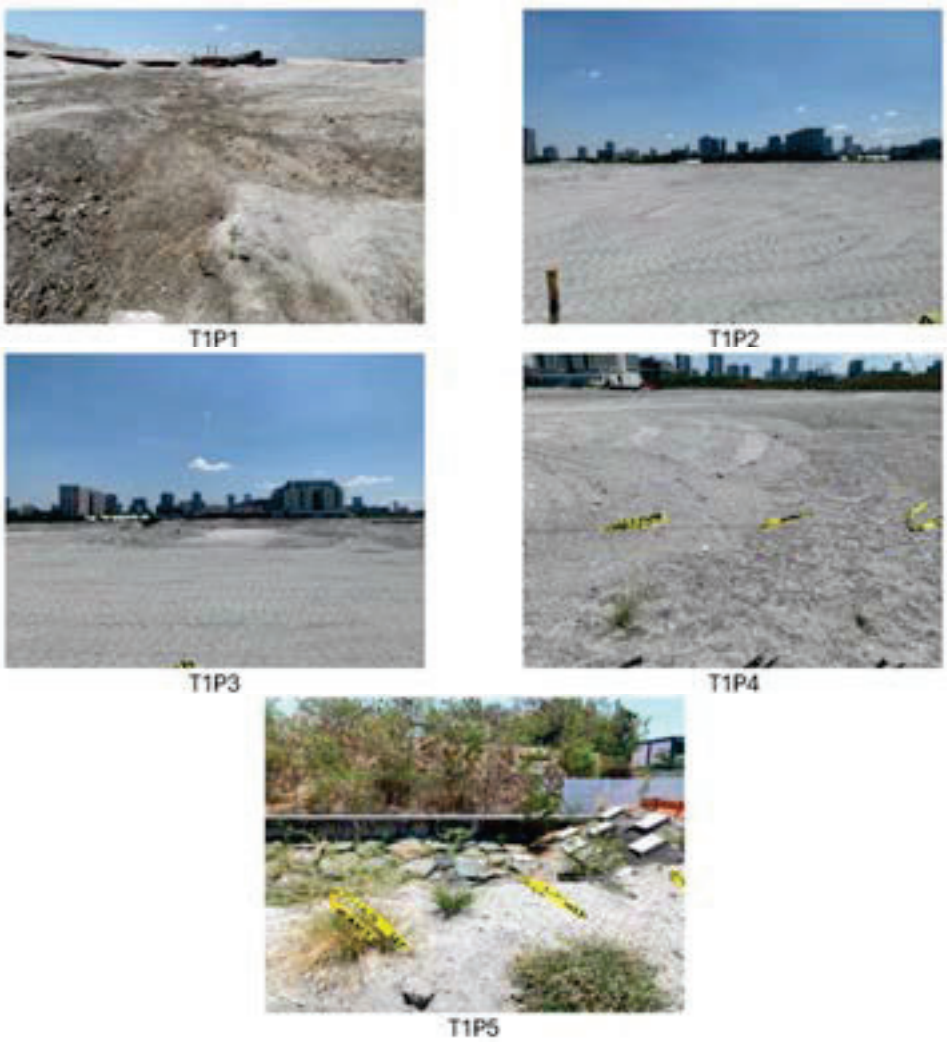


Figure 2.38 Established Plots along Transect 1

2.1.4.1.G.1.2. TRANSECT 2 – MOA SIDE

Transect 2 was established along the coastal area of Manila Bay in the MOA Seaside. The area was open to the public and a common spot for different activities such as biking, jogging, etc. Multiple establishments can also be seen around the area. Hence, most of the flora species observed within the vicinity were due to anthropogenic activity and mainly for ornamental purpose. The established flora sampling stations along transect 2 are shown in Figure 2.39.

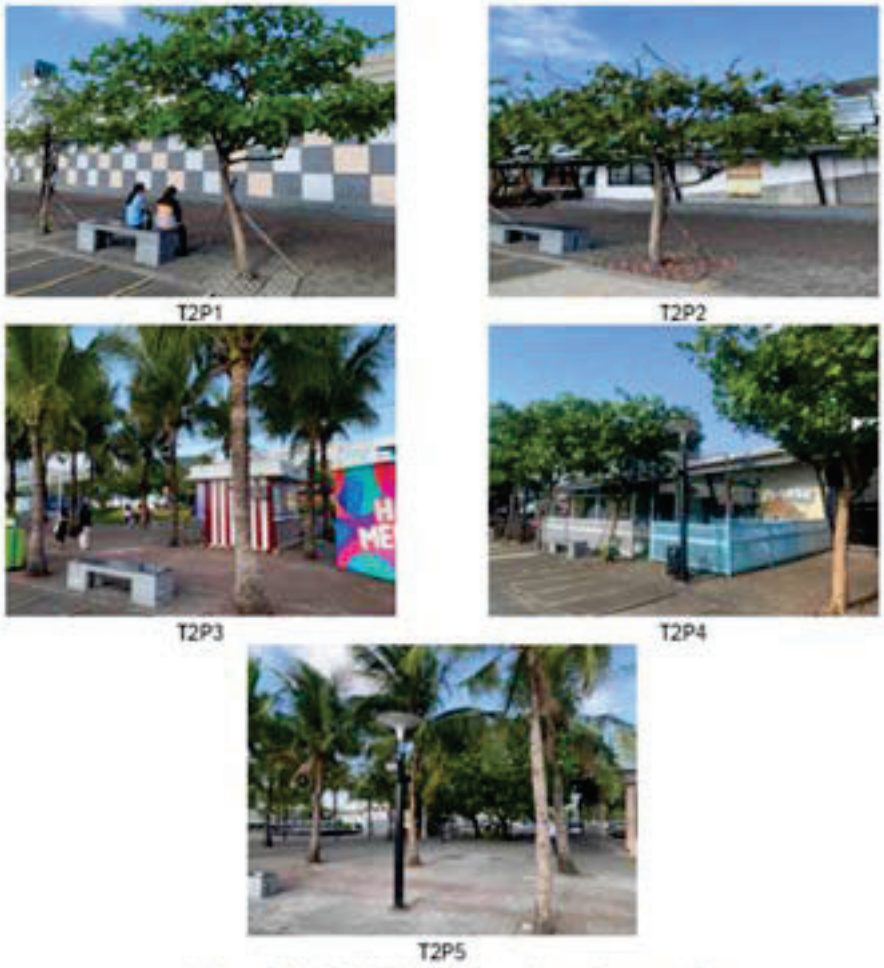


Figure 2.39 Established Plots along Transect 2

2.1.4.1.G.2. TERRESTRIAL FLORA

Overall, 42 individuals were listed during the primary survey. There were 20 species recorded under 15 families. Moreover, diversity and evenness index were measured to be at H' = 1.99 and J' = 0.67, respectively. This indicated that there was a low species diversity within the study area but a species distribution of highly even. The low species diversity was caused by the project being situated in urban area and the location of one transect line in the reclamation site. The summary of result of biodiversity parameters of terrestrial flora is shown in Table 2.27.

Table 2.27 Summary of Result of Terrestrial Flora

Parameters	Value
Species Richness	10
Number of Individuals	42
Diversity Index (H')	1.99
Evenness Index (J')	0.67

2.1.4.1.G.2.1. ABUNDANCE OF TERRESTRIAL FLORA

In total, 42 individuals were recorded from the established plots within the study area. The highest abundance was exhibited by Talisay (*Terminalia catappa*), totaling to 11 listed individuals. This species belonged to Combretaceae family and thrived in subtropical and tropical climates. In addition, it was typically found near coast areas and was able to adapt to a wide range of soil types, preferably light to medium soils, and including heavier-textured, clayey soils if well drained. The high abundance of this species was due to the site being situated in the coast of Manila Bay. The abundance of flora species found within the study area is presented in Figure 2.40 and the list of terrestrial flora species and some photos are shown in Figure 2.41 and Table 2.28, respectively.

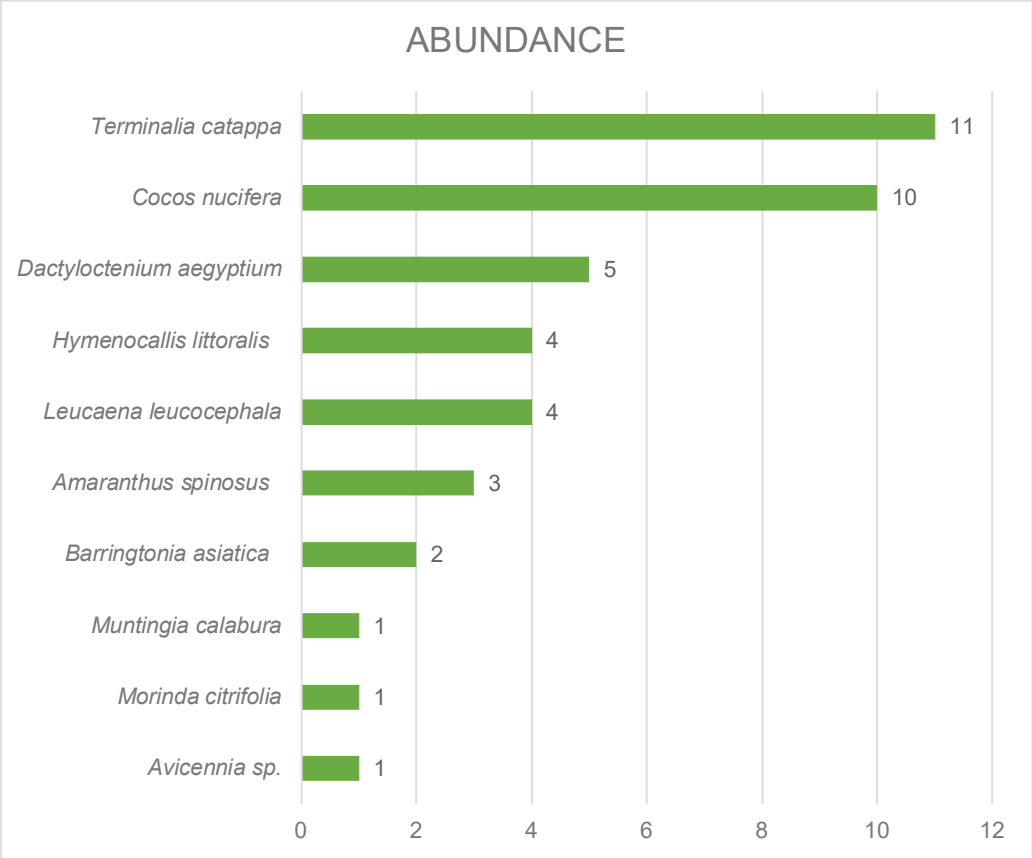


Figure 2.40 Abundance of Terrestrial Flora



Manglum (*Acacia manglum*)



Spiny Amaranth (*Amaranthus spinosus*)



Botong (*Barringtonia asiatica*)



Talisay (*Terminalia catappa*)



Crow's Foot Grass (*Dactyloctenium aegyptium*)

Figure 2.41 Terrestrial Flora Photos Taken During the Survey (2024)

Table 2.28 Checklist of Terrestrial Flora

Family	Scientific Name	Common Name
Acanthaceae	*Avicennia* sp.	-
Amaranthaceae	*Amaranthus spinosus*	Spiny Amaranth
Amaryllidaceae	*Hymenocallis littoralis*	Beach Spider Lily
Arecaceae	*Cocos nucifera*	Coconut
Combretaceae	*Terminalia catappa*	Talisay
Fabaceae	*Leucaena leucocephala*	Ipil-ipil
Lecythidaceae	*Barringtonia asiatica*	Botong
Muntingiaceae	*Muntingia calabura*	Datiles
Poaceae	*Dactyloctenium aegyptium*	Crow's Foot Grass
Rubiaceae	*Morinda citrifolia*	Bangkoro
Fabaceae	*Acacia auriculiformis*	Auri

Family	Scientific Name	Common Name
Fabaceae	*Acacia mangium*	Mangium
Cyperaceae	*Imperata cylindrica*	Cogon
Cyperaceae	*Cyperus rotundus*	Nutgrass
Poaceae	*Echinochloa colona*	Junglerice
Fabaceae	*Mimosa diplotricha*	Giant Sensitive Plant
Moraceae	*Ficus benjamina*	Salisi
Malvaceae	*Thespesia populneoides*	Beach Yellow Hibiscus
Aizoaceae	*Trianthema portulacastrum*	Giant Pigweed
Asteraceae	*Tridax procumbens*	Tridax

2.1.4.1.G.3. TERRESTRIAL FAUNA

During the assessment, different biodiversity parameters were measured for terrestrial fauna. In total, 255 fauna species were recorded under 23 species. In addition, the overall diversity and evenness index of terrestrial fauna were measured to be at Low H' = 2.43 and Very High J' = 0.78, respectively. This indicated that the diversity of faunal species in the study area was low. However, the distribution of species was very highly even. This was due to the study area being situated in urban setting. The overall biodiversity parameters result for terrestrial fauna is presented in the table below.

Table 2.29 Summary of Results of Terrestrial Fauna

Parameters	Values
No. of Individuals	255
Species Richness	23
Diversity Index (H')	2.43
Evenness Index	0.78

2.1.4.1.G.3.1. ABUNDANCE OF SPECIES RICHNESS

A total of 255 individuals under 23 species were recorded during the primary survey. Eurasian Tree Sparrow (*Passer montanus*) exhibited the highest abundance of 54 individuals. This species was introduced in the Philippines and now widely spread across the country. This was then followed by Little Egret (*Egretta garzetta*), having 44 number of individuals recorded. This species is a migratory species often seen in various habitats such as open wetlands (i.e., rivers and lakes, marshes, rice fields, saltpans, mudflats and mangroves). Its diet is mainly fish, but also feed on amphibians, small reptiles, mammals and birds, as well as crustaceans, mollusks, insects, spiders and worms. Third in rank for species with highest abundance was the Whiskered Tern (*Chlidonias hybrida*), with 44 total number of individuals observed. This species is a widespread winter visitor in the Philippines which often feeds on small fish and aquatic insects, utilizing its agility and precision to catch prey mid-flight over water bodies. Other species encountered during the primary survey is presented in Figure 2.42 to 3.43.

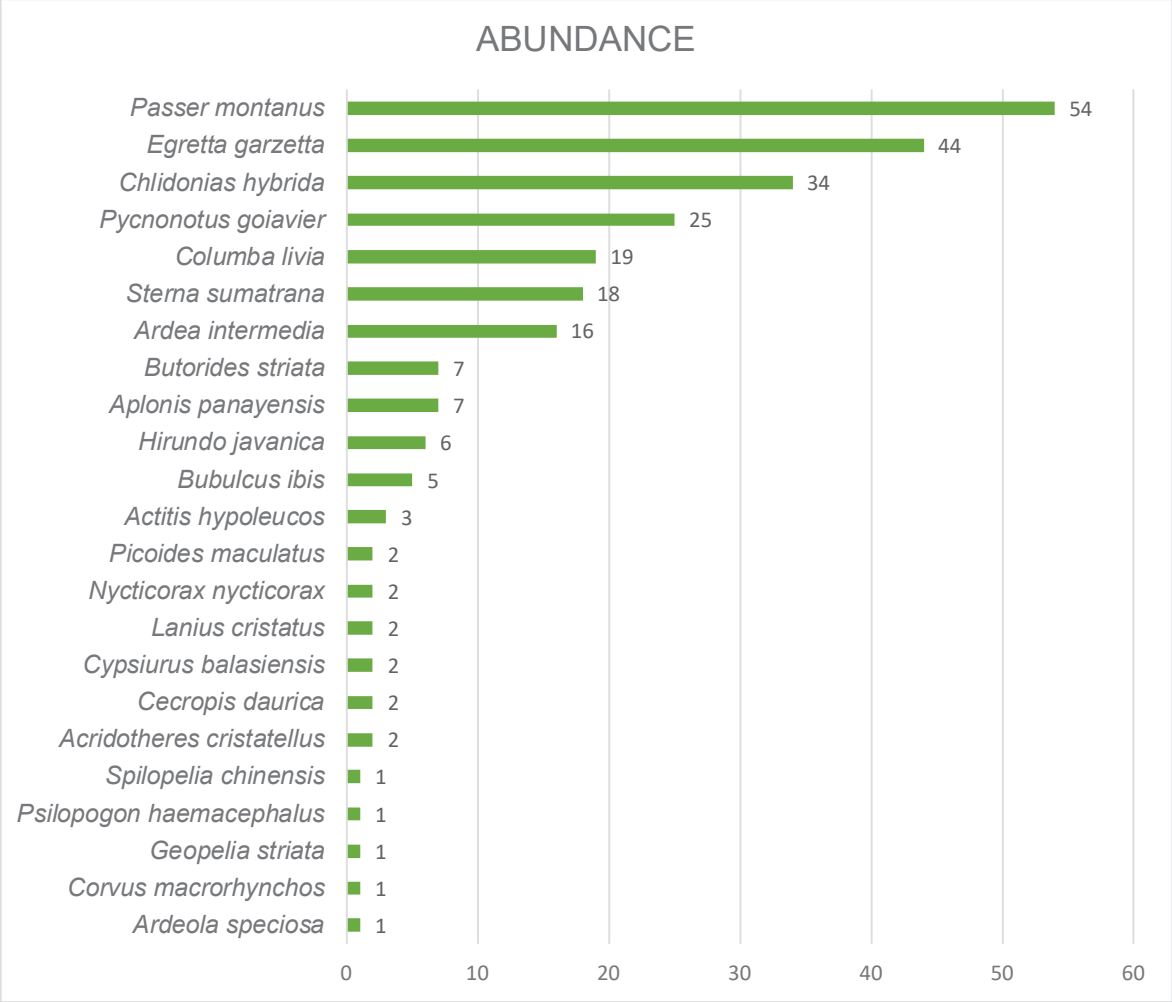


Figure 2.42 Abundance of Terrestrial Fauna On-site

Overall, a total of 255 individuals were recorded during the primary survey. Two transect lines were established in which the assessment was done on morning (0700H-0900H) and afternoon (1500H-1700H). Transect 1 exhibited a total of 89 individuals and Transect 2 had 166 individuals observed. Transect 1 had relatively lower abundance since it was situated on the reclamation area. The abundance of terrestrial fauna observed per transect line is presented in Figure 2.43.



Figure 2.43 Abundance of Terrestrial Fauna per Transect

A total of 23 species were observed during the assessment. Fifteen (15) species were recorded on Transect 1 while Transect 2, on the other hand, had 17 species listed. Most of the species encountered during the primary survey where migratory species since the study area is situated in a coastal area. Figure 2.44 shows the number of species observed per transect line during the assessment.



Figure 2.44 Species Richness of Terrestrial Fauna per Transect

2.1.4.1.G.3.2. DIVERSITY AND EVENNESS INDEX

Diversity Index (H') measured the diversity of species within the study area in which the overall was observed to be at Low H' = 2.43. Moreover, Transect 1 and Transect 2 exhibited a diversity index of 2.10 and 2.39, respectively. This indicated that both transect line had low species diversity. This was due to the area being situated in an urban area where there are

many moving vehicles and other disturbances. The diversity index of terrestrial fauna per transect line was presented in Figure 2.45.

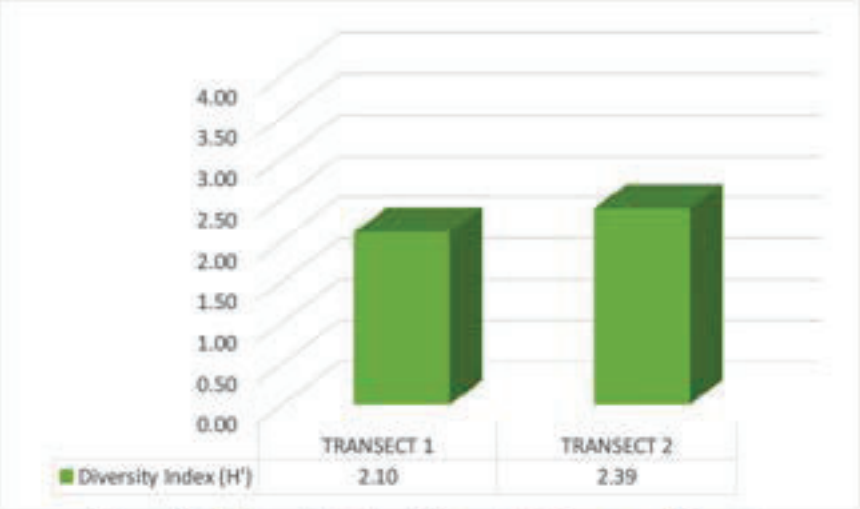


Figure 2.45 Diversity Index of Terrestrial Fauna per Transect

Overall, the study area exhibited an evenness index of Very High J' = 0.78. Evenness index implies if the species within the area are evenly distributed. Transect 1 showed an evenness index of J' = 0.78 while Transect 2 exhibited an evenness index of J' = 0.84. This indicated that the species in both transect lines were very highly even. Figure 2.45 shows the evenness index per transect line.

Table 2.30 Checklist of Terrestrial Fauna

Family	Scientific Name	Common Name
Apodidae	*Cypsiurus balasiensis*	Asian Palm Swift
Ardeidae	*Ardea intermedia*	Intermediate Egret
Ardeidae	*Ardeola speciosa*	Javan Pond-heron
Ardeidae	*Bubulcus ibis*	Cattle Egret
Ardeidae	*Butorides striata*	Striated Heron
Ardeidae	*Egretta garzetta*	Little Egret
Ardeidae	*Nycticorax nycticorax*	Black-crowned Night-heron
Columbidae	*Columba livia*	Rock Dove
Columbidae	*Geopelia striata*	Zebra Dove
Columbidae	*Spilopelia chinensis*	Eastern Spotted Dove
Corvidae	*Corvus macrorhynchos*	Large-billed Crow
Hirundinidae	*Cecropis daurica*	Red-rumped Swallow
Hirundinidae	*Hirundo javanica*	House Swallow
Laniidae	*Lanius cristatus*	Brown Shrike
Laridae	*Chlidonias hybrida*	Whiskered Tern
Laridae	*Sterna sumatrana*	Black-naped Tern
Megalaimidae	*Psilopogon haemacephalus*	Coppersmith Barbet
Passeridae	*Passer montanus*	Eurasian Tree Sparrow

Family	Scientific Name	Common Name
Picidae	*Picoides maculatus*	Philippine Pygmy Woodpecker
Pycnonotidae	*Pycnonotus goiavier*	Yellow-vented Bulbul
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper
Sturnidae	*Acridotheres cristatellus*	Crested Myna
Sturnidae	*Aplonis panayensis*	Asian Glossy Starling



Little Egret (*Egretta garzetta*)



Whiskered Tern (*Chlidonias hybrida*)



Black-crowned Night-heron (*Nycticorax nycticorax*)

Figure 2.46 Terrestrial Fauna Photos Taken During the Survey (2024)

2.1.4.1.G.4. ENDECIMITY AND GEOGRAPHIC DISTRIBUTION

2.1.4.1.G.4.1. TERRESTRIAL FLORA

During the site assessment, the geographic distribution of each listed species was determined. A total of 20 flora species were recorded in which none was endemic to the Philippines. More than half of the assessed species were indigenous species. On the other hand, exotic species and species with undetermined origin comprised of 40% and 5% of the total, respectively. Figure 2.47 shows the geographic distribution of assessed flora species.

GD	Number of Species	Percentage (%)
Indigenous	11	55.00
Exotic	8	40.00
Undetermined	1	5.00
Total	**20**	**100.00**

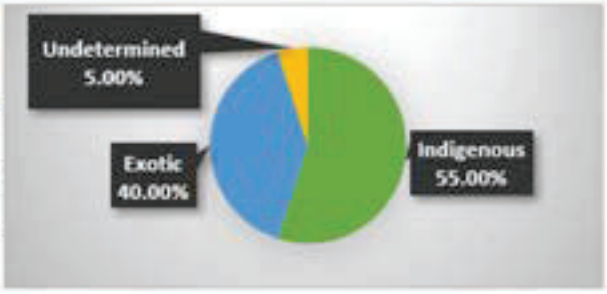


Figure 2.47 Geographic Distribution of Terrestrial Flora

2.1.4.1.G.4.2. TERRESTRIAL FAUNA

A total of 23 species was observed during the primary survey. Out of all the encountered species, only one (1) was endemic to the Philippines, the Philippine Pygmy Woodpecker (*Picoides maculatus*). The majority of surveyed species belonged to migratory species, having 12 species in total or 52.17%. This was due to the area being located in a coastal area where most migratory species pass through. Moreover, Resident and introduced species amounted to 30.44% and 13.04% of the total encountered species, respectively. Figure 2.48 shows the distribution of terrestrial fauna in terms of residency.

Residency	No. of Species	Percentage (%)
Endemic	1	4.35
Resident	7	30.44
Migrant	12	52.17
Introduced	3	13.04
Total	**23**	**100**

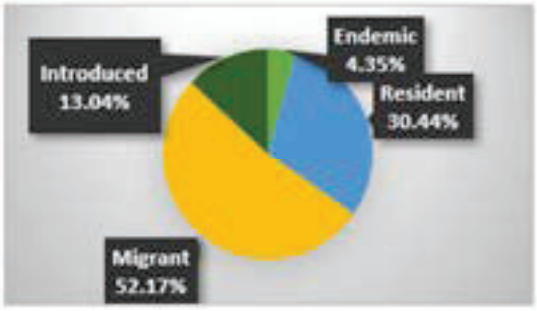


Figure 2.48 Residency of Terrestrial Fauna

2.1.4.1.G.5. CONSERVATION STATUS

The conservation status of listed terrestrial flora and fauna was assessed based on international standard (IUCN v2023-1), and local standard (DAO 2017-11 for Flora and DAO 2019-09 for Fauna). This was to determine which species was classified as threatened. In regards with the conservation status of assessed terrestrial flora and fauna species, no threatened species was identified.

2.1.4.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

As observed during the primary survey, vegetation within the Project Site was still in its initial growth process. Hence, mitigation and recommendation will depend on the vegetation which will vegetate the area. To hasten the ecological succession, pioneer species such as grasses and beach type trees be used in the re-vegetation of the area. Native trees which may be

used include Botong, Talisay and Noni, while grasses such as Crow's Foot Grass and Talahib may be used to stabilize the reclaimed area.

Most of the identified avifauna species during the site assessment were migratory waterbirds. One of the important indicators for monitoring wetland quality was the diversity of waterbirds within the area[10]. In line with this, the Land Reclamation Project would most likely impact the identified waterbird species in the area.

As identified during the site survey, the top species in terms of abundance within the Project Site were Little Egret (*Egretta garzetta*) and Whiskered Tern (*Chlidonias hybrida*), both classified as waterbirds. In terms of diet, both species were feeding on small fish and other food sources present in aquatic areas[11].

Siltation would most likely occur in water bodies near the coast during the land reclamation. In line with this, the abundance of fish and other aquatic food sources within the area would decline, resulting in the decrease of feeding grounds for the present aquatic avifauna species. As such, waterbirds would most likely disperse and look for more suitable area for feeding and breeding, resulting in temporary decline of avifauna species within the area.

To mitigate such impact, it was recommended to apply a proper planning of executing the dredging and piling up of soil. Unnecessary dumping of soil in areas not designed to be reclaimed should be avoided since this will further decrease the feeding grounds of aquatic avifauna species.

For terrestrial Flora and fauna, no species will be harmed in the development of the area.

Vegetation Removal and Loss of Habitat

Since the Project is reclamation of coastal area, vegetation removal will not occur.

Threat to existence and/or loss of important local species

No flora species will be affected by the impacts brought about by the Project. However, Impacts will mostly be pressed towards waterbirds since the disturbance will likely decrease the feeding behaviors of birds along the coast. Increased turbidity of the waters due to sediments and oil spills may impede visual cues for birds who mainly feed on fish and snails. As such, sedimentation should properly be addressed by engineering measures to minimize the disturbance on birds. On the other hand, heavy equipment and boats should be properly maintained to prevent Oil leakage/ spillage into the sea.

[10] Wang, Z., Li, N., Gao, S. & An, S. (2020). *Response of wintering waterbird diversity to reclamation history and post-reclamation habitat along Yellow Sea coast*. https://doi.org/10.1111/1749-4877.12464
[11] del Hoyo, J., Andrew, E., & Sargatal, J. (1992). *Handbook of the Birds of the World.* Barcelona: Lynx Edicions.

Threat to abundance, frequency, and distribution of important species

No threats to populations of flora species since the Project is a reclamation Project. During construction, populations of birds may decrease due to increased turbidity of waters, and noise coming from boats and heavy equipment. These birds will temporarily be displaced to nearby areas where there is less disturbance. Nearby greenspaces should be maintained and improved so as to let the areas accommodate those birds which will be affected by the disturbance. Reclaimed areas should also be planted with native and endemic species to promote the increase of populations of not only flora, but also fauna within the Project site. Also, to minimize noise in the Project area, noise cancelling devices should be used.

For the development of green spaces within the area, recommended species for planting are beach-type endemic flora species. The recommended species are the *Dischidia platyphylla, Salacia wenzelii*, and *Cynometra* ramiflora var. bifoliata among others. Non-beach endemic species which can also be used for re-vegetation of the reclaimed area are the Artocarpus blancoi, *Wallaceodendron celebicum*, *Sindora supa*, *Dillenia Philippinensis*, *Voacanga globosa* and *Dillenia luzonensis*. Endemic and indigenous species which can be used for greening is presented in Table 2.31.

Table 2.31 Tree Species for Consideration for the Establishment of the Green Spaces

Family Name	*Scientific Name*	Common Name	Geographic Distribution
Apcoynaceae	*Dischidia platyphylla*	Timbang-timbang	Endemic
Celastraceae	*Salacia wenzelii*	Bulag-iyot	Endemic
Fabaceae	*Cynometra ramiflora var. bifoliata*	Balitbitan	Endemic
Moraceae	*Artocarpus blancoi*	Antipolo	Endemic
Fabaceae	*Wallaceodendron celebicum*	Banuyo	Endemic
Fabaceae	*Sindora supa*	Supa	Endemic
Dilleniaceae	*Dillenia philippinensis*	Katmon	Endemic
Apocynaceae	*Voacanga globosa*	Bayag-Usa	Endemic
Dilleniaceae	*Dillenia luzonensis*	Malakatmon	Endemic
Apocynaceae	*Alstonia scholaris*	Dita	Indigenous
Apocynaceae	*Cerbera manghas*	Manghas	Indigenous
Calophyllaceae	*Calophyllum inophyllum L.*	Bitaog	Indigenous
Casuarinaceae	*Casuarina equisetifolia*	Agoho	Indigenous
Clusiaceae	*Cratoxylum sumatranum ssp. Sumatranum*	Paguringon	Indigenous
Clusiaceae	*Cratoxylum formosum*	Salingogon	Indigenous
Euphorbiaceae	*Macaranga tanarius*	Binunga	Indigenous
Fabaceae	*Albizia procera*	Akleng parang	Indigenous
Fabaceae	*Erythrina variegata*	Dapdap	Indigenous
Fabaceae	*Intsia bijuga*	Ipil	Indigenous
Fabaceae	*Millettia pinnata*	Bani	Indigenous

Family Name	*Scientific Name*	Common Name	Geographic Distribution
Lecythidaceae	*Barringtonia acutangula*	Botong botong	Indigenous
Lecythidaceae	*Barringtonia asiatica*	Botong	Indigenous
Lecythidaceae	*Barringtonia racemosa*	Mambog	Indigenous
Melastomataceae	*Melastoma malabathricum*	Malatungaw	Indigenous
Meliaceae	*Melia azedarach*	Bagalunga	Indigenous
Moraceae	*Ficus septica*	Hauili	Indigenous
Rubiaceae	*Ixora philippinensis*	-	Indigenous
Rubiaceae	*Morinda citrifolia*	Bangkoro	Indigenous
Sterculiaceae	*Heritiera littoralis*	Dungon-late	Indigenous
Verbenaceae	*Vitex parviflora*	Molave	Indigenous
Vitaceae	*Leea manillensis*	Mali-mali	Indigenous

For enrichment planting of mangroves, the Joint Technical Bulletin of ERDB and BMB No. 2017-01 may be followed as basis for mangrove ecosystems near the reclaimed area. This bulletin covers which species can be planted in the different zonations within and near mangrove ecosystems. Suggested mangrove species are shown in Figure 2.49.

Zonation	Species
Seaward to Landward	*Sonneratia alba* Sm. (Pagatpat) *Avicennia marina* Forssk. Vierh. (Bungalon) *Rhizophora stylosa* Griff. (Bakawan bato- seaward at the back of *S. alba* and *A. marina*) *Aegiceras floridum* Roem. And Schult. (Tinduk-tindukan - rocky to t substrate)
Middleward to Landward	*Ceriops tagal* Perr. C.B. Robb. (Tangal-most preferred) *Ceriops zippeliana* Blume (Malatangal) *Avicennia marina var. rhumpiana* Forssk. Vierh. (Piapi) *Avicennia officinalis* L. K.D. Koenig (Api-api) *Aegiceras corniculatum* Lour. Poir. (Saging-saging) *Bruguiera sexangula* (L.) Lam (Pototan) *Bruguiera gymnorhiza* (J.F. Gmel.) Blume (Busain) *Bruguiera cylindrica* (L.) Blume. (Pototan lalaki) *Bruguiera parviflora* Roxb. With. & Arn. Ex. Griff (Langarai) *Heritiera littoralis* Aiton (Dungon-late) *Xylocarpus granatum* J. Koenig (Tabigi) *Xylocarpus moluccensis* (Lam.) M. Ruem (Piagau) *Rhizophora apiculata* Blume (Bakawan lalake)
Riverine-upstream	*Sonneratia caseolaris* (L.) Engl. (Pedada) *Nypa fruticans* Wumb. (Nipa) *Rhizophora mucronata* Lam. (Bakawan babae)

Figure 2.49 Suggested Mangrove Species
Source/ Reference: ERDB and BMB TB No. 2017-01

Hindrance to wildlife access

To date, there are no recorded mammals and birds listed along the coast near the project area. Thus, there will be no effects on these faunal groups. However, majority of the disturbances will be experienced by water-birds since primary activities of these birds are near the coastal areas. Disruption of their activities will be temporarily experienced during the construction phase, and some will need to relocate to other areas with less disturbance. Since birds are highly mobile, they are able to seek areas with less disturbances.

Noise cancelling devices should be used for heavy equipment to prevent disturbances to resident and passing birds.

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.32 Impact Analysis and Environmental Management – Terrestrial Ecology

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Vegetation removal and loss of habitat					
Construction Phase – Land Clearing activities	Not Applicable	Not Applicable as there are no vegetation - The project site is located in Manila Bay (waters).			
Project Operations	2028 onwards	Mitigation and recommendation will depend on the vegetation which will vegetate the area. To hasten the ecological succession, pioneer species such as grasses and beach type trees be used in the re-vegetation of the area. Native trees which may be used include Botong, Talisay and Noni, while grasses such as Crow's Foot Grass and Talahib may be used to stabilize the reclaimed area.			
Potential Impact: • Threat to existence and/or loss of important local species due to siltation • Threat to abundance, frequency and distribution of important species due to siltation • Hindrance to wildlife access due to siltation					
Construction activities	2021 to 2028	Avoidance of disturbance of habitat and bird food	Proper planning of executing the dredging and piling up of soil Unnecessary dumping of filling materials in areas not designed to be reclaimed will be avoided Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries:	Part of Project Cost	

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
			• Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed	

2.2. THE WATER

2.2.1. HYDROLOGY/ HYDROGEOLOGY AND OCEANOGRAPHY

2.2.1.1. BASELINE DATA

Comparative 2017 and 2024 Hydrodynamic Modelling

Due to the changed layout of the project, an update of the hydrodynamic modelling is required. The main objective of this study is to provide an updated analysis of the hydraulic design conditions, including water levels, currents and waves. The bathymetry near the Project area is shown in Figure 2.50.

Main changes compared to 2017 (Figure 2.51):

- Analysis of the most recent typhoon data
- Updated bathymetry
- New SLR from IPCC
- Shelter from PHCC

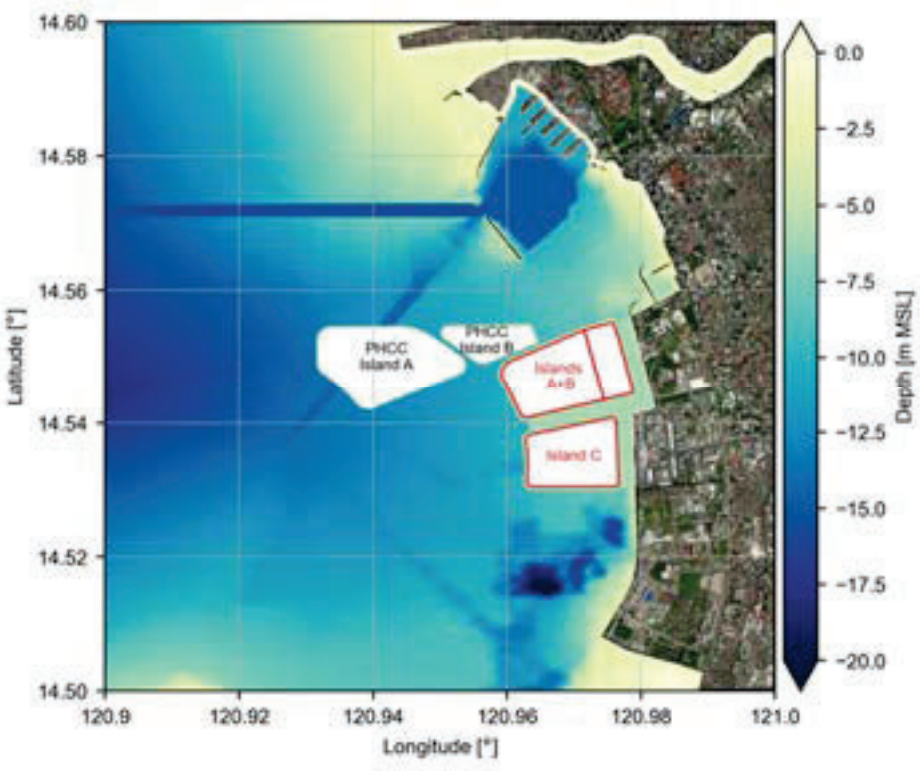


Figure 2.50 Bathymetry Near the Project Area
Source: Royal HaskoningDHV. Hydrodynamic modelling studies (2024)

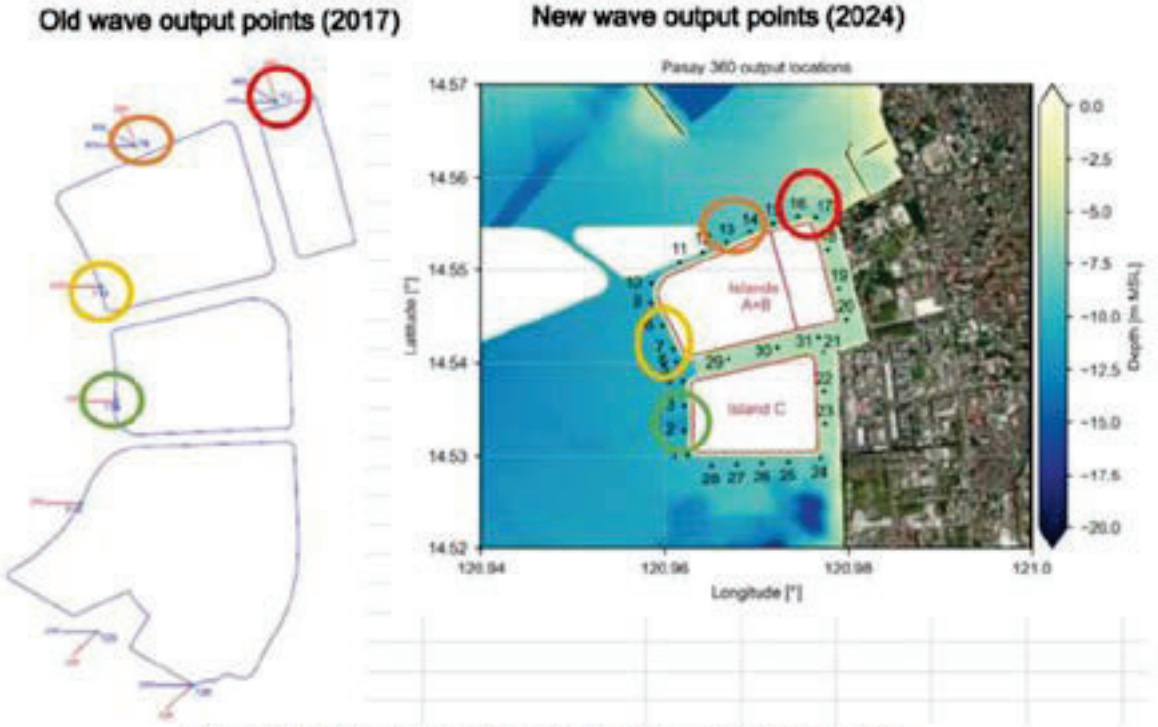


Figure 2.51 Hydrodynamic Modelling – Comparison 2017 – 2024

Comparison with 2017: Design Water Level

The comparison with the 2017 and 2024 water design level is presented in Table 2.33.

Table 2.33: Minor differences due to update with annual maxima from the years after 2015 (2016-2020)

Return Period	2017			2024		
	Best estimate water level [m MSL]	Uncertainty in total water level	Design water level [m MSL]	Best estimate water level [m MSL]	Uncertainty in total water level	Design water level [m MSL]
1	0.91	0.20	1.11	0.91	0.20	1.11
5	1.22	0.27	1.49	1.24	0.27	1.51
10	1.30	0.30	1.60	1.32	0.30	1.62
25	1.39	0.34	1.73	1.41	0.34	1.75
50	1.46	0.37	1.83	1.48	0.37	1.85
100	1.52	0.40	1.92	1.55	0.40	1.95
250	1.62	0.44	2.06	1.63	0.44	2.07
500	1.69	0.47	2.16	1.68	0.47	2.15
750	1.73	0.49	2.22	1.72	0.49	2.21
1000	1.77	0.50	2.27	1.74	0.50	2.24

Table 2.34: DWL with SLR

Return period [yr]	Design water level [+m MSL]	
	2017	2024
1	1.56	1.53
25	2.18	2.17
100	2.37	2.37
1000	2.72	2.66

Comparison with 2017: Design wave heights

Differences in wave heights arise from:

- Updated bathymetric data in Manila Bay
- Updated typhoon data (new storms)
- Presence of PHCC islands

Table 2.35: Typhoon Surge Levels

Location	Northern Boundary				Western boundary (island A+B)		Western boundary (island C)	
Model Year	2017		2024		2017	2024	2017	2024
WOP	T6	T6	13	14	T13	6	T16	2
Angle	300°	270°	Oblique	Oblique	270°	Normal	270°	Normal
1/1	3.21	4.35	2.38	2.34	4.38	1.76	4.10	1.85
1/25	4.74	4.97	5.12	4.97	5.24	4.45	5.15	4.57
1/100	4.92	5.04	5.23	5.06	5.36	4.89	5.27	5.00
1/1,000	4.96	5.06	5.26	5.09	5.41	5.24	5.33	5.33

Hydrodynamic modelling – main conclusions ½

- Area 1: Similar wave conditions compared to 2017, minor increase in wave period
- Area 2: Sheltered location, revetment optimization possible
- Area 3: Decreased wave conditions due to shelter from PHCC. Potentially a revetment optimization is possible

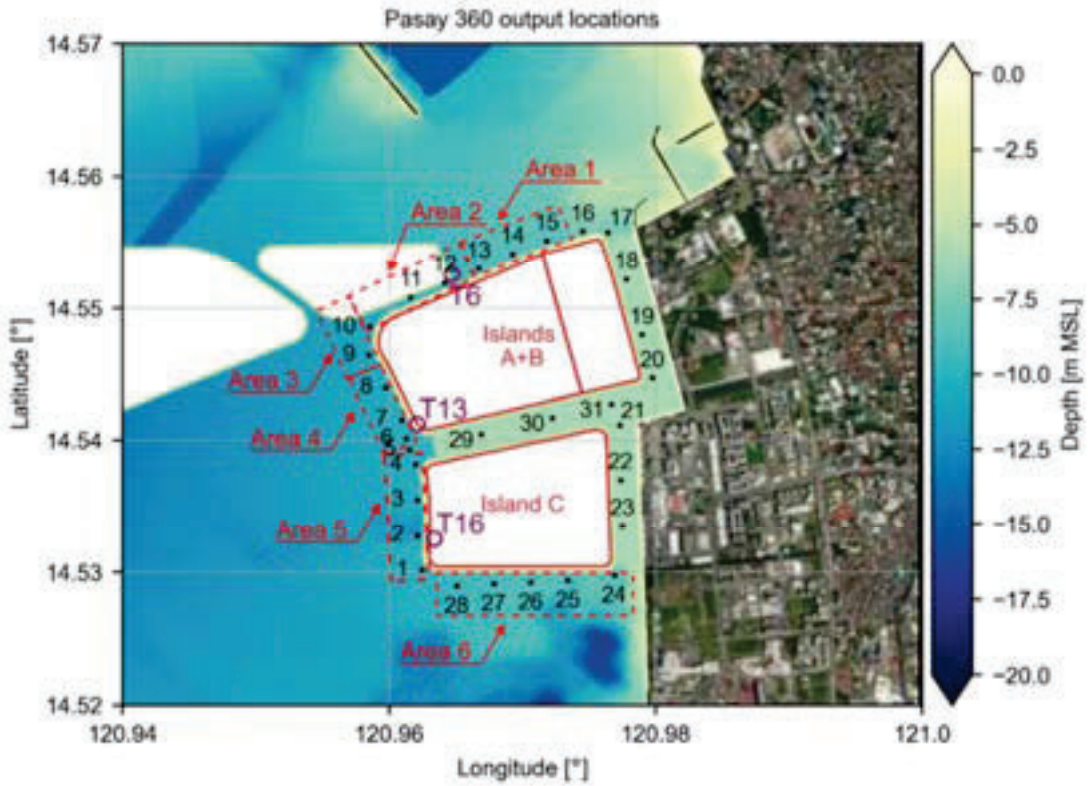


Figure 2.52 Wave output locations from 2017 (purple) and from 2024 (black)

Hydrodynamic modelling – main conclusions 2/2

- Area 4: Some shelter from PHCC, however optimization not likely
- Area 5: Similar wave conditions compared to 2017, increased wave period, check required if revetment still meets the Employer's Requirements
- Area 6: Wave heights have increased due to no more shelter from former island boundary change, hence no change for now
- Revetments are designed accordingly

The complete hydrodynamic modelling studies can be found in **Appendix J**.

The comparative analysis of existing water circulation patterns is discussed in Figure 10-18 until Figure 10-25 of **Appendix J** which shows dark red at the river near las pinas (high river discharge during rainy season) and it does not change at all between no islands scenario and islands scenario.

2.2.1.2. COASTAL GEOMORPHOLOGY AND LITHOLOGY

Based on the Pre-feasibility Studies for Navotas Coastal Bay prepared by Surbana International Consultants Pte Ltd. last November 2013, the watershed area of the Manila Bay encompasses the southern half of the Central Plain of Luzon; a 150 km long and 60 km wide north-northwest trending flat terrain bordered along the southwest by the Zambales Range and along the northeast by the southern portion of the Central Cordillera, Caraballo and Sierra Madre Mountain Ranges.

The bottom topography of Manila Bay is gently sloping from its mouth at about 1 m per km of horizontal distance. The bay is mostly shallow with an average depth of 17 m and about 64 percent of its surface has less than a 10-m depth, mainly at the northern half. The southwestern sector of the Bay is deeper with depths greater than 100 m. Spots of shallow areas, with depth of less than 5 m, are found along the coastline. At its mouth, depth of the Bay is about 50 m, except in the narrow channel north of Corregidor Island, where depth is approximately 90 m.

The seabed bathymetry is shown in Figure 2.53 which clearly indicates that the water along the coastline of Pasay City is generally shallow which ranges from 3 to 10 meters. Manila Bay is the catchment for numerous river systems that drain the surrounding land areas. In addition to the Pampanga River and Pasig River, other major rivers discharging directly into Manila Bay are: Meycauayan, Navotas-Malabon-Tullahan-Tenejeros, Talisay (Bataan), Imus (Cavite) and Maragondon (Cavite). Thus, deposition within the Bay is very active.

Depositional features found in the Bay are the sand spit of Cavite and numerous beach and sea bar deposits. A higher level of sedimentation in the northern parts of the Bay is characterized with the deposits of pyroclasic materials extruded by Mt. Pinatubo.

The project area mainly consists of sedimentary deposits of Quaternary era. This formation is a result of erosion and re-deposition of former sediments which generally consists of unsorted fluvial and river deposits. Both the effects of climate processes and tectonic young activities caused a miscellaneous alluvium of different types, thickness and grain sizes to be formed. The subsoil is generally weak (soft or loose) with thick sequence of Quaternary alluvium made up principally of unconsolidated strata of silty and clayey sand and high plasticity clay.

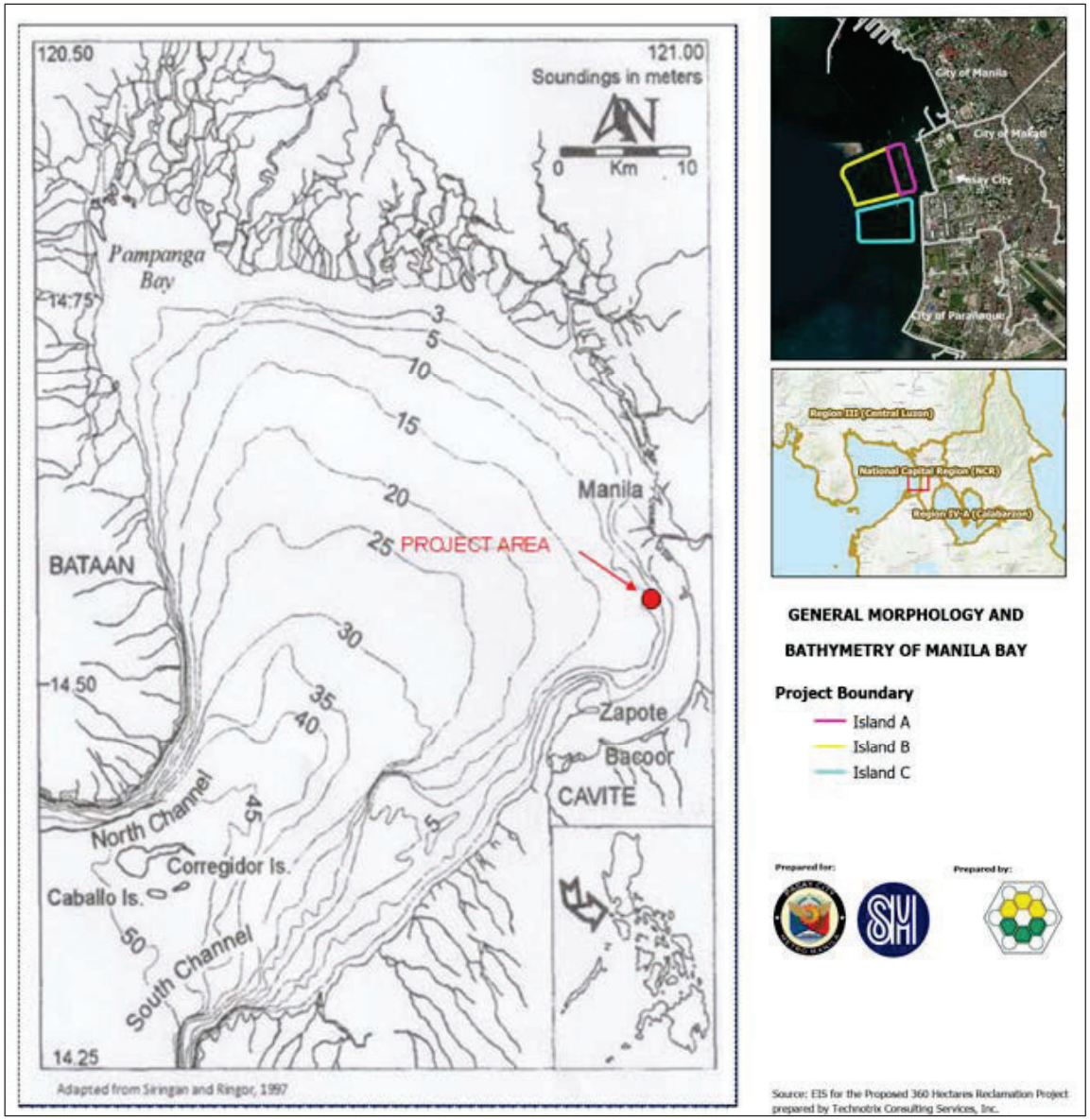


Figure 2.53 General Morphology and Bathymetry of Manila Bay

Source/Reference: EIA for the Proposed 360 Hectares Reclamation Project prepared by Technotrix Consulting Services, Inc. - Adapted from Siringan and Ringor, 1997

2.2.1.3. BASELINE OF PASAY CITY DRAINAGE SYSTEM

The following discussions were derived from the Environmental Impact Statement prepared by the Pasay City Government and Technotrix Consultancy Services, Inc. last October 2017 for the 360 Hectares Reclamation Project to be located along Manila Bay in the Territorial Water of the City of Pasay.

Several creeks traverse the drainage system of Pasay City. The Tripa De Gallina Creek is at the boundary of Pasay City and Makati City. Likewise, the Maricaban Creek that runs along the Villamor Village and Malibay Estate, is also at the boundary between the two cities. These two watercourses have their confluence in a lagoon at Aurora Boulevard and discharges into Paranaque River and eventually to Manila Bay. In times of rain, these serve as the main drainage discharges of the city. Surface runoff accumulates and cause flooding in low lying areas of the city due to siltation and clogging of the waterways. Figure 2.54 shows the Libertad-Tripa de Gallina Drainage System.

Further, majority of the city is drained by the Libertad Pumping Station, Tripa de Gallina Pumping Station, Buendia Outfall and Libertad Outfall. The Libertad Pumping Station has a capacity of 42.0 m^3/sec, draining large percentage of the northwestern portion of Pasay City. The Tripa De Gallina Pumping Station has a capacity of 56 m^3/sec, and drains about 1,769 hectares of land that extend beyond the boundaries of the city. Part of the runoff from Tripa De Gallina Creek flows into the Libertad Pumping Station via Buendia Outfall, Libertad Outfall and EDSA Outfall. The rest of its waters are discharged into Paranaque River. On the other hand, no city-wide sewerage system is in place in the city. Wastewater flows into the drainage lines and into the river. Some of the wastewater could infiltrate into the ground and may pose a threat to the groundwater quality.

At present majority of the residents and commercial establishments use individual septic tanks for treatment of waste water. In relation to the proposed project, none of the above identified drainage or sewerage system is within the boundaries of the reclamation project. Since water flows from the Libertad Channel outward to the channel's mouth in the southern end of the reclamation project in Manila Bay, the reclamation project therefore would not have any impact on the drainage system and that of the Libertad Channel.

Information from Pasay Reclamation Development Project (PRDP) and Parañaque Reclamation Development (PQRD) Hinterland Flood Risk Study conducted by Haskoning DHV this year 2024

Three channels named as Libertad, Seaside and Redemptorist channels are all draining towards the location of the reclamation areas. There are also several outfalls that are directly discharging to Manila Bay. Lastly, around 2km southeast of PQRD is the Parañaque river mouth.

This year 2024, Royal HaskoningDHV conducted PRDP and PQRD Hinterland Flood Risk Study whose main objective is to perform an initial analysis on the impact of flood risk to the hinterland due to the construction of the new islands through site visits and collecting available secondary data. In addition to the above objective, the goal of this study is to further define if modelling works on the drainage outfalls are required to further clarify flood risk.

The initial layout of PRDP, specifically for Island A, was directly connected to the existing land in Pasay City. This Island A is now proposed to be moved ±476m seaward and will be merged with Island B. Island C is approximately 250m away from the existing land.

Collected Data

The following list of data was collected by RHDHV:

1. Updated PRDP and PQRD layout
2. SM Reclamation Master Development Plan Report
3. Environmental Impact Statement (EIS) for Pasay 360
4. Existing waterways and facilities surrounding the project site.
5. University of the Philippines Nationwide Operational Assessment of Hazards (UP NOAH) 100-year Rain Return Scenario Flood Hazard Maps
6. Mall of Asia (MOA) inland channels survey
7. High tide and sea level data for the Manila Bay (will be taken from our updated Hydrodynamic Modelling Studies, refer to SF1013-RHD-XX-XX-RP-X-0001)

Below list will be collected if drainage modelling is identified as a necessary further study.

1. Updated data of the inland channels survey.
2. Historical extreme rainfall storm events
3. Rainfall Intensity Duration and Frequency (RIDF) data from the nearby meteorological stations
4. Flood discharges, high water level for Paranaque River and major 3 drainage channels at outflows
5. Land-use map of catchments of Paranaque River and drainage channels within the project area

The SM Reclamation Master Development Plan Report (SM Masterplan AECOM, 2016) prepared by AECOM for the Pasay-Paranaque reclamations stated the following.

"*To ensure that the development will cause no interference to flood flow from inland canals and rivers, a large canal of 200m in width is designed and located in between the existing hinterland and the new islands. This large canal is designed to have a flood capacity that is higher than the combined flood flows of Libertad Channel, Channel 1 (Redemptorist) and Channel 2 (Seaside). Moreover, waterways within the site are designed to provide proper connections between the three existing inland channels and the open sea. There are two main waterways between the islands that are designed such that they can be considered as extensions of Libertad Channel and Channel 1 (Redemptorist) towards the open sea. These two main waterways are designed to have a larger width than the width of the inland channels to provide higher flood flow capacity.*

This year 2024 two scenarios were modelled by Royal HaskoningDHV to examine the impacts of the new islands on hinterland flooding. The modelling results show that the designed waterways between the new islands and the 150m-wide large canal between the existing hinterland and the new islands will provide more than enough capacity for the flood flow discharged from Libertad Channel, Channel 1 (Redemptorist) and Channel 2 (Seaside).
In the case of the Paranaque River, the proposed project site is located further offshore from the river mouth and not directly blocking its flow. Therefore, the flood flow from Paranaque River will still be able to freely flow out into the open sea in a post-development scenario.
Based on the conducted flood modelling by Royal HaskoningDHV, no significant impact on inland floods was projected to be caused by the development.

Riverine Flooding

The proposed new islands do not block the outlet of existing channels, they are aligned and widened to enhance the discharge capacity from the hinterland. The islands are offset from the hinterland with a channel varying in width from 250m to ±476m. The combined discharge capacity of all these channels is much larger than the capacity of the existing hinterland channels.

The SM Reclamation Master Development Plan Report corroborates this, confirming that the proposed islands will not have negative impact on flooding. Furthermore, the Environmental Impact Statement (EIS) Study conducted for Pasay 360, where the proposed island is directly in front of the Libertad channel, concluded that the channels between the islands and the hinterland will prevent impact on upstream flooding.

The new reclamation layout has been designed with careful consideration of potential flooding impacts, and measures have been implemented to mitigate these risks effectively.
By offsetting the new islands from the existing hinterland with 250m to ±476m there is no direct blockage of any outfalls or channels. Hence, the proposed islands do not block the flow and will not cause locally increased water levels. As discussed from the updated Hydrodynamic Modelling Study, during storm conditions, a small increase in still water levels is observed comparing the situation with and without presence of the new islands. As the impact on water levels is in the order of 0.05m (5cm), and only happens during extreme storm conditions coming from the north-west, the impact on the riverine flooding risk to the existing hinterland is marginal.

As the islands also provide shelter against storm waves, this raising of still water level is offset against the sheltering effect of the islands which results in a reduced impact from wave overtopping. Specifically for Libertad Channel, any impact on water levels due to the new islands will not progress upstream of the Libertad Pumping Station. As stated in the EIS study, flooding in the areas is mainly caused by the upstream channels being clogged by solid wastes, which was verified and confirmed by residents.

The reclamation and construction of islands might impact on sediment transport and morphological processes at the location. This may result in sediment deposition at the existing and new channels from both the upstream hinterland channels and from coastal processes. As the new channels are designed, and will be maintained, at a bed level 4m below the existing hinterland channels, it is unlikely that sediment deposition will cause blockage at the outfall points as there is buffer capacity within the new channels for this material. The sediment deposition in the existing channels and in the new channels should be regularly monitored. Significant accumulation of sediments can be dredged to maintain both the existing and the new channel's discharge capacities after the construction of the islands. If this is done then, from the sedimentation and coastal morphological side, there is no additional flood risk to the existing hinterland due to the proposed new islands.

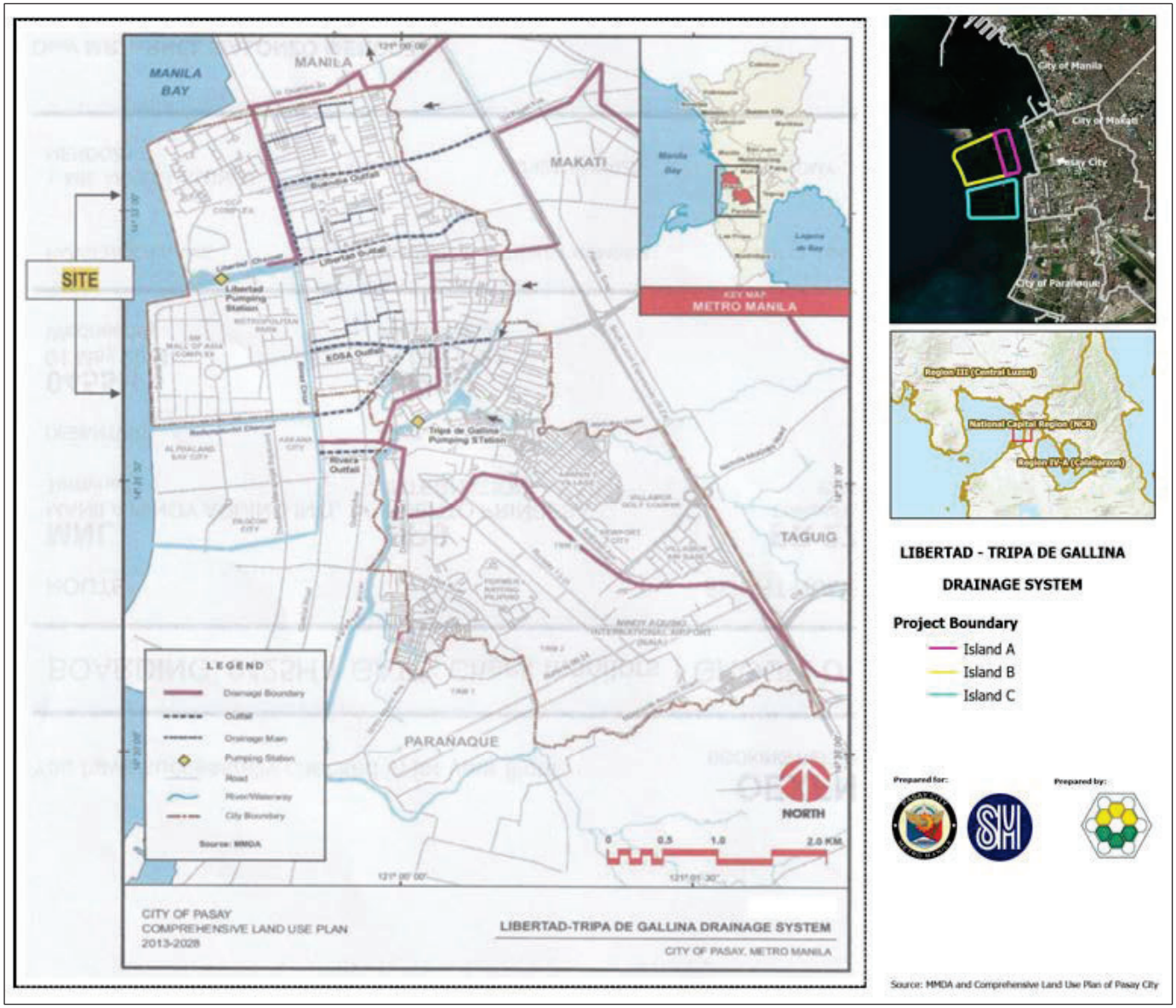


Figure 2.54 Libertad – Tripa de Gallina Drainage System
Source/Reference: MMDA and Comprehensive Land Use Plan of Pasay City , 2016

2.2.1.4. COASTAL ENVIRONMENT

It is important for the planning of the proposed reclamation and dredging to take into account the current flow, tidal movement and hydrodynamic forces so that an optimal profile can be achieved while minimizing the impact to the surrounding coastal environment. The sub-surface geology will experience changes but in the nature of enhancement because of the replacement of portion of the sea bed with fill materials. The extent will depend on the details of the reclamation methodology and works which will dictated by the geotechnical investigation that will be conducted.

Coastal Morphology, Current Flow Trends and Velocities

The complex current patterns of Manila Bay are generally attributed to the interplay of at least 3 major factors, i.e. the surface wind stress, the tidal forces and the influence of fresh water discharges into the Bay.

Royal HaskoningDHV conducted Hydrodynamic and Morphologic Modeling Study for the Pasay and Parañaque Reclamation Development last February 2017 wherein the following subsections/discussions were derived.

The current patterns in the coastal area off the vicinity of Manila Bay in Pasay City were studied using a two-dimensional non-linear numerical model of the coastal zone (using Delft3D of Deltares). The oceanographic model for the currents and sea surface elevation is essentially based on the shallow water equations derived from the two-dimensional (2D) Navier-Stokes equations for an incompressible fluid using the shallow water and Business assumptions as well as the continuity equation. The formulations allow the inclusion of the non-linear interaction between the wind and the tide.

Numerical Model Theoretical Background

The dynamics of the coastal environment warrant the need for proper hydraulic design considerations of coastal structures. As the nature of the coastal environment is dynamic and large-scale, the need for spatial and temporal detail of analysis necessitates the use and application of numerical simulation models.

Numerical models of physical processes serve as powerful tools for assessing quantitatively hydrodynamic conditions. Numerical models extend the spatial and temporal limits of field observed information for a more detailed and comprehensive engineering analysis. In dynamic ecosystems like that of the coastal environment, models allow simulation of management/engineering project alternatives without inadvertently causing undesirable changes to the ecosystem.

The current patterns in the coastal area off the vicinity of Manila Bay in Pasay City were studied using a two-dimensional non-linear numerical model of the coastal zone (using Delft3D of Deltares). The oceanographic model for the currents and sea surface elevation is essentially based on the shallow water equations derived from the two-dimensional (2D) Navier-Stokes equations for an incompressible fluid using the shallow water and Business assumptions as

well as the continuity equation. The formulations allow the inclusion of the non-linear interaction between the wind and the tide.

Modeling Approach and Set-up

Hydrodynamic conditions near and around the project area are influenced by various factors such as tidal fluctuation, prevailing wind stress, density gradient, coastal geometry and bathymetric heterogeneity. As such, the model formulations took into account the following processes: free surface gradient by tidal forcing, wind shear stress, the effect of the earth's rotation, bed shear stress and turbulence-induced mass and momentum fluxes.

For shallow coastal environments such as that of the Manila Bay, bathymetry (bottom water topography) is a crucial input for studying hydrodynamics. Bathymetric information of the study area was acquired from available bathymetric data outsourced from NAMRIA and from the bathymetric survey of the Proponent. Bathymetric points were digitized and extrapolated to coincide with the model domain and serve input to the model simulation. The coastal boundaries were established for which the computational model domain was based. Computational grid cells along two horizontal directions were then generated for this model domain where depths are recorded inside grid cells. This comprises the bathymetric data.
Tidal variation is another important input to the hydrodynamic model. Considering the limited observed information locally, and to incorporate accordingly the effects of varying tidal fluctuation as well as the complicated topography of the region, model boundaries were particularly specified at locations with observed tide conditions. The finest data should come from actual tidal records, fortunately the area is near the Manila South Harbor Station of which tidal water level records are available.

A typical tidal variation in the project area is provided in the Figure 2.55. As indicated, the tidal range exceeds 0.80 meter fluctuation between spring and neap tides.

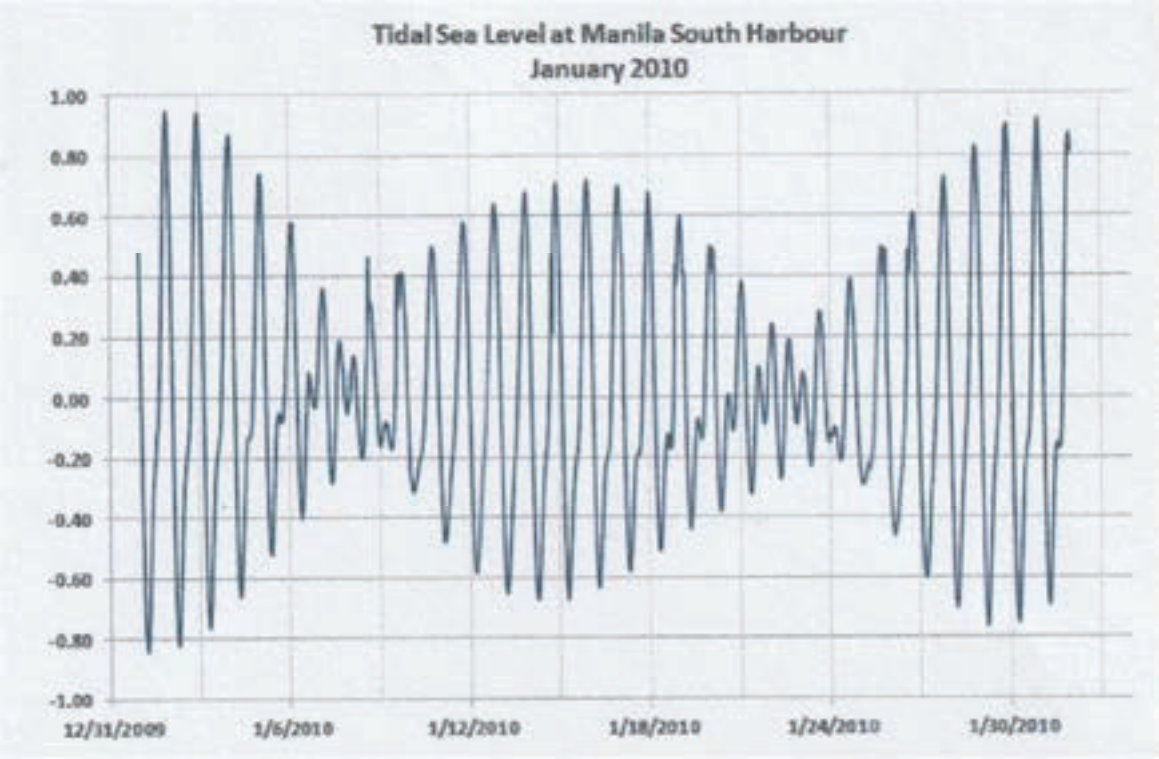


Figure 2.55 Observed Tidal Heights (m) in Manila Bay for January 2010
Source: Manila South Harbor Station, 2010

Wind is a principal driving force for most coastal processes and therefore constitutes another vital information for the model. The action of wind normally modifies the tide-driven motion of the coastal sea and therefore requires accurate information. A temporally varying uniform wind input is normally adequate (conservatively) to represent surface wind stress in hydrodynamic modeling but a spatially varying wind speed is recommendable if available.

Computational Grids

From the geometry of the coastal area, the computational grids of the model domain were constructed. Grids are basically a structured set of virtual points covering the model area where mathematical computations are carried-out and on which simulation results are obtained. The astronomical tidal constituents were imposed as boundary forcing at the open boundaries of the regional model. The simulated water levels and flow velocities from this regional model were then recorded, bi-linearly interpolated, and applied at locations along the open boundaries of the nested model representative of the Manila Bay coastal environment. Boundaries for the regional domain were particularly specified at locations with observed tide conditions.

A fine resolution grid was developed near the coast where the proposed project site is located. It was developed using a curvilinear grid structure, which allowed the generation of fine resolution computational mesh to accordingly follow coastal (and proposed reclamation) configuration and be consistent with the tidal streamline structure in the Bay. Grid sizes in the order of 45 m were adopted in the detailed model domain, with higher resolution mesh in the order of 25 m at spaces between piers. All major influences on hydrodynamics of the outer

regions were incorporated into the detailed models. The initial conditions for initiating the hydrodynamic computations of the detailed models were based on the computations of the regional model.

Modeling Inputs and Scenario Settings

To assess the impact of coastal development such that of the Pasay reclamation on current circulation and pollutant dispersal patterns in the area, scenario simulations were executed for comparative analysis. Grid cells coinciding to the outfall location of the Libertad Channel just south of the proposed development were provided with additional source term (flow rate and concentration) to mathematically incorporate the pollutant loading in the model simulation. In this study, two (2) predominant weather condition scenarios were investigated to predict the coastal currents and the transport and dispersion of pollutant plume near the reclamation location:

- Scenario A: Turbulent weather conditions with a strong south-westerly wind (Habagat wind: speed of 5 m.s-1 and direction of 140 to 225 degrees) prevailing over the study area, representing the weather conditions during the rainy months.
- Scenario B: Summer weather conditions is represented with a strong north-easterly wind (Amihan wind: speed of 5 m.s-1 and direction of 320 to 40 degrees) prevailing over the study area.

Results and Discussion

To quantitatively assess the coastal circulation and material transport conditions of the study area, the hydrodynamic model was simulated using the tidal conditions from January 5 to 15 2010 (coinciding with the available historical tidal data), with initial runs from January 1 to 5 to generate appropriate initial conditions of the model runs.

The limited simulation period was due to the lack of long-term continuous observed tidal information over a wide range of varying physical conditions (wind patterns, rainfall events, river discharges, etc.) immediate to the project site to properly investigate temporally-varying forcing conditions.

Scenario simulation analyses were nonetheless specified to cover representative atmospheric and hydrodynamic conditions of the study area. Notwithstanding, the hydrodynamic model is able to replicate observed water level conditions within acceptable limits of accuracy (Figure 2.56). As shown, the result gives a good agreement between observed and computed water levels, although a slight underestimation is evident in the simulation. Considering the water levels are reproduced well by the model, the tidal ebbing and flooding as well as the advection transport in the area are assumed to replicate actual conditions also in the analytical discussions of this study notwithstanding the given assumptions and limitations in modelling.

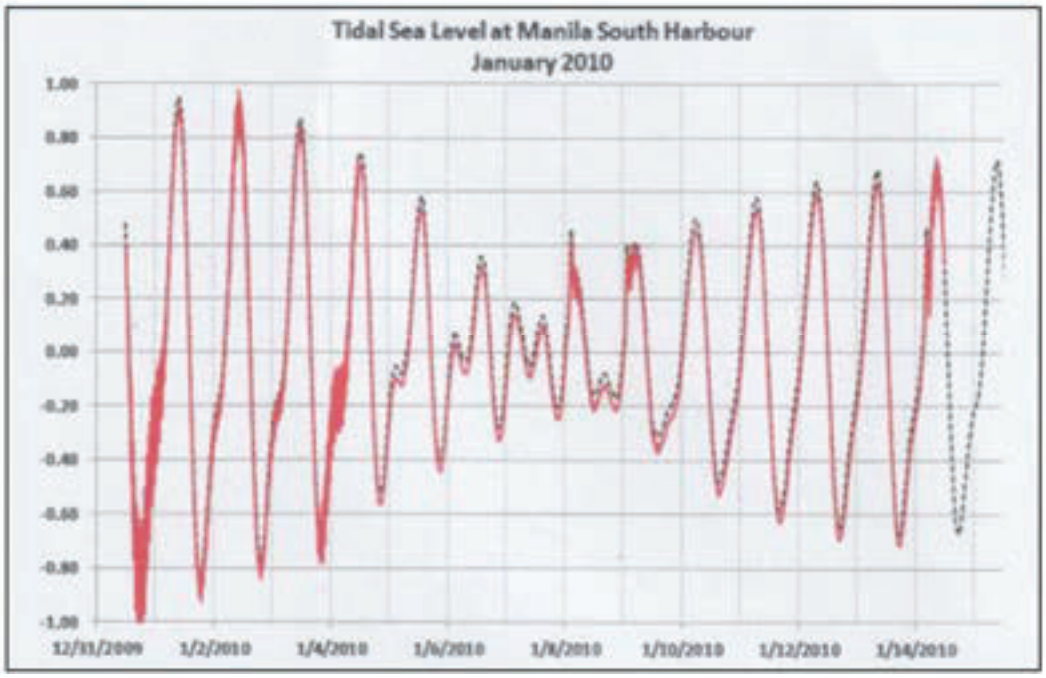


Figure 2.56 Comparison of Observed and Modeled Tidal Heights (m) - (black and red lines, respectively)
Source: Manila South Harbor Station, 2010

Predicted Currents in the Project's Coastal Area

While both winds and tidal forces significantly influence current circulation in coastal environments, currents were predominantly governed by tides in the Manila Bay domain, particularly in the project area. The results of the hydrodynamic simulation demonstrated tidal ebbing and flooding dictating current movement and mass transport within and out of the bay. This may have been brought by the complicated topography and coastal configuration of the project site. Under Amihan wind conditions scenario, with a wind velocity input of 5 m.s-1 and blowing from the northern direction, the model results revealed southward flow direction, with flow velocity fields in the range of 6 to 10 cm.s-1 near the coastline.

Figure 2.57 shows the Predicted Flow Velocity Field Under Amihan Wind Condition.

Using wind velocity input of 5 m.s-1 blowing from the southern direction for Habagat wind condition scenario, the model results revealed more or less similar flow magnitudes when compared to the Amihan wind scenario. The model runs revealed that from the open sea, a predominant flow direction is from the west and upon reaching shallow areas near the shore turns towards the northern direction following the configuration of the coast. Flow velocity fields in the range of 4 to 15 cm.s-1 are likewise predicted by the model. Figure 2.58 shows the Predicted Flow Velocity Field Under Windy Condition (Habagat).

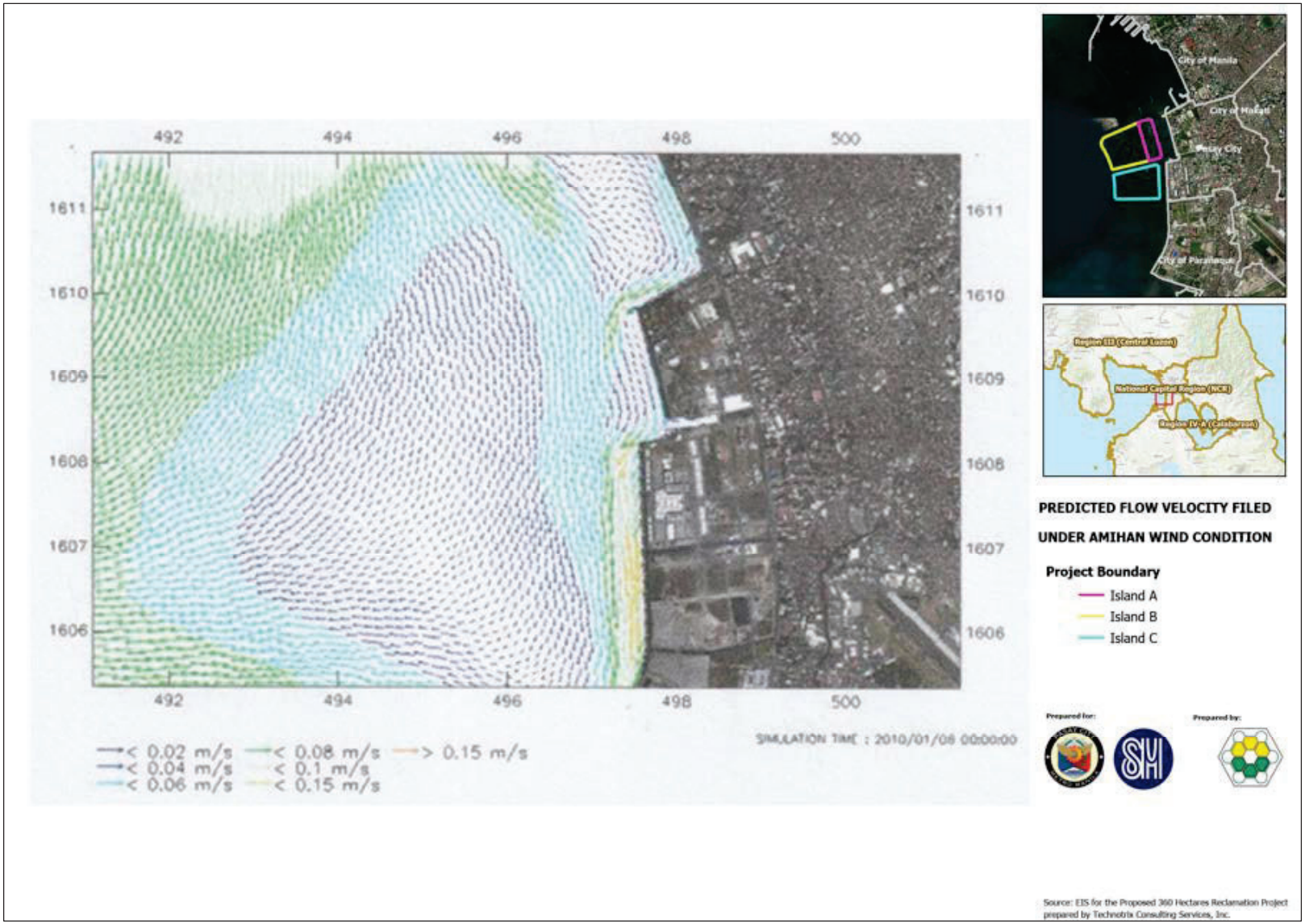


Figure 2.57 Predicted Flow Velocity Filed Under Amihan Wind Condition
Source: EIS for the Proposed 360 Hectares Reclamation Project prepared by Technotrix Consulting Services, Inc., 2017

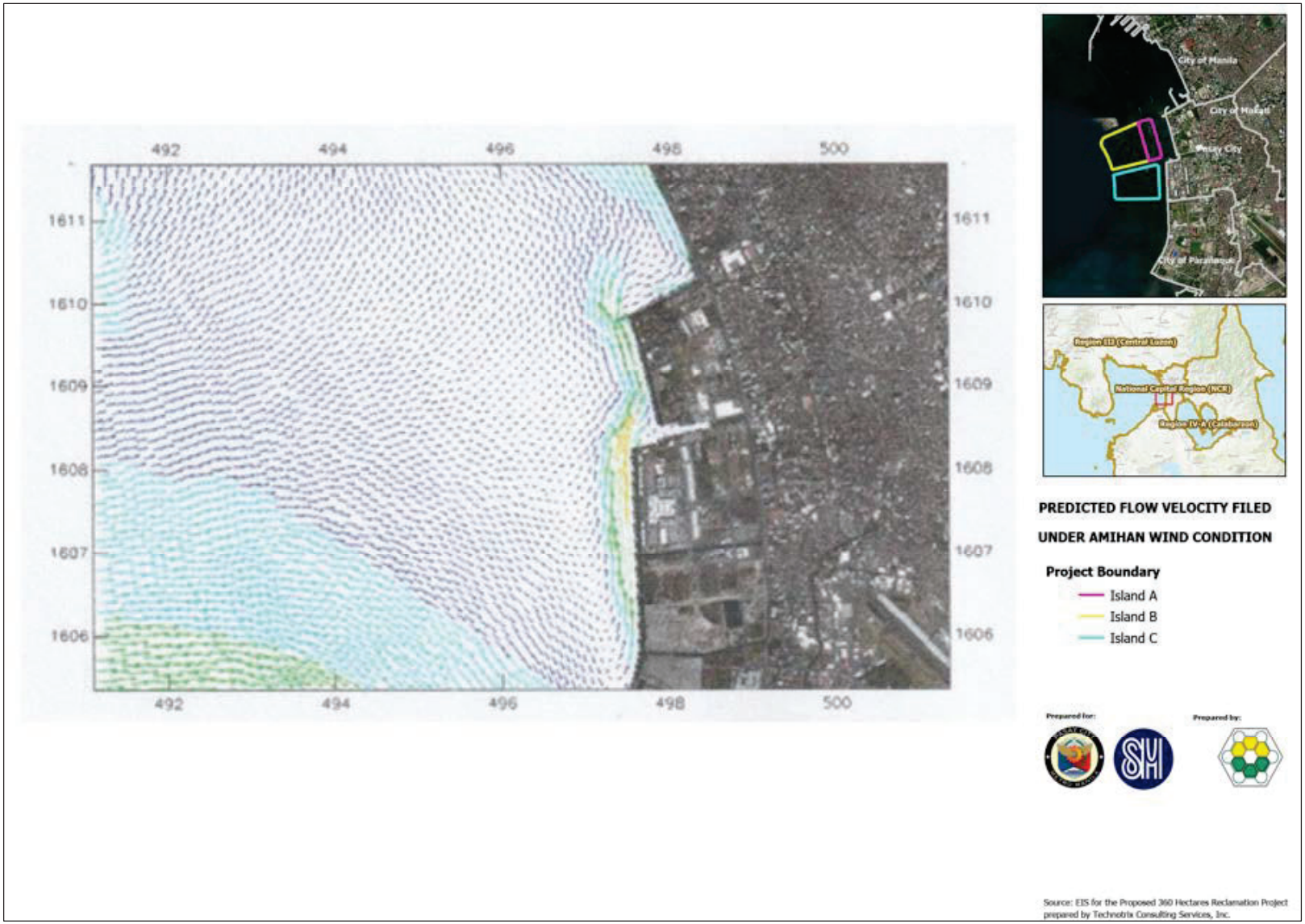


Figure 2.58 Predicted Flow Velocity Field Under Windy Condition (Habagat)
Source: EIS for the Proposed 360 Hectares Reclamation Project prepared by Technotrix Consulting Services, Inc., 2017

Wave Simulations

To obtain representative estimates of wave characteristics in the project area, use was made of the wave model SWAN (Simulating Waves Nearshore), a freely-available, open-source computer model that computes random, short-crested wind-generated waves in coastal regions and inland waters from given wind, bottom and current conditions. Using the same computational grid of the flow model, the wave parameters for the open boundaries were set with assumed significant wave height of 2 meters, a wave period of 10 seconds and a wave direction of 250 degrees.

The wave patterns were simulated for extreme wind conditions representing a storm event with an assumed constant wind magnitude of 42 m.s-1 (about 150 kph) blowing from the west. These inputs were used for both with and without the project scenarios. Results of the wave simulation for “without" the project show that wave refraction or bending occurs at the northeast of the coast as well as the mouth of Libertad Channel due to the coastline configuration.

During Habagat (southwest monsoon) conditions, waves predominantly come from the west and slightly refract or bend toward the coast upon reaching the shallow part of the sea. Due to the rather deep coasts near the project area, wave refraction will be slightly weaker. Waves approaching this portion of the coast at an angle will not be refracted enough to change the approach angle perpendicular to the coast. The presence of the reclamation project in the area does not significantly alter the wave direction, as shown in Figure 2.59 and Figure 2.60**.** However, significant wave heights of more than 5 meters during storm events predicted at the areas just north of the said reclamation works would be reduced, which would mean that the reclamation area serves some sort of a breakwater from incoming waves and thus „shelter" the said area especially during catastrophic storm surge event. Essentially, reclamation increases the protrusion of landmass into the coast and naturally increases the sheltering effect at the leeward side of the protrusion.

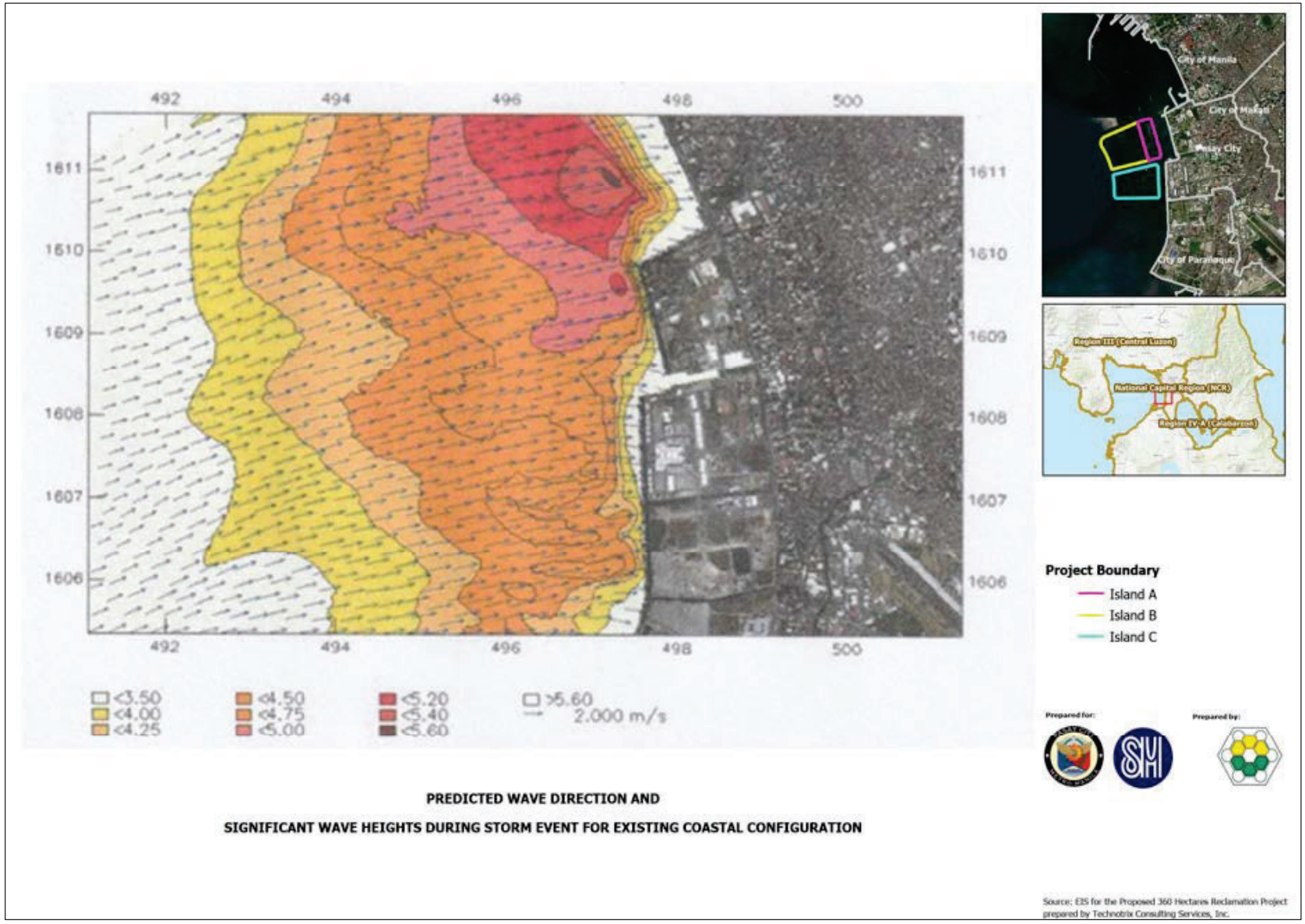


Figure 2.59 Predicted Wave Direction (shown in arrows) and Significant Wave Heights (shown as contours, in meters) during Storm Event for the Existing Coastal Configuration
Source: EIS for the Proposed 360 Hectares Reclamation Project prepared by Technotrix Consulting Services, Inc., 2017

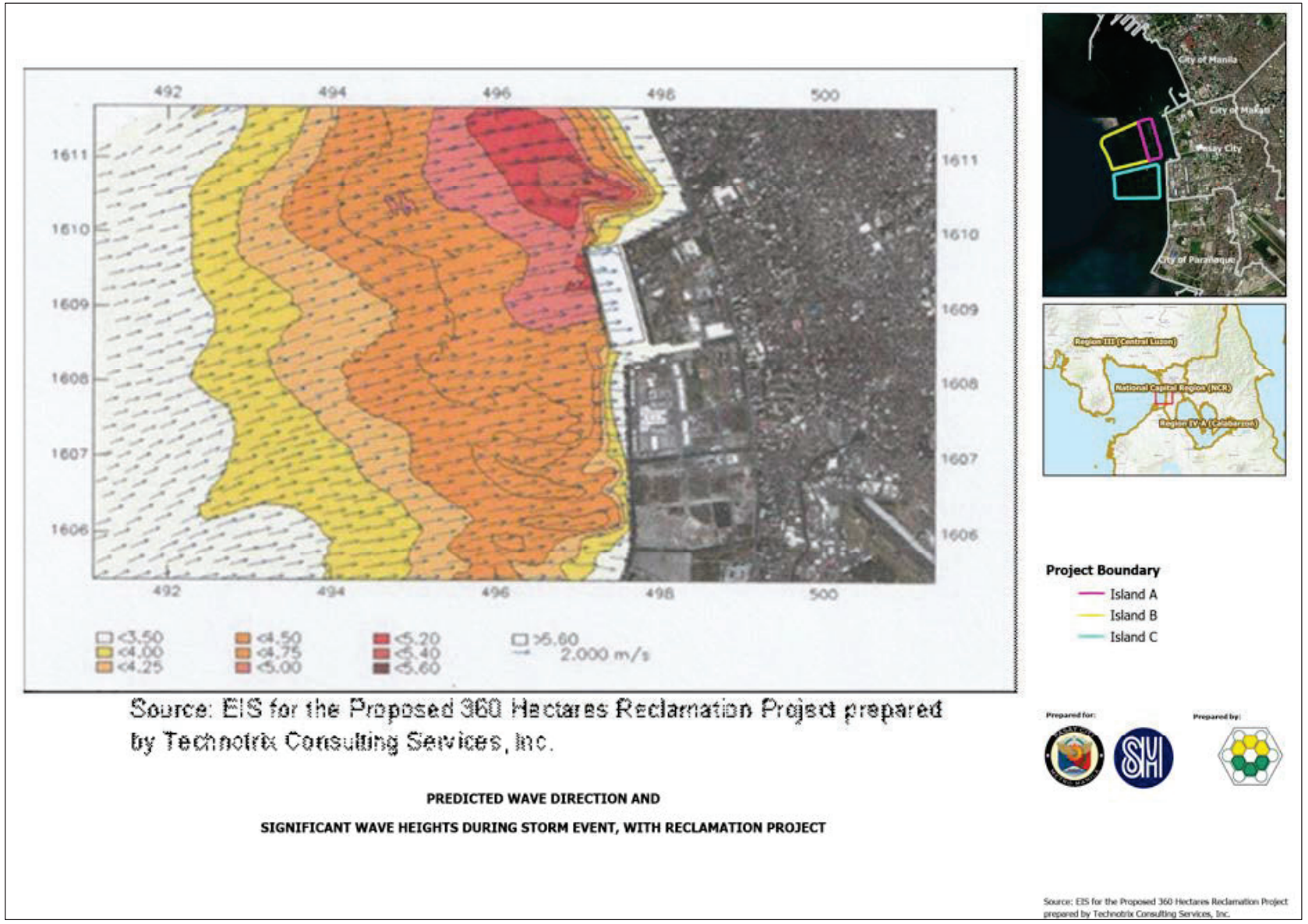


Figure 2.60 Predicted Wave Direction (shown as arrows) and Significant Wave Heights (shown as contours, in meters) during Storm Event, with the Reclamation Project
Source: EIS for the Proposed 360 Hectares Reclamation Project prepared by Technotrix Consulting Services, Inc., 2017

2.2.1.5. HYDRODYNAMIC AND MORPHOLOGY MODELLING CONDUCTED BY ROYAL HASKONING DHV

Hydrodynamic and Morphology Modelling Study (2017)

A Hydrodynamic and Morphology Modelling Study for Pasay and Parañaque Reclamation Development was carried out by Royal HaskoningDHV wherein the report was submitted last February 2017.

This study has been carried out in the framework of the development of the Pasay and Parañaque coastal developments in front of the existing reclamations in Manila Bay.

The main objective of the study is to develop the most cost-effective design for the land reclamation development, while adhering to the pre-construction requirements of the PRA for endorsement to NEDA. The design must meet the criteria of a detailed engineering design. The report covers the modelling and analysis tasks which are required to obtain the extreme and operational hydraulic design conditions (water levels, currents, waves), the morphological impact, the flow velocities (flushing) and the water quality inside the canals.

Figure 2.61 outlines the structure of the above-mentioned report. The figure identifies in which part of the report where the detailed background and tables with design values and/or impacts can be found.

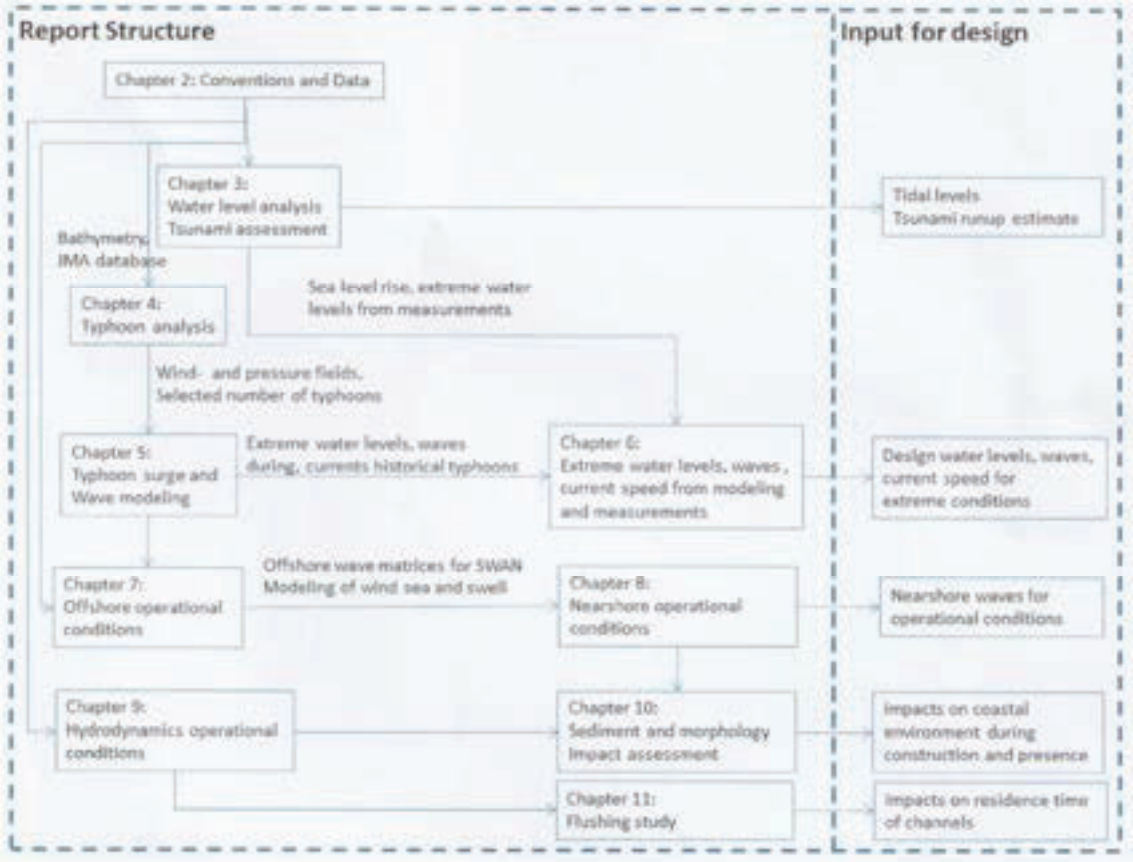


Figure 2.61 Report Structure and Outputs for Design Purposes
Source: SM 360 A1 – Hydrodynamics and Morphology Study by HaskoningDHV , 2017

The conclusions that were deduced from the said study are presented in the following discussions.

Chapter 3: Data analysis of water levels was carried out using a tidal record of 31 years close to the project site. Relevant tidal parameters have been derived which show good agreement with characteristic tidal parameters from other data sources. Also, the surge during historical typhoons has been deduced from this record to validate numerical modelling results. A high-level tsunami assessment has provided an estimate of the expected run-up at the open bay side of the coastal zone development for present-day conditions.

Chapter 4: A selection of 35 typhoons has been made for detailed numerical modelling which are considered to affect the project site. State-of-the-art numerical modelling with MIKE21 of these typhoons (a.o. Nesat, 2011; Ruby, 1988; Kim, 1977) was carried out to estimate the surge, waves, and currents. The modelled surges have been calibrated against measurements (1-month measurements at the project site), but the extreme waves and currents could not be validated since no typhoon passes by during the measurement period. Qualitatively it can be concluded that the modelled surge, wave and current speed results are realistic representations of real-life situations during typhoons.

Chapter 5: The modelling results of all typhoons considered herein shows that the peak surge and peak wave height more or less coincide in time at the project site during several severe

typhoons. Because of this, it is recommended to assume full dependency between these two parameters for design purposes. Another important phenomenon observed from the modelling results are the incoming waves with a long wave period (but lower surge and wave heights) after the typhoons have already passed. This so-called 'swell condition' penetrates from the Southern Chinese Sea into Manila Bay and is a result of offshore wave fields generated by the typhoons.

Chapter 6: Extreme value analysis of water levels was carried out using the measurements (Chapter 3) and the modelling results (Chapter 5). Design water levels for extreme events ranging from 1/1 to 1/1000yr return period have been derived. An allowance to the design water levels was added to account for uncertainties and for future conditions. Design waves have been derived for two conditions: 1) wave conditions which coincide with the surge peak (high wave height, moderate period, high surge), and 2) wave conditions which occur after the typhoon passage (high period, low wave height, low surge). An allowance to the peak wave conditions has been added to account for future conditions. Also, design current speeds at the bay-side of the project site are presented. The current speeds inside the canals during extreme conditions have not been assessed as of yet.

Chapter 7: A long-term dataset of offshore wave and wind conditions was analyzed for operational conditions at the project site. The offshore conditions show two important characteristics: 1) wind conditions are generally mild (95% of the time less than 9 m/s), and 2) swell waves approach Manila Bay from the southwestern to northern directions.

Chapter 8: A large number of nearshore wave computations with the SWAN model was carried out to define transformation matrices between offshore conditions and nearshore conditions. Computed nearshore waves have been validated against measurements close to the project site for a situation with mild eastern wind conditions only. Using the transformation matrices, operational wave tables have been generated for nearshore wave conditions. The nearshore higher waves (Hs > 0.5 m) are largely governed by incoming swell conditions according to these modelling results.

Chapter 9: Detailed hydrodynamic modelling has been carried out for daily conditions with tide and moderate winds. The modelled water levels and currents close to the project site are validated against measurements and show good (water level) / reasonable (currents) agreement. The typical depth-averaged velocities in the area of interest are small (< 0.10 m/s). The land reclamation causes an increase in the depth-averaged currents in some locations close to the project site. However, the magnitude of these depth-averaged currents remains small (< 0.15 m/s).

Chapter 10: A qualitative assessment has been carried out to investigate the effects of the land reclamation (both presence and construction phases). Limited local erosion around the land reclamation has to be expected due to increasing currents. It is not very likely that the presence of the land reclamation will impact the coastline morphology and/or Bacoor Bay. The dredging and dumping during construction, however, can result in a temporary dispersion and thus increase of fine sediments in the water column of Manila Bay.

Chapter 11: A flushing study has been carried out to provide information on flow velocities and flushing times in the future channels within the land reclamation in both the dry and wet

season. Furthermore, a qualitative assessment of the water quality has been presented. During the wet season, the peak current velocities are governed by typhoon conditions and design current speeds are recommended for the channels. During the dry season, the flushing times are longer inside the new channels, especially in the east-west oriented channels. The flushing time in the north-south oriented channel increases with deep channels, but does not change substantially with shallow channels. Two water quality issues with a moderate risks profile have been identified in the new channels around the land reclamations: low oxygen levels especially during the dry season and excess organic matter/nutrients. Shallow channels at 4m-MSL result in less environmental risk than deep channels, and are therefore preferred.

Based on the findings of their study, Royal Haskoning DHV recommends the following:

- Design surge and wave conditions have been presented but are inherently uncertain due to limited time series/records and the absence of publicly available nearshore wave data during extreme events. Allowances are added to the computed values to advice on the safe side for design purposes. It is strongly recommended to set up a solid monitoring program to measure accurate water levels and waves during typhoon conditions in Manila Bay to allow for further design optimizations.
- There is no information available to exclude tsunami risk from neither volcano activity nor landslides for Manila Bay as of yet. It should be verified in the detailed design phase that these root causes are not important for the project location. It is also recommended to study the behavior of tsunamis inside the new channels in more detail in the detailed design phase.
- To define more accurately the operational wave conditions for the cruise terminal, it is recommended to carry out wave measurements during the period June – September. In this period, swell waves from southwestern directions penetrate into Manila Bay. However, the extent of this penetration is not known and the wave model cannot be validated for these conditions at this moment.
- The dredging of sediments may result in the release and dispersion of fines. The scale of dispersion and also the magnitude of the concentration increase in the water column can only be assessed in more detail with additional analysis of the fine content of the borrow material, the used dredging methods, proposed mitigation measures and additional numerical modelling.
- Two water quality risks have been identified for the new channels (i.e. low oxygen levels during the dry season and excess organic matter/nutrients due to insufficient water exchange). It is recommended to analyze the potential impact of the development on the water quality in more detail. Baseline data of the existing conditions in the outfall channels must be considered and – if sufficient data is available – also additional water quality modelling could then be carried out to evaluate potential mitigation measures.

Updated (2024) Hydrodynamic and Flood Impact Modelling Studies

Royal HaskoningDHV conducted an update of the Hydrodynamic Modelling Study (typhoon analysis) considering the changed island boundaries. The main objective of that study is to provide an updated analysis of the hydraulic design conditions along the boundaries of the revised layout. Subsequently, wave penetration modelling was carried out to assess the wave heights in the channels between the islands. The wave penetration into the channels was modelled using the open-source numerical model SWASH (Simulating Waves till Shore). Finally, also a flushing study was conducted, the objective of the flushing study is to provide

insight into the flushing time of the water in the channels in between the proposed layout. This flushing time is used as an indication to estimate potential water quality issues due to the construction of the islands. The full copy of the Hydrodynamic Modelling Study (2024) is attached as **Appendix J**.

Based from the SWASH results, the new islands will result in a sheltering effect, protecting the existing mainland from direct wave impact. As a result, the flood risk of the existing land due to overtopping water (from waves) will significantly be reduced.

On the other hand, the results show that there is a slight increase in storm surge (still water level) due to the presence of the new islands. When a storm comes in from the north-west, and water levels are pushed up due to the strong storm winds, because of this “tunnel” water levels will be pushed up slightly more compared to a situation without any new islands. However, the increase in surge level is minimal and ranges from 0.01m at point 4 to 0.11m at point 2. It also shows that the surge level increase dampens from point 2 (0.11m) to point 3 (0.05m) i.e. by 0.06m.

Tidal Analysis

The Hydrodynamic Modelling Study include water level data analysis. Water level measurements are used to perform a tidal analysis and estimate the storm surge elevations during historical typhoons. The results of these analyses provide valuable input for the calibration of the hydraulic model used in later stages of this study. Furthermore, sea level rise projections for Manila Bay are discussed since sea level rise will have to be accounted for in the design of the land reclamation.

Tidal Signal Reconstruction

The water level measurements provided by NAMRIA were used for the reconstruction of the tidal signal. Using the Python-based adaptation of UTide (Unified Tidal Analysis and Prediction Functions [9]), the tidal signal was reconstructed to obtain the astronomical tide excluding storm surges. By subtracting this reconstructed signal from the original timeseries, the residual signal was obtained from which storm surge elevations can be estimated.

An initial analysis of the original timeseries with UTide shows that the residual signal varies substantially at the beginning and end of data gaps in the original timeseries (Figure 2.62 and Figure 2.63). These variations in the signal are likely caused by the neighbouring data gaps rather than storm surges. Therefore, the original timeseries was slightly modified for the period around data gaps where the residual signal shows implausible results.

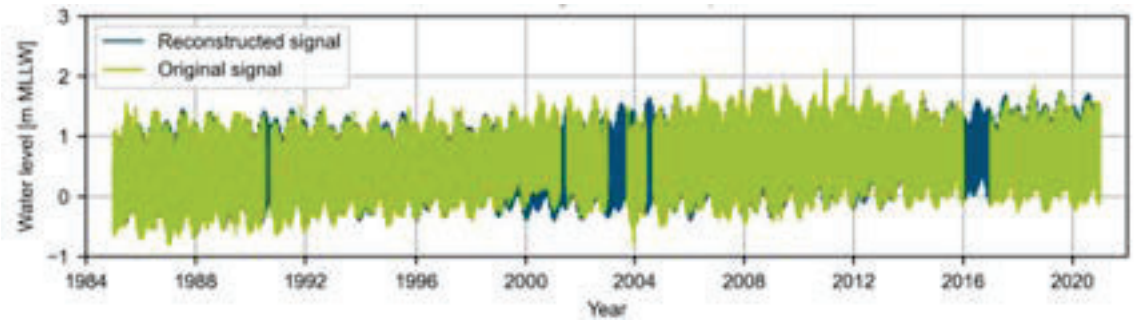


Figure 2.62 Original and Reconstructed Tidal Signal
Source: Hydrodynamic Modelling Studies by HaskoningDHV, 2024

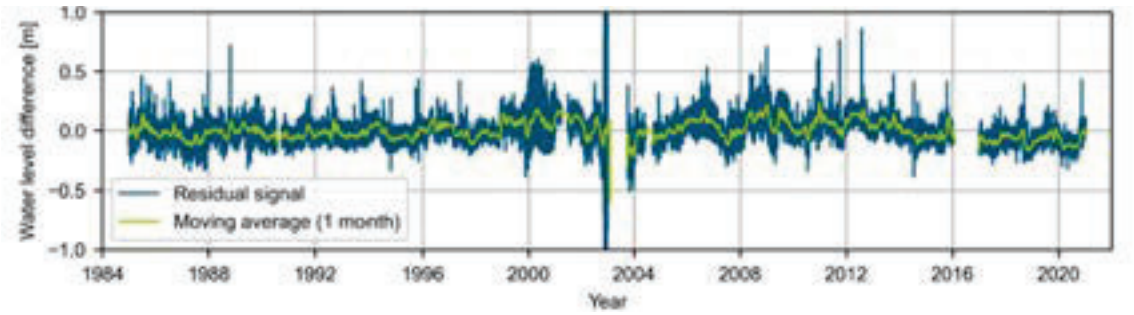


Figure 2.63 Residual Tidal Signal
Source: Hydrodynamic Modelling Studies by HaskoningDHV, 2024

The adjusted tidal signal and corresponding reconstructed signal are shown in Figure 2.64. Removing the data between 01-11-1999 and 29-06-2001 and between 01-11-2002 and 01-01-2004 results in a more robust residual signal (Figure 2.65) that is in line with what would be expected. The adjustments to the timeseries have little consequences for the analysis of the historical typhoons since none of the considered typhoons occurred during the time intervals for which the water level data was removed.

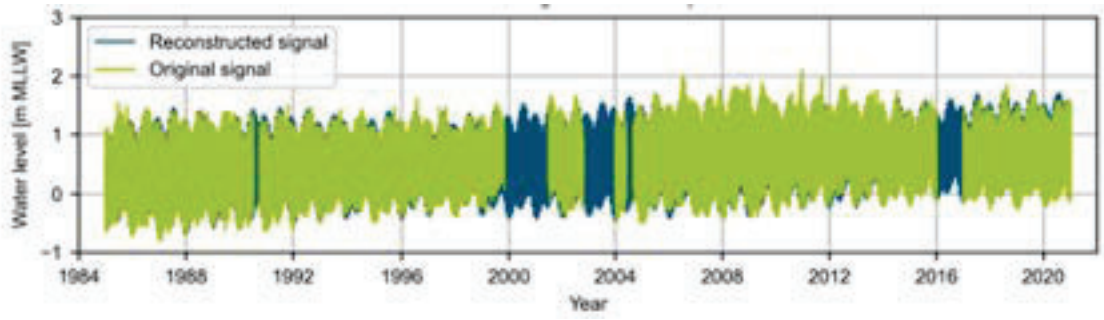


Figure 2.64 Original and Reconstructed Tidal Signal After Adjustments To The Original Timeseries
Source: Hydrodynamic Modelling Studies by HaskoningDHV, 2024

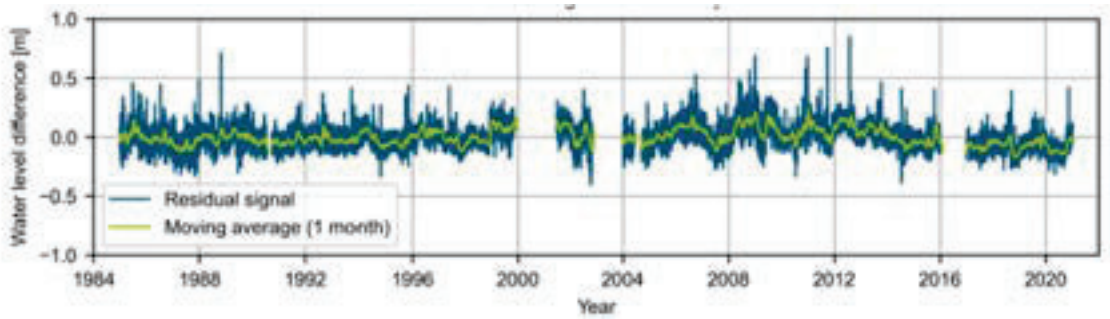


Figure 2.65 Residual Tidal Signal After Adjustments to the Original Timeseries
Source: Hydrodynamic Modelling Studies by HaskoningDHV, 2024

UTide also provides a long-term trend of relative sea level rise. The long-term trend of sea level rise derived by UTide is depicted in Figure 2.66. The figure shows that the sea level has risen by about 45 cm over a period of 36 years, which amounts to a linear trend of roughly 12.5 mm / year.

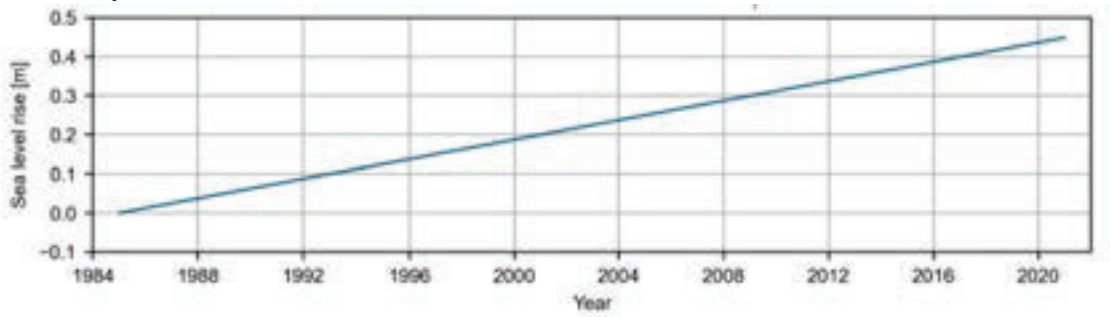


Figure 2.66 Linear Sea Level Rise Trend at Manila Bay derived using UTide
Source: Hydrodynamic Modelling Studies by HaskoningDHV, 2024

Flood Impact Study

The flood impact study of Royal HaskoningDHV, on the other hand, revealed that “the presence of the new islands does not impact existing hinterland (mainland) flood risk”. The study further concluded that a) Island A will be moved and connected to Island B, creating a 470m wide channel and avoiding a reclamation directly against the hinterland, removing direct blocking of outfalls; b) The channels created by the new islands will be wider than the channels initially designed for in both the SM Reclamation Master Development Plan (by AECOM) and as verified in the Environmental Impact Statement; and c) The channels created by the new islands should be monitored and maintained at their designed levels. The full copy of the Flood Impact Study (2024) is attached as **Appendix K**.

Coastal Flooding

In the existing situation without presence of the new islands, during severe storm conditions (typhoon) waves will hit the land in full force. Such waves combined with high water levels (storm surge) result in large quantities off water to overtop the coastal defense resulting in local flooding of the nearshore areas.

The proposed islands will have a positive impact on the hinterland in terms of protection against these waves. The edges of the proposed islands will consist of revetments with wave

walls and are designed to provide protection against normal and typhoon generated waves. As the proposed islands are to be constructed in front of the hinterland, the new islands will absorb most of the wave impact during storm conditions and will significantly reduce the wave impact (hence overtopping water) on the existing hinterland. This has a positive effect and reduces flood risks in the existing nearshore areas.

2.2.1.6. IMPACT ANALYSIS AND ENVIRONMENTAL

Change in drainage morphology / Inducement of flooding/ Reduction in stream volumetric flow, Change in stream, lake water depth and Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition

The project reconfiguration aims to enhance the water circulation and further mitigate the impact of flooding in the project site. The Sand consisting of a portion of the Current Island A will be removed and transferred to the Current Channel between the Current Island A and Island B, thereby creating the 476-meter wide Reconfigured Channel between the Reconfigured Island A and Pasay City mainland/CCP Complex Area. All of the sand removed from a portion of the Current Island A will be placed only on the above-mentioned Current Channel. Splitting of the Current Island B of the Project to create the Reconfigured Islands B and C and a channel in between, allowing the free flow of water from Libertad Channel to Manila Bay.

Royal HaskoningDHV conducted an update of the Hydrodynamic Modelling Study (typhoon analysis) considering the changed island boundaries. The main objective of that study is to provide an updated analysis of the hydraulic design conditions along the boundaries of the revised layout. Subsequently, wave penetration modelling was carried out to assess the wave heights in the channels between the islands. The wave penetration into the channels was modelled using the open-source numerical model SWASH (Simulating Waves till Shore). Finally, also a flushing study was conducted, the objective of the flushing study is to provide insight into the flushing time of the water in the channels in between the proposed layout. This flushing time is used as an indication to estimate potential water quality issues due to the construction of the islands.

Based from the SWASH results, the new islands will result in a sheltering effect, protecting the existing mainland from direct wave impact. As a result, the flood risk of the existing land due to overtopping water (from waves) will significantly reduce.

Based on the Hydrodynamic Modeling done by Royal Haskoning the Project does not block, impede or disturb the drainage system and thus does not impact on the occurrence of flooding. The buffer zone between the reclamation and the shore and the northern boundary of the other reclamation area provides a much wider drainage area than that of the Libertad Channel itself.

On the other hand, the results show that there is a slight increase in storm surge (still water level) due to the presence of the new islands. When a storm comes in from the north-west, and water levels are pushed up due to the strong storm winds, because of this “tunnel” water levels will be pushed up slightly more compared to a situation without any new islands. The increase in surge level is minimal and ranges from 0.01m at point 4 to 0.11m at point 2. It also

shows that the surge level increase dampens from point 2 (0.11m) to point 3 (0.05m) i.e. by 0.06m. The other cause of flood is storm surge; it could bring about flood water from the sea. On the other hand, the project is not a cause of storm surges. In fact, the proposed project could shelter the shore areas from flood. Further, flooding will not impact on the reclaimed land itself because of the high finished platform level of 4.0 meters above mean sea level (MAMSL).

In the existing situation without presence of the new islands, during severe storm conditions (typhoon) waves will hit the land in full force. Such waves combined with high water levels (storm surge) result in large quantities off water to overtop the coastal defense resulting in local flooding of the nearshore areas.

The proposed islands will have a positive impact on the hinterland in terms of protection against these waves. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves. As the proposed islands are to be constructed in front of the hinterland, the new islands will absorb most of the wave impact during storm conditions and will significantly reduce the wave impact (hence overtopping water) on the existing hinterland. This has a positive effect and reduces flood risks in the existing nearshore areas.

A qualitative assessment has been carried out by Royal HaskoningDHV to investigate the effects of the land reclamation (both presence and construction phases). Limited local erosion around the land reclamation has to be expected due to increasing currents. It is not very likely that the presence of the land reclamation will impact the coastline morphology and/or Bacoor Bay. The dredging and dumping during construction, however, can result in a temporary dispersion and thus increase of fine sediments in the water column of Manila Bay.

Storm drainage system, concrete culverts, and other erosion control measures were incorporated in the Detailed Engineering Design (DED) of the Project, and will be included in the Project's final Master Development Plan. Dredged and filled materials, if applicable will be properly stockpiled to avoid soil erosion or run-off.

Drainage System

The primary goal of the stormwater drainage system is to safely convey, collect, and divert runoff from roads and pedestrian areas into the designated drainage system, preventing flooding within the development. This system manages natural surface runoff, surface drainage from paved or artificially impervious surfaces, excess rainwater, stormwater, kitchen water, bath/shower water, and similar types of water. All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines.

Individual and/or centralized treating system is proposed for construction at Islands A, B, and C. The storm drainage system includes gullies, U-channels, manholes, pipes, box culverts, and outfalls. Stormwater will be collected by gullies or U-channels with grating covers and transported via pipes or box culverts. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years. According to BS EN 752 Part 4 Table 2, the runoff coefficient ranges from 0 to 1, depending on the pavement type. For this project, a coefficient of 0.9 will be used for roads and buildings due to their impermeable nature, and a coefficient of 0.2 for green areas due to their permeable nature. A rainwater tank will be installed before each

outfall, with overflow stormwater being discharged directly into the sea. Storm drainage manholes will be made of reinforced concrete with manhole covers 800mm in diameter.

The design will ensure drainage and stormwater collection along the entire road system. To address environmental concerns related to disposing of storm runoff directly into Manila Bay, the proponent will implement a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. This system may include swales instead of concrete/PVC drainage pipes, allowing infiltration, constructing cisterns for storage, and similar initiatives. Appropriate engineering interventions, such as installing cast iron grills along gutters and curbs, will minimize, if not eliminate, conditions like siltation, debris, scouring, and other factors that may impede the free flow of stormwater to designated drainage lines and cause flooding within the development. Porous materials such as grass/turf pavers, paving blocks, or similar materials will be used in areas fronting the sea and along the proposed linear forest to encourage infiltration and reduce surface runoff.

As to the flood risk impact of the new islands, the flood impact study revealed that "by offsetting the new islands from the existing hinterland with 250m to 470m, there is no direct blockage of any outfalls or channels. Hence, the proposed islands do not block the flow and will not cause locally increased water level. Specifically, for Libertad Channel, any impact on water levels due to the new islands will not progress upstream of the Libertad Pumping Station. As stated in the (2017) EIS study (refer to Section 2.2.3) flooding in the areas is mainly caused by the upstream channels being clogged by solid wastes, which was verified and confirmed by residents during our site visit

Depletion of water resources / competition in water use

In the absence of major water use by the project and of any underground water abstraction there will be no competition in water use. There are no springs and wells at the site and aquifers are absent; depths of water table are not relevant to this project. The water needs of the construction employees will be provided in bottled water and in small water tanks. The construction crew will be based or housed in the self-contained dredging vessels.

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.36 Impact Analysis and Environmental Management - Hydrology and Ocenaography

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Potential Impacts: • Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow • Change in stream, lake water depth • Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition • Change in bathymetry					

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Pre-Construction – Geotechnical and Feasibility Study Reclamation (construction of islands) and horizontal development (PVDs, construction of storm drainage, etc.)	2017 to 2024 2021 to 2028	Reclamation itself provides protection against storm surges and thus against floods. Flood water pathways in Pasay is NOT directed towards the project area, (Per the NOAH Project) Engineering intervention: structural and engineering designs to withstand earthquakes and liquefaction. Phil. standards	EGGAR (2017) Geotechnical Interpretation Report (2017) Hydrodynamic study (2017 and 2024) Flooding Impact Study (2024)	Preparation and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines. Installation of vertical containment structure, wave deflector, vertical drains, platform elevation, Prefabricated Vertical Drain (PVD) and Surcharging methods which are part of the Soft Soil and ground improvements	Part of development cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
				Implementation of a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years.	
Construction Phase - Construction of temporary access roads/ bridges from mainland to reclaimed area and between the islands	Alteration of water flow	-	NA	Construction/ Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges.	
Construction Phase - Maintenance of temporary access roads/ bridges from mainland to reclaimed area and between the islands	Alteration of water flow	-	NA	Maintenance of Steel Sheet pile (SSP) & Baily Bridge openings to strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations	

2.2.2. WATER QUALITY

2.2.2.1. DEGRADATION OF GROUNDWATER QUALITY

The project will not use groundwater and neither will it cause disturbance or damage to the groundwater/aquifer system which is absent at the project site.

2.2.2.2. DEGRADATION OF SURFACE WATER QUALITY AND DEGRADATION OF COASTAL/MARINE WATER QUALITY

2.2.2.2.A. BASELINE DATA

The comparison summary of the EIS and EPRMP baseline data for the water quality is presented in Table 2.37. The sampling points from the EIS to EPRMP have been updated in order to consider the changes of the Project boundary. Though there is no direct comparison of the water quality parameters with regards to the specific sampling stations due to the changes of sampling points, it has been observed that high level of fecal coliform in Manila Bay and Libertad channel sampling points have already been existing prior to the Project development.

Table 2.37 Comparison of Water Quality Baseline Data from the EIS 2017 and EPRMP 2024

<table>
<tr><th>Items</th><th>EIS 2017</th><th>EPRMP 2024</th></tr>
<tr><td>Sampling Parameters</td><td>2012: pH, Color, TDS, Oil & Grease, Ammonia-N, Cyanide, Nitrate, Phosphate, Salinity, Fecal and Total Coliform, As, Cr, Pb, Hg, TSS, BOD_5, COD, Chloride, DO, & Cadmium

2016: Fecal Coliform, Total Coliform, Cr^{+6}, Hg and BOD</td><td>BOD_5, Chloride, Color, DO, Nitrate, Oil and Grease, Phosphate, Fecal Coliform, TSS, Temp, pH, Pb, Cr^{+6}, As, Hg</td></tr>
<tr><td>No. of Stations</td><td>2012: 9 stations
2016: 5 stations</td><td>2024: 13 stations</td></tr>
<tr><td>Sampling Station Map</td><td>See Figure 2.67</td><td>See Figure 2.68 (Updated Sampling Points Considering the updated Project Boundary)</td></tr>
<tr><td>Parameters that Exceeded the Water Quality Guideline Values</td><td>
<table>
<tr><th>EIS Stations</th><th>Exceedances</th></tr>
<tr><td colspan="2">2012</td></tr>
<tr><td>1</td><td>pH, Ammonia, Cyanide</td></tr>
<tr><td>2</td><td>Cyanide</td></tr>
<tr><td>3</td><td>Cyanide</td></tr>
<tr><td>4</td><td>Ammonia, Cyanide, Phosphate, Fecal Coliform</td></tr>
<tr><td>5</td><td>Ammonia, Cyanide, Fecal Coliform</td></tr>
</table>
</td><td>
<table>
<tr><th>EPRMP Stations</th><th>Exceedances (2024)</th></tr>
<tr><td>SW01</td><td>Fecal Coliform</td></tr>
<tr><td>SW02</td><td>Fecal Coliform and Temp</td></tr>
<tr><td>SW03</td><td>Fecal Coliform and Temp</td></tr>
<tr><td>SW04</td><td>Fecal Coliform and Temp</td></tr>
<tr><td>SW05</td><td>-</td></tr>
</table>
</td></tr>
</table>

Items	EIS 2017		EPRMP 2024	
	6	pH	SW06	Fecal Coliform
	7	Ammonia, Cyanide, Fecal Coliform	SW07	-
			SW08	-
	8	pH	SW09	Fecal Coliform
	9	pH	SW10	Fecal Coliform
	2016		SW11	Fecal Coliform
	10 – Libertad Channel	Fecal Coliform	SW12 – Libertad Channel Upstream	BOD, Phosphate, Temp and Fecal Coliform
	11	Fecal Coliform	SW13 – Outfall Drainage	BOD, Color, Phosphate, Temp, TSS and Fecal Coliform
	12	-		
	13	Fecal Coliform		
	14	Fecal Coliform		

2.2.2.2.B. EIS (2017) BASELINE DATA

The EIS 2017 baseline data results for the water quality which was conducted in 2012 and 2016 is presented in Table 2.38. The results in the EIS baseline were compared with the updated water quality guideline (WQG) values. Based on the results, Cyanide, Ammonia, Fecal Coliform, Phosphate and pH exceeded the DAO 2016-08 and DAO 2021-19 WQG Values for both Class SB and Class SC at some sampling stations. The water sampling locations of the baseline data in 2012 and 2016 is presented in Figure 2.67 which were based on the original configuration of Pasay 360.



Figure 2.67 Water Quality Baseline Stations in 2012 and 2016
Source: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017), Google Earth

Table 2.38: EIS Water Quality Baseline Data (2012 and 2016)

Code	Sampling Date	pH	Color	TDS	Oil and Grease	Ammonia-N	Cyanide, Free	Nitrate, -N	Phosphate	Salinity as NaCl	Fecal Coliform	Arsenic	Chromium	Lead	Mercury	TSS	Total Coliform	BOD5	COD	Chloride	DO	Cadmium
	Units	-	PCU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	mg/L	mg/L	mg/L	°C	mg/L	MPN/100mL	mg/L	mg/L	mg/L	mg/L	mg/L
1	11 Nov 2012	9.05	75	18,900	0.40	0.12	0.15	0.11	0.04	17,900	17	0	0	0	0	-	-	-	-	-	-	-
2	11 Nov 2012	8.9	25	21,000	0.41	0.05	0.15	0.09	0.04	19,600	4.0	0	0	0	0	-	-	-	-	-	-	-
3	11 Nov 2012	8.80	25	21,000	0.36	0.04	0.14	0.03	0.04	21,000	2.0	0	0	0	0	10	-	-	-	-	-	-
4	11 Nov 2012	8.16	25	19,500	0.42	2.7	0.13	0.17	0.28	17,000	170	0	0	0	0	12	-	-	-	-	-	-
5	11 Nov 2012	7.3	-	29,600	0.52	0.08	0.30	0	0.04	25,800	350	0	0	0	0	0	-	-	-	-	-	-
6	11 Nov 2012	9.6	-	-	0.9	-	-	0.08	0.02	-	<1.8	<0.01	<0.003	-	<0.0001	29	<1.8	8	797	10,000	9.5	<0.006
7	11 Nov 2012	7.94	-	28,600	0.54	3.4	0.24	0	0.23	26,600	14,000	0	0	0	0	-	-	-	-	-	-	-
8	11 Nov 2012	9.4	-	-	0.8	-	-	0.2	0.04	-	<1.8	<0.01	<0.003	-	<0.0001	27	<1.8	7	797	9,570	9.3	<0.006
9	11 Nov 2012	9.2	-	-	0.8	-	-	0.3	0.02	-	<1.8	<1.8	<0.003		<1.8	26	<1.8	7	998	9,970	9.7	<1.8
10	7 January 2016	-	-	-	-	-	-	-	-	-	28,000	-	<0.003	<0.05	-	-	160,000	33	-	-	-	-
11	7 January 2016	-	-	-	-	-	-	-	-	-	170	-	<0.003	<0.05	-	-	170	5	-	-	-	-
12	7 January 2016	-	-	-	-	-	-	-	-	-	<1.8	-	<0.003	<0.05	-	-	<1.8	16	-	-	-	-
13	7 January 2016	-	-	-	-	-	-	-	-	-	350	-	<0.003	<0.05	-	-	350	5	-	-	-	-
14	7 January 2016	-	-	-	-	-	-	-	-	-	240	-	<0.003	<0.05	-	-	240	5	-	-	-	-
DAO 2016-08 and DAO 2021-19[b] WQG Values, Class – SB		**7.0-8.5**	**-**	**-**	**2**	**0.06[b]**	**0.02**	**10**	**0.2[b]**	**-**	**100[b]**	**0.01**	**0.05**	**0.01**	**0.001**	**50**	-	Not applicable	-	Not applicable	Min. 6	0.003
DAO 2016-08 and DAO 2021-19[b] QG Values, Class – SC		**6.5-8.5**	**-**	**-**	**3**	**0.06[b]**	**0.1**	**10**	**0.2[b]**	**-**	**200[b]**	**0.02**	**0.05**	**0.05**	**0.002**	**80**	-	Not applicable	-	Not applicable	Min 5	0.005

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

2.2.2.2.C. EPRMP (2024) BASELINE DATA

Water sampling was conducted by Ostrea Mineral Laboratories, Inc. (OMLI), a DENR accredited Laboratory, with the presence of PLANADES representatives on 23 April 2024. The 13 sampling stations, as gleaned from Figure 2.68, are located in Manila Bay, at a drainage outfall, and the Libertad Channel and were selected based on their proximity to the location of the proposed Project 360. The sampling site descriptions can be found in Table 2.40.

The assessment criteria were based on the DAO 2016-08 which provides the updated national Water Quality Guidelines (WQG) for marine and freshwater bodies. For the phosphate and fecal coliform parameters, the updated WQG likewise were based on DAO 2021-19.

Water quality in-situ parameters such as pH, DO and temp readings were taken using a calibrated water quality meter. On the other hand, grab sampling using laboratory-provided containers were employed to collect the other water quality parameters. The collected sample bottles were sealed and kept cool to ≤ 6°C upon sampling collection to transit. The sampling bottles were properly labelled using sampling codes. The sampling codes were recorded in the chain of custody (See **Appendix F**) which also include details such as time of collection, sampling coordinates, and the time received by the laboratory. The samples were delivered by OMLI at their Laboratory within the day of the collection. Table 2.39 shows the methodology used for laboratory analysis. The table also shows the minimum volume collected per parameter as well as their preservation. Copies of the laboratory certificates are attached as **Appendix F**.

Based on the marine water quality results of 2024 at the Manila Bay sampling stations as shown in Table 2.41, all parameters are within the water quality guideline values for Class SB except for some stations with high values of fecal coliform and temperature. Noting the water quality baseline data on 2012 and 2016 (Table 2.38), high fecal coliform values were also recorded even without the Project. For SW12 at the Libertad Channel as compared with Class C water, the parameters that exceeded the WQG values are BOD, Phosphate, Fecal Coliform and Temperature. This station is located upstream of the Project and the exceedance in water quality values may be attributed with other sources in the upstream. High level of fecal coliforms were also recorded in the EIS 2016 nearest baseline station in SW12. The SW13 located at the Drainage outfall is an additional station recommended by MMT to determine the effect of widening channel with the water quality., The sampling results for SW13 were compared to both Class C (Freshwater) and Class C (Effluent) and the results show exceedances in BOD, Color, Phosphate, Fecal Coliform, TSS and Temperature. Note that SW12 and SW13 have no river classification and that the class of water indicated therein is for comparison use only.

Table 2.39 Water Quality Analysis Methods and Sampling Bottles

Parameters	Method	Min. Volume Collected	Preservation
Arsenic (As)	ICP-OES	200 mL	Add HNO_3 to pH <2
Biochemical Oxygen Demand (BOD5)	5 – Day BOD Test	1000 mL	Cool to ≤ 6°C
Chloride (Cl^-)	Argentometric	200mL	None

Parameters	Method	Min. Volume Collected	Preservation
Chromium as Hexavalent Chromium (Cr^{6+})	Colorimetric	200mL	Adjust pH to 9.3-9.7 using 1 mL ammonium buffer solution plus 0.6 mL 5N NaOH per 100 mL sample
Color (True)	Visual Comparison	100 mL	Cool to ≤ 6°C
Dissolved Oxygen (DO)	DO Meter	On-site	
Lead (Pb)	ICP-OES	200 mL	Add HNO_3 to pH <2
Mercury (Hg)	Cold Vapor AAS	200 mL	Add HNO_3 to pH <2, Cool to 6 °C
Nitrate as NO_3-N	Colorimetric, Brucine	100 mL	2 mL conc. H2SO4 per liter
Oil and Grease	Liquid-Liquid, Partition – Gravimetric	1000 mL	Add (1:1) HCl or (1:1) H2SO4 to pH ≤ 2, Cool at ≤ 6°C
Phosphate as Phosphorus (Total, Reactive)	Stannous Chloride	500mL	Cool to ≤ 6°C
Thermotolerant (Fecal) Coliform	Multiple Tube Fermentation Technique – Fecal Coliform Procedure	100 mL	Cool to <10 °C
Total Suspended Solids (TSS)	Gravimetric, dried at 103-105 °C	1000 mL	Cool to ≤ 6°C
Temperature	In-situ/ Water Quality Meter	100 mL	Cool to ≤ 6°C
pH	In-situ/ Water Quality Meter	100 mL	Cool to ≤ 6°C



Sampling Bottles Received by OMLI

Source: OMLI, 2024

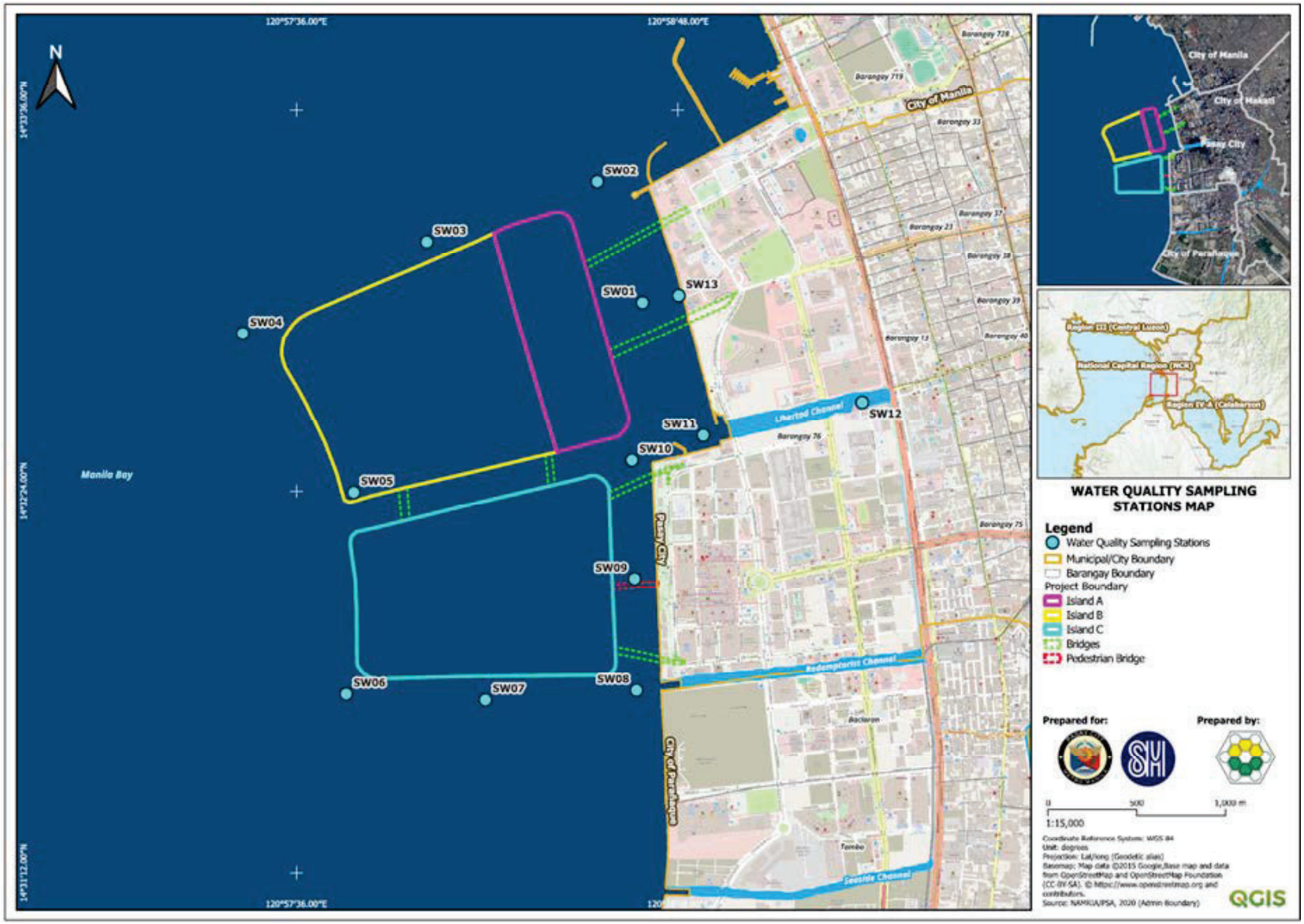
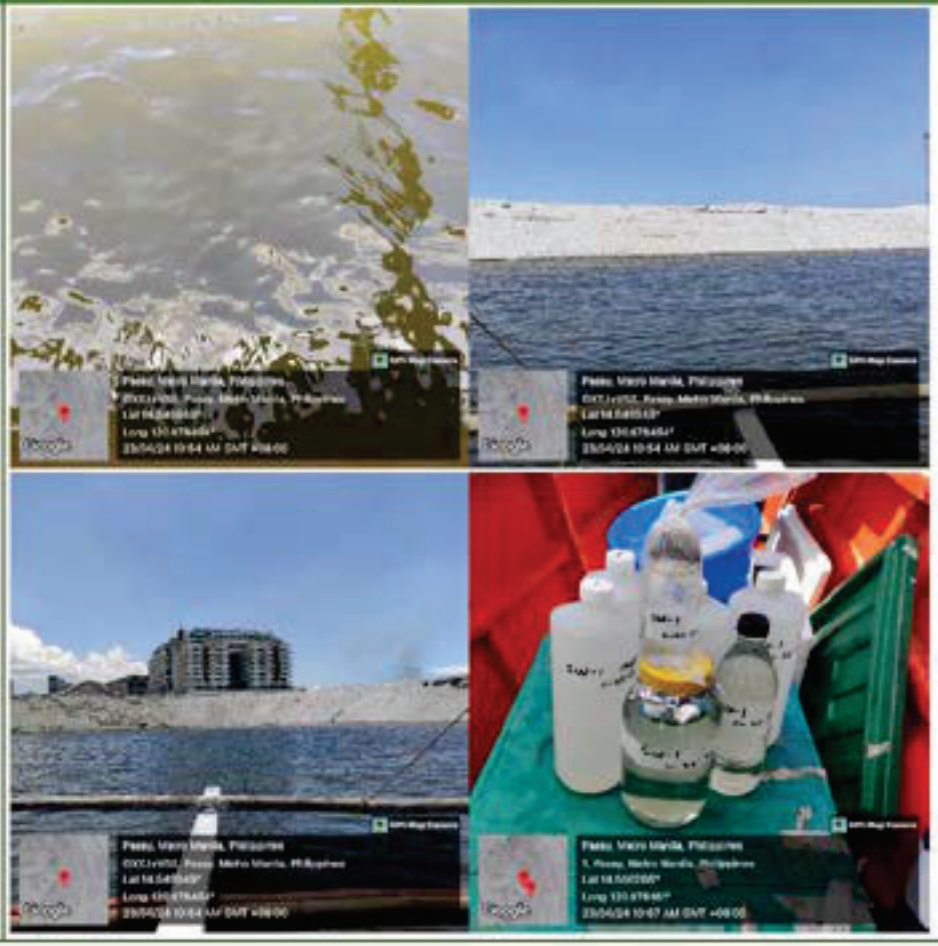
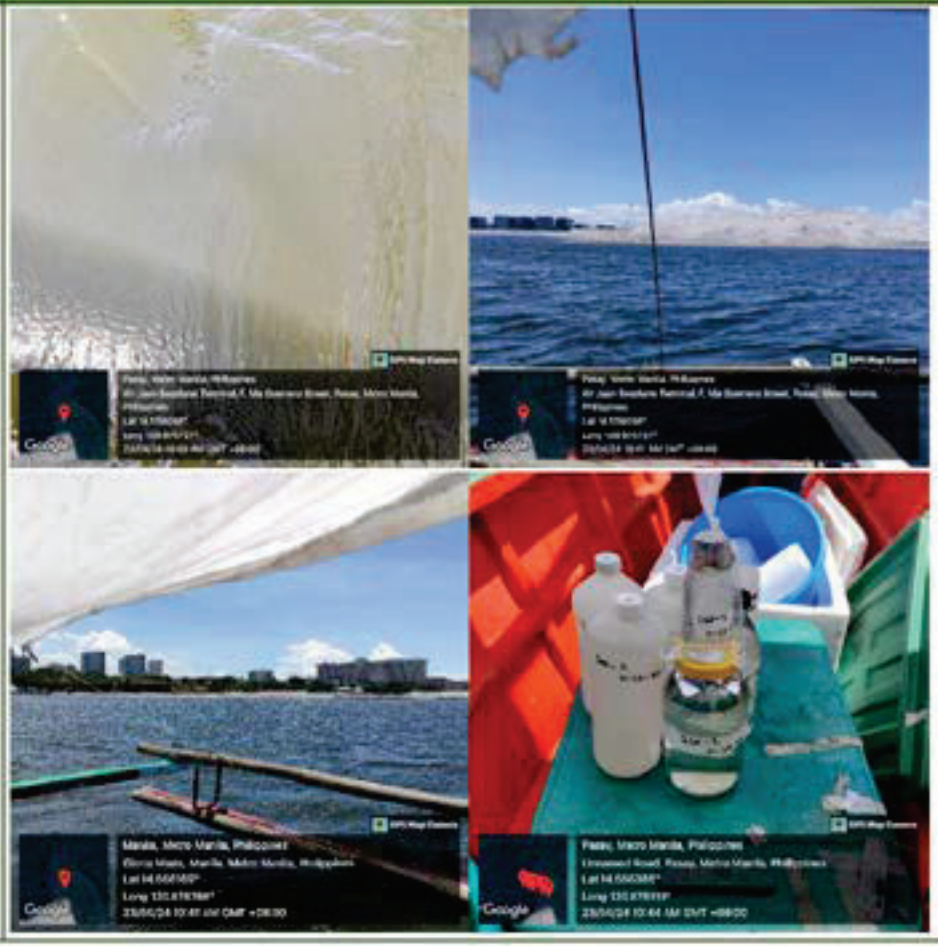


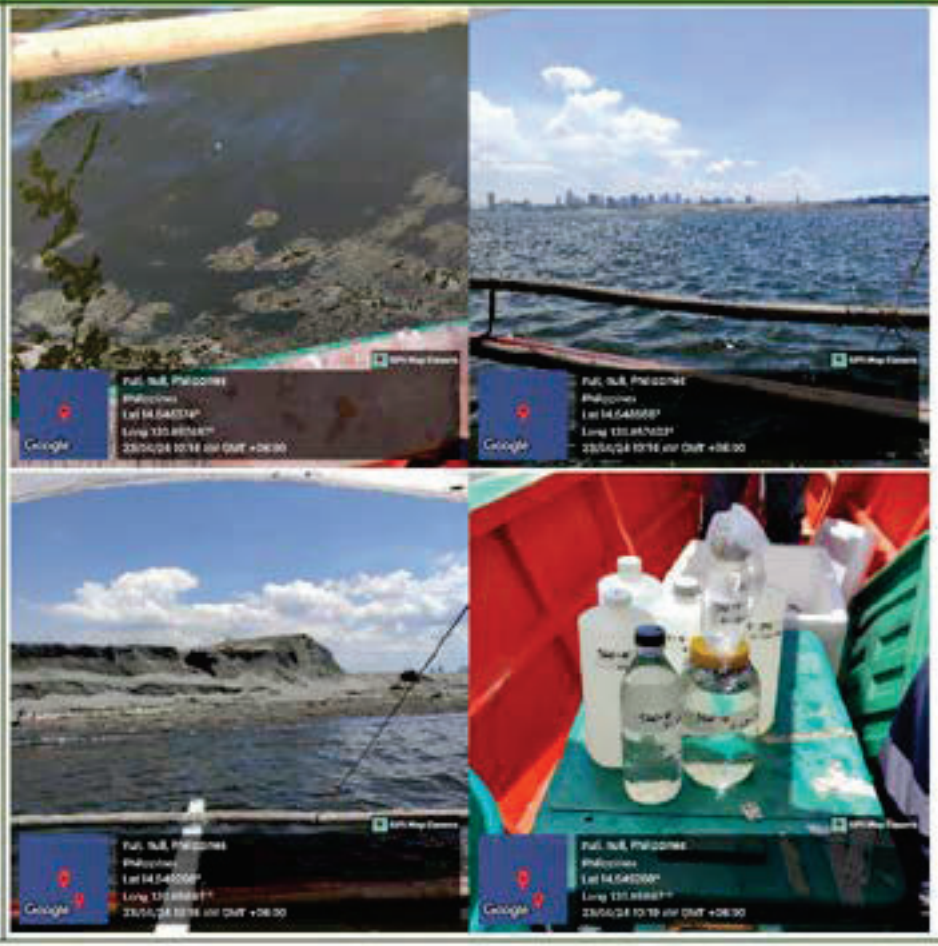
Figure 2.68 Water Quality Sampling Stations (2024)
Source/ Reference: Open Street Map, Admin Boundary – NAMRIA/PSA, 2020

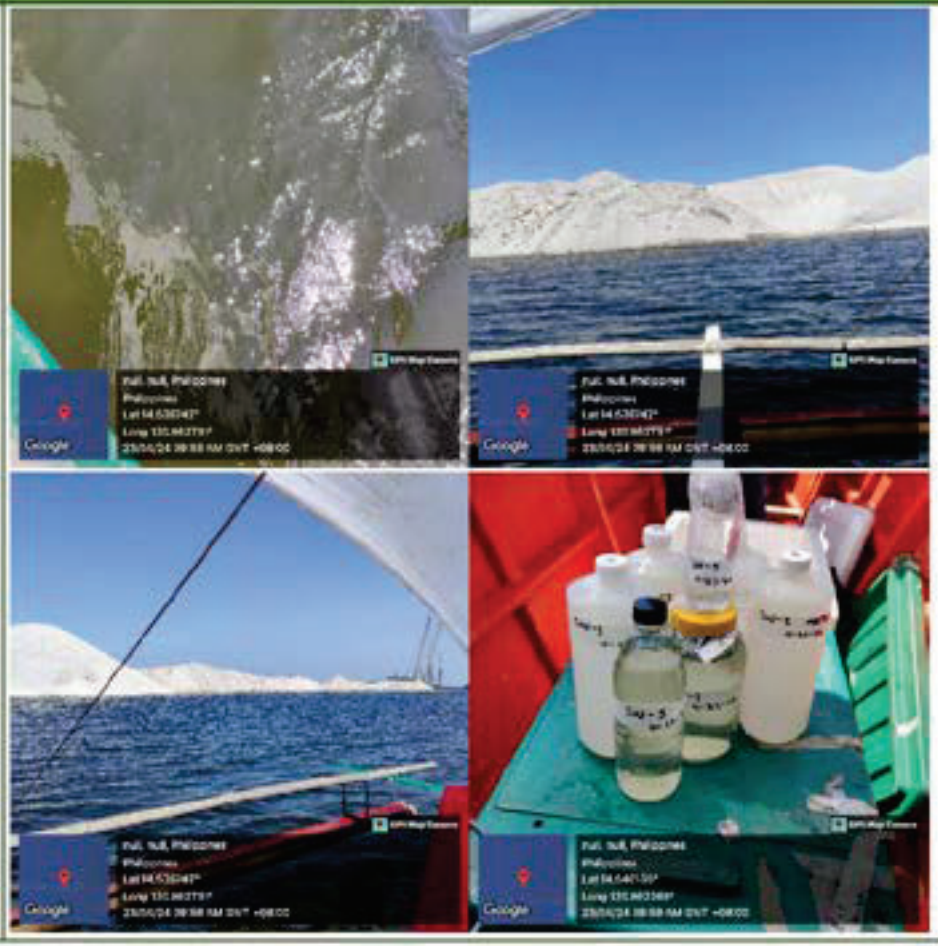
Table 2.40 Sampling Site Description

Station	Sampling Site Photos	Site Description (April 2024)
SW01 14°32'59.60"N 120°58'41.30"E Sampling Time: 10:54 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • The appearance of the water body was brownish in color during sampling • There was light current during sampling • Water sample collected was clear • Sampling site is near seaside • Sampling area is near commercial area • Hotels are observed near the area • Stockpiles were observed near the sampling area • Approximately 254m from Island A • An operating excavator is seen near the sampling station

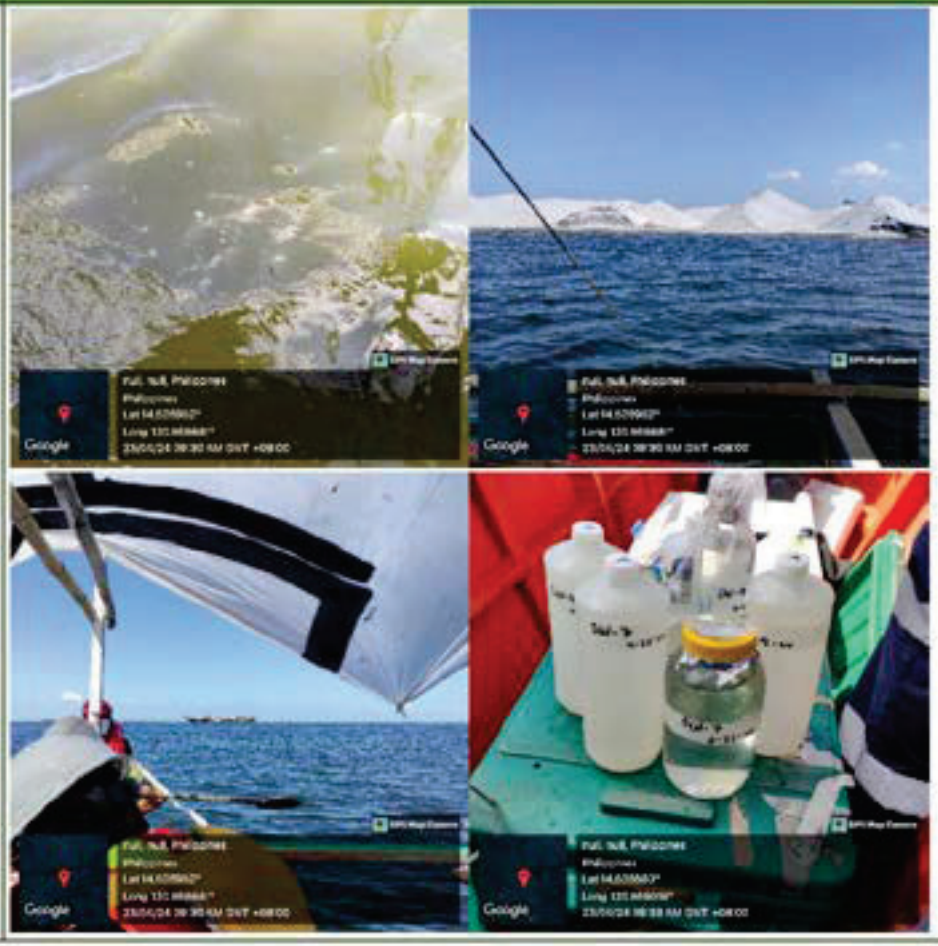
Station	Sampling Site Photos	Site Description (April 2024)
SW02 14°33'22.38"N 120°58'32.76"E Sampling Time: 10:41 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • There was light current during sampling • The apperance of the water body was brownish in color during sampling • Water sample collected was clear • There were stockpiles observed near the sampling area • There were dredgers near the sampling area • Sampling site is near seaside • Commercial area is observed near the seaside • Approximately 258m from Island A • An operating excavator is seen near the sampling station

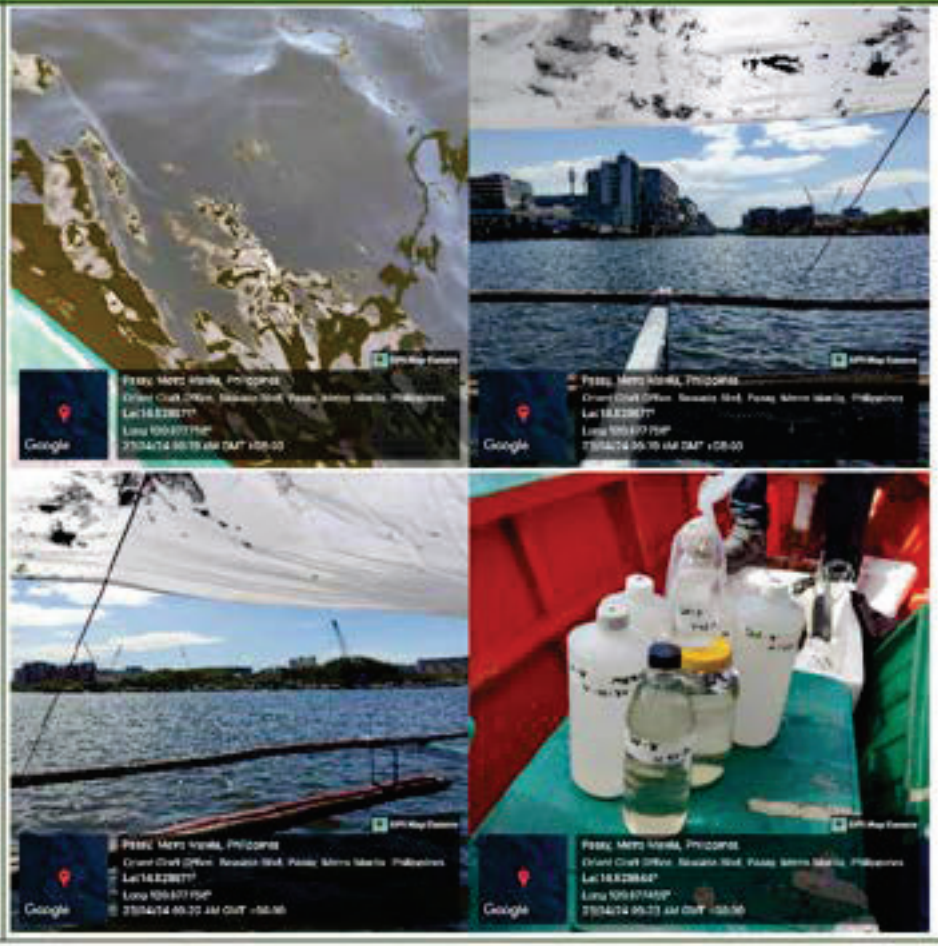
Station	Sampling Site Photos	Site Description (April 2024)
SW03 14°33'11.12"N 120°58'0.62"E Sampling Time: 10:29 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • There was light current during sampling • Appearance of the water body was greenish brown in color during sampling • Water sample collected was clear • Stockpiles were observed near the sampling area • Approximately 124m from Island B • An operating excavator is seen near the sampling station

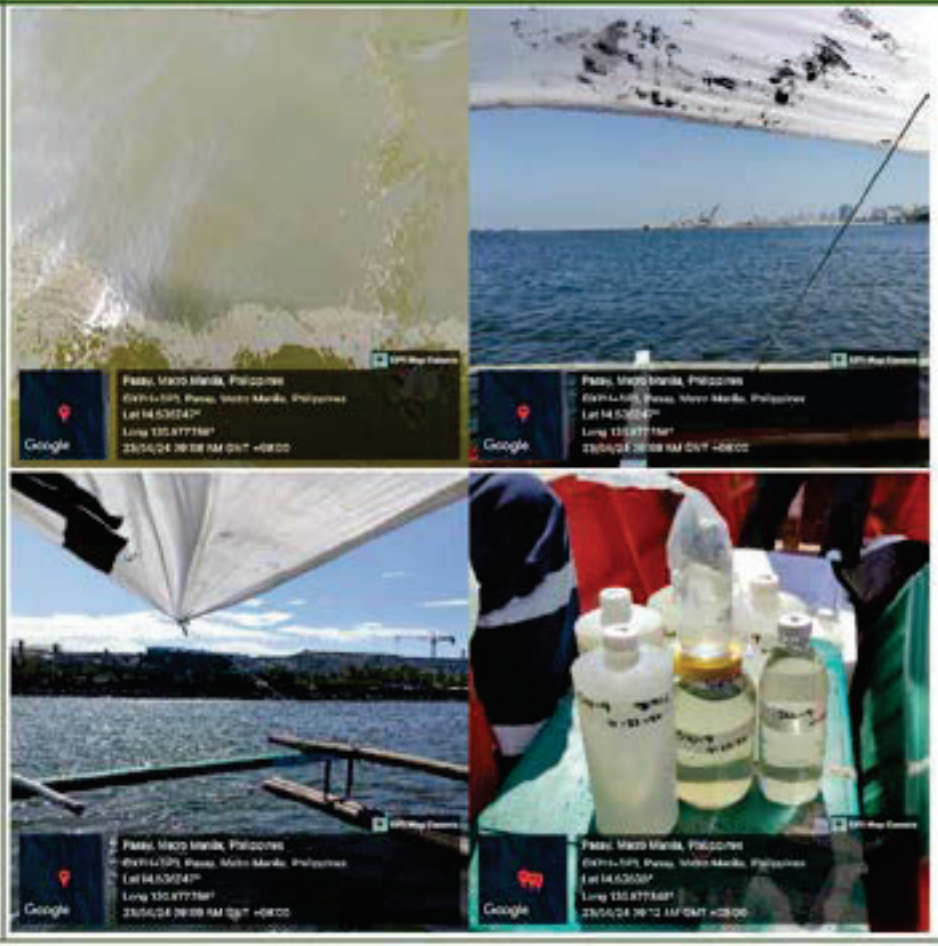
Station	Sampling Site Photos	Site Description (April 2024)
SW04 14°32'53.77"N 120°57'25.89"E Sampling Time: 10:15 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • There was light current during sampling • Appearance of water body during sampling was greenish brown in color • Water sample collected was clear • Stockpiles were observed near the sampling area • Debris of garbage are observed within the stockpile • Few traces of garbage floating within the sampling site were observed • Approximately 226m from Island B • No dredging or filling activities is observed within the vicinity of sampling area

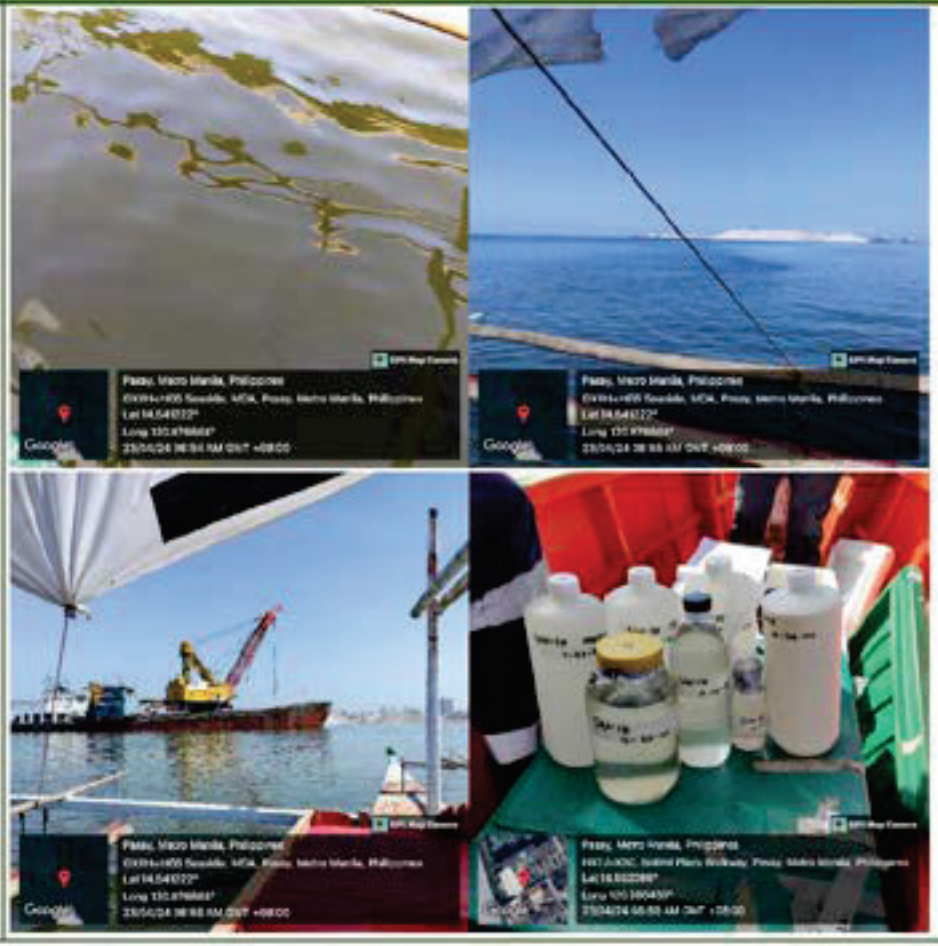
Station	Sampling Site Photos	Site Description (April 2024)
SW05 14°32'18.07"N 120°57'41.44"E Sampling Time: 9:56 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • There was light current during sampling • Appearance of the water body was brownish in color during sampling • Water sample collected was clear • Stockpiles were observed near the sampling area • Dredgers, boats are observed within the sampling area • Approximately 61m inside Island B (monitoring station in this location will be moved 300m outside Island B) • No dredging or filling activities is observed within the vicinity of sampling area

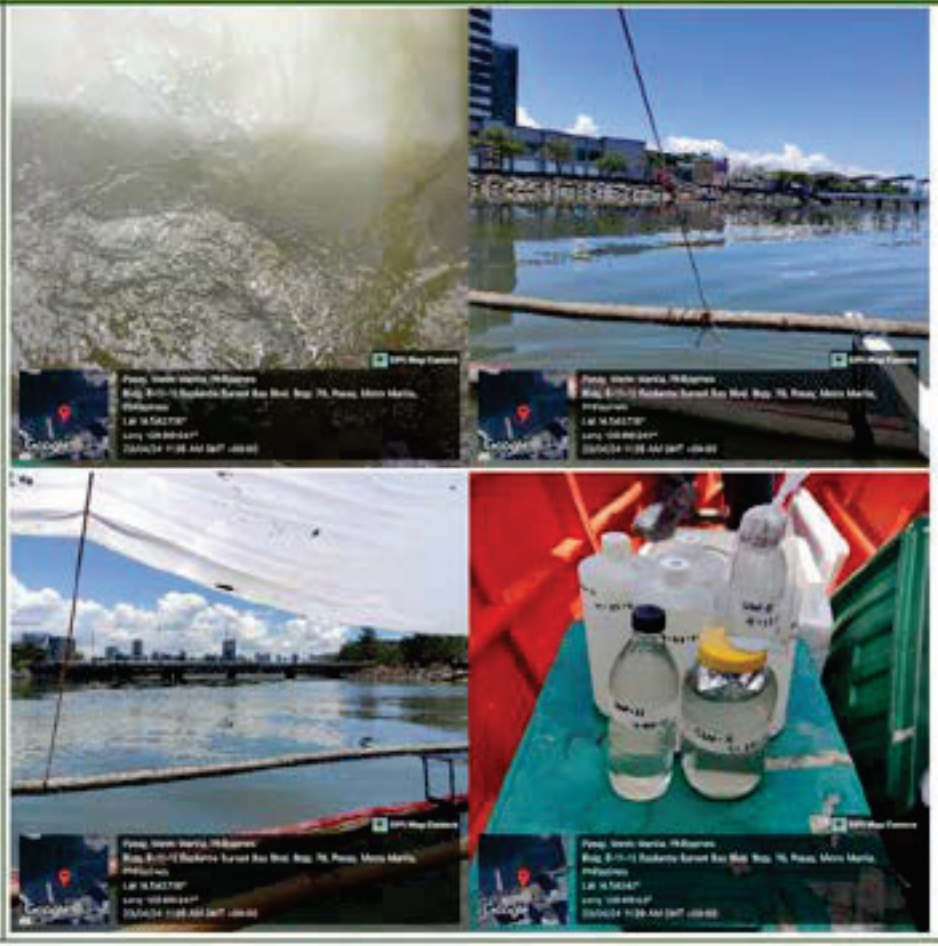
Station	Sampling Site Photos	Site Description (April 2024)
SW06 14°31'45.72"N 120°57'45.41"E Sampling Time: 9:40 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling is sunny • There was moderate current during sampling • Appearance of the water body was light brown during sampling • Water sample collected was clear • There was dredgers, boats observed during sampling within the area • Approximately 150 m from Island C • No dredging or filling activities is observed within the vicinity of sampling area

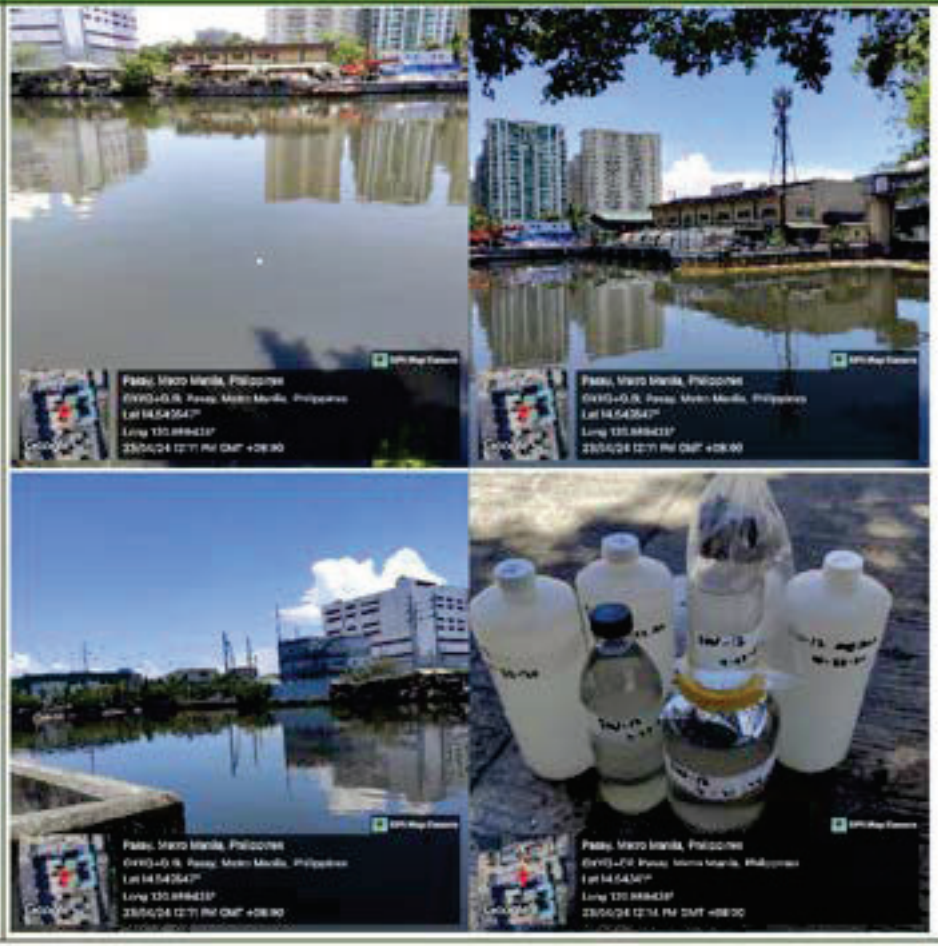
Station	Sampling Site Photos	Site Description (April 2024)
SW07 14°31'44.61"N 120°58'11.66"E Sampling Time: 9:30 am (23 April 2024)		• The sampling site is located within Manila Bay • The weather during sampling was sunny • There was light to moderate current during sampling • Apperance of water body was greenish brown in color during sampling • Water sample collected was clear • Stockpiles were observed near the sampling area • Boats and dredgers were observed near the sampling area • Approximately 136m from Island C • No dredging or filling activities is observed within the vicinity of sampling area

Station	Sampling Site Photos	Site Description (April 2024)
SW08 14°31'46.42"N 120°58'40.17"E Sampling Time: 9:20 am (23 April 2024)		• The sampling site is located in Manila Bay • The weather during sampling was sunny • There was moderate current during sampling • Appearance of water body was yellowish brown in color during sampling • Water sample collected was clear • Sampling area is near MOA seaside • Commercial area is observed along the seaside • A channel is located near the sampling area • Approximately 150m from Island C • No dredging or filling activities is observed within the vicinity of sampling area

Station	Sampling Site Photos	Site Description (April 2024)
SW09 14°32'7.42"N 120°58'39.81"E Sampling Time: 9:08 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • There was light to moderate current during sampling • Appearance of water body was yellowish brown in color during sampling • Water sample collected was clear • Sampling site was near MOA seaside or seaside • Commercial area are observed along seaside • Approximately 106m from Island C • No dredging or filling activities is observed within the vicinity of sampling area

Station	Sampling Site Photos	Site Description (April 2024)
SW10 14°32'29.83"N 120°58'39.31"E Sampling Time: 8:56 am (23 April 2024)		• The sampling site is within Manila Bay • The weather during sampling was sunny • There was light current during sampling • Appearance of the water body was yellowish brown in color during sampling • Water sample collected was clear • There were dredgers near the sampling site during sampling • Stockpiles were observed near the sampling area • Approximately 206m from Island C • Approximately 138m from Island A • No dredging or filling activities is observed within the vicinity of sampling area

Station	Sampling Site Photos	Site Description (April 2024)
SW11 14°32'34.52"N 120°58'52.77"E Sampling Time: 11:37 am (23 April 2024)		• The samplig site is within Manila Bay • The weather during sampling was sunny • There was light current during sampling • Appearance of the water body was grayish brown during sampling • Traces of algae, and few debris of garbage are within sampling site • The water body has a noticeable foul odor • Water sample collected was clear • Sampling site is near commercial area • Libertad channel is near the sampling area • Approximately 416 m from Island A • Approximately 628 m from Island C • No dredging or filling activities is observed within the vicinity of sampling area

Station	Sampling Site Photos	Site Description (April 2024)
SW12 WTP UPSTREAM 14°32'40.80"N 120°59'22.75"E Sampling Time: 12:10 pm (23 April 2024)		• The sampling site is within Libertad Channel • The weather during sampling was sunny • There was light current during sampling • Appearance of the water body was grayish brown in color during sampling • Water sample collected was slighty turbid • Sampling site is near commercial area • Libertad pumping station is near sampling site • There were few traces of garbage within sampling area • There were shrubs and grasses near sampling area • Approximately 1.3 km from Island A • Upstream station. No dredging and filling activities observed.

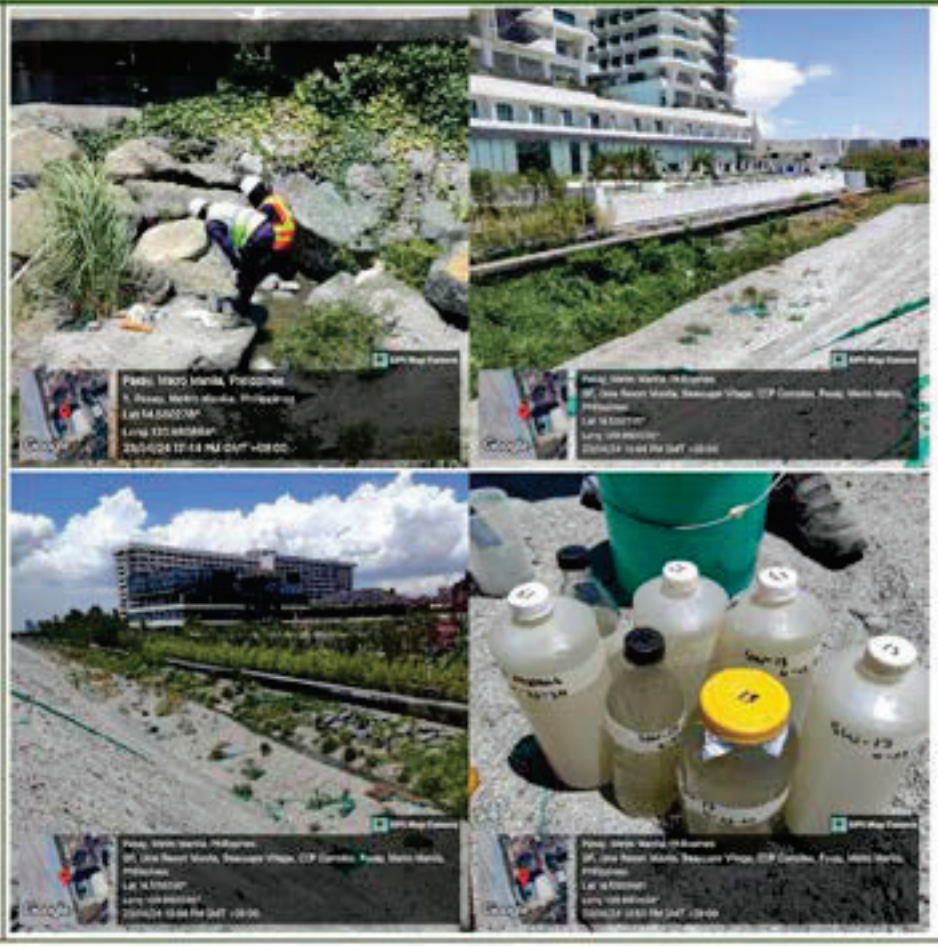
Station	Sampling Site Photos	Site Description (April 2024)
SW13 **DRAINAGE OUTFALL** 14°33'0.94"N 120°58'48.13"E Sampling Time: 12:49 pm (23 April 2024)		• The weather during sampling was sunny • The water was freely falling and surrounded by boulders • Apperance of the water body was brownish in color during sampling • Water sample collected was turbid • There were shrubs and grasses within sampling area • There were algae in the sampling area • Sampling site is near commercial area • The water body has a noticeable foul odor • Approximately 460 m from Island A • An operating excavator and other heavy equipments are seen near the sampling station

Table 2.41 Surface Water Quality Sampling Results (2024)

Code	Sampling Date	Arsenic	BOD	Chloride	Chromium Hexavalent	Color	Dissolved Oxygen	Lead	Mercury	Nitrate	Oil and Grease	Phosphate	Fecal Coliform	TSS	Temp	pH
	Units	mg/L	mg/L	mg/L	mg/L	CU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	mg/L	°C	-
SW01	04-23-2024	<0.010	4	17709.1	<0.01	<5	6	<0.007	<0.0004	0.20	<1.0	0.16	35×10^3	20	30	8.3
SW02	04-23-2024	<0.010	4	19505.9	<0.01	<5	6	<0.007	<0.0004	0.10	<1.0	0.08	540	18	31	8.3
SW03	04-23-2024	<0.010	4	18561.8	<0.01	<5	6	<0.007	<0.0004	0.10	<1.0	0.09	54×10^3	18	31	8.4
SW04	04-23-2024	<0.010	7	18134.3	<0.01	<5	6	<0.007	<0.0004	0.09	<1.0	0.08	540	15	34	8.3
SW05	04-23-2024	<0.010	5	19238.7	<0.01	<5	6	<0.007	<0.0004	0.09	<1.0	0.06	4.5	14	30	8.4
SW06	04-23-2024	<0.010	4	19725.6	<0.01	<5	7	<0.007	<0.0004	0.10	<1.0	0.11	130	20	30	8.4
SW07	04-23-2024	<0.010	5	25354.7	<0.01	<5	7	<0.007	<0.0004	0.10	<1.0	0.07	<1.8	20	29	8.3
SW08	04-23-2024	<0.010	4	19013.1	<0.01	<5	6	<0.007	<0.0004	0.09	<1.0	0.08	33	7	30	8.2
SW09	04-23-2024	<0.010	8	21352.6	<0.01	<5	7	<0.007	<0.0004	0.09	<1.0	0.10	350	7	30	8.2
SW10	04-23-2024	<0.010	15	22065.1	<0.01	<5	7	<0.007	<0.0004	0.09	<1.0	0.08	920	5	30	8.1
SW11	04-23-2024	<0.010	48	19274.3	<0.01	<5	6	<0.007	<0.0004	0.09	<1.0	0.13	35×10^3	15	32	8.1
DAO 2016-08 and DAO 2021-19[a] Water Quality Guidelines (WQG) Values, Class – SB		**0.01**	**-**	**-**	**0.05**	**50**	**6(min)**	**0.01**	**0.001**	**10**	**2**	**0.2[b]**	**100[b]**	**50**	**26 - 30**	**7.0 – 8.5**
SW12 WTP Upstream (Libertad channel)	04-23-2024	<0.010	24	242.5	<0.01	25	5	<0.007	<0.0004	0.12	<1.0	3.54	54×10^4	28	33	7.7
DAO 2016-08 Water Quality Guidelines Values, Class – C		**0.02**	**7**	**350**	**0.01**	**75**	**5(min)**	**0.05**	**0.002**	**7**	**2**	**0.025[b]**	**200[b]**	**80**	**25 - 31**	**6.5 – 9.0**
SW13 Drainage Outfall	04-23-2024	<0.010	247	86.9	<0.01	100	5	<0.007	<0.0004	0.25	<1.0	6.51	28×10^6	107	34	7.2
DAO 2016-08 Water Quality Guidelines Values, Class – C		**0.02**	**7**	**350**	**0.01**	**75**	**5(min)**	**0.05**	**0.002**	**7**	**2**	**0.025[b]**	**200[b]**	**80**	**25 - 31**	**6.5 – 9.0**
DAO 2016-08 WQV, Class – C (effluent)		**0.04**	**50**	**450**	**0.02**	**150**	**-**	**0.1**	**0.004**	**14**	**5**	**4[b]**	**400[b]**	**100**	**+3 (the BV)**	**6.0 – 9.0**

2.2.2.2.D. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

Degradation of Surface and Coastal/Marine Water Quality

The Project is comprised of multiple elements including dredging of an access channel, swing basins, excess sands and borrow area, and placement of dredged material offshore or at the reclamation area which may results to silt dispersal, increase in turbidity due to seabed disturbance or degradation of marine water quality. A turbidity study for the proposed development was conducted by the Contractor in 2020. The study contains details of the conducted 3-dimensional hydrodynamic and sediment plume model. The study recommended a series of measures through the formulation of Turbidity Management Plan to comply with all associated environmental requirements within a management system. As explained by Contractor, the silt curtains may not be appropriate at present due to navigation safety, and other concerns.

Turbidity Control

The construction of Pasay 360 islands may cause an increase in suspended sediment in the environment during construction, due to the wash out of fine sediment during the reclamation process. This increase in suspended sediment is referred to as a sediment plume. Those plumes are transported with the flow and by wind effects. An increased suspended sediment concentration during construction can lead to environmental effects for sensitive receivers, such as the Las Piñas mangrove area.

To reduce as much as possible the increase in suspended sediments, or in other words to reduce the increase in turbidity, the following measures are taken:

- Sand is being sourced from borrow areas generally containing coarser sand with low fines content
    - Larger particles settle faster resulting in reduced turbidity levels
    - Low fines (these are the smallest sand particles) means reduced turbidity levels
- Creating a sheltered (bunded) area wherein material is placed (outer contours of the islands are created first) in which suspended sediments will be contained, reducing the spreading of increased turbidity
- Material is placed in a more controlled manner within the project boundaries:
    - Controlled placement by barges (less water in the mix results in the sand to drop faster to the seabed)
    - Controlled placement by spreader pontoon (placement happens near the water line, reducing creating particles to get into suspension)
- Rehandling of material, for example as required for the removal of Island A (creating the 476m wide channel), happens sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising risk of increased turbidity levels
- Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded
- A detailed Turbidity Management Plan (Appendix S) is being followed

For this specific project using silt screens is inefficient, causes logistical challenges and poses safety risks:

- Open sea conditions with waves and currents makes it difficult to keep a silt screen in place. Silt screens will hinder the equipment (vessels) working at Site, resulting in:
- Complex and ineffective placement of sand hence longer construction duration
- Safety hazard, risk of collisions and reduced manoeuvring space in case of emergency
- Silt screens may not provide a good solution for controlling turbidity, as they cannot be kept in place over the entire water column, as the water depth is ranging from 5 to 20m in the project area
- The size of the reclamation is enormous, with sand placement going on simultaneously in multiple locations. It is almost impossible to have silt screens preventing increased turbidity from such a large area

The challenges of using silt screens are not new, reference is made to literature available online: “IADC: The art of screening: Effectiveness of silt screens”.

Sand Bunds as Turbidity Control Measures

Sand bunds (Plate 3-3) act as temporary physical containment structures, preventing the spread of sediments beyond the influence areas of the reclamation site. Strategically placed along the periphery of the project site, it rests over the sandkey and extends above the water level up to 2.0m high (min.); they trap suspended sediments within the enclosed area, reducing the likelihood of these particles drifting into surrounding water bodies. By containing the sediments, the bunds help maintain water clarity in nearby areas.

During land reclamation, the movement of water can stir up sediments, causing turbidity to spread. Sand bunds slow down the flow of water and reduce current velocities within the enclosed area. This reduction in water movement allows sediments to settle more quickly, minimizing the volume of suspended particles in the water. The calmer water within the bunded area encourages fine particles to settle at the bottom, thereby reducing turbidity.

In summary, sand bunds are an effective measure to control turbidity during land reclamation by providing physical containment, reducing water flow, promoting sediment settlement, and protecting nearby marine ecosystems. Their strategic placement at key locations ensures minimal environmental impact and helps comply with regulatory requirements for water quality.



Plate 2-3 Sand Bunds

Sediment Plume Modelling Results

The comparison of maximum SSC (suspended sediment concentration) from 1-month simulation between the two scenarios are shown in Figure 2.69 (in kg/m³) for all meteorological conditions.

From the figures it is visible that the dispersion area of the sediment plume is significantly larger and higher with the TSHD method compared to the Pelican Barge method. Although the Pelican Barges will cause a more continuous influx of suspended sediments (due to the longer discharge time). The sediment plume is mainly reduced due to the coarser sand (less fines), which are sourced by the Pelican Barges.

In can also be observed that wind influences the sediment plume development, as the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the port area, whilst in the NE monsoon the main direction of the plume is towards the south.

This wind effect becomes better visible when changing the scale of the images to mg/l, as shown in Figure 2.69. In this Figure 2.69, 50 mg/l is selected as the maximum limit value. This is to represent the maximum suspended sediment concentration in the Class SB water body, based on the Water Quality Guidelines and General Effluent Standard of 2016 issued by Department of Environment and Natural Resources (DENR). Both scenarios show that >50 mg/l of sediment plume can spread widely along the coastline.

Presenting the results using a mg/l scale has some disadvantages in our specific case:

1. Inside Manila Bay suspended sediment concentrations are in the range of 30-50 mg/l already (along the nearshore areas around MOA). In the rainy season such values can become 100 mg/l or more when heavy rains cause significant river outflow containing high levels of suspended sediments.
2. The main goal of the sediment plume assessment is to visualize the difference between the two methods suggested and sand sources used. The sediment plume model relies upon selected input and calculates based on certain settlement velocities what the sediment plume may be. The smallest particles (less than 4 µm) have a settlement velocity set in the model of 0.0 m/s which means they are assumed to always remain in suspension. This is a conservative approach, for two reasons:

a. Actual settlement velocity of such particles will be slightly more than 0.0 m/s, so they will settle over time;
b. The finest particles (less than 30 µm) are flushed out first during the dredging process. Generally leaving 5% fines, however ranging in size between say 20 – 63 µm. This distinction is not made in the sediment plume modelling, which assumes the 5% fines ranges in particle size between 0 and 63 µm.

3. More assumptions are made for this sediment plume model, which are justified by the defined goal of the sediment plume modelling. And as we are interested in the biggest impact from the reclamation works, meaning the highest concentrations produced, which are in the order of 10 – 30 kg/m³, the results are best shown to the kg/m³ scale.

In summary, for the goal of this assessment the best approach is to show sediment plumes with a scale using kg/m³. Using mg/l will result in a too conservative and detailed plume which does not reflect reality.

For completeness the results with the mg/l scale are shown in Figure 2.69.

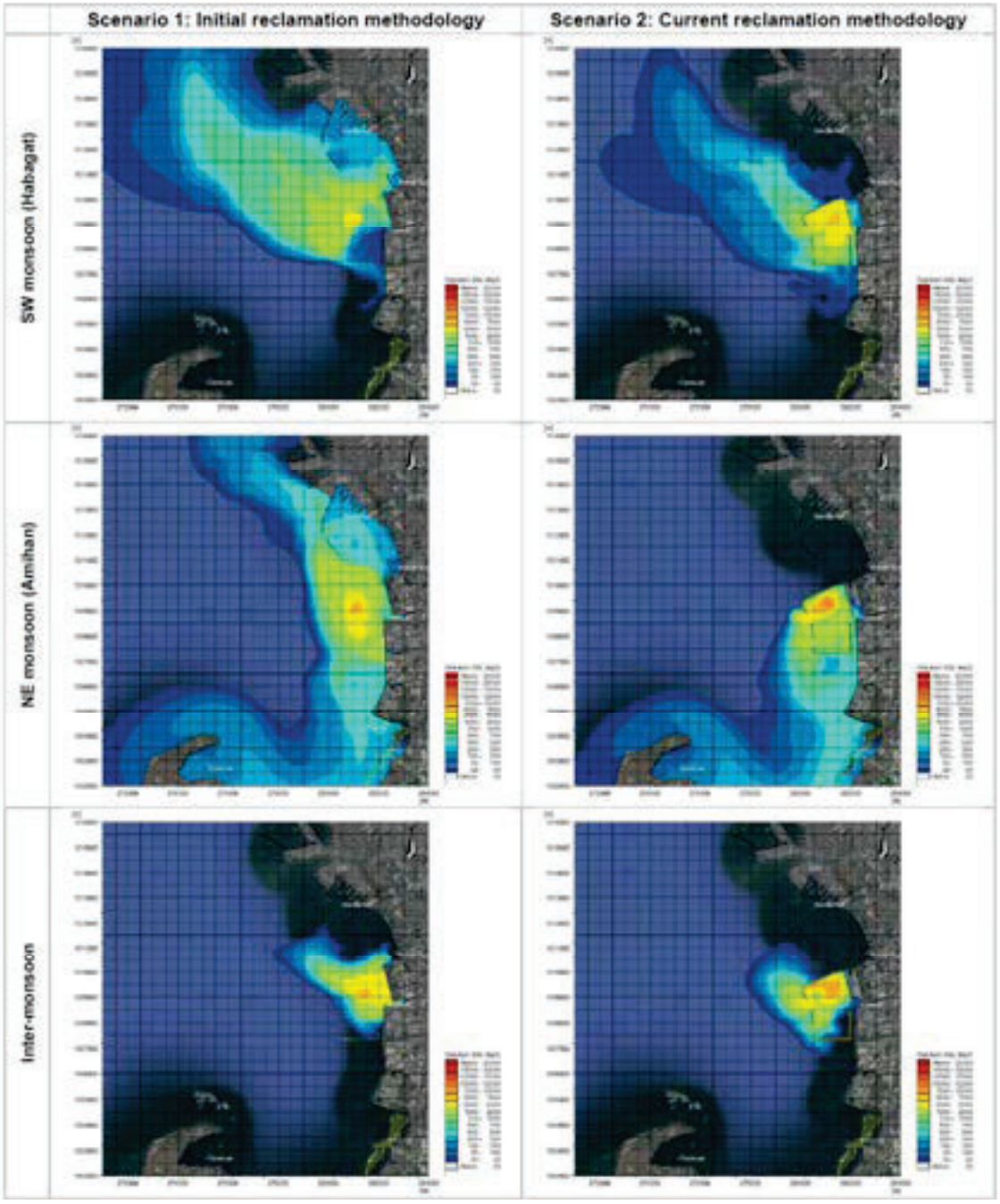


Figure 2.69 Sediment Plume Results
Source: Royal HaskoningDHV, Sediment Plume Modelling (September 2024)

The sediment plume assessment of RoyalHaskoningDHV based on the Sediment Plume Modelling (**Appendix P**) lead to the following general conclusions:

Primary conclusions

- The purpose if this assessment is to show the difference in sediment plume between the two identified construction methods (Scenario 1 and Scenario 2). Due to limitation on accuracy of input and model computations, the sediment plume images using a kg/m³ scale are more reliable for showing the expected extent of the sediment plume.
- Scenario 2 of sand filling with 6 Pelican Barges and a sand source with 5% fines content, will result in a reduced dispersion area if compared to Scenario 1 with 1 TSHD and 15% fines content.
- The suspended solids concentrations induced in Scenario 2 are approximately 50% of the suspended solids concentrations induced in Scenario 1.
- In the current situation (Scenario 2) bunds are already in place around large part of the outer contours of the islands. As most of the sand placement is done within those bunds, the higher concentrations of the sediment plume are well contained.

Secondary conclusions

- When considering very low suspended solids concentrations, such as those stipulated in the Water Quality Guidelines and General Effluent Standard of 2016, the plume can be seen to spread over larger areas; however, the plume will mainly attach to the shore.
- Wind has an effect, mainly on the smallest suspended sediments. As low concentrations of suspended solids remain in suspension for a long period of time and the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the west, whilst in the NE monsoon the main direction of the plume is towards the south.

Other mitigating measures include proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase, monitoring and controlling loading and unloading of fill/dredged materials, securing appropriate certifications and permits for fill material extraction activities, pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification, issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with TMP, proper implementation of hazardous waste management plan, provision of appropriate drip trays, chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank, maintenance of hazardous waste storage facility, provision of appropriate spill kits and booms, in case of accidental spillage; and practicing good maintenance of machineries and equipment to reduce oil losses.

For the generation of domestic wastewater from temporary facilities, portalets will be strategically located in the project area and toilet facilities in every vessel. This will be siphoned regularly by accredited STP facility.

For the horizontal development, a conceptual individual and/or centralized treating system is proposed for construction at Islands A, B, and C. Sewage will primarily come from residential, commercial, office, and hotel areas. Individual and/or centralized treating system will be constructed, with effluent quality meeting local environmental standards. Sewage lift stations will be built as needed. Sewage pipes will be made of HDPE drainage pipes, SN8 as per BS EN 13476, or RCC pipes, Class 120 as per BS 5911-1. Sewage manholes will be made of reinforced concrete with manhole covers 800mm in diameter.

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.42 Impact Analysis and Environmental Management – Water Quality

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Potential Impact: • Degradation of Surface and Coastal/Marine Water Quality • Oil and grease contamination					
Construction Phase • Dredging • Excavation • Filling • Construction of temporary access and bridges • Working on temporary areas • Construction of temporary support facilities and Horizontal Development Decommissioning of Temporary Facilities	2021 to 2028	Silt curtains/ containment at perimeters Pre-screening of filling materials; possible sourcing from Manila Bay	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed Proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase. Monitored/ controlled loading and unloading of fill/dredged materials On-site collection and segregation of wastes; strict policy on no shipboard waste disposal at sea Provision of appropriate certifications and permits for fill material extraction activities Pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification.		

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
			Issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with Turbidity Management Plan. Proper implementation of hazardous waste management plan. Provision of appropriate drip trays. Chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank. Maintenance of hazardous waste storage facility. Provision of appropriate spill kits and booms, in case of accidental spillage Practice good maintenance of machineries and equipment to reduce oil losses.		

2.2.2.2.E. MONITORING PLAN

The environmental monitoring plan for the identified potential impact is summarized in the table below. The complete EPRMP EMoP table can be found in **Section 6**.

Table 2.43 EMoP – Water Quality

EIA Module	Parameters to be Monitored	Method	Frequency	Location
EIS 2017	BOD_5	Azide Modification Dilution Technique (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	BOD_5	5-day BOD Test	Quarterly	see Figure 6.3
EIS 2017	-	-	-	-
EMoP 2024	Sediment Plume	Visual monitoring/ Drone survey	Daily	see Figure 6.3
EIS 2017	Total Suspended Solids (TSS)	Gravimetric (Dried at 103-105o C) (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	TSS	Gravimetric (Dried at 103- 105oC)	Monthly and as needed based on the daily	see Figure 6.3

EIA Module	Parameters to be Monitored	Method	Frequency	Location
			visual monitoring of Plume	
EIS 2017	-	-	-	-
EMoP 2024	Turbidity	Nephelometric	Monthly and as needed based on the daily visual monitoring of Plume	see Figure 6.3
EIS 2017	-	-	-	-
EMoP 2024	Transparency	Manual -Secchi disc	Monthly and as needed based on the daily visual monitoring of Plume	see Figure 6.3
EIS 2017	Color	(USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	Color	Visual comparison	Quarterly	see Figure 6.3
EIS 2017	Temperature	Thermometer (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	Temperature	Laboratory and field (in-situ)	Quarterly	see Figure 6.3
EIS 2017	pH	pH probe (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	pH	Electrometric	Quarterly	see Figure 6.3
EIS 2017	O & G	Std Method	During reclamation works	At strategic points
EMoP 2024	Oil and Grease	Liquid-Liquid, Partition - Gravimetric	Quarterly	see Figure 6.3
EIS 2017	Arsenic	SDDC, Spectrophotometric	During reclamation works	At strategic points
EMoP 2024	Arsenic	ICP-OES	Quarterly	see Figure 6.3
EIS 2017	Chromium	Flame AAS	During reclamation works	At strategic points
EMoP 2024	Chromium	Colorimetric	Quarterly	see Figure 6.3
EIS 2017	Lead	Flame AAS	During reclamation works	At strategic points
EMoP 2024	Lead	ICP-OES	Quarterly	see Figure 6.3
EIS 2017	Mercury	Manual Cold Vapor AAS	During reclamation works	At strategic points
EMoP 2024	Mercury	Cold Vapor AAS	Quarterly	see Figure 6.3

2.2.3. FRESHWATER ECOLOGY

There are no significant freshwater systems within the impact areas of the proposed reclamation site. Freshwater, mixed with domestic wastewaters, emanate from the Libertad Channel and Maynilad-PAGCOR pumping stations, are basically storm drains and not suitable bodies of surface water for the existence of significant fish stocks or sizeable invertebrate communities.

Freshwater discharges from these channels, as well as from other floodgates and waterways spilling from the Pasig River further to the south, are also not ecologically conducive for aquaculture or recreational uses. There will not be discharges from the reclamation project to these channels; discharges of treated effluents will be to the bay.

2.2.4. MARINE ECOLOGY

2.2.4.1. BASELINE DATA

The comparative matrix of the EIS 2017 and EPRMP is presented on Table 2.44.

Table 2.44: Comparative EIS 2017 and EPRMP 2024 Marine Ecology Baseline Data

Sector	EIS 2017	EPRMP 2024
Corals	No corals Results from forty-four (44) manta tows five (5) validation dives and four (4) spot dives in the periphery of the proposed reclamation islands revealed the complete absence of corals and reef associated benthic life forms across the proposed reclamation project.	No corals 10 manta tows and six spot dives revealed the samen benthic environmental condition – sebed in reclamation site is devoid of corals, seagrass and macro-algae; mud and grime comprised the bottom substrate.
Seagrass	No seagrass beds seen in all manta tows and spot dives	No seagrass beds seen in all manta tows and spot dives
Mangroves	No mangroves in and around impact area	No mangroves in and around impact area
Fisheries	Only 2 small fishing boats observed operating in the impact area with low catch rate of 0.17 kg per fishing hour Actual fishing operations using a 500-meter bottom-set gill net laid out for 1 hour each in three test fishing stations yielded 3 pieces of fish, a rainbow sardine (*Dussumieria acuta*) and two Tilapias *Oreochromis sp*)	No fishing observed in the impact area. Catch rate and catch composition of two small fishing boats operating offshore revealed a catch per unit effort of 0.30 kg/fishing hour and 7.5 kg/fishing hour. Same species composition as in baseline.

Sector	EIS 2017	EPRMP 2024
Macro-invertebrate	Three stations yielded two species recored in breakwater - Mussels (*Perna viridis*) and oysters (*Crassostrea sp*)	four (4) species were encountered in 1.5 hours of investigations. These consisted of the gastropod murex or rock snail *(Thais bituberculasis; "Bunsuran")*, a rock oyster or saddle tree oyster *(Isognomon ephippium; "Talaba")*, green mussels *(Perna viridis; "Tahong")*, and a ribbed limpet *(Lottia digitalis; "Tarukog")*

2.2.4.1.A. THREAT TO EXISTENCE AND/OR LOSS OF IMPORTANT LOCAL SPECIES AND HABITAT AND THREAT TO ABUNDANCE, FREQUENCY AND DISTRIBUTION

Updating of the EIA findings on marine ecology baseline assessment in the Pasay 360 hectare reclamation project generated in August 2014 was undertaken by a team of fisheries and marine biologists on April 6-7, 2024. The reconfigured reclamation project consists of three (3) islands – islands B and C, measuring 146.4, and Islands B and C measuring 213.6 hectares, combined. Island C is contiguous to the "seaside boulevard" in the CCP Complex of the Philippines, flanked by the Libertad Channel to the south. Island C was previously exclusively proposed for reclamation in 2012 and was subjected to marine ecology baseline assessment in the same year. The original coastline has been reconfigured by previously reclaimed areas that are now enclosed by a seawall of rocks and concrete where occasional pole and line fishers take position for mostly recreational fishing. The seawall is completely devoid of mangrove vegetation. Island B is directly in front of Island C, while Island A is less than a kilometer west of the SM Mall of Asia (Figure 2.70). The primary impact area where reclamation filling and compacting will be undertaken is more than three (3) kilometers from the mouth of the Paranaque River and the Las Pinas-Parañaque Wetland Park (LPPWP).

The survey was conducted for the purpose of validating the ecological parameters documented in the baseline assessment in the primary reclamation impact area coastal waters to be subjected to reclamation activities under the reconfigured 'islands'. More importantly, the survey was undertaken in order to discern major changes in ecological conditions, if any, and identify any susceptible coastal resource and benthic habitat that can be subject to stresses from potential anthropogenic environmental impacts attributable to the seabed filling and compacting. The survey was conducted employing standard scientific methods drawn from empirical survey experience in other reclamation areas surveyed in the broader impact area, extensively investigating the benthic environment and nature of the seabed in the proposed reclamation site in order to identify and locate benthic habitats and other ecological niches, if any, and associated resources and ecosystem functions that can be susceptible to anthropogenic disturbances arising from the project. The survey employed consistent survey methods and standard ecological monitoring parameters employed in the baseline assessment in order to generate comparable information. Emphasis was given to the identification of any coral or seagrass resource that may be present in the seabed, even as surveys in several reclamation projects (e.g., the Pasay 265 reclamation project which is beside the proposed 360 reclamation project) in the general vicinity of the proposed project

revealed muddy substrate and absence of coral resources. Subsequently, updated information reinforce the crafting of appropriate response measures to ensure that such impacts are mitigated over the long run and in the most effective manner. The characterization of susceptible endpoints, particularly benthic resources, and identification of causes and pathways that carry stressors will provide valuable data from where mitigating measures can be drawn. The conduct of the 2024 updating and monitoring in roughly the same survey pathways in 2014 and employing the same parameters will generate a comparable index from where future monitoring data can be comparatively analyzed in order to distinguish impacts of the project.

Brief Summary of Baseline Data – 2014

Baseline survey and environmental impact assessment in the original proposed reclamation site was conducted by a team of fisheries and marine biologists from 13-14 August 2014. The assessment was focused on determining existence and subsequently, defining ecological attributes of three principal coastal resources, i.e., (i) coral reefs, (ii) seagrass, and (iii) reef-associated fish communities. Mangroves are absent in the proposed project site and in contiguous coastlines. Key informants also declared that no coral reefs exist in the area and fisheries resources are insignificant due to extremely turbid waters. Coastal waters around the reclamation site were subjected to intensive manta tow and spot dive surveys, and systematic snorkeling appraisal in shallow portions for bottom substrate verification to verify the absence of benthic communities such as coral life forms, macro-invertebrate communities, demersal fish populations, algae and epiphytes in the bottom substrate. In this baseline assessment, a total of forty-four (44) manta tow observation stations were conducted within the proposed reclamation site. Observations from manta tow pathways covered a breadth of approximately 4 to 6 meters of coastal waters in the shallow portion of the sea in the proposed reclamation site and stretched to about 3.2 kilometers towards the Paranaque area. This was supplemented by three (3) spot dives inside and outside of the proposed site, three (3) stations where actual fishing was conducted to verify presence of fish species, five (5) plankton community survey stations, three (3) stations for meiofauna investigation and random surveys for the presence of macro-invertebrates in rocky portions of the breakwater lining the SM Mall of Asia perimeter.

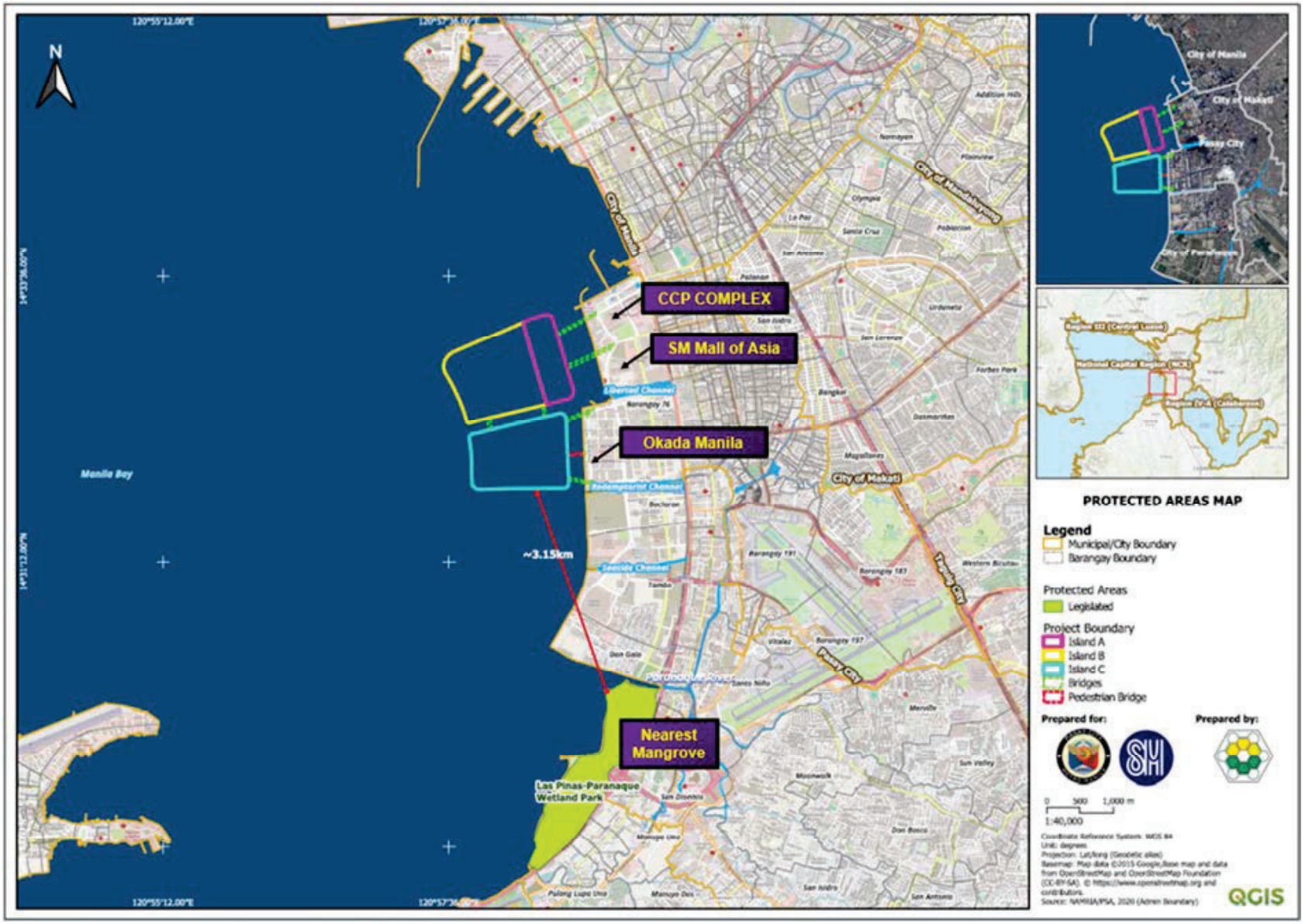


Figure 2.70 The Proposed 360-Hectare Reclamation Project in Pasay City Waters in Manila Bay
Source: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

Results from 44 manta tows of meandering pathways across the proposed reclamation area, five (5) validation dives in the manta tow pathways and four (4) spot dives in the periphery of the proposed reclamation islands revealed the complete absence of corals and reef associated benthic life forms across the proposed Project 360 in Manila Bay. Not even coral rubble or remnants of old dead corals in the impact area of the reclamation project were seen, indicating that coral animals have not existed in the area ever since (Figure 2.71 and Figure 2.72). Rocks, coralline boulders, or natural structures that could serve as habitats of cryptic species were also absent in the entire reclamation islands. The seabed was dominated by silt, foul-smelling soft mud in the upper layer and firmer mud and dark sand in deeper deposits, with debris and shellfish carapace littering the seabed (Figure 2.71). The seabed was essentially inhospitable and benthic ecological resources are completely bare, exacerbated by largely eutrophic conditions brought about by decaying organic sediments and extensive blankets of silt and suspended muddy substrates. This condition has discouraged habitation of demersal fish species. The absence of coral reef formations and coral reef-associated fish species in an oxygen-deficient benthic environment was confirmed by fishers.

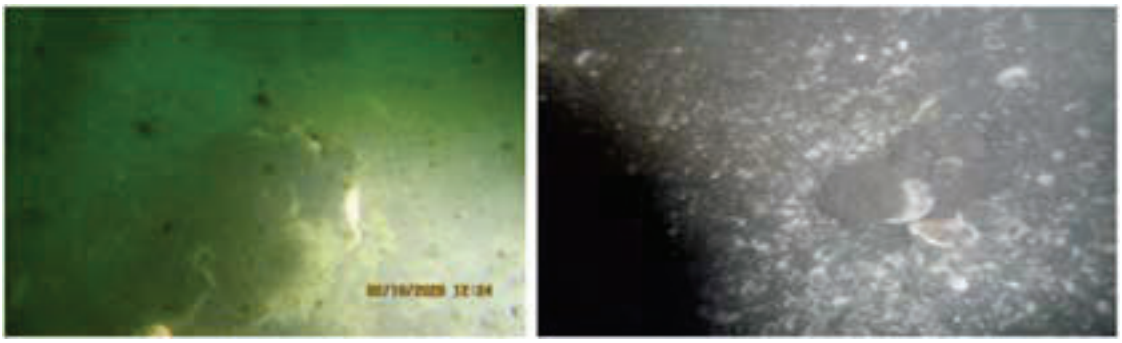


Figure 2.71 Results of Manta Tows and Spot Dives in 2014 Showing Silt, Sand, Mud and Bits of Shellfish Carapace in the Seafloor of the Proposed Pasay 360 ha Reclamation Area
Source: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

The 2014 manta tows and spot dives also revealed the absence of seagrass beds and macro-algae colonies in the Pasay 360 reclamation site. Instead, portions of the seabed were carpeted in white web-like matter suspected to be colonies of bacteria.

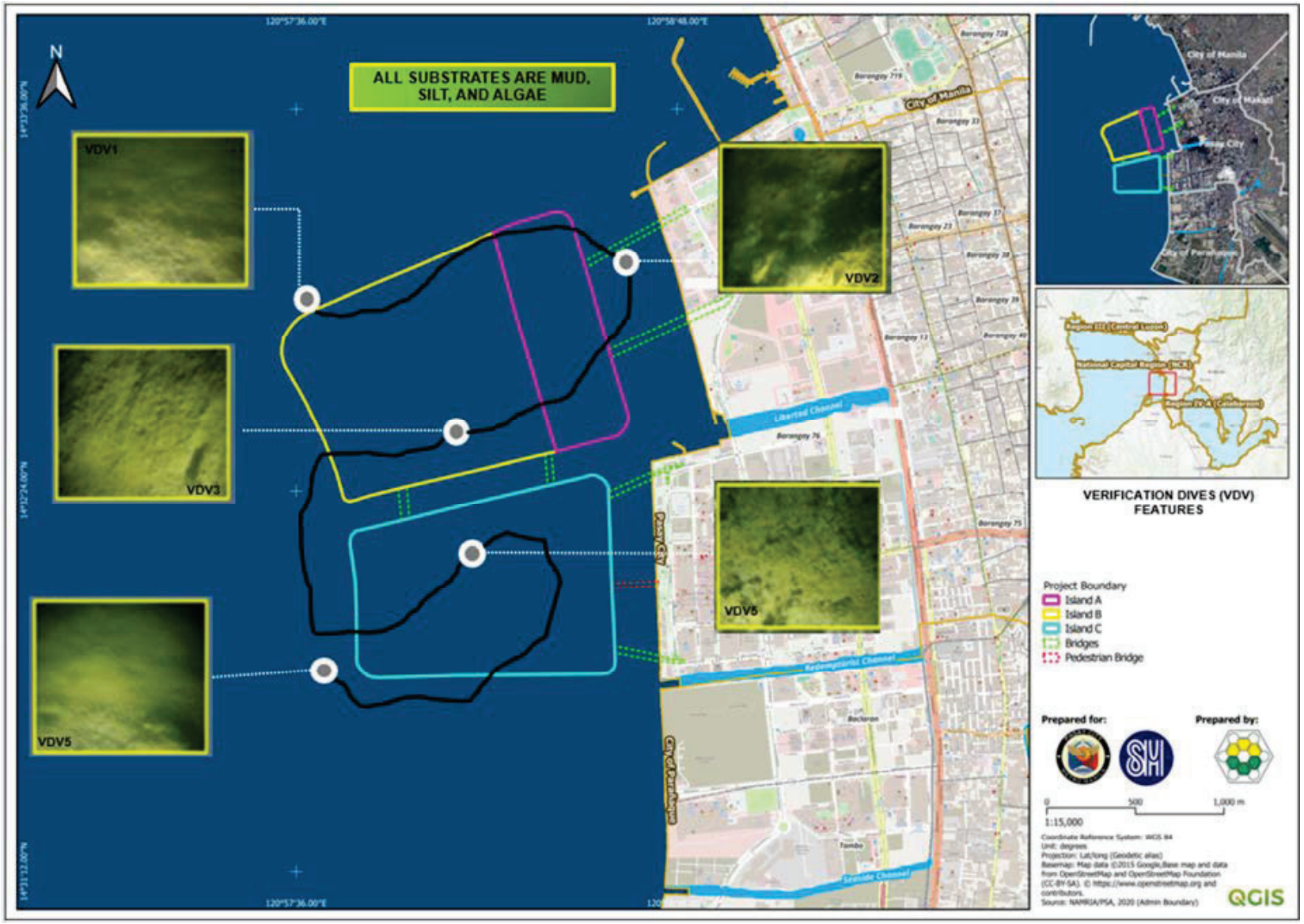


Figure 2.72 Seabed Spot Dives Results in Five (5) Survey Points During the Previous Study Conducted in February 2020
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

Fisheries surveys in 2014

The spot dives and sub-surface snorkeling surveys yielded no encounters with sizeable fish communities except for a few sightings of Tilapia and small Glassfish. In the rocky seawall of the SM Mall of Asia, a few pelagic species of needlefish (*Tylosorus leiurus*), a lone theraponid, *Pelates quadrilineatus (*Bagaong) and a lone, juvenile specimen of the soldierfish *Saurida Tumbil (*Kalaso) were the only species encountered, presumably seeking grazing grounds amongst the rocks. *No fishermen were encountered in two days of surveys*. The absence of viable fisheries resources was an offshoot of largely unproductive conditions and the complete lack of suitable habitats where growth, maturation and reproductive processes can take place.

Actual fishing operations using a 500-meter bottom-set gill net laid out for 1 hour each in three test fishing stations yielded 3 pieces of fish, a rainbow sardine (*Dussumieria acuta*) and two Tilapias (*Oreochromis s*p). The result of test fishing further confirms findings from manta tow surveys and systematic snorkeling indicating the absence of significant fisheries resources in the area. However, key informants claim that that they catch an average of 3 to 5 kg of Tilapia in fishing grounds about one kilometer from the seawalls. Key informants also claim that occasional hook and line fishers operate in the area for subsistence, at times catching small trevallies (talakitok) past the breakwater rocks. Catch rates were extremely low at less than one kilo per day and does not therefore indicate viable productivity for fisheries livelihoods. Key informants further alleged that only lift nets, gill nets and a few hook and line fishers operate in the fishing grounds farther from the reclamation site. The lift nets could be found some 2.5 to 3 kilometers southwest of the reclamation site, starting in upper Paranaque and becoming denser in Bacoor, Cavite. In the offshore fishing areas, lift nets and gill nets catch anchovies (Dilis), round scad (Galungong), ponyfishes (Sap-sap) and the common whiting (*Sillago sihama*; *asohos)*, among others.

2.2.4.1.A.1. EPRMP BASELINE DATA – 2024

Marine ecology assessment was conducted in the reconfigured Pasay 360 reclamation project site in 6 to 7 April 2024 essentially to validate and update ecological parameters observed in the baseline assessment. The marine ecology surveys, documentations and report writing was led by Benjamin Franciso. The members of the marine ecology survey team are as follows:

- Victor Pantaleon – scuba diver with specialty on corals, seagrass and fisheries;
- Ronald Pocon – specializing on seagrass, corals and macro-invertebrates;
- Roena Quimpo –specializing on mangroves and fish visual census;
- Garry Benico, PhD (work from lab) for plankton analysis.

The assessment was conducted to validate the nature of the seabed and current condition of coastal resources in the Project's impact area in conjunction with an estimation of potential negative issues and stressor pathways resulting from reclamation. Employing standard scientific assessment tools, the survey team conducted manta tows, spot dives and systematic snorkelling in the Pasay 360 reclamation site, profiling of fisheries resources focusing on catch per unit effort (CPUE), and sampling of macro-invertebrates of commercial importance to local communities. Drawing from results of the baseline assessment, the EIA attempts to strengthen project strategies and interventions that address the most likely impacts of anthropogenic origin within the impact area, and prescribes other suitable mitigating measures

that can be adopted in order to maintain ecological integrity during all phases of project establishment and operation. It was noted that the Pasay 360 reclamation site, as well as contiguous reclamation areas, are already partly filled up with sandy substrate such that the 2024 survey stations could not exactly be undertaken in the same spot dive stations surveyed in 2014. These other reclamations sites include the Pasay Harbor City 265-hectare reclamation project and the Pasay-Ulticon 260 reclamation project where seven spot dives and some thirty manta tow observation stations were conducted in 2019 that revealed muddy seabed. Further north of these two proposed reclamation areas, surveys with the same results were conducted previously for the Manila Goldcoast Project and the Waterfront reclamation project located above the Manila Yacht Club. To the south, muddy substrate also dominated the seabed in the proposed Parañaque 286.86-hectare reclamation project, surveyed in 2019 and 2020. In the Pasay 360-ha reclamation site, initial survey impressions indicate that the project area is situated in shallow sea with muddy substrate of about 5 to 17 meters deep.

2.2.4.1.A.2. SURVEY METHODS AND SURVEY STATIONS

2.2.4.1.A.2.1. VALIDATION OF PRESENCE OR ABSENCE OF BENTHIC LIFE FORMS (CORALS AND CORAL ASSOCIATED FAUNA) AND TO DEFINE THE NATURE OF THE BENTHIC ENVIRONMENT

Two methods were employed to characterize benthic habitats and validate the nature of the seabed: 1) Broad Area Manta Tows, and 2) Spot Dives to Reinforce Validation of Benthic and Substrate Condition.

2.2.4.1.A.2.1.1. BROAD AREA MANTA TOWS

Contiguous manta tows inside the proposed reclamation project site in Pasay City waters were employed to characterize the nature of the benthic environment and describe habitat types if they occur in the proposed 360-hectare reclamation area and contiguous coastal waters (Figure 2.76). A total of ten (10) observations tows across the proposed reclamation area were conducted on April 2024 (Figure 2.74). It should be noted that Islands A and B were previously surveyed with 44 manta tow stations and four (4) spot dives in 2014 it its initial reclamation configuration. Island C was similarly subjected to manta tows when it was originally proposed as a lone reclamation site in 2012 (Figure 2.75). The previous reclamation proposals have been amended and reconfigured in the current reclamation proposal. The objective of manta tows is to document the nature of the seabed and to locate benthic life forms and if they occur, record their diversity, condition, distribution and abundance at specific stations that can be subject for more detailed surveys. In the absence of corals and similar benthic life forms, a long stretch of nearshore shallow waters where the reclamation project will be implemented were subjected to ten (10) contiguous manta tows with tuck dives, with pathways that avoided areas already filled with sandy substrate (Figure 2.74). In turbid waters, tuck dives with torch will enable the observer to observe rugosity of the seabed if corals or other benthic structures occur along the survey pathways. The tows were also supplemented with validation dives using underwater torch to ascertain the nature of the seabed where surface water is turbid. Benthic observations on the seabed during the manta tow observations also aimed to locate seagrass beds if they occur, as well as document diversity

of demersal fish aggregations if such resources are encountered. The manta tow survey covered a total linear distance 3.4 kilometers, avoiding areas already filled up with sand sandy.

The coordinates of the manta tow stations and corresponding results are presented in Table 2.45 below.



Figure 2.73 Spot Dives with Scuba and Manta Tow Survey in Contiguous Observation Pathways (April 2024)

Table 2.45 Coordinates of Manta Tow Stations Surveyed for Benthic Substrate Characterization (6 April 2024)

Tow Coverage	Location [DecDeg]	Approx Distance (m)	Tow Coverage	Location [DecDeg]	Approx Distance (m)
S00-T01	N 14.545770° E 120.961100°	351	T05-T06	N 14.539890° E 120.970180°	327
T01-T02	N 14.548760° E 120.962020°	344	T06-T07	N 14.537310° E 120.972030°	346
T02-T03	N 14.547320° E 120.964710°	331	T07-T08	N 14.534570° E 120.970590°	343
T03-T04	N 14.544860° E 120.966580°	337	T08-T09	N 14.532900° E 120.968070°	328
T04-T05	N 14.542420° E 120.968590°	350	T09-T10	N 14.533640° E 120.964980°	344
Accumulated Distance Covered = 3.401 km					



Figure 2.74 Manta Tow Observation Pathways Surveyed for Benthic Life Form and Substrate Characterization (6 to 7 April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

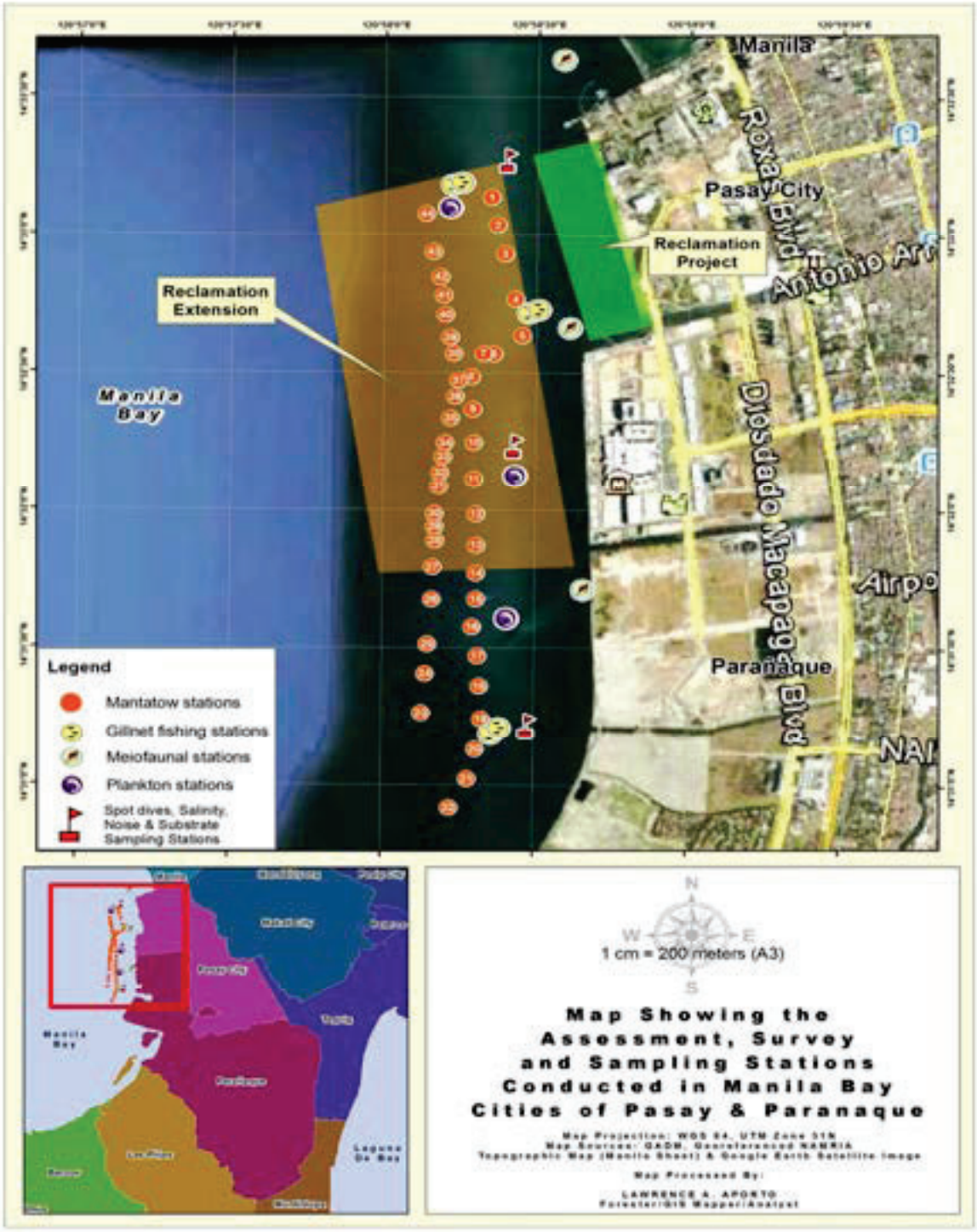


Figure 2.75 Map Showing Manta Tow Survey Stations Investigated in the previous study (13 to 14 August 2014)

Source: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

2.2.4.1.A.2.1.2. SPOT DIVES TO REINFORCE VALIDATION OF BENTHIC AND SUBSTRATE CONDITION

In view of highly turbid waters, verification spot dives along manta tow stations and spot dives using scuba were employed to corroborate absence of corals and similar habitats, to ascertain the nature of the benthic substrate and to check that the seabed do not possess other ecological niches conducive for settlement of coral recruits. A total of six (6) spot dives were conducted, distributed across the proposed reclamation area in depths ranging from five to ten meters. Inspection of the benthic condition over a 2-meter diameter radius around the spot dive points were undertaken (Figure 2.77; Figure 2.76). Sediment samples were also obtained from the spot dive stations for photo documentation. The coordinates of the spot dive stations are listed in Table 2.46 below.



Figure 2.76 Manta Tow with Tuck Dive (Left) and Diver with Underwater Torch for Spot Divers in Turbid Waters (April 2024)

Table 2.46 Coordinates of Spot Dive Stations Surveyed For Benthic Substrate Characterization (April 2024)

WP Code	Latitude	Longitude	Remarks
SPD 01	N 14.543260°	E 120.960030°	Located near Manila to Corregidor Navigational Route in Manila Bay, Pasay City with poor visibility (0.10 meter). Silt, sand, and mud comprise the seafloor in the study area bottom substrate and about 9.20 meters deep.
SPD 02	N 14.533890°	E 120.962040°	Located near Manila to Corregidor Navigational Route in Manila Bay, Pasay City with poor visibility (0.10 meter). Silt, sand, and mud comprise the seafloor in the study area bottom substrate and about 4.70 meters deep.
SPD 03	N 14.532540°	E 120.968220°	Located in front of La Fiesta, SM Mall of Asia Complex, Harbor Drive, Pasay City with poor visibility (0.10 meter). Silt, sand, and mud comprise the seafloor in the study area bottom substrate and about 9.30 meters deep.
SPD 04	N 14.535890°	E 120.973110°	Located in front of Pasay City Police Community Precinct No. 11, SM Mall of Asia

WP Code	Latitude	Longitude	Remarks
			Complex, Harbor Drive, Pasay City with poor visibility (0.10 meter). Silt, sand, and mud comprise the seafloor in the study area bottom substrate and about 8.40 meters deep.
SPD 05	N 14.544190°	E 120.967090°	Located in front of Government Service Insurance System (GSIS) Complex, Roxas Boulevard, Pasay City with poor visibility (0.10 meter). Silt, sand, and mud comprise the seafloor in the study area bottom substrate and about 4.60 meters deep.
SPD 06	N 14.549110°	E 120.963480°	Located in front of Lime Resort Manila, Seascape Village, CCP Complex, Atang Dela Rama, Pasay City with poor visibility (0.10 meter). Silt, sand, and mud comprise the seafloor in the study area bottom substrate and about 4.90 meters deep.

Due to turbid waters, verification 'tuck' dives using a torpedo buoy and underwater torch were undertaken to further validate the nature of the seabed along five (5) manta tow stations.

2.2.4.1.A.2.2. MANGROVES

There are no mangroves in or near the proposed reclamation site. The nearest mangroves, albeit more than 3.0 kilometers away, are found in the LPPWP.

2.2.4.1.A.2.3. SEAGRASS

No seagrass communities were found during the two-day survey. Not even isolated patches of small algal assemblages and associated epiphytes were encountered in the seabed due to overwhelming silt and sediment load which has completely prevented the growth of seagrass and associated benthic macro-algae. Validation through spot dives in areas suspected to have firmer substrate only further confirmed that seagrass and macro-algae resources were completely absent in the proposed reclamation area.

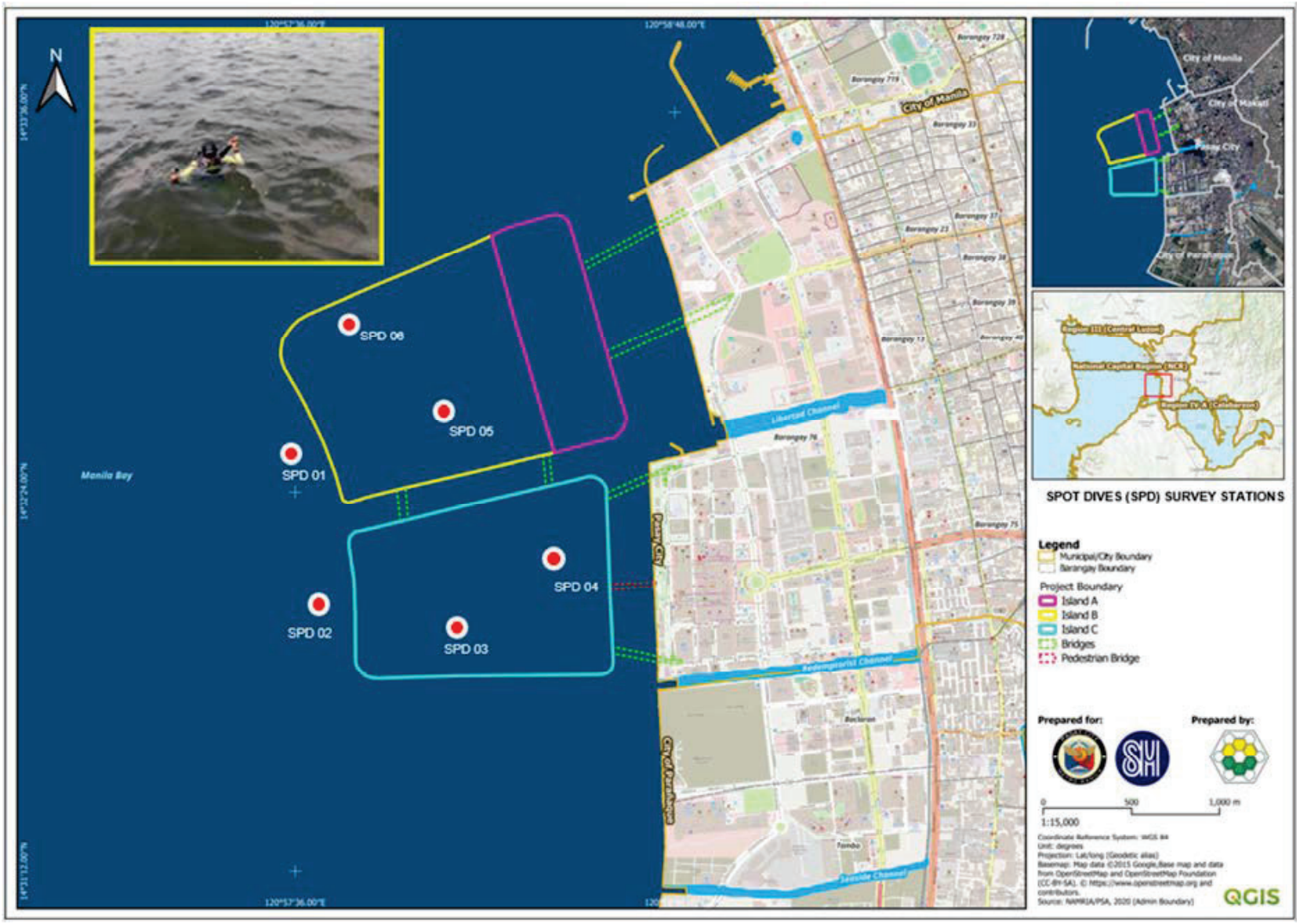


Figure 2.77 Location of Spot Dives Stations (April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

2.2.4.1.A.2.4. FISHERIES

In the absence of reef-associated fish assemblages as validated through manta tows and spot dives, identification of pelagic fish species present in the area at the time of survey was undertaken through boat-based observation of pelagic species, interview of boatmen and along the manta tow pathways. In addition, catch rate and catch composition of two small fishing boats encountered during the survey were documented in order to generate first hand data on catch per unit effort (CPUE; Figure 2.79; Figure 2.78; coordinates listed in Table 2.47). The fishers were operating some 3 kilometers from the MOA breakwater. In previous surveys in the originally proposed reclamation islands in the same area in 2014, several other fishing operations were documented. Fisheries profiling was reinforced with key informant (KI) interviews to determine (i) dominant fisheries resource practices, (ii) catch composition, and (iii) indicative productivity of fishing gears.



Two small-scale fishermen operating offshore from the proposed new Pasay 360 hectare reclamation project were documented to generate real time data on catch composition and catch per unit effort (CPUE)

Figure 2.78 Actual Fishing Operations of Two Small-Scale Fishermen

Table 2.47 Coordinates of Actual Fishing Operations of Two Gill Net Fishing Boats (April 2024)

WP Code	Latitude	Longitude	Remarks
AFO 01	N 14.532084°	E 120.954558°	Encountered 2 fishers using Bottom-Set Gill Net gear having a catch of approx 1.0 kg of theraponid, silver biddy and mullet species in 3 hours. CPUE = 0.33 kg/fishing hour.
AFO 02	N 14.540946°	E 120.931843°	Encountered 3 fishers using Bottom-Set Gill Net having a catch of approx 3.5 kg of various fish species mainly mullets (Mullidae) in 5 hours. CPUE = 0.7 kg/fishing hour.

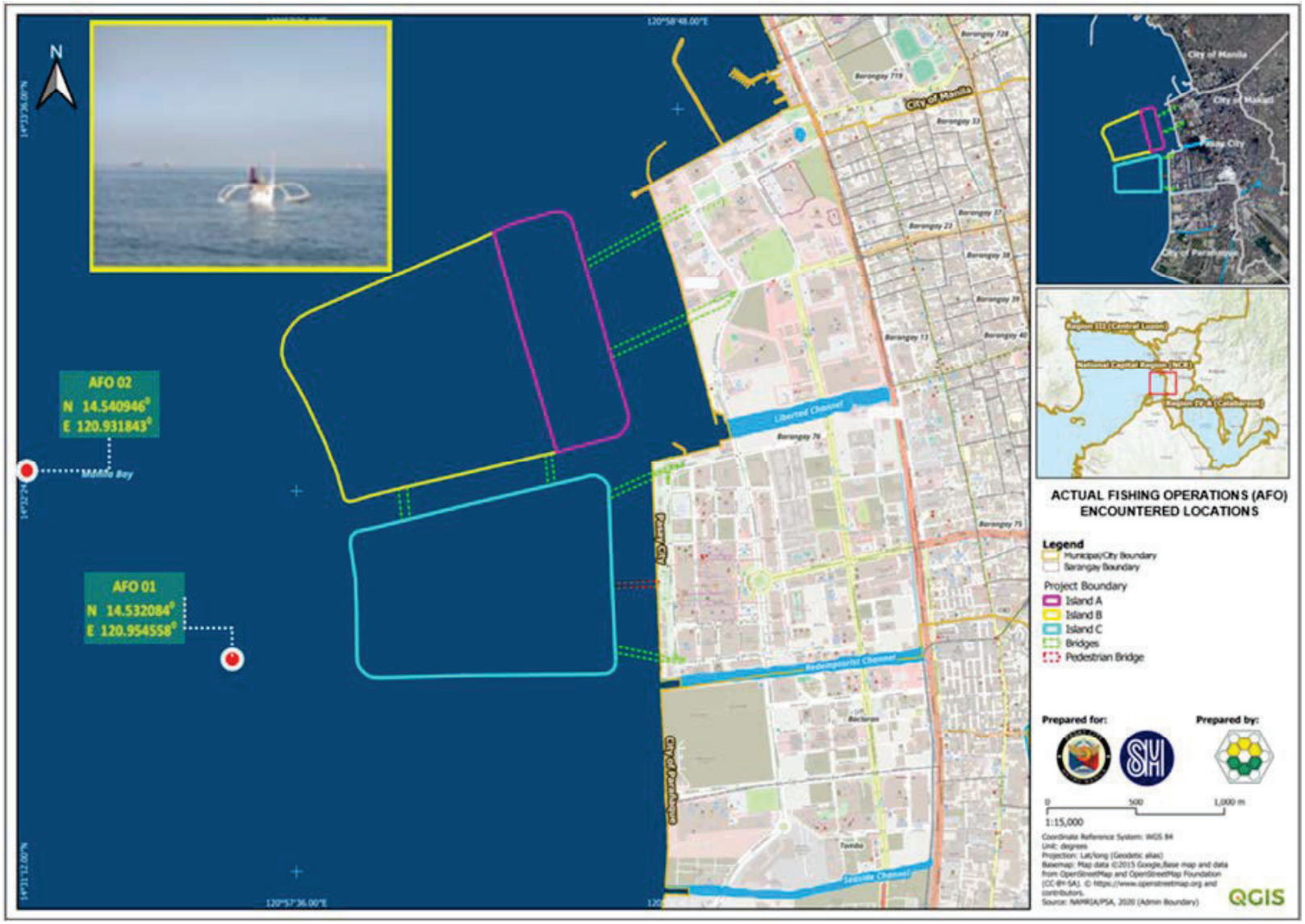


Figure 2.79 Location of Actual Fishing Documentation for Sampling of Catch Composition and Catch Per Unit Effort (CPUE) (April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020

2.2.4.1.A.2.5. MACRO-INVERTEBRATES OF SIGNIFICANCE COMMERCIAL VALUE

Except for the presence of mussels (*Perna viridis*) and oysters (*Crassostrea sp*) in the rocky seawall along Island A, no benthic macro-invertebrates were seen in muddy seabed during manta tows, six spot dives and in sediments collected. However, the macrobenthos sampling in the rocky seawall along the coastline of the MOA yielded the presence of murex gastropod and ribbed limpets at the eastern side of Island A. The macro-invertebrate sampling stations are listed in Table 2.48 and displayed in a map Figure 2.80.

Table 2.48 Survey Stations for Macro-Invertebrate Sampling in April 2024

WP Code	Latitude	Longitude	Remarks
MAC 01	N 14.532950°	E 120.979000°	Located in a breakwater in front of Starbucks Coffee, SM Mall of Asia Complex, Harbor Drive, Pasay City. Collected shellfish by the survey team were documented. Description of species discussed in narrative with specimens documented and photographed. All specimens collected were returned to their habitats.
MAC 02	N 14.534800°	E 120.978910°	Located in a breakwater in front of Fruitas Kiosk, SM Mall of Asia, Seaside Boulevard, Pasay City and about 200 meters away from MAC 01. Collected shellfish by the survey team were documented. Description of species discussed in narrative with specimens documented and photographed. All specimens collected were returned to their habitats.
MAC 03	N 14.537480°	E 120.978820°	Located in a breakwater in front of Wow Cow Fresh Beef Hot, SM Mall of Asia, Seaside Boulevard, Pasay City and about 300 meters away from MAC 02. Collected shellfish by the survey team were documented. Description of species discussed in narrative with specimens documented and photographed. All specimens collected were returned to their habitats.

Discussions/Response to Location of Fishing Grounds

Based on the EIA report of 2017, "spot dives and sub-surface snorkeling surveys yielded no encounters with sizeable fish communities except for a few sightings of tilapia and small glassfish. In the rocky seawall of the SM Mall of Asia, a few pelagic species of needlefish (*Tylosorus leiurus*), a lone theraponid, *Pelates quadrilineatus* (bagaong), and *Saurida tumbil* (kalaso) were the only species encountered, presumably seeking grazing grounds amongst the rocks. It was also reported that there were no fishermen encountered in two days of EIA surveys. The absence of viable fisheries resources may be an offshoot of the largely unproductive conditions and lack of suitable habitats for fishes where growth, maturation, and

reproductive processes can take place". This situation was further reinforced by the coastal and fisheries study of the PLANADES and PRIMEX Team. This study revealed the absence of lift nets in the proposed reclamation sites as observed during the site visit of the team on 04 December 2021. Most of the lift nets were confirmed to be in the Paranaque waters.

.

Based on the Coastal Habitats and Fisheries Final Report, Environmental and Coastal Studies for Pasay Reclamation Projects (2022), the PLANADES and PRIMEX team developed a map overlay of the proposed Pasay reclamations sites and the location of fishing structures (such as lift nets and mussel culture farms). It was confirmed that the fishing structures were located outside the Pasay 360 reclamation sites/area as shown in Figure 2.81.

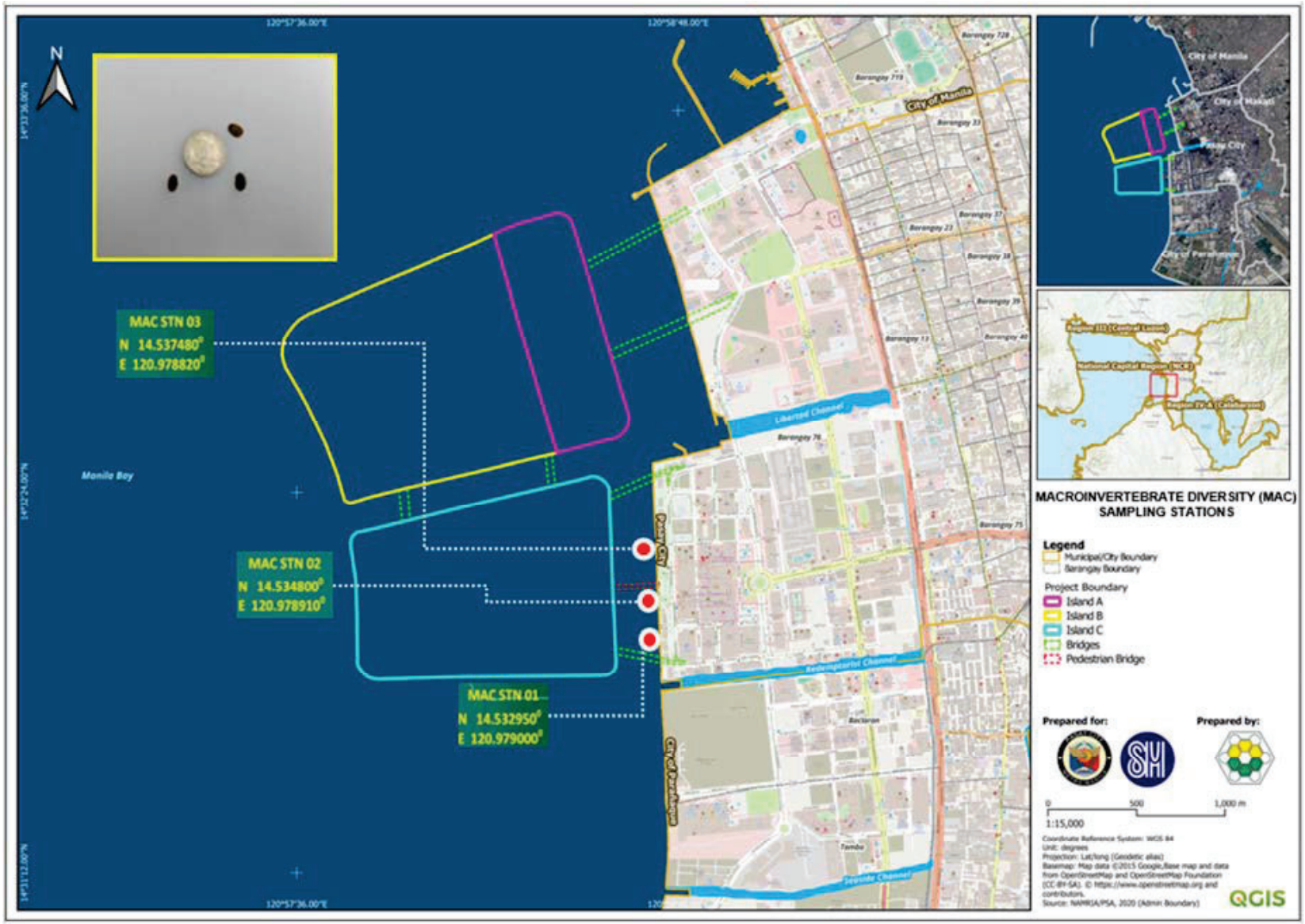
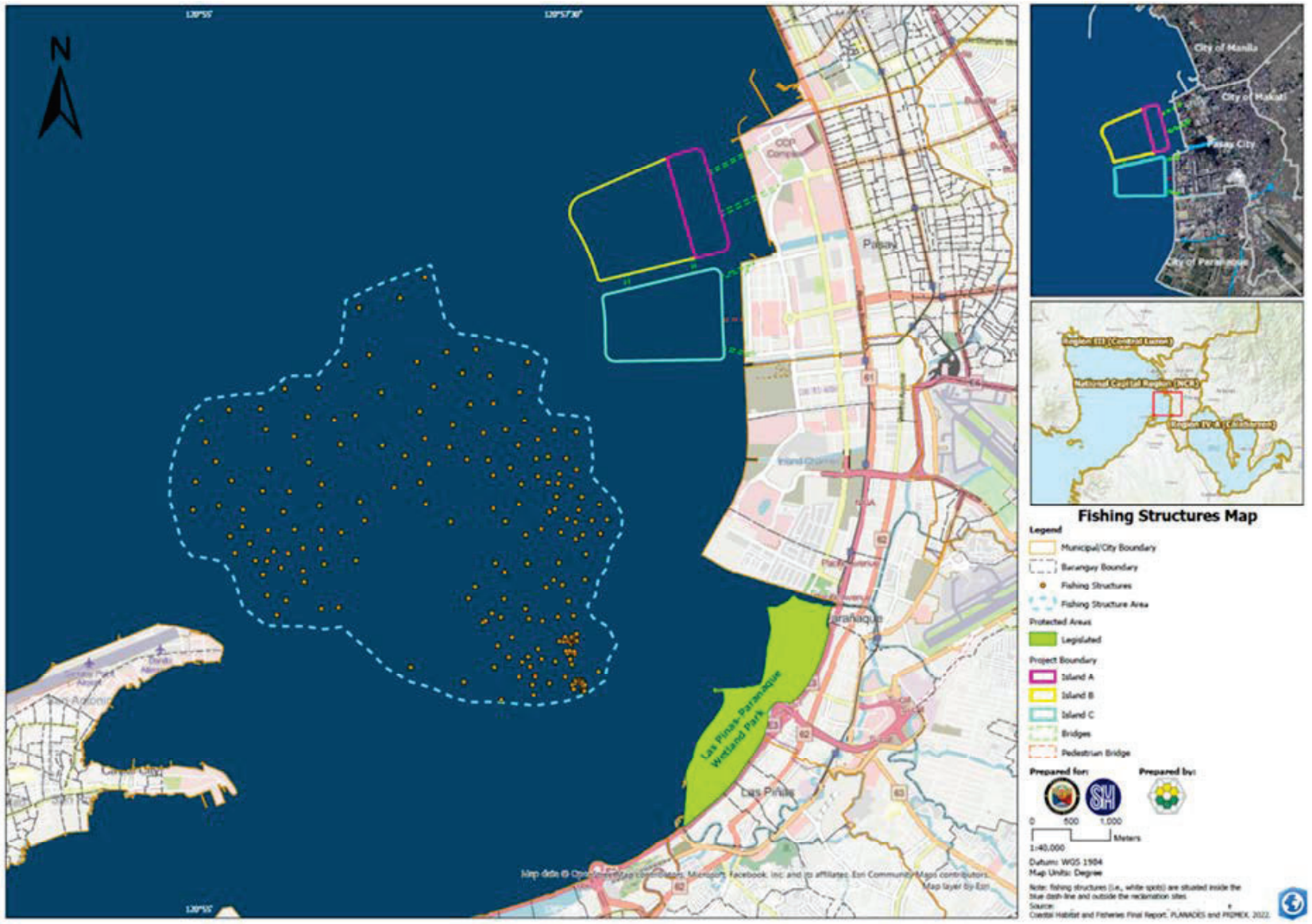


Figure 2.80 Location of Sampling Stations for Macro-Invertebrates (April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024



Note: fishing structures (i.e., orange spots) are situated inside the blue dash-line and outside the reclamation sites

Figure 2.81 (April 2024 Fishing Structures Map)

Reference: Open Street Map, Coastal Habitat and Fisheries Final Report. PLANADES and PRIMEX. 2022.

2.2.4.1.A.3. RESULTS OF MARINE ECOLOGY ASSESSMENT

2.2.4.1.A.3.1. BROAD AREA BENTHIC CHARACTERIZATION – RESULTS OF MANTA TOW SURVEYS, SPOT DIVES AND VALIDATION DIVES ALONG MANTA TOW PATHWAYS

Results from ten (10) manta tows covering 3 kilometers of meandering pathways across the proposed reclamation area, five (5) validation dives in the manta tow pathways and six (6) spot dives in the vicinity of the proposed reclamation islands all reaffirmed findings in the baseline EIA in 2014. The 2024 surveys revealed the complete absence of corals and reef associated benthic life forms across the proposed reclamation project. Not even coral rubble or remnants of old dead corals in the impact area of the reclamation project were seen, indicating that coral animals have not been existed in the area ever since (Figure 2.82, Figure 2.85, and Table 2.49). Rocks, coralline boulders, or natural structures that can serve as habitats of cryptic species are also absent in the entire reclamation islands. The seabed was dominated by silt, foul-smelling soft mud in the upper layer and firmer mud and dark sand in deeper deposits, with debris and shellfish carapace littering the seabed Figure 2.83). The seabed is essentially inhospitable and benthic ecological resources are completely bare, exacerbated by largely eutrophic conditions brought about by decaying organic sediments and extensive blankets of silt and suspended muddy substrates. This condition has also discouraged habitation of demersal fish species. The absence of coral reef formations and coral reef - associated benthic life forms was confirmed by fishers who were interviewed during the survey. Moreover, portions of the seabed in the proposed reclamation area was enveloped in webs of whitish fiber-like mats suspected to be colonies of bacteria in an oxygen-deficient benthic environment. The graphs of the ten Manta Tow Bentic observation pathways can be found in **Appendix H**.

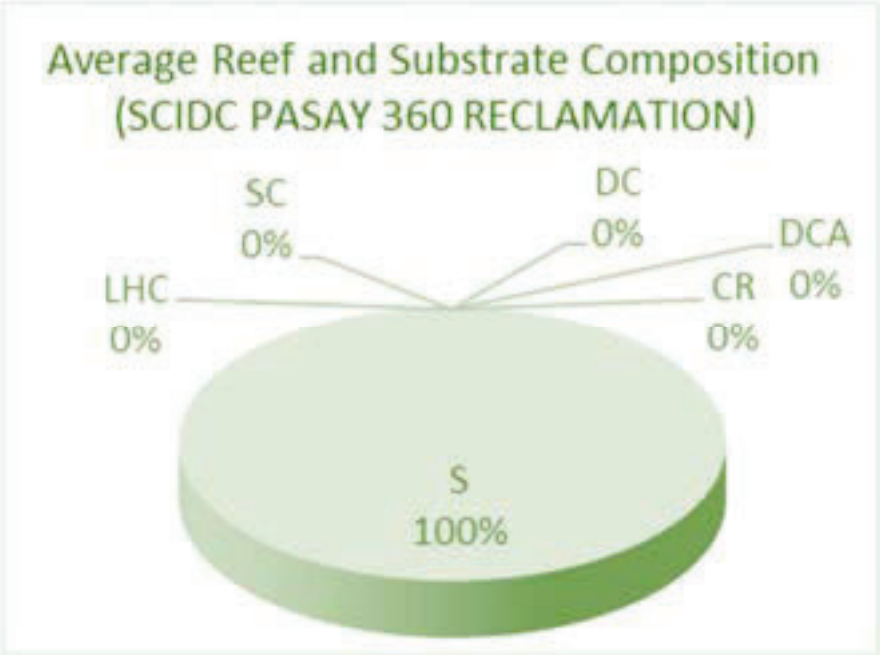
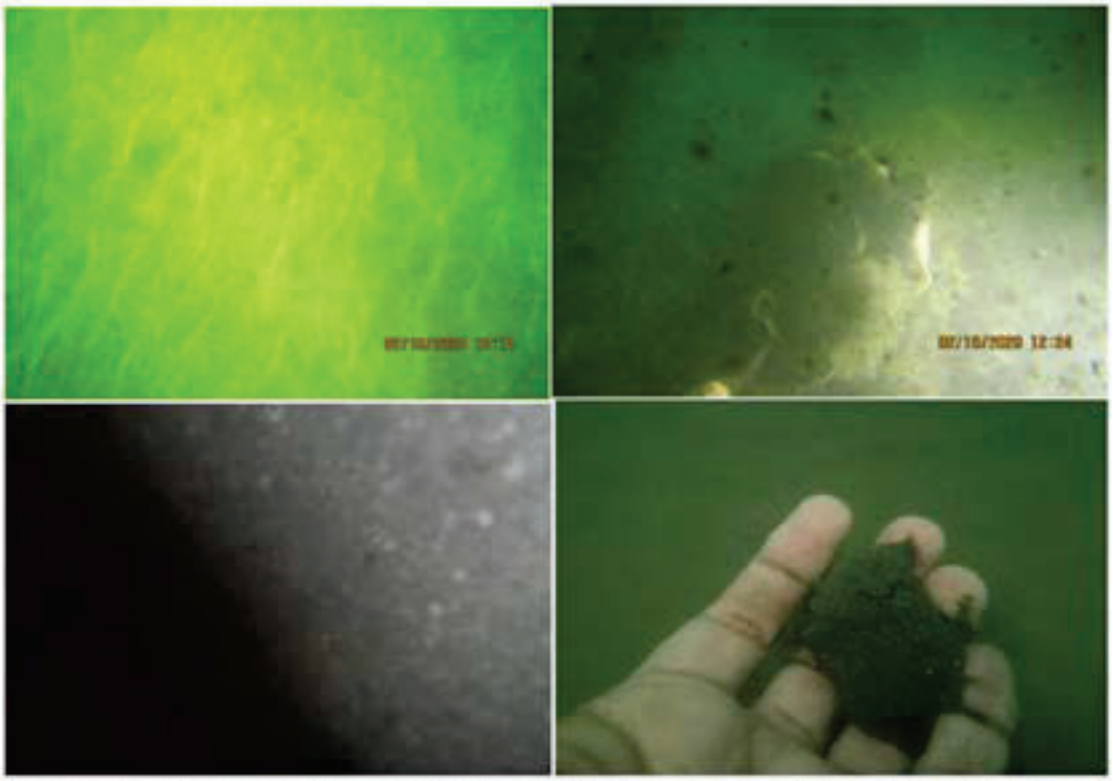


Figure 2.82 Substrate Composition Across Ten (10) Manta Tows and Six (6) Spot Dive Stations (April 2024)

Due to the grimy and polluted nature of the seabed, it is unlikely that benthic life forms, except for bacteria, pollution-tolerant macrobenthos, and planktonic micro-organisms in soft bottom, silt-laden substrates, can proliferate in the turbid, nearly oxygen-deficient benthic environment. No significant benthic aquatic animals were seen in exhaustive underwater observations. Overall, the benthic environment across manta tow pathways inside and outside of the proposed reclamation project in Pasay City waters is composed of mud, silt, and crushed shellfish carapace visibly mixed with ubiquitous debris. Polluted waters become more pronounced in the shallower portions in Island A which near the Libertad Channel.



Upper photos show the substrate in the reclamation site taken in 2020 (Francisco B.S, 2020), lower photos were taken on April 2024 (The blurred green coloration of underwater photographs is due to poor light penetration in the bottom)

Figure 2.83 Substrate in the Seabed Seen During Manta Tows and Spot Dives were Completely Comprised of Silt and Mud

Table 2.49 Results of Manta Tow Benthic Observation Across 15 Manta Tow Stations in a 9-Kilometer Pathway (April 2024)

Manta Tow Results for Reef And Substrate Composition [Coast of Pasay City along Manila Bay; MM NCR]		
Site name:	Coast of Manila Bay within the jurisdiction of Pasay City along the proposed reclamation site; MM, NCR	**Survey Team:** 1. Victor L Pantaleon 2. Ronald T Pocon 3. Benjamin S Francisco 4. Rowena R Quimpo
Time / Date:	1307H-1548H / 06 April 2024	
Tow Speed:	5.0 kmh (ave)	
Visibility:	Turbid waters, max 0.0 m – 0.10 m visibility	
Weather:	Cloudy	
Wave:	Mild wave action from approx. ± 2.0 m to ± 2.4 m wave crests	

Current:		Moderate						
Tide:		Rising from -0.40 m to 2.0 m as ref from Manila, Philippines Tidal Station (WXTIDE32)						
Water Temp:		Varying from approx. ± 28°C						
Wind:		Beaufort Scale #2						
Cloud Type(s):		Altocumulus Clouds						
Tow Coverage	**Location [DecDeg]**	**LHC**	**SC**	**DC**	**DCA**	**CR**	**S**	**Remarks**
S00	N 14.542750° E 120.960140°	-	-	-	-	-	-	**Start of Tow**
S00-T01	N 14.545770° E 120.961100°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T01-T02	N 14.548760° E 120.962020°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T02-T03	N 14.547320° E 120.964710°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T03-T04	N 14.544860° E 120.966580°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T04-T05	N 14.542420° E 120.968590°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T05-T06	N 14.539890° E 120.970180°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T06-T07	N 14.537310° E 120.972030°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T07-T08	N 14.534570° E 120.970590°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T08-T09	N 14.532900° E 120.968070°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility
T09-T10	N 14.533640° E 120.964980°	0	0	0	0	0	100	Predominantly dark gray silt and sand with poor visibility; **End of Tow**
Average Reef and Substrate Composition		**0**	**0**	**0**	**0**	**0**	**100**	

- Tow area coverage are expressed in Decimal Degrees WCS notation in reference to WGS84 Map Datum
- Reef and Substrate composition are expressed in (%) and described as follows:

Live hard coral (LHC) - coverage of stony or hard corals on the bottom or part of the bottom
Live soft coral - (SC) - coverage of soft corals attached to the bottom
Dead coral (DC) - recently dead coral still attached and recognizable at the bottom in original upright position, color usually white with no living tissue
Dead coral with algae (DCA) - corallites still visible, skeletal structure can still be seen but algae dominate the structure (often appears greenish to brownish)
Coral rubble/rock (CR) - loose broken fragments of stony corals, consolidated hard bottom or large blocks of hard reef materials not attached or easily moved around
Sand/silt (S)

Spot dives in six stations in April 2024 further confirmed that the bottom substrate is bluish-black in color, composed of silt, mud, coarse sediments, grits of shells, and an array of trash and plastic rubbish, and mats of whitish fiber (Figure 2.84 and Figure 2.85). No macro-invertebrate bivalves and gastropods; or seagrass communities were seen.

The absence of coral reefs and other benthic life forms can be attributed to several causative factors – polluted and turbid waters that reduce sunlight penetration in the water column and impairs photosynthesis required for coral survival, the silted soft substrate which is constantly disturbed by clouds of silt is not a suitable substrate for attachment of corals and seagrass, and the dilution of seawater salinity brought about by freshwater discharges from channels, sewage canals, household wastewaters and run-offs from the metropolis.

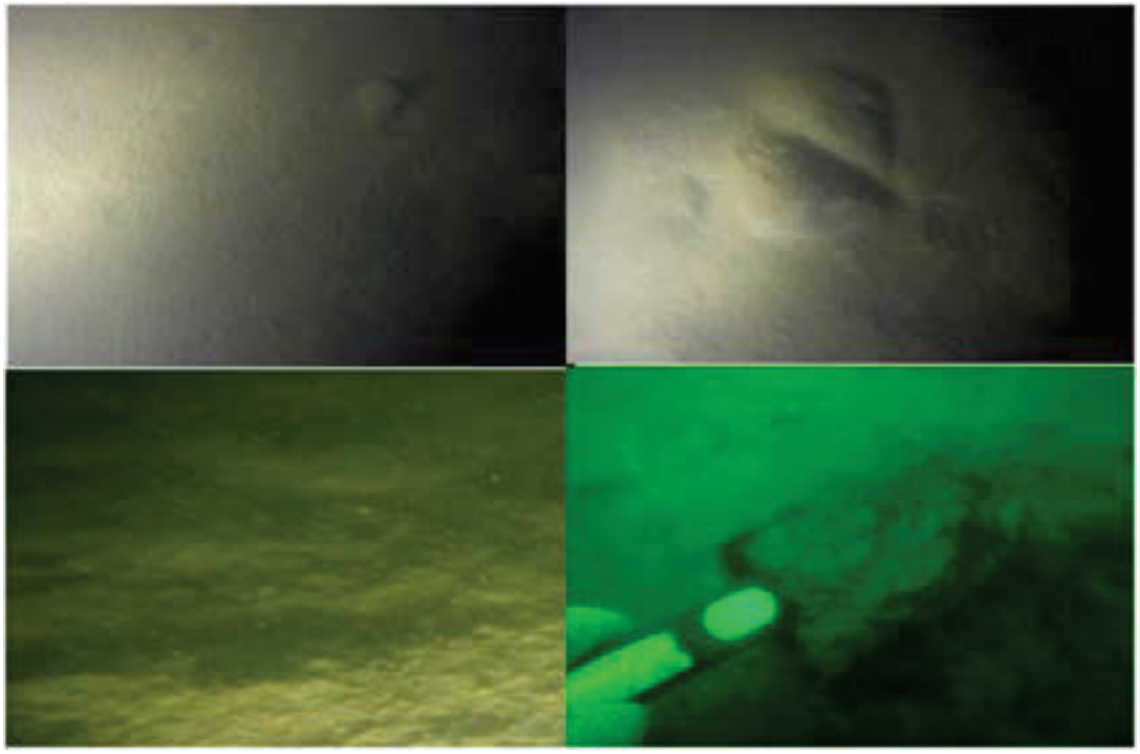


Figure 2.84 Substrate in the Seabed Seen During Spot Dives (April 2024)

The same conclusions on the absence of coral habitats and seagrass resources were generated from several other current reclamation projects in Pasay City waters that have been surveyed before. These include the Pasay Harbor City 265-hectare reclamation project and the Pasay-Ulticon 260 reclamation project where seven spot dives and some thirty manta tow observation stations were conducted in 2019. Further north of these two proposed reclamation areas, surveys with the same results were conducted previously for the Manila Goldcoast Project and the Waterfront reclamation project. To the south, muddy substrate also dominated the seabed in the proposed Parañaque 286.86-hectare reclamation project, surveyed in 2019 and 2020.

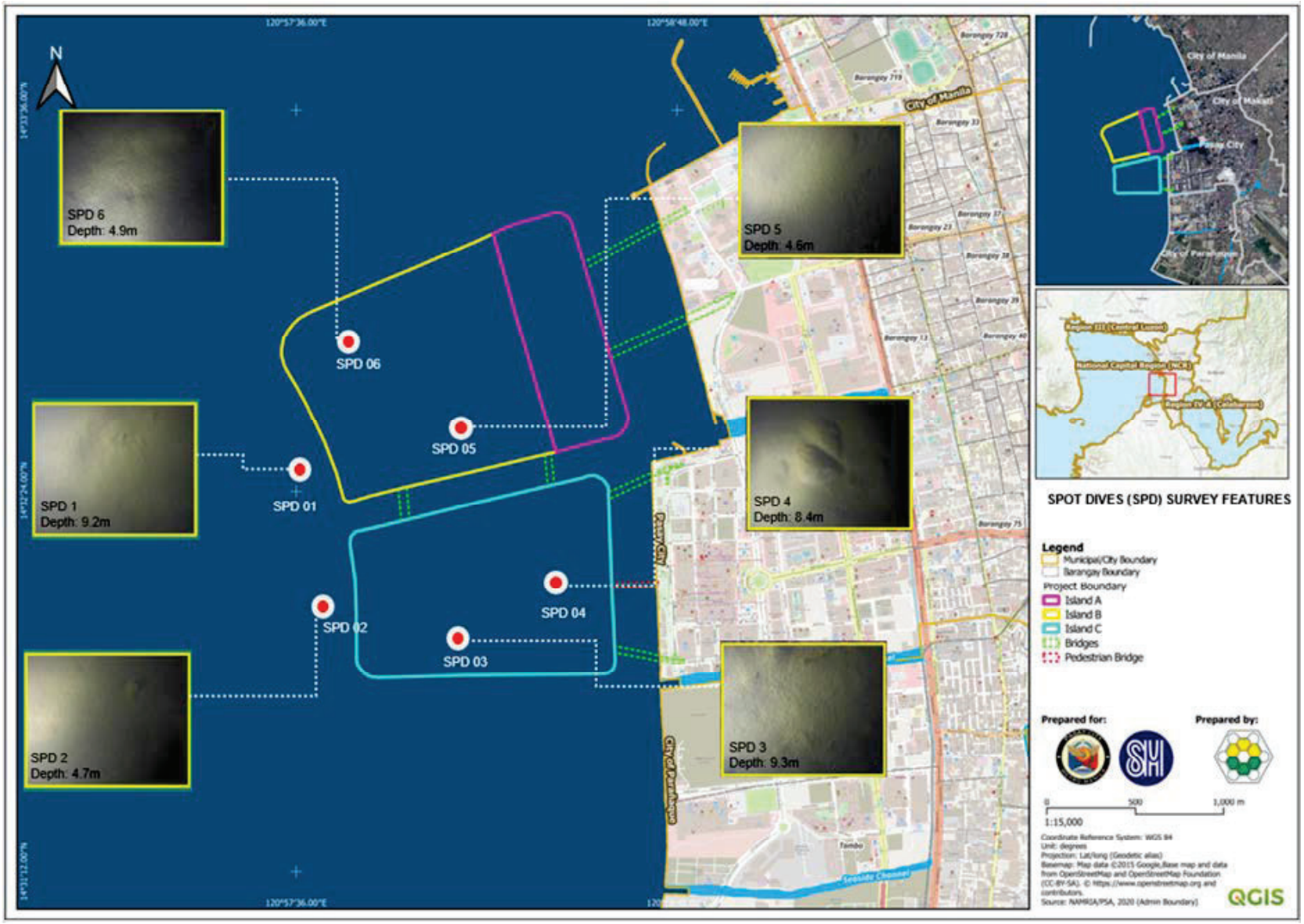


Figure 2.85 Results of Spot Dives in Six Stations Revealed Substrate Comprise of 100% Silt and Mud (2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

2.2.4.1.A.3.2. RESULTS OF FISHERIES PROFILING AND DOCUMENTATION OF TWO ACTUAL FISHING OPERATION IN-SITU

The spot dives and sub-surface snorkeling surveys yielded no fish encounters with fish communities in significant numbers or biological importance. There are only scant observations of solitary species in isolated areas near the rocky seawall and the few species present represented fish that are hardy and can tolerate turbid conditions. Pelagic species of needlefish (*Tylosorus leiurus*), halfbeaks (*Hemiramphus far*) and off-bottom species of gobies (*Valenciennea sp*.) comprised most of the species encountered. A lone fisher was met near the Parañaque river mouth with a handful of Sardines (*Sardinella lemuru*) caught through hook and line. In the same manner, no significant demersal fish communities were seen. Fishers in the Libertad Channel, however, declared that a few Grouper fish have been caught near the channel outlet. Fishers further alleged that blue swimmimg crabs have been seen to settle in the sandy portions of reclamation project recently filed up. Algae and other marine epiphytic species, which are important for photosynthesis, nutrient cycles and contribute to fish diversity and biomass by providing grazing grounds for fish, were completely absent in the loose muddy substrate.

In a fishing effort survey conducted in late 2016 for the previous Pasay reclamation project, it was found out that there were about 70 small fishing boats owned by fishers in shanties located inside Libertad channel. Major fishing ground of most fishers is 1.5 to 2.5 kilometers away from seawall. The nearest fishing grounds offshore are just outside the boundary of the 360-hectare reclamation project and a few fishermen fish inside the proposed reclamation area only when waves are too strong for small boats to go offshore. The few who fish inside reclamation area catch only small Tilapia. The offshore fishing grounds are for hook and line, the catch are small *Talakitok (cavalla), Bugaong* (teraponids) and *Bid-bid (*tenpounder*)*; the catch per unit effort is small, averaging 1 kilogram per day. A list of common species caught in fishing grounds offshore of the proposed 360-hectare reclamation project is presented in Table 2.50.

In 2017, actual fishing operations (*for the old Pasay 360-hectare reclamation 'expansion' project, by B.S. Francisco and Technotrix Inc.)* in generally the same area as the current proposed 360-hectare reclamation project using a 500-meter bottom-set gill net laid out for 1 hour each in three test fishing stations yielded 3 pieces of fish, a rainbow sardine (*Dussumieria acuta*) and two Tilapias (*Oreochromis s*p). The result of test fishing further confirmed findings from manta tow surveys and systematic snorkeling indicating the absence of significant fisheries resources in the area. However, key informants claim that that they catch an average of 3 to 5 kg of Tilapia in the fishing grounds about one kilometer from the seawalls. Key informants further alleged that only lift nets, gill nets and a few hook and line fishers operate in the fishing grounds farther from the reclamation site. The lift nets can be found some 2.5 to 3 kilometers southwest of the site, starting in upper Paranaque and becoming denser in Bacoor, Cavite. The location of the nearest lift nets are mapped in Figure 2.87. In the offshore fishing areas, lift nets and gill nets catch anchovies (Dilis), round scad (Galungong), ponyfishes (Sap-sap) and the common whiting (*Sillago sihama*; asohos*)* (Figure 2.86). Among these gears, the lift nets are the most productive, catching an average of 10 to 20 kilograms of mostly anchovies per night of gear setting.

There are however, species of pelagic fish that occur in the upper column of coastal waters, including species of *Sardinella*, needlefish, mojarra, tilapia and schools of juvenile mullet that

have somehow acclimatized to the polluted condition of the waters. It is presumed that these species move into these coastal waters to feed on plankton that has been enriched with organic nutrients from wastewaters. Also, gleaning for mussels in the seawall and the south breakwater further away is common.



Fisherman employing gill net and spear gun to catch predominantly Tilapia near the seawall; typical catch include mullets, mojarras, sardines, gizzard shad and few swimmer crabs

Figure 2.86 Small-scale Fisherman

Table 2.50 List of Fish Species Caught Along Nearshore Waters in the Vicinity of the Proposed Reclamation Site in Parañaque City Waters

English name	Local name	Scientific name	IUCN Red List Category
Hawaiian ladyfish	Bidbid	*Elops hawaiensis*	Not assessed
Nile Tilapia	Tilapia	*Oreochromis nilotica*	Not assessed
Flathead mullet	Banak	*Mugil cephalos*	Least concern
Gizzard shad	Kabansi	*Clupanodon thrissa*	Not assessed
Deep bodied mojarra	Latab	*Gerres erythrorus*	Not assessed
Caranx/cavalla	Samin-samin	*Ulua mentalis*	Not assessed
Blue swimmer crab	Alimasag	*Portunus armatus (previously P. pelagicus)*	Least concern
Silver biddy	malakapas	*Gerres filamentosus*	Unknown/Not assessed
Sardines	Law-law	*Sardinella lemuru*	Least concern
Largescale terapon	Bugaong	*Terapon theraps*	Unknown/Not assessed

While catch rates for tilapia have remained more or less stable in nearshore areas in Manila Bay in the last several years due to in-migration of this species from Laguna de Bay passing through the Pasig River, production rate for other species have steadily declined. Based on key informants, the catch per unit effort (CPUE) was estimated at between 0.58 kg to 0.75 kg per fishing hour for various types of fishing gear, with the "sapra", located mostly in Parañaque and Bacoor, having the highest yield. The issues behind the deterioration of productivity may include superfluous fishing capacity and recruitment overfishing, marine pollution and use of fine mesh nets. Catches of 'law-law' (bali sardines), normally caught using round haul seines and surrounding gill nets off the coast of Rosario and Cavite City, has allegedly remained stable. The result of actual fishing documentation in the Pasay City 360 reclamation area is presented in Figure 2.87.

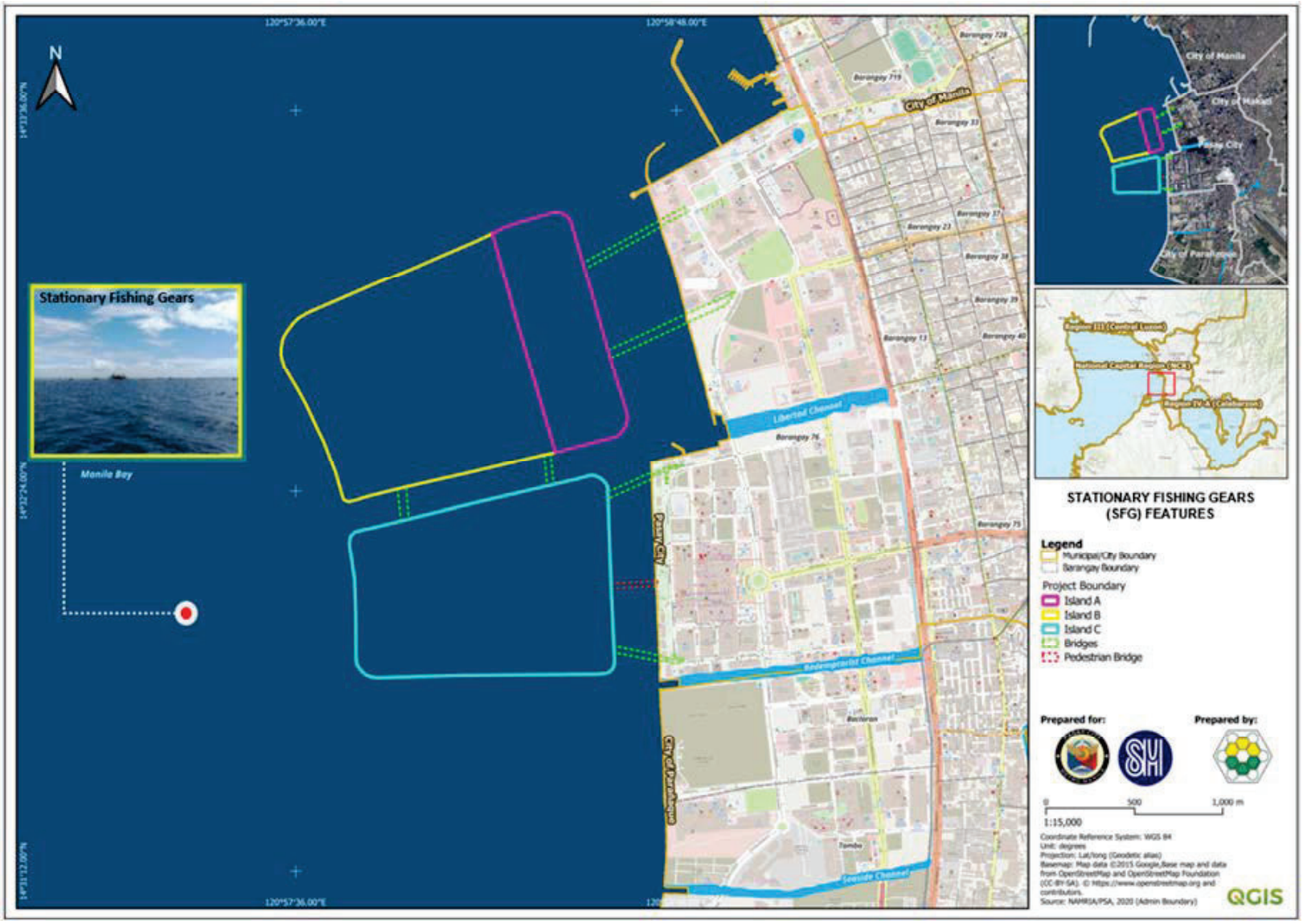


Figure 2.87 Stationary Fishing Gears (April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

Results of actual fishing documentation

Documentation of catch rates and CPUE of actual fishing operations encountered in the 2024 marine ecology assessment is summarized below.

Actual fishing documentation 1: documented six (6) fishers from Barangay La Huerta, Parañaque City. Municipal fishers utilizing encircling gillnet with plunger fishing gear *"Lambat palitaw na may timbog"* along Manila Bay (Location: 14.531630^0 N, 120.959190^0 E) with an initial catch of approximately 30.00 kilograms in four (4) hours (9:00 a.m. to 1:00 p.m.); CPUE = 7.50 kilogram per hour. Catch composition: bluespot mullet (*Crenimugil seheli; "Banak")*, and Squaretail mullet *(Ellochelon vaigensis; "Agwas")*. The CPUE of this operation is high.

Actual fishing documentation 2: Encountered one (1) fisher from Barangay La Huerta, Parañaque City (Location: 14.5311200 N, 120.9566000 E). Municipal fisher utilizing simple hook and line *"Kawil"* fishing gear along nearshore Manila Bay with an initial catch of approximately 1.50 kilogram in five (5) hours (9:00 a.m. to 1:00 p.m.); CPUE = 0.30 kilogram per hour. Catch composition includes common silver-biddy (*Gerres oyena) "Latab"*, Jarbua terapon *(Therapon jarbua) "Bagaong"*, and Bluespot mullet (*Crenimugil seheli) "Banak"*.

Results of actual fishing documentation is shown in a map in Figure 2.89.



Mullet, silver biddy and convex-lined theraponid

Figure 2.88 Common Species of Fish Caught During Actual Fishing Documentation (April 2024)

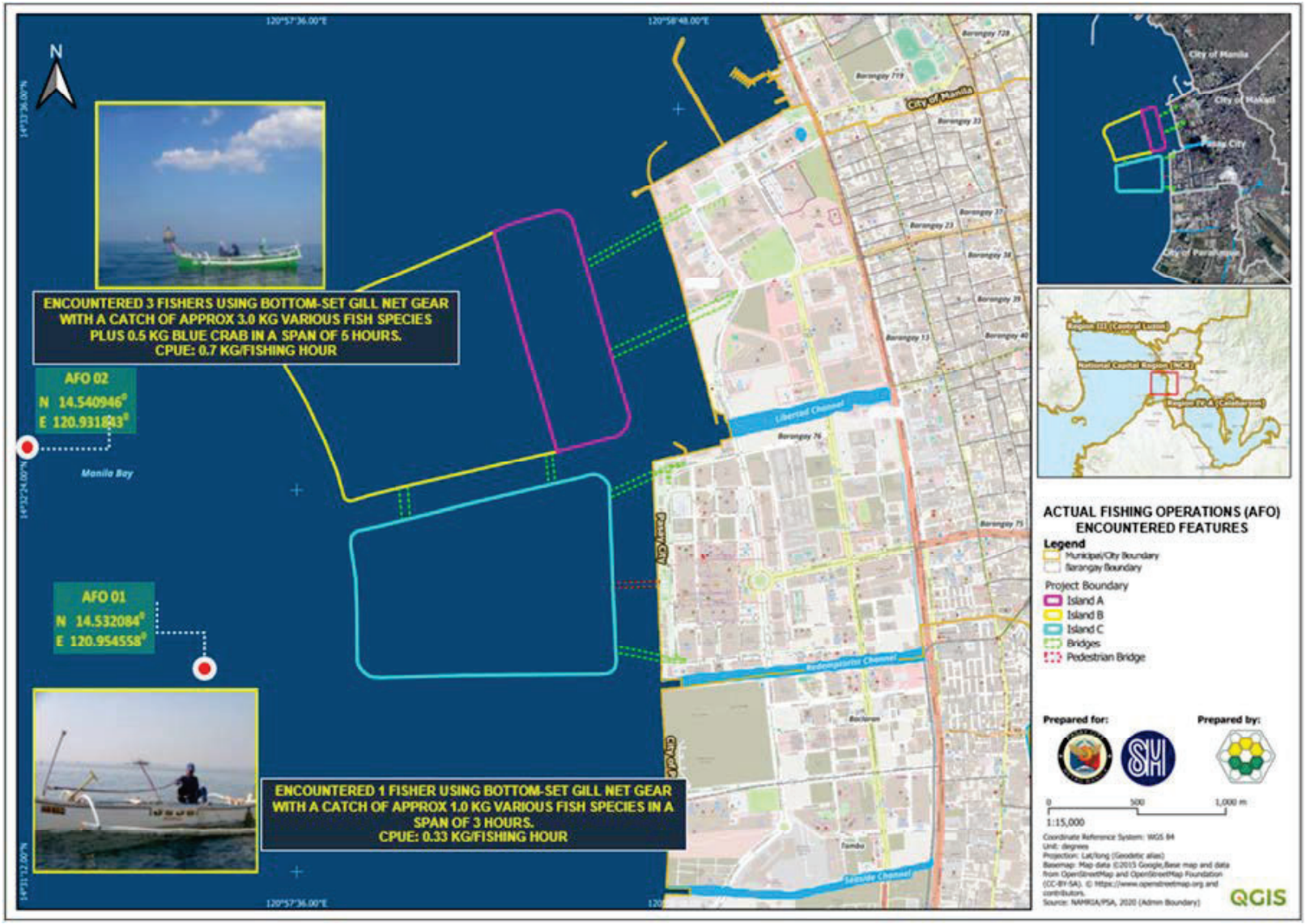


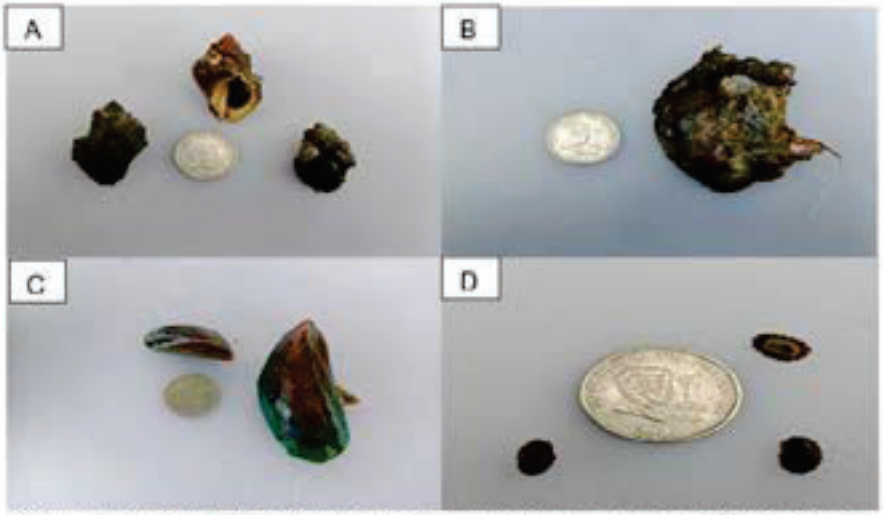
Figure 2.89 Results of Actual Fishing Documentation in a Map Showing Locations (April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020 and OSM Standard 2024

2.2.4.1.A.3.3. MACROINVERTEBRATES

Mussels (*Perna viridis*) and oysters (*Crassostrea sp*) normally occur in the rocky seawall near Island A, and in rock breakwater northeast of Island C. No benthic macro-invertebrates were seen in muddy seabed during manta tows, six spot dives and in sediments collected. However, the macrobenthos sampling in the rocky seawall along the seawall of the MOA yielded the presence of murex gastropod and ribbed limpets at the eastern side of Island C. Elsewhere, snorkelling near the shoreline only revealed the presence of immature and isolated appearances of bivalves consisting of mussels and oysters. In the seafloor, remains of dead seashells have been observed in samples of substrate collected. The dead shells and shellfish carapace are believed to have spilled over from land fillings of previous reclamation projects and from the Parañaque "bagsakan". Macro-invertebrates were only found in the crevices of the rocky seawall facing the Mall of Asia. Only fifteen (15) individuals in four (4) species were encountered in 1.5 hours of investigations. These consisted of the gastropod murex or rock snail *(Thais bituberculasis; "Bunsuran")*, a rock oyster or saddle tree oyster *(Isognomon ephippium; "Talaba")*, green mussels *(Perna viridis; "Tahong")*, and a ribbed limpet *(Lottia digitalis; "Tarukog")*; Table 2.51, Figure 2.91, *and* Figure 2.90.

Table 2.51 List of Macro-Invertebrates Encountered in Survey Stations in the Coastal Impact Area of the Project (April 2024)

Scientific Name	Common Name	Habitat	Group
Thais bituberculasis	Murex or rock snail	Rocky substrate	Gastropod
Isognomon ephippium	Rock oyster or saddle tree oyster	Rocky substrate	Bivalve
Perna viridis	Green mussel	Rocky substrate	Bivalve
Lottia digitalis	Ribbed limpet	Rocky substrate	Gastropod



(A) murex or rock snail, (B) rock oyster or saddle oyster, (C) green mussel and (D) ribbed limpet

Figure 2.90 Macro-invertebrates found in the rock seawall of SM Mall of Asia (April 2024)

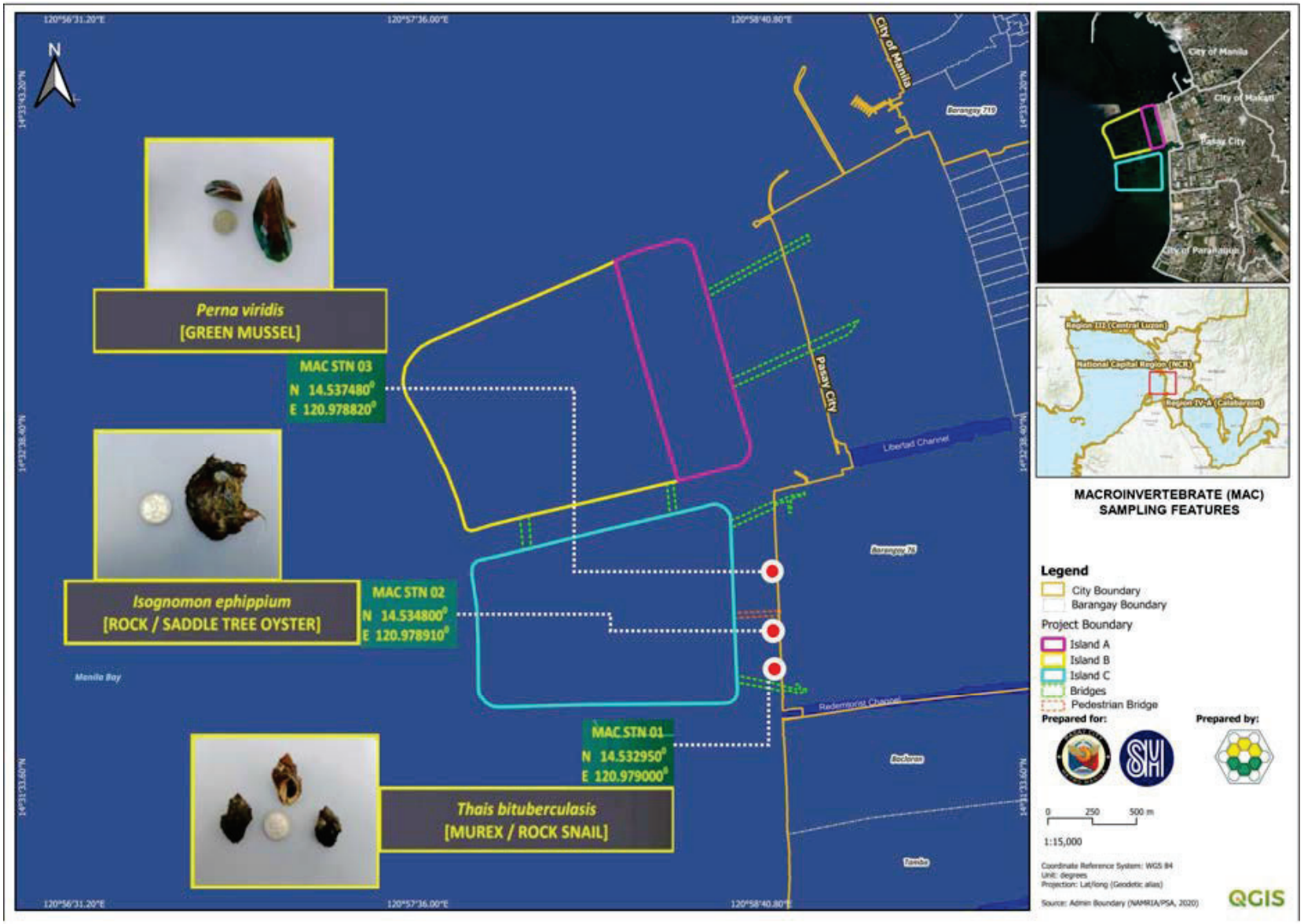


Figure 2.91 Macro-invertebrates Found in the Rocky Seawall of SM Mall of Asia (April 2024)
Reference: Open Street Map, Admin Boundary – NAMRIA/ PSA 2020

2.2.4.2. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

Threat to existence and/or loss of important local species and habitat & Threat to abundance, frequency and distribution

Impact on Plankton Community

Generally, there is insufficient information on the direct and indirect effects of suspended sediment plumes during reclamation on planktonic communities to assess with certainty the impacts on planktonic communities found within the site. It is certain that the increased load of suspended solids and the movement of the silt along the water column will decrease primary productivity which is already severely impaired because of low sunlight penetration. Planktonic communities can be affected albeit, these organisms can readily regenerate. Also, high sediment loads would reduce the grazing success of zooplankton. However, the reduction of photosynthetic function will have little impact as hardly any significant group of benthic marine animals dwell in the seabed within the project's impact area and contiguous waters. Benthic micro-organisms have the capability to adjust and re-establish themselves because of their ability to "regenerate" in a short period of time from advection as facilitated by water circulation and current systems in the water body. The impact on the alteration of species diversity and density of benthos communities which is anticipated as a result of the reclamation project will only be temporary and short-term in duration, and reversible in the long term.

Primary productivity will eventually improve in the long term as cleaner seas around the reclaimed site will be a primary objective of the Project. Farther away from the impact area, the effect may not be likely felt as the movement of the water along the water column would result to dispersion of silt to a greater area causing lesser stress to bottom-dwelling biotic communities where they exist.

Mitigating Measures:

Wastewater Management - Waste minimization and retrieval will be practiced in all aspects of reclamation activities. Modern and sufficient sanitation facilities and disposal systems will be installed. State-of-the art latrines with chambered septic tanks will be installed and sludge will be periodically collected. The objective is to ensure that pollution-causing effluents that can be potentially carried downstream are controlled at the source.

Larval Dispersal - The provision of adequate channels in between the reclamation islands should ensure that movement of free-drifting fish larvae and juveniles will not be prejudiced. Movement of plankton will also be sustained and plankton communities will continue to enrich inshore fishing grounds where sardines and other small pelagic fishes graze, as well as sustain macro-invertebrate recruitment elsewhere. Larvae and juveniles of pelagic species of sardines will continue to move to areas close to the shore and their seasonal movement into the coastal seas surrounding the reclamation project will be sustained. In the same manner, it is unlikely that mussel spat settlement in farms in the Bacoor area will be affected as the mussel farms, as well as and stationary lift nets (sapra) are too far from the proposed reclamation site in Pasay City.

Presence of pollution indicator species - Mussels and oysters are standard biotoxin monitoring media and the BFAR implements a periodic monitoring system of plankton levels and toxicity analysis through bioassay in mussel and oysters in Manila Bay. While the reclamation project would not be a primary trigger for harmful algal blooms (HAB) episode enhancement, bivalves gathered by gleaners near the project area will be placed under a strict biotoxin level monitoring system through engagement of BFAR personnel. Moreover, the Project will support the conduct information, education and communication (IEC) campaigns to promote red tide awareness and to pinpoint sources of hyper nutrient loading into the sea.

Effects on fisheries

Extreme turbidity can also impair fish feeding and reproductive physiology particularly if turbidity further intensifies. However, the silt and sediment fluxes will be temporary as the area is completely reclaimed and fugitive sediments settle or are carried elsewhere by wave action. The ecological impacts of sediment sequestration and intrusion will thus be temporary. In fact, cleaner water may be dispersed during project operation of its WTP and STP and may contribute to clearer waters around the reclaimed area over the long run.

Since there are no significant capture fisheries resources and resource use practices present in the project site, the project will have very insignificant effects on capture fisheries as fishers will simply move farther past the boundary of the reclamation project. There will be little impact on catch rates and fisheries operation in fishing grounds offshore of the reclamation and generally in Manila Bay as fishers will move to new fishing grounds past the reclaimed area where seawater will probably be less polluted in the long term. The project will have hardly any impact on small-scale fisheries near the Paranaque River estuary and the LPPWP as these fishing grounds are more than 4 kilometers away from the reclamation activities.

One positive development is that crabs have been witnessed by fishers to have settled into sandy reclamation filling.

Mitigating Measures: The reclamation will not displace stationary fishing gears and the few fishers operating in the vicinity. Provision of alternative livelihoods will be considered in the Project's social development funds.

Effect on mangroves

The reclamation site is almost ±3.15 km North of the mangroves in the LPPWP. Since reclamation filling consists mainly of heavy sand material, it is unlikely that fugitive sand will reach the LPPWP.

The Proponent and JV is in support of greening activities as such and compliance to ECC Condition No. 7 Implementation of Reforestation and Carbon Sink Program. On 4 May 2021, the Pasay LGU already submitted its Reforestation and Carbon Sink Program, which was duly acknowledged by the EMB on 4 May 2021. On 22 August 2023, the Pasay LGU submitted an updated program to the EMB. The Private Joint Venture (JV) Partner plans to implement the project on the Project Site as well as in other locations, which will be made in partnership with the DENR Central Office's Strategic Communication Initiative Service, DENR-NCR, National Greening Program (NGP), and LLDA's Adopt-a-Mangrove Program. Off-site implementation of the program began in 2023 with activities already implemented in Nasugbu, Batangas; Macabebe, Pampanga; Tuba, Benguet; and Maragondon, Cavite.

On 18 October 2023, SM SCIDC initiated the mangrove planting in Brgy. Sta. Ana, Calatagan, Batangas (Plate 2-4) in coordination and partnership with the LGU MENRO and the People's Organization Samahan ng mga Mangingisda at Magsasaka sa Sitio Palobandera. The activity was participated by 103 representatives from SM SCIDC, PRA, Calatagan MENRO, PCG Auxiliary, and residents of Brgy. Sta. Ana. A total of more than 2,000 Ceriops species propagules were planted in the area. A total of 1.96 hectares (19,664 square meters) was covered during the planting activity wherein 0.03 hectare (303 square meters) was allocated for the establishment of new mangrove area, while the rest was for the replanting/reforestation.

Another mangrove planting was initiated by SM SCIDC on 20 December 2023 (Plate 2-4) in Brgy. Dalayap, Macabebe, Pampanga, which was kicked-off by a clean-up activity on 19 December 2023 in coordination with LGU Macabebe and in partnership with the People's Organization Dalayap Fruit Vegetables Farmers and Fisherfolks Association Inc. Said activity was participated by officials of Pasay City, Macabebe MENRO, residents of Brgy. Dalayap, Macabebe and the members of Dalayap Fruit Vegetables Farmers and Fisherfolks Association Inc. A total of 3,000 Rhizophora mangrove species seedlings were planted on 20-22 December 2024 covering 0.2095 heactare (2,095 square meters).



Plate 2-4 Mangrove Planting

Coastal Ecosystem Management Plan

The Pasay City Council adopted on 13 December 2019 its Coastal and Sea Use Plan (CSUP) which incorporated the Coastal Ecosystem Management Plan (CEMP). This was submitted to BFAR on 6 January 2020 and then to the EMB-CO on 26 March 2021 with EMB-CO acknowledging on 07 April 2021 that this submission is compliant with the on the ECC condition #1 for the Project.
Subsequently, BFAR and Pasay LGU agreed to work together to enhance the submitted CSUP/CEMP. This culminated to an enhanced CSUP/CEMP submitted to BFAR on 12 October 2022 and which BFAR acknowledged on 19 December 2022 that:

> "The enhanced Coastal and Sea Use Plan took into consideration "economic development, coastal development, rational use of natural resources, landscape and seascape protection and rehabilitation, and protection of national heritage," including the "scientific basis for the zoning."

The CSUP/CEMP identified Four Zones. These zones, their key features, and the status of implementation is summarized in the table below:

Table 2.52 CSUP/CEMP identified Four Zones

Zones	Key Features	Status of Implementation
Built-up Zones	Aims to achieve urban development thru reclamation within the City's municipal waters while efforts to improve and restore the marine life of the Manila Bay is hoped to be realized.	On-going reclamation activities within Pasay City municipal waters while ensuring compliance with laws, rules, and regulations. On-going planting of mangroves on neighboring provinces which will become part of marine ecosystem for Manila Bay. On-going testing and studies for possibility of establishing mangrove corridors within this Zone.
Small Vessels Navigational Channels	To supplement the inland inter-island mobility, the channels between the reclamation islands may be utilized for water-based mobility in all portions of island development and location of water-based activities. Thus, this zone's major role is to increase mobility within the municipal waters while ensuring the safety and security during navigation and the promotion of ecotourism activities.	PLAA members identified and registered as fishers under BFAR with long-term plans of alternative livelihood by giving priority to these fishers in the employment for maintaining and protecting coastal habitats. Initial Channel Traffic Circulation has been proposed under the CSUP

Zones	Key Features	Status of Implementation
	Another management objective of this zone is to campaign for and establish mangrove and coastal habitats while trying to protect the coastal habitat restoration. Lastly, it also aims to provide livelihood for the community.	On-going masterplanning of the design and uses of the channels once reclamation is complete
Marine Ecotourism Zone	This zone is mainly dedicated for increasing the productivity of fishery resources within the Manila Bay. It also promotes and establishes coastal habitats while trying to protect the coastal habitat restoration.	On-going studies for the viability of aquaculture and artificial reefs to increase fishery resources within Manila Bay
Marine Restricted Zone	This zone is mainly dedicated to increase the productivity of fishery resources within the Manila Bay by minimizing the disturbance of the marine resources.	Zone coordinates identified
Shipping and Navigation Zone	The City's municipal waters are currently being used by passenger and cargo vessels as part of the sea route accessing the Manila North Harbor and Manila South Harbor. The City recognizes that portions of its municipal waters shall be dedicated to the safe passage and navigation of these sea vessels. The management objective of this zone is to ensure the safe and unobstructed navigation of ships. This zone is placed far from the Built-up Zone and beyond the Marine Restricted Use Zone, wherein minimal human activities are occurring.	Pasay City has entered in a MOA with PPA on 07 September 2021 to establish a new navigational sealane consistent with PPA's own plans and the City's CSUP/CEMP at no cost to the local or national government. This new navigational sealane has now been established and announced by the PPA through its Port Operations Bulletin on 19 June 2023

Sediment fluxes and re-suspension of silt

Dredging, filling and compacting of sand, soil and earthen materials into the reclamation area will result to short term, albeit localized and reversible increase in total suspended solids in the water column. Sediment plumes can travel over a broad area although the absence of significant benthic resources in the inshore portions of Manila Bay will have little, far-fetched impact on the coastal environment that is already heavily impaired by pollution, eutrophic episodes, and absence of benthic ecological structures and functions. Through substrate disturbance, reclamation activities will contribute further to turbidity and dispersal of silt plumes

but this will be temporary and would not affect any significant benthic communities or fishing practices in the area and its contiguous environs. Re-suspension of silt and substrates, as well as increments in water turbidity will not significantly affect benthic life forms nor significant fish and shellfish habitats. Suspended materials will ultimately re-settle around the site, in the same manner that silt and sediments constantly discharged from point sources in the metropolis are settled. The few numbers of mollusks and fishes dwelling in the rocky seawall will be displaced but resettlement can occur once a new seawall, this time in cleaner waters, will be achieved. In spite of the low numbers, smothering of epi-benthic macro-invertebrates, filter feeding mollusks and other detritus feeders in the immediate area can happen with continuous sediment deposition.

Mitigating Measures: Sedimentation is predicted to be high during reclamation area filling and compacting and impacts are predicted to range from moderate to high depending on the implementation of mitigating measures in the primary impact area. Mitigation measures as stated in the water quality mitigating measures particularly the turbidity management plan will be implemented to prevent sediment streams and broad dispersion of silt throughout the reclamation process, to monitor clouds of effluents, discharges and fugitive particle and liquid mud, so that they can be captured and controlled early on. Other precautionary mitigation measures to prevent sediment streams and broad dispersion of silt will be adopted by the project through the installation of appropriate sieves during soil transport and dispensing. A primary objective is to prevent the possibility of sediment fluxes reaching areas with set nets and bivalve farms. During soil compacting, a series of diverse sediment mitigation measures and facilities will be established in strategic locations, with silt and sediment diversion canals to ensure loose soil are captured. An additional measure is the early planting of extensive vegetative cover in order to increase sediment amalgamation capacity and soil compacting aided by stabilization of areas where earth moving has been completed.

One positive note arising from spillage of sandy substrate around the reclamation site is that it can firm up and stabilize the surrounding seabed and enhance settlement of various marine animals into the improved seabed.

Oil and Grease Contamination

The risk of oil and grease contamination in seawater around the reclamation site can occur if disposal of marine vessel bilge water and if accidental spillage from refueling at sea is experienced. While the issue is not anticipated to be severe, oil slicks from inadvertent spillage may remain sequestered in the water column or carried to the shoreline in blotches. Areas with inter-tidal corals in Bataan and macro algae colonies in Cavite can be considered at risk from exposure to large slicks, leading to immediate coral mortality and algae wilting. In open waters of Manila Bay, the chain reaction can be far-reaching, affecting not only benthic communities but stocks of fish that are dependent on plankton and zooplankton as primary diet.

Mitigating Measures: Potential risks of small oil spills from reclamation vessels will be controlled through strict fuel and oil dispersal protocols backed-up by an oil/fuel spill contingency plan consistent with MARPOL standards and Philippine Coast Guard regulations. An oil and grease recovery system will be adopted employing the best facilities. The project will enforce strict policies against indiscriminate disposal of oily waste and marine vessel bilge.

Increase in domestic wastewater and shipboard bilge around the reclamation site

Compacting, configuring and development structuring of the reclaimed area will result to increased human activity in the project site due to the influx of workers and reclamation vessels and this is expected to generate a significant amount of solid wastes, bilge waste and domestic wastewater that could find its way to the coastal and marine environment if waste disposal and management systems are not sufficient. However, the risk of waste contamination of benthic resources is insignificant due to the absence of significant benthic habitats. The predicted impact of this threat to epi-benthic soft bottom communities in the seabed could be more pronounced. The outflow of domestic wastewaters from project facilities if such waste streams are not properly treated and managed can lead to hyper-nutrient loading which in turn can cause algal blooms. In the project area where seawater flushing is moderate and water turbidity is already intense, such phenomenon can lead to problems on paralytic shellfish poisoning (PSP).

Potential accidents causing damages to marine ecosystems

Dredging and filling may result into potential accidents causing damages to marine ecosystems during transport of dredging vessel. To mitigate this, the following will be conducted:

- Use of sea-worthy vessel approved by MARINA, PCG and appropriate regulatory bodies,
- Installation of adequate navigational devices including early warning system.,
- Avoid and stop transport during inclement weather.,
- Implementation of Typhoon Response Plan.,
- Compliance with MARINA, PCG and international regulations., and
- Proper training of vessel crew and personnel.

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.53 Impact Analysis and Environmental Management – Marine Ecology

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Threat to existence and/or loss of important local species and habitat and Threat to abundance, frequency and distribution					
Construction Phase • Dredging • Excavation • Filling • Construction of temporary access and bridges	2021 to 2028	Insignificant ecologically important marine life Containment wall Appropriate toilet facilities	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon		

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
• Working on temporary areas • Construction of support facilities and Horizontal Development Decommissioning of Temporary Facilities		Oil and lubricants (used or spent) should be collected and treated by TSD facility	Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed Proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase. Monitored/ controlled loading and unloading of fill/dredged materials On-site collection and segregation of wastes; strict policy on no shipboard waste disposal at sea Provision of appropriate certifications and permits for fill material extraction activities Pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification. Issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with Turbidity Management Plan. Proper implementation of hazardous waste management plan. Provision of appropriate drip trays. Chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank. Maintenance of hazardous waste storage facility. Provision of appropriate spill kits and booms, in case of accidental spillage		

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
			Practice good maintenance of machineries and equipment to reduce oil losses.		

2.2.4.3. MONITORING PLAN

The environmental monitoring plan for the identified potential impact is summarized in the table below. The complete EPRMP EMoP table can be found in **Section 6**.

Table 2.54 EMoP – Marine Ecology

Parameters to be Monitored	Sampling and Measurement Plan		
	Method	Frequency	Location
Threat to existence and/or loss of important local species and habitat and Threat to abundance, frequency and distribution			
EIS 2017			
Marine species	Underwater Survey	During Reclamation works	Near the site where Construction activities, e.g. dredging or filling are conducted
EPRMP 2024			
Marine species	Ocular Survey; Interview Survey with Fisherfolks	During Reclamation works	Near the site where construction activities, e.g. dredging or filling are conducted dredging or filling are conducted.

2.3. THE AIR

2.3.1. METEOROLOGY / CLIMATOLOGY

2.3.1.1. BASELINE DATA

2.3.1.1.A. CHANGE IN THE LOCAL MICRO-CLIMATE E.G. LOCAL TEMPERATURE

2.3.1.1.A.1. CLIMATE

The project site falls under Type 1 climate based on the Modified Coronas Climate Classification as shown in Figure 2.92. This type of climate has two pronounced seasons:

- Dry from November to April; and
- Wet during the rest of the year (May to October).

2.3.1.1.A.2. TROPICAL CYCLONE FREQUENCY AND TROPICAL CYCLONE PATHS

The tropical cyclone frequency map of the Philippines is shown in Figure 2.93. PAGASA categorizes a tropical cyclone based on the intensity of its maximum winds. On average, approximately 20 tropical cyclones pass through the Philippine Area of Responsibility (PAR) every year. Most cyclone disturbances traverse Luzon and Visayas, and rarely cross Mindanao. The Project site is situated in an area traversed by 20 cyclones in 12 years (5 tropical cyclones in 3 years).

2.3.1.1.A.3. CLIMATOLOGICAL NORMAL VALUES

The nearest Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) stations that were used as reference for the climatological normal (Table 2.55) is the Port Area Manila Synoptic Station which is ~3.6 km from the nearest project boundary as shown in Figure 2.94.

Based on this synoptic weather station, the records of rainfall show the advent of rainy seasons in the month of May, and the peak of rainy reasons on the month of August, while the wettest months are July, August and September. This weather station recorded an annual rainfall amount of 2,242.7 mm representing a long-term average over a 30-year period.

The mean annual relative humidity recorded at the Port Area Manila Synoptic Stations is 74%. The months of July to September are the most humid months. The annual mean average temperature at this station is 28.6°C with January being the coldest month having an average mean temperature of 26.9°C while the month of April and May are the warmest with an average mean temperature of 30.3°C.

2.3.1.1.A.4. CLIMATOLOGICAL EXTREME VALUES

The climatological extreme values at the Port Area Manila Synoptic Station which is ~3.6 km from the nearest project boundary is shown in Table 2.56. This table include the highest and lowest values and date of occurrence for temperature, rainfall, strongest winds and sea level pressures. The recorded annual extreme high and low temperatures at this station is 38.6°C (May 17, 1915) and 14.5°C (January 1, 1914). The amount of extreme greatest rainfall is 403.1mm which occurred in September 1, 1970. The strongest wind is at 56 mps WNW which occurred in November 19, 1970.

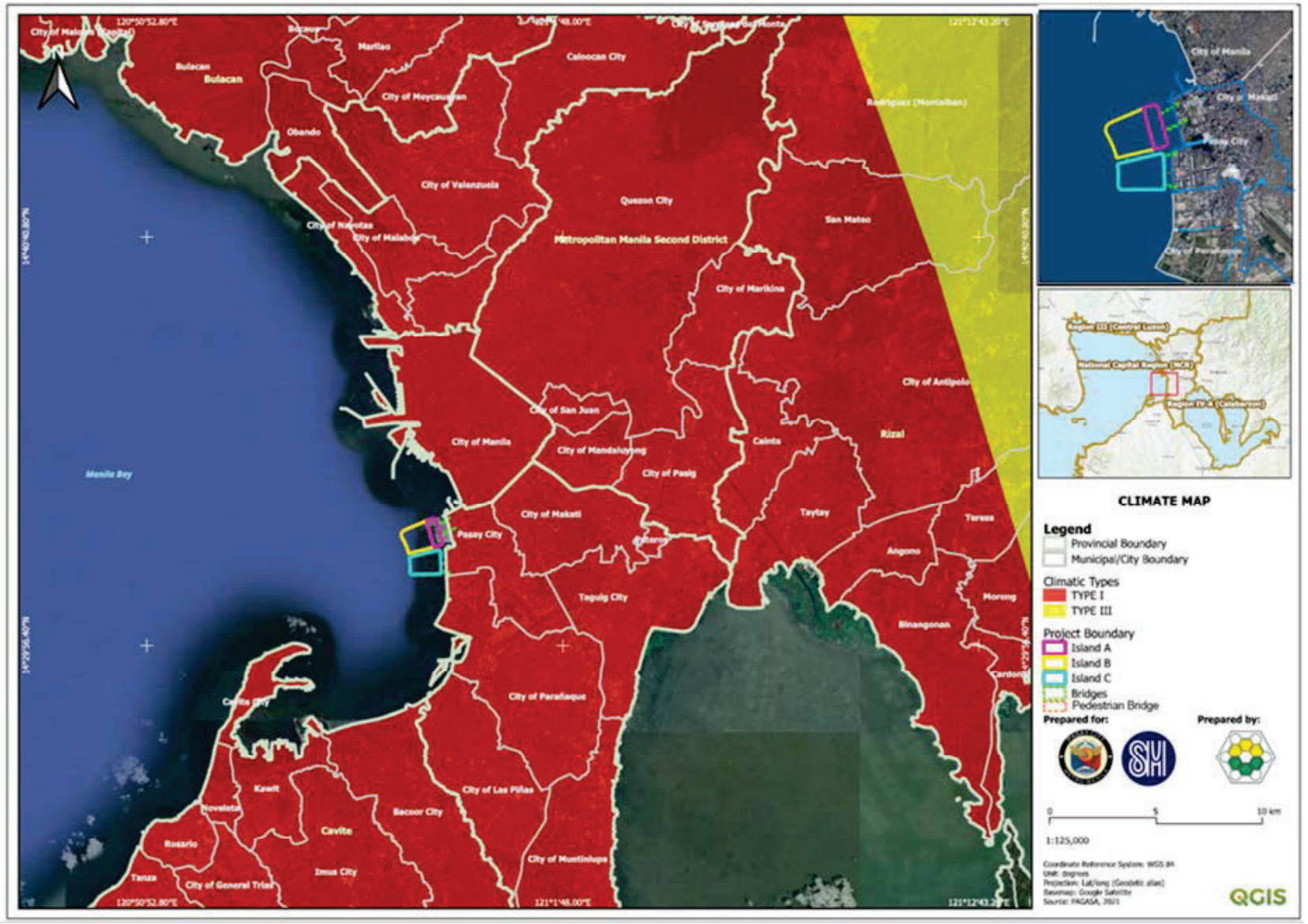


Figure 2.92 Climate Map of the Philippines
Source/ Reference: PAGASA, 2021

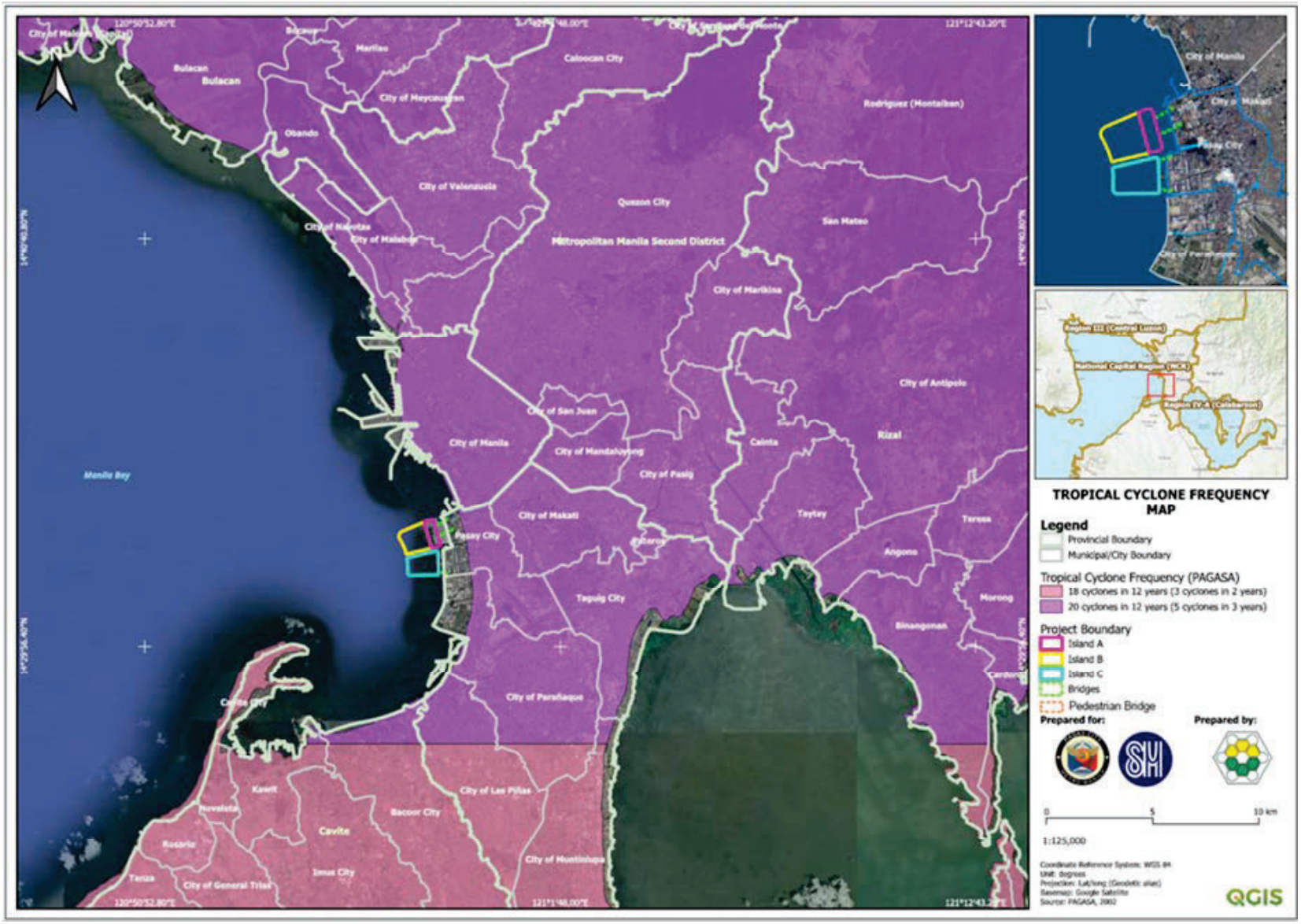


Figure 2.93 Tropical Cyclone Frequency Map of the Philippines
Source/ Reference: PAGASA , 2002

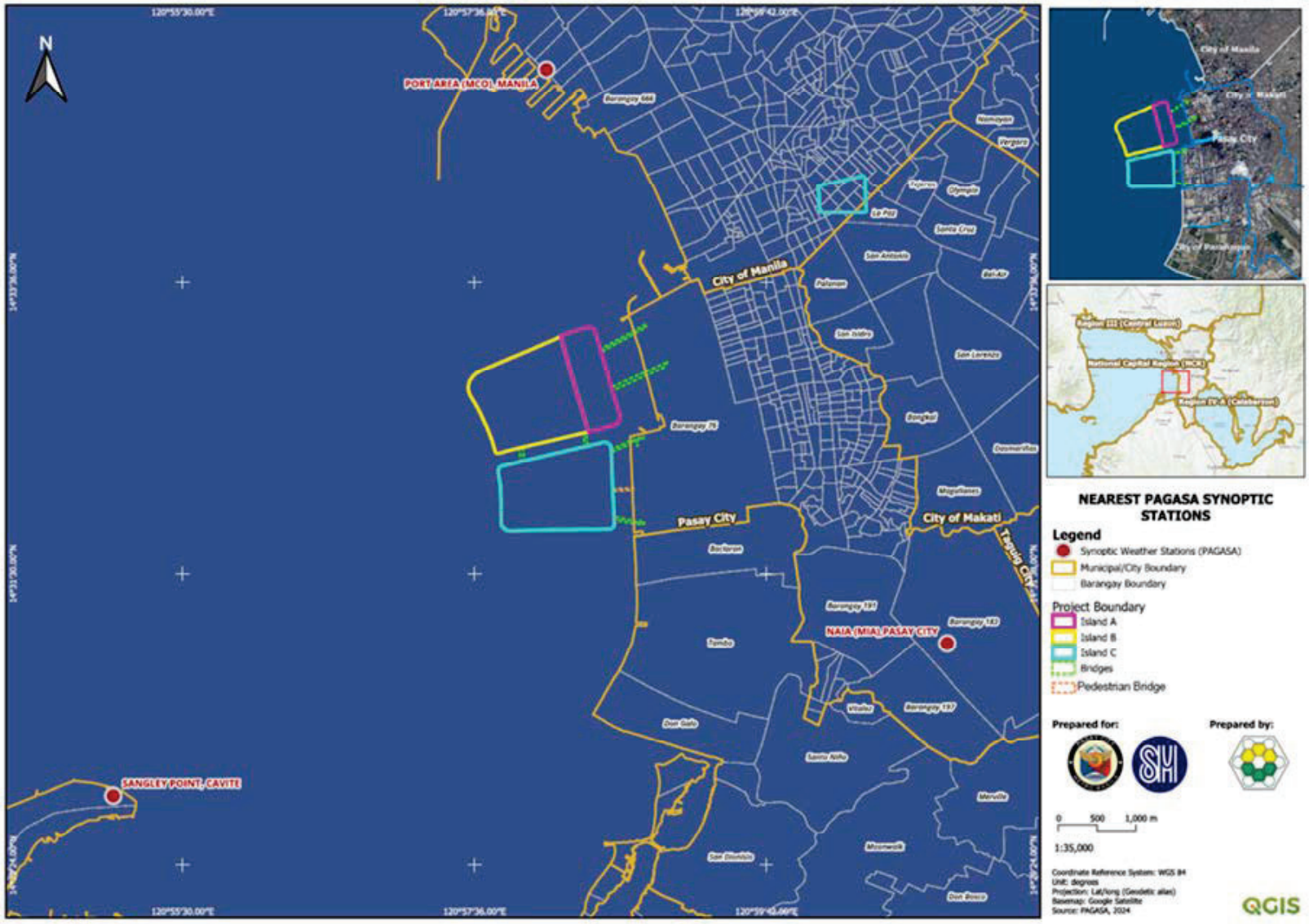


Figure 2.94 Nearest PAGASA Synoptic Station
Source/ Reference: PAGASA , 2024

Table 2.55 Climatological Normals recorded at Port Area, Manila Synoptic Station (1991-2020)

Station: PORT AREA (MCO), MANILA
Period: 1991 – 2020

Latitude: 14°35'13.10" N
Longitude: 120°58'43.44" E
Elevation: 15m

Month	Rainfall		Temperature						Vapor Pressure (mbs)	Relative Humidity (%)	Mean Sea Level Pressure (MSLP)	Wind		Cloud Amount (okta)	No. of Days w/	
	Amount (mm)	No. of Rainy Days	Max (°C)	Min (°C)	Mean (°C)	Dry Bulb (°C)	Wet Bulb (°C)	Dew Pt. (°C)				Direction (16 pt)	Speed (mps)		TSTM	LTNG
JAN	19.4	4	29.9	23.9	26.9	26.8	22.9	21.3	25.4	72	1012.5	WSW	2	7	1	0
FEB	21.9	3	30.7	24.3	27.5	27.3	22.9	21.2	25.2	70	1012.5	WSW	3	6	1	0
MAR	21.8	3	32.1	25.3	28.7	28.5	23.7	21.8	26.2	67	1011.7	WSW	3	6	1	0
APR	23.4	3	33.8	26.7	30.3	30.1	24.9	23.0	28.1	66	1010.4	WSW	3	6	2	1
MAY	159.1	9	33.6	27.0	30.3	30.2	25.9	24.5	30.7	72	1008.8	SW	3	6	8	5
JUN	253.3	14	32.8	26.5	29.7	29.5	26.0	24.9	31.4	76	1008.3	SW	3	7	10	6
JUL	432.3	19	31.5	25.9	28.7	28.5	25.7	24.8	31.3	80	1007.7	SW	3	7	10	5
AUG	476.1	19	31.0	25.9	28.5	28.3	25.8	24.9	31.5	82	1007.5	SW	3	7	10	5
SEP	396.4	18	31.2	25.7	28.4	28.3	25.6	24.8	31.2	81	1008.2	SW	3	7	10	4
OCT	220.6	14	31.4	25.7	28.6	28.5	25.2	24.1	30.0	77	1009.0	SW	3	7	6	3
NOV	119.9	10	31.3	25.3	28.3	28.2	24.6	23.3	28.6	75	1010.2	N	3	7	2	1
DEC	98.5	8	30.3	24.6	27.4	27.3	23.7	22.4	27.1	75	1011.3	N	3	7	1	0
ANNUAL	**2,242.7**	**124**	**31.6**	**25.6**	**28.6**	**28.5**	**24.7**	**23.4**	**28.9**	**74**	**1009.8**	**SW**	**3**	**7**	**62**	**30**

Source: Port Area, Manila Synoptic Station, PAGASA, 1991-2020

Table 2.56 Climatological Extremes recorded at Port Area, Manila Synoptic Station (as of 2023)

Station: PORT AREA (MCO), MANILA
Year: As of 2023

Latitude: 14°35'13.10" N
Longitude: 120°58'43.44" E
Elevation: 15m

Month	Temp °C				Greatest Daily Rainfall (mm)		Strongest Winds (mps)			Sea Level Pressures (mbs)			
	High	Date	Low	Date	Amount	Date	SPD	DIR	Date	High	Date	Low	Date
JAN	36.5	01-30-1984	14.5	01-11-1914	37.8	01-08-1955	18	E	01-15-1987	1,022.4	01-09-1914	1,003.3	01-05-1999
FEB	35.6	02-25-1906	15.6	02-18-1920	61.3	02-07-2020	25	SE	02-26-1962	1,021.4	12-01-1962	1,002.7	02-18-1998
MAR	36.8	03-23-1966	16.2	03-10-1911	47.0	03-25-2009	27	SSE	03-16-1962	1,020.5	03-30-1958	997.3	03-27-1991
APR	38.0	04-30-1915	17.2	04-02-1923	143.0	04-29-1905	24	WSW	04-18-1962	1,018.8	04-01-1958	998.1	04-29-1905
MAY	38.6	05-17-1915	20.0	05-01-1921	371.4	05-19-1976	35	E	05-17-1989	1,015.9	05-09-1937	987.4	05-23-1922
JUNE	37.6	06-04-1912	20.1	06-04-1973	252.8	06-27-1985	47	SW	06-29-1964	1,021.6	06-28-1993	974.6	06-29-1964
JULY	37.0	07-05-2023	19.4	07-14-1970	293.6	07-29-1919	31	WSW	07-24-1968	1,014.9	07-29-1987	990.7	07-16-2014
AUG	36.2	08-17-2017	18.0	08-14-1974	358.0	08-07-2012	34	S	08-04-1989	1,015.2	08-12-1958	990.8	08-31-1920
SEP	35.3	09-18-1903	20.2	09-02-1970	403.1	09-01-1970	34	SW	09-13-1961	1,015.2	09-20-1965	986.7	09-27-1906
OCT	35.8	10-01-1968	19.5	10-26-1913	203.9	10-05-1986	41	W	10-26-1978	1,017.0	10-28-1960	977.9	10-14-1970
NOV	35.6	11-04-1966	16.8	11-03-1911	278.4	11-18-1923	56	WNW	11-19-1970	1,019.0	11-29-1985	966.5	11-19-1970
DEC	34.6	12-14-1947	15.7	12-03-1992	146.8	12-15-2015	41	W	12-14-1964	1,020.9	12-08-1960	971.1	12-26-1947
ANNUAL	**38.6**	**05-17-1915**	**14.5**	**01-11-1914**	**403.1**	**09-01-1970**	**56**	**WNW**	**11-19-1970**	**1,022.4**	**01-09-1914**	**966.5**	**11-19-1970**
Period Record	1885 – 2023				1865 – 2023		1948 – 2023			1885 - 2023			

Source: Port Area, Manila Synoptic Station, PAGASA, 2023

2.3.1.1.A.5. CHANGE IN LOCAL CLIMATE

The projected seasonal temperature increases and seasonal rainfall change is shown in Table 4.3 while the frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in NCR is shown Table 4.4. Predicted range of temperature change in NCR in 2050 is 1.8 to 2.1°C while seasonal rainfall change is from -38.5 to 3.7%.

Table 2.57 Seasonal temperature increases (in °C) and rainfall change (in%) in 2020 and 2050 under medium-range emission scenario in NCR

Month	Observed Baseline (1971 to 2000)				Change in 2020 (2006 to 2035)				Change in 2050 (2036 to 2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
NCR / Metro Manila Seasonal Temperature Increase	26.1	28.8	28.0	27.4	1.0	1.1	0.9	1.0	2.0	2.1	1.8	1.9
Seasonal Rainfall Change (in %)	107.5	198.5	1,170.2	758.7	-12.8	-33.3	8.5	0.0	-17.3	-38.5	21.3	3.7

Source: PAGASA. Climate Change in The Philippines (February 2011)

Table 2.58 Frequency of extreme events in 2020 and 2050 under medium-range emission scenario

Station	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of rainfall >200mm		
	OBS (1971 to 2000)	2020	2050	OBS (1971 to 2000)	2020	2050	OBS (1971 to 2000)	2020	2050
Port Area	299	1,176	2,118	7,380	6,445	6,382	12	12	13

OBS: Observed Baseline
Source: PAGASA. Climate Change in The Philippines (February 2011)

2.3.1.1.B. CONTRIBUTION IN TERMS OF GREENHOUSE GAS EMISSIONS (OR GHG MITIGATION POTENTIAL)

POTENTIAL PROJECT GREENHOUSE GAS EMISSION

Majority of the greenhouse gas (GHG) emissions that will be generated from the proposed project are expected to come from activities associated with the reclamation activities (fuel use for the operation of service vehicles and equipment and electricity consumption). These fuel combustion and electricity consumption activities release three (3) out of seven (7) GHGs, namely: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Majority of these emissions will be CO_2 with very minimal share for CH_4 and N_2O. As such, this report will only focus on CO_2 emissions.

Methodology

GHG emissions were calculated using an emission factor-based calculation method. Emissions were estimated by multiplying a level of activity data (AD) by an emission factor (EF). Activity data is a quantified measure of activity resulting in emissions during a given period of time (e.g. data on fuel consumption (liters/km) and purchased electricity (kWh reading) while emission factor is the average emission rate of a given GHG for a given source,

relative to units of activity. The general equation which is based on The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI), 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories and 2014 IPCC Assessment Report is presented below:

GHG Emissions = AD x EF

The emissions associated with the project are categorized into direct and indirect emissions. Direct GHG emissions of Scope 1 are from sources that are owned and/or controlled by the proponent. This is usually applicable during the operational phase (e.g. use of generator set and equipment owned by the proponent). Indirect emissions, on the other hand, are further categorized into Scope 2 and Scope 3. Scope 2 emissions are a consequence of the project's implementation at sources owned and/or controlled by another entity, which include purchased electricity consumption. Scope 3 emissions are a consequence of the proponent's activities but to which the proponent has no direct control over which include tailpipe emissions from contracted equipment/vehicles during project implementation activities.

Table 2.59 Items to consider for each Scope of GHG Emissions

Scope	Activities
1	Stationary combustion Emissions from fuel use of entity-owned/ controlled stationary equipment (e.g. standby generator set) Mobile combustion Tailpipe emissions from entity-owned/ controlled vehicles (e.g. service vehicles)
2	Power Requirement Emissions from the consumption of purchased electricity for construction works
3	Stationary combustion Emissions from fuel use of contracted construction equipment (e.g. generator sets) Mobile combustion Emissions from mobile vehicles and equipment

In the case of this project, the types of emissions are Scope 2 and Scope 3. Actual data on electricity and fuel (diesel) consumptions has been provided by the proponent from its Self-Monitoring Report submissions (see Table 2.60).

Table 2.60 Activity Data

Year	Quarter	Consumption per Quarter	
		Electricity (kWh)	Fuel (liters of diesel)
2021	2nd	17,472	-
	3rd	9,222	-
	4th	12,338	-
2022	1st	5,482	-
	2nd	8,729	-
	3rd	19,930	-
	4th	25,793	-
2023	1st	27,575	9,807.0588
	2nd	35,975	11,643.5294
	3rd	27,829	14,141.1765
	4th	22,307	18,258.8235

Year	Quarter	Consumption per Quarter	
		Electricity (kWh)	Fuel (liters of diesel)
2024	1st	25,791	32,240.0000
	2nd	26,775	34,314.8235

GHG EMISSIONS CALCULATIONS

Based on DOE Department Order No. 2011-08-0009, the National Grid Emission Factor (NGEF) serves as the reference for energy projects under the Clean Development Mechanism[12] (CDM) as the per-grid standard amount of GHG emissions related to the activities performed on a particular grid (see Table 2.61).

Table 2.61 Computed Grid Emission Factors using DOE Power Statistics Data

Grid	National Grid Emission Factor (tCO_2/MWh)	
	Wind and Solar Projects	Other Projects
Luzon-Visayas Grid	0.7058	0.7181
Mindanao Grid	0.8348	0.8173

Source: Department of Energy

In calculating the GHG emission from purchased electricity, 0.7181 tCO2/MWh will be used. The consumption is based on the actual data from 2021 to 2024.

In calculating Scope 3 emissions for fuel consumption, actual fuel consumption from 2021 to 2024 has been used. Fuel emission factor for diesel is 2.676327 $kgCO_2/L$.

1) Scope 2 GHG Emissions (Purchased Electricity)

Table 2.62 shows the GHG emission from purchased electricity which is based on actual data from 2021 to 2024.

Table 2.62 GHG Emission from Purchased Electricity

Year	Quarter	Electricity (kWh)	Emission Factor (kgCO2/kWh)	GHG Emission (tCO2)	Annual Emission (tCO2)	Coverage
2021	2	17,472	0.7181	2.5466	28.0289	3 quarters
	3	9,222	0.7181	6.6223		
	4	12,338	0.7181	8.8599		
2022	1	5,482	0.7181	3.9366	43.0386	4 quarters
	2	8,729	0.7181	6.2683		
	3	19,930	0.7181	14.3117		
	4	25,793	0.7181	18.5220		
2023	1	27,575	0.7181	19.8016	81.6379	4 quarters
	2	35,975	0.7181	25.8336		
	3	27,829	0.7181	19.9840		
	4	22,307	0.7181	16.0187		
2024	1	25,791	0.7181	18.5205	37.7476	2 quarters
	2	26,775	0.7181	19.2271		

Note: Electricity consumption data is based on the Self-Monitoring Reports submitted by the Proponent to DENR-EMB

[12] Article 12 of the Kyoto Protocol

2) Scope 3 GHG Emissions from Fuel Consumption

Table 2.63 shows the GHG emission from purchased electricity which is based on actual data from 2021 to 2024.

Table 2.63 GHG Emission from Fuel Consumption

Year	Quarter	Fuel Consumption (Liters)	Emission Factor (kgCO2/kWh)	GHG Emission (tCO2)	Annual Emission (tCO2)	Coverage
2023	1	9,807.0588	2.6763	26.2469	144.1218	4 quarters
	2	11,643.5294	2.6763	31.1619		
	3	14,141.1765	2.6763	37.8464		
	4	18,258.8235	2.6763	48.8666		
2024	1	32,240.0000	2.6763	86.2848	178.1225	2 quarters
	2	34,314.8235	2.6763	91.8377		

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**. The Proponent and JV is in support of greening activities as such and compliance to ECC Condition No. 7 Implementation of Reforestation and Carbon Sink Program. On 4 May 2021, the Pasay LGU already submitted its Reforestation and Carbon Sink Program, which was duly acknowledged by the EMB on 4 May 2021. On 22 August 2023, the Pasay LGU submitted an updated program to the EMB. The Private Joint Venture (JV) Partner plans to implement the project on the Project Site as well as in other locations, which will be made in partnership with the DENR Central Office's Strategic Communication Initiative Service, DENR-NCR, National Greening Program (NGP), and LLDA's Adopt-a-Mangrove Program. Off-site implementation of the program began in 2023 with activities already implemented in Nasugbu, Batangas; Macabebe, Pampanga; Tuba, Benguet; and Maragondon, Cavite.

Table 2.64 Impact Analysis and Environmental Management – Meteorology/Climatology

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Change in the local micro-climate e.g. local temperature and Contribution in terms of greenhouse gas emissions (or GHG mitigation potential)					
Project Construction	2021 onwards	There are no activities that will impact on the local climate particularly temperature. It is significant to note that the construction works will be undertaken	Submitted updated reforestation and carbon sink program on August 22, 2023 to DENR EMB CO. Reforestation activity as follows: - 18 October 2023 - Calatagan Mangrove Planting (2,000) - 20 December 2023-Macabebe	Allotment of PRA 2019-05 requires 5% of the Project Area to be dedicated for Green spaces to supplement the Carbon Sink Program. Support to reforestation and greening	Part of Project Cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
		for a short period (~2 years). Thus, this short duration is not expected to impact on local climate. The loss of 600,000 sq.m. out of 1,800 sq.km. of the Manila Bay water (reckoned in terms of surface area) is considered insignificant to cause change in local temperature.	Mangrove Planting (3,000)	program activities	

2.3.2. AMBIENT AIR QUALITY AND NOISE

2.3.2.1. BASELINE DATA

2.3.2.1.A. DEGRADATION OF AIR QUALITY AND INCREASE IN AMBIENT NOISE LEVEL

The comparison summary for the EIS and EPRMP baseline data for Air Quality and Noise is presented in Table 2.65. The sampling points from the EIS to EPRMP have been updated in order to consider the changes of the Project boundary as well as relocating some of the sampling points nearer the Project boundary. Though there is no direct comparison of the air and noise quality parameters with regards to the specific sampling stations due to the changes of sampling points. However, it has been observed that there are no exceedances in air quality for both the EIS and EPRMP baseline. For noise baseline data, exceedance in NPCC were both observed during the EIS and EPRMP. The noise exceedances were attributed to the surrounding activities near the Project site.

Table 2.65 Comparison of Air Quality and Noise Baseline Data from the EIS 2017 and EPRMP 2024

Items	EIS 2017	EPRMP 2024
Ambient Air Quality		
Sampling Parameters and No. of Sampling Stations	**2013:** • 1-hr PM10, SO2, NO2, CO (5 stations)	**2024:** • 24-hrs TSP, PM10, SO2, NO2 (2 stations) • 1-hr TSP (5 stations)
Sampling Map	See **Table 2.66**	See **Figure 2.95**
Results	No Exceedances to DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes	No exceedances to DENR NAAQS for Source Specific Air Pollutants based on 24 hours averaging time and DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes
Noise		
Sampling Parameters and No. of Sampling Stations	**2013:** • Daytime Noise (3 stations) **2014:** • Daytime Noise (3 stations)	**2024:** • 24-hrs Noise (2 stations) • Daytime Noise (5 stations)
Sampling Map	See **Table 2.67**	See **Figure 2.95**
Results	Daytime noise exceeded the NPCC standard for Class B for all of the sampling stations. Source of noise were not mentioned.	Evening Noise exceeded the NPCC Class B at stations A1 and A3 while Nighttime noise in A1 exceeded the NPCC standard. The source of noise at the time of sampling came from Entertainment activities, e.g. band, music and other form of entertainment, that usually start early evening up to late night time.

2.3.2.1.A.1. EIS (2017) BASELINE DATA

Ambient Air

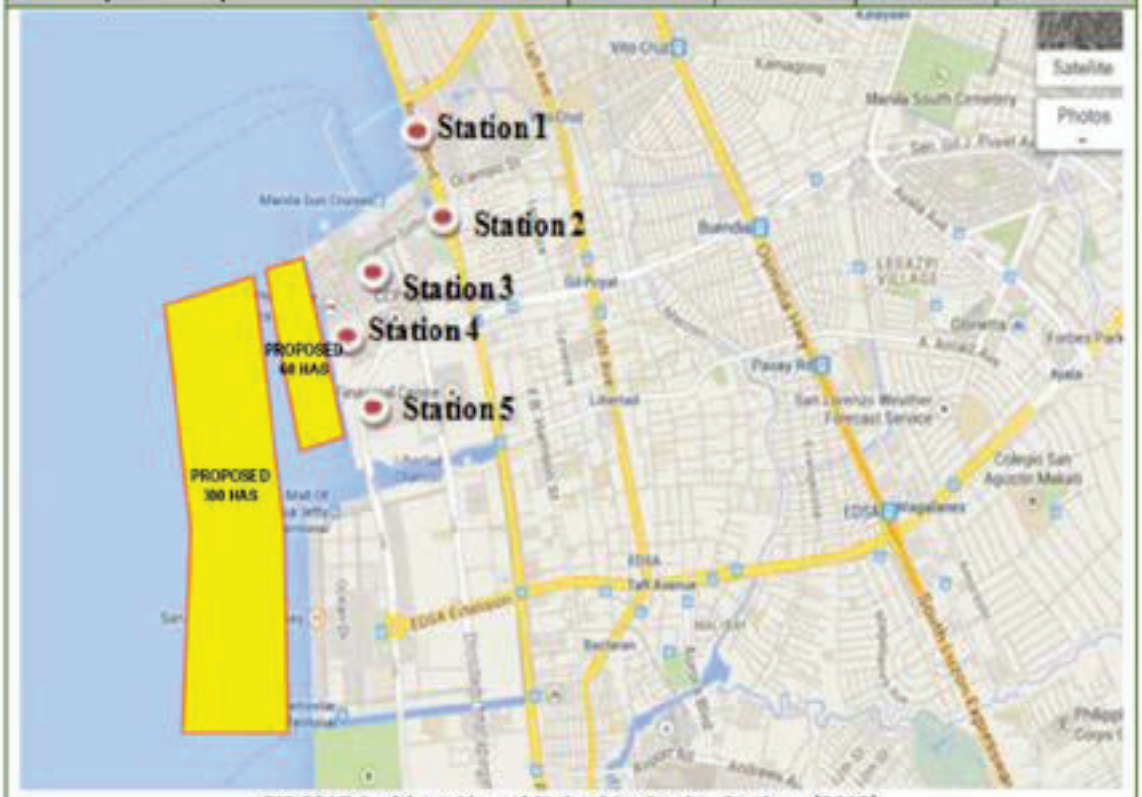
The baseline data for ambient air which was conducted in 2013 and 2014 as well as the sampling map is shown in Table 2.66. The baseline data shows that all parameters measured are within the DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes and DENR National Ambient Air Quality Guideline Values (NAAQGV).

Noise

The baseline data for noise which was conducted in 2013 and 2014 as well as the sampling map is shown in Table 2.67. The baseline data shows that daytime noise exceeded the NPCC standard for Class B for all of the sampling stations.

Table 2.66: EIS Ambient Air Baseline Data (2013)

Station	Location	Date	PM_{10} (µg/Ncm)	SO_2 (µg/Ncm)	NO_2 (µg/Ncm)	CO (mg/Ncm)
1	Near Yacht Club	January 28-29, 2013	68	3.4	3.4	0.1
2	Near PICC Area		42	2.4	4.8	0.1
3	Near Sofitel Basketball Court		28	9.9	7.2	0.7
4	Near Coastal Mall Area		52	10.0	36.6	0.3
5	Near D. Macapagal Road		44	10.2	47.3	0.2
DENR National Ambient Air Quality Standards (NAAQS) for Source Specific Air Pollutants based on 60 minutes averaging time			**200**	**340**	**260**	**-**
DENR National Ambient Air Quality Guideline Values (NAAQGV)			**-**	**-**	**-**	**35**



EIS 2017 Ambient Air and Noise Monitoring Stations (2013)

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 2.67: EIS Noise Baseline Data (2013 and 2014)

Station	Location	Date/Time of Sampling	MIN (dBA)	MAX (dBA)	MEAN (dBA)	MEDIAN (dBA)	NPCC standard for Class B
1	NE part of the proposed Pasay Reclamation and Extension Project, in front of Coconut Palace	January 28-29, 2013 (Daytime)	63.8	76.7	69.1	69.0	**65**
2	In front of SM – Mall of Asia (MOA), Pasay City		53.1	66.7	57.0	56.4	**65**
3	Near the mouth of Parañaque River, Parañaque City		51.6	60.8	54.5	54.2	**65**
1	NE part of the proposed Pasay Reclamation and Extension Project, in front of Coconut Palace		58.4	68.7	64.1	64.2	**65**
2	In front of SM – Mall of Asia (MOA), Pasay City		60.3	80.5	70.1	70.2	**65**
1	NE part of the proposed Pasay Reclamation and Extension Project, in front of Coconut Palace	August 2014 (Daytime)	53.3	80.9	69.9	69.8	**65**
2	In front of SM – Mall of Asia (MOA), Pasay City		67.0	81.5	75.3	75.6	**65**
3	Near the mouth of Parañaque River, Parañaque City		69.1	83.7	74.5	74.3	**65**



EIS 2017 Noise Monitoring Stations (2013 and 2014)

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

2.3.2.1.A.2. EPRMP (2024) BASELINE DATA

The method and analysis used for the ambient air and noise sampling is presented in Table 2.68 while the sampling station map is presented in Figure 2.95.

Table 2.68 Methods of Sampling and Analysis

Parameters	Methodology
Total Suspended Particulates (TSP)	High Volume / Gravimetric
Particulate Matter 10 (PM10)	High Volume / Gravimetric
Sulfur Dioxide (SO_2)	Gas Bubbler / Pararosaniline Colorimetric Method
Nitrogen Dioxide (NO_2)	Gas Bubbler / Griess-Saltzman Reaction Method
Noise	Direct Reading / Sound Level Meter

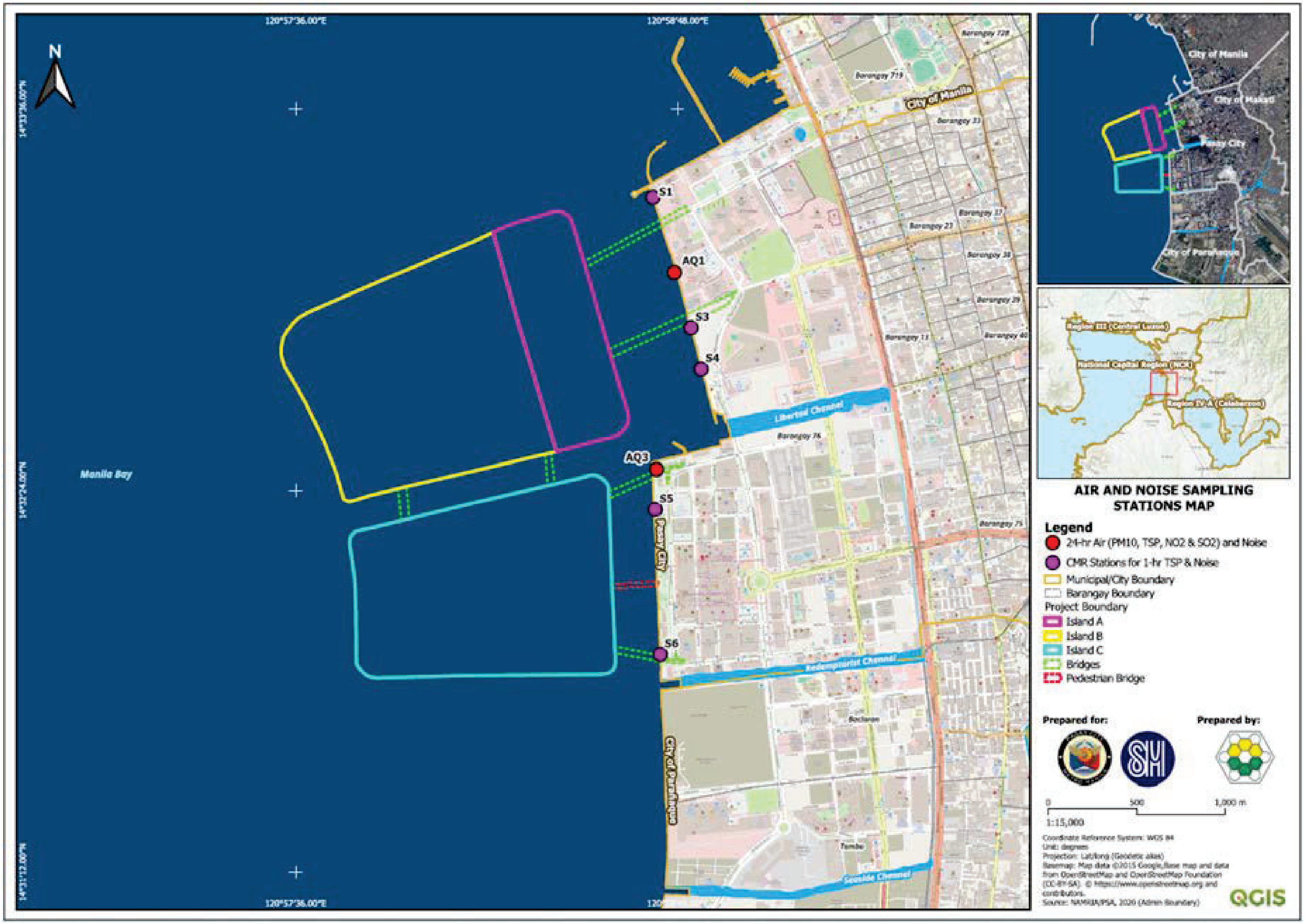


Figure 2.95 Ambient Air and Noise Sampling Station Map
Source/ Reference: Open Street Map, Admin Boundary – NAMRIA/PSA, 2020

Two (2) sampling stations were assessed with 24-hr TSP, PM_{10}, SO_2 and NO_2 as shown in Table 2.69 as well as additional five stations from SA1 2024 CMR – 1 hr TSP monitoring were incorporated as baseline stations for this Project. The approved EIS EMoP only requires TSP. Hence, we assigned the CMR SA1 2024 data as baseline data points. However, we have added two stations in the baseline to check PM10, SO2 and NO2 and the results show that these parameters are minimal or have less than 7 µg/Ncm which is far from the limit of DENR NAAQS for Source Specific Air Pollutants.

Based on the 2024 results all parameters are within the DENR NAAQS for Source Specific Air Pollutants based on 24 hours averaging time and DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes. Copies of the laboratory certificates are attached as **Appendix G**.

Table 2.69: Measured 24-hr Ambient Air Concentrations of TSP, PM_{10}, SO_2 and NO_2 (µg/Ncm)

Station	Location	Date/Time of Sampling	TSP (µg/Ncm)	PM_{10} (µg/Ncm)	SO_2 (µg/Ncm)	NO_2 (µg/Ncm)	Remarks
24-hrs Ambient Air Stations (EPRMP 2024)							
AQ-1	Seascape Village	April 9-10, 2024 0915H-0915H	71.2	2.1	1.0	3.4	PASSED
AQ-3	MOA Vikings Area	April 11-12, 2024 1200H-1200H	95.3	3.3	1.7	6.8	PASSED
DENR NAAQS for Source Specific Air Pollutants based on 24 hours averaging time			**230**	**150**	**180**	**150**	
1-hr Ambient Air Stations (CMR SA1 2024)							
S1	Coconut Palace Area	January 24, 2024 (1445H-15:45H)	36.0	-	-	-	PASSED
S3	West side of Lime Hotel	January 24, 2024 (1550H-1650H)	37.7	-	-	-	PASSED
S4	SM Esplanade	January 24, 2024 (1230H-1330H)	43.7	-	-	-	PASSED
S5	Teppanyaki Area	January 24, 2024 (1120H-1220H)	23.7	-	-	-	PASSED
S6	SM Moa Eye Area	January 24, 2024 (0945H-1045H)	11.2	-	-	-	PASSED
DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes			**300**				

Ambient Noise

The same air quality stations were sampled for the ambient noise level and the results are presented in Table 2.70. Observed sources of noise during sampling are also presented in Table 2.71. Stations A1 and A3 exceeded the standard limit for evening and nighttime, sources of noise mainly due to the entertainment activities, e.g. band, music and other form of entertainment, that usually start early evening up to late night time. Meanwhile, all the others stations were recorded to be below to the standard limit of the National Pollution Control Commission (NPCC); therefore, is compliant to the NPCC standard.

Table 2.70 24-hr Ambient Noise Level Monitoring Results (dBA)

Station	Location	Period	Date/Time	Noise Level	NPCC standard for Class B
24-hrs **Noise** Stations (EPRMP 2024)					
A1	Seascape Village	Morning	April 9, 2024 0829H-0839H	55.6	**60**
		Daytime	April 9, 2024 1055H-1155H	56.3	**65**
		Evening	April 9, 2024 2144H-2154H	66.3	**65**
		Nighttime	April 9, 2024 2252H-2302H	62.6	**55**
A3	MOA Vikings Area	Morning	April 12, 2024 0706H-0716H	57.1	**65**
		Daytime	April 12, 2024 1003H-1013H	59.1	**65**
		Evening	April 11, 2024 1845H-1855H	67.4	**65**
		Nighttime	April 11, 2024 2238H-2248H	62.8	**55**
1-hr Noise Stations (CMR SA1 2024)					
S1	Coconut Palace Area	Daytime	January 24, 2024 (1430H-14:45H)	48.7	**65**
S3	West side of Lime Hotel	Daytime	January 24, 2024 (1650H-1705H)	54.7	**65**
S4	SM Esplanade	Daytime	January 24, 2024 (1330H-1345H)	64.5	**65**
S5	Teppanyaki Area	Daytime	January 24, 2024 (1220H-1235H)	62.7	**65**
S6	SM Moa Eye Area	Daytime	January 24, 2024 (1045H-1100H)	61.9	**65**

Note:
[a]Class B areas (areas zoned or used as a commercial area)
For areas directly facing a public transportation route, a correction factor is added to the applicable standard by:
i. *+5 dBA (if the area is facing a two-lane road) or
ii. **+10 dBA (if the area is facing a four-lane or wider road)

Table 2.71: Primary Sources of Noise

Station	Location	Sources of Noise
A1	Seascape Village	Noise came from the business establishment during the evening and night time while employees cleaning during the morning and daytime.
A3	MOA Vikings Area	Noise came from people in the area during early morning, daytime, heavy foot traffic was observed during the evening and night time.

2.3.2.1.B. BASELINE DATA IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT PLAN

Degradation of air quality

Dust during the reclamation may occur on the reclaimed land especially during filling of sand keys in the reclamation area (above water level) and construction of containment structure especially during sunny and windy days. This dust may emanate from open areas. In order to mitigate this, dust suppression activities such as green net installation and water truck sprinkling or road spraying (3 times or more as needed per day) will be conducted.

Potential air pollution discharges can result from the use of fuels by the vessels and vehicles. In order to mitigate emissions from the fuel combustion, the use of diesel fuel which is low in sulfur is recommended. Regular inspection and preventive maintenance servicing of all vessels, vehicles and generators will also be conducted.

Increase in ambient noise level

Potential source of noise during the project implementation may come from the filling of sand keys in the reclamation area (above water level), construction of containment structure and noise pollution from the operation of heavy equipment. In order to mitigate this, regular noise monitoring will be scheduled and a regular preventive maintenance servicing for the vessels and vehicles will be conducted. Noise will not be a significant nuisance because the population center is distant from the activity areas.

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Table 2.72 Impact Analysis and Environmental Management – Air Quality and Noise

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Degradation of air quality					
Construction Phase Excavation Dredging and Filling Mobilization of vehicles and vessels Use of gensets Construction of support facilities and Horizontal Development	2021 to 2028	Use of quality fuel Proper maintenance of gensets	Conduct dust suppression activities, e.g. green net installation and water truck sprinkling or road spraying (3 times or more as needed per day during dry season) Use of diesel fuel (low sulfur fuels) in all gensets. Regular inspection and preventive maintenance servicing of all generators and equipment.		Part of Project Cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Decommissioning of Temporary Facilities			Provide safety goggles or eye protection to employees and visitors		
Increase in ambient noise level					
Construction Phase Excavation Dredging and Filling Mobilization of vehicles and vessels Use of gensets Construction of support facilities and Horizontal Development Decommissioning of Temporary Facilities	2021 to 2028	Temporary-construction - short time only	Ensure mufflers are installed in all equipment. Conduct regular preventive maintenance servicing.		

2.3.2.1.C. MONITORING PLAN

The environmental monitoring plan for the identified potential impact is summarized in the table below. The complete EPRMP EMoP table can be found in **Section 6**.

Table 2.73 EMoP – Ambient Air

Parameters to be Monitored	Sampling and Measurement Plan		
	Method	Frequency	Location
Degradation of air quality			
EIS 2017			
TSP	1 – Hour High Volume Sampler / Gravimertic (USEPA method5)	Semi Annually	Downwind at nearest existing establishments or buildings (Purple Points)
EPRMP 2024			
24-hr TSP and 24-hr PM10	High Volume – Gravimetric Method	Quarterly	EPRMP Baseline Station (Figure 6.2)

Table 2.74 EMoP – Noise

Parameters to be Monitored	Sampling and Measurement Plan		
	Method	Frequency	Location
Increase in ambient noise level			
EIS 2017			
Noise	Meter	Daily	Downwind at nearest existing establishments or buildings
EPRMP 2024			
Daytime Noise	Meter	Quarterly Weekly (internal)	EPRMP Baseline Station (Figure 6.2)

2.4. THE PEOPLE

2.4.1. BASELINE DATA

Comparative Summary of Socio-Economic Condition of Pasay City and Barangay 76

Pasay City's population has increased by 432,455 individuals, starting with 8,201 individuals in 1903 to 440,656 in 2020. The 2020 census data showed a growth rate of 1.19%, an increase of 24,134 individuals from 2015. Barangay 76, being the direct impact area of the proposed project, comes 3rd in the most populous barangay in Pasay City, with 19,604 individuals.

The economic growth of Pasay City and Barangay 76 are evident in its growing income brought about by continuously increasing labor force and business investments and entertainment. Since 2015, 72% of Pasay's population belongs to the economically active population (aged 15 to 64 years old). Business investments in Pasay City have been consistently expanding, thereby giving employment opportunities to its residents and providing them with essential services. Thousands of jobs are being offered to every Filipino, from skilled professional to diligent laborers. With the City's strategic location, it has attracted local and international tourists and businesses generating revenues for social and economic programs for Pasayeños.

In 2020, the pandemic has affected the number of unemployed residents in Pasay City, with 15.51% unemployment rate in 2020 compared to 4.54% in 2019. The tourism industry that has been providing income to the city also suffered as tourist arrival decreased in 2021. However, in a post pandemic landscape, the BPLO has recorded more than P15M new business registrations in 2022.

Table 2.75 presents the comparative summary of socio-economic condition of Pasay City prior to 2017 EIS application vis-à-vis 2023 EPRMP application:

Table 2.75: Comparative Summary of Socio-Economic Condition of Pasay City

Sector	Previous Data Available (Prior to 2017 EIS)	EPRMP 2024 and CLUP 2023-2034
Demographics		
Household Population Pasay	PSA Year 2015: 412,497	PSA Year 2020: 437,003
Household Population (Brgy. 76)	PSA Year 2015: 4,813 (1.17%)	PSA Year 2020: 19,212 (4.4%)
Land Area (Brgy. 76)	417.5 has (CLUP 2014-2022)	417.5 has (CLUP 2023-2034)
Economically Active Population (15 to 64 yrs old)	Year 2015 (PSA) Pasay City: 297,303 (72%) out of 412,497 individuals Brgy. 76 (2015) 3,872 (79%)	Year 2020 (PSA) Pasay City: 314,725 (72%) out of 391,456 individuals Brgy. 76 (2020) No aggregated data available for 2020
Education		
Literacy and Education Pasay City	2007 (CLUP 2014): Mostly high school graduate (36.93%) 2015 (PSA): Mostly high school graduate (38.7%) 99.9% Literacy Rate Educational Institution (CLUP 2014): 2013: Public 49; Private 102	2020 (PSA): Mostly high school graduate (21.7%) 99.1% literacy rate Educational Institution (CLUP 2023): 2022: Public 63; Private 202
Health and Welfare		
Health Personnel Pasay	2010 (CLUP 2014) Doctors: 33 Nurse: 24 Midwife: 55 Sanitary Inspector: 10 Dentist: 19	2021 (CLUP 2023): Doctors: 21 Nurse: 24 Midwife: 45 Sanitary Inspector: 8 Dentist: 19 Nutritionist: 7
Health Facilities Pasay	2013 (CLUP 2014) Health Centers: 14 Gov't Hospitals: 2 Private Hospitals: 2 Lying-in: 1	2022 (CLUP 2023) Health Centers: 13 Gov't Hospitals: 2 Private Hospitals: 2 Lying-in: 4 Private Clinics: 14 Dental Clinics: 15
Day Care Centers	2010: 70 day care centers	2019: 112 day care centers
Mortality Cases Pasay	PSA 2010: Diseases of the Heart – 102,936 Diseases of the Vascular System – 68,553	CLUP 2023-2034:

<table>
<tr><th>Sector</th><th>Previous Data Available (Prior to 2017 EIS)</th><th>EPRMP 2024 and CLUP 2023-2034</th></tr>
<tr><td></td><td>Malignant Neoplasms – 49,817

CLUP 2023-2034
<table><tr><th>Cause of Death</th><th>2017</th><th>2018</th></tr><tr><td>Acute Myocardial Infarction</td><td>0</td><td>478</td></tr><tr><td>Pneumonia</td><td>400</td><td>413</td></tr><tr><td>Hypertensive Cardiovascular Diseases</td><td>188</td><td>144</td></tr><tr><td>Diabetes Mellitus</td><td>114</td><td>110</td></tr><tr><td>Cerebrovascular Disease</td><td>89</td><td>52</td></tr></table></td><td><table><tr><th>Cause of Death</th><th>2019</th><th>2020</th><th>2021</th></tr><tr><td>Acute Myocardial Infarction</td><td>651</td><td>587</td><td>1020</td></tr><tr><td>Pneumonia</td><td>488</td><td>483</td><td>299</td></tr><tr><td>Hypertensive Cardiovascular Diseases</td><td>216</td><td>216</td><td>121</td></tr><tr><td>Diabetes Mellitus</td><td>136</td><td>136</td><td>17</td></tr><tr><td>Cerebrovascular Disease</td><td>113</td><td>53</td><td>82</td></tr></table></td></tr>
<tr><td>Morbidity Cases Pasay</td><td>Ecological Profile<table><tr><th>Disease</th><th>2017</th><th>2018</th></tr><tr><td>Cough and Colds</td><td>105,414</td><td>5,851</td></tr><tr><td>UTI</td><td>3,059</td><td>3,548</td></tr><tr><td>Hypertension</td><td>2,280</td><td>933</td></tr><tr><td>Pneumonia</td><td>1,200</td><td>1,188</td></tr><tr><td>Acute Gastroenteritis</td><td>701</td><td>897</td></tr></table></td><td>CLUP 2023-2034:<table><tr><th>Disease</th><th>2019</th><th>2020</th><th>2021</th></tr><tr><td>Cough and Colds</td><td>7,574</td><td>2,272</td><td>5,072</td></tr><tr><td>UTI</td><td>5,090</td><td>785</td><td>1,728</td></tr><tr><td>Hypertension</td><td>4,318</td><td>559</td><td>560</td></tr><tr><td>Tuberculosis of the lungs</td><td>2,164</td><td>435</td><td>508</td></tr><tr><td>Wound infection</td><td>1,539</td><td>388</td><td>424</td></tr></table></td></tr>
<tr><td>Malnourished Children Pasay</td><td>Ecological Profile<table><tr><th>Degree</th><th>2017</th><th>2018</th></tr><tr><td>Underweight</td><td>781</td><td>518</td></tr><tr><td>Severely Underweight</td><td>242</td><td>98</td></tr><tr><td>Stunted</td><td>1269</td><td>878</td></tr><tr><td>Severely Stunted</td><td>531</td><td>241</td></tr><tr><td>Overweight</td><td>812</td><td>430</td></tr><tr><td>Obese</td><td>492</td><td>249</td></tr><tr><td>Moderately Wasted</td><td>749</td><td>432</td></tr><tr><td>Severely Wasted</td><td>344</td><td>88</td></tr></table></td><td>Ecological Profile<table><tr><th>Degree</th><th>2019</th><th>2020</th><th>2021</th></tr><tr><td>Underweight</td><td>473</td><td>406</td><td>472</td></tr><tr><td>Severely Underweight</td><td>56</td><td>45</td><td>106</td></tr><tr><td>Stunted</td><td>756</td><td>595</td><td>800</td></tr><tr><td>Severely Stunted</td><td>128</td><td>56</td><td>78</td></tr><tr><td>Overweight</td><td>297</td><td>213</td><td>275</td></tr><tr><td>Obese</td><td>204</td><td>189</td><td>240</td></tr><tr><td>Moderately Wasted</td><td>232</td><td>1076</td><td>259</td></tr><tr><td>Severely Wasted</td><td>46</td><td>20</td><td>32</td></tr></table></td></tr>
<tr><td>Social Welfare Pasay</td><td>Ecological Profile:
Population Served by Type</td><td>Ecological Profile:
Population Served by Type</td></tr>
</table>

Sector	Previous Data Available (Prior to 2017 EIS)			EPRMP 2024 and CLUP 2023-2034		
	Type	2017	2018	Type	2019	2020
	Women in especially difficult cisrcumstances	331	252	Women in especially difficult cisrcumstances	374	261
	Children in need of special protection	117	189	Children in need of special protection	215	72
	Persons with Disabilities			Persons with Disabilities		
	Senior Citizens	33,363	34,854	Senior Citizens	35,774	37,749
	Solo Parents	962	727	Solo Parents	944	4,001
Economic						
Tax Allocation (Brgy. 76)	*No available data*			Barangay Profile 2024: 22,329,297.00 budget for 2022		
New Business Registration (Brgy. 76)				(CLUP 2023) Brgy. 76 2018: 3,554 2019: 3,169 2020: 3,672 2021: 3,707 Barangay 76 is consistently the highest in number of new business registration		
No. of Establishments: Pasay	2000: 4,792 (EIS) 2012: 11,644 (CLUP 2014)			2021: 14,551 (CLUP 2023) List of Establishments in Brgy 76: IKEA, MOA, Luxe Duty Free, GSIS, SSS, PSA, PICC, Sofitel, CCP, World Trade, Conrad Manila, residential condominiums,		
No. of MSMEs Pasay	2016: 116,923 (CLUP 2014)			2020: 139,942 (CLUP 2023)		
Business Registration by Type of Ownership Pasay				Pasay City (CLUP 2023) 2018: Single Prop.: 8,527 Corporation: 6,336 2020: Single Prop.: 8,713 Corporation: 6,850 2022: Single Prop.: 7,591 Corporation: 6,643		
Employment (all type of industries Pasay City	Employed Individuals (CLUP 2014): 2005: 87,921 (80%) 2008: 92,344 (86%) 2011: 101,148 (88%) Employed Individuals at MSMEs: No data available			Employed Individuals (CLUP 2023): 2018: 167,580 2019: 182,730 2020: 268,140 (84.89%) Employed Individuals at MSMEs (CLUP 2023):		

Sector	Previous Data Available (Prior to 2017 EIS)	EPRMP 2024 and CLUP 2023-2034
		2016: 116,923 2017: 114,505 2018: 138,839 2019: 142,324 2020: 139,942
	Unemployment Rate (CLUP 2014): 2005: 20% 2008: 14% 2011: 12%	Unemployment Rate (EP; PSA) 2018: 7.19% 2019: 4.54% 2020: 15.51% (pandemic)
Tourism Pasay	Tourist Arrival before 2017: No data available Tourism Income: 2010: 3,608,000 2013: 2,997,450	Tourist Arrival (CLUP 2023): 2017: 4,274,175 2018: 4,691,003 2021: 1,482,535 Tourism Income: 2016: 2,894,548 2019 (Jan): 2,058,148
Poverty Incidence Pasay City	CLUP 2014 2005: 13.67% (among families) 2008: 11.3% (among families) 2011: 13.59% (among families)	CLUP 2023 2018: 1.46% (among families)
Recreational Facilities Pasay City	CLUP 2014: 7 establishments as of 2013 Cuneta Astrodome, Folk Arts Theater, Manila Film Center, Phil Center for Intl Trade and Exhibitions, PICC, Pasay Sports Complex	CLUP 2023: 12 establishments as of 2022 Additional: Mall of Asia Arena, SMX convention center, MOA, Pasay City Coliseum, Pasay City Cockpit Arena, Newport Performing Arts Theater
Water and Sanitation		
Access to Water Source Pasay City	CLUP 2014 2008: 99.9% HH with access 2011: 98.3% HH with access	CLUP 2023 2017: 94% HH with access 2019: 97.6% HH with access 2021: 97.6% HH with access
Access to Sanitary Toilet Facilities Pasay City	CLUP 2014 2008: 97.8 HH with access 2011: 97.1% HH with access	CLUP 2023 2017: 95% HH with access 2019: 98% HH with access 2021: 98% HH with access

EPRMP (2024) BASELINE DATA

This baseline information on people is consistent with the policies stated in DAO 2017-15, to wit, "the proponent shall promote public participation in the implementation of the Philippine EIS System". The objective are to improve and rationalize Public Participation by incorporating best practice principles and standardizing the procedures and requirements. It shall employ the following basic principles:

a. Public participation should be initiated early and sustained at the various stages of the EIA process.

b. Public participation should be well-planned and should involve the stakeholders in the assessment, management, and monitoring of environmental impacts.
c. Timely public disclosure of all necessary relevant information especially to the stakeholders who shall be made to understand and appreciate the specific purpose and context of their participation for each stage of the process.

METHODOLOGY

The EIA Team has identified Barangay 76 as the project's direct impact barangay. To ensure transparency and to enable stakeholders to make proactive participation about the project, series of public consultation were conducted. A key informant interview and focus group discussion were administered to the impact barangay to validate the secondary data on the community, assess the community members' needs, and identify gaps for future interventions of the proponent, Pasay LGU, and its joint venture partner, SM SCIDC.

INFORMATION, EDUCATION AND COMMUNICATION (IEC) ACTIVITIES

To encourage the participation of impact barangay, the implementation of IEC activities is necessary to raise the awareness of the direct impact community about the proposed project. This includes presentation of its progress and accomplishments throughout the stages of project implementation. Below is the summary of preliminary IEC activities for the project:

Table 2.76: Summary of IEC Activities

Date and Venue	Activity	Participants	Summary of Discussion and Issues
18 May 2024	FGD	Pasay Libertad Anglers Association (PLAA) – Fisherfolk Group	Negative Notes: - Low fish species supply - Disruption to their livelihood Positive Notes: - SM has been providing them with livelihood support (financial assistance) - Monetary and grocery supplies during Christmas or when requested by PLAA - Other work duties to augment need for income (clean-up drive) - Pasay City LGU has been providing them support, either financially or provision of fishing materials
06 May 2024 Barangay Hall	KII	Barangay Chair Rosemarie San Miguel	- Pasay City LGU is supportive of the needs of Barangay 76 and the rest of the City. - Since Barangay 76 is a highly urbanized barangay (no urban poor community), the Barangay Chairwoman said that they do not need financial support as of the moment. All other concerns of their residents not in their terms are all forwarded to the City. However, should SM decide to help, they will welcome the provision.
06 May 2024 Barangay Hall	FGD	Barangay 76 Councilors	Expressed support to the modification as it will positively affect the City, income generation and flooding prevention
29 April 2024 The Henry Hotel Manila	FGD	Pasay City LGU	- The City has been providing the needed support and services to all its residents.

Date and Venue	Activity	Participants	Summary of Discussion and Issues
		City Planning and Development Office City Environment and Natural Resources Office City Health Office Office of the Mayor SM Smart City	They call it "from womb to tomb" services. No resident will go home empty-handed or request unprovided. - SM has been the City's partner in providing other financial support to its residents, not only in Barangay 76 but its indirect impact barangays as well.

PERCEPTION SURVEY

A. PERCEPTION SURVEY OF 100 RESIDENTS FROM BARANGAY 76

The survey team conducted a perception survey of randomly selected adult residents of Barangay 76, Pasay City on 05 September 2024 (Figure 2.97). The primary goal of the survey was to understand the current situation of the community through its representative population, and gather their issues and concerns related to the 360-hectare Reclamation Project. The information collected during the survey will enable the proponent to create plans, programs and activities in the SDP and IEC that will help enrich the lives of the community as the Reclamation Project progresses.

The respondents were selected randomly and were gathered in a venue for a face-to-face survey. They were provided with a survey questionnaire using self-administered structured questions. The questionnaire contains dichotomous questions, multiple choice and open-ended questions. The questionnaire has four (4) main parts: 1) respondent and household characteristics, 2) health and sanitation, 3) household profile, 4) satisfaction of the respondents to the current state of the community, and 5) project awareness and concerns. Participants were also personally informed regarding the non-disclosure of their identity without proper consent.

The margin of sampling error used was ± 10.0 percent at a 90 percent confidence level. Using the Slovin's Formula for 6,404 households, we have:

$$n = \frac{N}{1 + N\,e^2} \qquad \text{(Equation 1)}$$

where N = population size, n = sample size, and e = margin of error

$$n = \frac{6404}{1 + 6404\,(0.10)^2} = \frac{6404}{1 + 6404\,(0.10)^2} = \frac{6404}{65.04} \cong 100$$

Therefore, given the calculations above, a simple random sampling survey design was adopted where the registered households of Barangay 76 were each assigned a number, written on piece of paper, and placed in a box. The selection of the 100 respondents was done by sequentially picking numbers written on the papers placed in a box. The survey team gathered the selected 100 residents residing in Barangay 76, Pasay City as its the respondents for the survey.

B. PERCEPTION SURVEY OF 30 MEMBERS OF THE FISHERFOLK GROUP IN BARANGAY 76

The survey team conducted a purposive perception survey of fisherfolks who are members of the Pasay Libertad Anglers Association (PLAA) stationed in Barangay 76, Pasay City on 03 September 2024 (Figure 2.97). The primary goal of the survey was to understand the current status of this fisherfolk group, and their issues and concerns related to the 360-hectare Reclamation Project. The information collected during the survey will enable the proponent to create plans, programs and activities in the SDP that will help improve the lives of the PLAA members and to mitigate the risks to their livelihood as the Reclamation Project progresses.

The selection of respondents was done by using a purposive sampling method as they are directly affected by the ongoing construction activities for the Reclamation Project. The respondents were gathered at their wharf for a face-to-face self-administered survey. All 60 members were invited to participate in the survey through their president, 30 members responded. The respondents were provided with a survey questionnaire using structured questions. The questionnaire contains dichotomous questions, multiple choice and open-ended questions. The questionnaire has four (4) main parts: 1) respondent and household characteristics, 2) health and sanitation, 3) household profile, 4) satisfaction of the respondents to the current state of the community, and 5) project awareness and concerns. Participants were also personally informed regarding the non-disclosure of their identity without proper consent.





Barangay 76 Chairperson and Councilors (6 May 2024)



Pasay City LGU Representative Group (29 April 2024)



Pasay Libertad Anglers Association (PLAA) – Fisherfolk Group (18 May 2024)

Figure 2.96 Photo Documentation of IEC Activities



Figure 2.97 Photo Documentation of Household Survey (3 and 5 September 2024)

SECONDARY DATA

The secondary data were sourced from the Draft Comprehensive Land Use Plan for 2023-2034 (2024) provided by Pasay City's Planning and Development Office. Other materials were obtained from published documents of Philippine Statistics Office (POPCEN 2015 and 2020 CPH), City Health Office, Department of Education, Commission on Higher Education, Pasay Tourism and Cultural Development Office, Pasay City LGU Official Website, and other relevant data available on the internet.

HISTORICAL PROFILE OF THE CITY OF PASAY

In reference to the Pasay CLUP 2023-2034 (2024), the name Pasay originated from the pre-colonial period, where tales explained that it is named after Princess Dayang-Dayang Pasay of the ancient kingdom of Namayan more than 800 years ago. Dayang-Dayang Pasay was believed to have inherited the lands, which stretched from Manila Bay to Laguna de Bai, including the territories of Culi-Culi, Pasay and Baclaran.

In honor of Don Cornelio Pineda, a Spanish horticulturist, the name Pasay was changed to Pineda in 1727. It was during this period too that Princess Dayang-Dayang donated her estate to the Augustinians before her death. In 1863, Pasay became a pueblo through the recommendation of Archbishop Gregorio Martinez of Sta. Cruz. In 1901, Pasay was formed as part of the Province of Rizal and the pueblo of Malibay was annexed to Pasay. (CLUP 2023-2034, 2024).

During World War II, McArthur declared Manila and its suburbs (Caloocan, Quezon City, San Juan, Mandaluyong, Makati and Pasay) an open city before the government was turned over to President Segio Osmena. Osmena, however, returned Manila and its suburbs to their original province of Rizal (CLUP 2023-2034, 2024).

Later, Congressman Ignacio Santos Diaz from the first district of Pasay, pushed for the conversion of the town into a city and be named after Rizal. The Diaz bill was signed into law by President Roxas in 1947. The population of Rizal then was 88,738. Eventually, President Elpidio Quirino signed a bill reverting the name Rizal to its original name, Pasay (CLUP 2023-2034, 2024).

During the presidency of Ferdinand Marcos, a decree was implemented that renamed every barrio in the country into a barangay. Mayor Pablo Cuneta of Pasay created 487 barangays and eventually trimmed it down to 200 (CLUP 2023-2034, 2024).

2.4.2. DISPLACEMENT OF SETTLER/S AND IN-MIGRATION

2.4.2.1. DEMOGRAPHIC PROFILE OF THE CITY OF PASAY

Pasay is a first class, highly urbanized city with 201 barangays, in the National Capital Region (NCR). It is considered the third smallest political subdivision in the NCR (DOF Order No. 23-08, dated 29 July 2008).

Based on the 2020 CPH, Pasay recorded a total population of 440,656 and a household population of 437,003, representing 3.27% of the total population of the NCR. There were 127,629 households, with an average size of 3.4 members per household. Of Pasay City's household population, there were 217,169 (49.7%) males and 219, 834 (50.3%) females. In 117 years, Pasay City's population increased by 432,455 individuals, from 8,201 in 1903 to 440,656 in 2020. From the previous population of 416,522 in 2015, the recent census data in 2020 showed a positive growth rate of 1.19%, or an increase of 24,134 individuals.

Among the 201 barangays in Pasay, Barangay 183 is the most populous, with 37,372 individuals or 8.48% of the total population of Pasay. This is followed by Barangay 201 (19,788 individuals or 4.49%), Barangay 76 (19,604 or 4.45%), Barangay 184 (14,209 or 3.22%), and Barangay 145 (8,758 or 1.99%) (PSA CPH 2020).

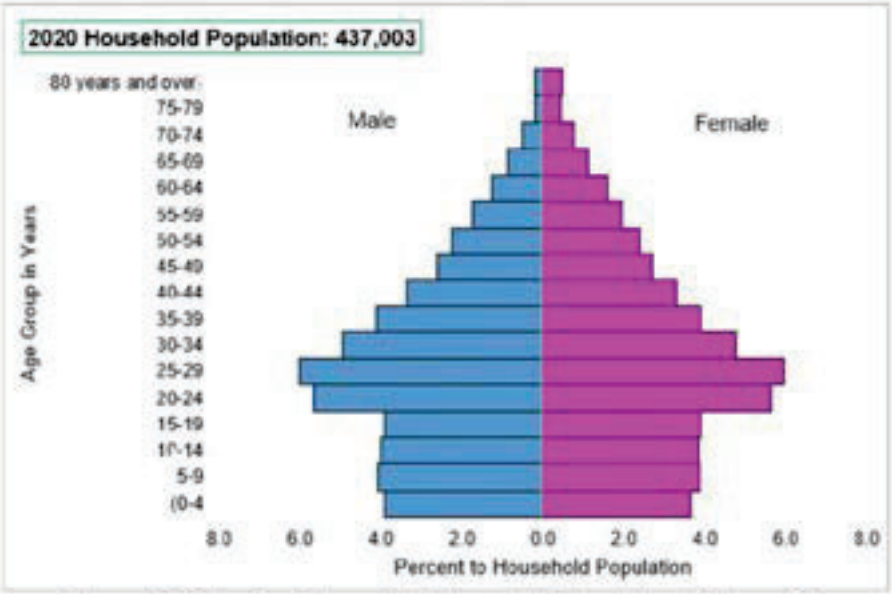


Figure 2.98 Age-Sex Pyramid of Household Population in Pasay City
Source: Philippine Statistics Authority, 2020 CPH

Table 2.77 List of Barangays in Pasay City, 2015 and 2020

Barangay	Population (2020)	Population (2015)
Barangay 1	2,275	1,233
Barangay 2	1,327	1,562
Barangay 3	824	906
Barangay 4	2,086	1,888
Barangay 5	6,081	1,035
Barangay 6	463	605
Barangay 7	2,676	709
Barangay 8	1,160	1,028
Barangay 9	257	281
Barangay 10	1,405	1,501
Barangay 11	408	471
Barangay 12	540	1,192
Barangay 13	2,646	2,405
Barangay 14	4,769	7,219
Barangay 15	2,328	2,718
Barangay 16	424	1,035
Barangay 17	985	1,013
Barangay 18	1,019	896
Barangay 19	812	968
Barangay 20	623	1,048
Barangay 21	790	1,265

Barangay	Population (2020)	Population (2015)
Barangay 22	714	801
Barangay 23	1,419	1,806
Barangay 24	704	1,229
Barangay 25	595	864
Barangay 26	932	659
Barangay 27	273	416
Barangay 28	1,237	926
Barangay 29	1,429	2,031
Barangay 30	964	773
Barangay 31	3,544	1,495
Barangay 32	1,906	2,044
Barangay 33	983	855
Barangay 34	939	2,090
Barangay 35	600	741
Barangay 36	3,799	1,162
Barangay 37	1,529	1,457
Barangay 38	1,967	2,800
Barangay 39	1,290	1,287
Barangay 40	2,311	2,147
Barangay 41	1,591	1,706
Barangay 42	1,826	1,752
Barangay 43	2,620	2,871
Barangay 44	1,417	1,235
Barangay 45	1,672	1,262
Barangay 46	5,783	6,038
Barangay 47	1,207	1,005
Barangay 48	509	531
Barangay 49	290	451
Barangay 50	478	468
Barangay 51	2,159	2,078
Barangay 52	2,392	2,074
Barangay 53	788	794
Barangay 54	1,479	1,560
Barangay 55	832	761
Barangay 56	855	891
Barangay 57	1,361	1,209
Barangay 58	1,382	1,723
Barangay 59	1,657	1,641
Barangay 60	1,425	1,516
Barangay 61	2,503	2,962
Barangay 62	1,228	1,294
Barangay 63	679	702
Barangay 64	1,582	1,603
Barangay 65	2,932	2,883
Barangay 66	2,797	2,472

Barangay	Population (2020)	Population (2015)
Barangay 67	1,104	1,127
Barangay 68	852	1,007
Barangay 69	1,153	1,012
Barangay 70	2,199	1,588
Barangay 71	685	659
Barangay 72	1,423	1,383
Barangay 73	699	1,143
Barangay 74	460	589
Barangay 75	1,326	1,128
Barangay 76	19,604	4,902
Barangay 77	1,107	1,238
Barangay 78	494	100
Barangay 79	677	622
Barangay 80	1,208	713
Barangay 81	2,129	2,162
Barangay 82	554	707
Barangay 83	794	956
Barangay 84	719	783
Barangay 85	1,285	1,223
Barangay 86	1,389	1,097
Barangay 87	633	681
Barangay 88	958	1,356
Barangay 89	1,003	1,041
Barangay 90	1,615	1,856
Barangay 91	1,881	1,738
Barangay 92	469	562
Barangay 93	382	279
Barangay 94	2,375	1,801
Barangay 95	1,132	1,147
Barangay 96	826	1,121
Barangay 97	1,361	1,123
Barangay 98	1,487	1,199
Barangay 99	1,111	1,334
Barangay 100	1,223	1,360
Barangay 101	550	409
Barangay 102	826	845
Barangay 103	949	1,024
Barangay 104	1,127	1,718
Barangay 105	567	620
Barangay 106	1,158	1,131
Barangay 107	1,561	1,840
Barangay 108	2,070	2,134
Barangay 109	1,122	1,094
Barangay 110	1,827	1,973
Barangay 111	1,279	1,237

Barangay	Population (2020)	Population (2015)
Barangay 112	640	382
Barangay 113	1,800	1,926
Barangay 114	1,050	932
Barangay 115	1,240	1,072
Barangay 116	1,205	1,320
Barangay 117	935	1,021
Barangay 118	1,634	1,963
Barangay 119	1,622	1,398
Barangay 120	332	330
Barangay 121	1,007	847
Barangay 122	1,184	1,176
Barangay 123	1,284	1,295
Barangay 124	1,666	1,473
Barangay 125	1,508	1,591
Barangay 126	725	1,168
Barangay 127	1,799	1,977
Barangay 128	1,634	1,133
Barangay 129	1,209	1,076
Barangay 130	4,042	3,537
Barangay 131	1,427	1,555
Barangay 132	5,088	3,501
Barangay 133	2,221	1,805
Barangay 134	1,686	1,747
Barangay 135	2,768	2,239
Barangay 136	2,167	1,550
Barangay 137	2,994	4,174
Barangay 138	1,031	1,520
Barangay 139	1,065	848
Barangay 140	590	816
Barangay 141	465	711
Barangay 142	318	495
Barangay 143	1,390	1,402
Barangay 144	2,212	1,714
Barangay 145	8,758	7,428
Barangay 146	1,036	533
Barangay 147	1,459	1,580
Barangay 148	3,164	3,888
Barangay 149	768	460
Barangay 150	662	622
Barangay 151	1,175	864
Barangay 152	1,219	1,386
Barangay 153	1,367	1,382
Barangay 154	743	682
Barangay 155	916	814
Barangay 156	3,540	3,299

Barangay	Population (2020)	Population (2015)
Barangay 157	2,242	2,425
Barangay 158	961	798
Barangay 159	1,301	1,543
Barangay 160	1,245	1,174
Barangay 161	2,834	2,700
Barangay 162	1,898	1,429
Barangay 163	1,467	1,203
Barangay 164	1,749	1,735
Barangay 165	5,472	5,330
Barangay 166	1,190	1,023
Barangay 167	755	805
Barangay 168	521	421
Barangay 169	2,825	3,111
Barangay 170	1,571	1,939
Barangay 171	3,390	3,202
Barangay 172	4,919	5,442
Barangay 173	1,814	2,020
Barangay 174	1,826	1,731
Barangay 175	1,952	2,064
Barangay 176	1,617	1,833
Barangay 177	6,235	5,074
Barangay 178	3,889	5,620
Barangay 179	6,692	5,058
Barangay 180	2,059	2,074
Barangay 181	1,883	2,453
Barangay 182	2,906	2,725
Barangay 183	37,372	32,146
Barangay 184	14,209	15,059
Barangay 185	4,639	5,179
Barangay 186	3,450	5,093
Barangay 187	4,629	4,077
Barangay 188	2,094	1,857
Barangay 189	2,431	1,238
Barangay 190	4,336	3,553
Barangay 191	3,406	3,086
Barangay 192	4,217	4,364
Barangay 193	7,430	8,067
Barangay 194	4,523	5,779
Barangay 195	2,449	2,246
Barangay 196	1,499	1,506
Barangay 197	3,854	4,139
Barangay 198	1,904	1,846
Barangay 199	2,044	2,195
Barangay 200	594	558
Barangay 201	19,788	22,165

Barangay	Population (2020)	Population (2015)
Total	**440,656**	**416,522**

Source: Philippine Statistics Authority, 2020 CPH

Referring to the 2020 CPH, the age group with the highest population in Pasay City belonged to the 15 to 64 years old or those considered economically active population and actual/potential members of the workforce, with 314,725 individuals or 72.02%. On the contrary, the age group with the least population belonged to the 65 years old and over, with 20,143 individuals or 4.61%. The young dependent population (14 years old and below) was at 102,135 individuals or 23.37%.

Table 2.78 Household Population by Age Group and Sex in Pasay City, 2020

Age Group	Both Sexes	%	Male	% Total (Male)	Female	% Total (Female)
0-4	33,038	7.6%	17,045	7.8%	15,993	7.3%
5-9	34,698	7.9%	17,840	8.2%	16,858	7.7%
10-14	34,399	7.9%	17,605	8.1%	16,794	7.6%
15-19	34,196	7.8%	17,049	7.9%	17,147	7.8%
20-24	49,416	11.3%	24,733	11.4%	24,683	11.2%
25-29	52,250	12.0%	26,241	12.1%	26,009	11.8%
30-34	42,628	9.8%	21,715	10.0%	20,913	9.5%
35-39	35,045	8.0%	18,010	8.3%	17,035	7.7%
40-44	29,187	6.7%	14,699	6.8%	14,488	6.6%
45-49	23,236	5.3%	11,463	5.3%	11,773	5.4%
50-54	20,200	4.6%	9,772	4.5%	10,428	4.7%
55-59	16,047	3.7%	7,576	3.5%	8,471	3.9%
60-64	12,520	2.9%	5,570	2.6%	6,950	3.2%
65-69	8,704	2.0%	3,789	1.7%	4,915	2.2%
70-74	5,706	1.3%	2,268	1.0%	3,438	1.6%
75-79	2,857	0.7%	953	0.4%	1,904	0.9%
80 and over	2,876	0.7%	841	0.4%	2,035	0.9%
Total	**437,003**	100.0%	**217,169**	100.0%	**219,834**	100.0%

Source: Philippine Statistics Authority, 2020 CPH

2.4.2.1.A. DEMOGRAPHIC PROFILE OF BARANGAY 76 – DIRECT IMPACT BARANGAY

In 30 years, Barangay 76's population decreased by 8,899 individuals, from 28,503 in 1990 to 19,604 in 2020. From the previous population of 4,902 in 2015, the most recent census data in 2020 showed a positive growth rate of 33.88%, or an increase of 14,702 individuals. Its household population in 2015 was 4,813 with 1,601 households or an average of 3.01 members per household. The 2020 CPH showed that Barangay 76 represented 4.45% of the total population of Pasay City.

Referring to the 2020 CPH household data, the age group with the highest population in Barangay 76 belonged to the 25 to 29 years old, with 2,958 individuals. On the contrary, the age group with the least population belonged to the 80 years old and over, with 90 individuals.

In terms of age group, there were 3,872 (20.2%) individuals considered as young dependents (aged 14 and under). Those aged 15 to 64 or those known as economically active population and actual/potential members of the work force were at 75.6% or 14,521 individuals. The remaining population were those 65 years old and over (old dependents), with 819 (4.3%) individuals.

Table 2.79 Household Age Group by Sex, 2020

Age Group	Total	Male	Female
Total	19,212	9,592	9,620
0 - 4	1,256	630	626
5 - 9	1,331	714	617
10 - 14	1,285	637	648
15 - 19	1,303	648	655
20 - 24	2,051	1,035	1,016
25 - 29	2,958	1,433	1,525
30 - 34	2,138	1,108	1,030
35 - 39	1,807	896	911
40 - 44	1,444	757	687
45 - 49	1,021	483	538
50 - 54	722	340	382
55 - 59	656	331	325
60 - 64	421	202	219
65 - 69	379	200	179
70 - 74	258	97	161
75 - 79	92	37	55
80 and over	**90**	**44**	**46**

Source: Philippine Statistics Authority, 2020 CPH

Barangay 76 Economic Profile

Barangay 76 had an estimated National Tax Allocation of PhP22,329,297.00 for budget year 2022. Categorized as a highly urbanized barangay in Pasay City, with 3,912,573.42 square meters land area, Barangay 76 has been famous for its shopping and leisure centers such as Mall of Asia, IKEA, Luxe Duty Free, Sofitel Manila, World Trade Center, Philippine International Convention Center, Cultural Center of the Philippines, high-rise residential buildings and commercial centers (Barangay 76 Profile, 2023).

Barangay Ethnicity

As of 01 May 2020, Barangay 76 is mostly composed of Tagalog ethnic group, with 9,876 (51.4%) individuals. This is followed by Bisaya/Binisaya (2,811 individuals or 14.6%) and Chinese (1,210 individuals or 6.3%). It can be observed that there are foreign ethnicity in Barangay 76, which includes American, British, French, Indian, Indonesian, Japanese, Koreans, Singaporean, Spanish, Swiss, and Taiwanese (PSA CPH 2020).

Table 2.80 Barangay 76 Ethnicity, 2020

Ethnicity	Population (2020)
Aeta/Ayta-Magbukun	1
American	5
Applai	2
Aromanen-Manobo/Eromanen-Manobo Ilianen	9
Ayta	1
Bagobo	1
Bagobo Klata	16
Batangan	15
Bikol/Bicol	882
Bisaya/Binisaya	2,811
Boholano	17
Bontok	18
British	2
Bukidnon	1
Bukidnon-Akeanon	4
Bukidnon-Magahat	2
Cagayanen	3
Calinga	2
Capizeno	2
Caviteno	98
Caviteno-Chavacano	1
Cebuano	325
Chinese	1,210
Cotabateno	4
Cotabateno-Chavacano	2
Cuyonen/Cuyunon	3
Davaweno	7
French	3
Guiangan	1
Higaonon/Higa-onon	34
Higaonon-Tagoloanon	1
Ibaloy	1
Ibanag	53
Ibatan	2
Ifugao	3
Ilocano	960
Ilonggo	992

Ethnicity	Population (2020)
Imalawa	1
Indian	36
Indonesian	7
Itawes	1
Itneg	6
Japanese	56
Kalinga-Gaddang	1
Kamiguin	3
Kankanaey	9
Kapampangan	164
Karay-a	71
Korean North	1
Korean South	36
Maguindanao	30
Mangyan	2
Manobo	14
Manobo-Aromanon	21
Maranao	32
Masbateno/Masbatenon	12
Matigsalog	5
Palawani	9
Palawan-O-Tao't-Bato	1
Panay Bukidnon	21
Pangasinan	251
Parananum	1
Romblomanon	18
Sama/Samal	35
Sama Bangingi	4
Sama Delaut/ Sama Laut	1
Singaporean	2
Spanish	14
Subanen/Subanon	4
Surigaonon	3
Swiss	14
T'duray/Teduray	1
Tagabawa	1
Tagalog	9,876
Tagbanua-Calamian	1
Taiwanese	9
Tausog/Tausug	19
Tigwahanon	2
Tuwali	1
Waray	684
Yakan	30
Yogad	1

Ethnicity	Population (2020)
Zamboangueño	24
Other Local Ethnicity	32
Other Foreign Ethnicity	151
Total	**19,212**

Source: Philippine Statistics Authority, 2020 CPH

Barangay Marital Status

Out of 19,212 household population in Barangay 76, 7,992 are single, 6,290 are married, 4,098 are in common-law/live-in set-up, 454 are widowed, 373 are divorced/separated/annulled, and 5 being unknown (PSA CPH 2020).

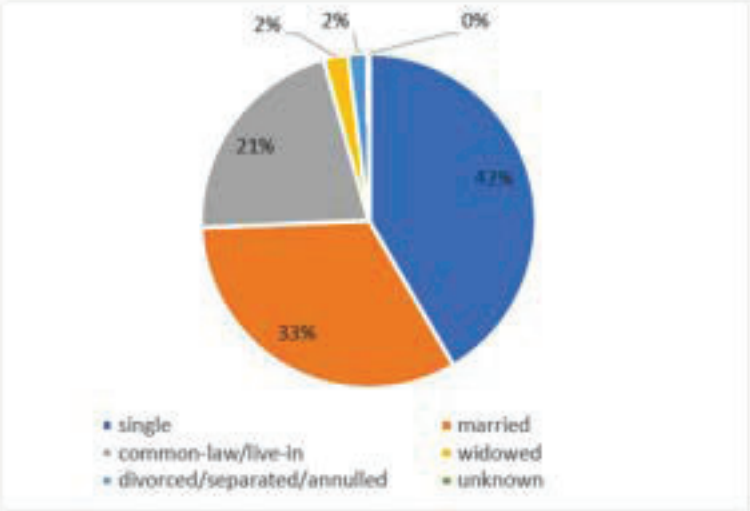


Figure 2.99 Household Marital Status, 2020
Source: Philippine Statistics Authority, 2020 CPH

2.4.2.2. ECONOMIC STRUCTURE

Pasay City is the so-called "travel city" because of the presence of Ninoy Aquino International Airport. Pasay City is envisioned to be a premiere city and world-class travel destination. According to the Department of Trade and Industry (DTI) - Cities and Municipalities Competitiveness Index (CMCI), Pasay City ranked first in economic dynamism and the third most competitive among the highly urbanized cities in the country (Pasay City, 2019).

Pasay City is strategically located on a territory where many shopping malls, hotels, restaurants, casinos, and convention centers are flourishing. As the city's Mayor Calixto boasted, the property value in Pasay, especially along Manila Bay, is higher than Makati or Quezon City. This is one of the reasons why the Mayor is pursuing land reclamation projects to expand the city's territories by over 658 hectares, from 18 square kilometers (1800 hectares).

The city government of Pasay believes that they can generate more revenues without giving their constituents burden from paying taxes but by taxing businesses. The city's annual budget of PhP8.6 billion is expected to triple up to PhP30 billion (Pasay City, 2019).

2.4.2.2.A. INDUSTRIAL

This sector primarily deals with the development of raw materials to goods/products for consumption or sale. It includes 1) mining and quarrying, 2) manufacturing, 3) water supply, sewerage, waste management, and remediation activities, 4) electricity, gas, steam, and air conditioning supply, and 5) construction.

Pasay City's previously allocated area of 35.17 has. for industrial use were converted into residential and commercial use (CLUP 2014-2022, 2016).

2.4.2.2.B. AGRICULTURAL

Pasay City does not have land allocated for agricultural use based on its 2022 existing land use map. The 63.08% (1,141 has.) of the City's total land area of 1,808.68 hectares are dominated by residential, utility and transportation and commercial cum PUD. However, urban agriculture (known as farming in the cities and other highly urbanized areas) has been practiced in Pasay City. The current administration has launched a program, *"Gulayan sa Pamayanan"*, in cooperation with the Department of Science and Technology (DOST) wherein residents are trained to grow vegetables such as pechay, leaf mustard, and tomato (Pasay City, 2019).

2.4.2.2.C. EMPLOYMENT

As an attractive city to invest in, Pasay City's priority in employment is filling up the job vacancies available in their City. Pasay City's Public Employment Service Office (PESO) provides equal opportunities to all its constituents. PESO has programs for Pasayenos such as the Special Program for Employment of Students (SPEs), skills/livelihood training, and Tulong Pang Hanapbuhay Para sa Ating Disadvantaged Workers (TUPAD). In 2015, the city's working age or the economically active population were at 193,588 individuals. Out of these, 57.92% were males and 42.08 were females (Pasay City, 2019).

In terms of major occupation group, the top five (5) with highest number of working populations were, in descending order: 1) Service and sales workers (58,972), 2) Clerical support workers (32,212), 3) Elementary occupations (28,477), 4) Managers (16,760), and 5) Plant and machine operators and assemblers (16,086).

Table 2.81 Gainful Workers Population by Sex and Occupation Group, 2015

Major Occupation Group	Male	%	Female	%	Total	% Total
Managers	7,579	45.22	9,181	54.78	16,760	8.66
Professionals	6,936	45.49	8,311	54.51	15,247	7.88
Technicians and Associate Professionals	5,005	55.70	3,980	44.30	8,985	4.64
Clerical Support Workers	13,805	42.86	18,407	57.14	32,212	16.64
Service and Sales Workers	30,879	52.36	28,093	47.64	58,972	30.46

Major Occupation Group	Male	%	Female	%	Total	% Total
Skilled Agricultural Forestry and Fishery Workers	348	89.00	43	11.00	391	0.20
Craft and Related Trades Workers	12,834	88.52	1,665	11.48	14,499	7.49
Plant and Machine Operators and Assemblers	15,469	96.16	617	3.84	16,086	8.31
Elementary Occupations	17,772	62.41	10,705	37.59	28,477	14.71
Armed Forces Occupations	1,205	88.21	161	11.79	1,366	0.71
Other Occupation: Not Elsewhere Classified	-		-		-	-

Source: Philippine Statistics Authority POPCEN 2015

Pasay City values the role of the Micro, Small and Medium Enterprises (MSMEs) in developing its economy. MSMEs are considered to have provided jobs to the people, as well as encouraging local supplies and providers. From a record of 116,923 MSMEs in 2016, it grew to 142,324 in 2019. A slight decrease was observed in 2020 due to the pandemic (Pasay City, 2019).

Furthermore, the contribution of large enterprises, those with 200 and more employees, have consistently brought the biggest employment from 2016 to 2020 (see the table below).

Table 2.82 Number of MSMEs in Pasay City, 2016-2020

MSME	2016	2017	2018	2019	2020
Micro (1-9 emp)	22,420	22,453	21,572	21,860	21,886
Small (10 -99 emp)	24,815	24,941	31,662	27,794	28,010
Medium (100-199 emp)	7,935	8,174	8,768	7,939	7,782
Large (200 and above emp)	61,753	58,937	76,837	84,731	82,264
Total	**116,923**	**114,505**	**138,839**	**142,324**	**139,942**

Source: Pasay City CLUP; Philippine Statistics Authority – 6th Edition (2021)

2.4.2.2.D. COMMERCE AND TRADE

The reforms made by the Pasay City government to provide easier and more efficient processing of new and old business permits through its Business One Stop-Shop, have encouraged entrepreneurs to invest in the City; thereby increasing the city's revenues. According to the City's BLPO, they are receiving an average of 20 business applications daily. Its new business registrations were increasing from 2010 (2,363), 2013 (2,723), 2016 (2,605), 2018 (3,124) but noted a decline in 2019. Nevertheless, its business renewal steadily increased from 2010 to 2019 (Pasay City, 2019).



Figure 2.100 Business License Renewal and New Registration in Pasay City
Source: Pasay City LGU Website – Pasay: Rise of the Travel City (2019)

The barangay that has consistently highest number of business registration from 2018 to 2021 is Barangay 76. It is followed by Barangay 183 as second, and Barangay 145 as third.

Table 2.83 Number of Business Registration per Barangay in Pasay City, 2018-2020

Rank	Barangay	2018	2019	2020	2021
1	Barangay 76	3,554	3,169	3,672	3,707
2	Barangay 183	1,136	1,008	1,315	1,259
3	Barangay 145	457	408	509	488
4	Barangay 78	622	373	458	455
5	Barangay 201	344	296	362	356
6	Barangay 39	335	294	360	335
7	Barangay 38	331	283	316	321
8	Barangay 92	333	313	314	315
9	Barangay 191	319	284	308	315
10	Barangay 79	339	232	307	293

Source: Pasay City CLUP, Business Permits and Licensing Office 2022

In the 2016-2020 data from Pasay City CLUP, the services sector comprised more than 50.0% of the total employment with the administrative support services activities having the highest number of employment at 23,957 (22.0% of the services sector). In terms of business type, 83.0% were recorded as single proprietorship and 17.0% are stock corporations.

Table 2.84 Number of Employment per Industry in Pasay City, 2016-2020

INDUSTRY	2016	2017	2018	2019	2020
Agriculture	**8**	**8**	**4**	**4**	**4**
Agriculture, Forestry and Fishing	8	8	4	4	4
Industry	**8,142**	**8,218**	**9,144**	**9,304**	**9,304**
Mining and Quarrying	-	-	44	35	35
Manufacturing	6,578	6,538	7,489	7,058	7,058
Electricity, Gas, Steam and Air Conditioning Supply	-	-	-	-	-
Water Supply; Sewerage, Waste Management and Remediation Activities	202	202	145	-	-
Construction	1,362	1,478	1,466	2,211	2,211
Services	**108,773**	**106,279**	**129,691**	**133,016**	**130,634**
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	23,839	23,698	23,432	23,433	23,651
Transportation and Storage	22,501	21,271	19,795	31,668	31,585
Accommodation and Food Service Activities	15,535	15,680	21,042	18,525	18,624
Information and Communication	1,407	1,427	2,839	3,026	2,823
Financial and Insurance Activities	5,308	3,618	11,238	6,675	6,676
Real Estate Activities	2,956	3,097	5,103	4,150	5,209
Professional, Scientific and Technical Activities	1,731	1,653	1,706	1,625	1,407
Administrative Support Service Activities	23,957	23,679	29,560	30,767	28,213
Private Education	2,699	3,353	3,426	2,719	2,701

INDUSTRY	2016	2017	2018	2019	2020
Human Health and Social Work Activities	2,187	2,174	2,387	2,252	2,252
Entertainment and Recreation	3,859	3,861	5,386	4,991	4,295
Other Service Activities	2,794	2,768	3,777	3,185	3,198
Total	**116,923**	**114,505**	**138,839**	**142,324**	**139,942**

Source: Pasay City CLUP; Philippine Statistics Authority - 6th Edition (2021)

2.4.2.2.E. POVERTY INCIDENCE

According to Republic Act No. 8425, also known as the Social Reform and Poverty Alleviation Act, the term "poor" refers to individuals and families whose income fall below the poverty threshold set by the PSA and/or cannot afford in a sustained basis to provide their minimum basic needs of food, education, health, housing, and other essential amenities of life.

Based on the Preliminary Results of the Family Income and Expenditure Survey (FIES) in 2018, poverty incidence among the population, defined as the proportion of Filipinos whose per capita income cannot sufficiently meet the individual basic food and non-food needs, was recorded at 16.6 percent. This translates to around 17.6 million Filipinos who lived below the poverty threshold of about PhP10,727 (average) per month for a family of five. The subsistence incidence, defined as the proportion of Filipinos whose income is not enough to meet even just the basic food needs, was registered at 5.2 percent in 2018. It was estimated that a family of five needs at least PhP7,528 per month to meet their basic food requirements.

Among Filipino families, around 3.0 million or 12.1 percent were considered poor in 2018. On the other hand, the subsistence incidence among families was observed at 3.4 percent, which is equivalent to 800,000 poor families below the food poverty line.

In 2018, Pasay City's poverty incidence among families was at 1.46% (1.67 thousand families) and among population at 2.06% (8.85 thousand individuals). The improvement of Pasay City's economic performance is evidenced in the reduction of its poverty incidence among its population, from 3.0% in 2015 to 2.06% in 2018.

2.4.2.2.F. LITERACY AND EDUCATION

A person is deemed literate if he/she can read and write a simple message in any language or dialect (PSA). A person is considered illiterate is he/she can only read and write his/her name, or there is an absence of one of the two factors: reading or writing ability. Based on the 2020 CPH, literacy rate in Pasay City is at 99.1%. This means that 400,316 of Pasay City's population, those aged five years old and over, were literate. In these figures, 49.1% were males and 50.0% were females.

In terms of education, the 2020 CPH data revealed that the highest educational attainment for most of the population in Pasay City is high school graduate This comprised the 21.7% (87,803 individuals) of the total household population of Pasay City, aged 5 years old and over.

Table 2.85 Educational Attainment of Household Population in Pasay City (5 years old and over), 2020

Highest Grade Completed	Both Sexes	Male	Female
No Grade Completed	4,650	2,452	2,198
Preschool	4	3	1
Kindergarten	7,100	3,686	3,414
Grade 1 (K to 12)	7,747	3,992	3,755
Grade 2 (K to 12)	7,430	3,878	3,552
Grade 3 (K to 12)	7,084	3,615	3,469
Grade 4 (K to 12)	6,713	3,486	3,227
Grade 5 (K to 12)	7,553	3,830	3,723
Grade 6 (K to 12)	7,805	3,995	3,810
Grade 7 (K to 12)	7,799	4,059	3,740
Grade 8 (K to 12)	7,537	4,003	3,534
Grade 9 (K to 12)	7,216	3,568	3,648
Grade 10 (K to 12)	9,125	4,688	4,437
Grade 11 (K to 12)	5,590	2,704	2,886
Grade 12 (K to 12)	6,988	3,479	3,509
Grade 1 (Old Curriculum)	404	218	186
Grade 2 (Old Curriculum)	835	436	399
Grade 3 (Old Curriculum)	1,435	760	675
Grade 4 (Old Curriculum)	1,562	817	745
Grade 5 (Old Curriculum)	2,391	1,264	1,127
Grade 6 (Old Curriculum)	56	35	21
Grade 6 Graduate (Old Curriculum)	14,308	6,833	7,475
Grade 7 Graduate (Old Curriculum)	42	13	29
1st year High School (Old Curriculum)	3,816	1,990	1,826
2nd year High School (Old Curriculum)	9,122	4,563	4,559
3rd year High School (Old Curriculum)	8,325	4,069	4,256
4th year High School (Old Curriculum)	36	17	19
High School Graduate (Old Curriculum)	87,803	43,914	43,889
Inclusive/Special Needs Education Programs - Elementary	208	144	64
Inclusive/Special Needs Education Programs -High School	222	124	98
Continuing/Second-Chance Education Program - Elementary	35	19	16
Continuing/Second-Chance Education Program - High School	341	220	121
Post-Secondary Undergraduate	271	153	118
Post-Secondary Non-tertiary Graduate	3,615	2,226	1,389
1st Year College	17,859	8,626	9,233
2nd Year College	26,732	13,463	13,269
3rd Year College	15,879	8,366	7,513
4th Year College	2,746	1,374	1,372
5th Year College	198	110	88
6th Year College	52	32	20
Bachelor's Degree Graduate	94,488	43,293	51,195
Master's Degree Undergraduate	110	55	55
Master's Degree Graduate	1,045	429	616
Doctorate Degree Undergraduate	33	18	15
Doctorate Degree Graduate	340	152	188
Not Reported	746	396	350

Source: Philippine Statistics Authority, 2020 CPH

The enrolment in both public and private schools in Pasay City is significantly highest in elementary level. The increase in enrollees in public school is more notable than the private school during the pandemic period or the school year 2020-2021 (see table below).

Table 2.86 Enrolment in Public and Private Schools, Pasay City SY 2016-2021

Education Level	Enrollment				
	SY 2016-2017	SY 2017-2018	SY 2018-2019	SY 2019-2020	SY 2020-2021
Public					
Kindergarten	4,541	4,666	5,322	4,500	5,105
Elementary	30,577	29,385	28,465	29,681	30,015
Jr. High School	18,375	18,105	18,671	19,278	19,395
Sr. High School	2,025	3,695	4,707	5,820	6,434
Private					
Kindergarten	1,205	1,168	1,253	1,145	468
Elementary	6,657	6,414	6,221	6,161	4,028
Jr. High School	5,396	5,579	5,538	5,395	4,239
Sr. High School	5,362	10,817	8,538	7,375	6,434

Source: DepEd Pasay City (SDO Pasay Basic Education Situationer, 2022), as cited in Pasay City CLUP 2023-2034 (2024)

In 2022, Pasay City has recorded 66 pre-schools, 67 elementary schools, 51 high schools, 15 colleges/universities and 65 TESDA-accredited vocational/technical schools. In the tertiary level, the government-controlled school – City University of Pasay (CUP) has been providing quality education at a minimal cost to the less privileged but qualified students of the City. A special education is also provided by the Philippine School for the Deaf and Philippine National School for the Blind, Pasay SPED Center, and one Alternative Learning (ALS) Center.

Table 2.87 Public and Private School Institutions in Pasay City, 2022

Level	Public	Private
Pre-School	21	45
Elementary	22	45
High School	18	33
College/University	1	14
Vocational	1	65

Source: DepEd Pasay City and CHED, 2022 as cited in Pasay City CLUP 2023-2034 (2024)

Below is the list of public and private schools in school year 2023-2024 as listed by CHED and DepEd.

Table 2.88 Public and Private School Institutions in Pasay City, 2022

Elementary	High School	College/University
Cluster 1 – North District Epifanio Delos Santos ES Rafael Palma ES Bernabe ES	Cluster 8 Kalayaan National HS Pasay City South HS	Air Link International Aviation College (private) Arellano University-Pasay (private)
Cluster 2 – East District Padre Burgos ES Padre Zamora ES Juan Sumulong ES	Cluster 9 Pasay City National HS Pasay City West HS Pasay City National Science HS	Asian Institute of Maritime Studies (private) Lacson College (private)
Cluster 3 – East District Timoteo Paez ES	Cluster 10	Manila Tytana Colleges (private)

Elementary	High School	College/University
Marcela Marcelo ES Apelo Cruz ES	President Corazon 'Cory" C. Aquino National HS Pasay City North HS – M. Dela Cruz Campus Pasay City East High School	Manila Adventist College (private) Metro Business College-Pasay (private) City University of Pasay (LUC) Philippine Law School (private) Philippine State College of Aeronautics-Main (SUC) San Juan de Dios Educational Foundation (private) Southeastern College (private) Wesleyan College of Manila (private) St. Therese of the Child Jesus Institute of Arts and Sciences (private)
Cluster 4 – West District Jose Rizal ES Andres Bonifacio ES Gotamco ES		
Cluster 5 – West District P. Villanueva ES Philippine School for the Deaf Philippine National School for the Blind		
Cluster 6 – South District Kalayaan ES Villamor Air Base ES Rivera Village ES		
Cluster 7 – South District Maricaban ES Don Carlos Village ES Cuneta ES		

Source: Department of Education, Masterlist of Schools as of SY 2020-2021

In terms of the student-teacher ratio in 2020, there was one (1) teacher for every 31 students in elementary level, one (1) teacher for 26 students at secondary level, respectively. The city expressed that teacher personnel vis-à-vis number of students is adequate, while the number of classrooms vis-à-vis number of students are not enough considering the fast-growing number of students in the public schools. The city mentioned the need for additional 301 classrooms at the kinder-elementary level and additional 239 classrooms at the high school level.

Table 2.89 Public Schools Personnel and Facilities in Pasay City, 2018 and 2020

Item	2018	2020
Number of Teachers		
Elementary (including Kindergarten)	1,066	1,239
Secondary (Junior and Senior)	742	1,173
Number of Classrooms		
Elementary (including Kindergarten)	650	779
Secondary (Junior and Senior)	374	480
Special Schools	94	n.d.
Teacher-Student Ratio		
Elementary	32	31
Secondary (Junior and Senior)	32	26

Item	2018	2020
Classroom-Student Ratio		
Elementary	59	50
Secondary (Junior and Senior)	63	63

Source: DepEd Pasay, 2018 and 2020, as cited in Pasay City CLUP 2023-2034 (2024)

2.4.2.2.G. TOURISM

Tourism is one of the largest and fastest-growing sectors in the world as it boosts economic growth through creating employment and improves infrastructure. Tourism contributes significantly to the local economy of Pasay. From 2017 to 2021, the tourism industry in the City has contributed PhP17.4 million local revenues. The tourism revenues shown in Table 6.14 below only covers tourism service income (permits, registration fees, clearance, and certification fees, etc.) and do not include tax revenues, such as business tax, attributable to the tourism industry.

Table 2.90 City Income from Tourism Services in Pasay City, 2017-2021

Year	Number of Tourism Related Establishments	Total Income (in PhP)
2017	2,857	4,319,006.00
2018	3,153	4,800,568.00
2019	2,371	3,612,168.00
2020	1,910	3,006,468.00
2021	1,534	1,705,422.00
Total		**17,443,632.00**

Source: Pasay Tourism and Cultural Development Office 2022, as cited in Pasay City CLUP 2023-2034 (2024)

As Pasay City called itself the "Travel City of the Philippines," it has established the City's Tourism and Cultural Development Office to govern and regulate tourism development programs and supervision of tourism-related establishments in the City.

The number of tourists visiting the City decreased in 2020 due to the pandemic. From PhP4.3M in 2017 to PhP1.5M in 2021. The table below shows the annual tourist arrival in Pasay City.

Table 2.91 Annual Tourist Arrival in Pasay City, 2017-2021

Year	Total Tourist Arrival	Total Overnight Guest Stay*
2017	4,274,175	373,298
2018	4,691,003	1,067,017
2019	n.d.a	n.d.a
2020	COVID-19 pandemic	COVID-19 pandemic
2021	1,482,535	172,728

Source: Pasay Tourism and Cultural Development Office 2022, as cited in Pasay City CLUP 2023-2034 (2024)

Pasay City offers multifaceted urban tourism activities. It has 16 cultural and recreational attractions, 13 historical and cultural heritage spots (3 are NHCP sites), and five (5) crowd puller cultural and tourism activities. The approximate distance from the nearest Project components is summarized in Table 2.92. The Sangguniang Panlungsod issued Resolution

No. 4624 in 2019, recognizing the list of cultural properties submitted to the National Commission for Culture and the Arts (NCCA). The nearest of which is the Conrad Manila categorizes as cultural and recreational attractions which is approximately 350m away from the nearest Project Boundary. The nearest historical and cultural heritage based on the City loist is the House of Mr. James C. Rockwell at 1155 F.B. Harrison Street. which is 1.73 km away from the nearest reclamation boundary.

Table 2.92 Pasay City Urban Tourism Activities Approximate Distance to the Project

Pasay City Urban Tourism Activities	Approximate Distance to the nearest edge of the reclamation island (km)	Approximate Distance to the nearest edge of the bridge (km)
CULTURAL AND RECREATIONAL ATTRACTIONS		
Cultural Center of the Philippines	1.31 km	0.69 km
Coconut Palace (Tahanang Pilipino)	0.61 km	0.04 km
Folk Arts Theater (Tanghalang Francisco Balagtas)	0.77 km	0.20 km
Philippine International Convention Center (PICC)	0.90 km	0.26 km
Philippine World Trade Center (World Trade Center Metro Manila, WTCMM)	1.23 km	0.45 km
Philippine Trade Training Center (PTTC)	1.37 km	0.61 km
Sofitel Philippine Plaza Manila (formerly Philippine Plaza Hotel)	0.70 km	0.25 km
SM Mall of Asia (MOA) and SM MOA Skating Rink (the biggest mall in Asia and the biggest indoor skating rink in the Philippines)	0.59 km 0.48 km	0.34 km 0.22 km
SMX Convention Center	0.53 km	0.18 km
The Shrine of St. Therese of the Child Jesus	4.38 km	4.08 km
Chinese Temple (Pao Ong Kong Chinese Temple)	1.76 km	1.13 km
The Archdiocesan Shrine of Jesus: The Way, the Truth and the Life	0.59 km	0.20 km
Conrad Manila	0.35 km	0.01 km
Resorts World Manila	4.65 km	4.28 km
Star City	1.25 km	0.61 km
HISTORICAL AND CULTURAL HERITAGE AREAS		
Residence of the Lopa and Oppen families in Roberts Street	Cannot be located in GoogleEarth	Cannot be located in GoogleEarth
Residence of Vicente Arias – a realtor and insurance magnate at #240 Roberts Street.	Cannot be located in GoogleEarth	Cannot be located in GoogleEarth
Residence of Mr. Go Kim Pah	2.14 km	1.89 km
House of Mr. James C. Rockwell at 1155 F.B. Harrison Street.	1.73 km	1.09 km
Residence of Mr. Julio and Juan Ledesma	2.60 km	2.24 km
Residence of Placido Mapa	Cannot be located in GoogleEarth	Cannot be located in GoogleEarth
Residence of Tomas Mapua	2.51 km	2.07 km

Pasay City Urban Tourism Activities	Approximate Distance to the nearest edge of the reclamation island (km)	Approximate Distance to the nearest edge of the bridge (km)
Manila Sanitarium	2.24 km	1.48 km
Ospital ng San Juan de Dios	1.78 km	1.42 km
School for the Deaf and Blind	1.95 km	1.64 km
Unang Paaralang Bayan ng Pasay	2.57 km	1.91 km

2.4.3. CULTURAL/LIFESTYLE CHANGE (ESPECIALLY ON INDIGENOUS PEOPLE, IF ANY) AND IMPACTS ON PHYSICAL CULTURAL RESOURCES

2.4.3.1. CULTURAL AND RECREATIONAL ATTRACTIONS

Among the cultural and recreational attractions that are part of Barangay 76 as the Project 360's impact barangay includes the following:

1. Cultural Center of the Philippines (CCP) Complex. Also known as the *Sentrong Pangkultura ng Pilipinas*, it is a 62-hectare government-owned and controlled corporation established during the Marcos Regime to be used for musical/theater presentations.

2. Coconut Palace (Tahanang Pilipino). The Coconut Palace was originally intended as a guest house for visiting artists at the CCP but later hosted the Office of the Vice President. The building showcases the use several Philippine hard wood, coconut shells, and specially engineered coconut lumber.

3. Folk Arts Theater (*Tanghalang* Francisco Balagtas). Described as a proscenium amphitheater, Folk Arts is located within the CCP Complex and has a seating capacity of 8,458. Designed for music concerts but now popularly used for various religious group activities.

4. Philippine International Convention Center (PICC). Built on reclaimed land along Manila Bay, it is a premier venue for exhibitions, special events and meetings. It is also known as an architectural landmark housing paintings and sculptures of renowned Filipino artists.

5. Philippine World Trade Center (World Trade Center Metro Manila, WTCMM). A member of the World Trade Center Association (WTCA) of New York and is the first exhibition venue in the Philippines listed by the *Union des Foires Internationales (UFI)*.

6. Philippine Trade Training Center (PTTC). PTTC was established in 1987 through the initiative of the DTI in cooperation with Japan International Cooperation Agency (JICA) to provide training in the field of international marketing and produce world-class Filipino exporters.

7. Sofitel Philippine Plaza Manila (formerly Philippine Plaza Hotel). This is a 5-star resort hotel which was opened in 1976. The hotel features 609 rooms, two (2) opera suites,

12 family suites and 32 Sofitel suites and international airports.

8. SM Mall of Asia (MOA) and SM MOA Skating Rink (the biggest mall in Asia and the biggest indoor skating rink in the Philippines). SM Mall of Asia, which opened on May 21, 2006, is the 2nd largest mall in the Philippines, the 3rd largest shopping mall in Asia, and the 4th largest shopping mall in the world. It is about four (4) hectares of floor area built on 19.5 hectares of reclaimed land. MOA also features the Philippines' first Olympic-size ice skating rink, which is described as the biggest of its kind in Southeast Asia and can accommodate recreational and competitive figure skating, as well as ice hockey.
9. SMX Convention Center. This is the Philippines' second largest privately-owned events venue, owned by the SM Group of SM Prime Holdings. The 46,647 square meter facility located in the Mall of Asia Complex has four (4) exhibition halls, five (5) function rooms, and fourteen (14) meeting rooms ideal for international exhibitions, and various trade, and corporate/social functions.

Other cultural and recreational attractions near/adjacent (within 5 kilometers) to the Project 360 are the following:

1. The Shrine of St. Therese of the Child Jesus. First started as a chapel in the 1970s, it was reconstructed as a church in 1983. This sprawling 6,244 square meter sacred ground is shaped like a cross.

2. Chinese Temple (Pao Ong Kong Chinese Temple). This Chinese Taoist Temple is located along F.B. Harrison Street.

3. The Archdiocesan Shrine of Jesus: The Way, the Truth and the Life. This church is located at the Reclamation Area of Pasay City. Built in 1999, this church, was a fulfillment of the late Pope's expression of interest during the 1995 World Youth Day to establish a center for the youth. Furthermore, this Shrine was a project of the former Archbishop of Manila, the late Jaime Cardinal Sin.

4. Conrad Manila. A 5-star hotel within the Mall of Asia Complex offering 347 rooms and suites. Formerly under the Hilton Worldwide, it is now being managed by the SM subsidiary.

5. Resorts World Manila. This is the first integrated tourist hub in the Philippines with combined lodging, restaurants, entertainment, gaming, and mall area in one. It is home to three hotels: the five- star Marriot Hotel Manila, Remington Hotel, and Maxims Hotel. The Newport Mall is also located here, which houses shops and boutiques for international luxury brands, high-end cinemas, dining outlets, and a Newport Performing Arts Theater which can seat 1,500 individuals.

6. Star City. This is an amusement park next to CCP, which began as a seasonal carnival during the Christmas season but then evolved into a permanent complex that is open every day. It has been open to the public since 1991.

2.4.3.1.A. HISTORICAL AND CULTURAL HERITAGE AREAS

The following are the historical and cultural heritage areas near/adjacent (within 5 kilometers) to the Project 360:

1. Residence of the Lopa and Oppen families in Roberts Street
2. Residence of Vicente Arias – a realtor and insurance magnate at #240 Roberts Street.
3. Residence of Mr. Go Kim Pah, prominent businessperson, founder of Equitable Banking Corporation on Cuneta Avenue.
4. House of Mr. James C. Rockwell at 1155 F.B. Harrison Street.
5. Residence of Mr. Julio and Juan Ledesma, sugar tycoons from Silay, Negros Occidental at #3336 Taft Avenue.
6. Residence of Placido Mapa, finance wizard from Talisay.
7. Residence of Tomas Mapua, first architect in the Philippines and founder of Mapua Institute of Technology at #2635 Taft Avenue.
8. Manila Sanitarium, founded in1928.

The following are declared National Historical Commission of the Philippines (NHCP) Sites/Installed with Historic Markers by NHCP:

1. Ospital ng San Juan de Dios – along Roxas Boulevard. NHCP Historic Marker was installed on 15 August 1979
2. School for the Deaf and Blind – along F.B. Harrison Street, NHCP Historic Marker was installed in 1961
3. *Unang Paaralang Bayan* ng Pasay – also known as the P. Burgos Elementary School. A historic marker was installed here in 1951 proclaiming its status as a National Historical Landmark.

2.4.3.1.B. CULTURAL AND TOURISM ACTIVITIES

The following annual cultural activities are celebrated in Pasay City:

1. Talulot Festival. Talulot being the local term for petal is coined in honor of St. Therese of the Child Jesus who is also known as God's Little Flower. The Talulot Festival started in 2007 and is usually celebrated in October to coincide with the feast day of St. Therese.
2. Pasay Foundation Festival. Pasay City celebrates its Foundation Anniversary every 2nd day of December. In 2013, Pasay celebrated its 150th foundation anniversary.
3. Aliwan Festival. An annual event that started in 2003, this festival gathers different Filipino Cultural Festivals in Star City, including competitions in dance parade and floats, as well as a beauty pageant. It is held every April.
4. *Santacruzan sa* MOA. Held in May, The Mall of Asia (MOA) celebrates the yearly Flores de Mayo or Santacruzan by which Catholics honor the Virgin Mary through a procession of young girls/women.
5. *Senakulo sa* Malibay. Held annually during the Lenten Season (during Holy Week), the Senakulo tradition reenacts the Passion of Christ.

2.4.3.1.C. CULTURAL AND RECREATIONAL ATTRACTIONS

The Project site is located offshore and in the proposed reclamation island. Philippine Registry of Cultural Property (PRECUP) Registered Properties and Local Cultural Properties are not located within the proposed Project site as shown in Figure 2.101 and Table 2.93. Based on the list, there are no cultural registered properties and historical markers within the 1-km buffer from the reclamation islands. The nearest PRECUP in the reclamation Island in the category of Works of National Artist is the Gloria Maris Restaurant which is approximately 500m.

Table 2.93 Philippine Registry of Cultural Property (PRECUP) Registered Properties and Local Cultural Properties Near the Project Site

Establishment	MAPAMANA Category	Approximate Distance to the nearest edge of the reclamation island (km)	Approximate Distance to the nearest edge of the bridge (km)
Manila Yacht Club	Historical Markers	1.51 km	1.0 km
Philippine Navy Headquarters | Memorare Marker	Historical Markers	1.44 km	0.89 km
Cultural Center of the Philippines Main Theater/ Theater of Performing Arts	Works of National Artists	1.28 km	0.67 km
Design Center Philippines--Cultural Center of the Philippines	Works of National Artists	1.21 km	0.58 km
Folk Arts Theater--Cultural Center of the Philippines	Works of National Artists	0.77 km	0.22 km
Philippine International Convention Center--Cultural Center of the Philippines	Works of National Artists	0.95 km	0.29 km
Philippine Plaza Hotel--Cultural Center of the Philippines	Works of National Artists	0.57 km	0.06 km
Westin Philippine Plaza Hotel	Works of National Artists	0.80 km	0.15 km
APEC Sculpture Garden	Works of National Artists	0.75 km	0.09 km
Cultural Center of the Philippines	Works of National Artists	1.45 km	0.83 km
PICC Rehabilitation/Upgrading	Works of National Artists	0.84 km	0.19 km
Interior Design - Philippine Plaza Hotel–Cultural Center of the Philippines	Works of National Artists	0.59 km	0.12 km

Establishment	MAPAMANA Category	Approximate Distance to the nearest edge of the reclamation island (km)	Approximate Distance to the nearest edge of the bridge (km)
Interior Design - Philippine International Convention Center--Cultural Center of the Philippines	Works of National Artists	0.82 km	0.18 km
Interior Design - Theater of Performing Arts-Cultural Center of the Philippines	Works of National Artists	1.30 km	0.67 km
Gloriamaris Restaurant	Works of National Artists	0.50 km	0.17 km
Tahanang Pilipino (Coconut Palace)	Works of National Artists	0.61 km	0.05 km
PICC Upgrading & Rehabilitation Work	Works of National Artists	0.83 km	0.18 km
Filipinescas: Philippine Life, Legend and Lore in Dance	Works of National Artists	1.28 km	0.67 km
Vamos a Belen	Works of National Artists	1.28 km	0.66 km
Itim Asu	Works of National Artists	1.28 km	0.66 km
Bungkos Suite	Works of National Artists	1.28 km	0.66 km
Participaton to Aliwan Fiesta	Registered Properties	1.28 km	0.63 km

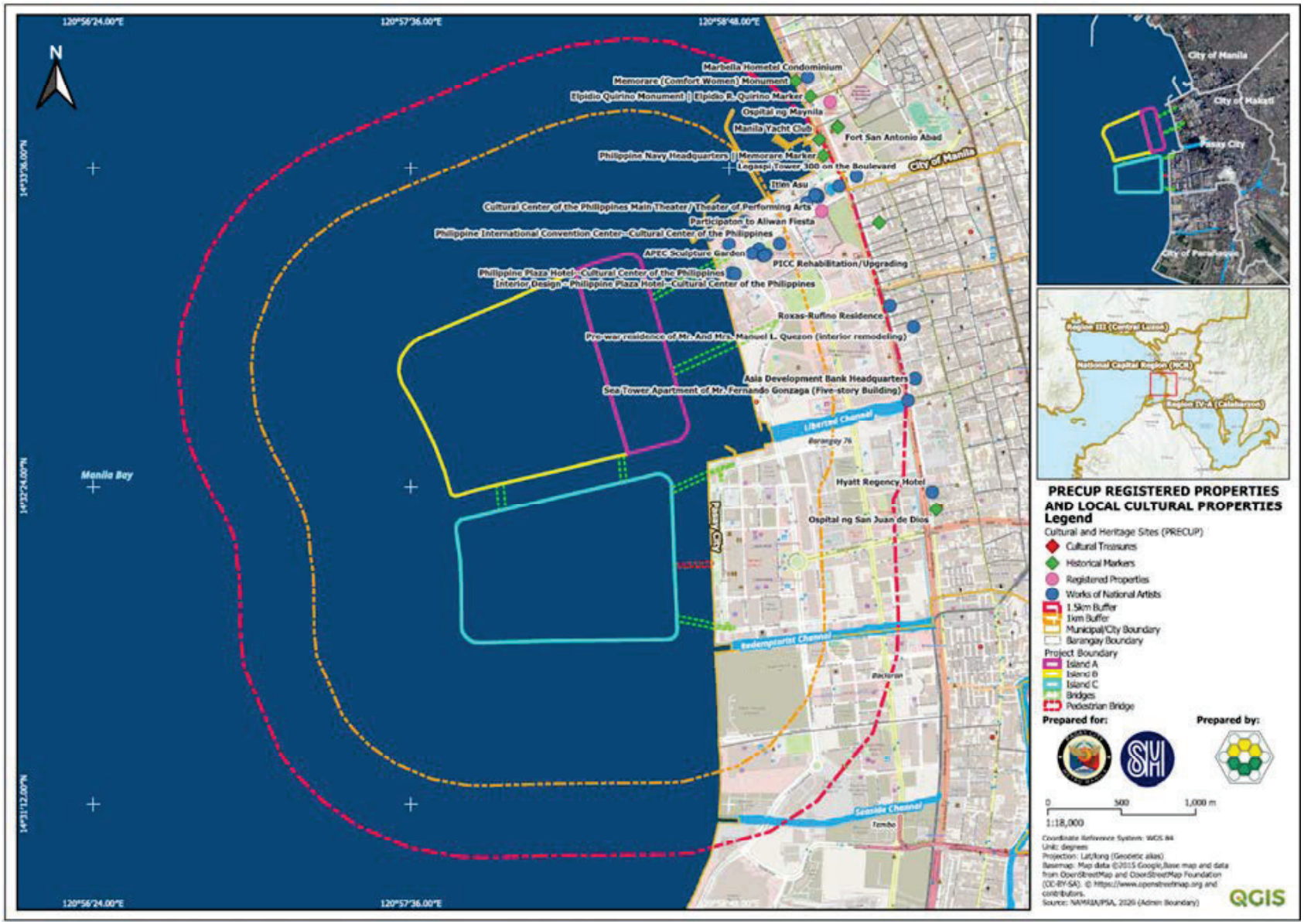


Figure 2.101 PRECUP Registered Properties and Local Cultural Properties
Source: Open Street Map, The Philippine Registry of Cultural Property, 2024

2.4.4. THREAT TO DELIVERY OF BASIC SERVICES /RESOURCE COMPETITION AND THREAT TO PUBLIC HEALTH AND SAFETY

2.4.4.1. HEALTH FACILITIES AND PERSONNEL

Pasay City prioritizes its people's health care. It has allocated PhP440,449,587.68 in 2019 for all improvements and modern innovations in the healthcare system of Pasay City residents. Currently, the City has four (4) hospitals, 13 health centers, (8) lying-in clinics and maternity clinics, tuberculosis treatment satellite centers, HIV/AIDS treatment hub, and sundown clinics.

The health centers are divided into two (2) health districts based on the City's political districts with Taft Avenue as its demarcation line. District 1 has eight (8) health centers District 2 has five (5). Each health center has dedicated health workers consisting of physician, dentist, nurse, midwives, medical technologist, and laboratory aide. Nonetheless, Pasay City has apparent deficiencies in public health facilities and services considering that it has a population of 437,003; hence the need to add more health centers to comply with the DOH standards of one (1) health center and one (1) physician for every 20,000 population, one (1) nurse for every 10,000 population, one (1) midwife for every 5,000 population, one (1) health dentist for every 50,000 population, and one (1) BHW for every 20 households.

Table 2.94 List of Health Facilities in Pasay City 2022

Classification	Name
Government Hospital	Pasay City General Hospital
Government Hospital	San Juan de Dios Hospital
Private Hospital	Adventist Medical Center Manila
Private Hospital (PAF staff and families)	Air Force General Hospital
Health Center	San Roque Health Center – Brgy. 138
Health Center	San Isidro Health Center – Brgy. 47
Health Center	Doña Nena Health Center – Brgy. 186
Health Center	Doña Marta Health Center – Brgy. 147
Health Center	Dr. Elvira M. Lagrosa Health Center – Brgy. 67
Health Center	San Pablo Health Center – Brgy. 179
Health Center	Leveriza Health Center – Brgy. 23
Health Center	Malibay Health Center – Brgy. 174
Health Center	Cuyegkeng Health Center – Brgy. 2
Health Center	M. Dela Cruz Health Center – Brgy. 128
Health Center	Villamor Health Center – Brgy. 183
Health Center	MIA Health Center – Brgy. 194
Health Center	Kalayaan Health Center – Brgy. 201
Health Center	Social Hygiene Clinic – Brgy. 174
Health Center	Lying-in Clinic – Brgy. 147

Source: Pasay City CLUP 2023-2034 (2024)

Pasay City General Hospital (PCGH) is a Level 3 government hospital with a capacity of 150 beds. It is considered as one of the best local public hospitals in Pasay City due to its complete and state-of-the-art medical equipment, and highly trained doctors and medical personnel in Metro Manila. Under the arm of Pasay City Comprehensive Hospitalization Program, "Take

Care I Care (TCIC)" was created. This program believes that *"all poor residents, employees of the City Government as well as teaching and non-teaching staff are qualified to avail of up to PhP25,000 in hospital bills per year."* Through this program, Pasay City residents can seek immediate medical attention in its city's prime hospitals when needed by using their TCIC Green Card.

The health centers mentioned above have modern equipment for fast testing and cure of their patients. They are provided with own laboratories for urinalysis, stool exam, sputum microscopy, HIV testing, complete blood count, and other health services, free of charge. Aside from regular vaccinations given to newborn and small children, the city also provides free vaccinations against Hepatitis B, influenza and pneumococcal and HPV to its employees, senior citizens, and other residents.

2.4.4.1.A. MORBIDITY AND MORTALITY

The top two (2) leading causes of morbidity in Pasay City from 2019-2021, across all ages, were mainly due to cough and colds, and urinary tract infection (UTI).

Table 2.95 Leading Causes of Morbidity in Pasay City, 2019-2021

Rank	2019		2020		2021	
	Cause	#	Cause	#	Cause	#
1	Cough and Colds	7,574	Cough and Colds	2,272	Cough and Colds	5,072
2	UTI	5,090	UTI	785	UTI	1,728
3	Hypertension	4,318	Pneumonia	559	Animal Bite	560
4	Tuberculosis of the lungs	2,164	Acute Tonsilitis	435	Wound Infection	508
5	Wound infection	1,539	Wound infection	388	Pneumonia	424

Source: Pasay City CLUP; Pasay City Health Office, as cited in Pasay City CLUP 2023-2034 (2024)

Based on the 2019-2021 health report of the Pasay City Health Office, the top two (2) causes of mortality in Pasay were Acute Myocardial Infarction and Pneumonia.

Table 2.96 Leading Causes of Mortality in Pasay City; 2019-2021

	2019				2020				2021			
	M	F	Total	%	M	F	Total	%	M	F	Total	%
Acute Myocardial Infarction	422	229	651	37	412	175	587	36	573	447	1020	60.2
Pneumonia	251	237	488	28	246	237	483	30	173	126	299	17.7
Hypertensive Cardiovascular Diseases	133	83	216	12	134	82	216	13	66	55	121	7.1
Diabetes Mellitus	71	65	136	8	93	43	136	8	7	10	17	1.0
Cerebrovascular Disease	71	42	113	6	32	21	53	3	45	37	82	4.8
Gunshot Wounds	37	3	40	2	31	8	39	2	4	1	5	0.3
Ischemic Heart Disease	21	6	27	2	15	10	25	2	97	34	131	7.7
Traumatic Injuries	2	5	7	0	5	4	9	1	5	0	5	0.3
Coronary Artery Disease	16	9	25	1	10	10	20	1	0	4	4	0.2

Source: Pasay City Health Office, as cited in Pasay City CLUP 2023-2034 (2024)

2.4.4.1.B. WATER AND SANITATION

Pasay City primarily sources its water from a piped water supply system operated and maintained by Maynilad Water Services, Inc. – a distribution concessionaire of the Metropolitan Water and Sewerage System (MWSS). The data from the City Planning showed that 97.6% of the total households in Pasay City have access to improved water source. This trend can also be seen in households with access to sanitary toilets.

Table 2.97 Water and Sanitation in Pasay City, 2017-2021

Performance Indicators	2017	2018	2019	2020	2021
Percentage of Households with Access to Safe Drinking Water	94%	94%	97.6%	97.6%	97.6%
Percentage of Households with Access to Sanitary Toilets	95%	94%	98%	98%	98%

Source: Makati Health Department as cited in Pasay City CLUP 2023-2034 (2024)

Based on the POPCEN 2015, the main source of drinking water in Pasay City was bottled water (47.0%). This is followed by own faucet community water system (39.9%) and shared faucet community water system (13.0%).

Table 2.98 Main Source of Water Supply for Drinking in Pasay City, 2015

Source of Water	Number	%
Own use faucet community water system	42,903	39.9
Shared faucet community water system	13,983	13.0
Bottled water	50,698	47.1
Others	35	0.03
Number of Households*	107,619	100.0

Source: Pasay City CLUP 2023-2034 (2024)

As to the source of water for cooking, 81.5% said that they sourced it from own faucet community water system and 18.0% said it was from shared faucet community water system.

Table 2.99 Number of Households by Source of Drinking Water, 2018

Main Source of Water Supply for Cooking	Number	%
Own use faucet community water system	87,737	81.5
Shared faucet community water system	19,367	18.0
Own use tubed/piped deep well	1	0.001
Bottled water	513	0.5
Others	1	0.001
Number of Households	**107,619**	**100.0**

Source: Pasay City CLUP 2023-2034 (2024)

2.4.4.2. ENERGY

The Manila Electric Railroad and Light Company (MERALCO) provides electric power services to different residential, commercial, and industrial part of Pasay City. The table below shows the annual consumption of Pasay City based on segment/user.

Table 2.100 Number of Connections and Annual Consumption by Segment in Pasay City, 2012

Segment	Customer Count	Annual Consumption	% Share
Residential	77,682	174,519,582	17.82%
Commercial	8,779	755,503,193	77.14%
Industrial	49	46,620,591	4.76%
Streetlights	10	2,738,123	0.28%
Total	**86,520**	**979,381,489**	**100.00%**

Source: MERALCO , as cited in Pasay City CLUP 2023-2034 (2024)

2.4.5. GENERATION OF LOCAL BENEFITS FROM THE PROJECT

2.4.6. RESULTS OF PERCEPTION SURVEY

To establish a baseline data of Barangay 76 and the fisherfolk group – PLAA, a perception survey was conducted on September 2 and 3, 2024. Barangay 76 was represented by 100 randomly selected residents and PLAA was purposively sampled by 30 respondents. The complete perception survey result can be read at **Appendix Q**.

Perception Survey Result of Barangay 76

Most of the 100 respondents who answered the belonged to the adult population of 26-65 years old (91% individuals). They were also represented by 50% male and 47% female, while 3% did not disclose their sex.

In terms of income, the result shows that majority of the household's family monthly income is below the latest poverty threshold of at least PhP13,873 (43% households), 39% are earning between PhP10,001 to PhP20,000.

Among the 100 respondents, 54% are renting a house/room and have been living in Barangay 76 for more than 26 years (27% respondents). Each household is mostly composed of 4-6 members (44%) and is living in a duplex/attached houses (78%).

More than half of the households (53%) did not experience any illness outbreaks in the last five (5) years, while those who experienced it, stated experiencing COVID-19 (21%) and Measles (11%). Their household illnesses in the last five (5) years are due to respiratory problem (43%). Those household members who get sick preferred accessing their community health centers (51%) and public hospital (37%). As regards the mortality, 28% household members experienced death in the last five (5) years. Known cause reported was due to cardiac arrest (17.9%), COVID-19 (10.7%) and diabetes (10.7%).

In the matter of satisfaction with community services - employment opportunities, health services, peace and order, cleanliness and sanitation, education, infrastructure, utilities, community facilities and amenities, commercial services, barangay services, transportation and disaster management, more than 90% are satisfied.

On project awareness and acceptance, 66% are aware of the 360-hectares reclamation project. Those who are aware have slight understanding of the project (54%). Others have full understanding (5%) and 7% of the respondents do not understand the project at all. Their source of information is mostly the barangay official/employee (32%). Although not all of the respondents know about the project, 95% agreed to having the reclamation project at their barangay for the reasons of perceived opportunities for employment, land expansion, financial and educational assistance, livelihood assistance, reliable infrastructure, support to vulnerable sectors, economic growth, and healthcare assistance. Other respondents mentioned of risks like decrease in fishing area, environmental destruction, flooding, traffic congestion, and overcrowding.

Perception Survey Result of Fisherfolk Group (Pasay Libertad Anglers Association (PLAA) stationed in Barangay 76, Pasay City.

All 30 respondents from PLAA are male. The adult population of 18-65 years old in PLAA represented the group with 24 respondents and are mostly married (60%). Twenty-five (83.3%) respondents said that they are the breadwinner in the family and are earning below the poverty threshold of PhP13,873. Majority of these respondents (96.7% or 29 individuals) are relying on fishing as its main source of income.

In terms of health, the respondents shared that COVID-19 (23.3%) was experienced by their family, followed by chickenpox (13.3%) in the last five (5) years. Common illnesses reported were respiratory problems (80.0%). Those who fell ill preferred to go to community health centers (46.7%) or the public hospital (36.7%). There were also death in the family of 14 respondents due to hypertension (21.4%) and cardiac arrest (14.3%).

On project awareness and acceptance, 73.7% are aware of the 360-hectares reclamation project. Those who are aware have slight understanding of the project (81.8%). Others have full understanding (81.8%) and 13.6% of the respondents do not understand the project at all. Their source of information is mostly their friends/co-members (36.4%). Although not all of the respondents know about the project, 80% or 24 respondents agreed to having the reclamation project for the reasons of perceived opportunities for employment, land expansion, financial and educational assistance, livelihood assistance, healthcare assistance, and continuance of fishing activities.

Conclusion and Recommendation

Generally, the respondents agreed that having the reclamation project has its advantages. Although there were few risks mentioned, majority of the respondents perceived that the land expansion project may bring certain benefits like opening of employment and livelihood opportunities for their community, additional income for the LGU, and improved social services. While other studies suggest environmental degradation, change of landscape, increased disaster risk on reclamation projects, respondents are acknowledging also the social and economic impacts of the project to their community and the fisherfolk group.

Reclamation project is one way of decongesting the growing population of Pasay City. The government of Pasay sees the development as an opportunity to boost their economy by creating real estate opportunities, attracting tourism, employment opportunities, commercial/business development and improved infrastructure and services. It is imperative that Pasay City government to create measures to minimize the impacts of natural and man-

made hazards and commit to provide long-term benefits to the affected community. Collaborative effort must be made with Barangay 76 and surrounding communities, professional/business group, and government and non-government stakeholders to create shared benefits and harmonious relationship towards sustainable development.

2.4.7. TRAFFIC CONGESTION

As discussed during the EIA Review Committee Technical Review Meeting, an amendment of the ECC is needed to include the bridges connecting the reclamation area to the mainland of Pasay. As such, a detailed Traffic Impact and Management Plan Study has to be conducted to include the impact of the traffic; hence, traffic congestion will be very minimal during the pre-construction phase, mostly due to personnel engaged in further study and research within the project area. During the construction phase, increase in traffic congestion will be noticeable near the temporary access road/bridge in J. W. Diokno Boulevard as it will become the entrance/exit of in personnel of the reclamation area.

2.4.8. IMPACT ANALYSIS AND ENVIRONMENTAL MANAGEMENT

Displacement of users needing access to water bodies, Displacement / Disturbance of Properties, Change/conflict in land ownership, and Change /conflict of Right of Way

Construction Phase

Since the proposed project is located offshore, there is no presence of residential/commercial buildings or houses in the area; hence, no displacement of settlers is needed. Further, there are no fish sanctuaries, fishing structures or mussel/oyster farm that will be affected by the reclamation.

Operation Phase

The fishing operations of small-scale fisherfolk may have to move past the reclaimed area. They will be provided with compensation and other assistance as discussed in the SDP section.

In-migration and Proliferation of Informal Settlers

Construction Phase

The proposed project will prioritize hiring of local workers in Barangay 76 or its nearby barangays in Pasay City, in coordination with Pasay City PESO. Should there be a need for additional workers from outside Pasay City, a migration of workers may happen that would induce population growth in Pasay City once construction is underway. Workers who opt to stay in Barangay 76 will be instructed to register to Barangay 76 Office for proper identification.

The proposed project will ensure that no proliferation of informal settlers will happen during the construction phase. Workers may be provided with temporary housing, if needed, but it will be demolished to avoid being utilized by unauthorized persons.

Operation Phase

In-migration of new residents and business owners during operation phase is expected. New residents will be required by the LGU to register to the concerned barangay and new business owners will have to apply for business registration at Pasay City BPLO.

Cultural/Lifestyle change (especially involving employees in the nearby developed areas of the site and vicinity)

Construction

There are no residents and Indigenous People (IP) settlements observed in the project area nor Ancestral Domain claim/Certificate of Ancestral Domain Title (CADT) released within the said area. The land is owned by the proponent. Also, there are no cultural landscapes at the project site that may be affected by the proposed reclamation project. However, during construction, workers may be coming from different communities other than Pasay City. The proponent shall enforce protocols and guidelines (Code of Conduct) for all contracted workers/employees to ensure that no social norms, religious traditions or cultural values are discriminated. The proponent will also ensure that there will be a regular communication with barangay office for incident reporting relating to its workers.

Impacts on Physical Cultural Resources or Historical/Cultural Heritage

Construction Phase

The proposed reclamation project shall not affect the national historical landmarks in Pasay City. There are no physical structures or known archaeological/heritage sites that are to be affected on the proposed reclamation project. Manila has been known as one of the historical sites in the Philippines since World War II. Should the proponent discover artifacts or objects considered as Physical Cultural Resources (PCR), the proponent is committed to following the protocols for chance finds and coordinate with the National Museum through the Cultural Properties Regulation Division or concerned agencies for any chance PCR finds in the project site. The construction activities will be modified to avoid significant archeological, cultural, ceremonial and historic sites.

Threat to delivery of basic services /resource competition

Construction Phase

There is no threat expected to the delivery of basic services or increase in demand for resources during construction. The water and electricity in Pasay City are sufficient to supply its current population. During construction, no water is needed in the reclamation works, except only for domestic use of workers.

During reclamation works/dredging, the proponent shall source its power through onboard generators connected to each vessel.

Operation Phase

Since in-migration is expected once the proposed project is operational, the proponent shall ensure that basic services, such as water, electricity, food, are adequate to cater to new residents and businesses in the expansion area.

Threat to public health and safety

Construction Phase

The construction activities within the project site may have the potential to negatively impact the health and safety of workers and the passing public if not mitigated properly. Unsafe activities and improper use of vehicles and equipment may result in accidents. People may also be exposed to noise, vibration and air pollution while construction is ongoing.

To prevent/minimize threat to public health and safety, the proponent shall require its contractor to strictly follow DOLE's labor laws and policies and to provide the Occupational Health and Safety Management Plan (OHSMP) prior to commencement of work. The contractor must designate a Health and Safety Manager at the project site to ensure conformance of the project to health and safety standards. Other measures that may be implemented are the following:

1. The proponent will secure the area with its own security group.
2. The project site will be fully fenced and will be restricted to workers and authorized personnel only.
3. No workers are permitted to carry firearms or any deadly weapons.
4. The project site will be provided with sanitary facilities and an adequate water system.
5. The dust and emission must be managed well so that the residents/businesses and workers are protected from pollutants (e.g. dust suppression)
6. The workers will be provided with appropriate personal protective equipment (PPE).
7. The construction shall comply with noise and air standards.
8. Implementation of solid waste management and installation of sanitation or toilet facilities at the construction site.
9. Installation of proper safety signage at conspicuous places.
10. Provision of medical station for workers that may require first aid assistance.
11. Installation of closed-circuit televisions (CCTVs) within the project site.

Operation Phase

Once operational, the reclaimed land may be used for residential, commercial and tourism area. An increase in waste generation is anticipated as the project starts its operation. The proponent shall maintain proper coordination with concerned barangays and relevant agencies for compliance of commercial/residential establishments with environmental policies of the LGU (e.g. Solid Waste Management and Water and Sanitation Management). The proponent shall ensure that each commercial/residential establishment has its proper solid waste management, sewerage treatment plant, and proper hygiene and sanitation practices.

For crime prevention, the commercial/residential establishments shall implement its safety and control measures against crime, in coordination with the Philippine National Police (PNP) and Barangay Offices.

Generation of Local Benefits from the project

Construction Phase

The project will require a significant number of workers. The proponent is committed to provide equal employment opportunities to everyone regardless of age and sex. The project would provide an additional source of income, especially for the unemployed residents.

The wages that will be paid during the construction phase will increase the capability of the economically active adults to support their dependents. The recruitment of workers shall be coordinated with the LGU of Pasay City, Barangay 76 and surrounding barangays/cities. Whenever possible, the proponent will use available local labor during the construction and operation phase. The influx of workers would also mean a demand for retail and other services; thereby increasing the income of each barangay.

Operation

The proposed project is not expected to adversely affect the income of the residents, businesses and the LGU. Instead, the proposed project is presumed to enhance business opportunities, tourism activities and associated economic activities in the area. The local economy would benefit as new residents/businesses tend to encourage more consumption, that in turn increases the demand for goods and services. This will also increase the local revenue of the LGU when prompt payment of taxes, and other permits and licenses are paid to Pasay City. Moreover, the additional income for the LGU would mean increase in the provision of basic social services and infrastructure projects for the community of Pasay City.

Gender and Development and Vulnerable Groups

Construction Phase

During construction, the proponent shall include in their IEC the vulnerable groups, business sectors, government and non-government agencies, professionals/academe and the project's Multi-Partite Monitoring team for the project update. The proponent shall conduct public consultation to gather issues and concerns, such as the following:

1. Identify gender issues and concerns involving women, youth, senior citizens, PWDs, fisherfolk, tricycle drivers and other groups that may deemed necessary in the provision of SDP.
2. Encourage the participation of women stakeholders during consultation at various phases of project implementation.

Operation Phase

The proponent shall include the provision of SDP to the direct and indirect impact barangays, especially to the vulnerable groups in the community. The proponent shall undertake the following:

1. Include gender-sensitive design of infrastructure and facilities that caters to the needs of women, LGBTQIA+, senior citizen, children, people with special needs PWDs, and Indigenous People (if any).
2. Encouraged the business sector to provide equal employment opportunities to the vulnerable sectors in Pasay City in terms of recruitment, employment and compensation/benefits.
3. Provision of community-based skills training/livelihood projects.

Traffic Congestion

As discussed during the EIA Review Committee Technical Review Meeting, an amendment of the ECC is needed to include the bridges connecting the reclamation area to the mainland of Pasay. As such, a detailed Traffic Impact and Management Plan Study has to be conducted to include the impact of the traffic; hence, traffic congestion will be very minimal during the pre-construction phase, mostly due to personnel engaged in further study and research within the project area. During the construction phase, increase in traffic congestion will be noticeable near the temporary access road/bridge in J. W. Diokno Boulevard as it will become the entrance/exit of in personnel of the reclamation area.

Construction

During construction, there may be an increase traffic due to the mobilization of heavy vehicles, restriction of roadways, use of access roads to and from the project site during transportation of construction materials and equipment. The proponent shall implement lane designation, speed limit, and trucks deployment schedule. Since the project is an offshore operation, the proponent shall coordinate with the Philippine Coast Guard (PCG) and Philippine Ports Authority (PPA) to prevent navigational routes traffic or collision. Proper implementation of approved Vessel Traffic Management Plan and waterways will be conducted.

To prevent traffic-related accidents, the proponent shall ensure that there are traffic marshals directing the flow of traffic at the project site and ensure installation of traffic signs, warning signs, and safety barriers. Advisories shall be posted at conspicuous places to caution travelers and passengers regarding the planned construction/development. Other measures involve are improvement of road conditions, development of road networks, installation of road and pedestrian safety signs and installation of light posts and CCTVs. Likewise, the proponent shall ensure that vehicle/heavy equipment operators are licensed/certified.

Operation

During operation, a significant increase in traffic volume is expected due to expansion of business/residential areas. Upon completion, 30% of the reclaimed land will be dedicated to new roads, bridges, parks and open spaces. The internal and access roads and bridges in the

reclaimed land will be integrated with the existing access roads and national highways. Moreover, the proponent shall craft/implement a Traffic Management Plan to prevent or minimize traffic congestion and traffic-related accidents.

Reclamation Phase

- Mobilization and operation of construction land vehicles
- Mobilization and operation of marine construction vehicles
- Dredging
- Sand Filling
- Construction of temporary access bridges/ roads

Horizontal Development

- Mobilization and operation of construction land vehicles

The environmental management plan for the identified potential impact is listed in the table below while the complete EPRMP EMP table can be found in **Section 3**.

Loss of employment during abandonment phase/ decommissioning phase of the Project

The proposed project including the reconfiguration is limited to reclamation and horizontal land development and that vertical developments are not covered in this project.

The end of construction activities for reclamation and horizontal development would mean decommissioning/abandonment of temporary facilities such as temporary waste facilities, storages, construction signages, temporary access roads and bridges as discussed in Chapter 7. It is projected that there will be loss of employment of workers at approximately 1,200 to 1,500 workers/employees who were hired for contractual/temporary basis. The workers who would lose their job will be properly compensated based on DOLE rules and other government laws and regulations. For construction workers who resides in Pasay City may be provided with skills training (e.g. Training for Security Guards and Housekeeping) and livelihood training by Pasay City LGU. They may also be endorsed to contractors for vertical development at the same Project site.

Table 2.101 Impact Analysis and Environmental Management – The People

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Displacement of settler/s					
The Project area is offshore; hence, no presence of residential/commercial buildings or houses in the area; no fish sanctuaries or structures.					
In-migration and Proliferation of informal settlers					
Construction Phase - Hiring of Manpower	2021 to 2028	-	Prioritize hiring of local qualified workers from the DIA and IIA Coordination with Pasay LGU to prevent informal settlements in Brgy. 76		Part of Project Cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Cultural/Lifestyle change					
Construction Phase - Hiring of Manpower	2021 to 2028	-	Enforce protocols and guidelines (Code of Conduct) for all contracted workers/employees to ensure that no social norms, religious traditions or cultural values are discriminated. Ensure that there will be a regular communication with barangay office for incident reporting relating to its workers.		Part of Project Cost
Impacts on physical cultural resources					
Construction Phase - Dredging	2021 to 2028	-	When found, artifacts shall be coordinated and turned over to the National Museum.		Part of Project Cost
Threat to delivery of basic services /resource competition					
Construction Phase	2021 to 2028	There is no threat expected to the delivery of basic services or increase in demand for resources during construction. The water and electricity in Pasay City are sufficient to supply its current population. During construction, no water is needed in the reclamation works, except only for domestic use of workers. During reclamation works/dredging, the proponent shall source its power through onboard generators connected to each vessel while standby generators will be used during horizontal development.			
Threat to public health and safety					
Construction Phase	2021 to 2028	Onsite Clinic Emergency Response Plan and Trainings PPEs Sanitation Facilities and proper hauling	Implement a construction safety and management plan. Provision of medical station and standby nurse Create measures to protect workers and community against spread of communicable diseases Provide appropriate safety signs/warning Provision of PPE Conduct emergency preparedness and response trainings		Part of Project Cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
			Restrict site access of visitors or unauthorized personnel to prevent potential construction hazards and damage to equipment or theft Strict security and safety protocols Conduct of safety inductions for Project visitors and for the newly hired personnel Provide adequate water and sanitation facilities to the project site		
Positive Impacts • Generation of Local Benefits from the project, Enhancement of employment and livelihood opportunities, Increased business opportunities and associated economic activities and Increased revenue of LGUs					
Construction Phase	2021 to 2028		Implementation of SDP Prioritize hiring of local qualified workers from the DIA and IIA Prioritize local contractors and local suppliers Coordinate with the LGU's Public Employment Services Office (PESO) with regard to employment of qualified workers/staff Identify issues and concerns involving various sectors as maybe necessary in the provision of SDP.		Part of Project Cost
Potential conflict with PPA					
Construction Phase - Hiring of Manpower	2021 to 2028	-	Close coordination with Philippine Ports Authority (PPA) and Vessel Traffic Management System (VTMS) Proper implementation of approved Vessel Traffic Management Plan and waterways		Part of Project Cost
Construction Phase	2021 to 2028	-	Implementation of Traffic Management Plan which include proper lane designation, speed limit, trucks deployment schedule, traffic signs, CCTV, and traffic marshals among others. Coordinate with the PCG and PPA to prevent navigational routes traffic or collision		Part of Project Cost

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Loss of employment during abandonment phase/ decommissioning phase of the Project					
Construction Phase - End of construction/ reclamation activities End of horizontal development activities	2027 to 2028	-	NA	Payment of Social Benefits subject to DOLE rules. Skills training/livelihood training for construction workers/employees who will be losing employment and residing in Pasay City prior to decommissioning. Endorsement of the displaced construction employees to the contractors of vertical development.	Part of Project Cost

2.4.9. MONITORING PLAN

The environmental monitoring plan for the identified potential impact is summarized in the table below. The complete EPRMP EMoP table can be found in **Section 6**.

Table 2.102 EMoP – The People

Parameters to be Monitored	Sampling and Measurement Plan		
	Method	Frequency	Location
EIS 2017			
Employment of local qualified residents	Record of contractors	Entire reclamation period	NA
Payment of compensation workers	Payment Records	Entire reclamation period	NA
EPRMP 2024			
Occupational safety incidents	Recording of safety incidents	Daily	Reclamation /Construction site
Oil Spill incidents	Recording of Oil Spill Incidents	Daily	Reclamation /Construction site
Implementation of safety guidelines	Recording of incidents	Daily	

3. ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) is an important management tool to ensure that adverse environmental impacts are prevented and positive impacts are enhanced throughout all phases of the project. The EMP documents the Proponent's approach to environmental management and will serve as a guidance document to measure and achieve compliance.

The summary of the modifications made from the EMP of EIS 2017 to EPRMP 2024 is presented in Table 3.2 while the updated EMP can be found in Table 3.14. The updated EMP table summarizes the corresponding preventive and mitigating measures that should be implemented by the City of Pasay, SM Smart City and the contractors to prevent adverse impacts to the environment while this section discusses the potential impacts and mitigations.

The Supplemental Environmental Management Plan (SEMP) for the construction and decommissioning of the temporary support facilities is presented in Table 3.15. The SEM includes activities for the construction and decommissioning of Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets. The supplemental information report which includes the impact and assessment for each of the temporary facilities can be found in Appendix T.

Environmental Regulatory Framework

The environmental regulations that are applicable to the reclamation project is summarized in Table 3.1. The requirements of these regulations are continuously being followed to ensure compliance and to reduce the impact of the projects on the environment.

Table 3.1 Relevant Environmental Laws

Environmental Laws	Particulars
PD No. 1586	The Environmental Impact Statement System **Presidential Decree (PD) No. 1586** titled "Establishing an Environmental Impact Statement System, Including Other Environmental Management Related Measures and for Other Purposes."
DAO 2017-15	Guidelines on Public Participation Under the Philippine Environmental Impact Statement (EIS) System
DAO 2003-27	Details the preparation and submission of a Self-Monitoring Report (SMR). Unless otherwise provided, all covered firms shall submit the SMR on a quarterly basis. SMR covering activities in a quarter shall be submitted within 15 calendar days after the end of the said quarter as may be determined by the DENR-EMB regional office concerned.
Law associated with Air Emissions	

Environmental Laws	Particulars
RA No. 8749	**Republic Act No. 8749**, otherwise known as the Philippine Clean Air Act, is a comprehensive air quality management policy and program which aims to achieve and maintain healthy air for all Filipinos. It also establishes the standards for ambient air quality and emission standards for point sources. The Act contains provisions on empowering ordinary citizens to address situations involving violators and government officials who neglect the performance of their duties. This law mostly provides a general framework for the new air pollution requirements.
DENR Administrative Orders (DAO) for the implementation of the Law on Air Emissions	
DAO 2000-81	Under this order, a valid Permit to Operate must be obtained from DENR for any source of air pollution continuously emitted out to the environment. Air emission and ambient standards are also listed under this order.
DENR Memorandum Circulars (DMC) on Air Emissions	
DMC 2007-03	Provides the implementing rules and regulations for RA. 8749. Details the policy on compliance and permitting for industrial facilities relating to air quality. The frequencies of emission testing for new or existing sources are also specified in this circular.
DMC 2020-17	Guidelines on the issuance of Permit to Operate (PTO) for air pollution source installation or equipment (APSI/APSE) through the online permitting and monitoring system (OPMS)
Laws associated with control of Hazardous Wastes and Substances	
PD 984	**Presidential Decree (PD) No 984** commonly known as the Pollution Control Law that provides the standards for storage, collection, processing, transport and disposal of solid and hazardous wastes
RA 6969	**Republic Act (RA) No 6969** entitled "An Act to Control Toxic Substances and Hazardous and Nuclear Wastes, Providing Penalties for Violations Thereof, and for Other Purposes." This act regulates, prohibits and restricts the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment. This Act also specifies proper handling of toxic substances which includes pre-manufacture and pre-importation requirements.
RA 9003	**Republic Act (RA) No 9003** entitled "An Act Providing for an Ecological Solid Waste Management Program Creating the Necessary Institutional Mechanism and Incentives, Declaring Certain Acts Prohibited and Providing Penalties, Appropriating Funds Therefore, and for Other Purposes." The Ecological Solid Waste Management Act provides the framework for the handling of solid wastes, standards for the establishment of dumpsites, and guidelines for the segregation and recycling of solid wastes.
DENR Administrative Orders (DAO) for the implementation of the Pollution Control Law	
DAO 2014-02	Revised Guidelines for Pollution Control Officer Accreditation – To effectively enforce RA 9275 by establishing linkages among the (1) Department of Environment and Natural Resources, (2) industrial establishments which are potential and actual sources of pollution and (3) local government agencies, and to carry out the national policy of maintaining a reasonable quality of the environment.
DENR Administrative Orders (DAO) for the implementation of the Law on Hazardous Wastes and Substances	
DAO 2001-34	Provides the implementing rules and regulations for RA 9003

Environmental Laws	Particulars
DAO 2004-01	Provides the Chemical Control Order (CCO) for Polychlorinated Biphenyls (PCBs)
DAO 2000-02	Regulates the use and disposal of asbestos
DAO 2019-20	Revised CCO for Mercury and Mercury Compounds
DAO 2013-25	Revised Regulations on the CCO for Ozone-Depleting Substances (ODS)
DAO 2013-22	Revised Procedures and Standards for the Management of Hazardous Wastes (Revising DAO 2004-36)
DAO 2007-23	Implementation of Priority Chemical List (PCL) to regulate the use and importation of selected chemicals such as cadmium acetate
Laws associated with Water Resources	
PD 1067	**Presidential Decree (PD) No 1067** The Water Code of the Philippines, provides the framework relating to the appropriation, control, and conservation of water resources, as well as defines the rights and obligations of water users and water owners. This decree further sets basic laws governing the ownership, utilization, and exploitation of water resources and identifies administrative agencies that will enforce the Code.
RA 9275	**Republic Act (RA) No 9275** Otherwise known as the Clean Water Act of 2004 provides the rules and regulations for the proper implementation of water utilization, protection and conservation to protect water bodies from pollution from land-based sources such as industries and commercial establishments, agriculture and community/household activities.
PD 856	The Code of Sanitation of the Philippines provides the need for updating and codifying our scattered Sanitary Laws to ensure that they are in keeping with modern standards of sanitation and provide a handy reference and guide for their enforcement.
DENR Administrative Orders (DAO) for the implementation of the Law on Water Resources	
DAO 2005-10	Provides the implementing rules and regulations for RA 9275. Under this Order, discharging, injecting or allowing seeping into the soil or subsoil any substance in any form that would pollute groundwater is prohibited.
DAO 2016-08	Water Quality Guidelines and General Effluent Standards of 2016
DAO 2021-19	Updated Water Quality Guidelines (WQG) and General Effluent Standards (GES) for Ammonia, Boron, Total Fecal Coliform, Phosphorus and Sulfate.

Table 3.2 Summary of Changes from EIS 2017 EIS to 2024 EPRMP

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
Pre-Construction – Permitting such as ECC and PRA Board Resolution, among others)	2012 to 2024	The Land - Land Use and Classification	Impact in terms of compatibility with existing land use Project delays	-	Secured ECC (24 Oct 2017), Area Clearance (16 August 2019) And PRA Board Resolution (Series of 2012 and 2013)	Secure applicable permits and clearances from the concerned government offices
Pre-Construction	*NA*	*The Land - Land Use and Classification*	*Impact in existing land tenure issue/s*	*There is no possible tenurial and land issue in the Proposed Project site since the project site is not located into any tenurial instruments such as protected area, forest area, CADT, agricultural area, etc.*		
Pre-Construction – Geotechnical and Feasibility Study Reclamation (construction of islands) and horizontal development (PVDs, construction of storm drainage, etc.)	2017 to 2024 2021 to 2028	The Land - Land Use and Classification The Land - Geology/ Geomorphology The Water – Hydrology/Hydrogeology	Impact on compatibility with classification as an Environmentally Critical Area (ECA) Possible encroachment in the ECA such as natural hazards, flooding, storm surge, etc. Change in surface landform/geomorphology/ topography/ terrain/slope and change in sub-surface geology/underground conditions Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc. Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow Change in stream, lake water depth Change in bathymetry	Reclamation itself provides protection against storm surges and thus against floods. Flood water pathways in Pasay is NOT directed towards the project area, (Per the NOAH Project) Engineering intervention: structural and engineering designs to withstand earthquakes and liquefaction. Phil. standards	EGGAR (2017) Geotechnical Interpretation Report (2017) Hydrodynamic study (2017 and 2024) Flooding Impact Study (2024)	Preparation, consideration and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others to the Project Design. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines. Installation of vertical containment structure, wave deflector, vertical drains, platform elevation, Prefabricated Vertical Drain (PVD) and Surcharging methods which are part of the Soft Soil and ground improvements Implementation of a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years.
Pre-Construction - IEC / Stakeholder Consultations	2021 to 2028	The People	Misinformation / Lack of knowledge about the Project	-	Project billboards/ tarpaulins IECs	Install project billboards IEC campaign Coordination with Pasay City LGU

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
Project Construction – Generation of Solid Waste during reclamation and construction of horizontal development Decommissioning of temporary facilities	2021 to 2028 2027 to 2028	The Land - Land Use and Classification The Land - Pedology	Devaluation of land value as a result of improper solid waste management and other related impacts Generation of hazardous wastes such as used oil, used batteries, contaminated rags, busted bulbs and lamps Change in soil quality/fertility	Oil and lubricants (used or spent) should be collected and treated by TSD facility	All types of waste except are properly segregated and collected by an approved waste service provider Materials Recovery Facility Hazardous Waste Storage A 3rd party DENR-Accredited Waste Service Providers, such as Vertex and RMS, are contacted to collect the solid wastes for disposal to landfill. The contractor has secured memorandum of agreement with DENR-Accredited Sanitary Landfills for the transport of residual waste coming from foreign vessels and has secured disposal agreement with a waste management corporation to handle transport and disposal of residual waste.	Proper collection and segregation of solid waste among vessels, lay-down area and other areas within the project by an accredited third- party waste service provider Proper implementation of hazardous waste management plan. Collected solid waste shall be segregated and collected by a 3rd party hauler.
Construction Phase – Land Clearing activities	*Not Applicable*	*The Land – Terrestrial Ecology*	*Vegetation removal and loss of habitat*	*Not applicable as there are no vegetation - The project site is located in Manila Bay (waters).*		
Project Operations	*2028 onwards*	*The Land – Terrestrial Ecology*	*Vegetation removal and loss of habitat*	*Mitigation and recommendation will depend on the vegetation which will vegetate the area. To hasten the ecological succession, pioneer species such as grasses and beach type trees be used in the re-vegetation of the area. Native trees which may be used include Botong, Talisay and Noni, while grasses such as Crow's Foot Grass and Talahib may be used to stabilize the reclaimed area.*		
Construction activities	2021 to 2028	The Land – Terrestrial Ecology	Threat to existence and/or loss of important local species due to siltation	Avoidance of disturbance of habitat and bird food	Proper planning of executing the dredging and piling up of soil Unnecessary dumping of filling materials in areas not designed to be reclaimed will be avoided Placing coarse sand with low fines content	
Construction activities	2021 to 2028	The Land – Terrestrial Ecology	Threat to abundance, frequency and distribution of important species due to siltation			

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
Construction activities	2021 to 2028	The Land – Terrestrial Ecology	Hindrance to wildlife access due to siltation		Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximizing control possibilities and minimizing turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed	
Construction Phase - Construction of temporary access roads/ bridges from mainland to reclaimed area and between the islands	2025 to 2026	The Water – Hydrology/ Hydrogeology	Alteration of water flow	-	NA	Construction/Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges.
Construction Phase - Maintenance of temporary access roads/ bridges from mainland to reclaimed area and between the islands	2025 to 2027	The Water – Hydrology/ Hydrogeology	Alteration of water flow	-	NA	Maintenance of Steel Sheet pile (SSP) & Baily Bridge openings to strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations contained in the hydrodynamic modelling study and flooding impact study
Construction Phase - Reclamation Works • Dredging works (channel dredging, excavation, dredged material disposal) • Sandkey formation (dredging of sandkey, dredge material disposal, sand replacement) • Sand Filling (Formation of islands and channels, excavation)	2021 to 2028	The Water – Water Quality The Water – Marine Ecology	Degradation of Coastal/ Marine water quality (Turbidity and Siltation) Threat to existence and/or loss of important local species and habitat Threat to abundance, frequency and distribution Oil and grease contamination	Silt curtains/ containment at perimeters Pre-screening of filling materials; possible sourcing from Manila Bay	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: Controlled direct placement by barges Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed	

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
• Soil Improvement (Installation of PVDs, Surcharging, Vibro Compaction) • Reclamation Edge Structure • Construction and Installation of Concrete Wave Wall • Decommissioning of Temporary Facilities Related construction activities in temporary working areas					Proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase. Monitored/ controlled loading and unloading of fill/dredged materials On-site collection and segregation of wastes; strict policy on no shipboard waste disposal at sea Provision of appropriate certifications and permits for fill material extraction activities Pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification. Issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with Turbidity Management Plan. Proper implementation of hazardous waste management plan. Provision of appropriate drip trays. Chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank. Maintenance of hazardous waste storage facility. Provision of appropriate spill kits and booms, in case of accidental spillage Practice good maintenance of machineries and equipment to reduce oil losses.	
Construction Phase • Dredging works (channel dredging, excavation, dredged material disposal) • Sandkey formation (dredging of sandkey, dredge material disposal, sand replacement) • Sand Filling (Formation of islands and channels, excavation) • Soil Improvement (Installation of PVDs,	2021 to 2028 2027 to 2028	The Water – Water Quality The Water – Marine Ecology	Potential accidents causing damages to marine ecosystems	-	Use of sea-worthy vessel approved by MARINA, PCG and appropriate regulatory bodies Installation of adequate navigational devices including early warning system. Avoid and stop transport during inclement weather. Implementation of Typhoon Response Plan. Compliance with MARINA, PCG and international regulations. Proper training of vessel crew and personnel.	

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
Surcharging, Vibro Compaction) • Reclamation Edge Structure • Construction and Installation of Concrete Wave Wall Decommissioning of Temporary Facilities						
Project construction	2021 onwards	The Air - Meteorology/Climatology	Change in the local micro-climate e.g. local temperature	There are no activities that will impact on the local climate particularly temperature. It is significant to note that the construction works will be undertaken for a short period (~2 years). Thus, this short duration is not expected to impact on local climate. The loss of 600,000 sq.m. out of 1,800 sq.km. of the Manila Bay water (reckoned in terms of surface area) is considered insignificant to cause change in local temperature.	Submitted updated reforestation and carbon sink program on August 22, 2023 to DENR EMB CO. Reforestation activity as follows: - 18 October 2023 - Calatagan Mangrove Planting (2,000) - 20 December 2023- Macabebe Mangrove Planting (3,000)	Allotment of PRA 2019-05 requires 5% of the Project Area to be dedicated for green spaces to supplement the Carbon Sink Program. Support to reforestation and greening program activities
Project construction	2021 onwards	The Air - Meteorology/Climatology	Contribution in terms of greenhouse gas emissions (or GHG mitigation potential) Note: applicable only for projects with significant GHG emissions			
Construction Phase • Excavation • Dredging and Filling Mobilization of vehicles and vessels • Use of gensets • Construction of support facilities and Horizontal Development Decommissioning of Temporary Facilities	2021 to 2025 2026 to 2028 2027 and 2028	The Air – Air Quality (& Noise)	Degradation of air quality Emissions if power generating sets used and fossil fuel using equipment	Use of quality fuel Proper maintenance of gensets	Conduct dust suppression activities, e.g. green net installation and water truck sprinkling or road spraying (3 times or more as needed per day during dry season)	
		The Air – Air Quality (& Noise)	Increase in ambient noise level	Temporary-construction - short time only	Ensure mufflers are installed in all equipment. Conduct regular preventive maintenance servicing.	
Preconstruction Phase	*2017*	*The People*	*Displacement of settler/s*	*The Project area is offshore; hence, no presence of residential/commercial buildings or houses in the area; no fish sanctuaries or structures.*		

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
Construction Phase - Hiring of Manpower	2021 to 2028	The People	In-migration Proliferation of informal settlers	-	Prioritize hiring of local qualified workers from the DIA and IIA Coordination with Pasay LGU to prevent informal settlements in Brgy. 76	
Construction Phase – Hiring of Manpower	2021 to 2028	The People	Cultural/Lifestyle change	-	Enforce protocols and guidelines (Code of Conduct) for all contracted workers/employees to ensure that no social norms, religious traditions or cultural values are discriminated. Ensure that there will be a regular communication with barangay office for incident reporting relating to its workers.	
Construction Phase - Dredging	2021 to 2027	The People	Impacts on physical cultural resources	-	When found, artifacts shall be coordinated and turned over to the National Museum.	
Construction Phase	*2021 to 2028*	*The People*	*Threat to delivery of basic services /resource competition*	*There is no threat expected to the delivery of basic services or increase in demand for resources during construction. The water and electricity in Pasay City are sufficient to supply its current population. During construction, no water is needed in the reclamation works, except only for domestic use of workers.* *During reclamation works/dredging, the proponent shall source its power through onboard generators connected to each vessel while standby generators will be used during horizontal development.*		
Construction Phase	2021 to 2028	The People	Threat to public health and safety	-	Onsite Clinic Emergency Response Plan and Trainings PPEs Sanitation Facilities and proper hauling	Implement a construction safety and management plan. Provision of medical station and standby nurse Create measures to protect workers and community against spread of communicable diseases Provide appropriate safety signs/warning Provision of PPE Conduct emergency preparedness and response trainings Restrict site access of visitors or unauthorized personnel to prevent potential construction hazards and damage to equipment or theft Provide adequate water and sanitation facilities to the project site Conduct of safety inductions for Project visitors and for the newly hired personnel
Construction Phase	2021 to 2028	The People	Generation of Local Benefits from the project	Enhancement	Implementation of SDP	Prioritize hiring of local qualified workers from the DIA and IIA

Project Components/ Activities	Inclusive Dates	Environmental Components to be Impacted	Potential Impacts	Mitigating Measures		
				EIS 2017 (Original Landform)	Implemented/ Existing (2021 to present)	EPRMP 2024 (Project Reconfiguration)
			Enhancement of employment and livelihood opportunities Increased business opportunities and associated economic activities Increased revenue of LGUs			Prioritize local contractors and local suppliers Coordinate with the LGU's Public Employment Services Office (PESO) with regard to employment of qualified workers/staff Identify issues and concerns involving various sectors as maybe necessary in the provision of SDP.
Construction Phase	2021 to 2028	The People	Potential conflict with PPA	-	Close coordination with Philippine Ports Authority (PPA) and Vessel Traffic Management System (VTMS) Proper implementation of approved Vessel Traffic Management Plan and waterways	
Construction Phase	2021 to 2028	The People	Traffic density increase and Traffic-related Accidents (for both marine vessel and land vehicles)	-	Implementation of Traffic Management Plan which include proper lane designation, speed limit, trucks deployment schedule, traffic signs, CCTV, and traffic marshals among others. Coordinate with the PCG and PPA to prevent navigational routes traffic or collision	
Construction Phase - Horizontal Development (include major/primary access roads and bridges, open spaces, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems)	2026 to 2028	All Modules	As identified above	Not specified	To be implemented	See Table 3.14
Construction Phase - End of construction/ reclamation activities End of horizontal development activities	2027 2028	The People	Loss of employment	-	NA	Payment of social benefits subject to DOLE rules. Skills training/livelihood training for construction workers/employees who will be losing employment and residing in Pasay City prior to decommissioning. Endorsement of the displaced construction employees to the contractors of vertical development

3.1. THE LAND

3.1.1. LAND USE AND CLASSIFICATION

Impact in terms of Compatibility with Existing Land Use

The Pasay City-LGU is in the final stages of updating its 2014-2022 CLUP referred to as the Comprehensive Land, Water, and Air Use Plan (CLWAUP) covering the period 2023-2034. It is important to note that the CLWAUP, already reflects the three-island configuration of reclamation project with SM SCIDC including the two islands jointly undertaken by the Pasay City with the Pasay Harbor City Corporation. It also incorporates the proposed reclamation islands that the Pasay City intends to carry out in the future.

The proof of authority and compatibility over the project site of the proponent are the following:

- Memorandums of Agreement ("MOA") between Philippine Reclamation Authority ("PRA") and the City Government of Pasay ("Pasay City") on which the total land area to be reclaimed is 360 hectares;
- Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc.;
- PRA approval of the Proposed Land Form;
- Area Clearance: AC-NCR-2019-003;
- Previously issued ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017;
- The CLUP and its Zoning Ordinance which identify the development of new coastal reclamation areas supporting the goals of Pasay City; and the
- BFAR Authorization to implement the Comprehensive Coastal and Sea Use Plan.

Hence, the reconfiguration project boundary shows no inconsistency in the land and water use of the City.

Encroachment in Environmentally Critical Areas (ECAs)

The project site is located within two (2) environmentally critical areas as defined in the EMB Memorandum Circular (MC) 2014-005 - Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System which. The two ECAs category are (1) Areas frequently visited or hard-hit by natural calamities (Prone to Ground Shaking and Ashfall) and (2) water bodies. The project area is prone to ground shaking hazards due to the presence of several earthquake generators.

Since the project site will be located in water that will be reclaimed, encroachment to ECA category of Natural Hazards can be mitigated through proper design and engineering. Geotechnical Interpretation Report were prepared that includes the more detailed geotechnical marine soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor. The project also has taken into consideration the recommendations from the Engineering Geological and Geohazard Assessment Report (EGGAR) report and that the proposed reclamation project is suitable for the intended purpose and development.

Possible tenurial / land and water issue

There is no possible tenurial and land issue in the Proposed Project site since the project site is not located into any tenurial instruments such as protected area, forest area, CADT, agricultural area, etc. The project EIS original configuration has also obtained an Area Clearance for its reclamation component.

The project site is not being used in any of the following water-based activities or projects:

- As navigational lane;
- As areas for significant or commercial fishing;
- As port;
- As a water-based settlement (e.g. boat people);
- As a source of bulk water supply; and
- As a source of commercial/economic supply of fish and other marine species.

The splitting of the 2017-approved 300-hectare Island B (hereinafter referred to as “Original Island B”) of the Project to create the Reconfigured Islands B and C will feature a water channel in between, thereby allowing the free flow of water from Libertad Channel to Manila Bay.

Impairment to Visual Settings

Primarily because the on-going reclamation activities and proposed horizontal civil works are sea-based, Project 360 will not have notable visual impairment and intrusion impacts since there are no significant seaward landform structures. At most, the seaward concern will be the annoyance of visitors within the adjacent land areas interested in the world-famous Manila Bay sunset. However, this concern is considered to be short term and will wane once the reclamation and horizontal works are completed. The landward visual intrusion from the sea will likewise be insignificant. Once the reclamation and horizontal development are completed, it is expected that Project 360 will enhance the visual quality of the Manila Bay coastal waters and nearby land areas.

3.1.2. GEOLOGY/ GEOMORPHOLOGY

Change in surface landform/topography/ terrain/slope, Change in sub-surface/ underground geomorphology

The sub-surface geology will experience changes but in the nature of enhancement because of the replacement of portion of the sea bed with fill materials. The extent of which will follow the recommendations of the geotechnical investigation, hydrodynamic modelling, flood study and EGGAR.

No changes in the onshore portion as the Project is a reclamation. Only the coastal geomorphology will change due to excavations of undesirable soil materials which will be replaced by good quality sands.

Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.

It is important to note that the project will not undertake ground water extraction. Hence, the project will not cause or contribute to land subsidence. During the reclamation phase, there

will be minimal water usage such being accounted for by the needs of the construction workers, the reclamation works being a “dry process”.

In areas of Manila where the thickness of the soft soil may be anywhere from less than ten to thirty meters, subsidence is much less because it is mainly due to secondary consolidation. Most importantly, the technology exists from reliably estimating and taking into account ground subsidence in the area proposed to be reclaimed. The very soft clayey silt and clay encountered at the proposed areas to be reclaimed which are of poor quality will be excavated and replaced with good quality sand. The reclaimed area will be raised to a height, above mean sea level.

Based on available geotechnical/soil investigation report, the project area is underlain by very loose to loose sand with very soft to soft silt from top to depth of 12 meters to 15 meters in some locations. From these depths the soils down to 15 meters and 16.5 meters are either hard silt or very dense gravel followed by highly fractured, weathered siltstone and/or sandstone. In its natural conditions the soils are subject to subsidence and liquefaction. The undesirable soils at the upper 15 to 16.5 meters will be excavated and replaced by good quality sand which will be subjected to compaction (including application of pre-fabricated sand drains and surcharge). During the reclamation phase whereby based on geotechnical investigation the appropriate methodology will be accordingly adopted. Soil consolidation shall be duly undertaken. The reclaimed land will necessarily have to be stabilized prior to construction of both horizontal and vertical structures during the operations phase. The reclaimed area can only be used if it has already reached the required degree of compaction. The compacted sands can already be considered as very dense sands.

The existing subsoil and fill material have been assessed for liquefaction potential through the EGGAR and DED. The existing subsoils are clay and not liquifiable. The reclamation fill is granular and is liquifiable if not improved. The construction specifications include compaction requirements to densify the fill and prevent liquefaction. Prefabricated Vertical Drain (PVD) and Surcharging are methods part of the Soft Soil and ground improvements. These are part of the works required to accelerate consolidation, reduce residual settlement, improve geotechnical stability and reduce susceptibility for liquefaction. PVD is installed for the acceleration of the design settlements and enhance the strength of the soil by assisting in the drainage of water which allows the soil to consolidate faster. Temporary surcharge will be then placed in combination with PVD to meet the residual settlement requirement. The temporary surcharge load will further accelerate the consolidation process (SA2 2023 CMVR & Royal HaskoningDHV, DED Report, 2019).

3.1.3. PEDOLOGY

Soil erosion / Loss of topsoil/overburden

A qualitative assessment has been carried out by Royal HaskoningDHV to investigate the effects of the land reclamation (both presence and construction phases). Limited local erosion around the land reclamation has to be expected due to increasing currents. It is not very likely that the presence of the land reclamation will impact the coastline morphology and/or Bacoor

Bay. The dredging and dumping during construction, however, can result in a temporary dispersion and thus increase of fine sediments in the water column of Manila Bay.

Storm drainage system, concrete culverts, and other erosion control measures were incorporated in the Detailed Engineering Design (DED) of the Project, and will be included in the Project's final Master Development Plan. Dredged and filled materials, if applicable will be properly stockpiled to avoid soil erosion or run-off.

Change in soil quality/fertility

The implementation of the reconfiguration activities includes generation of solid domestic waste from the contractors, as well as accumulation solid waste from the sea which include plastic, woods and tree branches, etc. that may pose changes in the quality of the soil when not properly managed.

A waste management system is already being practice for the Project. The on-site waste management involves process and practices used to handle, segregate, and dispose of waste materials generated on site and wastes from the sea. The collected wastes are stored and segregated in a Materials Recovery Facility (MRF) until disposal by DENR-accredited waste service providers. The MRF is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes. The MRF also has a designated hazardous waste section, consists of 3 partially closed areas for liquid and solid hazardous wastes as shown in Plate 3-1. The project generates various hazardous wastes such as used oil and other oily wastes e.g., contaminated rags and gloves. The facility is designed to provide open-air ventilation to the stored hazardous waste. Secondary containment, such as drip trays, is provided inside the hazardous waste storage area for liquid hazardous wastes. Spill kits, fire extinguishers, gloves, eye protection, and hazard signages are also provided. Permit-To-Transport and Certificates of Treatment are also posted in the hazardous waste storage area.

A 3rd party DENR-Accredited Waste Service Providers, such as Vertex and RMS, are contacted to collect the solid wastes for disposal to landfill. The dredging activity on Island A includes extraction of previously installed PVD materials. These extracted PVDs are stored in a temporary stockpile for drying before disposal.



Plate 3-1 Existing Materials Recovery Facility and Hazardous Waste Storage in the Project Site

Most active works will be at sea. All types of waste except Sewage Treatment Plant (STP) wastes will be properly segregated and collected by an approved waste service provider. Waste

bins were painted according to waste classification and strategically placed on its designated waste management area. The contractor has secured memorandum of agreement with DENR-Accredited Sanitary Landfills for the transport of residual waste coming from foreign vessels and has secured disposal agreement with a waste management corporation to handle transport and disposal of residual waste. STP disposal of all vessels will be properly monitored and siphoned by an accredited hauler. A certificate of treatment for the hauling of the portalets will be secured and documented. The onshore and offshore existing waste management practice is shown in Plate 3-2.

Dredged waste materials will be disposed at an identified disposal area (Philippine Coast Guard approved/ permitted) outside Manila Bay.

Chemicals that will be used in the project implementation activities will have its own storage that is segregated and stored properly. Both the chemical and hazardous waste will have its own inventory. Regular Spill Kit inspection and inventory is also currently being implemented.

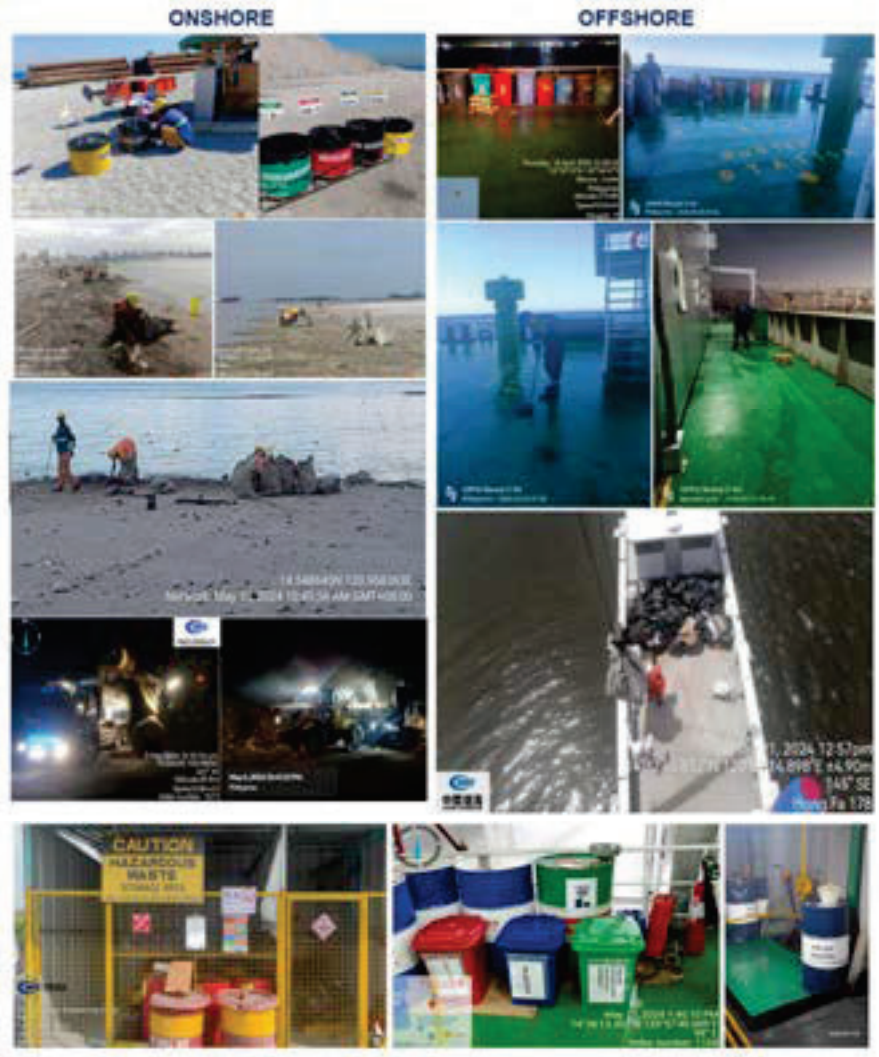


Plate 3-2 Onshore and Offshore Waste Management Practice

3.1.4. TERRESTRIAL ECOLOGY

As observed during the primary survey, vegetation within the Project Site was still in its initial growth process. Hence, mitigation and recommendation will depend on the vegetation which will vegetate the area. To hasten the ecological succession, pioneer species such as grasses and beach type trees be used in the re-vegetation of the area. Native trees which may be used include Botong, Talisay and Noni, while grasses such as Crow's Foot Grass and Talahib may be used to stabilize the reclaimed area.

Most of the identified avifauna species during the site assessment were migratory waterbirds. One of the important indicators for monitoring wetland quality was the diversity of waterbirds within the area[13]. In line with this, the Land Reclamation Project would most likely impact the identified waterbird species in the area.

As identified during the site survey, the top species in terms of abundance within the Project Site were Little Egret (*Egretta garzetta*) and Whiskered Tern (*Chlidonias hybrida*), both classified as waterbirds. In terms of diet, both species were feeding on small fish and other food sources present in aquatic areas[14].

Siltation would most likely occur in water bodies near the coast during the land reclamation. In line with this, the abundance of fish and other aquatic food sources within the area would decline, resulting in the decrease of feeding grounds for the present aquatic avifauna species. As such, waterbirds would most likely disperse and look for more suitable area for feeding and breeding, resulting in temporary decline of avifauna species within the area.

To mitigate such impact, it was recommended to apply a proper planning of executing the dredging and piling up of soil. Unnecessary dumping of soil in areas not designed to be reclaimed should be avoided since this will further decrease the feeding grounds of aquatic avifauna species.

For terrestrial Flora and fauna, no species will be harmed in the development of the area.

Vegetation Removal and Loss of Habitat

Since the Project is reclamation of coastal area, vegetation removal will not occur.

[13] Wang, Z., Li, N., Gao, S. & An, S. (2020). *Response of wintering waterbird diversity to reclamation history and post-reclamation habitat along Yellow Sea coast*. https://doi.org/10.1111/1749-4877.12464
[14] del Hoyo, J., Andrew, E., & Sargatal, J. (1992). *Handbook of the Birds of the World.* Barcelona: Lynx Edicions.

Threat to existence and/or loss of important local species

No flora species will be affected by the impacts brought about by the Project. However, Impacts will mostly be pressed towards waterbirds since the disturbance will likely decrease the feeding behaviors of birds along the coast. Increased turbidity of the waters due to sediments and oil spills may impede visual cues for birds who mainly feed on fish and snails. As such, sedimentation should properly be addressed by engineering measures to minimize the disturbance on birds. On the other hand, heavy equipment and boats should be properly maintained to prevent Oil leakage/ spillage into the sea.

Threat to abundance, frequency, and distribution of important species

No threats to populations of flora species since the Project is a reclamation Project. During construction, populations of birds may decrease due to increased turbidity of waters, and noise coming from boats and heavy equipment. These birds will temporarily be displaced to nearby areas where there is less disturbance. Nearby greenspaces should be maintained and improved so as to let the areas accommodate those birds which will be affected by the disturbance. Reclaimed areas should also be planted with native and endemic species to promote the increase of populations of not only flora, but also fauna within the Project site. Also, to minimize noise in the Project area, noise cancelling devices should be used.

For the development of green spaces within the area, recommended species for planting are beach-type endemic flora species. The recommended species are the *Dischidia platyphylla*, *Salacia wenzelii*, and *Cynometra* ramiflora var. bifoliata among othersNon-beach endemic species which can also be used for re-vegetation of the reclaimed area are the Artocarpus blancoi, *Wallaceodendron celebicum*, *Sindora supa*, *Dillenia Philippinensis*, *Voacanga globosa* and *Dillenia luzonensis*. Endemic and indigenous species which can be used for greening is presented in Table 3.3.

Table 3.3 Tree Species for Consideration for the Establishment of the Green Spaces

Family Name	*Scientific Name*	Common Name	Geographic Distribution
Apcoynaceae	*Dischidia platyphylla*	Timbang-timbang	Endemic
Celastraceae	*Salacia wenzelii*	Bulag-iyot	Endemic
Fabaceae	*Cynometra ramiflora var. bifoliata*	Balitbitan	Endemic
Moraceae	*Artocarpus blancoi*	Antipolo	Endemic
Fabaceae	*Wallaceodendron celebicum*	Banuyo	Endemic
Fabaceae	*Sindora supa*	Supa	Endemic
Dilleniaceae	*Dillenia philippinensis*	Katmon	Endemic
Apocynaceae	*Voacanga globosa*	Bayag-Usa	Endemic
Dilleniaceae	*Dillenia luzonensis*	Malakatmon	Endemic
Apocynaceae	*Alstonia scholaris*	Dita	Indigenous
Apocynaceae	*Cerbera manghas*	Manghas	Indigenous
Calophyllaceae	*Calophyllum inophyllum L.*	Bitaog	Indigenous
Casuarinaceae	*Casuarina equisetifolia*	Agoho	Indigenous

Family Name	*Scientific Name*	Common Name	Geographic Distribution
Clusiaceae	*Cratoxylum sumatranum ssp. Sumatranum*	Paguringon	Indigenous
Clusiaceae	*Cratoxylum formosum*	Salingogon	Indigenous
Euphorbiaceae	*Macaranga tanarius*	Binunga	Indigenous
Fabaceae	*Albizia procera*	Akleng parang	Indigenous
Fabaceae	*Erythrina variegata*	Dapdap	Indigenous
Fabaceae	*Intsia bijuga*	Ipil	Indigenous
Fabaceae	*Millettia pinnata*	Bani	Indigenous
Lecythidaceae	*Barringtonia acutangula*	Botong botong	Indigenous
Lecythidaceae	*Barringtonia asiatica*	Botong	Indigenous
Lecythidaceae	*Barringtonia racemosa*	Mambog	Indigenous
Melastomataceae	*Melastoma malabathricum*	Malatungaw	Indigenous
Meliaceae	*Melia azedarach*	Bagalunga	Indigenous
Moraceae	*Ficus septica*	Hauili	Indigenous
Rubiaceae	*Ixora philippinensis*	-	Indigenous
Rubiaceae	*Morinda citrifolia*	Bangkoro	Indigenous
Sterculiaceae	*Heritiera littoralis*	Dungon-late	Indigenous
Verbenaceae	*Vitex parviflora*	Molave	Indigenous
Vitaceae	*Leea manillensis*	Mali-mali	Indigenous

For enrichment planting of mangroves, the Joint Technical Bulletin of ERDB and BMB No. 2017-01 may be followed as basis for mangrove ecosystems near the reclaimed area. This bulletin covers which species can be planted in the different zonations within and near mangrove ecosystems. Suggested mangrove species are shown in Figure 3.1.

Zonation	Species
Seaward to Landward	*Sonneratia alba* Sm. (Pagatpat) *Avicennia marina* Forssk. Vierh. (Bungalon) *Rhizophora stylosa* Griff. (Bakawan bato- seaward at the back of *S. alba* and *A. marina*) *Aegiceras floridum* Roem. And Schult. (Tinduk-tindukan - rocky to s substrate)
Middleward to Landward	*Ceriops tagal* Perr. C.B. Robb. (Tangal-most preferred) *Ceriops zippeliana* Blume (Malatangal) *Avicennia marina var. rhumpiana* Forssk. Vierh. (Piapi) *Avicennia officinalis* L. K.D. Koenig (Api-api) *Aegiceras corniculatum* Lour. Poir. (Saging-saging) *Bruguiera sexangula* (L.) Lam (Pototan) *Bruguiera gymnorhiza* (J.F. Gmel.) Blume (Busain) *Bruguiera cylindrica* (L.) Blume. (Pototan lalaki) *Bruguiera parviflora* Roxb. With. & Arn. Ex. Griff (Langarai) *Heritiera littoralis* Aiton (Dungon-late) *Xylocarpus granatum* J. Koenig (Tabigi) *Xylocarpus moluccensis* (Lam.) M. Ruem (Piagau) *Rhizophora apiculata* Blume (Bakawan lalake)
Riverine-upstream	*Sonneratia caseolaris* (L.) Engl. (Pedada) *Nypa fruticans* Wumb. (Nipa) *Rhizophora mucronata* Lam. (Bakawan babae)

Figure 3.1 Suggested Mangrove Species
Source/ Reference: ERDB and BMB TB No. 2017-01

Hindrance to wildlife access

To date, there are no recorded mammals and birds listed along the coast near the project area. Thus, there will be no effects on these faunal groups. However, majority of the disturbances will be experienced by water-birds since primary activities of these birds are near the coastal areas. Disruption of their activities will be temporarily experienced during the construction phase, and some will need to relocate to other areas with less disturbance. Since birds are highly mobile, they are able to seek areas with less disturbances.

Noise cancelling devices should abe used for heavy equipment to prevent disturbances to resident and passing birds.

3.2. THE WATER

3.2.1. HYDROLOGY/ HYDROGEOLOGY

Change in drainage morphology / Inducement of flooding/ Reduction in stream volumetric flow, Change in stream, lake water depth

The project reconfiguration aims to enhance the water circulation and further mitigate the impact of flooding in the project site. The Sand consisting of a portion of the Current Island A will be removed and transferred to the Current Channel between the Current Island A and Island B, thereby creating the 476-meter wide Reconfigured Channel between the Reconfigured Island A and Pasay City mainland/CCP Complex Area. All of the sand removed

from a portion of the Current Island A will be placed only on the above-mentioned Current Channel. Splitting of the Current Island B of the Project to create the Reconfigured Islands B and C and a channel in between, allowing the free flow of water from Libertad Channel to Manila Bay.

Royal HaskoningDHV conducted an update of the Hydrodynamic Modelling Study (typhoon analysis) considering the changed island boundaries. The main objective of that study is to provide an updated analysis of the hydraulic design conditions along the boundaries of the revised layout. Subsequently, wave penetration modelling was carried out to assess the wave heights in the channels between the islands. The wave penetration into the channels was modelled using the open-source numerical model SWASH (Simulating Waves till Shore). Finally, also a flushing study was conducted, the objective of the flushing study is to provide insight into the flushing time of the water in the channels in between the proposed layout. This flushing time is used as an indication to estimate potential water quality issues due to the construction of the islands.

Based from the SWASH results, the new islands will result in a sheltering effect, protecting the existing mainland from direct wave impact. As a result, the flood risk of the existing land due to overtopping water (from waves) will significantly reduce.

Based on the Hydrodynamic Modeling done by Royal Haskoning the Project does not block, impede or disturb the drainage system and thus does not impact on the occurrence of flooding. The buffer zone between the reclamation and the shore and the northern boundary of the other reclamation area provides a much wider drainage area than that of the Libertad Channel itself.

On the other hand, the results show that there is a slight increase in storm surge (still water level) due to the presence of the new islands. When a storm comes in from the north-west, and water levels are pushed up due to the strong storm winds, because of this “tunnel” water levels will be pushed up slightly more compared to a situation without any new islands. The increase in surge level is minimal and ranges from 0.01m at point 4 to 0.11m at point 2. It also shows that the surge level increase dampens from point 2 (0.11m) to point 3 (0.05m) i.e. by 0.06m. The other cause of flood is storm surge; it could bring about flood water from the sea. On the other hand, the project is not a cause of storm surges. In fact, the proposed project could shelter the shore areas from flood. Further, flooding will not impact on the reclaimed land itself because of the high finished platform level of 4.0 meters above mean sea level (MAMSL).

In the existing situation without presence of the new islands, during severe storm conditions (typhoon) waves will hit the land in full force. Such waves combined with high water levels (storm surge) result in large quantities off water to overtop the coastal defense resulting in local flooding of the nearshore areas.

The proposed islands will have a positive impact on the hinterland in terms of protection against these waves. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves. As the proposed islands are to be constructed in front of the hinterland, the new islands will absorb most of the wave impact during storm conditions and will significantly reduce the wave

impact (hence overtopping water) on the existing hinterland. This has a positive effect and reduces flood risks in the existing nearshore areas.

Drainage System

The primary goal of the stormwater drainage system is to safely convey, collect, and divert runoff from roads and pedestrian areas into the designated drainage system, preventing flooding within the development. This system manages natural surface runoff, surface drainage from paved or artificially impervious surfaces, excess rainwater, stormwater, kitchen water, bath/shower water, and similar types of water. All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines.

Individual and/or centralized treating system is proposed for construction at Islands A, B, and C. The storm drainage system includes gullies, U-channels, manholes, pipes, box culverts, and outfalls. Stormwater will be collected by gullies or U-channels with grating covers and transported via pipes or box culverts. The storm drainage pipelines are designed for a rainfall return period of 1 in 10 years. According to BS EN 752 Part 4 Table 2, the runoff coefficient ranges from 0 to 1, depending on the pavement type. For this project, a coefficient of 0.9 will be used for roads and buildings due to their impermeable nature, and a coefficient of 0.2 for green areas due to their permeable nature. A rainwater tank will be installed before each outfall, with overflow stormwater being discharged directly into the sea. Storm drainage manholes will be made of reinforced concrete with manhole covers 800mm in diameter.

The design will ensure drainage and stormwater collection along the entire road system. To address environmental concerns related to disposing of storm runoff directly into Manila Bay, the proponent will implement a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. This system may include swales instead of concrete/PVC drainage pipes, allowing infiltration, constructing cisterns for storage, and similar initiatives. Appropriate engineering interventions, such as installing cast iron grills along gutters and curbs, will minimize, if not eliminate, conditions like siltation, debris, scouring, and other factors that may impede the free flow of stormwater to designated drainage lines and cause flooding within the development. Porous materials such as grass/turf pavers, paving blocks, or similar materials will be used in areas fronting the sea and along the proposed linear forest to encourage infiltration and reduce surface runoff.

As to the flood risk impact of the new islands, the flood impact study revealed that “by offsetting the new islands from the existing hinterland with 250m to 470m, there is no direct blockage of any outfalls or channels. Hence, the proposed islands do not block the flow and will not cause locally increased water level. Specifically, for Libertad Channel, any impact on water levels due to the new islands will not progress upstream of the Libertad Pumping Station. As stated in the (2017) EIS study (refer to Section 2.2.3) flooding in the areas is mainly caused by the upstream channels being clogged by solid wastes, which was verified and confirmed by residents during our site visit

Verification Of Flushing Time for Temporary Access Bridges Through Flushing Study

A separate flushing study (which can be found in Annex D of Appendix T) was conducted to verify the impact of the proposed temporary access bridges on water circulation during the construction phase. The following are the temporary access bridges considered:

1) The 476m wide temporary access bridge in the north-south (N-S) channel connecting island AB with the hinterland; and
2) The 180m wide temporary access bridge in the east-west (E-W) channel connecting islands AB and C.

A. Key findings/ conclusion:

- During the rainy season, water moves quickly through the N-S and E-W channels, clearing out in less than 4 days. This means the temporary access bridges do not hinder the water flow.
- In the dry season, water in the larger N-S channel moves at an acceptable rate, fully refreshing in 10 days. The E-W channel takes slightly longer at 11 days. However, it should be noted that the E-W channel will be situated far from the existing land, and no developments have yet been constructed on the islands. Temporary water quality issues in that channel would not cause hindrance, and can easily be mitigated through constant monitoring and cleaning of the water channel, in case of excessive algal bloom.
- Considering that this is only a temporary condition during a construction stage of approximately 18 months, we can conclude that the proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-S channel (476m wide), still allow an adequate water exchange in between the islands.

B. Comparative Summary of Results of Flushing Studies

Table 3.4 Comparative Summary of Results of Flushing Study

Project activities	Layout	Flushing Time	Remarks
During Construction	Updated Pasay 360 Island A&B and C (470m wide channel and all channel bed levels at -6m MSL) + proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-Schannel (476m wide)	Day-10 to 11	Acceptable (for temporary condition)
Post Construction	Updated Pasay 360 Island A&B and C (470m wide channel and all channel bed levels at -6m MSL) + PHCC Island A and B	Day-8	Acceptable

Depletion of water resources / competition in water use

In the absence of major water use by the project and of any underground water abstraction there will be no competition in water use. There are no springs and wells at the site and aquifers are absent; depths of water table are not relevant to this project. The water needs of the construction employees will be provided in bottled water and in small water tanks. The construction crew will be based or housed in the self-contained dredging vessels.

3.2.2. WATER QUALITY

Degradation of Groundwater Quality

The project will not use groundwater and neither will it cause disturbance or damage to the groundwater/aquifer system which is absent at the project site.

Degradation of Surface and Coastal/Marine Water Quality

The Project is comprised of multiple elements including dredging of an access channel, swing basins, excess sands and borrow area, and placement of dredged material offshore or at the reclamation area which may results to silt dispersal, increase in turbidity due to seabed disturbance or degradation of marine water quality. A turbidity study for the proposed development was conducted by the Contractor in 2020. The study contains details of the conducted 3-dimensional hydrodynamic and sediment plume model. The study recommended a series of measures through the formulation of Turbidity Management Plan to comply with all associated environmental requirements within a management system. As explained by Contractor, the silt curtains may not be appropriate at present due to navigation safety, and other concerns.

Turbidity Control

The construction of Pasay 360 islands may cause an increase in suspended sediment in the environment during construction, due to the wash out of fine sediment during the reclamation process. This increase in suspended sediment is referred to as a sediment plume. Those plumes are transported with the flow and by wind effects. An increased suspended sediment concentration during construction can lead to environmental effects for sensitive receivers, such as the Las Piñas mangrove area.

To reduce as much as possible the increase in suspended sediments, or in other words to reduce the increase in turbidity, the following measures are taken:

- Sand is being sourced from borrow areas generally containing coarser sand with low fines content
    - Larger particles settle faster resulting in reduced turbidity levels
    - Low fines (these are the smallest sand particles) means reduced turbidity levels
- Creating a sheltered (bunded) area wherein material is placed (outer contours of the islands are created first) in which suspended sediments will be contained, reducing the spreading of increased turbidity
- Material is placed in a more controlled manner within the project boundaries:
    - Controlled placement by barges (less water in the mix results in the sand to drop faster to the seabed)
    - Controlled placement by spreader pontoon (placement happens near the water line, reducing creating particles to get into suspension)
- Rehandling of material, for example as required for the removal of Island A (creating the 476m wide channel), happens sheltered, material is pumped through pipelines

where no turbidity can exist and is discharged on land maximising control possibilities and minimising risk of increased turbidity levels

- Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded
- A detailed Turbidity Management Plan (Appendix S) is being followed

For this specific project using silt screens is inefficient, causes logistical challenges and poses safety risks:

- Open sea conditions with waves and currents makes it difficult to keep a silt screen in place. Silt screens will hinder the equipment (vessels) working at Site, resulting in:
- Complex and ineffective placement of sand hence longer construction duration
- Safety hazard, risk of collisions and reduced manoeuvring space in case of emergency
- Silt screens may not provide a good solution for controlling turbidity, as they cannot be kept in place over the entire water column, as the water depth is ranging from 5 to 20m in the project area
- The size of the reclamation is enormous, with sand placement going on simultaneously in multiple locations. It is almost impossible to have silt screens preventing increased turbidity from such a large area

The challenges of using silt screens are not new, reference is made to literature available online: “IADC: The art of screening: Effectiveness of silt screens”.



CONCLUSIONS

This article aims to treat the effectiveness of silt screens in an integral way. Main insights on silt screen effectiveness are:

- Hanging silt screens in an open configuration do not achieve a significantly positive performance in mitigating the potential environmental impact of suspended sediment, regardless of local flow conditions and silt screen geometry.
- Silt screen effectiveness must be rated with a reference effectiveness parameter (comparing the situation with and without silt screen), not with an inflow effectiveness parameter (comparing downstream with upstream of the silt screen) as has always been done up to now.
  Hanging silt screens often have a positive inflow effectiveness, but this study shows that in the case of a current, even with a positive inflow effectiveness, it would have been better to have no hanging silt screen at all. The reference effectiveness is not positive.
- Flow contraction underneath hanging silt screens actually leads to enhanced erosion if erodible bed material is available.
- Silt screens in an open configuration give rise to a significant amount of horizontal flow diversion, which counteracts the intended use of silt screens as a vertical current deflector.
- Adaptive management strategies are a viable alternative to the application of silt screens.

The conclusion of this study is that hanging silt screens in an open configuration, as often applied in present-day dredging practice, are not effective in reducing the environmental impact of dredging projects.

The recommendation is to integrate the insights about silt screen effectiveness as described here in the decision making process regarding mitigation of potential environmental impact of suspended sediments, using a receptor-based approach and adaptive management strategies. Relying solely on silt screens, even when local conditions ensure that their effectiveness is negligible (or even adverse), hinders progress in the protection of the marine environment.

Figure 3.2 Snippets from IADC: The art of screening: Effectiveness of silt screens
Source: M. Radermacher et.al. The Art of Screening Effectiveness of Silt Screens. https://www.iadc-dredging.com/wp-content/uploads/2017/02/article-the-art-of-screening-effectiveness-of-silt-screens-terra-et-aqua-132-1.pdf

Sand Bunds as Turbidity Control Measures

Sand bunds (Plate 3-3) act as temporary physical containment structures, preventing the spread of sediments beyond the influence areas of the reclamation site. Strategically placed along the periphery of the project site, it rests over the sandkey and extends above the water

level up to 2.0m high (min.); they trap suspended sediments within the enclosed area, reducing the likelihood of these particles drifting into surrounding water bodies. By containing the sediments, the bunds help maintain water clarity in nearby areas.

During land reclamation, the movement of water can stir up sediments, causing turbidity to spread. Sand bunds slow down the flow of water and reduce current velocities within the enclosed area. This reduction in water movement allows sediments to settle more quickly, minimizing the volume of suspended particles in the water. The calmer water within the bunded area encourages fine particles to settle at the bottom, thereby reducing turbidity.

In summary, sand bunds are an effective measure to control turbidity during land reclamation by providing physical containment, reducing water flow, promoting sediment settlement, and protecting nearby marine ecosystems. Their strategic placement at key locations ensures minimal environmental impact and helps comply with regulatory requirements for water quality.



Plate 3-3 Sand Bunds

Sediment Plume Modelling Results

The comparison of maximum SSC (suspended sediment concentration) from 1-month simulation between the two scenarios are shown in Figure 3.3 (in kg/m³) for all meteorological conditions.

From the figures it is visible that the dispersion area of the sediment plume is significantly larger and higher with the TSHD method compared to the Pelican Barge method. Although the Pelican Barges will cause a more continuous influx of suspended sediments (due to the longer discharge time). The sediment plume is mainly reduced due to the coarser sand (less fines), which are sourced by the Pelican Barges.

In can also be observed that wind influences the sediment plume development, as the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the port area, whilst in the NE monsoon the main direction of the plume is towards the south.

This wind effect becomes better visible when changing the scale of the images to mg/l, as shown in Figure 3.3. In this Figure 3.3, 50 mg/l is selected as the maximum limit value. This is to represent the maximum suspended sediment concentration in the Class SB water body, based on the Water Quality Guidelines and General Effluent Standard of 2016 issued by Department of Environment and Natural Resources (DENR). Both scenarios show that >50 mg/l of sediment plume can spread widely along the coastline.

Presenting the results using a mg/l scale has some disadvantages in our specific case:

1. Inside Manila Bay suspended sediment concentrations are in the range of 30-50 mg/l already (along the nearshore areas around MOA). In the rainy season such values can become 100 mg/l or more when heavy rains cause significant river outflow containing high levels of suspended sediments.
2. The main goal of the sediment plume assessment is to visualize the difference between the two methods suggested and sand sources used. The sediment plume model relies upon selected input and calculates based on certain settlement velocities what the sediment plume may be. The smallest particles (less than 4 µm) have a settlement velocity set in the model of 0.0 m/s which means they are assumed to always remain in suspension. This is a conservative approach, for two reasons:

a. Actual settlement velocity of such particles will be slightly more than 0.0 m/s, so they will settle over time;
b. The finest particles (less than 30 µm) are flushed out first during the dredging process. Generally leaving 5% fines, however ranging in size between say 20 – 63 µm. This distinction is not made in the sediment plume modelling, which assumes the 5% fines ranges in particle size between 0 and 63 µm.

3. More assumptions are made for this sediment plume model, which are justified by the defined goal of the sediment plume modelling. And as we are interested in the biggest impact from the reclamation works, meaning the highest concentrations produced, which are in the order of 10 – 30 kg/m³, the results are best shown to the kg/m³ scale.

In summary, for the goal of this assessment the best approach is to show sediment plumes with a scale using kg/m³. Using mg/l will result in a too conservative and detailed plume which does not reflect reality.

For completeness the results with the mg/l scale are shown in Figure 3.3.

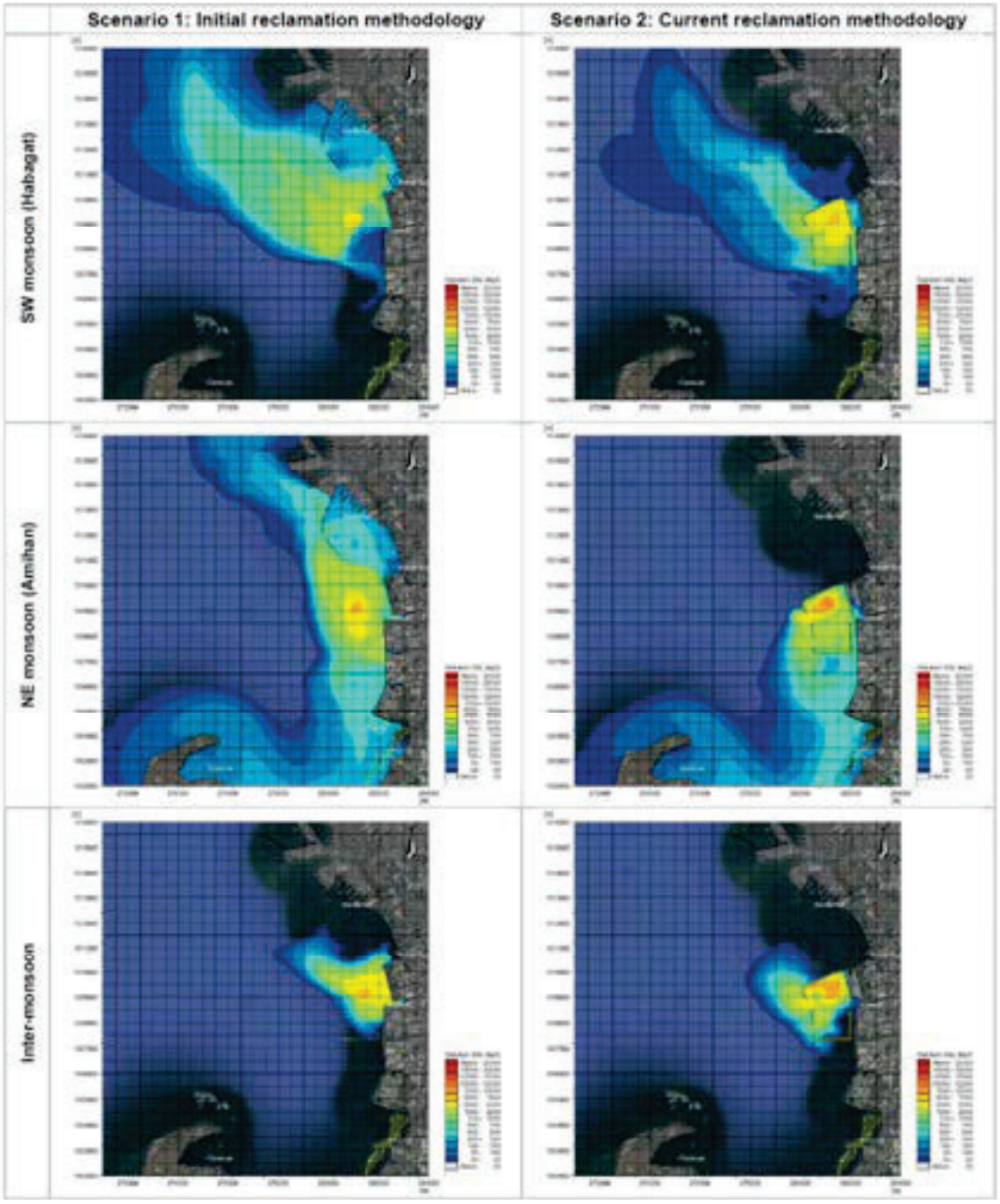


Figure 3.3 Sediment Plume Results
Source: Royal HaskoningDHV, Sediment Plume Modelling (September 2024)

The sediment plume assessment of RoyalHaskoningDHV based on the Sediment Plume Modelling (**Appendix P**) lead to the following general conclusions:

Primary conclusions

- The purpose if this assessment is to show the difference in sediment plume between the two identified construction methods (Scenario 1 and Scenario 2). Due to limitation on accuracy of input and model computations, the sediment plume images using a kg/m³ scale are more reliable for showing the expected extent of the sediment plume.
- Scenario 2 of sand filling with 6 Pelican Barges and a sand source with 5% fines content, will result in a reduced dispersion area if compared to Scenario 1 with 1 TSHD and 15% fines content.
- The suspended solids concentrations induced in Scenario 2 are approximately 50% of the suspended solids concentrations induced in Scenario 1.
- In the current situation (Scenario 2) bunds are already in place around large part of the outer contours of the islands. As most of the sand placement is done within those bunds, the higher concentrations of the sediment plume are well contained.

Secondary conclusions

- When considering very low suspended solids concentrations, such as those stipulated in the Water Quality Guidelines and General Effluent Standard of 2016, the plume can be seen to spread over larger areas; however, the plume will mainly attach to the shore.
- Wind has an effect, mainly on the smallest suspended sediments. As low concentrations of suspended solids remain in suspension for a long period of time and the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the west, whilst in the NE monsoon the main direction of the plume is towards the south.

- towards the west, whilst in the NE monsoon the main direction of the plume is towards the south.

Other mitigating measures include proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase, monitoring and controlling loading and unloading of fill/dredged materials, securing appropriate certifications and permits for fill material extraction activities, pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification, issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with TMP, proper implementation of hazardous waste management plan, provision of appropriate drip trays, chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank, maintenance of hazardous waste storage facility, provision of appropriate spill kits and booms, in case of accidental spillage; and practicing good maintenance of machineries and equipment to reduce oil losses.

For the generation of domestic wastewater from temporary facilities, portalets will be strategically located in the project area and toilet facilities in every vessel. This will be siphoned regularly by accredited STP facility.

For the horizontal development, a conceptual individual and/or centralized treating system is proposed for construction at Islands A, B, and C. Sewage will primarily come from residential, commercial, office, and hotel areas. Individual and/or centralized treating system will be constructed, with effluent quality meeting local environmental standards. Sewage lift stations will be built as needed. Sewage pipes will be made of HDPE drainage pipes, SN8 as per BS

EN 13476, or RCC pipes, Class 120 as per BS 5911-1. Sewage manholes will be made of reinforced concrete with manhole covers 800mm in diameter.

3.2.3. FRESHWATER ECOLOGY

There are no significant freshwater systems within the impact areas of the proposed reclamation site. Freshwater, mixed with domestic wastewaters, emanate from the Libertad Channel and Maynilad-PAGCOR pumping stations, are basically storm drains and not suitable bodies of surface water for the existence of significant fish stocks or sizeable invertebrate communities.

Freshwater discharges from these channels, as well as from other floodgates and waterways spilling from the Pasig River further to the south, are also not ecologically conducive for aquaculture or recreational uses. There will not be discharges from the reclamation project to these channels; discharges of treated effluents will be to the bay.

3.2.4. MARINE ECOLOGY

Threat to existence and/or loss of important local species and habitat & Threat to abundance, frequency and distribution

Impact on Plankton Community

Generally, there is insufficient information on the direct and indirect effects of suspended sediment plumes during reclamation on planktonic communities to assess with certainty the impacts on planktonic communities found within the site. It is certain that the increased load of suspended solids and the movement of the silt along the water column will decrease primary productivity which is already severely impaired because of low sunlight penetration. Planktonic communities can be affected albeit, these organisms can readily regenerate. Also, high sediment loads would reduce the grazing success of zooplankton. However, the reduction of photosynthetic function will have little impact as hardly any significant group of benthic marine animals dwell in the seabed within the project's impact area and contiguous waters. Benthic micro-organisms have the capability to adjust and re-establish themselves because of their ability to "regenerate" in a short period of time from advection as facilitated by water circulation and current systems in the water body. The impact on the alteration of species diversity and density of benthos communities which is anticipated as a result of the reclamation project will only be temporary and short-term in duration, and reversible in the long term.

Primary productivity will eventually improve in the long term as cleaner seas around the reclaimed site will be a primary objective of the Project. Farther away from the impact area, the effect may not be likely felt as the movement of the water along the water column would result to dispersion of silt to a greater area causing lesser stress to bottom-dwelling biotic communities where they exist.

Mitigating Measures:

Wastewater Management - Waste minimization and retrieval will be practiced in all aspects of reclamation activities. Modern and sufficient sanitation facilities and disposal systems will be installed. State-of-the art latrines with chambered septic tanks will be installed and sludge will be periodically collected. The objective is to ensure that pollution-causing effluents that can be potentially carried downstream are controlled at the source.

Larval Dispersal - The provision of adequate channels in between the reclamation islands should ensure that movement of free-drifting fish larvae and juveniles will not be prejudiced. Movement of plankton will also be sustained and plankton communities will continue to enrich inshore fishing grounds where sardines and other small pelagic fishes graze, as well as sustain macro-invertebrate recruitment elsewhere. Larvae and juveniles of pelagic species of sardines will continue to move to areas close to the shore and their seasonal movement into the coastal seas surrounding the reclamation project will be sustained. In the same manner, it is unlikely that mussel spat settlement in farms in the Bacoor area will be affected as the mussel farms, as well as and stationary lift nets (sapra) are too far from the proposed reclamation site in Pasay City.

Presence of pollution indicator species - Mussels and oysters are standard biotoxin monitoring media and the BFAR implements a periodic monitoring system of plankton levels and toxicity analysis through bioassay in mussel and oysters in Manila Bay. While the reclamation project would not be a primary trigger for harmful algal blooms (HAB) episode enhancement, bivalves gathered by gleaners near the project area will be placed under a strict biotoxin level monitoring system through engagement of BFAR personnel. Moreover, the Project will support the conduct information, education and communication (IEC) campaigns to promote red tide awareness and to pinpoint sources of hyper nutrient loading into the sea.

Effects on fisheries

Extreme turbidity can also impair fish feeding and reproductive physiology particularly if turbidity further intensifies. However, the silt and sediment fluxes will be temporary as the area is completely reclaimed and fugitive sediments settle or are carried elsewhere by wave action. The ecological impacts of sediment sequestration and intrusion will thus be temporary. In fact, cleaner water may be dispersed during project operation of its WTP and STP and may contribute to clearer waters around the reclaimed area over the long run.

Since there are no significant capture fisheries resources and resource use practices present in the project site, the project will have very insignificant effects on capture fisheries as fishers will simply move farther past the boundary of the reclamation project. There will be little impact on catch rates and fisheries operation in fishing grounds offshore of the reclamation and generally in Manila Bay as fishers will move to new fishing grounds past the reclaimed area where seawater will probably be less polluted in the long term. The project will have hardly any impact on small-scale fisheries near the Paranaque River estuary and the LPPWP as these fishing grounds are more than 4 kilometers away from the reclamation activities.

One positive development is that crabs have been witnessed by fishers to have settled into sandy reclamation filling.

Mitigating Measures: The reclamation will not displace stationary fishing gears and the few fishers operating in the vicinity. Provision of alternative livelihoods will be considered in the Project's social development funds.

Effect on mangroves

The reclamation site is almost ±3.15 km North of the mangroves in the LPPWP. Since reclamation filling consists mainly of heavy sand material, it is unlikely that fugitive sand will reach the LPPWP.

The Proponent and JV is in support of greening activities as such and compliance to ECC Condition No. 7 Implementation of Reforestation and Carbon Sink Program. On 4 May 2021, the Pasay LGU already submitted its Reforestation and Carbon Sink Program, which was duly acknowledged by the EMB on 4 May 2021. On 22 August 2023, the Pasay LGU submitted an updated program to the EMB. The Private Joint Venture (JV) Partner plans to implement the project on the Project Site as well as in other locations, which will be made in partnership with the DENR Central Office's Strategic Communication Initiative Service, DENR-NCR, National Greening Program (NGP), and LLDA's Adopt-a-Mangrove Program. Off-site implementation of the program began in 2023 with activities already implemented in Nasugbu, Batangas; Macabebe, Pampanga; Tuba, Benguet; and Maragondon, Cavite.

On 18 October 2023, SM SCIDC initiated the mangrove planting in Brgy. Sta. Ana, Calatagan (Plate 3-4), Batangas in coordination and partnership with the LGU MENRO and the People's Organization Samahan ng mga Mangingisda at Magsasaka sa Sitio Palobandera. The activity was participated by 103 representatives from SM SCIDC, PRA, Calatagan MENRO, PCG Auxiliary, and residents of Brgy. Sta. Ana. A total of more than 2,000 Ceriops species propagules were planted in the area. A total of 1.96 hectares (19,664 square meters) was covered during the planting activity wherein 0.03 hectare (303 square meters) was allocated for the establishment of new mangrove area, while the rest was for the replanting/reforestation.

Another mangrove planting was initiated by SM SCIDC on 20 December 2023 in Brgy. Dalayap, Macabebe, Pampanga (Plate 3-4), which was kicked-off by a clean-up activity on 19 December 2023 in coordination with LGU Macabebe and in partnership with the People's Organization Dalayap Fruit Vegetables Farmers and Fisherfolks Association Inc. Said activity was participated by officials of Pasay City, Macabebe MENRO, residents of Brgy. Dalayap, Macabebe and the members of Dalayap Fruit Vegetables Farmers and Fisherfolks Association Inc. A total of 3,000 Rhizophora mangrove species seedlings were planted on 20-22 December 2024 covering 0.2095 heactare (2,095 square meters).



Plate 3-4 Mangrove Planting

Coastal Ecosystem Management Plan

The Pasay City Council adopted on 13 December 2019 its Coastal and Sea Use Plan (CSUP) which incorporated the Coastal Ecosystem Management Plan (CEMP). This was submitted to BFAR on 6 January 2020 and then to the EMB-CO on 26 March 2021 with EMB-CO acknowledging on 07 April 2021 that this submission is compliant with the on the ECC condition #1 for the Project.

Subsequently, BFAR and Pasay LGU agreed to work together to enhance the submitted CSUP/CEMP. This culminated to an enhanced CSUP/CEMP submitted to BFAR on 12 October 2022 and which BFAR acknowledged on 19 December 2022 that:

> "The enhanced Coastal and Sea Use Plan took into consideration "economic development, coastal development, rational use of natural resources, landscape and seascape protection and rehabilitation, and protection of national heritage," including the "scientific basis for the zoning."

The CSUP/CEMP identified Four Zones. These zones, their key features, and the status of implementation is summarized in the table below:

Table 3.5 CSUP/CEMP identified Four Zones

Zones	Key Features	Status of Implementation
Built-up Zones	Aims to achieve urban development thru reclamation within the City's municipal waters while efforts to improve and restore the marine life of the Manila Bay is hoped to be realized.	On-going reclamation activities within Pasay City municipal waters while ensuring compliance with laws, rules, and regulations. On-going planting of mangroves on neighboring provinces which will become part of marine ecosystem for Manila Bay. On-going testing and studies for possibility of establishing mangrove corridors within this Zone.
Small Vessels Navigational Channels	To supplement the inland inter-island mobility, the channels between the reclamation islands may be utilized for water-based mobility in all portions of island development and location of water-based activities. Thus, this zone's major role is to increase mobility within the municipal waters while ensuring the safety and security during navigation and the promotion of ecotourism activities. Another management objective of this zone is to campaign for and establish mangrove and coastal habitats while trying to protect the coastal habitat restoration. Lastly, it also aims to provide livelihood for the community.	PLAA members identified and registered as fishers under BFAR with long-term plans of alternative livelihood by giving priority to these fishers in the employment for maintaining and protecting coastal habitats. Initial Channel Traffic Circulation has been proposed under the CSUP On-going masterplanning of the design and uses of the channels once reclamation is complete
Marine Ecotourism Zone	This zone is mainly dedicated for increasing the productivity of fishery resources within the Manila Bay. It also promotes and establishes coastal habitats while trying to protect the coastal habitat restoration.	On-going studies for the viability of aquaculture and artificial reefs to increase fishery resources within Manila Bay
Marine Restricted Zone	This zone is mainly dedicated to increase the productivity of fishery resources within the Manila Bay by	Zone coordinates identified

Zones	Key Features	Status of Implementation
	minimizing the disturbance of the marine resources.	
Shipping and Navigation Zone	The City's municipal waters are currently being used by passenger and cargo vessels as part of the sea route accessing the Manila North Harbor and Manila South Harbor. The City recognizes that portions of its municipal waters shall be dedicated to the safe passage and navigation of these sea vessels. The management objective of this zone is to ensure the safe and unobstructed navigation of ships. This zone is placed far from the Built-up Zone and beyond the Marine Restricted Use Zone, wherein minimal human activities are occurring.	Pasay City has entered in a MOA with PPA on 07 September 2021 to establish a new navigational sealane consistent with PPA's own plans and the City's CSUP/CEMP at no cost to the local or national government. This new navigational sealane has now been established and announced by the PPA through its Port Operations Bulletin on 19 June 2023

Sediment fluxes and re-suspension of silt

Dredging, filling and compacting of sand, soil and earthen materials into the reclamation area will result to short term, albeit localized and reversible increase in total suspended solids in the water column. Sediment plumes can travel over a broad area although the absence of significant benthic resources in the inshore portions of Manila Bay will have little, far-fetched impact on the coastal environment that is already heavily impaired by pollution, eutrophic episodes, and absence of benthic ecological structures and functions. Through substrate disturbance, reclamation activities will contribute further to turbidity and dispersal of silt plumes but this will be temporary and would not affect any significant benthic communities or fishing practices in the area and its contiguous environs. Re-suspension of silt and substrates, as well as increments in water turbidity will not significantly affect benthic life forms nor significant fish and shellfish habitats. Suspended materials will ultimately re-settle around the site, in the same manner that silt and sediments constantly discharged from point sources in the metropolis are settled. The few numbers of mollusks and fishes dwelling in the rocky seawall will be displaced but resettlement can occur once a new seawall, this time in cleaner waters, will be achieved. In spite of the low numbers, smothering of epi-benthic macro-invertebrates, filter feeding mollusks and other detritus feeders in the immediate area can happen with continuous sediment deposition.

Mitigating Measures: Sedimentation is predicted to be high during reclamation area filling and compacting and impacts are predicted to range from moderate to high depending on the implementation of mitigating measures in the primary impact area. Mitigation measures as stated in the water quality mitigating measures particularly the turbidity management plan will be implemented to prevent sediment streams and broad dispersion of silt throughout the reclamation process, to monitor clouds of effluents, discharges and fugitive particle and liquid

mud, so that they can be captured and controlled early on. Other precautionary mitigation measures to prevent sediment streams and broad dispersion of silt will be adopted by the project through the installation of appropriate sieves during soil transport and dispensing. A primary objective is to prevent the possibility of sediment fluxes reaching areas with set nets and bivalve farms. During soil compacting, a series of diverse sediment mitigation measures and facilities will be established in strategic locations, with silt and sediment diversion canals to ensure loose soil are captured. An additional measure is the early planting of extensive vegetative cover in order to increase sediment amalgamation capacity and soil compacting aided by stabilization of areas where earth moving has been completed.

One positive note arising from spillage of sandy substrate around the reclamation site is that it can firm up and stabilize the surrounding seabed and enhance settlement of various marine animals into the improved seabed.

Oil and Grease Contamination

The risk of oil and grease contamination in seawater around the reclamation site can occur if disposal of marine vessel bilge water and if accidental spillage from refueling at sea is experienced. While the issue is not anticipated to be severe, oil slicks from inadvertent spillage may remain sequestered in the water column or carried to the shoreline in blotches. Areas with inter-tidal corals in Bataan and macro algae colonies in Cavite can be considered at risk from exposure to large slicks, leading to immediate coral mortality and algae wilting. In open waters of Manila Bay, the chain reaction can be far-reaching, affecting not only benthic communities but stocks of fish that are dependent on plankton and zooplankton as primary diet.

Mitigating Measures: Potential risks of small oil spills from reclamation vessels will be controlled through strict fuel and oil dispersal protocols backed-up by an oil/fuel spill contingency plan consistent with MARPOL standards and Philippine Coast Guard regulations. An oil and grease recovery system will be adopted employing the best facilities. The project will enforce strict policies against indiscriminate disposal of oily waste and marine vessel bilge.

Increase in domestic wastewater and shipboard bilge around the reclamation site

Compacting, configuring and development structuring of the reclaimed area will result to increased human activity in the project site due to the influx of workers and reclamation vessels and this is expected to generate a significant amount of solid wastes, bilge waste and domestic wastewater that could find its way to the coastal and marine environment if waste disposal and management systems are not sufficient. However, the risk of waste contamination of benthic resources is insignificant due to the absence of significant benthic habitats. The predicted impact of this threat to epi-benthic soft bottom communities in the seabed could be more pronounced. The outflow of domestic wastewaters from project facilities if such waste streams are not properly treated and managed can lead to hyper-nutrient loading which in turn can cause algal blooms. In the project area where seawater flushing is moderate and water turbidity is already intense, such phenomenon can lead to problems on paralytic shellfish poisoning (PSP).

Potential accidents causing damages to marine ecosystems

Dredging and filling may result into potential accidents causing damages to marine ecosystems during transport of dredging vessel. To mitigate this, the following will be conducted:

- Use of sea-worthy vessel approved by MARINA, PCG and appropriate regulatory bodies,
- Installation of adequate navigational devices including early warning system.,
- Avoid and stop transport during inclement weather.,
- Implementation of Typhoon Response Plan.,
- Compliance with MARINA, PCG and international regulations., and
- Proper training of vessel crew and personnel.

3.3. THE AIR

3.3.1. METEOROLOGY/CLIMATOLOGY

Change in the local micro-climate e.g. local temperature

The projected seasonal temperature increases and seasonal rainfall change is shown in Table 4.3 while the frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in NCR is shown Table 4.4. Predicted range of temperature change in NCR in 2050 is 1.8 to 2.1°C while seasonal rainfall change is from -38.5 to 3.7%.

Table 3.6 Seasonal temperature increases (in °C) and rainfall change (in%) in 2020 and 2050 under medium-range emission scenario in NCR

Month	Observed Baseline (1971 to 2000)				Change in 2020 (2006 to 2035)				Change in 2050 (2036 to 2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
NCR / Metro Manila Seasonal Temperature Increase	26.1	28.8	28.0	27.4	1.0	1.1	0.9	1.0	2.0	2.1	1.8	1.9
Seasonal Rainfall Change (in %)	107.5	198.5	1,170.2	758.7	-12.8	-33.3	8.5	0.0	-17.3	-38.5	21.3	3.7

Source: PAGASA. Climate Change in The Philippines (February 2011)

Table 3.7 Frequency of extreme events in 2020 and 2050 under medium-range emission scenario

Station	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of rainfall >200mm		
	OBS (1971 to 2000)	2020	2050	OBS (1971 to 2000)	2020	2050	OBS (1971 to 2000)	2020	2050
Port Area	299	1,176	2,118	7,380	6,445	6,382	12	12	13

OBS: Observed Baseline
Source: PAGASA. Climate Change in The Philippines (February 2011)

Contribution in terms of greenhouse gas emissions (or GHG mitigation potential)

POTENTIAL PROJECT GREENHOUSE GAS EMISSION

Majority of the greenhouse gas (GHG) emissions that will be generated from the proposed project are expected to come from activities associated with the reclamation activities (fuel use for the operation of service vehicles and equipment and electricity consumption). These fuel combustion and electricity consumption activities release three (3) out of seven (7) GHGs, namely: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Majority of these emissions will be CO_2 with very minimal share for CH_4 and N_2O. As such, this report will only focus on CO_2 emissions.

Methodology

GHG emissions were calculated using an emission factor-based calculation method. Emissions were estimated by multiplying a level of activity data (AD) by an emission factor (EF). Activity data is a quantified measure of activity resulting in emissions during a given period of time (e.g. data on fuel consumption (liters/km) and purchased electricity (kWh reading) while emission factor is the average emission rate of a given GHG for a given source, relative to units of activity. The general equation which is based on The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI), 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories and 2014 IPCC Assessment Report is presented below:

GHG Emissions = AD x EF

The emissions associated with the project are categorized into direct and indirect emissions. Direct GHG emissions of Scope 1 are from sources that are owned and/or controlled by the proponent. This is usually applicable during the operational phase (e.g. use of generator set and equipment owned by the proponent). Indirect emissions, on the other hand, are further categorized into Scope 2 and Scope 3. Scope 2 emissions are a consequence of the project's implementation at sources owned and/or controlled by another entity, which include purchased electricity consumption. Scope 3 emissions are a consequence of the proponent's activities but to which the proponent has no direct control over which include tailpipe emissions from contracted equipment/vehicles during project implementation activities.

Table 3.8 Items to consider for each Scope of GHG Emissions

Scope	Activities
1	Stationary combustion Emissions from fuel use of entity-owned/ controlled stationary equipment (e.g. standby generator set) Mobile combustion Tailpipe emissions from entity-owned/ controlled vehicles (e.g. service vehicles)
2	Power Requirement Emissions from the consumption of purchased electricity for construction works
3	Stationary combustion Emissions from fuel use of contracted construction equipment (e.g. generator sets) Mobile combustion Emissions from mobile vehicles and equipment

In the case of this project, the types of emissions are Scope 2 and Scope 3. Actual data on electricity and fuel (diesel) consumptions has been provided by the proponent from its Self-Monitoring Report submissions (see Table 2.60).

Table 3.9 Activity Data

Year	Quarter	Consumption per Quarter	
		Electricity (kWh)	Fuel (liters of diesel)
2021	2nd	17,472	-
	3rd	9,222	-
	4th	12,338	-
2022	1st	5,482	-
	2nd	8,729	-
	3rd	19,930	-
	4th	25,793	-
2023	1st	27,575	9,807.0588
	2nd	35,975	11,643.5294
	3rd	27,829	14,141.1765
	4th	22,307	18,258.8235
2024	1st	25,791	32,240.0000
	2nd	26,775	34,314.8235

GHG EMISSIONS CALCULATIONS

Based on DOE Department Order No. 2011-08-0009, the National Grid Emission Factor (NGEF) serves as the reference for energy projects under the Clean Development Mechanism[15] (CDM) as the per-grid standard amount of GHG emissions related to the activities performed on a particular grid (see Table 2.61).

Table 3.10 Computed Grid Emission Factors using DOE Power Statistics Data

Grid	National Grid Emission Factor (tCO_2/MWh)	
	Wind and Solar Projects	Other Projects
Luzon-Visayas Grid	0.7058	0.7181
Mindanao Grid	0.8348	0.8173

Source: Department of Energy

In calculating the GHG emission from purchased electricity, 0.7181 tCO2/MWh will be used. The consumption is based on the actual data from 2021 to 2024.

In calculating Scope 3 emissions for fuel consumption, actual fuel consumption from 2021 to 2024 has been used. Fuel emission factor for diesel is 2.676327 $kgCO_2/L$.

1) Scope 2 GHG Emissions (Purchased Electricity)

Table 2.62 shows the GHG emission from purchased electricity which is based on actual data from 2021 to 2024.

[15] Article 12 of the Kyoto Protocol

Table 3.11 GHG Emission from Purchased Electricity

Year	Quarter	Electricity (kWh)	Emission Factor (kgCO2/kWh)	GHG Emission (tCO2)	Annual Emission (tCO2)	Coverage
2021	2	17,472	0.7181	2.5466	28.0289	3 quarters
	3	9,222	0.7181	6.6223		
	4	12,338	0.7181	8.8599		
2022	1	5,482	0.7181	3.9366	43.0386	4 quarters
	2	8,729	0.7181	6.2683		
	3	19,930	0.7181	14.3117		
	4	25,793	0.7181	18.5220		
2023	1	27,575	0.7181	19.8016	81.6379	4 quarters
	2	35,975	0.7181	25.8336		
	3	27,829	0.7181	19.9840		
	4	22,307	0.7181	16.0187		
2024	1	25,791	0.7181	18.5205	37.7476	2 quarters
	2	26,775	0.7181	19.2271		

Note: Electricity consumption data is based on the Self-Monitoring Reports submitted by the Proponent to DENR-EMB

2) Scope 3 GHG Emissions from Fuel Consumption

Table 2.63 shows the GHG emission from purchased electricity which is based on actual data from 2021 to 2024.

Table 3.12 GHG Emission from Fuel Consumption

Year	Quarter	Fuel Consumption (Liters)	Emission Factor (kgCO2/kWh)	GHG Emission (tCO2)	Annual Emission (tCO2)	Coverage
2023	1	9,807.0588	2.6763	26.2469	144.1218	4 quarters
	2	11,643.5294	2.6763	31.1619		
	3	14,141.1765	2.6763	37.8464		
	4	18,258.8235	2.6763	48.8666		
2024	1	32,240.0000	2.6763	86.2848	178.1225	2 quarters
	2	34,314.8235	2.6763	91.8377		

The environmental management plan for the identified potential impact is listed in the table below. The Proponent and JV is in support of greening activities as such and compliance to ECC Condition No. 7 Implementation of Reforestation and Carbon Sink Program. On 4 May 2021, the Pasay LGU already submitted its Reforestation and Carbon Sink Program, which was duly acknowledged by the EMB on 4 May 2021. On 22 August 2023, the Pasay LGU submitted an updated program to the EMB. The Private Joint Venture (JV) Partner plans to implement the project on the Project Site as well as in other locations, which will be made in partnership with the DENR Central Office's Strategic Communication Initiative Service, DENR-NCR, National Greening Program (NGP), and LLDA's Adopt-a-Mangrove Program. Off-site implementation of the program began in 2023 with activities already implemented in Nasugbu, Batangas; Macabebe, Pampanga; Tuba, Benguet; and Maragondon, Cavite.

Table 3.13 Impact Analysis and Environmental Management – Meteorology/Climatology

Project Activities	Inclusive Dates	Mitigating Measures			
		EIS 2017	Implemented/ Existing	EPRMP 2024	
				Measures	Cost
Change in the local micro-climate e.g. local temperature and Contribution in terms of greenhouse gas emissions (or GHG mitigation potential)					
Project Construction	2021 onwards	There are no activities that will impact on the local climate particularly temperature. It is significant to note that the construction works will be undertaken for a short period (~2 years). Thus, this short duration is not expected to impact on local climate. The loss of 600,000 sq.m. out of 1,800 sq.km. of the Manila Bay water (reckoned in terms of surface area) is considered insignificant to cause change in local temperature.	Submitted updated reforestation and carbon sink program on August 22, 2023 to DENR EMB CO. Reforestation activity as follows: - 18 October 2023 - Calatagan Mangrove Planting (2,000) - 20 December 2023-Macabebe Mangrove Planting (3,000)	Allotment of PRA 2019-05 requires 5% of the Project Area to be dedicated for Green spaces to supplement the Carbon Sink Program. Support to reforestation and greening program activities	Part of Project Cost

3.3.2. AIR QUALITY AND NOISE

Degradation of air quality

Dust during the reclamation may occur on the reclaimed land especially during filling of sand keys in the reclamation area (above water level) and construction of containment structure especially during sunny and windy days. This dust may emanate from open areas. In order to mitigate this, dust suppression activities such as green net installation and water truck sprinkling or road spraying (3 times or more as needed per day during dry season) will be conducted.

Potential air pollution discharges can result from the use of fuels by the vessels and vehicles. In order to mitigate emissions from the fuel combustion, the use of diesel fuel which is low in sulfur is recommended. Regular inspection and preventive maintenance servicing of all vessels, vehicles and generators will also be conducted.

Increase in ambient noise level

Potential source of noise during the project implementation may come from the filling of sand keys in the reclamation area (above water level), construction of containment structure and noise pollution from the operation of heavy equipment. In order to mitigate this, regular noise monitoring will be scheduled and a regular preventive maintenance servicing for the vessels and vehicles will be conducted. Noise will not be a significant nuisance because the population center is distant from the activity areas.

3.4. THE PEOPLE

Displacement of users needing access to water bodies, Displacement / Disturbance of Properties, Change/conflict in land ownership, and Change /conflict of Right of Way

Construction Phase

Since the Project is located offshore, there is no presence of residential/commercial buildings or houses in the area; hence, no displacement of settlers is needed. Further, there are no fish sanctuaries, fishing structures or mussel/oyster farm that will be affected by the reclamation.

Operation Phase

The fishing operations of small-scale fisherfolk may have to move past the reclaimed area. They will be provided with compensation and other assistance as discussed in the SDP section.

In-migration and Proliferation of Informal Settlers

Construction Phase

The Project will prioritize hiring of local workers in Barangay 76 or its nearby barangays in Pasay City, in coordination with Pasay City PESO. Should there be a need for additional

workers from outside Pasay City, a migration of workers may happen that would induce population growth in Pasay City once construction is underway. Workers who opt to stay in Barangay 76 will be instructed to register to Barangay 76 Office for proper identification.

The Project will ensure that no proliferation of informal settlers will happen during the construction phase. Workers may be provided with temporary housing, if needed, but it will be demolished to avoid being utilized by unauthorized persons.

Operation Phase

In-migration of new residents and business owners during operation phase is expected. New residents will be required by the LGU to register to the concerned barangay and new business owners will have to apply for business registration at Pasay City BPLO.

Cultural/Lifestyle change (especially involving employees in the nearby developed areas of the site and vicinity)

Construction

There are no residents and Indigenous People (IP) settlements observed in the project area nor Ancestral Domain claim/Certificate of Ancestral Domain Title (CADT) released within the said area. The land is owned by the proponent. Also, there are no cultural landscapes at the project site that may be affected by the reclamation Project. However, during construction, workers may be coming from different communities other than Pasay City. The proponent shall enforce protocols and guidelines (Code of Conduct) for all contracted workers/employees to ensure that no social norms, religious traditions or cultural values are discriminated. The proponent will also ensure that there will be a regular communication with barangay office for incident reporting relating to its workers.

Impacts on Physical Cultural Resources or Historical/Cultural Heritage

Construction Phase

The reclamation Project shall not affect the national historical landmarks in Pasay City. There are no physical structures or known archaeological/heritage sites that are to be affected on the reclamation Project. Manila has been known as one of the historical sites in the Philippines since World War II. Should the proponent discover artifacts or objects considered as Physical Cultural Resources (PCR), the proponent is committed to following the protocols for chance finds and coordinate with the National Museum through the Cultural Properties Regulation Division or concerned agencies for any chance PCR finds in the project site. The construction activities will be modified to avoid significant archeological, cultural, ceremonial and historic sites.

Threat to delivery of basic services /resource competition

Construction Phase

There is no threat expected to the delivery of basic services or increase in demand for resources during construction. The water and electricity in Pasay City are sufficient to supply its current population. During construction, no water is needed in the reclamation works, except only for domestic use of workers.

During reclamation works/dredging, the proponent shall source its power through onboard generators connected to each vessel.

Operation Phase

Since in-migration is expected once the Project is operational, the proponent shall ensure that basic services, such as water, electricity, food, are adequate to cater to new residents and businesses in the expansion area.

Threat to public health and safety

Construction Phase

The construction activities within the project site may have the potential to negatively impact the health and safety of workers and the passing public if not mitigated properly. Unsafe activities and improper use of vehicles and equipment may result in accidents. People may also be exposed to noise, vibration and air pollution while construction is ongoing.

To prevent/minimize threat to public health and safety, the proponent shall require its contractor to strictly follow DOLE's labor laws and policies and to provide the Occupational Health and Safety Management Plan (OHSMP) prior to commencement of work. The contractor must designate a Health and Safety Manager at the project site to ensure conformance of the project to health and safety standards. Other measures that may be implemented are the following:

12. The proponent will secure the area with its own security group.
13. The project site will be fully fenced and will be restricted to workers and authorized personnel only.
14. No workers are permitted to carry firearms or any deadly weapons.
15. The project site will be provided with sanitary facilities and an adequate water system.
16. The dust and emission must be managed well so that the residents/businesses and workers are protected from pollutants (e.g. dust suppression)
17. The workers will be provided with appropriate personal protective equipment (PPE).
18. The construction shall comply with noise and air standards.
19. Implementation of solid waste management and installation of sanitation or toilet facilities at the construction site.
20. Installation of proper safety signage at conspicuous places.
21. Provision of medical station for workers that may require first aid assistance.
22. Installation of closed-circuit televisions (CCTVs) within the project site.

Operation Phase

Once operational, the reclaimed land may be used for residential, commercial and tourism area. An increase in waste generation is anticipated as the project starts its operation. The proponent shall maintain proper coordination with concerned barangays and relevant agencies for compliance of commercial/residential establishments with environmental policies of the LGU (e.g. Solid Waste Management and Water and Sanitation Management). The proponent shall ensure that each commercial/residential establishment has its proper solid waste management, sewerage treatment plant, and proper hygiene and sanitation practices.

For crime prevention, the commercial/residential establishments shall implement its safety and control measures against crime, in coordination with the Philippine National Police (PNP) and Barangay Offices.

Generation of Local Benefits from the project

Construction Phase

The project will require a significant number of workers. The proponent is committed to provide equal employment opportunities to everyone regardless of age and sex. The project would provide an additional source of income, especially for the unemployed residents.

The wages that will be paid during the construction phase will increase the capability of the economically active adults to support their dependents. The recruitment of workers shall be coordinated with the LGU of Pasay City, Barangay 76 and surrounding barangays/cities. Whenever possible, the proponent will use available local labor during the construction and operation phase. The influx of workers would also mean a demand for retail and other services; thereby increasing the income of each barangay.

Operation

The Project is not expected to adversely affect the income of the residents, businesses and the LGU. Instead, the Project is presumed to enhance business opportunities, tourism activities and associated economic activities in the area. The local economy would benefit as new residents/businesses tend to encourage more consumption, that in turn increases the demand for goods and services. This will also increase the local revenue of the LGU when prompt payment of taxes, and other permits and licenses are paid to Pasay City. Moreover, the additional income for the LGU would mean increase in the provision of basic social services and infrastructure projects for the community of Pasay City.

Gender and Development and Vulnerable Groups

Construction Phase

During construction, the proponent shall include in their IEC the vulnerable groups, business sectors, government and non-government agencies, professionals/academe and the project's Multi-Partite Monitoring team for the project update. The proponent shall conduct public consultation to gather issues and concerns, such as the following:

3. Identify gender issues and concerns involving women, youth, senior citizens, PWDs, fisherfolk, tricycle drivers and other groups that may deemed necessary in the provision of SDP.
4. Encourage the participation of women stakeholders during consultation at various phases of project implementation.

Operation Phase

The proponent shall include the provision of SDP to the direct and indirect impact barangays, especially to the vulnerable groups in the community. The proponent shall undertake the following:

4. Include gender-sensitive design of infrastructure and facilities that caters to the needs of women, LGBTQIA+, senior citizen, children, people with special needs PWDs, and Indigenous People (if any).
5. Encouraged the business sector to provide equal employment opportunities to the vulnerable sectors in Pasay City in terms of recruitment, employment and compensation/benefits.
6. Provision of community-based skills training/livelihood projects.

Traffic Congestion

As discussed during the EIA Review Committee Technical Review Meeting, an amendment of the ECC is needed to include the bridges connecting the reclamation area to the mainland of Pasay. As such, a detailed Traffic Impact and Management Plan Study has to be conducted to include the impact of the traffic; hence, traffic congestion will be very minimal during the pre-construction phase, mostly due to personnel engaged in further study and research within the project area. During the construction phase, increase in traffic congestion will be noticeable near the temporary access road/bridge in J. W. Diokno Boulevard as it will become the entrance/exit of in personnel of the reclamation area.

Construction

During construction, there may be an increase traffic due to the mobilization of heavy vehicles, restriction of roadways, use of access roads to and from the project site during transportation of construction materials and equipment. The proponent shall implement lane designation, speed limit, and trucks deployment schedule. Since the project is an offshore operation, the proponent shall coordinate with the Philippine Coast Guard (PCG) and Philippine Ports Authority (PPA) to prevent navigational routes traffic or collision. Proper implementation of approved Vessel Traffic Management Plan and waterways will be conducted.

To prevent traffic-related accidents, the proponent shall ensure that there are traffic marshals directing the flow of traffic at the project site and ensure installation of traffic signs, warning signs, and safety barriers. Advisories shall be posted at conspicuous places to caution travelers and passengers regarding the planned construction/development. Other measures involve are improvement of road conditions, development of road networks, installation of road

and pedestrian safety signs and installation of light posts and CCTVs. Likewise, the proponent shall ensure that vehicle/heavy equipment operators are licensed/certified.

Operation

During operation, a significant increase in traffic volume is expected due to expansion of business/residential areas. Upon completion, 30% of the reclaimed land will be dedicated to new roads, bridges, parks and open spaces. The internal and access roads and bridges in the reclaimed land will be integrated with the existing access roads and national highways. Moreover, the proponent shall craft/implement a Traffic Management Plan to prevent or minimize traffic congestion and traffic-related accidents.

Reclamation Phase

- Mobilization and operation of construction land vehicles
- Mobilization and operation of marine construction vehicles
- Dredging
- Sand Filling
- Construction of temporary access bridges/ roads

Horizontal Development

- Mobilization and operation of construction land vehicles

Loss of employment during abandonment phase/ decommissioning phase of the Project

The proposed project including the reconfiguration is limited to reclamation and horizontal land development and that vertical developments are not covered in this project.

The end of construction activities for reclamation and horizontal development would mean decommissioning/abandonment of temporary facilities such as temporary waste facilities, storages, construction signages, temporary access roads and bridges as discussed in Chapter 7. It is projected that there will be loss of employment of workers at approximately 1,200 to 1,500 workers/employees who were hired for contractual/temporary basis. The workers who would lose their job will be properly compensated based on DOLE rules and other government laws and regulations. For construction workers who resides in Pasay City may be provided with skills training (e.g. Training for Security Guards and Housekeeping) and livelihood training by Pasay City LGU. They may also be endorsed to contractors for vertical development at the same Project site.

Table 3.14 Environmental Management Plan

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Reclamation Phase (include island reconfiguration activities, dredging, sand filling, other related construction activities in temporary working areas, temporary jetty, wharf, and construction of temporary support facilities)							
Pre-Construction Phase	Permitting such as ECC and PRA Board Resolution, among others)	Impact in terms of compatibility with existing land use Project Delays	Land Use	Secure applicable permits and clearances from the concerned government offices	Proponent (Pasay City) Project Developer (SM SCIDC) Contractor	Part of permitting and development cost	Project Proponent and Developer JV Agreement Project Developer Contract / Agreement with the Contractor/s
	IEC / Stakeholder Consultations	Misinformation / Lack of knowledge about the Project	People	Install project billboards IEC campaign Coordination with Pasay City LGU	Proponent Project Developer Contractor	Part of project development cost	Project Proponent and Developer JV Agreement Project Developer Contract / Agreement with the Contractor/s
	Geotechnical and Feasibility Study	Possible encroachment in the ECA such as natural hazards, flooding, storm surge, etc.	Land Use	Preparation, consideration and implementation of the results of the Geotechnical Interpretation Report, EGGAR, Hydrodynamic Modelling Study and Flooding Impact Study, among others to the Project design. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide	Project Developer Consultant	Part of project development cost	Project Developer

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				protection against normal and typhoon generated waves. All storm drainage system designs will comply with the latest editions of the Sanitation Code of the Philippines and the National Plumbing Code of the Philippines. Installation of vertical containment structure, wave deflector, vertical drains, platform elevation, Prefabricated Vertical Drain (PVD) and Surcharging methods which are part of the Soft Soil and ground improvements. Implementation of a storm runoff collection/recycling system for irrigating landscape features within the lot boundaries. The storm drainage pipelines are designed for a rainfall			

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				return period of 1 in 10 years.			
Construction Phase	Site clearing • Clearing of site of debris, solid wastes	Increase in turbidity due to seabed disturbance	Water	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity	Project Developer/ Contractor	Part of Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed			
		Generation of solid waste	Water and Land	Collected solid waste shall be segregated and collected by a 3rd party hauler.			
	• Clearing of the site of possible ordnance(s) remnants from World War II	Impacts on Physical and Cultural Resources or Heritage (Accidental discovery of artifacts/fossils of cultural/historical significance)		When found, artifacts shall be turned over to the responsible regulatory body.			

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Hiring of Manpower	Generation of Employment including Gender and Development and Vulnerable Sectors, and Business Opportunities	People	Prioritize hiring of local qualified workers from the DIA and IIA Prioritize local contractors and local suppliers Coordinate with the LGU's Public Employment Services Office (PESO) with regard to employment of workers/staff Identify issues and concerns involving various sectors as maybe necessary in the provision of SDP.	Project Proponent - PESO Project Developer Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	• Dredging works (channel dredging, excavation, dredged material disposal)	Silt dispersal; Increase in Turbidity Deterioration of surface water quality Leak/Discharge of oil and/or other hazardous materials	Water	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	• Sandkey formation (dredging of sandkey, dredge material disposal, sand replacement) • Sand Filling (Formation of islands and channels, excavation) • Soil Improvement (Installation of PVDs, Surcharging, Vibro Compaction) • Reclamation Edge Structure • Construction and Installation of Concrete Wave Wall	from ships and equipment Threat to existence and/or loss of important local species due to siltation Threat to abundance, frequency and distribution of important species due to siltation Hindrance to wildlife access due to siltation		Material is placed in a controlled manner within the project boundaries: Controlled direct placement by barges Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed Proper maintenance of the vessels to prevent			

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Related construction activities in temporary working areas			accidental spillages and minimize turbidity increase. Monitored/ controlled loading and unloading of fill/dredged materials On-site collection and segregation of wastes; strict policy on no shipboard waste disposal at sea			
		Change in the local micro-climate e.g. local temperature Contribution in terms of greenhouse gas emissions (or GHG mitigation potential) Note: applicable only for projects with significant GHG emissions	Meteorology/ Climatology	Allotment of PRA 2019-05 requires 5% of the Project Area to be dedicated for Green spaces to supplement the Carbon Sink Program. Support to reforestation and greening program activities	Project Proponent/ Project Developer	Project Construction Cost	Project Proponent/ Developer Contract / Agreement with the Contractor/s
		Potential contamination with substances in filling materials	Water	Provision of appropriate certifications and permits for fill material extraction activities Pre-screening of fill materials thru Toxicity Characteristic Leaching	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Procedure (TCLP) analysis and technical sand specification.			
		Devaluation of land value as a result of improper solid waste management and other related impacts Generation of hazardous wastes	Water and Land	Proper collection and segregation of solid waste among vessels, lay-down area and other areas within the project by an accredited third- party waste service provider. Proper implementation of hazardous waste management plan. Collected solid waste shall be segregated and collected by a 3rd party hauler.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Change in marine water quality	Water	Placing coarse sand with low fines content Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded A detailed Turbidity Management Plan is being followed. Issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with TMP.			

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		Oil and grease contamination	Water	Proper implementation of hazardous waste management plan. Provision of appropriate drip trays. Chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank. Maintenance of hazardous waste storage facility. Provision of appropriate spill kits and booms, in case of accidental spillage Practice good maintenance of machineries and equipment to reduce oil losses.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Potential conflict with PPA	People	Close coordination with PPA and VTMS Proper implementation of approved Vessel	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Traffic Management Plan and waterways			
		Potential accidents causing damages to marine ecosystems during transport of dredging vessel	Water	Use of sea-worthy vessel approved by MARINA, PCG and appropriate regulatory bodies Installation of adequate navigational devices including early warning system. Avoid and stop transport during inclement weather. Implementation of Typhoon Response Plan. Compliance with MARINA, PCG and international regulations. Proper training of vessel crew and personnel.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
	Transport of dredged material from the project	Dispersal of reclamation materials resulting in increase	Water	Placing coarse sand with low fines content	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	area to dumping area	in turbidity/ water pollution		Creating a sheltered (bunded) area where material is placed will contain turbidity Material is placed in a controlled manner within the project boundaries: • Controlled direct placement by barges • Controlled placement by spreader pontoon Removal of Island A happens fully sheltered, material is pumped through pipelines where no turbidity can exist and is discharged on land maximising control possibilities and minimising turbidity Turbidity levels are being monitored and works will be stopped in case maximum allowed levels are exceeded			

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				A detailed Turbidity Management Plan is being followed			
	Filling of Sand keys in the reclamation area (above water level); Construction of containment structure Related construction activities in temporary working areas	Dust pollution emanating from open areas	Air	Conduct dust suppression activities, e.g. green net installation and water truck sprinkling or road spraying (3 times or more as needed per day during dry season)	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Noise pollution from the operation of heavy equipment	Air	Conduct noise monitoring during active works. Ensure mufflers are installed in all equipment. Conduct regular preventive maintenance servicing.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Generation of domestic wastewater from temporary facilities	Water	Provision of portalets in project area, and toilet facilities in every vessel. Regular siphoning by accredited STP facility.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		Generation of solid waste	Water and Land	Collection and disposal of solid waste by a DENR accredited 3rd party Waste Service Provider (WSP)	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Generation of hazardous wastes such as used oil, used batteries, contaminated rags, busted bulbs and lamps	Water and Land	Provision of a Hazardous Waste Storage Area with proper labeling, segregation and storage of wastes. Issuance of Hazardous Waste Generator ID from DENR Collection, transport, treatment, and disposal by a DENR accredited 3rd party hauler and TSD facility	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Traffic density increase and Traffic-related Accidents (for both marine vessel and land vehicles)	Land People	Implementation of Traffic Management Plan which include proper lane designation, speed limit, trucks deployment schedule, traffic signs, CCTV, and traffic marshals among others. Coordinate with the PCG and PPA to prevent	Project Proponent Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				navigational routes traffic or collision			
	Use of power generating sets and fossil fuel using equipment	Fossil fuel emissions	Air	Use of diesel fuel (low sulfur fuels) in all gensets. Regular inspection and preventive maintenance servicing of all generators and equipment. Regular Ambient Air Monitoring.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary access roads/ bridges from mainland to reclaimed area and between the islands	Alteration of water flow	Water	Construction/Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Construction activities	Threat to Public Health and Safety Occupational Health and Safety Hazards	People	Implement a construction safety and management plan. Provision of medical station and standby nurse Create measures to protect workers and community against spread of communicable diseases Provide appropriate safety signs/warning Provision of PPE Conduct emergency preparedness & response trainings Restrict site access of visitors or unauthorized personnel to prevent potential construction hazards and damage to equipment or theft Strict security and safety protocols Installation of CCTVs	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Provide adequate water and sanitation facilities to the project site Conduct of safety inductions for Project visitors and for the newly hired personnel			
Construction Phase	End of construction/ reclamation activities	Loss of employment	People	Payment of social benefits subject to DOLE rules. Endorsement of the displaced construction employees to the contractors of horizontal development.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Decommissioning of temporary facilities	Disposal of waste including hazardous waste generated during the reclamation activities	Water and Land	Proper management and disposal of waste using DENR accredited 3rd party hauler and TSD facility Air and water sampling and monitoring to ensure that there is no adverse impact to the environment.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Horizontal Development (include major/primary access roads and bridges, open spaces, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems)							
Pre-construction	Permitting	Project Delays	Land Use	Secure applicable permits and clearances from the concerned	Project Developer (SM SCIDC)	Part of permitting and	Project Developer Project Developer

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
phase				government offices	Contractor	development cost	Contract / Agreement with the Contractor/s
	IEC / Stakeholder Consultations	Misinformation / Lack of knowledge about the Project	People	Install project billboards IEC campaign Coordination with Pasay City LGU	Proponent Project Developer Contractor	Part of project development cost	Project Developer Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Hiring of Manpower	Generation of Employment including Gender and Development and Vulnerable Sectors, and Business Opportunities	People	Prioritize hiring of local qualified workers from the DIA and IIA Prioritize local contractors and local suppliers Coordinate with the LGU's Public Employment Services Office (PESO) with regard to employment of workers/staff Identify issues and concerns involving various sectors as maybe necessary in the provision of SDP.	Project Proponent-PESO Project Developer Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of horizontal development	Solid waste generation	Water and Land	Proper collection and segregation of solid waste among vessels,	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	structures such as roads and bridges, drainage systems, parks and open spaces, among others (earthworks, mobilization, excavation, among others)			lay-down area and other areas within the project by an accredited third- party waste service provider			
		Change in marine water quality	Water	Implement Turbidity Management Plan (TMP) Regular water quality monitoring Issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with TMP.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Oil and grease contamination	Water	Proper implementation of hazardous waste management plan. Provision of appropriate drip trays. Chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank. Maintenance of hazardous waste	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				storage facility. Provision of appropriate spill kits and booms, in case of accidental spillage Practice good maintenance of machineries and equipment to reduce oil losses.			
		Dust pollution emanating from open areas	Air	Conduct dust suppression activities, e.g. green net installation and water truck sprinkling or road spraying (3 times or more as needed per day during dry season) Conduct regular Air Quality Monitoring and compare with baseline data.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Noise pollution from the operation of heavy equipment	Air	Conduct noise monitoring during active works. Ensure mufflers are installed in all equipment. Conduct regular preventive maintenance	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				servicing.			
		Change in the local micro-climate e.g. local temperature Contribution in terms of greenhouse gas emissions (or GHG mitigation potential) Note: applicable only for projects with significant GHG emissions	Meteorology/ Climatology	Allotment of PRA 2019-05 requires 5% of the Project Area to be dedicated for Green spaces to supplement the Carbon Sink Program. Support to reforestation and greening program activities	Project Proponent/ Project Developer	Project Construction Cost	Project Proponent/ Developer Contract / Agreement with the Contractor/s
		Generation of domestic wastewater from temporary facilities	Water	Provision of portalets in project area, and toilet facilities in every vessel. Regular siphoning by accredited STP facility.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Generation of solid waste	Water and Land	Collection and disposal of solid waste by an accredited 3rd party Waste Service Provider (WSP)	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Generation of hazardous wastes such as used oil, used batteries, contaminated rags,	Water and Land	Provision of a Hazardous Waste Storage Area with proper labeling, segregation and	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
		busted bulbs and lamps		storage of wastes. Issuance of Hazardous Waste Generator ID from DENR Collection, transport, treatment, and disposal by a DENR accredited 3rd party hauler and TSD			
		Traffic density increase and Traffic-related Accidents	Land People	Implementation of Traffic Management Plan which include proper lane designation, speed limit, trucks deployment schedule, traffic signs, CCTV, and traffic marshals among others.	Project Proponent Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
	Use of power generating sets and fossil fuel using equipment	Fossil fuel emissions	Air	Use of diesel fuel (low sulfur fuels) in all gensets. Regular inspection and preventive maintenance servicing of all generators and equipment. Regular Ambient Air Monitoring.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Maintenance of temporary access roads/ bridges from mainland to reclaimed area and between the islands	Alteration of water flow	Water	Maintenance of Steel Sheet pile (SSP) & Baily Bridge openings to strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations contained in the hydrodynamic modelling study and flooding impact study	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction activities	Threat to Public Health and Safety Occupational Health and Safety Hazards	People	Implement a construction safety and management plan. Provision of medical station and standby nurse Create measures to protect workers and community against spread of communicable diseases Provide appropriate safety signs/warning Provision of PPE	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Conduct emergency preparedness & response trainings Restrict site access of visitors or unauthorized personnel to prevent potential construction hazards and damage to equipment or theft Strict security and safety protocols Provide adequate water and sanitation facilities to the project site Conduct of safety inductions for Project visitors and for the newly hired personnel			
Construction Phase	End of horizontal development activities	Loss of employment	People	Payment of social benefits subject to DOLE rules. Skills training/livelihood training for construction workers/employees who will be losing employment and residing in Pasay City	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				prior to decommissioning. Endorsement of the displaced construction employees to the contractors of vertical development			
Construction Phase	Decommissioning of temporary facilities (worker's barracks, temporary access bridges/roads and construction signboards, among others)	Disposal of waste including hazardous waste generated during the reclamation activities	Water and Land	Proper management and disposal of waste using DENR accredited 3rd party hauler and TSD facility Air and water sampling and monitoring to ensure that there is no adverse impact to the environment. Implement Turbidity Management Plan	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Traffic density increase and Traffic-related Accidents (for both marine vessel and land vehicles)	Land People	Implementation of Traffic Management Plan which include proper lane designation, speed limit, trucks deployment schedule, traffic signs, CCTV, and traffic marshals among others.	Project Proponent Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impacts	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Coordinate with the PCG and PPA to prevent navigational routes traffic or collision			
Abandonment (Plans for rehabilitation, abandonment and decommissioning will be communicated with the DENR/EMB for the latter's requirements and approval) • The proposed reclamation Project will form islands intended to be a permanent part of Pasay City land area.							

Table 3.15 Supplemental Environmental Management Plan for the Construction and Decommissioning of the Temporary Support Facilities

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Construction of temporary support facilities - mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	Air	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary support facilities -	Road Accident	People	Separate pedestrian walkway (Personnel Entrance and Exit) and	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract /

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	mobilization of land-based equipment and vehicles			access for vehicles (Vehicle Entrance and Exit) Set up warning strips for isolation The main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher or / linemen Observe vehicle speed limit. No overloading. Keep linemen at its post to observe and give signal to moving vehicles			Agreement with the Contractor/s
Construction Phase	Construction of Movable Transferable Jetty, Temporary Rock Wharf,	Threat to Health and Safety	People	Wearing of PPE particularly life-vest Avoid and stop activities during inclement weather.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C - moving around / vessel transport	Vessel Collision	People	Compliance with Maritime Industry Authority (MARINA), Philippine Coast Guard (PCG) and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Mobilisation and Transport of vehicles and vessels	Potential oil spill leaks	Water Quality	Regular inspection and maintenance of machineries, vehicles, vessels and equipment to avoid oil leaks/ spills. Implementation of Oil Spill Contingency Plan.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary facilities	Oil Spills	Land Water Quality	Set up a chemical storage area with proper signages, spill kits, fire extinguisher and ventilation, all chemicals will have MSDS, use warning tape to isolate, and put up warning signs. Hot work is prohibited near the chemical storage area,	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				and extinguishers shall be set up The disposal of hazardous wastes and/or expired chemicals will be through DENR accredited Treatment, Storage And Disposal (TSD) facility. Implementation of the Oil Spill and Contingency Plan			
Construction Phase	Construction of Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf,	Generation of Solid Waste Soil contamination	Land Water People	Implementation of waste management Plan Proper housekeeping and materials handling Collection and disposal of solid waste by a DENR accredited 3rd party Waste Service Provider (WSP) Proper housekeeping and hauling of solid waste. Provision of a Hazardous Waste Storage Area with proper labeling, segregation and storage	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets including transfer of materials, clearing of site location, hauling, mobilization and transport,			of wastes. Collection, transport, treatment, and disposal by a DENR accredited 3rd party hauler and TSD facility Provision of secondary containment and/or containment bund wall with 110% capacity by volume.			
Construction Phase	Stockpiling of materials such as CBM, rock and pipes	Presence of debris	Land	Materials such as CBM, rock and pipe stockpiles should be limited and confined on its designated area. Proper hauling and delivery.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Storage of fuel	Fuel leaks	Land Water	Establishment of secondary containment/ bundwall that can contain	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract /

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				110% capacity by the actual total volume of stored fuels. Readily available oil spill kit and fire extinguisher.			Agreement with the Contractor/s
Construction Phase	Use of generator set	Fuel leaks and emissions	Air	Secure and adherence to permit to operate. Proper handling of diesel fuel.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary facilities - Use of engines of generators, ships, vehicles and machinery, Whistles, horns, reversing alarms, intercom communication noise, workers' voices, etc. of machinery and vehicles in the site area	Increase in Noise and Vibration	Air and Noise	Take sealing measures or sound-absorbing materials to reduce the noise intensity of generators and equipment engines Control the working hours and reduce unnecessary equipment movement at night Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs and train and supervise personnel to use them correctly	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Construction of temporary support facilities	Occurrence of Accidents Threat to Health and Safety	People	Induction and PPE to be given to all the new workers and staff toolbox to be conducted prior to each activity Mandatory of PPE compliance Provide proper barricading and signage to be installed. Security Personnel to be deployed to control the entry and exit of Equipment, Materials and Workers Safety Officer and First Aider will be assigned 24/7 to ensure the implementation of Safety Management System All moving equipment's will be controlled by certified operator and assisted by trained spotter, Temporary fence of operational area must be installed During night operation proper illumination will be	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				provided and night work permit to be applied. Welfare Facilities to be ensure in place prior to start the activities: Toilet, Rest Shelter, Storage of Materials Provision of water and Security booth. Basic requirements for all heavy/light vehicle must be provided as well as operator certification, Rucker's Personal Conveyance (TPC's), License, Vehicle registration, etc. Proper Waste Management implementation			
Construction Phase	Installation and use of temporary movable jetty	Contamination of water and soil due to rustling of steel	Water Quality	Proper maintenance of movable transferable jetty	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Temporary movable jetty steel works	Threat to Health and Safety	People	Proper PPE of construction workers	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Transfer of temporary movable jetty	Degradation of water quality / turbidity	Water Quality	Control of speed limit especially near the sand filling activities.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of rock wharf: Laying of smaller rocks or gravel to create a stable base Laying of geotextile to prevent soil erosion Installation of bigger rocks on the center and	Degradation of water quality / turbidity	Water Quality	Proper handling of rocks and gravel Control of speed limit especially near the sand filling activities. Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	boulders on outer edge Backfilling and compaction Installation of precast mooring, barricades and safety signages						
Construction Phase	Construction and usage of temporary bridges during transport and mobilization	Alteration of water flow	Hydrology	Construction/Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Installation of temporary bridge (sand filling)	Loss of topsoil / soil erosion	Water Quality	Installation of geotextiles and placement of sandbags along the slope	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Installation of temporary bridge (sand filling)	Water quality degradation / Turbidity	Water Quality	Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Construction of temporary support facilities - mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	Air	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary support facilities - mobilization of land-based	Road Accident	People	Separate pedestrian walkway (Personnel Entrance and Exit) and access for vehicles (Vehicle Entrance and Exit)	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	equipment and vehicles			Set up warning strips for isolation Main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher or / linemen Observe vehicle speed limit. No overloading. Keep linemen at its post to observe and give signal to moving vehicles			
Decommissioning Phase	Decommissioning of Movable Transferable Jetty, Temporary Rock Wharf, Temporary	Threat to Health and Safety	People	Wearing of PPE particularly life-vest Avoid and stop activities during inclement weather.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C - moving around / vessel transport	Vessel Collision	People	Compliance with Maritime Industry Authority (MARINA), Philippine Coast Guard (PCG) and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Mobilisation and Transport of vehicles and vessels	Potential oil spill leaks	Water Quality	Regular inspection and maintenance of machineries, vehicles, vessels and equipment to avoid oil leaks/ spills. Implementation of Oil Spill Contingency Plan.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary facilities	Oil Spills	Land Water Quality	Set up a chemical storage area with proper signages, spill kits, fire extinguisher and ventilation, all chemicals will have MSDS, use warning tape to isolate, and put up warning signs. Hot work is prohibited near the chemical storage area,	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				and extinguishers shall be set up The disposal of hazardous wastes and/or expired chemicals will be through DENR accredited Treatment, Storage And Disposal (TSD) facility. Implementation of the Oil Spill and Contingency Plan			
Decommissioning Phase	Decommissioning of Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary	Generation of Solid Waste Soil contamination	Land Water People	Implementation of waste management Plan Proper housekeeping and materials handling Collection and disposal of solid waste by a DENR accredited 3rd party Waste Service Provider (WSP) Proper housekeeping and hauling of solid waste. Provision of a Hazardous Waste Storage Area with proper labeling, segregation and storage	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets including transfer of materials, clearing of site location, hauling, mobilization and transport,			of wastes. Collection, transport, treatment, and disposal by a DENR accredited 3rd party hauler and TSD facility Provision of secondary containment and/or containment bund wall with 110% capacity by volume.			
Decommissioning Phase	Pull out/ Removal of excess materials such as CBM, rock and pipes	Presence of debris	Land	Proper hauling and delivery.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Use of generator set	Fuel leaks and emissions	Air	Secure and adherence to permit to operate.	Project Developer/ Contractor	Project Decom-	Project Developer Contract /

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Proper handling of diesel fuel.		missioning Cost	Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary facilities - Use of engines of generators, ships, vehicles and machinery, Whistles, horns, reversing alarms, intercom communication noise, workers' voices, etc. of machinery and vehicles in the site area	Increase in Noise and Vibration	Air and Noise	Take sealing measures or sound-absorbing materials to reduce the noise intensity of generators and equipment engines Control the working hours and reduce unnecessary equipment movement at night Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs and train and supervise personnel to use them correctly	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary support facilities	Occurrence of Accidents Threat to Health and Safety	People	Induction and PPE to be given to all the new workers and staff toolbox to be conducted prior to each activity Mandatory of PPE compliance	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Provide proper barricading and signage to be installed. Security Personnel to be deployed to control the entry and exit of Equipment, Materials and Workers Safety Officer and First Aider will be assigned 24/7 to ensure the implementation of Safety Management System All moving equipment's will be controlled by certified operator and assisted by trained spotter, During night operation proper illumination will be provided and night work permit to be applied. Basic requirements for all heavy/light vehicle must be provided as well as operator certification, Rucker's Personal Conveyance (TPC's), License, Vehicle registration, etc.			

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Proper Waste Management implementation			
Decommissioning Phase	Dismantling of temporary movable jetty	Contamination of water and soil due to rustling of steel	Water Quality	Proper maintenance of movable transferable jetty	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Dismantling of jetty steel works	Threat to Health and Safety	People	Proper PPE of construction workers	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of rock wharf	Degradation of water quality / turbidity	Water Quality	Proper handling and hauling of rocks and gravel Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary bridge	Loss of topsoil / soil erosion	Water Quality	Placement of sandbags along the slope	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Decommissioning Phase	Decommissioning of temporary bridge	Water quality degradation / Turbidity	Water Quality	Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Siphoning, pull-out of portalets and site clean-up where these portalets	Generation of Solid waste Soil Contamination	Water Land	Proper housekeeping and pulled up of portalets Proper siphoning and collection by the siphoning contractor and contractor of the portalets	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

4. ENVIRONMENTAL RISK ASSESSMENT & EMERGENCY RESPONSE POLICY

4.1. ENVIRONMENTAL RISK ASSESSMENT (ERA)

4.1.1. DESCRIPTIVE / QUATLITATIVE RISK ASSESSMENT

Risk Screening Level

A risk screening level exercise refers to specific facilities or the use of certain processes that has the potential to pose significant risks to people and its surrounding environment. Based on the Risk Screening Matrix provided under Annex 7-2e of DAO 2003-30 or the Revised Procedural Manual, the Project (Table 4.1) does not fall within all identified activities requiring risk screening exercise, and thus, does not require to prepare an ERA.

Table 4.1: Risk Screening Matrix

Activities Requiring Risk Screening Exercise				ERA applicability to the Project
1. Facilities for the production or processing of organic/inorganic chemicals using:				Not applicable
Alkylation	Esterification	Polymerization	Distillation	
Amination	Halogenation	Sulphonation	Extraction	
Carbonylation	Hydrogenation	Desulphurization	Solvation	
Condenstation	Hydrolysis	Nitration	Pesticides &	
Dehydrogenation	Oxidation	Phosphorus prod.	pharmaceutical prod.	
2) Installations for distillation, refining, and other processing of petroleum products				Not applicable
3) Installations for total or partial disposal of solid or liquid substances by incineration or chemical decomposition				Not applicable
4) Installations for the production or processing of energy gases (e.g., LPG, LNG, SNG.)				Not applicable
5) Installations for the dry distillation of coal or lignite				Not applicable
6) Installations for the production of metals and non-metals by wet process or electrical energy				Not applicable
7) Installations for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 29)				Not applicable
			Conclusion	Not applicable

4.1.2. SAFETY RISKS

The first step to any response procedure is to evaluate the danger to human health. Health, Safety and Environment (HSE) Team with the assistance of the Site Manager/Responding Personnel will evaluate the situation to identify if the incident area is safe for addressing environmental issues. If there is no immediate danger, the Environmental Unit (EU) and the Site Manager/Responding Personnel will address the identified environmental emergency.

However, if imminent danger is detected, the personnel will act to protect human life. Boats are also equipped with Safety and evacuation plan and placed in its strategic places. Table 4.2 shows the summary matrix of safety risks for this Project:

Table 4.2 Summary Matrix of Safety Risks

Activities	Safety Risks	Probability of Incident	Prevention/Control Measures
Dredging	Fire	Nil to Minimal	Safety procedures at the dredging vessel Diesel Oil used has high Flash Point
	Explosion	Nil	Diesel Oil not explosive
	Release of toxic substances	Nil	No HAPs (Hazardous Air Pollutants) from exhaust of engines
Filling	Fire	Nil to Minimal	Safety procedures at the dredging vessel Diesel Oil used has high Flash Point
	Explosion	Nil	Diesel Oil not explosive
	Release of toxic substances	Nil	No HAPs (Hazardous Air Pollutants) from exhaust of engines
Operation of Heavy Equipment	Fire	From fossil fuels	Safe worthiness of equipment Firefighting equipment on board equipment
	Explosion	Not applicable, fuel with high flash point	Not applicable
	Release of toxic substances	Oil sludge generation	Not discharged to bay, instead to onshore

Based from the above table, there is no significant safety risks involved in the Project as long as the prevented control measures are at placed. The activities involved are confined to the reclamation area and away from population centers; thus, there are no societal risks associated.

4.1.3. EXTREME CLIMATE EVENTS

The projected seasonal temperature increases and seasonal rainfall change is shown in Table 4.3 while the frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in NCR is shown Table 4.4. Predicted range of temperature change in NCR in 2050 is 1.8 to 2.1°C while seasonal rainfall change is from -38.5 to 3.7%.

Table 4.3 Seasonal temperature increases (in °C) and rainfall change (in%) in 2020 and 2050 under medium-range emission scenario in NCR

Month	Observed Baseline (1971 to 2000)				Change in 2020 (2006 to 2035)				Change in 2050 (2036 to 2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
NCR / Metro Manila	26.1	28.8	28.0	27.4	1.0	1.1	0.9	1.0	2.0	2.1	1.8	1.9
Seasonal Rainfall Change (in %)	107.5	198.5	1,170.2	758.7	-12.8	-33.3	8.5	0.0	-17.3	-38.5	21.3	3.7

Source: PAGASA. Climate Change in The Philippines (February 2011)

Table 4.4 Frequency of extreme events in 2020 and 2050 under medium-range emission scenario

Station	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of rainfall >200mm		
	OBS (1971 to 2000)	2020	2050	OBS (1971 to 2000)	2020	2050	OBS (1971 to 2000)	2020	2050
Port Area	299	1,176	2,118	7,380	6,445	6,382	12	12	13

OBS: Observed Baseline
Source: PAGASA. Climate Change in The Philippines (February 2011)

For the assessment whether the project location is projected to have extreme climate events for 2020 &or 2050 that could contribute to the triggering identified scenarios, there are no conceivable societal risks from the extreme climate events because (a) there are no population centers in the reclamation area and (b) the reclamation activities will be completed by 2028. The identified scenarios and potential impacts of extreme events in terms of safety and physical risk is summarized in Table 4.5 and Table 4.6, respectively.

Table 4.5 Identified Scenarios and Potential Impacts of Extreme Climate Events (Safety)

Activities	Safety Risks	Temperature	Rainfall
Dredging	Fire	Nil	Nil
	Explosion	Nil	Nil
	Release of toxic substances	Nil	Nil
Filling	Fire	Nil	Nil
	Explosion	Nil	Nil
	Release of toxic substances	Nil	Nil
Operation of Heavy Equipment	Fire	Unlikely, flash point not ambient temperature determining factor	Nil
	Explosion	Not applicable, fuel	Not applicable

Activities	Safety Risks	Temperature	Rainfall
		Not combustible	
	Release of toxic substances	Not applicable	Not applicable

Table 4.6 Identified Scenarios and Potential Impacts of Extreme Climate Events (Physical)

Activities	Physical Risks	Temperature	Rainfall
Dredging	Accidents to Construction Personnel	Heat effects on workers	Not applicable
Filling	Accidents to Construction Personnel	Same as above	Not applicable
Operation of Heavy Equipment	Accidents to Construction Personnel	Same as above	Not applicable

4.1.4. RELEASE OF TOXIC SUBSTANCES

The project generates various hazardous wastes such as used oil and other oily wastes e.g., contaminated rags and gloves. Typical hazardous wastes recorded and reported and may produce during the project implementation are summarized on

Table 4.7. The hazardous waste is stored in a hazardous waste storage facility that is designed to provide open-air ventilation to the stored hazardous waste. Secondary containment, such as drip trays, is provided inside the hazardous waste storage area for liquid hazardous wastes. Spill kits, fire extinguishers, gloves, eye protection, and hazard signages are also provided. Permit-To-Transport and Certificates of Treatment are also posted in the hazardous waste storage area.



Plate 4-1 Existing Hazardous Waste Storage in the Project Site

Table 4.7 Recorded and Potential Hazardous Waste During Project Implementation

HW No.	HW Class	HW Nature	HW Cataloguing Toxic (T), Reactive (R), Flammable (F), & Corrosive (C)
I101	Used Industrial Oil	Liquid	T/F
I102	Cooking Oil	Liquid	T/F
I104	Oil Contaminated Materials	Solid	T/R/F
M506	E-Waste (WEEE)	Solid	C
L402	Waste with specific nonhalogenated toxic organic chemicals	Liquid	T
M501	Pathological or Infectious waste	Solid	T
M503	Pharmaceuticals and Drugs	Solid	T
E501	Oxidizing Agents	Liquid	C
J201	Containers previously containing toxic chemical substances	Solid	T/C/F
F601	Solvent based	Liquid	T/C/R/F
D406	Lead Compounds	Solid	T/F
G704	Nonhalogenated organic solvents	Liquid	T/F

Concentrations of Toxic/Hazardous Substances (i.e. cyanide, mercury, etc.) in Water

The risk factor that needs to be carefully identified during the construction phase is the potential contamination of the Bay with toxic and hazardous substance that may be present from filling materials and from the operations of vessels and vehicles.

For the filling materials, pre-screening of any filing materials to be used is mandatory; with chemical analysis for toxic elements e.g. cyanide, mercury, lead, chromium, etc. The use of and sourcing of the filling materials from its likely source is subject to prior permits and clearances from the Philippine Reclamation Authority. One of the requirements for securing such permits/clearances is an ECC.

Notwithstanding that the import of filling/burrows are to undergo strict screening and evaluation, mitigation measures will nevertheless will put in place for dispersal of silts/disturbed sea beds. The use of containment sheet piles along the perimeter of the project will further ensure that any toxic/hazardous substances will not disperse beyond the reclamation area.

For the vessels and vehicles and other equipment, proper check-ups and maintenance will be conducted routinely especially for leak checking. Proper housekeeping, handling and inspection of storage of hazardous waste will be practiced and monitored.

4.1.5. PHYSICAL RISKS

The worst-case anticipated accident scenarios or potential accidents could occur during the construction phase involving the use of heavy machineries such as dredging equipment, and others.

The criteria for the choice of the construction contractor(s) will include among others the safety policies and protocol that will be observed.

The summary of the physical risks is presented in Table 4.8.

Table 4.8 Summary Matrix of Physical Risks

Activities	Physical Risks	Probability of Incident	Prevention/Control Measures
Dredging	Accidents to Construction Personnel	Nil to insignificant	Safety Training of Construction Crews Safety worthy equipment
Filling	Accidents to Construction Personnel	Nil to insignificant	Safety Training of Construction Crews Safety worthy equipment
Operation of Heavy Equipment	Accidents to Construction Personnel	Nil to insignificant	Safety Training of Construction Crews Safety worthy equipment

It is thus concluded that there exist no significant physical risks as long as preventive measures are at placed.

4.1.6. GEOHAZARDS

Section 2 of this EPRMP enumerates the hazard types within the project site using the HazardHunter website. Portions of the project site is identified to experience the following hazards: Prone to Ground Shaking; and Prone to Ashfall.

Discussion of the geohazards, mitigating measures can be found in Section 2 and Section 3 of this EPRMP, respectively. Other geohazards identified in the Project site and nearby areas are the following: highly susceptible to liquefaction, highly susceptible to differential settlement (EGGAR 2017), potential of tsunamis in Manila Bay and at/near the project site may occur such as in scenarios of strong earthquakes. The project also has taken into consideration the recommendations from the Hydrodynamic Modelling Study (Appendix J), Flooding Impact Study (Appendix K), Engineering Geological and Geohazard Assessment Report (EGGAR) report and Geotechnical Investigation Report (Appendix E.2) that the reclamation Project is suitable for the intended purpose and development.

The revised Landform Plan is consistent with Pasay City's Disaster Risk Reduction and Management Plan as it addresses the issues on flooding and storm surge. Flooding has always been a predominant problem of the City, with the root cause for flooding mainly attributable to the clogged/blocked wide water tributaries of the City that flows out to Manila Bay and the country's geographical location within the Typhoon Belt. With intense rainfall, low-lying areas of the City may be submerged to flooding. During intense rainfall, low-lying areas of the City become susceptible to flooding. Rainwater, which traverses Estero de Paco, Estero de Pandacan in Manila and a portion of Estero de Tripa de Gallina in Makati, as well as the Redemptorist and Seaside Channels are connected to the Libertad Channel, which ultimately discharges to the Manila Bay. Under the PCDRRMP, the City should ensure that these wide waterways should have free flow of water. In line with the above the Original 300-hectare Island B will be split to Reconfigured Islands B and C, thereby creating a ±183-meter channel, which will enhance the free flow of water from Libertad Channel to Manila Bay. The new water channel will provide a much wider drainage area than the Libertad Channel itself and prevent accumulation of water discharge at the mouth of the Libertad Channel. This change in the

landform has been duly illustrated in the Development History-Based Geographical Map of the PCDRRMP.

In addition to the creation of a new water channel, the recently approved revised landform further enhanced water circulation by expanding the initial ±20-meter wide channel between the mainland and the Original 60-hectare Island to ±476-meter channel. Similarly, this enhancement is consistent with the governing principles under the 2023-2025 PCDRRMP. Finally, the Revised Landform for the Project, with a final platform land elevation of at least 4 MLLW, a higher elevation than of the low-lying areas in the Pasay City mainland, may even provide for a sheltering effect, where the higher reclaimed area will serve as a barrier to protect the low-lying strip of Manila Bay from the direct impact of storm surges as identified in the PCDRRMP. Moreover, the higher final platform elevation may also reduce the risk of flooding as a result of the barrier, which may protect the existing land from overtopping of water (from waves). As such the PCDRRMP has considered the on-going reclamation projects as among Pasay LGU's strengths in relation to disaster prevention and mitigation and an opportunity for new spatial development

4.2. EMERGENCY RESPONSE PLAN

The Project has an Environmental Emergency Response Plan prepared by CHEC for both onshore and offshore emergencies as well as an Oil Spill Contingency Plan prepared by RMS Petroleum Technology within the reclamation area.

4.2.1. OFFSHORE – EMERGENCY

Vessel Preparedness

All Project vessels will comply with the applicable maritime conventions and Flag State requirements (e.g. Safety of Life at Sea (SOLAS), International Safety Management (ISM)). The safety management system implemented on board Contractor and Subcontractor vessels incorporates predefined emergency situations.

Emergency Contacts

Offshore emergency situations which require assistance may be supported by contacting the following:

- Coast Guard which is available via VHF channel 16
- Man Overboard, VHF channel 16
- Injury at Sea, VHF channel 16
- General Emergency telephone number: 9-1-1
- Unexploded Ordinance (UXO) discovery PNP EOD Head Office Col-Omengan: +63 908 866 1996

Emergency Alarm

Two main emergency signals on board the vessels are:

- General alarm – 7 short ringing of the bell followed by a long ring (on alarm bell or vessel horn); and
- Fire alarm – continuous ringing of the alarm bell or blasting vessels horn.

4.2.1.1. OFFSHORE EMERGENCY SCENARIO – PERSONAL INJURIES

Each working location will have trained first aider and first aid facilities. A minimum of one qualified First Aider will be on board during operations. Personnel on board will be informed of the first aid arrangements during induction training.

A map and directions to the local hospitals will be compiled and distributed to all vessels.

First aid boxes will be provided and maintained and will be checked on a monthly basis.

4.2.1.2. OFFSHORE EMERGENCY SCENARIO - FIRE

In the majority of cases, the first to identify the fire must activate the general alarm and inform the Master, Superintendent or Construction Site Manager of the emergency. Unless the fire is of very minor nature and has been put out by the personnel working in the vicinity, the Fire Fighting Team (vessel) or construction Site Emergency Response Team (ERT) will be mobilized immediately.

For the purpose of these guidelines, major fires shall be defined as fires, which cannot be handled by the personnel and resources available at the facility and outside assistance is required. In the event of a major fire, the Master / Construction Site Manager / Environmental Response Committee (ERC) will have to decide on the possibility of partial or total evacuation. In almost all major fires, partial evacuation shall be required, i.e. evacuation of non-essential personnel, and this should be initiated immediately.

The Master / Construction Site Manager / ERC shall:

- Make a vessel wide announcement clearly stating who are to be evacuated and by which method i.e. crew boat, supply vessel or tugs; and
- To inform the Project Director / Project Manager (and Fleet Manager for vessel related emergencies) requesting assistance if required.

4.2.1.3. OFFSHORE EMERGENCY SCENARIO – VESSEL COLLISION

In the event that the vessel loses its positioning control and collides with a facility, vessel or other offshore facilities, the Master must then act as follows:

- Inform the Project Manager / Construction Manager and request assistance, if required;
- Extent of the damage caused – to both the facilities;
- Likelihood of progressive failure of both facilities as a result of damage induced by the collision;
- Necessity to shut down the operations; and
- Necessity for total/partial evacuation of the facilities, if manned.

On assessment that a total evacuation is required, the Master shall:

- Activate the onboard 'Prepare-to-Abandon Vessel procedure; and
- Shutdown the operations.

Action to be carried out on board (or as per vessels own ERP):

- Sound the general alarm;
- Inform engine room and all personnel below the waterline;
- Maneuver the ship so as to minimize effects of collision;
- Establish contact with another vessel;
- Close watertight doors and automatic fire doors;
- Muster all personnel and execute headcount;
- Switch on deck lights at night;
- Make ship's position available to GMDSS equipment;
- Sound bilges, tanks and void spaces after collision;
- Check for fire/ damages;
- Offer/ ask assistance to/from the other ship;
- Broadcast a distress message if the ships are in grave and imminent danger and immediate; and
- Assistance is required, otherwise inform ships or coast guard in the vicinity.

When reporting such incident, as much information as possible should be provided on the following:

- General dimensions of the colliding vessel;
- Name and port of registration of vessel;
- Locations;
- Environmental conditions;
- Whether it is completely/partially disabled;
- Weather forecast; and
- Other vessels available in the area.

In a collision situation, it is important to record all times and actions, including radar data, as accurately as possible. It should also be remembered that any other vessel involved may have severe damage and require assistance. This information will be required when existing by, Employer and assisting local area authorities.

4.2.1.4. OFFSHORE EMERGENCY SCENARIO – OIL SPILL

The basic procedure outlined below shall serve as an emergency response guide only and is not intended to replace the vessel's Shipboard Oil Pollution Emergency Plan (SOPEP) or Project specific plans (e.g. Environmental Management Plan). Should an incident occur that may cause an accidental release to the environment such as oil, chemicals etc. the following actions shall be taken:

- Regardless of the quantity released / spilled the Master shall immediately notify the Project Manager and the Fleet Manager (as indicated in the Corporate Crisis Management Plan);

- Inform bridge / engine room;
- Assemble oil spill team;
- Check if it is safe to approach the spill;
- Try to stop the outflow and reduce spreading of the spill by using absorbent materials;
- Clean up; and
- Report to Port Authorities, Engineer and Employer if applicable.

Action relating to the size of the spill:

- If the spill is of a small quantity, but a clean-up operation is not possible (e.g. due to unfavorable weather or sea conditions), the Master shall initiate the ERP notification;
- If the clean-up operation lies within the vessel's own capabilities, the Master shall evaluate how best to respond, taking into consideration the weather forecast, sea condition and maintaining personnel safety as top priority;
- If the conditions do not permit clean-up or recovery, the need for application of dispersant shall be considered by the Project Manager and/or Fleet Manager in close consultation with the Master, taking into consideration actual / expected sea state and any approval possibly required for the use on Project location; and
- If the spill exceeds the vessel's capability initiate the ERP notification process as indicated in the Corporate Crisis Management Plan.

4.2.2. ONSHORE – CONSTRUCTION SITE EMERGENCY

Onshore Emergency Equipment

The following onshore emergency equipment will the available:

- Portable fire extinguisher shall be made available at worksite/office and maintain in working condition;
- Automated External Defibrillators (AED) to be available on the construction site;
- A first aid room/ center shall be available in the Site office/camp area and equipped with first aid facilities and supplies;
- A first aid kit shall be available on the construction site;
- An air horn will be used to sound the emergency alarm; and
- Muster Stations/Escape Routes.

The Security personnel will inform all personnel of the muster station/assembly point prior to the commencement of work activities. The briefing shall include the type of emergency alarm, escape routes and lifesaving equipment.

A plan showing Escape Routes is posted at locations where personnel normally congregate. Escape routes are marked and sign-posted. They must be kept clear of trip hazards and adequately lit at all times.

Emergency Contacts

Onshore Emergency situations which require assistance will be coordinated and supported by:

- General Emergency telephone number (Injury/Security/Environmental /Fire) 9-1-1
- Philippine National Police Patrol 1-1-7

4.2.2.1. ONSHORE EMERGENCY SCENARIO – FIRE/ EXPLOSION – GAS RELEASE

All personnel are informed on the actions to be taken during a fire emergency through their Induction.

Following are the actions to be undertaken:

Fire/ Explosion

- Sound the airhorn alarm;
- Secure the location;
- Muster all personnel away (upwind) from the location;
- Establish cause and stop the source when possible;
- Inform internal Firefighting team /external assistance;
- Inform Construction Manager / HSE coordinator; and
- Treat any casualties as per “Medical Emergencies”.

Gas leak

- Sound the airhorn alarm;
- Stop gas flow;
- Muster personnel outside gas area (upwind) and avoid flames and sparks;
- Inform Construction Manager / HSE coordinator; and
- If required call Fire brigade via 911.

Specific responsibilities in case of a fire or gas leak are listed below. These responsibilities maybe transferred to local fire services arrive.

Fire wardens (in buildings)

- Turn off the power supply;
- Guide staff out of the floors to emergency staircase;
- Give the first response by using the existing fire-fighting equipment; and
- Fire wardens are the last persons to leave the building and they check the building to confirm everybody has evacuated.

First Aider

- Approach and give necessary help to the personnel who need first aid;
- Rescue and Search for any unaccounted-for personnel; and
- Provide help to the activities for the search and rescue of personnel and material.

Site Emergency Response Team

- Coordinate the actions to be taken by the building owner such as turning off the gas supply to the building.

4.2.2.2. ONSHORE EMERGENCY SCENARIO – MEDICAL EMERGENCY

Each working location will have trained first aider and first aid facilities. A minimum of one qualified First Aider will be on site during site working hours. Personnel on site will be informed of the first aid arrangements during induction training.

A map and directions to the local hospital will be compiled and displayed on the site noticeboard along with the completed Telephone list. These documents will also be placed in the project cars where applicable.

First aid boxes will be provided and maintained and will be checked on a monthly basis.

4.2.2.3. ONSHORE EMERGENCY SCENARIO – ENVIRONMENTAL SPILL

Personnel will be trained in the environmental and waste management arrangements during induction, drills and toolbox talks.

The storage of hazardous materials such as diesel, hydraulic oil, paint and other chemicals that poses potential environmental hazards are to be stored in bunded chemical storage areas. Capacity of the bunds should be at least 110% of the net capacity of the largest container. Drip trays shall be provided for chemicals used outside the chemical storage area. The amount of hazardous materials on site will be kept to a practicable minimum. The chemical storage area shall be kept clean, temperature maintained and Safety Data Sheets (SDS) available and followed. Chemical spill materials, including PPE, will be available at the chemical storage areas.

Filling and fueling valves / taps will be kept locked with access only to authorized personnel. Drip trays will be made available for all refueling activities. Fuel storage tanks and drums are provided with appropriately sized secondary containment (i.e. ≥ 110% of container volume).

For onsite refueling, oil spill response and firefighting equipment will be stationed near mobile bowsers. Only generators and mobile plant that are too far away to drive up to the fuel storage will be refueled on site. Preventive oil spill materials including PPE are to be available.

Regular inspections shall be conducted to ensure well maintained area against possible spill incidents.

Action to be carried out in case of spill:

1. Inform Construction Manager /HSE Coordinator;
2. Assemble oil spill team;
3. Check if it is safe to approach the spill (check your surroundings);
4. Try to stop the outflow
5. Reduce spreading of the spill by using bunding of absorbent materials;

6. Inform Engineer; and
7. Clean up of spill and disposing of waste materials in line with the Contractor's Waste Management Plan.

4.3. OIL SPILL CONTINGENCY PLAN

The Proponent has secured approval of its project Oil Spill Contingency Plan (OSCP) from the Philippine Coast Guard (PCG) on 19 October 2023. The content of the approved OSCP is presented below.

4.3.1. SPILL KITS

Spill kits and PPE would be placed at locations where the potential for a spill exists, such as areas with storage tanks or hazardous materials. For temporary operations or repairs that may result in a contamination event, a Spill kits will be provided on site.

4.3.1.1. TYPE OF SPILL KITS

a. General Spill Kits: are also known as universal spill kits or all-liquid spill kits. They are used to soak up coolant, degreaser, paint, blood, bodily fluids, oils and fuels as well as mild acids, bases and water-based chemicals.

b. Oil Spill Kit: are one of the most common workplace chemical spills. Even though oil has a relatively low toxicity level, it still poses a serious threat to the safety of your employees and workspace. Taking a proactive approach to oil containment will prevent possible spills as well as equip you with an effective means of containing the oil in the event of a spill.

c. Chemical Spill Kit: are a complete solution for emergency spills. These kits can be used for a wide variety of spill applications, from a small leak or drip from a transport trailer, to a large spill at a shipping and receiving facility, to a large-scale oil spill on water.

Below shows the type of spill kits and its content that will be used in the project:

Table 4.9 Types of Oil Spill Kits

No	Item	Types of Spill Kits		
		General	Oil	Chemical
1.	Absorbent booms			
2.	Mats			
3.	Pads			
4.	Socks/rolls			
5.	Oil Only Socks			
6.	Oil Only Pads			
7.	Caution Tape			
8.	Nitrile Gloves			
9.	Safety Goggles			
10.	Protective Coveralls			
11.	Disposal Bags			
12.	Instruction Book/MSDS/SDS			
13.	Haz-Mat Socks			
14.	Haz-Mat Pads			
15	Haz-Mat Pillows			

Source: China Harbour Engineering Company Ltd. (CHEC). Pasay Reclamation Development Project Environmental Emergency Response Plan (EERP), October 2021

Prior to performing any containment or clean-up measures, the health and safety of personnel and the general public will be considered. All responding personnel will wear appropriate Personal Protective Equipment (PPE) at all times, when required.

Examples of PPE include:

- Eye protection: safety glasses, chemical splash goggles
- Skin protection: resistant gloves, nitrile rubber, clothing

4.3.2. RESPONSE

In the event of an environmental emergency, on-site personnel will need to determine the level of response required. If the Site/Construction Manager is present, they will assume the roles and responsibilities during an emergency.

Measures will be taken to notify members of the public who may be adversely affected by any harm or danger.

4.3.2.1. NOTIFICATIONS AND CONTACTS

For all Environmental Emergencies, the following are contacts would be notified:

- HSE Director
- Environmental Manager
- Environmental Engineer/PCO
- HSE Manager
- Site/Construction Manager

If the environmental emergency causes an immediate threat to the health and safety of personnel or the public, or presents a risk of fire, **DIAL 911** for assistance.

Site manager would ensure that all personnel who are listed in the Contacts (Table 4.10) are informed and made aware of their responsibility in case of an environmental emergency. This can be checked as part of the annual review.

Table 4.10 External Contact List

Name	Who Would Contact	When to Call	Contact Number
Bureau of Fire Protection – Pasay City			
• Central Fire Station	Duty Officer	Emergency Assistance only	+632844-2120 +632843-6523
• Pasay Volunteer Fire Brigade	Duty Officer	Emergency Assistance only	+632-8831-3801
• Malibay Fire Sub-Station	Duty Officer	Emergency Assistance only	+632 851 0869
• Villamor Airbase Fire-Substation	Duty Officer	Emergency Assistance only	+632853-5031 +632 854-6722
• Senate Fire-Substation	Duty Officer	Emergency Assistance only	+632552-6601 local 1999
DENR-EMB (NCR)	Duty Officer	When spill occurs/or discovered	+63289206214
Manila Bay Coast Guard	Site Head/OIC	Reporting of spills in watercourses; clean-up assistance	+632527-8482 to 89 / +632527-3880 to 85
Manila Bay Maritime Office-Main	Manager/OIC	Reporting of spills in sealine are; clean-up assistance	+63916 315 4812
Barangay 76, Pasay City	Brgy Captain/OIC	Public alert and notification of Environmental emergency	+6328340812

4.3.3. RESPONSE PROCEDURE

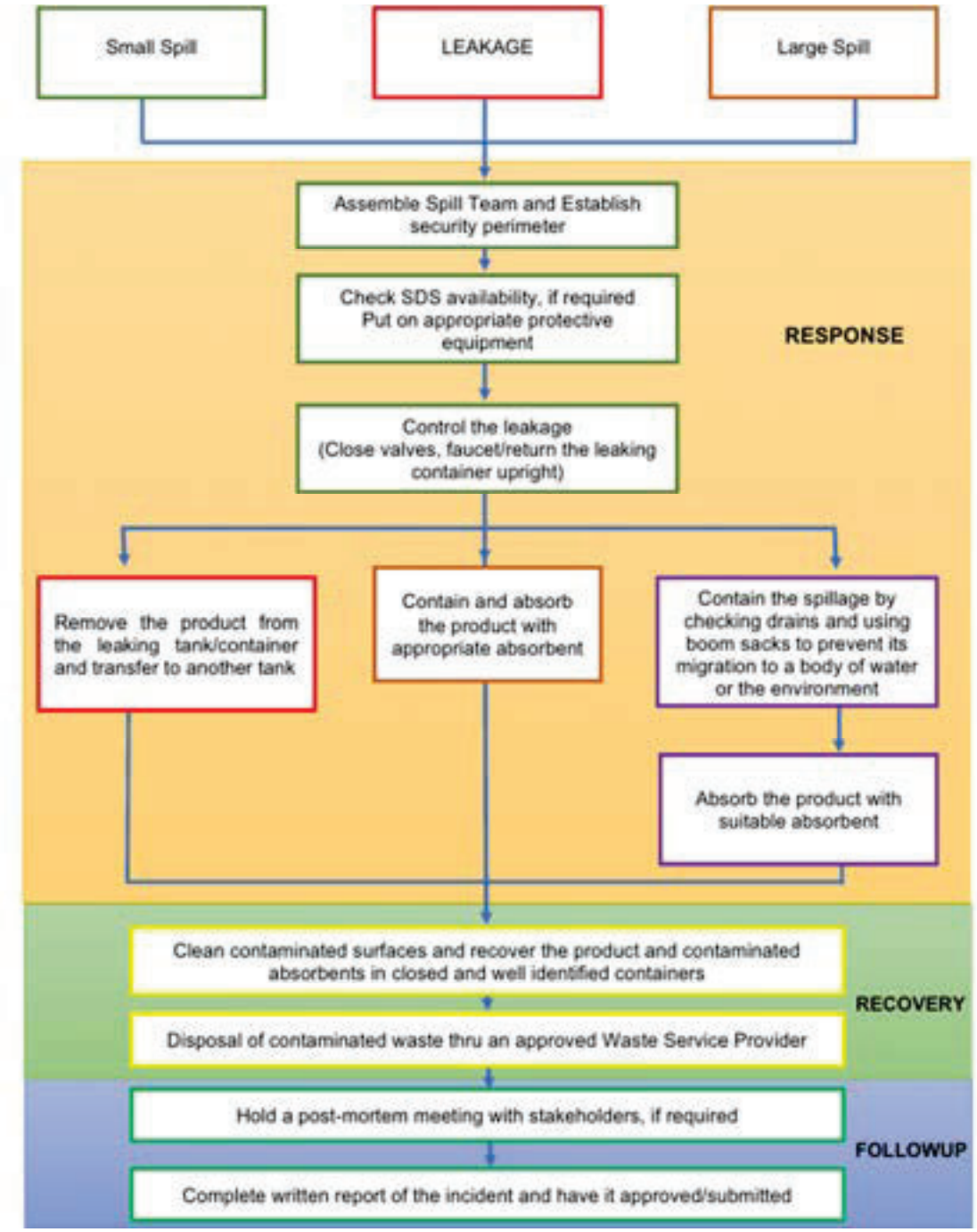
Figure 4.1 shows the summary of response guide for oil spill scenario. This guide will be posted in high-risk areas for guidance.

Quick Reference Initial Response Guidance Document	
Typical response steps in the event of a release of hazardous materials:	
STEP	**NOTES**
ASSESS THE SITUATION & DEFINE A SAFETY PERIMETER	• Identify the product (look at labels, placards or other markings). • Refer to the product's SDS. • Keeping a safe perimeter, carefully locate the source of the release. • Assess the source of the release (such as drum, storage tank or other container) to assist with the approximation of the quantity spilled. • If the spill has reached a drain or watercourse, it can no longer be contained and external parties will have to be immediately notified.
DETERMINE RESPONSE LEVEL	• What's the response level required? LEVEL 1: You are trained and capable to handle response LEVEL 2: Require additional assistance from Environmental Unit and the Engineer LEVEL 3: External third-party assistance required
CAREFULLY STOP OR CONTROL THE RELEASE	• Approach the spill site with the wind at your back. • Only if the situation is deemed safe to do so (For example: eliminate source of leak/spill by turning off valves, taps, faucets or other controls). • Cover grates/drains/sewers.
CONFINE THE SPILL OR CONTAIN THE PRODUCT	• Contain the spilled product in the smallest possible space close to the source. • Avoid directing the product toward the sewer system or body of water.
NOTIFY AUTHORITIES AND THE PUBLIC (AS APPROPRIATE)	• If the spill is no longer under your control, notify the concerned agencies/authorities, and/or fire/police (emergency response agencies). • Notify the public (if necessary).
RECOVER SPILLED MATERIALS	• The product will be recovered quickly to limit its migration or spread, taking into consideration the properties of the product and weather conditions.
SAFELY DISPOSE OF CONTAMINATED MATERIALS AND WASTE	• Store wastes separately from in-use products. • Use an accredited contractor. Obtain a correctly completed Waste Forms (i.e., hazardous waste transportation manifest).
PREPARE AN INCIDENT REPORT & REPORT TO THE AUTHORITIES	• Use Environmental Emergency (Spill Response) Incident Form. • Forward a copy to Engineer. • The EM/EPO will assume responsibility for informing and reporting to other authorities (with the Engineer's approval) as a result of the environmental incident, as needed.
REPLENISH RESPONSE SUPPLIES	• Conduct a spill kit inventory check, document. • Restore spill kit equipment, ensure used PPE is clean or replaced.

Figure 4.1 Summary of Response Guide for Oil Spill Scenario
Source: China Harbour Engineering Company Ltd. (CHEC). Pasay Reclamation Development Project Environmental Emergency Response Plan (EERP), October 2021

Figure 4.2 and Figure 4.3 section provides specific procedures during leakage and land spill of petroleum products and other hazardous materials that could potentially occur at the

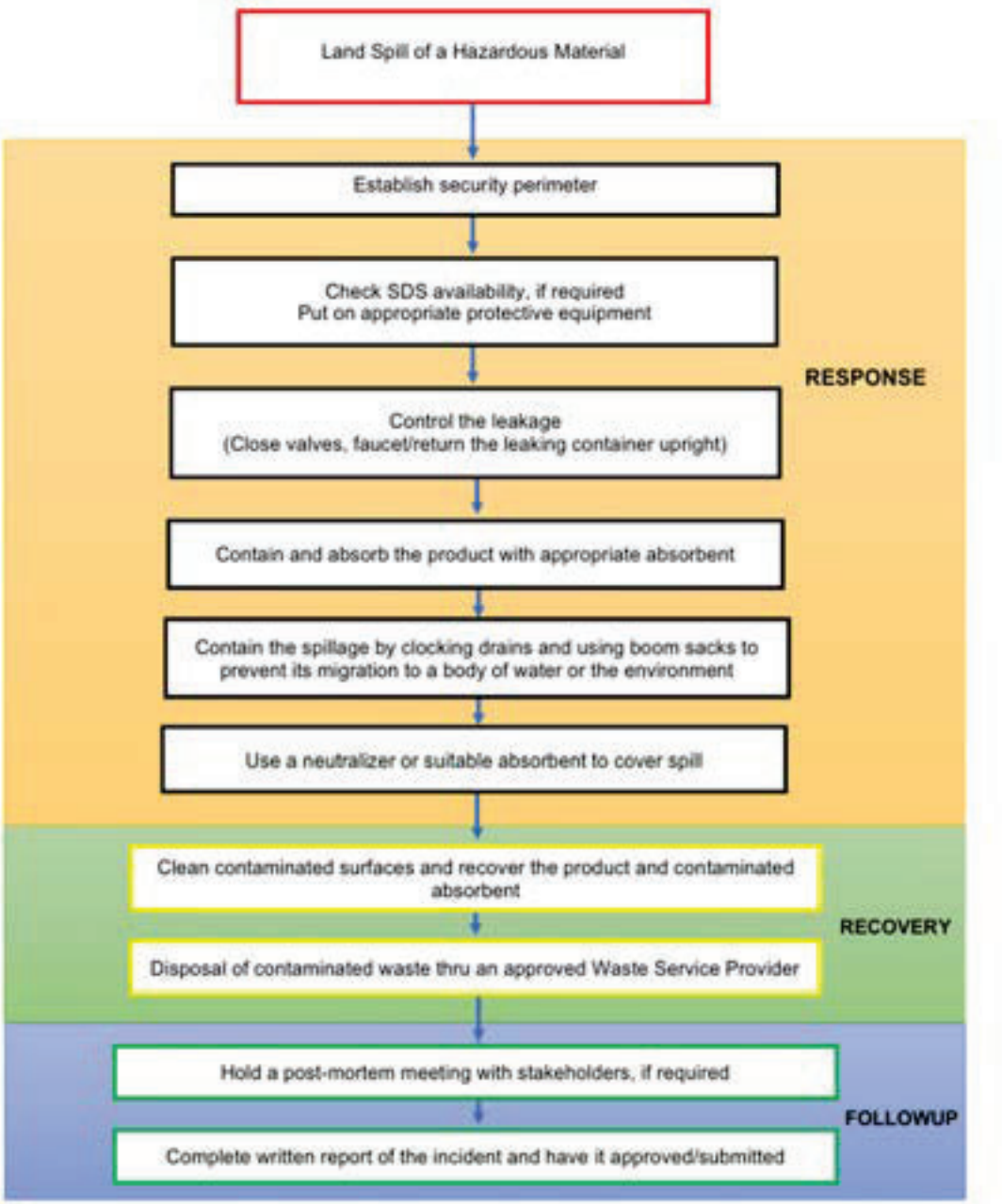
Project. These procedures will be posted beside fuel storage tanks or other areas where they can be easily accessible.



Note: The location of the leakage varies in every accident/incident. The flowchart is a representation of how to address incidents in different locations

Figure 4.2 Environmental Emergency Procedures during Leakage

Source: China Harbour Engineering Company Ltd. (CHEC). Pasay Reclamation Development Project Environmental Emergency Response Plan (EERP), October 2021



Note: Huge construction vessels (e.g., THSD) have their own set of mature and effective on spot oil spill contingency plans.

Figure 4.3 Environmental Emergency Procedures during Land Spill of any Hazardous Material
Source: China Harbour Engineering Company Ltd. (CHEC). Pasay Reclamation Development Project Environmental Emergency Response Plan (EERP), October 2021

5. SOCIAL DEVELOPMENT PROGRAM (SDP) FRAMEWORK AND INFORMATION, EDUCATION, AND COMMUNICATION (IEC) IMPLEMENTATION

5.1. SOCIAL DEVELOPMENT PLAN / FRAMEWORK

Consistent with the Revised Procedural Manual for DENR Administrative Order No. 30, Series of 2003 (DAO 03-30), the Social Development Plan (SDP) aims to provide plans, programs and activities (PPAs) that will enhance the quality of life of the project's direct impact and indirect impact communities, such as their livelihood, health, education, and the environment. The PPAs shall be identified through consultations with the impact community, the LGU, and other concerned government offices.

The SDP framework of the Project is anchored on the existing vision and plans of Pasay City as a sustainable eco-City.



Figure 5.1 Social Development Strategy Vision
Source: Social Development Plan (PLANADES& PRIMEX, 2022)

The SDP presented in Table 5.1 summarizes the programs, projects and activities (PPAs) that were implemented from 2022 to 2024 while Table 5.2 provides the updated Social Development Plan/Framework for future implementation.

Programs and Activities stated below are based on the submitted updated Social Development Plan for the Pasay Reclamation Projects (Pasay 360 and Pasay 265) to EMB Central Office on 01 June 2024. All Projects are initially identified to be part of Government Appropriations Act (GAA) funding of the City of Pasay but can also be in partnership with other institutions.

Based on the DENR EMB letter dated November 07, 2022, the submitted SDP Plan (Appendix M.2) is duly accepted. This plan has been updated for the EPRMP as presented in Table 5.2. MMT compliance to SDP conditions is also presented in Sections 6.1.1 and 6.1.5.

SOCIAL DEVELOPMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

Table 33 Social Development Program, Projects and Activities

PROGRAM/PROJECTS	GOAL/ STRATEGY ADDRESSED	BENEFICIARY	LOCATION	CONCERNED GOVERNMENT AGENCY/NGO	LEAD AGENCY	INDICATIVE TIMELINE[6]	SOURCE OF FUND[7]
HEALTH							
1. Medical Missions and Emergency Relief Programs	G1S3	Vulnerable Persons and Groups	Citywide	CHO	CHO	M	City of Pasay[8]
2. Medical Assistance	G1S3	Vulnerable persons	Citywide	CHO	Office of the Mayor/CHO	M	City of Pasay
3. Feeding Program for Malnourished Children	G1S1	Qualified Children 0-5 years old	Citywide	CHO	CHO	S	City of Pasay
4. Masterplan for Sustainable Use of COVID Isolation Facilities	G2S1	CHO	Bgy 76	CHO/DOH	CHO	S	City of Pasay
HOUSING & URBAN SETTLEMENTS							
5. In-City Socialized Housing Program (Medium-rise Building)	G1S1	IDF within the City	Cuenca Libertad	UDHO, NHA	UDHO	M	City of Pasay, NHA
6. Upgrading of City/Public Facilities to Increase Accessibility	G1S2	All residents	Citywide	CEO	UDHO	M	City of Pasay
7. Support for Community-Based Initiatives (Urban Gardening)	G1S2	All residents	Citywide	UDHO, CEO	UDHO	M	City of Pasay
EDUCATION							
8. Educational Assistance	G1S3	Qualified elementary & HS students	Citywide	OCM/DepEd	DepEd	M	City of Pasay

[6] S – Short-term (<1 year); M- Medium-term (1 - <3 years); L-Long-term (≥3 years)
[7] All Projects are initially identified to have GAA funding of the City of Pasay but can also be in partnership with other institutions
[8] Funds included in the budget under Government Appropriations Act (GAA)

46

SOCIAL DEVELOPMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PROGRAM/PROJECTS	GOAL/ STRATEGY ADDRESSED	BENEFICIARY	LOCATION	CONCERNED GOVERNMENT AGENCY/NGO	LEAD AGENCY	INDICATIVE TIMELINE[6]	SOURCE OF FUND[7]
9. Scholarship Program for High School & College Students	G2S1	Qualified High School & College Students	Citywide	Office of the Mayor/DepEd/ CHED	Office of the Mayor	M	City of Pasay
10. E-Learning Systems for Public Schools	G1S3	Selected Public Schools	Citywide	Office of the Mayor/DepEd	DepEd	M	City of Pasay
11. F.S.for STEM Innovation Learning Center	G2S1	High School students		DepEd	DepEd	M	City of Pasay
EMPLOYMENT AND LIVELIHOOD							
12. Alternative Livelihood Program	G2S1	PWD	Citywide	PESO/DSWD	PESO	S	City of Pasay
13. Credit Program for Pasay City Fisherfolks	G2S1	PLAA	Bgy 76	TBD	TBD	S	City of Pasay
14. Training and Technical Assistance Program for Pasay Fisherfolks	G2S1	PLAA	Bgy 76	BFAR, PCG	TBD	S	City of Pasay, BFAR, PCG
15. Diskwento Caravan	G2S1	Vulnerable families	Citywide	PCCDO/DTI	PCCDO	S	City of Pasay
SOCIAL WELFARE							
16. Liaison Services for Senior Citizens and PWDs	G1S3	Senior Citizens	Citywide	CSWD			
17. Establishment of high quality, safe child care services	G1S4	Low income families	Bgy 76 & Select Barangays	CSWD, NGO	CSWD	M	City of Pasay
18. F.S. for Sports and Activity Center for Youth and the Eldery	G1S3	All residents		CPDO, CEO,	Office of the Mayor	L	City of Pasay
19. Discounted Rates for Recreational and Wellness Facilities for Pasay City Residents		All residents	Citywide	Sanggunian g Panlunsod, Office of the Mayor	Sanggunian g Panlunsod	S	City of Pasay

47

Figure 5.2 Social Development Strategy Vision
Source: Social Development Plan (PLANADES& PRIMEX, 2022)

Table 5.1 Social Development Programs from 2022 to 2024

Project Activity	Year of Implementation	Status of Completion	Number and Category of Beneficiaries
Livelihood/Employment (Men, Women, Youth and Elderly)			
Livelihood Assistance of PSWD	2024	Ongoing	Residents of Pasay City
Three (3) livelihood activity of PESO	August to December 2023	Completed	Pasay City
Facilitation of SSEN of PLAA fisherfolks with PCG on the renewal of 45 boats	March 2023	Completed	Pasay Libertad Anglers Association (PLAA) - Fisherfolk Group: 63 Pax
13 job fairs	May to November 2023	Completed	Residents of Pasay City
Alternative livelihood assistance	June 2023	Ongoing	Pasay Libertad Anglers Association (PLAA) - Fisherfolk Group: 63 Pax
Christmas assistance	December 2023	Completed	Pasay Libertad Anglers Association (PLAA) - Fisherfolk Group: 63 Pax
Provided smart TVs	September 2023	Completed	Day care center in coastal barangays of Naic and Ternate
Provided Medicines	March 2024	Completed	Fisherfolk of coastal barangays in Naic and Ternate: 301 Pax

Project Activity	Year of Implementation	Status of Completion	Number and Category of Beneficiaries
Conducted Youth are the Future Program	October 2023	Completed	Young Student leaders: 34 Students
Conducted Eco-Camp for Youth ambassadors	Nov. 24-26, 2023	Completed	13 Students
Hired project contractor of locals as cleaners in the project	January to May 2024	On-going	Pasay residents: 99pax
Kabalikat sa Kabuhayan (KSK), Padyakbuhayan/ Oplan Tulong Express	Aug. to Dec. 2022	Completed	Pasay Residents
Distributed 5kg of rice to 1	Jan. 4 & 23, 2024.	Completed	1,750 fisherfolks in Ternate and Maragondon
Health and Safety			
Welfare assistance and Financial Literacy	Mar. 10, 2023	Completed	Residents of Pasay City
Distribution of medicines	Oct. 20, 2023	Completed	Naic fisherfolks and Ternate Municipal Health Office: 11 Naic coastal barangays, 2419 Naic Fisherfolks and 5 Ternate Coastal Barangays.
Education and Recreation			
Upgrading of school facilities ongoing and under the SEF	Continuous through-out the years	Ongoing	Pasay City
Financial Assistance to Students	Continuous through-out the years	Ongoing	Residents of Pasay City
Pasay SM-Don Bosco TechVoc Scholarship	August to December 2022	Completed	Pasay SM-Don Bosco TechVoc:
Support to Ternate Central Elementary School celebration	Dec. 9, 2023	Completed	Ternate Central Elementary School

Project Activity	Year of Implementation	Status of Completion	Number and Category of Beneficiaries
UP Los Banos Sustainability Scholarship Grant – SY 2023-2024	2024	Ongoing release for 2nd Sem scholarship grant	10 UPLB Scholars
Educational assistance by provision of 16 units of 55" smart TV	September 2023	Completed	Day care center in coastal barangays of Naic and Ternate
Environment and Sanitation			
International Clean-up in Pasay and Naic, Cavite	Sept. 16, 2023	Completed	Pasay and Naic, Cavite
Coastal clean-up activities in Pasay and Cavite	July to Sept 2023	Completed	Pasay and Cavite
Tree Planting	August 2023	Completed	Maragondon, Cavite
Mangrove Planting	October 2023	Completed	Calatagan, Batangas
Mangrove Planting	October 2023	Completed	Ternate, Cavite
Mangrove Planting	December 2023	Completed	Macabebe, Pampanga
Padyak Pasay (Envi Awareness Campaign)	Nov. 25, 2023	Completed	Pasay City
Eco-Camp	Nov. 24-26, 2023	Completed	13 Students
Peace and Order			
International Clean-up in Pasay and Naic, Cavite	Sept. 16, 2023	Completed	Pasay and Naic, Cavite

Table 5.2 EMB CO duly Accepted Social Development Plan/Framework

Concern (Program and Activities)	Beneficiary	Government Agency Partner	Proponent/Implementing Office	Indicative Timeline	Source of Fund	Status
HEALTH						
1. Medical Missions and Emergency Relief Program (Activity that the city conducts from time to time to augment the plight of affected stakeholders during emergencies and disasters)	Vulnerable Persons and Groups of Pasay City	CHO	Mayor's Office, CHO, PSWDD and NGOs	Construction Operation	City of Pasay	On-going
2. Medical Assistance (Activity that the city conducts from time to time to augment the plight of affected stakeholders during emergencies and disasters) Take Care I Care (Assistance provided for residents who are confined in partner hospitals)	Vulnerable Persons and Groups of Pasay City PLAA members and their families	CHO	Pasay Gen /City Health/Mayor's Office Mayor's Office	Construction Operation	City of Pasay	2,553 individuals received assistance Amount: P120,827,000.00 Provided to 643 recipients Amount: P60,000,000.00
3. Feeding Program for Malnourished Children (Conducted monthly by the city to provide nutritious foods to children)	Qualified Children 0-5 years old of Pasay City	CHO	Pasay City Social Welfare and Development Office	Construction Operation	City of Pasay	Provided to 8,000 children Amount: P10,000,000.00
4. Masterplan for Sustainable Use of COVID Isolation Facilities	CHO	CHO/DOH	Engineering/Mayor's Office/City Planning Office	-	City of Pasay	Not yet implemented Activity will be changed since COVID is not a primary concern
HOUSING AND URBAN SETTLEMENTS						
5. In-City Socialized Housing Program (Medium-rise Building) – (Provision of housing facilities for informal settler families)	ISF within the City	UDHO, NHA	Urban Development and Housing Office / Mayor's Office	Construction Operation	City of Pasay, NHA	On-going
6. Upgrading of City/Public Facilities to Increase Accessibility (Regular upgrading of existing facilities to address needs and expand coverage)	All residents of Pasay City	CEO	Engineering / Mayor's Office	Construction Operation	City of Pasay	On-going
7. Support for Community-Based Initiatives (Urban Gardening) – (A yearly competition aimed at promoting awareness on environmental issues and concerns)	All residents of Pasay City	UDHO, CEO	Tourism Council/ I-Care for Mother Earth	Construction Operation	City of Pasay	25 gardens listed Amount: P350,000.00

Concern (Program and Activities)	Beneficiary	Government Agency Partner	Proponent/Implementing Office	Indicative Timeline	Source of Fund	Status
EDUCATION						
8. Educational Assistance/Financial Assistance (Provided to students in their needs)	Qualified Students of Pasay City	OCM/DepEd	Mayor's Office	Construction Operation	City of Pasay	5,844 assisted Amount: P750,571,900 (included in this amount is the scholarship program)
9. Scholarship Program for High School & College Students (Assistance provided to students who cannot afford fees from schools)	Qualified High School & College Students of Pasay City	Office of the Mayor/DepEd/ CHED	Office of the Mayor	Construction Operation	City of Pasay	1,733 beneficiaries Amount: included in item 8
10. E-Learning Systems for Public Schools (Mechanism provided for students in distance learning)	Selected Public Schools of Pasay City	Office of the Mayor/DepEd	DepEd Pasay	Construction Operation	City of Pasay	Implemented – TBD
11. F.S for STEM Innovation Learning Center (Mechanism provided for students in distance learning)	High School students of Pasay City	DepEd	DepEd	Construction Operation	City of Pasay	Implemented – TBD
EMPLOYMENT AND LIVELIHOOD						
12. Alternative Livelihood Program (Assistance given to qualified beneficiaries especially to unemployed constituents)	Vulnerable sectors (PWDs, Senior Citizens, Solo Parents, Below income families, out-of-school youth, women of Pasay City	PESO/DSWD	Pasay Social Welfare Department / Pasay City Employment Center/Mayor's Office	Construction Operation	City of Pasay	100 beneficiaries Amount: TBD
13. Credit Program for Pasay City Fisherfolk	PLAA	TBD	Pasay Social Welfare Department / Pasay City Employment Center	Construction Operation	City of Pasay	For future implementation
14. Training and Technical Assistance Program for Pasay Fisherfolks (i.e. employment readiness once the project construction/operation starts, provision of skills training)	PLAA	BFAR, PCG, DTI	Pasay City Environment and Natural Resources Office / Bureau of Fisheries & Aquatic Resources	Construction Operation	City of Pasay,BFAR, PCG	Registry of fisherfolks conducted. Ongoing Implementation.
15. Financial assistance for Pasay City fisherfolks	Barangay 76 PLAA	DTI	Mayor's Office	Construction Operation	JV Partner	Ongoing
16. Diskwento Caravan (Program of the present administration aimed at lowering the prices of basic commodities by purchasing the commodities straight from the suppliers)	Vulnerable families of Pasay City	PCCDO/DTI	Mayor's Office//National Government Agencies	Construction Operation	City of Pasay	On-going. Every 15th and 30th of the month

Concern (Program and Activities)	Beneficiary	Government Agency Partner	Proponent/Implementing Office	Indicative Timeline	Source of Fund	Status
SOCIAL WELFARE						
17. Liaison Services for Senior Citizens and PWDs (Assistance provide for Senior Citizens and PWDs)	Senior Citizens of Pasay City	CSWD	Office of Senior Citizens Affairs/Person's with disability Affairs Office	Construction Operation	City of Pasay	On-going
18. Establishment of high quality, safe childcare services (Continuous improvement of services to children)	Children of Pasay City	CSWD, NGO	Pasay City Social Welfare and Development Office/City Health Office	Construction Operation	City of Pasay	On-going
19. F.S. for Sports and Activity Center for Youth and the Elderly	All residents of Pasay City	CPDO, CEO	Mayor's Office/Department of Education-Pasay	Construction Operation	City of Pasay	For Future Implementation
20. Discounted Rates for Recreational and Wellness Facilities for Pasay City Residents	All residents of Pasay City	Sangguniang Panlunsod,/Office of the Mayor	Sangguniang Panlunsod		City of Pasay	For Future Implementation

5.2. INFORMATION, EDUCATION AND COMMUNICATION (IEC) PLAN / FRAMEWORK

The Information, Education and Communication's (IEC) main goal is to create awareness by disseminating information about the Project and gather issues and concerns to further improve the Project's implementation and compliances. The development and conduct of an effective IEC plan are vital due to the perceived and predicted adverse impacts of the reclamation projects to community health and environment welfare on Pasay City waters. With the Supreme Court Mandamus, citizens are now more aware of the importance of Manila Bay as a natural resource and the role of the state and private entities to clean up, rehabilitate, and preserve it. Given the heightened social and environmental consciousness and the legal mandate, the proponents need to work closely to prepare an IEC plan that will educate and galvanize stakeholder support.

The Project seeks to align itself to the grand vision of Pasay City. The IEC for 360 Hectares Reclamation Project aims to: (a) ensure that the impact communities understand the Project and its development. (b) provide an opportunity to stakeholders to freely express their issues and concerns. (c) identify potential impacts, impediments and benefits through stakeholders' engagement. (d) create effective solutions and strategies in achieving project acceptance and stakeholders' participation.

The IEC campaigns that were conducted from 2022 to 2024 based on the IEC Plan/ Framework in the EIS and approved IEC Plan is presented in Table 5.3 while the updated IEC Plan/ Program for future implementation is presented in Table 5.4. Based on the DENR EMB letter dated November 07, 2022, the submitted IEC Plan (Figure 5.3) is duly accepted which can also be found in **Appendix M.2**. This plan has been updated for the EPRMP as presented in Table 5.4. MMT compliance to IEC conditions is also presented in Sections 6.1.1 and 6.1.4.

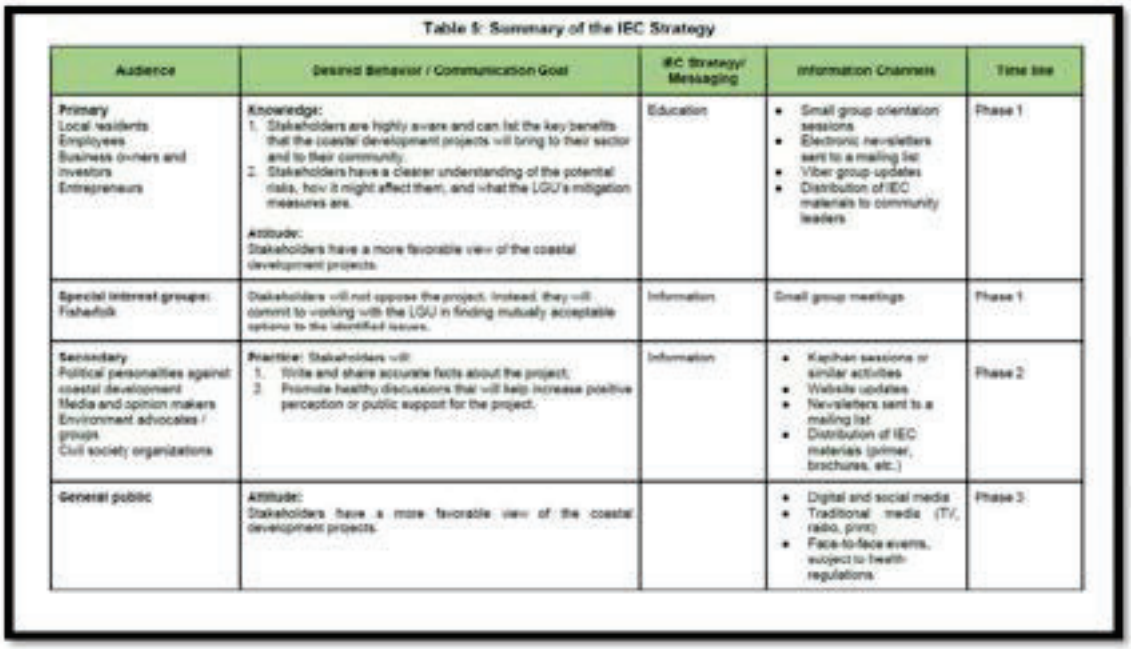


Table 5: Summary of the IEC Strategy

Audience	Desired Behavior / Communication Goal	IEC Strategy/ Messaging	Information Channels	Time line
Primary Local residents Employees Business owners and investors Entrepreneurs	Knowledge: 1. Stakeholders are highly aware and can list the key benefits that the coastal development projects will bring to their sector and to their community. 2. Stakeholders have a clearer understanding of the potential risks, how it might affect them, and what the LGU's mitigation measures are. Attitude: Stakeholders have a more favorable view of the coastal development projects.	Education	• Small group orientation sessions • Electronic newsletters sent to a mailing list • Viber group updates • Distribution of IEC materials to community leaders	Phase 1
Special interest groups: Fishefolk	Stakeholders will not oppose the project. Instead, they will commit to working with the LGU in finding mutually acceptable options to the identified issues.	Information	Small group meetings	Phase 1
Secondary Political personalities against coastal development Media and opinion makers Environment advocates / groups Civil society organizations	Practice: Stakeholders will: 1. Write and share accurate facts about the project; 2. Promote healthy discussions that will help increase positive perception or public support for the project.	Information	• Kapihan sessions or similar activities • Website updates • Newsletters sent to a mailing list • Distribution of IEC materials (primer, brochures, etc.)	Phase 2
General public	Attitude: Stakeholders have a more favorable view of the coastal development projects.		• Digital and social media • Traditional media (TV, radio, print) • Face-to-face events, subject to health regulations	Phase 3

Figure 5.3 Draft Final Strategic IEC Plan
Source: IEC Plan (PLANADES& PRIMEX, 2022)

Table 5.3 IEC Campaigns from 2022 to 2024

IEC Program/ Activity	Date	Audience
IEC	July 20-21, 2023 June 19,2024	Pasay City LGU employees
IEC	Sept. 1,20,27 and Oct. 5&11, 2023	Pasay City Barangay Officials
IEC	Nov. 16&28, 2023	SK Officials
IEC	July 20-21, 2023	Pasay City General Hospital
IEC	Sept. 18,20,27 – Oct. 5,11, 2023 Feb. 29, Apr. 25&29, May 20, Jun 04,11, &25, 2024	Newly elected barangay officials
IEC	Nov. 19,20,27,28, 2023	SK Youth leaders of 201 Pasay Barangays
IEC		Regular meetings with neighboring hinterland locators (e.g. Sofitel, Seascape, Lime Hotel)
IEC	Jan. 16, 2024	BPLO

IEC Program/ Activity	Date	Audience
IEC	Feb. 27, 2024	Pasay City Alliance of Tourism Advocates
IEC	Mar. 5, 2024	Travel City Youth Scholards
Kapihan Session (Kamustahan)	18 May 2024	PLAA fisherfolk
Regular Quarterly Meeting	Aug 31, 2022 (Q1 2022) Sep 20, 2022 (Q2 2022) Nov 24, 2022 (Q3 2022) March 17, 2023 (Q1 2023) June 15, 2023 (Q2 2023) Aug 30, 2023 (Q3 2023) Nov 8, 2023 (Q4 2023) March 12, 2024 (Q1 2024) June 11, 2024 (Q2 2024)	MMT

Table 5.4 IEC Plan/ Framework Based on the EMB CO duly Accepted IEC Plan

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
Primary: Local residents, employees, business owners and investors, entrepreneurs	Project Information ▪ Background ▪ Project key benefits ▪ Environmental impacts and mitigating measures	Conduct of Group Orientation Project Update thru email or Viber Distribution of IEC Materials	Printed IEC Materials Small group orientation Viber group	Construction Operation Abandonment	Part of Project Cost	Conducted: o Pasay City General Hospital ((PCGH) employees, staff, and workers) on July 20-21, 2023: *No. of Pax: 213 health workers* o Newly elected barangay officials (Barangay captains, kagawad members, lupon members, tanod personnel, secretaries, treasurers, and SK chairpersons) on Sept. 18,20,27 – Oct. 5,11, 2023

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
						No. of Pax: 4,844 barangay officials o SK Kagawad, SK Secretaries and SK Treasurers on Nov. 19, 20, 27 & 28. *No. of Pax: 983 youth leaders* o Business Sector (BPLO) on Jan. 16. 2024. *No. of Pax: 120 business people* o Newly elected barangay officials and their constituents on Feb. 26, 2024 *No. of Pax: 107 Barangay*

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
						officials and constituents o Business sector – Pasay City Alliance of Tourism Advocates (PCATA) on Feb. 27, 2024. *No. of Pax: 25 business people* o Newly elected barangay officials and their constituents of Brgy. 40 on Feb. 29, 2024. *No. of Pax: 100 Barangay officials and constituents* o Travel City Youth Scholars on Mar. 5, 2024.

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
						No. of Pax: 2,500 youth o Senior Citizen, OSCA on Apr. 22, 2024 *No. of Pax: 120 senior citizens* o Newly elected Barangay officials and constituents of Brgy. 65, Zone 8 on Apr. 25, 2024 *No. of Pax: 146 barangay officials and constituents* o Newly elected Barangay officials and constituents of Brgy. 65, Zone 9 on Apr. 29, 2024.

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
						No. of Pax: 399 barangay officials and constituents o Government Sector on May 2, 2024 *No. of Pax: 99 government officials; NAPC* o Youth participants on May 6, 2024 *No. of Pax: 5,000 youth* o Newly elected Barangay officials and constituents of Zone 13 on May 20, 2024 *No. of Pax: 100 barangay*

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
						officials and constituents o Pasay City Hall employees on May 29, 2024 *No. of Pax: 2 LGU employees* o Newly elected Barangay officials and constituents of Zone 11 on Jun. 4, 2024 *No. of Pax: 174 barangay officials and constituents* o Newly elected Barangay officials and constituents of Zone 16 on Jun. 11, 2024 *No. of Pax: 141 barangay*

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
						officials and constituents o Pasay City Hall Employees and Private Sector on Jun. 19, 2024 No. of Pax: 10 LGU employees o Newly elected Barangay officials and constituents of Zone 17 and 18 on Jun. 25, 2024 *No. of Pax: 236 barangay officials and constituents* o Regular meeting with neighboring establishments (i.e. Seascape, Sofitel, Lime Hotel)

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
Special Interest Group: Fisherfolk group	Project Information ▪ Background ▪ Project key benefits ▪ Environmental impacts and mitigating measures	Meeting with PLAA Project Update Distribution of IEC Materials	Small group meeting	Construction Operation Abandonment	Part of Project Cost	○ Kapihan session with PLAA members on May 18, 2024 No of Pax: 35 members
Secondary: Political personalities against coastal development Media and opinion makers Environment advocates/groups Civil Society Organizations	Project Information ▪ Background ▪ Project key benefits ▪ Environmental impacts and mitigating measures ▪ Increase positive perception or public support	Distribution of information materials Project Update Distribution of IEC Materials	Kapihan session or similar activities Website updates Newsletter Printed IEC materials	Construction	Part of Project Cost	For Future Implementation
General Public	Project Information ▪ Background ▪ Project key benefits ▪ Environmental impacts and	Distribution of information materials Project Update Distribution/posting of IEC Materials	Digital and social media Traditional media (TV, radio, print) Face-to-face events	Construction Operation	Part of Project Cost	For Future Implementation

Target Sector	Major Topic of Concern	IEC Scheme/Strategy/Methods	Information Medium	Indicative Timeline and Frequency	Indicative Cost	Status
	mitigating measures • SDP implemented					

6. ENVIRONMENTAL COMPLIANCE MONITORING

6.1. ENVIRONMENTAL PERFORMANCE BASED ON THE ORIGINAL ECC-COVERED ENVIRONMENTAL MANAGEMENT PLAN

The Pasay City reclamation and horizontal land development of three hundred sixty (360) hectares was issued an ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017 while the start of the project implementation was on 08 May 2021. On 31 October 2023, Pasay sent a letter to the DENR on the proposed Revised Landform Plan for the Project. The proposed plan includes a 300-meter channel between the reclamation island and the Pasay City mainland/CCP Complex to enhance water circulation and further mitigate the impact of flooding, thereby promoting environmental protection. The revised Landform Plan was approved by the PRA Board and endorsed to the DENR in a letter dated 28 November 2023. During the SA1 2023, MMT observed that activities are being undertaken beyond the ECC Boundaries MMT. MMT recommended to strictly confine all activities within the limits of the existing/valid ECC while awaiting issuance of the amendment on a report dated 10 Jul 2023. On 24 January 2024, the EMB recognized the PRA-approved land reconfiguration and allowed Pasay to proceed with the reclamation activities as proposed because the revised landform already formed part of the EIA, subject to the submission of the EPRMP and other documents for the amendment of the ECC. On 24 March 2024, Pasay City, through the Private Joint Venture Partner, has already commenced in drafting of the EPRMP.

Two monitoring reports have been periodically submitted to EMB for this Project as follows:

- Compliance Monitoring Report (CMR) on a semi-annual basis which started on SA2 2021 (July to December 2021) up to the present; and
- Self-Monitoring Report (SMR) on a quarterly basis which started on Q2 2021 up to the present.

MMT has been established and conducted regular monitoring which was started on SA2 2022. The MMT Memorandum of Agreement (MOA) was signed on 2 September 2021. The findings of the MMT are reported through the submission of the semi-annual Compliance Monitoring Validation Report (CMVR).

6.1.1. COMPLIANCE TO ECC CONDITIONS

The historical compliances of the Proponent with the ECC conditions which is reported in a semi-annual (SA) basis through CMR by the proponent and CMVR report by MMT are presented in Table 6.1. The annexes mentioned in this table are the proof of compliances which were included as attachment on that monitoring period.

The summary of ECC conditions that are "**Not applicable during the monitoring period**" are as follows:

- ECC Condition No. 4: Conduct a more detailed geotechnical marine soil investigation and seismic risk analysis to be considered in the final engineering design for submission to EMB Central Office before any horizontal development activity.

  - SA1 2024 CMVR: Geotechnical Interpretation Report was submitted to EMB Central Office on 24 May 2023. Geotechnical Interpretation Report includes the more detailed geotechnical marine soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor.
  - Annex 13 – Geotechnical Interpretation Report Updated GIR to be used for Final Engineering Design shall be submitted to DENR Central Office prior to horizontal development construction.

- ECC Condition No. 5: Proper storm drainage system, concrete culverts, and other flood and erosion control measures shall be provided during the construction phase to adequately protect the receiving water body from siltation, physico-chemical/marine pollution and further protect the surrounding communities from environmental degradation.
  - SA1 2024 CMVR: Storm drainage system and concrete culverts are incorporated in the Detailed Engineering Design (DED) and will be included in the Project's final Master Development Plan. Storm drainage system and concrete culverts shall be installed during horizontal development, as determined during the Technical Conference with EMB CO held on 29 September 2023 for the Summons dated 19 September 2023. The agenda of the Technical Conference was for EMB to validate Proponent/JV Partner's compliance with ECC conditions. Proponent/JV Partner was deemed compliant. Sand key dredging as part of erosion control measures is a soil replacement method which replace the soft soil by sand and that makes the toe stable. The soft soil is dredged from the underwater center, making space for construction activities as well as water way for vessels. This process involves replacing soil up to about 30 to 40 meters deep, creating a foundation for landform. This method is especially useful in reclamation projects where the goal is to transform underwater areas into solid ground for future development. On 12 Sep 2023, TCLP analysis was conducted on the sand sources from PRA 2000, Bucao and Maloma. Results show that all of the tested parameters from these sand source samples passed the DAO 2013-22 standard.
  - On 05 July 2024, TCLP Analysis was carried out on the additional sand source from Amnay, Mindoro. Results will be submitted once available.
  - These will be strictly complied with starting at the horizontal development phase.
  - Annex 14 - TCLP Results for Bucao and Maloma in Zambales and PRA 2000 in Cavite Annex 15 - Chain of Custody of TCLP Analysis for Amnay.

- ECC Condition No. 6: Adequate land area shall be allotted for the construction of a centralized sewage treatment facility to be able to treat all the wastewater that will be generated by the locators prior to discharge
  - SA1 2024 CMVR: The area shall be identified in the final Master Development Plan.
  - **Proposed change to the ECC Condition:** Adequate land area shall be allotted for the construction of "individual and/or centralized treating system" to be able to treat all the wastewater that will be generated by the locators prior to discharge

- ECC Condition No. 8: Submit a detailed Master Plan to cover the entire reclamation Projects one (1) year prior to Project construction
    - SA1 2024 CMVR: Conceptual Master Plan was included in the EIS submitted on 30 October 2017. Master Plan shall be submitted one (1) year prior to horizontal development construction.
    - Annex 19: Initial Master Development Plan for Pasay 360

- ECC Condition No. 10.3: Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures
    - SA1 2024 CMVR: The Project's estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC.

- ECC Annex B Condition 7: Proponent needs to design and construct access roads and bridges of the project site with minimal land and ecological disturbance and with adequate drainage. Proponent needs to implement a Roadway Maintenance and Transport Management Plan which will include maintenance of public and private roads within the project site.
    - SA1 2024 CMVR: To date, interconnectivity of the reclamation projects by concerned agencies together with the Reclamation Proponent are still being discussed and shall be implemented during horizontal development phase.

6.1.2. COMPLIANCE TO EMP CONDITIONS

The historical compliances of the Proponent to the EIS 2017 EMP conditions which is reported in a semi-annual (SA) basis through CMVR report by MMT are presented in Table 6.2. The annexes mentioned in this table are the proof of compliances which were included as attachment on that monitoring period.

Based on the MMT CMVR report for SA1 2024, there were several EMP conditions that are recommended to be updated to ensure that project impacts are measurable and mitigating measures are attainable. On 25 June 2024, Pasay City received EMB CO's response to Pasay City's 08 March 2024 letter-request for an ECC amendment meeting. In its letter-response dated 21 June 2024, EMB CO required Pasay City to first submit an updated EPRMP based on an updated EMP prior to conduct of a meeting. On 05 July 2024, Pasay City informed EMB CO that the EPRMP is now in the process of being updated together with the EMP for which it will be based on or as required by EMB CO in its 21 June 2024 letter. The revised and updated EMP can be found in Section 3 of this EPRMP.

Table 6.1: Compliance to ECC Conditions (2021 to 2024)

ECC Conditions ECC-CO-1601-0003 (24 October 2017) Start of Project Implementation: 8 May 2021	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
Status of Compliance to ECC Conditions												
1. Submission of a Coastal Ecosystem Management Plan/ Program and Environmental Management Plan (EMP) consistent with; (a) DENR Manila Bay Coastal Strategy and its Operational Plan, (b) Continuing Supreme Court Mandamus on Manila Bay, (c) PRA laws and policies, (d) PRA Boulevard 2000 Integrated Framework Plan, and (e) the City of Manila and Pasay related rules and regulations one hundred twenty (120) days prior to project implementation	Yes		Coastal Ecosystem Management Plan as required under the ECC, was submitted on 07 May 2021. The EMB-CO acknowledged and noted compliance of Condition No. 1 on 17 May 2021. Environmental Management Plan (EMP), as embodied in the EIS Report, also submitted to EMB, and adopted by dredging contractor for the Project. Implementation of the CEMP/EMP is for continuing compliance. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 5 - DENR letter to Pasay Acknowledgement of 360 ECC Compliance 17 May 2021 Annex 6: Coastal Ecosystem Management Plan Annex 1 – [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024	Coastal Ecosystem Management Plan as required under the ECC, was submitted on 07 May 2021. The EMB-CO acknowledged and noted compliance of Condition No. 1 on 17 May 2021. Environmental Management Plan (EMP), as embodied in the EIS Report, also submitted to EMB, and adopted by dredging contractor for the Project. Implementation of the CEMP/ EMP are for continuing compliance. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response.	Coastal Ecosystem Management Plan as required under the ECC, was submitted on 07 May 2021. The EMB-Co acknowledged and noted compliance of Condition No. 1 on 17 May 2021, Environmental Management Plan (EMP), as embodied in the EIS Report, also submitted to EMB, and adopted by dredging contractor for the Project. Implementation of the CEMP/EMP are for continuing compliance. Annex 25: DENR EMB CO Acknowledgement Letter dated May 17, 2021 Annex 26: Coastal Ecosystem Management Plan	Coastal Ecosystem Management Plan as required under the ECC, was submitted on 07 May 2021. The EMB-CO acknowledged and noted compliance of Condition No. 1 on 17 May 2021. Environmental Management Plan (EMP), as embodied in the EIS Report, also submitted to EMB, and adopted by dredging contractor for the Project.	Coastal Ecosystem Management Plan was submitted on 04 May 2021 Annex 21: DENR Acknowledgement Letter dated, 7 May 2021 Annex 22: Coastal Ecosystem Management Plan For continuing compliance	Coastal Ecosystem Management Plan was submitted on 04 May 2021	EMB Acknowledged thru letter dated May 17, 2021; Continuing Compliance Annex 19: DENR Acknowledgement Letter to ECC Conditions Compliance 1, 3,7 ,9.1, 9.2 9.3, 12, 14 Annex 36: Coastal Ecosystem Management Plan	On-going. CEMP-Proponent Responsibility, EMP-Submitted and Implemented	On-going. CEMP-Proponent Responsibility, EMP-Submitted and Implemented CMVR: Coastal Ecosystem Management Plan was submitted on 04 May 2021	On-going. CEMP-Proponent Responsibility, EMP-Submitted and Implemented
2. Undertake an effective and continuing Information, Education and Communication (IEC) Program to inform and educate all stakeholders, especially its local residents, employees of commercial and government establishments within the site and vicinity, on the Project's mitigating measures embodied in its EIS and the conditions stipulated in this Certificate	Yes		IEC activities: - IEC conducted with: a. Business Sector (BPLO) on 16 January 2024 b. Newly elected barangay officials and constituents of Barangay 14 on 26 Feb 2024 c. Business Sector: Pasay City Alliance of Tourism Advocates (PCATA) on 27 Feb 2024 d. Newly elected barangay officials and constituents of Barangay 40 on 29 Feb 2024 e. Travel City Youth Scholars (Youth) on 05 March 2024 f. Senior Citizens, OSCA on 22 April 2024 g. Newly elected Barangay officials and constituents of Barangay 65, Zone 8 on 25 April 2024 h. Newly elected Barangay officials and constituents of Brgy. 65, Zone 9 on 29 April 2024 i. Government Sector on 02 May 2024 j. Newly elected Barangay officials and Constituents of Zone 11 on 04 June 2024 k. Newly elected Barangay officials and Constituents of Zone 16 on 11 June 2024 l. Pasay City Hall Employees and	Continuous conduct of IEC activities: - IEC conducted with: a. Newly elected barangay officials and constituents of Barangay 14 on 26 Feb 2024 b. Business Sector: Pasay City Alliance of Tourism Advocates (PCATA) on 27 Feb 2024 c. Newly elected barangay officials and constituents of Barangay 40 on 29 Feb 2024 d. Travel City Youth Scholars (Youth) on 05 March 2024 e. Senior Citizens, OSCA on 22 April 2024 f. Newly elected Barangay officials and constituents of Barangay 65, Zone 8 on 25 April 2024 g. Newly elected Barangay officials and constituents of Brgy. 65, Zone 9 on 29 April 2024 h. Government Sector on 02 May 2024 i. Newly elected Barangay officials and Constituents of Zone 11 on 04 June 2024 j. Newly elected Barangay officials and Constituents of Zone 16 on 11 June 2024	Continuous conduct of IEC activities: - IEC conducted with employees of Pasay City General Hospital, newly elected barangay officials and youth leaders of the 201 Pasay Barangays for Second Semester. - Continuous conduct of IEC with Pasay Libertad Anglers' Association (PLAA). - Regular meetings with neighboring hinterland locators i. e. Sofitel Seascape, Lime Hotel). Interim and permanent solutions are being discussed to address the issues at hand and maintain good relationship. - Pasay LGU and JV Partner's presentation and discussion of the Pasay Eco-City Coastal Development Project during the 23 November 2023 Public Hearing of the House of Representatives Ways and Means Committee Chaired by Cong. Salceda. Annex 16: IEC Documentation	Continuous conduct of IEC activities: - IEC conducted with: a) Pasay LGU employees on July 20 21, 2023, b) Pasay Barangay officials on September 18, 20, 27, and October 5 and 11, 2023, c) SK Officials on November 16 and 28, 2023 - Continuous conduct of IEC with Pasay Libertad Anglers' Association (PLAA). - Regular meetings with neighboring hinterland locators (i.e. Sofitel, Seascape, Lime Hotel). Interim and permanent solutions are being discussed to address the issues at hand and maintain good relationship.	IEC conducted with the LGU Offices from Feb to Apr 2023. Continuous conduct of IEC with Pasay Libertad Anglers' Association. Ongoing update of strategic IEC Plan Annex 14: IEC Documentation MMT instructed to conduct one IEC per Quarter considering the primary stakeholders	IEC conducted with the LGU Offices from Feb to Apr 2023. Continuous conduct of IEC with Pasay Libertad Anglers' Association.	Annex 39: IEC Framework from Pasay 360 EIA	Draft of IEC Plan in progress by proponent.	Draft of IEC Plan in progress by proponent.	Draft of IEC Plan in progress by proponent.

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
			Private Sector on 19 June 2024 m. Newly elected Barangay officials and Constituents of Zone 17 and 18 on 25 June 2024 - Continuous conduct of IEC with Pasay Libertad Anglers' Association (PLAA). - Maintained open communication channels with neighboring hinterland locators (i.e. Sofitel, Seascape, Lime Hotel.) - Proponent and JV Partner's presentation and discussion of the Pasay Eco-City Coastal Development Project during the 23 November 2023 Public Hearing of the House of Representatives Ways and Means Committee Chaired by Cong. Salceda. - On 22 May 2024, Proponent and its Private Joint Venture Partners attended the Public Hearing on the House Committee on Ways and Means where the committee highlighted the economic benefits of the various reclamation projects in Manila Bay Annex 7 – IEC Documentation	k. Pasay City Hall Employees and Private Sector on 19 June 2024 l. Newly elected Barangay officials and Constituents of Zone 17 and 18 on 25 June 2024 - Continuous conduct of IEC with Pasay Libertad Anglers' Association (PLAA). - Maintain open communication channels meetings with neighboring hinterland locators (i.e. Sofitel, Seascape, Lime Hotel. - Pasay LGU and JV Partner's presentation and discussion of the Pasay ECO-City Coastal Development Project during the 23 November 2023 Public Hearing of the House of Representatives Ways and Means Committee Chaired by Cong. Salceda. - On 22 May 2024, Pasay City and its Private Joint Venture Partners attended the Public Hearing on the House Committee on Ways and Means where the committee highlighted the economic benefits of the various reclamation projects in Manila Bay								

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
3. Provide detailed Social Development Plan (SDP) based on the framework submitted in the EIS and shall be submitted sixty days (60) from the receipt of this Certificate	Yes		- SDP Framework submitted through the EIS on 30 October 2017. - Detailed SDP based on the EIS Framework submitted by Proponent to EMB Central Office on 04 May 2021. This was acknowledged by EMB on 17 May 2021. - Updated SDP was submitted by Proponent to EMB Central Office on 7 September 2022 and was acknowledged by EMB Central Office on 7 November 2022. - Updated SDP was submitted to EMB CO on 2 June 2023. - Alternative Livelihood (Total of Php 1,595,540.08) was provided to PLAA members as of June 2024. - Meet and Greet with UPLB Scholars on 08 February 2024 - Pasay Fisherfolk BFAR Registration on 24 April 2024 - SDP consultative meetings participated by Proponent, JV Partner, Libra Law and PHCC on 29 April 2024 and 02 May 2024 - JV Partner participated in the Coastal Clean- Up in MOA Seaside on 07 June 2024 as part of the celebration for World Ocean's Day - Hiring of the Project Contractor of local as cleaners in the project Annex 8 – Activity Report UPLB Scholars Meet and Greet Annex 9 – SDP Documentation Annex 10 – Hiring of Cleaners of Contractor (January to March 2024) Annex 11 - Hiring of Cleaners of Contractor (April to May 2024) Annex 103 – LGU Social Development Programs	SDP Framework submitted through the EIS on 30 October 2017. - Detailed SDP based on the EIS Framework submitted by Pasay City LGU to EMB Central Office on 04 May 2021. This was acknowledged by EMB on 17 May 2021. - Updated SDP was submitted by Pasay City LGU to EMB Central Office on 7 September 2022 and was acknowledged by EMB Central Office on 7 November 2022. - Updated SDP was submitted to EMB CO on 2 June 2023. - Alternative Livelihood (Total of Php 1,595,540.08) was provided to PLAA members as of June 2024. - Meet and Greet with UPLB Scholars on 08 February 2024 - Pasay Fisherfolk BFAR Registration on 24 April 2024 - SDP consultative meetings participated by Pasay LGU, JV Partners and Libra Law on 29 April 2024 and 02 May 2024 - JV Partner participated in the Coastal Clean-Up in MOA Seaside on 07 June 2024 as part of the celebration for World Ocean's Day - Hiring of the Project Contractor of local as cleaners in the project	- SDP Framework submitted through the EIS on 30 October 2017. - Detailed SDP based on the EIS Framework submitted by Pasay City LGU to EMB Central Office on 04 May 2021. This was acknowledged by EMB on 17 May 2021. - Updated SDP was submitted by Pasay City LGU to EMB Central Office on 7 September 2022 and was acknowledged by EMB Central Office on 7 November 2022. - Updated SDP was submitted to EMB CO on 2 June 2023. - Engagement for the clean-up activity in the island and provision of financial assistance (Total of Php 1,041,140.08) were provided to PLAA members as of December 31,2023. Annex 15: SDP Documentation	- SDP Framework submitted through the EIS on 30 October 2017. - Detailed SDP based on the EIS Framework submitted by Pasay City LGU to EMB Central Office on 04 May 2021. This was acknowledged by EMB on 17 May 2021. - Updated SDP was submitted by Pasay City LGU to EMB Central Office on 7 September 2022 and was acknowledged by EMB Central Office on 7 November 2022. - Updated SDP was submitted to EMB CO on 2 June 2023. - Alternative Livelihood (Total of Php1,041,140.08) was provided to PLAA members as of December 31, 2023. Christmas assistance was also given to the members. - Provision of smart televisions (19 September 2023) and medicines (20 October 2023) to the fisherfolks and coastal barangays in Naic and Ternate. - Launched the Youth are the Future Program which promotes sustainability on 10 October 2023. - Conducted Eco-Camp to the youth ambassadors (24-26 November 2023)- Supported Padyak Pasay 2023 on 25 November 2023. - Hiring of the Project contractor of local as cleaners in the project	Revised SDP submitted to EMB CO on 01 Jun 2023 Annex 13: Copy of updated SDP	Revised SDP submitted to EMB CO on 01 Jun 2023.	Documentation with Photos and Dates of SDP Activities: Kabalikat sa Kabuhayan (KSK) Program Pasay-SM-Don Bosco Techvoc Scholarship Padyakabuhayan \ Oplan Tulong Express PLAA Activities from August – December 2022 Annex 37: Pasay letter to DENR dated May 4, 2021 Annex 39: Documentation of Activities (SDP)	Refer to Proponent	Refer to Proponent	Refer to Proponent

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
4. Conduct a more detailed geotechnical marine soil investigation and seismic risk analysis to be considered in the final engineering design for submission to EMB Central Office before any horizontal development activity			Geotechnical Interpretation Report was submitted to EMB Central Office on 24 May 2023. Geotechnical Interpretation Report includes the more detailed geotechnical marine soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor. Annex 13 – Geotechnical Interpretation Report Updated GIR to be used for Final Engineering Design shall be submitted to DENR Central Office prior to horizontal development construction.	Geotechnical Interpretation Report was submitted to EMB Central Office on 24 May 2023. Geotechnical Interpretation Report includes the more detailed soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor. Updated GIR to be used for Final Engineering Design shall be submitted to DENR Central Office prior to horizontal development construction. Final Engineering Design which will use the GIR shall be submitted to DENR Central Office for approval prior to horizontal development construction.	Geotechnical Interpretation Report was submitted to EMB Central Office on 24 May 2023. Geotechnical Interpretation Report includes the more detailed geotechnical marine soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor. Annex 27: Geotechnical interpretation Report Updated GIR to be used for Final Engineering Design shall be submitted to DENR Central Office prior to horizontal development construction.	Geotechnical Interpretation Report was submitted to EMB Central Office on 24 May 2023. Geotechnical Interpretation Report includes the more detailed soil investigation and seismic risk analysis which were the basis for the detailed engineering design of the Contractor. Final Engineering Design which will use the GIR shall be submitted to DENR Central Office for approval prior to horizontal development construction.	Annex 23: Geotechnical interpretation Report submitted on 22 May 2023. Geotechnical investigation and seismic analysis of the reclaimed land shall be conducted prior to any horizontal development activity.	Soil investigation conducted. GAR and EGGAR has been submitted as part of the EIS Study.	To be complied at the horizontal development stage	Document is with the proponent	Document is with the proponent	Document is with the proponent
5. Proper storm drainage system, concrete culverts, and other flood and erosion control measures shall be provided during the construction phase to adequately protect the receiving water body from siltation, physico-chemical/marine pollution and further protect the surrounding communities from environmental degradation			Storm drainage system and concrete culverts are incorporated in the Detailed Engineering Design (DED) and will be included in the Project's final Master Development Plan. Storm drainage system and concrete culverts shall be installed during horizontal development, as determined during the Technical Conference with EMB CO held on 29 September 2023 for the Summons dated 19 September 2023. The agenda of the Technical Conference was for EMB to validate Proponent/JV Partner's compliance with ECC conditions. Proponent/JV Partner was deemed compliant. Sand key dredging as part of erosion control measures is a soil replacement method which replace the soft soil by sand and that makes the toe stable. The soft soil is dredged from the underwater center, making space for construction activities as well as water way for vessels. This process involves replacing soil up to about 30 to 40 meters deep, creating a foundation for landform. This method is especially useful in reclamation projects where the goal is to transform underwater areas into solid ground for future development. On 12 Sep 2023, TCLP analysis was conducted on the sand sources from PRA 2000, Bucao and Maloma. Results show that all of the tested parameters from these sand source samples passed the DAO 2013-22 standard.	Storm drainage system, concrete culverts, and other erosion control measures were incorporated in the Detailed Engineering Design (DED) of the Project and will be included in the Project's final Master Development Plan. Storm drainage system and concrete culverts shall be installed during horizontal development, as determined during the Technical Conference with EMB CO held on 29 September 2023 for the Summons dated 19 September 2023. The agenda of the Technical Conference was for EMB to validate Proponent/JV Partner's compliance with ECC conditions. Proponent/JV Partner was deemed compliant. Sand key dredging as part of erosion control measures is a soil replacement method which replace the soft soil by sand and that makes the toe stable. The soft soil is dredged from the underwater center, making space for construction activities as well as water way for vessels. This process involves replacing soil up to about 30 to 40 meters deep, creating a foundation for landform. This method is especially useful in reclamation projects where the goal is to transform underwater areas into solid ground for future development on 12 Sep 2023, TCLP analysis was conducted on the sand sources from	Storm drainage system and concrete culverts shall be installed during horizontal development as determined during the Technical Conference for the Summons with EMB CO. Sand key dredging as part of erosion control measures is a soil replacement method which replace the soft soil by sand and that makes the toe stable. The soft soil is dredged from the underwater center, making space for construction activities as well as water way for vessels. This process involves replacing soil up to about 30 to 40 meters deep, creating a foundation for landform. This method is especially useful in reclamation projects where the goal is to transform underwater areas into solid ground for future development. On 12 Sep 2023, TCLP analysis was conducted on the sand sources from PRA 2000, Bucao and Maloma. Results show that all of the tested parameters from these sand source samples passed the DAO 2013-22 standard. Annex 28 - TCLP Results	Storm drainage system, concrete culverts, and other erosion control measures were incorporated in the Detailed Engineering Design (DED) of the Project, and will be included in the Project's final Master Development Plan. On 12 Sep 2023, TCLP analysis was conducted on the sand sources from PRA 2000, Bucao and Maloma. Results show that all of the tested parameters from these sand source samples passed the DAO 2013-22 standard.	Storm drainage system, concrete culverts, and other erosion control measures will be considered in the Detailed Engineering Plans of the Master Plan. The MMT requires the proponent to test the fill materials for geochemical parameters and TCLP analysis. However, this will also be coordinated with EMB if this test is not necessary.	Project is still in reclamation phase.	JV Partner is to coordinate with neighboring establishments parallel to area of operation	Not part of the reclamation scope	Not part of the reclamation scope	Not part of the reclamation scope

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
			On 05 July 2024, TCLP Analysis was carried out on the additional sand source from Amnay, Mindoro. Results will be submitted once available These will be strictly complied with starting at the horizontal development phase. Annex 14 - TCLP Results for Bucao and Maloma in Zambales and PRA 2000 in Cavite Annex 15 - Chain of Custody of TCLP Analysis for Amnay	PRA 2000, Bucao and Maloma. Results show that all of the tested parameters from these sand source samples passed the DAO 2013-22 standard. On 05 July 2024, TCLP Analysis was carried out on the addition of sand source from Amnay. Results will be submitted once available.								
6. Adequate land area shall be allotted for the construction of a centralized sewage treatment facility to be able to treat all the wastewater that will be generated by the locators prior to discharge			The area shall be identified in the final Master Development Plan.	The area shall be identified in the final Master Development Plan; Area for the CSTF identified in the MDP to be approved.	The area shall be identified in the final Master Development Plan; Area for the CSTF identified in the MDP to be approved.	The area shall be identified in the final Master Development Plan; Area for the CSTF identified in the MDP to be approved.	The area shall be identified in the final Master Development Plan; Area for the CSTF identified in the MDP to be approved. Annex 24: Wastewater system per draft MDP Annex 25: Benchmarking of STP location	Project is still in reclamation phase.	Area for the CSTF will be identified in the final Master Development Plan Annex 20: Master Development Plan – Centralized Sewage Treatment Facility Allotment	Not part of the reclamation scope	Not part of the reclamation scope	Not part of the reclamation scope
7. Submit a reforestation and carbon sink program using endemic/indigenous species to mitigate greenhouse gas (GHG) emissions in line with the DENR's thrust on GHG emission reduction programs. The program's status of implementation shall be submitted to EMB Central Office every six (6) months as part of its compliance monitoring report	Yes		program submitted to EMB and acknowledged on 17May 2021 Submitted updated reforestation and carbon sink program on August 22, 2023 to DENR EMB CO. Status of implementation was included in the 1st Semester CMR 2024. Reforestation activity as follows: a) 1st and 2nd quarter monitoring of planted Macabebe Mangrove Seedlings on 11March 2024 and 24 May 2024, respectively. b) On 11 April 2024, JV Partner initiated the request for meeting with DENR offices regarding Tree Planting Support. Presently, planting areas, together with types of Seedlings appropriate per area, are already identified. PRA A.O. 2019-05 requires 5% of the Project Area to be dedicated for Green spaces to supplement the Carbon Sink Program. Annex 5 – DENR letter to Pasay Acknowledgement of 360 ECC Compliance 17 May 2021 Annex 16 – Minutes of Meeting of Consultation with FMB and Different DENR Offices Annex 17 – Reforestation Documentation Annex 18 – CMR 2024 1st Semester	Initial reforestation program submitted to EMB and acknowledged on 17 May 2021. Submitted updated reforestation and carbon sink program on August 22, 2023 to DENR EMB CO. Annex 5: DENR EMB CO Acknowledgement Letter dated 17 May 2021 Status of implementation was included in the 1st Semester CMR 2024. Reforestation activity as follows: a. 1st and 2nd quarter monitoring of planted Macabebe Mangrove Seedlings on 11 March 2024 and 24 May 2024, respectively. b. On 11 April 2024, JV Partner initiated the request for meeting with DENR offices regarding Tree Planting Support. Presently, planting areas, together with types of seedlings appropriate per area, are already identified.	Initial reforestation program submitted to EMB and acknowledged on 17 May 2021. Submitted updated reforestation and carbon sink program on August 22, 2023 to DENR EMB CO. Status of implementation was included in the 2nd Semester CMR 2023, reforestation activity as follows: - 18 October 2023 - Calatagan Mangrove Planting (2,000) - 20 December 2023- Macabebe Mangrove Planting (3,000) PRA 2019-05 requires 5% of the Project Area to be dedicated for Green spaces to supplement the Carbon Sink Program. Annex 6: CMR (July-December 2023) Annex 25: DENR EMB CO Acknowledgement Letter dated 17 May 2021 Annex 29: Reforestation - Carbon Sink Documentation	Initial reforestation program submitted to EMB and acknowledged on 17 May 2021 Annex 21: DENR EMB CO Acknowledgement Letter dated 17 May 2021 Status of implementation was included in the 2nd Semester CMR 2023, reforestation activity as follows: 18 October 2023 – Calatagan Mangrove Planting (2,000 propagules) 20 December 2023- Macabebe Mangrove Planting (3,000 seedlings)	Initial reforestation program submitted to EMB and acknowledged on I7 May 2021 Annex 21: EMB Letter dated 17 May 2021 Status of implementation was included in the 1st Sem CMR 2023 Annex 6: Compliance Monitoring Report Jan - June 2023 Updating the reforestation and carbon sink program. Proponent is instructed by MMT to clarify with EMB if its ongoing reforestation projects can be	Ongoing tree-planting in Tuba, Benguet and Nasugbu, Batangas. Mangrove planting ongoing in Macabebe, Pampanga.	Annex 19: DENR Acknowledgement Letter to ECC Conditions Compliance 1, 3, 7 ,9.1, 9.2 9.3, 12, 14 Ongoing implementation: to identify an area	Not part of the reclamation scope	Not part of the reclamation scope	Not part of the reclamation scope

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
							credited as compliance with the specific condition of the project on the GHG requirement					
8. Submit a detailed Master Plan to cover the entire reclamation Projects one (1) year prior to Project construction			Conceptual Master Plan was included in the EIS submitted on 30 October 2017. Master Plan shall be submitted one (1) year prior to horizontal development construction. Annex 19: Initial Master Development Plan for Pasay 360	Conceptual Master Plan was included in the EIS submitted on 30 October 2017. Final Master Plan shall be submitted one (1) year prior to horizontal development construction.	Conceptual Master Plan was included in the EIS submitted on 30 October 2017. Final Master Plan shall be submitted one (1) year prior to horizontal development construction. Annex 30: Initial Master Development Plan for Pasay 360	Conceptual Master Plan was included in the EIS submitted on 30 October 2017. Final Master Plan shall be submitted one (1) year prior to horizontal development construction.	Master Plan submitted will be updated and submitted to EMB. Annex 26: Initial Master Development Plan for Pasay 360	Ongoing updating of the submitted Master Plan.	Master Development Plan ongoing update Annex 39: Master Plan	Refer to Proponent	Refer to proponent	Refer to proponent
The proponent shall set-up the following: 9.1 Environmental Guarantee Fund (EGF) which can be replenished anytime to cover the following: a) Expenses for further environmental assessments; b) Compensation, indemnification for whatever damages to life and property that may be caused by the Project; and c) Rehabilitation and/or restoration of areas affected by the Project's implementation	Yes		EGF Cash Fund Account was established on 17 February 2022. EGF Performance Bond was established on 31 December 2022. Annex 20 – EGF Cash Fund Account and Proof of Establishment of Performance Bond 14 January 2025	EGF Cash Fund Account was established on 17 February 2022. EGF Performance Bond was established on 31 December 2022	EGF Cash Fund Account was established on 17 February 2022. EGF Performance Bond was established on 31 December 2022. Annex 31: EGF Cash Fund Account and Proof of Establishment of Performance Bond	EGF Cash Fund Account was established on 17 February 2022. EGF Performance Bond was established on 31 December 2022	EGF Cash Fund Account was established. EGF Performance Bond was established Annex 27: Copy of EGF Cash Fund Account and Proof of Establishment of Performance Bond	EGF has been established. EGF bank account is open	For establishment	Proponent established the EGF	Proponent established the EGF	Proponent established the EGF
9.2 A Multi-partite Monitoring Team (MMT) composed of representative(s) from the proponent, local environmental Non- Government Organization (NGO) concerned, the Manila Bay Coordinating Office, PAGASA, DPWH and other concerned government agencies shall be organized consistent with DAO 2003-30. The MMT shall primarily oversee and report to EMB Central Office full compliance of proponent with the EMP/ EMoP, other commitments, as well as mitigation measures that are contained in the EIS documents and conditions herein enumerated	Yes		MMT established and activated through a MOA signed on May 2021 [EMB and Project Proponent] September 2021 [MMT Members]. MMT Manual of Operations (MOO) was submitted to EMB Central Office on 14 March 2023 and still pending approval. The MOO was resubmitted to the EMB on 21 June 2024. The 2024 AWFP was submitted to the EMB on 4 July 2024. Annex 21: Submitted MOO to EM CO Annex 104: Acknowledgement Letter of 2024 AWFP submission dated 4 July 2024 Annex 105: 2024 AWFP and MMT Resolution	MMT established and activated with the following members as determined by the Chairman (MoA signed May 2021[EMB and Project Proponent] September 2021 [MMT Members]). MOA was submitted to EMB on 13 March 2023 pending approval of EMB. MMT Manual of Operations (MOO) was submitted to EMB Central Office on 14 March 2023 and still pending approval. Ongoing coordination with the MMT to comply with the 15 March 2024 comments of the EMB on the MOO and finalization of AWFP for 2024 (MMT Resolution no. 2024-02).	MMT established and activated through a MOA signed on May 2021 [EMB and Project Proponent] September 2021 [MMT Members]). MMT Manual of Operations (Moo) was submitted to EMB Central Office on 14 March 2023 and still pending approval. Annex 10: Submitted MOO to EMB Co	MMT established and activated with the following members as determined by the Chairman (MoA signed May 2021[EMB and Project Proponent] September 2021 [MMT Members]). MOA was submitted to EMB on 13 March 2023 pending approval of EMB. MMT Manual of Operations (MOO) was submitted to EMB Central Office on 14 March 2023 and still pending approval.	MMT established and activated with the following members as determined by the Chairman (MOA signed May 2021[EMB and Project Proponent] September 2021 [MMT Members]. MOO was submitted to EMB on 13 March 2023 pending approval of EMB. Annex 9 Receiving copy of MOO MMT and Proponent to follow up status of MOO with EMB CO	MMT established and activated with the following members as determined by the Chairman (MoA signed May 2021 [EMB and Project Proponent] September 2021 [MMT Members]). MOA was submitted to EMB on 13 March 2023 pending approval of EMB.	MMT established; MOO drafted; Annex 10: MMT Memorandum of Agreement	Proponent established the MMT	Proponent established the MMT	Proponent established the MMT

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
9.3 A replenishable Environmental Monitoring Fund (EMF) to cover all costs attendant to the operation and monitoring activities of the MMT including but not limited to capability building, training, actual sampling and laboratory analysis. Said provisions must be consistent with DAO 2003-30. The amount and mechanics of the EGF, EMF, and the establishment of MMT shall be determined by EMB Central Office and the proponent in consultation with EMB Regional Office, through an integrated Memorandum of Agreement (MOA) which shall be submitted to the EMB Central Office for approval within ninety (90) days upon receipt hereof.	Yes		EMF has been established and currently being used to cover costs of MMT monitoring activities. EMF Bank Account opened on 17 February 2022. MMT Memorandum of Agreement (MOA) signed on 02 September 2021. Annex 22 – MMT MOA Annex 23 – Proof of EMF Establishment Annex 24 – EMF Bank Certification	EMF has been established and currently being used to cover costs of MMT monitoring activities. EMF Bank Account opened on 17February 2022. MMT Memorandum of Agreement (MOA) signed on 02 September 2021.	EMF has been established and currently being used to cover costs of MMT monitoring activities. EMF Bank Account opened on 17 February 2022. MMT Memorandum of Agreement (MOA) signed on 02 September 2021. Annex 9: MMT MOA Annex 21: Proof of EMF Establishment Annex 32: EMF Bank Certification	EMF has been established and currently being used to cover costs of MMT monitoring activities. EMF Bank Account opened on 17 February 2022. MMT Memorandum of Agreement (MOA) signed on 02 September 2021.	EMF has been established and being used to cover costs for monitoring/MMT activities. EMF bank account is open. Annex A: MMT MOA Annex 18: Copy of EMF Bank Account	EMF has been established and being used to cover costs for monitoring/MMT activities. EMF bank account is open.	To Establish EMF, activities shouldered by JV Partner; MOA approved and submitted Annex 10: MMT Memorandum of Agreement Annex 19: DENR Acknowledgement Letter	Proponent established the EMF	Proponent established the EMF	Proponent established EMF
10. An Environmental Unit (EU) shall be established to completely handle the environment related aspects of the Project in addition to the Monitoring requirements as specified in the Environmental Management Plan (EMP)/Environmental Monitoring Plan (EMoP). The EU shall: 10.1 Monitor actual Project impacts vis-a vis the predicted impacts management measures in the EIS	Yes		Original EU established by JV Partner on 11 January 2022. New EU was established on 28 July 2023. Endorsement letter from Proponent was received by DENR EMB on 01 August 2023. Continuous monitoring of the EMP/EMoP requirements through updating as deem necessary. PCO for the Project was appointed on 2 September 2023 (COA No. 2023-NCR-10199). Ongoing accreditation for the 2nd PCO. Annex 25 – Letter Delegating SM EU Annex 26 – PCO Accreditation Raymond Cabanilla Annex 27 – Managing Head Certificate	Original EU established by JV Partner on 11 January 2022. New EU was established on 28 July 2023 and received by DENR EMB on 01 August 2023, respectively. Continuous monitoring of the EMP/EMoP requirements through updating as deem necessary. PCO for the Project was appointed on 2 September 2023 (COA No. 2023-NCR-10199). Ongoing accreditation for the 2nd PCO.	Original EU established by JV Partner on 11 January 2022. New EU was established on 28 July 2023, Endorsement letter from Pasay was received by DENR EMB on 01 August 2023. Annex 23: PCO Accreditation Raymond Cabanilla Annex 24: Managing Head Certificate	Original EU established by JV Partner on 11 January 2022. New EU was established on 28 July 2023 and received by DENR EMB on 01 August 2023, respectively.	EU has been established by JV Partner. The Managing Head signed the reports during the period pending the accreditation of the PCO; Accreditation will be monitored in the 3" quarter 2023 MMT meeting. Mr. Raymond Cabanilla (PCO) will undergo immediate PCO training and accreditation. Atty. Leah Quiambao, Atty. Christiene Demaisip, Atty. Sheryll Javier, Mr. Kenaz, Punzalan and Ms. Kristine Dator will undergo Managing Heads Training The Contractor has also established its EU Annex to: Letter delegating SM EU	EU has been established by JV Partner.	Proponent designated JV Partner EU; MMT encouraging one personnel from LGU to be part of the project EU Annex 11: Proponent delegating EU responsibilities	CHEC has established an EU doing all environmental works - actively monitoring	CHEC has established an EU doing all environmental works - actively monitoring	CHEC has established an EU doing all environmental works - actively monitoring

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
10.2 Ensure that monitoring and submission of reports to EMB (Central Office and NCR) are carried out as required	Yes		Continuous monitoring of the EMP/EMoP requirements through updating as deem necessary. Quarterly Self-Monitoring Report (SMR) and Semiannual Compliance Monitoring Report (CMR) are promptly submitted to the EMB Central Office and EMB NCR. Q1and Q2 2024 SMR submitted on dates 12 April 2024 and 15 July 2024, respectively. 2nd Sem 2023 CMR submitted on 17 January 2024. 1st Sem 2024 CMR was submitted on 15 July 2024. Annex 28 – SMR 2024 Q1 Annex 29 – SMR 2024 Q2 Annex 30 – CMR 2023 S2 Annex 18 – CMR 2024 1st Semester	Quarterly Self-Monitoring Report (SMR) and Semi-annual Compliance Monitoring Report (CMR) are promptly submitted to the EMB Central Office and EMB NCR. Q1and Q2 2024 SMR submitted on dates 12 April 2024 and 15 July 2024, respectively. 2nd Sem 2023 CMR submitted on 17 January 2024.	Quarterly Self-Monitoring Report (SMR) and Semiannual Compliance Monitoring Report (CMR) are promptly submitted to the EMB Central Office and EMB NCR. Q3 and Q4 SMR submitted on dates 13 October 2023 and 12 January 2024, respectively. 2nd sem CMR submitted on 17 January 2024	Quarterly Self-Monitoring Report (SMR) and Semi-annual Compliance Monitoring Report (CMR) are promptly submitted to the EMB Central Office and EMB NCR. Q3 and Q4 SMR submitted on dates October 13, 2023, 2023 and January 12, 2024, 2023, respectively 1st Sem CMR submitted on July 15, 2023	SMR, CMR dates of submittal; SMR submitted on dates Apr 17, 2023, and Jul 14,2023 CMR submitted on Jul, 5,2023 Annex 5,6, and 7	EU has been established by JV Partner.	SMR, CMR dates of submittal; Annex 9: SMRs and CMRs 9.1: Proof of submission	On-going submittal	On-going submittal	On-going submittal
10.3 Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures			The Project's estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC.	The Project's estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC.	The Project's estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC.	The Project's estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC.	Project estimated date of completion July 2028	EU has been established by JV Partner.	To be complied one (1) year prior to tentative date of completion (Reclamation): July 2025	TBD. Project is on-going.	TBD. Project is on-going.	TBD. Project is on-going.
10.4 Submit the geographical coordinates of actual area approved by PRA to be reclaimed prior to Project construction; and	Yes		EIS configuration of the Project is based on the 2017 PRA-approved configuration. However, in November 2023, the PRA approved a Revised Landform Plan for the Project, which was also allowed by the EMB to proceed in its letter dated 24 January 2024. Proponent sent a letter to the DENR on the proposed Revised Landform Plan for the Project on 31 October 2023. Revised Landform Plan was approved by the PRA Board and endorsed to the DENR in a letter dated 28 November 2023. On 24 January 2024, the EMB recognized the PRA approved Land reconfiguration and allowed Proponent to proceed with the reclamation activities. JV Partner sent a letter dated 15 March 2024 to Proponent regarding	EIS configuration of the island is based on the 2017 PRA-approved configuration. However, on November 2023, the PRA approved a Revised Landform Plan for the Project, which was also allowed by the EMB to proceed in its letter dated 24 January 2024. Pasay sent a letter to the DENR on the proposed Revised Landform Plan for the Project on 31 October 2023. Revised Landform Plan was approved by the PRA Board and endorsed to the DENR in a letter dated 28 November 2023. On 24 January 2024, the EMB recognized the PRA-approved land reconfiguration and allowed Pasay to proceed	Area approved by PRA Board and submitted through EIS on 30 October 2017. Annex 33: Actual area approved through PRA Board Resolution to be reclaimed. Annex 34: Geographical coordinates from EIS	Area approved by PRA Board and submitted through EIS on 30 October 2017.	Original geographical coordinates in the approved EIS submitted on 30 October 2017; while revised geographical coordinates for the reconfiguration was submitted to EMB Annex 36: ECC amendment timeline Annex 28: EIS coordinates	EU has been established by JV Partner.	Annex 2: Pasay 360 coordinates; Annex 2.1: Philippine Reclamation Authority Approval of project 360:	Refer to Proponent	Refer to Proponent	Refer to Proponent

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
			the Revised Pasay 360 Landform, which Proponent endorsed to the Philippine Reclamation Authority (PRA) on 26 April 2024. Proponent, through the JV Partner, has already commenced drafting of the EPRMP and has engaged a consultant for the application process for ECC amendment covering the land reconfiguration. Annex 31 – Actual area approved through PRA Board Resolution to be reclaimed Annex 32 – Geographical coordinates from EIS Annex 65 - DENR EMB's Permission to Proceed with Land Reconfiguration Annex 75 – PRA Board Resolution Annex 76 – PRA Letter to DENR Endorsing Approved Revised Land Form Annex 106 – SM Letter to Pasay regarding Enhanced Landform dated 15 March 2024 Annex 107 - Pasay Letter to PRA regarding Revised Landform Plan as received by PRA on 26 April 2024	Pasay City, through the Private Joint Venture Partner, has already commenced drafting of the EPRMP and has engaged a consultant for the application process for ECC amendment.								

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
10.5 Conduct continuing consultation with the stakeholders in updating EMP and EMoP that shall include necessary baseline data, geohazard and disaster risk reduction and management and ground settlement monitoring of the reclaimed area.	Yes		Private Joint Venture Partners, engaged environmental and urban planning experts Planades and Primex to conduct environmental studies and come up with environmental programs in compliance with the ECC for the Project. Their work includes the formulation, based on technical studies, of the enhanced and updated EMP and EMoP for the Project. Consultations were done with officials and residents of the cities of Manila on 31 August 2022 and City of Parañaque on 16 September 2022, respectively. Annex 33 – Minutes of the Consultations Recommendations from EMB CO to transfer monitoring station closer to the Project site made on 27 September 2023 was duly incorporated in the updated EMP submitted on 07 May 2024. Proponent, together with its JV Partners, also regularly update PLANADES and Primex (consultants for the Pasay Reclamation Projects) with the comments and suggestions of the Project's Multipartite Monitoring Team (which members include Pasay City CENRO and PCHO, Barangay 76, sectoral representatives from Urban Poor Sector, Council of Leaders and Yahad Consumer Cooperative, PRA, BFAR, PCG, DENR-NCR and EMB) on matters regarding environment management and mitigating measures. Currently, PLANADES conducted consultation and social baseline surveys for ECC Amendment covering the land reconfiguration to the concerned Barangay Stakeholders and LGU Officials	Pasay LGU, through its Private Joint Venture Partners, engaged environmental and urban planning experts Planades and Primex to conduct environmental studies and come up with environmental programs in compliance with the ECC for the Project. Their work includes the formulation, based on technical studies, of the enhanced and updated EMP and EMoP for the Project. Consultations were done with officials and residents of the cities of Manila on 31 August 2022 and (b) City of Parañaque on 16 September 2022, respectively. Recommendations from EMB CO to transfer monitoring station closer to the Project site made on 27 September 2023 was duly incorporated in the updated EMP submitted on 07 May 2024. Pasay City, together with its JV Partners, also regularly update Planades and Primex with the comments and suggestions of the Project's Multipartite Monitoring Team (which members include Pasay City CENRO and PCHO, Barangay 76, sectoral representatives from Urban Poor Sector, Council of Leaders and Yahad Consumer Cooperative, PRA, BFAR, PCG, DENRNCR and EMB) on matters regarding environment management and mitigating measures. Currently, PLANADES conducted consultations through social baseline surveys for ECC Amendment to the concerned Barangay Stakeholders and LGU Officials.	Pasay LGU, through its Private Joint Venture Partners, engaged environmental and urban planning experts Planades and Primex to conduct environmental studies and come up with environmental programs in compliance with the ECC for the Project. Their work includes the formulation, based on technical studies, of the enhanced and updated EMP and EMOP for the Project. Consultations were done with officials and residents of the cities of Manila on 31 August 2022 and to) City of Parañaque on 16 September 2022, respectively. Annex 35: Minutes of the Consultations Recommendations from EMB CO to transfer monitoring station closer to the Project site made on 27 September 2023 will be duly incorporated in the updated EMP. Pasay City, together with its JV Partners, also regularly update Planades and Primex (consultants for the Pasay Reclamation Projects) with the comments and suggestions of the Projects Multipartite Monitoring Team (which members include Pasay City CENRO and PCHO, Barangay 76, sectoral representatives from Urban Poor Sector, Council of Leaders and Yahad Consumer Cooperative, PRA, BFAR, PCG, DENR-NCR and EMB) on matters regarding environment management and mitigating measures.	Pasay LGU, through its Private Joint Venture Partners, engaged environmental and urban planning experts Planades and Primex to conduct environmental studies and come up with environmental programs in compliance with the ECC for the Project. Their work includes the formulation, based on technical studies, of the enhanced and updated EMP and EMoP for the Project. Consultations were done with officials and residents of the cities of Manila on 31 August 2022 and (b) City of Parañaque on 16 September 2022, respectively. Pasay City, together with its JV Partners, also regularly update Planades and Primex with the comments and suggestions of the Project's Multipartite Monitoring Team (which members include Pasay City CENRO and PCHO, Barangay 76, sectoral representatives from Urban Poor Sector, Council of Leaders and Yahad Consumer Cooperative, PRA, BFAR, PCG, DENR NCR and EMB) on matters regarding environment management and mitigating measures.	Awaiting consultants to provide proof/evidence of consultation made with City of Manila- Aug 31, 1:30pm; City of Parañaque - Sep1, 1:30pm. There was no consultation with stakeholders within the monitoring period. Annex 65: Evidence of Consultation Annex 30: Settlement Report	EU has been established by JV Partner.	Consultations made with: City of Manila – August 31, 2022 1:30pm City of Parañaque – September 1,2022 1:30pm Annex 21: Evidences of Consultation	On process of update	On process of update	On process of update

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
11. Ensure that its contractors and subcontractors properly comply with the relevant conditions of this Certificate including those regulations covering the entire activity of the Project;	Yes		Proponent/ JV Partner is monitoring the compliance of the contractor through continuous coordination. The contractor is also required to submit its report to EMB. The Contractor is also required to submit periodic reports i.e., quarterly SMRs and other relevant permitting requirement applications such as Hazardous Waste Generator ID, PTO and PCO Accreditation to EMB. Regular weekly coordination and monitoring between Proponent/JV Partner and Project Contractor. Annex 49 - Contractor Permits	Proponent / JV Partner is monitoring the compliance of the contractor through continuous coordination. The contractor is also required to submit its report to EMB. The Contractor is also required to submit periodic reports i.e., quarterly SMRs and other relevant permitting requirement applications such as Hazardous Waste Generator ID, PTO and PCO Accreditation to EMB. Regular weekly coordination and monitoring between Proponent/JV Partner and Project Contractor.	Proponent / JV Partner is monitoring the compliance of the contractor through continuous coordination. The contractor is also required to submit its report to EMB. The Contractor is also required to submit periodic reports i. e., quarterly SMRs and other relevant permitting requirement applications such as Hazardous Waste Generator ID, PTO and PCO Accreditation to EMB. Regular weekly coordination and monitoring between Proponent JV Partner and Project Contractor.	Proponent / JV Partner is monitoring the compliance of the contractor through continuous coordination. The contractor is also required to submit its report to EMB The Contractor is also required to submit periodic reports i.e., quarterly SMRs and other relevant permitting requirement applications such as Hazardous Waste Generator ID, PTO and PCO Accreditation to EMB.	Proponent/JV Partner is monitoring the compliance of the contractor through continuous coordination. The contractor is also required to submit its report to EMB Annex 5: SMR with acknowledgment	Proponent/JV Partner is monitoring the compliance of the contractor.	Contractors and Sub-contractors' compliance are closely monitored by the Proponent. Annex 9: SMR, CMR 9.1 Proof of Submission, Contractor Permits, Hauling Reports, Transmittal Forms to PCG	On-going monitoring/Compliance	On-going monitoring/Compliance	On-going monitoring/Compliance
12. The proponent shall notify the EMB Central Office the location of filling materials	Yes		- Notification of original sand source submitted to EMB Central Office on 04 May 2021. - On 22 August 2023, the Proponent issued a written notification to the DENR-EMB (that the filling materials for the Project are sourced from the following locations: 1. Philippine Reclamation Authority (PRA) borrow area in San Nicholas Shoal (SNS) covered by Government Seabed Quarry Permit (GSQP) No. OMROOI-2008-FIRA-amended. Currently, there is no dredging since March 2023 because of insufficient sand volume due to the red zone/nodredge zone imposed by the DENR-Mines Geosciences Bureau. 2. Western River Basins of Mt. Pinatubo - Downstream Portion of Bucao River, Botolan, Zambales, Philippines, covered by Dredging Operations Permit (Renewal) No. DoP-2022-Booi and OOF-2022-Boo2; and 3. Western River Basins of Mt. Pinatubo Downstream Portion of Maloma River, San Felipe, Zambales, On 16 May 2024, EMB was notified of the additional sand source material (i.e. Amnay, Mindoro). All the relevant consents for the above-mentioned sand sources have been secured. Annex 34 – Letter to EMB regarding sources of fill materials dated 17 August 2023 Annex 35 – Update on the latest sand source dated 16 May 2024 Annex 36 – Dredging Clearance for Amnay River Annex 37 – Ore Transport Permit Amnay River [15 Tons] Annex 38 – Ore Transport Permit Amnay River [16 Tons]	- Notification of original sand source submitted to EMB Central Office on 04 May 2021. - On 22 August 2023, the Proponent issued a written notification to the DENREMB (that the filling materials for the Project are sourced from the following locations: 1. Philippine Reclamation Authority (PRA) borrow area in San Nicholas Shoal (SNS) covered by Government Seabed Quarry Permit (GSQP) No. OMRooi-2008-firA-amended. Currently, there is no dredging since March 2023 because of insufficient sand volume due to the red zone/no-dredge zone imposed by the DENR-Mines Geosciences Bureau. 2. Western River Basins of Mt. Pinatubo - Downstream Portion of Bucao River, Botolan, Zambales, Philippines, covered by Dredging Operations Permit (Renewal) No. DoP-2022-Booi and OOF- 2022-Boo2; and 3. Western River Basins of Mt. Pinatubo Downstream Portion of Maloma River, San Felipe, Zambales, On 16 May 2024, EMB was notified of the additional sand source material (i.e. Amnay). All the relevant consents for the abovementioned sand sources have been secured.	- Notification of original sand source submitted to EMB Central Office on 04 May 2021. - On 22 August 2023, the Proponent issued a written notification to the DENR-EMB (that the filling materials for the Project are sourced from the following locations: 1. Philippine Reclamation Authority (PRA) borrow area in San Nicholas Shoal (SNS) covered by Government Seabed Quarry Permit (GSQP) No. OMRooi-2008-firAamended. Currently, there is no dredging since March 2023 because of insufficient sand volume due to the red zone/no-dredge zone imposed by the DENR-Mines Geosciences Bureau. 2. Western River Basins of Mt. Pinatubo - Downstream Portion of Bucao River, Botolan. Zambales, Philippines, covered by Dredging Operations Permit (Renewal) No. DoP-2022-Booi and OOF-2022-Boo2; and 3. Western River Basins of Mt. Pinatubo Downstream Portion of Maloma River, San Felipe, Zambales, All the relevant consents for the above-mentioned sand sources have been secured. No activity shall be undertaken unless the following documents are submitted to this Office within one hundred twenty (120) days prior to project implementation; Clearance/notice to proceed	- Notification of original sand source submitted to EMB Central Office on 04 May 2021. - On 22 August 2023, the Proponent issued a written notification to the DENR EMB (that the filling materials for the Project are sourced from the following locations: 1. Philippine Reclamation Authority (PRA) borrow area in San Nicholas Shoal (SNS) covered by Government Seabed Quarry Permit (GSQP) No. OMRooi-2008-firA-amended. Currently, there is no dredging since March 2023 because of insufficient sand volume due to the red zone/no-dredge zone imposed by the DENR-Mines Geosciences Bureau. 2. Western River Basins of Mt. Pinatubo Downstream Portion of Bucao River, Botolan, Zambales, Philippines, covered by Dredging Operations Permit (Renewal) No. DoP-2022-Booi and OOF 2022-Boo2; and 3. Western River Basins of Mt. Pinatubo Downstream Portion of Maloma River, San	Notifications submitted to EMB-CO on 04 May 2021. Annex 21: DENR Letter of acknowledgment dated 17 May 2021	Notifications submitted to EMB-CO on 04 May 2021.	Complied: Annex 19: DENR Acknowledgement letter			

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
			Annex 15 – Chain of Custody for TCLP Analysis of Amnay Sand		(NTP) duly issued by the Philippine Reclamation Authority (PRA ; Area Clearance issued by the DENR; and 14 Annex 36: Letter to EMB regarding sources of fill materials dated I7 August 2023	Felipe, Zambales. All the relevant consents for the above-mentioned sand sources have been secured.						
13. The proponent shall use filling materials from legal suppliers/suppliers that secure necessary government permits	Yes		All sand sources are covered by relevant consents. Proponent/JV Partner is monitoring compliance of sand suppliers with necessary government permits. Annex 39 – GSQP PRA SNS Annex 40 – ECC PRA SNS Annex 41 – ECC Botolan Annex 42 – Geochemical and Physical Report of filling materials Annex 43 – ECC Amnay	All sand sources are covered by relevant consents. Proponent/JV Partner is monitoring compliance of sand suppliers with necessary government permits.	All sand sources are covered by relevant consents. Proponent /JV Partner is monitoring compliance of sand suppliers with necessary government permits. Annex 37: GSQP PRA SNS Annex 38: ECC PRA SNS Annex 39: ECC Botolan Annex 40: Geochemical and Physical Report of filling materials	All sand sources are covered by relevant consents. Proponent/JV Partner is monitoring compliance of sand suppliers with necessary government permits.	Proponent/JV Partner is monitoring the compliance of the suppliers of filling materials with necessary government permits.; Annex 31: GSQP PRA SNS Annex 32: ECC PRA SNS Annex 33: ECC Botolan Annex 34: Geochemical and Physical Report of filling materials	Proponent/JV Partner is monitoring the compliance of the suppliers of filling materials with necessary government permits.	Complied. Annex 22: Government Seabed Quarry Permit of PRA Annex 23: Environmental Compliance Certificate PRA Annex 24: Dredging Operations Permit, Environmental Compliance Certificate Magnacorp Annex 25: Dredging Operations Permit, Enviromental Compliance Certificate Sevenwest			
14. No activity shall be undertaken unless the following documents are submitted to this Office within one hundred twenty (120) days prior to Project implementation: a. Clearance/notice to proceed (NTP) duly issued by the Philippine Reclamation Authority (PRA); b. Area Clearance issued by the DENR; and c. Approval from the National Economic and Development Authority in accordance with Executive Order No. 146 and the Implementing Rules and Regulation thereof;	Yes		Proponent received a Notice to Proceed issued by the PRA on 04 December 2019, and Area Clearance by the DENR on 15 August 2019. The Project is covered in the Transitory Provision of EO 74 which delegated to the PRA Governing Board the power of the President to approve reclamation projects. Annex 45 – PRA Notice to Proceed Annex 46 – PRA Letter to Pasay LGU certifying compliance with the NTP and NTM/NTCARW conditions dated 01 December 2021 Annex 47 – Area Clearance for Pasay 360 DENR EMB CO Annex 5 - DENR letter to Pasay Acknowledgement of 360 ECC Compliance 17 May 2021	Proponent received a Notice to Proceed issued by the PRA on 04 December 2019, and Area Clearance by the DENR on 15 August 2019. The Project does not need NEDA approval based on EO 74 Series of 2019, delegating to the PRA Governing Board the power of the President to approve reclamation projects.	Proponent received a Notice to Proceed issued by the PRA on 04 December 2019, and Area Clearance by the DENR on 15 August 2019. The Project is covered in the Transitory Provision of E0 74 which delegated to the PRA Governing Board the power of the President to approve reclamation projects. Annex 41 : PRA Notice to Proceed Annex 88: PRA Letter to Pasay LGU certifying compliance with the NTP and NTM/NTCARW conditions dated 01 December 2021 Annex 42: Area Clearance for Pasay 360 Annex 25: DENR EMB CO Acknowledgement Letter dated May 17,2021	Proponent received a Notice to Proceed issued by the PRA on 04 December 2019, and Area Clearance by the DENR on 15 August 2019. The Project does not need NEDA approval based on EO 74 Series of 2019, delegating to the PRA Governing Board the power of the President to approve reclamation projects.	Proponent has secured NTP from PRA (04 Dec 2019) and AC from DENR (, 5 Aug 2019). The project does not need approval of NEDA based on E0 74 Series of 2019, delegating to the PRA Governing Board the power of the President to approve reclamation projects Annex 29: PRA Notice to Proceed Annex 35: Area Clearance Annex 21: DENR Letter acknowledgment	Proponent has secured NTP from PRA (04 Dec 2019) and AC from DENR (15 Aug 2019). The project does not need approval of NEDA based on EO 74 series of 2019, delegating to the PRA Governing Board the power of the President to approve reclamation projects.	14 a. Complied, Annex 26: Notice to Proceed from PRA b. Complied, Annex 27: Area Clearance for Pasay 360 Project c. The Pasay 360 Hectares Reclamation Project do not need approval from the NEDA pursuant to the transitory provision under EO 74 Implementing Rules and Regulations			

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
15. No other activities shall be undertaken other than what was stipulated in the EIS document. Expansion of the project/construction of other structures or any change in the activity beyond those stated in the EIS shall be subject to a new Environmental Impact Assessment	Yes		Activities are within those stated in the EIS. On 24 January 2024, the EMB CO recognized the PRA-approved land reconfiguration and allowed Proponent to proceed with the reclamation activities as proposed because the revised landform already formed part of the EIA, subject to the submission of the EPRMP and other documents for the amendment of the ECC.	No activity outside beyond those stated in the EIS. 24 January 2024: EMB CO recognized the PRA-approved land reconfiguration and allowed Pasay to proceed with the reclamation activities as proposed because the revised landform already formed part of the EIA, subject to the submission of the EPRMP and other documents for the amendment of the ECC.	Activities are within those stated in the EIS.	No activity outside beyond those stated in the EIS.	MMT observed during its 2nd Quarter monitoring that there are reclamation activities outside the coordinates of the final EIS. A special MMT meeting was conducted with the proponent Pasay City, JV Partner SM-SGIDC and its contractor on 19 June 2023 to discuss the observation. A Position Paper was submitted by the Proponent and noted that an Application for ECC Amendment for project enhancement has been filed with the EMB. An MMT report, together with the Position Paper, was submitted to the EMB-Co and EMB-NCR on 14 July 2023. Annex 36: Chronology of request for ECC Amendment Annex 37: Position Paper of Proponent on ECC Amendment	An application for project enhancement has been submitted to EMB CO resulting in ECC amendment.	Ongoing application for expansion of project from 360 hectares to 390 hectares Annex 40: Acknowledgment Receipt for Project Expansion			
16. Transfer of Ownership of this Project carries these same conditions and restrictions for which written notification must be made herein grantee to EMB within fifteen (15) days from such transfer.	Yes		No transfer of ownership to date.	No transfer of ownership.	No transfer of ownership to date.	No transfer of ownership.	No transfer of ownership to date	No transfer of ownership.	No transfer of ownership to date			
Status of Compliance to Annex B Project Assessment Planning Tool of ECC												
1. Proponent needs to comply with: 1.a. Sanitation Code of the Philippines: Compliance with the Sanitation Code of the Philippines	Yes		Annex 54 – Documentary evidence on compliance to Sanitation Code of the Philippines	Annex 54 – Documentary evidence on compliance to Sanitation Code of the Philippines	Annex 43: Documentary evidence on compliance to Sanitation Code of the Philippines	Proponent and contractor of the Project provide welfare facilities that complies with the Sanitation Code of the Philippines.	Annex 38: Sanitation Permits	Annex B - 1 a and b: Proponent and contractor of the project provide area (staff house, hygiene areas, office) for employees and complies with sanitation and	No establishment/ activity needing compliance to Sanitation Code of the Philippines, at time of reporting	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
								DOLE requirements				
1.b. Labor Code of the Philippines: Compliance with the Labor Code of the Philippines including occupational health and safety standards	Yes		Annex 55 – Work Permits	Annex 55 – Work Permits	Annex 44: Work Permits	In Place	Annex 39: Work Permits	Annex B - 1 a and b: Proponent and contractor of the project provide area (staff house, hygiene areas, office) for employees and complies with sanitation and DOLE requirements	Annex 30: Work Permits (DOLE)	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions
1.c. Building Structures, Drainage and Flood Control System, Reclamation practices in accordance with the Building Code of the Philippines occupational health and safety standards: Compliance with Building Code of the Philippines (LGU-CPDO). Implementation of Comprehensive Safety and Health Plan.	Yes		Annex 56 – Comprehensive Safety and Health Plan Annex 57 – DOLE OSHC	Annex 56 – Comprehensive Safety and Health Plan Annex 57 – DOLE OSHC	Annex 45: Comprehensive Safety and Health Plan Annex 89: DOLE OSHC Accreditation	Building code will be complied with once reclamation phase is completed. In Place	Annex 40: Comprehensive Safety and Health Plan	Annex B - 1 c - Building code will be complied with once reclamation phase is completed	Annex 7: COSH Training Certificates	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions
1.d Coastal/Marine community development program: Compliance with BFAR conditions or requirements	Yes		Annex 59 – Submission of Enhanced CSUP dated 10 October 2022 Annex 60 – BFAR Acknowledgement Letter dtd 19 December 2022	Annex 59 – Submission of Enhanced CSUP dated 10 October 2022 Annex 60 – BFAR Acknowledgement Letter dtd 19 December 2022	Annex 46: Ordinance Approving CSUP and received by BFAR on 06 January 2020 Annex 90: Submission of Enhanced CSUP dated to October 2022 Annex 79: BFAR acknowledged the enhanced CSUP dated 19 December 2022	Ordinance Approving CSUP and receiving copy from BFAR	Annex 44: Initial draft of Coastal/Marine Community Program under CSUP	Annex B - 1 d - No coastal community identified in the project area; SDP caters PLAA members. The Comprehensive Sea Use Plan / Coastal Management Plan was submitted to BFAR on 12 Oct. 2022.	Submitted to EMB, updated and submitted to BFAR Annex 41: BFAR Acknowledgement Letter to Submission of CSUP	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions	On-going implementation as indicated in the ECC conditions
2. Solid Waste Management System need to be in placed in coordination with LGU. / Compliance with RA 9003 in coordination with LGU-CENRO	Yes		a. Annex 61 - Disposal Agreement between RMS and Metro Clark Waste Management Corporation b. Annex 50 - Provision of Material Recovery Facility onsite c. Annex 62 - RMS Accreditation d. Annex 63 - Transport Management Plan & Route of Transport e. Annex 66 - Contract Agreement between CHEC & RMS on Solid Waste Disposal f. Annex 67 - Certificates of Final Disposal g. Annex 68 – Documentation of Latest Solid Waste Hauling	Adheres to the requirement with the following items: a. Annex 61 - Disposal Agreement between RMS and Metro Clark Waste Management Corporation b. Annex 50 - Provision of Material Recovery Facility onsite c. Annex 62 - RMS Accreditation d. Annex 63 - Transport Management Plan & Route of Transport e. Annex 66 - Contract Agreement between CHEC &RMS on Solid Waste Disposal f. Annex 67 - Certificates of Final Disposal g. Annex 68 – Documentation of Latest Solid Waste Hauling	Annex 6: SMR Annex 47: RMS Accreditation Annex 48: Transport Management Plan and Route of Transport Annex 49: Contract Agreement between CHEC and RMS on Hauling, Transport, Treatment and Disposal of Hazardous and Non-Hazardous Wastes Annex 50: Disposal Agreement between RMS and Metro Clark Waste Management Corporation Annex 93: Certificate of Waste Disposal	Disposal Agreement between Project waste Subcontractor (RMS) and Metro Clark Waste Management Corporation (Sanitary Landfill).	Annex 5: SMR Annex 42: RMS Accreditation Annex 43: Transport Management Plan and Route of Transport Annex 66: Contract Agreement between CHEC and RMS on Hauling, Transport, Treatment and Disposal of Hazardous and Non-Hazardous Wastes	Annex B - 2 - LGU Pasay implements Solid Waste Management Plan	Waste hauled by 3rd party accredited hauler; Annex 9: SMR, CMR	On-going implementation	On-going implementation	On-going implementation

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
					Annex 51: MRF Photo documentation		Annex 67: Disposal Agreement between RMS and Metro Clark Waste Management Corporation Annex 44: Picture of MRF					
3. The proponent shall coordinate prior to the initial stage of project implementation on the assessment of the presence of artifacts following the rules and protocols of the concerned agencies, i.e. National Museum Cultural Properties Division, National Historical Commission of the Philippines (NHCP) – Historic Preservation Division and Philippine Navy for artifacts and bombs. / Compliance with NHCP and National Museum requirements	Yes		All relevant documents are readily available: a. Annex 69 - NHCP letter to Pasay dated 20 February 2020 b. Annex 70 - Pasay LGU Letter to National Museum 27 April 2023 Annex 71 - NHCP Endorsement to NCCA	All relevant documents are readily available: a. Annex 69 - NHCP letter to Pasay dated 20 February 2020 b. Annex 70 - Pasay LGU Letter to National Museum 27 April 2023 c. Annex 71 – NHCP Endorsement to NCCA	Annex 52: NHCP letter to Pasay dated 20 February 2020 Annex 53: Pasay LGU Letter to National Museum Annex 54: NHCP Endorsement to NCCA	In Place	Annex 45: NHCP letter to Pasay dated 20 Feb 2020 Annex 46: Pasay LGU Letter to National Museum	Annex B - 3 - Proponent coordinated with and secured LONOs from NHCP, PN and National Museum	Annex 33: UXO Procedure Annex 38: Letter to National Museum	N/A	N/A	N/A
4. The Proponent shall secure approval of its project Oil Spill Contingency Plan (OSCP) from the Philippine Coast Guard (PCG) before project implementation and shall ensure that all vessels the project will use will secure government permits. / Compliance with PCG requirement on the approval of OSCP.	Yes		The Oil Spill Contingency Plan (OSCP) of the Contractor contains their Emergency Response Plan which is valid until 19 October 2026 Annex 72 - Approved OSCP (CHEC) valid until 19 October 2026 In addition, the Contractor has a 3rd party service provider that has an approved Oil Spill Contingency Plan. Annex 73 - RMS Oil Spill Contingency Plan valid until 04 October 2024	The Oil Spill Contingency Plan (OSCP) of the Contractor is included in its Environmental Emergency Response Plan and Emergency Response Plan. Annex 72 - Approved OSCP (CHEC) In addition, the Contractor has a 3rd party service provider that has an approved Oil Spill Contingency Plan. Annex 73 - RMS Oil Spill Contingency Plan	The Oil Spill Contingency Plan (OSCP) of the Contractor is included in its Environmental Emergency Response Plan and Emergency Response Plan. Annex 55: Approved OSCP (CHEC). In addition, the Contractor has a 3rd party service provider that has an approved Oil Spill Contingency Plan. Annex 56: Emergency Response Plan Annex 57: Environmental Emergency Response Plan Annex 58: RMS Oil Spill Contingency Plan	Approved OSCP secured on October 19, 2023.	The Oil Spill Contingency Plan (OSCP) of the Contractor is included in its Environmental Emergency Response Plan and Emergency Response Plan. The OSCP of the Contractor was sent to PCG as part of its requirements but is pending acknowledgement and approval. In addition, the Contractor has a 3rd party service provider that has an approved Oil Spill Contingency Plan. Annex 49: Emergency Response Plan Annex 56: Environmental Emergency Response Plan Annex 57: RMS Oil Spill Contingency Plan	Annex B - 4 - The JV partner is monitoring the project contractor's OSCP	For submission: OSCP by PCG Annex 13 Environmental Emergency Response Plan Annex 42: Oil Spill Contingency Plan (OSCP)	Implemented	Implemented	Implemented

ECC Conditions ECC-CO-1601-0003 (24 October 2017)	Compliance Based on CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)		SA1 2022 (January to June 2023)	SA2 2021 (July to December 2021)
Start of Project Implementation: 8 May 2021	Yes	No	SA1 2024 CMVR	SA1 2024 CMR	SA2 2023 CMVR	SA2 2023 CMR	SA1 2023 CMVR	SA1 2023 CMR	SA2 2022 CMVR	SA2 2022 CMR	SA1 2022 CMR	SA2 2021 CMR
							Proponent through Contractor to secure approval of Oil Spill Contingency Plan from PCG prior to the next compliance monitoring validation period					
5. Submission of Engineering Geological and Geohazard Assessment Report: Submission of EGGAR to DENR EMB CO as part of EIS.	Yes		Submitted EGGAR as part of the EIS on 30 October 2017. EGGAR resubmitted on 24 May 2023 for the application of ECC Amendment which was also submitted to MGB. Annex 74 - EGGAR for Pasay 360	Submitted EGGAR as part of the EIS on 30 October 2017. EGGAR resubmitted on 24 May 2023 for the application of ECC Amendment which was also submitted to MGB. Annex 74 - EGGAR for Pasay 360	Annex 59: EGGAR for Pasay 360	In Place	Annex 47: Submitted EGGAR as part of the EIS	Annex B - 5 - The proponent submitted its EGGAR as part of the EIS	Submitted with EIS	Refer to proponent	Refer to proponent	Refer to proponent
6. Proponent needs to give priority employment to qualified residents of the affected communities. Adequate public information for jobs available to local residents in the affected areas need to be provided. / Adhere to the local employment requirement	Yes		Local employment data shows priority of employment to qualified residents of the affected communities. PLAA alternative livelihood also focuses on Pasay residents. Moreover, Locally Hired Cleaners of the Project Contractor were resident from Pasay. Annex 10 – Hiring of Cleaners of Contractor (January to March 2024) Annex 11 - Hiring of Cleaners of Contractor (April to May 2024) Annex 12 – Local Employment Data	Local employment data shows priority of employment to qualified residents of the affected communities. PLAA alternative livelihood also focuses on Pasay residents. Moreover, Locally Hired Cleaners of the Project Contractor were resident from Pasay.	Annex 60: Local employment (CHEC) PLAA alternative livelihood that focuses on Pasay residents.	In Place	Annex 48: Local employment	Annex B - 6 - The proponent/JV Partner through its contractor hired manpower from Pasay City locals	Actual number of hired qualified employees from Pasay/ local Annex 32: List of Hired Qualified Employees	TBD	TBD	TBD
7. Proponent needs to design and construct access roads and bridges of the project site with minimal land and ecological disturbance and with adequate drainage. Proponent needs to implement a Roadway Maintenance and Transport Management Plan which will include maintenance of public and private roads within the project site. / Adhere to the LGU-CPDO requirement on the TMP			To date, interconnectivity of the reclamation projects by concerned agencies together with the Reclamation Proponent are still being discussed and shall be implemented during horizontal development phase.	To date, interconnectivity of the reclamation projects by concerned agencies together with the Reclamation Proponent was discussed and shall be implemented during horizontal development phase.	Interconnectivity of the reclamation projects by concerned agencies together with the Reclamation Proponent are still being discussed.	To date, only the temporary access road from Diokno Blvd. owned by the Government is being utilized. Plans on the interconnectivity of the reclamation projects are still being discussed.	To date, only the temporary access road from Diokno Blvd, owned by the Government is being utilized. Plans on the interconnectivity of the reclamation projects are still being discussed.	Annex B - 7 - On going updating of master plan.	Master Development Plan for update Annex 34: Access Roads in Master Development Plan	TBD	TBD	TBD
8. The Proponent needs to address environmental risks, and come up with contingency measures in case of accidents, equipment malfunctions, machine failures, oil spills, and other emergencies including security risks: / Adhere to conduct an environmental risk assessment to identify all project related risks and hazards in order to address them properly through provision of corrective actions and contingency measures	Yes		Emergency Preparedness and Response Plan is available, which includes the Oil Spill Contingency Plan within the reclamation area. Annex 85: Environmental Emergency Response Plan which includes the Oil Spill Contingency Plan within the reclamation area. Annex 86: Emergency Response Plan see 6.3.4. Onshore Emergency Scenario - Security Incident (p. 30)	Emergency Preparedness and Response Plan is available, which includes the Oil Spill Contingency Plan within the reclamation area.	Annex 57: Environmental Emergency Response Plan which includes the Oil Spill Contingency Plan within the reclamation area. Reclamation itself provides protection against storm surges Annex 61: Notice of Maintenance Works Annex 56: Emergency Response Plan See 6.3.4. On shore Emergency Scenario - Security Incident.	Emergency Preparedness and Response Plan implementation	Annex 49: Emergency Preparedness and Response Plan, which includes the Oil Spill Contingency Plan within the reclamation area. To be presented next CMVR.	Annex B - 8 - The proponent/JV Partner through its contractor established Emergency Preparedness and Response	Project follows Environmental Emergency Response Plan Annex 13: Environmental Emergency Response Plan	On-going implementation	On-going implementation	On-going implementation

Source/Reference: Compliance Monitoring Validation Report for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 CMVR, SA1 2023 CMVR, SA2 2023 and SA1 2024 CMVR) and Compliance Monitoring Report (SA2 2021, SA1 2022, SA2 2022, SA1 2023, SA2 2023 and SA1 2024)

Table 6.2: Compliance to EIS EMP Conditions (2022 to 2024)

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
I. Pre-Construction Phase - Not Relevant No Impacts during this Phase. No activities at reclamation site except survey works.																
II. Construction Phase																
Environmental Aspect # 1	A. The Land	Perception of Flooding on Shore as a result of reclamation	Reclamation itself provides protection against storm surges and thus against floods.	Not Applicable	Not Applicable	Not Applicable				To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To ensure the design of wave wall to mitigate impacts of storm surge		
			Flood water pathways in Pasay is **NOT** directed towards the project area. (Per the NOAH Project)	Not Applicable	Not Applicable	Not Applicable								Project impact and the corresponding mitigating measure for clarification and revision, as necessary	Flood water pathways in Pasay is NOT directed towards the project area. (Per the NOAH Project)	No observed flooding in the area on monitoring period
		Ground shaking and liquefaction	Engineering intervention: structural and engineering designs to withstand earthquakes and liquefaction.	Engineering Consultants	Incl. in master plan cost	Not Applicable			The existing subsoil and fill material have been assessed for liquefaction potential through the EGGAR and DED. The existing subsoils are clay and not liquifiable. The reclamation fill is granular and is liquifiable if not improved. The construction specifications include compaction requirements to densify the fill and prevent liquefaction. Prefabricated Vertical Drain (PVD) and		The existing subsoil and fill material have been assessed for liquefaction potential through the EGGAR and DED. The existing subsoils are clay and not liquifiable. The reclamation fill is granular and is liquifiable if not improved. The construction specifications include compaction requirements to densify the fill and prevent liquefaction. Prefabricated Vertical Drain (PVD) and		installation of Prefabricated Vertical Drains (PVDs) for soil improvement	Project impact and the corresponding mitigating measure for clarification and Revision/updating, as necessary	Ongoing Reclamation stage	

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
									Surcharging are methods part of the Soft Soil and ground improvements. These are part of the works required to accelerate consolidation, reduce residual settlement, improve geotechnical stability and reduce susceptibility for liquefaction. PVD is installed for the acceleration of the design settlements and enhance the strength of the soil by assisting in the drainage of water which allows the soil to consolidate faster. Temporary surcharge will be then placed in combination with PVD to meet the residual settlement requirement. The temporary surcharge load will further accelerate the consolidation process. Annex 62: Detailed Engineering Design Report		Surcharging are methods part of the Soft Soil and ground improvements. These are part of the works required to accelerate consolidation, reduce residual settlement, improve geotechnical stability and reduce susceptibility for liquefaction. PVD is installed for the acceleration of the design settlements and enhance the strength of the soil by assisting in the drainage of water which allows the soil to consolidate faster. Temporary surcharge will be then placed in combination with PVD to meet the residual settlement requirement. The temporary surcharge load will further accelerate the consolidation process. Annex 62: Detailed Engineering Design Report					
			Phil. standards	Engineering Consultants	Incl. in master plan cost	Not Applicable										

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
		Disturbance of flora and fauna	Avoidance of disturbance of habitat and bird food	Reclamation Contractor	Part of project cost	Not Applicable				To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Proponent to conduct Biodiversity Assessment and Monitoring System in accordance with the BMB Guidelines	Project area far from protected area Annex 2: EIS Coordinates Annex 35: Summary of Compatibility with Protected Area; No observable impacts within monitoring period	No observable impacts within monitoring period
		Mangroves absent at the project site	Master plan will consider feasibility of enhancement of habitats, including growing of mangroves near site	Reclamation Contractor	Part of project cost	Not Applicable				To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Proponent to conduct study as planned	Annex 35: Summary of Compatibility with Protected Area;	
		Exotic and rare bird species sighted hovering over the site and immediate vicinity.		Reclamation Contractor	Part of project cost	Not Applicable								Proponent to conduct study as planned	No observable impacts within monitoring period	
		Damage to roads	Avoidance/Location of access roadways	Reclamation Contractor	Part of project cost	Not Applicable			No major roads or ancillary roads used as of date. Only temporary access road from Diokno Blvd. owned by the Government is being utilized.		No major roads or ancillary roads used as of date. Only temporary access road from Diokno Blvd. owned by the Government is being utilized.		Reclamation phase: Fill materials delivered through barges and TSHDs		Offshore Operation	
		Incl. Diversions of access points		Reclamation Contractor	Part of project cost	Not Applicable										

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
Environmental Aspect # 2	B. The Water Manila Bay No rivers, creeks, lakes at site	Permanent loss of Manila Bay water equivalent to 360 has.	Irreversible. Comply with PRA Notice to Proceed. Creation of equivalent water volume at the San Nicholas Shoal	Proponent/ Contractor	Part of project cost	Contract with PRA				To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Project Impact and the corresponding mitigating measure for clarification and revision/updating, as necessary	Complying with PRA Notice to Proceed Annex 26: Notice to Proceed from PRA	
		Silt dispersal to Bay due to dredging/filling operations	Silt curtains/containment at perimeters	Proponent/ Contractor	Part of contract	EIA Commitment	YES		As explained by Contractor, the silt curtains may not be appropriate at present due to navigation safety, and other concerns. Furthermore, the Contractor also uses its Turbidity Management Plan, Spray Pontoons, and Green Valve Technology. Enhanced mitigating measure through improved reclamation methodology is put in place and has been proven effective as	To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024	As explained by Contractor, the silt curtains may not be appropriate at present due to navigation safety, and other concerns. Furthermore, the Contractor also uses its Turbidity Management Plan, Spray Pontoons, and Green Valve Technology. Enhanced mitigating measure through improved reclamation methodology is put in place and has been proven effective as	- To update the EMP to reflect the actual mitigating measures for Turbidity which has proven effective as reflected in the water quality monitoring results.	Turbidity Management Plan is being implemented	Mitigating measure for updating Annex 50 Turbidity Management Plan	Silt curtains will be deployed as needed. Storage and maintenance ongoing.	

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
		Turbidity Increase	Dredging/filling methodology; Stockpiling of earth fill shall be placed away from water bodies and covered with suitable material during rainy season	Proponent/ Contractor	Filling materials sourcing not in scope of EIA	ECC or applicable regulations MMT			shown in the monitoring results. Annex 3: Water Quality Monitoring 1st Quarter Annex 4: Water Quality Monitoring 2nd Quarter 2024 Annex 52 – Turbidity Management Plan (TMP) Annex 51 – Silt Curtains Storage		shown in the monitoring results. See Annex t 9: Q3& Q42023 Water Quality ROLA Annex 64: Turbidity Management Plan (other alternative mitigating measures and silt curtains is absolutely not viable)		Stockpiling on the reclaimed land Annex 15: Environmental Monitoring Activities and Photo Documentation	Contractor should ensure that increase in turbidity is always mitigated	Water Quality Monitoring done Quarterly: 3rd Qtr 2022: August 17, 2022 4th Qtr 2022: December 14, 2022 Annex 14: Water Quality Monitoring Results Annex 14.1: Environmental Monitoring Activities Photo Documentation	
		Potential contamination with substances in filling materials	Pre-screening of filling materials; possible sourcing from Manila Bay	Proponent/ Contractor	Part of contract	ECC commitment MMT	Yes		Pre-screening of filling materials conducted through Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification for SNS and Zambales sources. Annex 14 - TCLP Results for Bucao, Maloma and PRA 2000 Annex 15 - Chain of Custody of TCLP Analysis for Amnay		Pre-screening of filling materials conducted through Toxicity Characteristic Leaching Procedure TCLP) analysis and technical sand specification for SNS and Zambales sources. Annex 65: Reclamation Sand Specification Annex 28: TCLP		Sand Sources have the necessary permits for seabed extraction Annex 3d : GSQP PRA SNS Annex 32: ECC PRASNS	To clarify with EMB if toxicity characteristic leaching procedure (TCLP) analysis is needed	Sand Sources have the necessary permits for sea bed extraction Annexes: Annex 22: Government Seabed Quarry Permit of PRA Annex 23: Environmental Compliance Certificate PRA Annex 24: Dredging Operations Permit, Environmental Compliance Certificate Magnacorp Annex 25: Dredging Operations Permit, Environmental Compliance Certificate Seawest	

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
			Observe project boundaries	Proponent/ Contractor	Part of contract	ECC commitment MMT							MMT observed that activities are being undertaken beyond the ECC Boundaries MMT Report submitted to EMB CO 11 July 2023 together with the position paper prepared by the proponent	To strictly confine all activities within the limits of the existing/valid ECC while awaiting issuance of amendment Annex 51: MMT Report dated 10 Jul 2023	Annex 2: EIS coordinates	
	Libertad Drainage Channel	Domestic wastes from construction crew and possible hazardous waste material accidental spillage	Appropriate toilet facilities	Proponent/ Contractor	Part of contract	ECC commitment MMT	Yes		Portalets are installed in project area; Each vessel has toilet facilities Annex 87: Portable Toilet Cleaning and Treatment Process Flow		Portalets are installed in project area; Each vessel has toilet facilities Annex 66: Portable Toilet Cleaning and Treatment Process Flow		Portalets are installed in project area; Each vessel has toilet facilities		Each vessel has toilet facilities; Ongoing reclamation stage	
			Oil and lubricants (used or spent) should be collected and treated by TSD facility	Proponent/ Contractor	Part of contract	ECC commitment MMT	Yes		Hauling of wastes by 3rd party accredited hauler by DENR Annex 62: RMS Certifications		Hauling of wastes by 3rd party accredited hauler by DENR Annex 47: RMS Certifications		Hauling of wastes by 3rd party accredited hauler Annex a SMR Annex 6: CMR Annex 52: Permit to Transport Annex 53: Manifest	To strictly comply with the EMB requirements on storage, collection and treatment of Hazardous Wastes	Monthly Hauling of wastes by 3rd party accredited hauler Annex 9: SMR, CMR 9.1: Proof of submission	
	Manila Bay	Not disturbed by the Project	Insignificant ecologically important marine life	Proponent/ Contractor	Part of contract	ECC commitment MMT				To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Reclamation activity should align with the CLUP, CSUP	Minimal disturbance by the Project	
		Potential damage to marine life		Proponent/ Contractor	Part of contract	ECC commitment MMT									No observable impacts within monitoring period	

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
			Containment wall	Proponent/ Contractor	Part of contract	ECC commitment MMT				Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Mitigating measure may not be appropriate Clarification is required	Air and Noise monitoring weekly Annex 14.2air And Noise Quality Monitoring Results (2nd Sem 2022)	
Environmental Aspect # 3	C. The Air	Noise	Temporary-construction short time only	Contractor	Part of contract	MMT	Yes		The Air Quality and Noise Level Monitoring results are within the DENR standards (see table "1st Sem 2024 Total Suspended Particulate (TSP) Results")	To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable. Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360 dated 07 March 2024		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Provide sprinkling trucks.	Air and Noise monitoring weekly Annex 14.2air And Noise Quality Monitoring Results (2nd Sem 2022)	
		Emissions if power generating sets used and fossil fuel using equipment	Use of quality fuel	Contractor	Part of contract	MMT	Yes		Diesel fuel used in all gen sets (LSF) Results of Ambient Air Monitoring are within the DENR standards. Annex 2: 1st Sem AQM Results	Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360	Diesel fuel used in all gen sets (LSF) Results of ambient Air Monitoring are within the DENR standards.	For revision in the EMP		Fill materials are properly covered particularly near Seascape area. To present kind of fuel use	N/A	

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
			Proper maintenance of gensets	Contractor	Part of contract	MMT	Yes		Regular inspection and maintenance of gen sets as per PM schedule Annex 88 - Generator Maintenance Report		Regular inspection and maintenance of gen sets as per PM schedule Annex 67 - Generator Maintenance Report		Generator set have a valid Permit to Operate Annex 54: Permit to Operate		N/A	
Environmental Aspect #4	D. The People	Essentially none-no settlers to be displaced because the area is uninhabited	Enhancement	Proponent	Not Applicable	MMT				To update the EMP to reflect the actual mitigating measures Updated EMP with incorporated MMT recommendations was submitted to DENR EMB CO on 07 May 2024 and awaiting EMB CO's response. Annex 1: [DENR EMB Received] Pasay letter to DENR EMB re EMP for 360		To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.				Ongoing Reclamation
		Livelihood and employment opportunity	Enhancement	Proponent	Not Applicable	MMT	Yes		Contractor of the project employs local residents for the project operation. Annex 12 – Local Employment Data See discussion on Local Employment in A.1B Compliance to Annex B		Contractor of the project employs local residents for the project operation. Annex 60: Local Employment (CHEC) Annex: Alternative Livelihood program for PLAA See discussion on Local Employment in A.1B Compliance to Annex B	To update the EMP to ensure that project impacts are measurable and mitigating measures are attainable.		Proposed Mitigating Measure needs to be clarified		
OPERATIONS PHASE **THIS PHASE IS OUTSIDE THE COVERAGE OF THE RECLAMATION WORKS-For Reference Purpose Only**																
Environmental Aspect # 1	I. The Land ("Land" refers to the original on shore land not to the reclaimed land")	Traffic density increased	Traffic Management	In coordination with MMDA and LGU	To be included in operating cost	Not Applicable			NA							
			Internal circulation within the reclaimed land	In coordination with MMDA and LGU	To be included in operating cost	Not Applicable										
Environmental Aspect # 2	II. The Water	Generation of domestic wastes	Individual and centralized treating system(s)	Proponent	Part of project cost	EIA Commitments										
		Damage to Marine Water and Species		Proponent	Part of project cost	EIA Commitments										

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee / Financial Arrangements	Compliance Based on SA1 2024 CMVR		SA1 2024 (January to June 2024)		SA2 2023 (July to December 2023)		SA1 2023 (January to June 2023)		SA2 2022 (July to December 2022)	
							Y	N	SA1 2024 CMVR	Recommendations	SA2 2023 CMVR	Recommendations	SA1 2023 CMVR	Recommendations	SA2 2022 CMVR	Recommendations
Environmental Aspect # 3	III. The Air	Air pollution from vehicles	Traffic Management Quality motor fuels	Proponent	Not applicable	RA 8749										
Environmental Aspect # 4	IV. The People	Enhancement	SDP / IEC	Proponent	Part of Project Cost	ECC Conditions and commitments in the EIS										
	Migration/In migration		Preferential hiring of qualified residents	Proponent	Per agreement with affected sectors	Separate agreements reached										
	Livelihood and Employment			Proponent	Not applicable	Agreement w affected sectors										
	Health		Same as in air module			SDP										
IV. Abandonment Phase - The plans for rehabilitation, abandonment and decommissioning will necessarily be communicated with the DENR/EMB for the latter's requirements and approval																
Environmental Aspect # 3	A. The Air	Not Relevant	Not Relevant	N/A	N/A	N/A			NA							
Environmental Aspect # 4	B. The People	Loss of employment	Payment of Social benefits			DOLE Rules on Labor Standards										

Source/Reference: Compliance Monitoring Validation Report for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 CMVR, SA1 2023 CMVR, SA2 2023 and SA1 2024 CMVR)

6.1.3. COMPLIANCE TO EMOP CONDITIONS

The EIS 2017 Environmental Monitoring Plan (EMoP) is presented in Table 6.4. This table included a remarks column for its historical compliance. The sampling parameters, frequency and location of the monitoring stations as indicated in the EIS 2017 were updated based on the project reconfiguration and existing condition of the project site. The updated EMoP is presented in Section 6.2.

Based on the MMT CMVR report for SA1 2024, there were several EMP conditions that are recommended to be updated to ensure that project impacts are measurable and mitigating measures are attainable. A revised EMP including a revised EMoP was again submitted by Pasay City LGU and received by EMB on 7 May 2024. In its letter-response dated 21 June 2024, EMB CO required Pasay City to first submit an updated EPRMP based on an updated EMP prior to conduct of a meeting. On 05 July 2024, Pasay City informed EMB CO that the EPRMP is now in the process of being updated including the EMoP for which it will be based on or as required by EMB CO in its 21 June 2024 letter. The revised and updated EMoP can be found in Section 6.2 of this EPRMP.

6.1.3.1. COMPLIANCE TO AMBIENT AIR AND NOISE MONITORING

Ambient Air Monitoring

The Ambient Air Environmental Monitoring Plan (EMoP) indicated in the EIS 2017 is presented in Table 6.3 while the baseline data for ambient air which was conducted in 2013 and 2014 is shown in Table 6.5. The ambient air sampling stations for the Compliance Monitoring Report (CMR) of the project is shown in Table 6.6 while the results are presented in Table 6.7. The ambient air sampling locations of the baseline data in 2013 and 2014 (Table 6.5) and the CMR stations (Table 6.6) were based on the original configuration of Pasay 360. These data are presented to show the historical performance of the Project. These monitoring stations have been updated in this EPRMP (See Figure 6.2) to consider the existing environment and Project reconfiguration.

Based on the historical data for TSP, all sampling stations did not exceed the DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes from 2023 to 2024. The EIS Ambient Air EMoP 2017 has been updated in the EMoP section of this EPRMP (See Section 6.2) in order to consider the modifications that has been made for this project and the current environmental conditions.

Table 6.3: EIS Environmental Monitoring Plan for Ambient Air

Parameter to be Monitored	Sampling & Measurement Plan			EQPL MANAGEMENT SCHEME					
	Method	Frequency	Location	EQPL RANGE			MANAGEMENT MEASURE		
				ALERT	ACTION	LIMIT	ALERT	ACTION	LIMITT
TSP	1 – Hour Gas Bubbler GriessSultzman High Volume Sampler / Gravimertic (USEPA method5)	Semi Annually	Downwind at nearest existing establishments or buildings	Of minor significance because of absence of air pollution generators and because construction activities will be undertaken at sea and not at land.					

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.4: EIS Environmental Monitoring Plan (2017)

Key Environmental Aspects per Project Phase	Potential Impacts Per Envit'l Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL MANAGEMENT SCHEME						Remarks (2024)
								EQPL RANGE			MANAGEMENT MEASURE			
			Method	Frequency	Location			ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT	
I. Pre-Construction Phase - Not Applicable														
II. Construction Phase														
Environmental Aspect #1 Air	Ambient Air Quality	TSP	1 – Hour Gas Bubbler GriessSultzman High Volume Sampler / Gravimertic (USEPA method5)	Semi Annually	Downwind at nearest existing establishments or buildings	Project Manager	Php 100,000	Of minor significance because of absence of air pollution generators and because construction activities will be undertaken at sea and not at land.						TSP is being monitored semi-annually from SA1 2023 to the present. (See Section 6.1.3.1)
Environmental Aspect #1 Air	Ambient Air Quality	Noise	Meter	Daily	Same as above	Project Manager	Nil	Of minor significance because of absence of air pollution generators and because construction activities will be undertaken at sea and not at land.						Noise was monitored monthly in 2022, annually in 2023, and once in 2024 (See Section 6.1.3.1)
Environmental Aspect #2 Land	Terrestrial	Considered as Nil or not significant. There are no Terrestrial (Floral) resources.												-
	Solid Wastes	Not relevant. Activities will be on sea. Solid wastes during construction or dredging will consist of unwanted seabed materials which will be disposed at an area within the Manila Bay or on shore. Activities on land will be during the stabilization of the reclaimed land and will not involve major work except settling and compaction of the reclaimed land.												Solid waste values are being reported quarterly in the SMR by CHEC
Environmental Aspect #3 Water	Water Quality Bay Pollution	BOD_5	Azide Modification Dilution Technique (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Project Manager	Php 7000	Not considered relevant because domestic wastes are from construction crews only who are based on barges or sea going vessels						All water quality parameters are being monitored quarterly from Q3 2022 to Q4 2023 / up to the present (See Section 6.1.3.2)
	Water Quality Bay Pollution	Total Suspended Solids (TSS)	Gravimetric (Dried at 103-105o C) (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Project Manager	Php 2000	90 % of the prescribed limit	95 % of the prescribed limit	At least 100 % prescribed limit	Inspection of activities	Corrective Actions, e.g. silt traps	Temporary stoppage until corrections made	
	Water Quality Bay Pollution	Color	(USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Project Manager	Php 1000	Not considered significant, no color modifying substances to be discharged						
	Water Quality Bay Pollution	Temperature	Thermometer(USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Project Manager	Nil	Not considered significant, no thermal effects						

Key Environmental Aspects per Project Phase	Potential Impacts Per Envit'l Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL MANAGEMENT SCHEME						Remarks (2024)
								EQPL RANGE			MANAGEMENT MEASURE			
			Method	Frequency	Location			ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT	
	Water Quality Bay Pollution	pH	pH probe (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Project Manager	Nil	Not considered significant, no acid or bases in effluents						
	Water Quality Bay Pollution	O & G	Std Method	During reclamation works	At strategic points	Project Manager		90 % of prescribed limit	95 % of prescribed limit	At least 100 % of prescribed limit	Inspection of activities for corrective actions	Corrective Actions	Temporary Stoppage	
	Water Quality Bay Pollution	Arsenic	SDDC, Spectrophotometric	During reclamation works	At strategic points	Project Manager	Included in the Php 50.000 estimated annual budget for heavy metals parameters	90 % of prescribed limit	95 % of prescribed limit	At least 100 % of prescribed limit	Same as above	Same as above	Same as above	
	Water Quality Bay Pollution	Chromium	Flame AAS	During reclamation works	At strategic points	Project Manager	Included in the Php 50.000 estimated annual budget for heavy metals parameters	90 % of prescribed limit	95 % of prescribed limit	At least 100 % of prescribed limit	Inspection of activities for corrective actions	Corrective Actions	Temporary Stoppage	
	Water Quality Bay Pollution	Lead	Flame AAS	During reclamation works	At strategic points	Project Manager	Included in the Php 50.000 estimated annual budget for heavy metals parameters	90 % of prescribed limit	95 % of prescribed limit	At least 100 % of prescribed limit	Inspection of activities for corrective actions	Corrective Actions	Temporary Stoppage	
	Water Quality Bay Pollution	Mercury	Manual Cold Vapor AAS	During reclamation works	At strategic points	Project Manager	Included in the Php 50.000 estimated annual budget for heavy metals parameters	90 % of prescribed limit	95 % of prescribed limit	At least 100 % of prescribed limit	Inspection of activities for corrective actions Corrective Actions		Temporary Stoppage	
	Water Quality Bay Pollution	Marine species	Underwater survey	During reclamation works	Near the site where construction activities, e.g. dredging or filling are conducted	Project Manager	Php 200,000	10 % decrease from the baseline	20 % decrease from the baseline	50 % decrease from the baseline	Inspection of activities Check and monitor the performance of dredging works	Corrective Actions Increase frequency of inspection and	Temporary Stoppage until corrective measures in place	The results of underwater surveys for marine species were embedded in study

Key Environmental Aspects per Project Phase	Potential Impacts Per Envit'l Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL MANAGEMENT SCHEME						Remarks (2024)
								EQPL RANGE			MANAGEMENT MEASURE			
			Method	Frequency	Location			ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT	
												monitoring		reports such as Coastal and Sea Use Plan (CSUP) and Pasay City Sustainable Ecosystem Management Plan (SCEMP). These study reports were included in the annexes of the CMR & CMVR submitted to EMB CO.
Environmental Aspect # 4 People	Jobs	Employment of local qualified residents	Record of contractors	Entire reclamation period	N.A.	Project Manager	Part of the operation cost	Negative feedback to the Proponent	Formal complaint by the hired workers		Proponent to investigate	Bring Notice of DOLE	Review the operation protocol and reconsider the complain if applicable	There are local hires
	Jobs	Payment of compensation workers	Payment records	Same	N.A.	Proponent	Part of the operation cost	Negative feedback to the Proponent	Formal complaint by the hired workers		Payment of Salaries within the month	Review the operation protocol and reconsider the complain if applicable	Bring Notice of DOLE	Workers are paid on time
The operation phase is not applicable because the project only involves horizontal development and that is the Reclamation Project.														-
The operations phase will be subject to separate and relevant laws governing the PEISS.														-

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.5: EIS Ambient Air Baseline Data (2013)

Station	Location	Date	PM_{10} (µg/Ncm)	SO_2 (µg/Ncm)	NO_2 (µg/Ncm)	CO (mg/Ncm)
1	Near Yacht Club	January 28-29, 2013	68	3.4	3.4	0.1
2	Near PICC Area		42	2.4	4.8	0.1
3	Near Sofitel Basketball Court		28	9.9	7.2	0.7
4	Near Coastal Mall Area		52	10.0	36.6	0.3
5	Near D. Macapagal Road		44	10.2	47.3	0.2
DENR National Ambient Air Quality Standards (NAAQS) for Source Specific Air Pollutants based on 60 minutes averaging time			**200**	**340**	**260**	**-**
DENR National Ambient Air Quality Guideline Values (NAAQGV)			**-**	**-**	**-**	**35**

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)



EIS 2017 Ambient Air and Noise Monitoring Stations (2013)

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.6: CMR Ambient Air Monitoring Stations

Station	Location	Latitude	Longitude
1	Coconut Palace Area	N 14° 55' 29"	E 120° 9' 50"
3	West side of Lime Hotel	N 14° 54' 81"	E 120° 9' 80"
4	SM Esplanade	N 14° 54' 18"	E 120° 9' 80"
5	Teppanyaki Area	N 14° 53' 13"	E 120° 97' 96"
6	SM Moa Eye Area	N 14° 53' 31"	E 120° 9' 79"



CMR Ambient Air Monitoring Stations (2021 to 2024)

Source/Reference: CMR and CMVR (2021 to 2024)

Table 6.7: CMR Results of Ambient Air Monitoring

Station	Semi-Annual	Year	1-hr TSP µg/Ncm	Remarks
Station 1 Coconut Palace Area	SA1	2023	13.7	Passed
	SA2	2023	13.7	Passed
	SA1	2024	36.0	Passed
Station 3 West side of Lime Hotel	SA1	2023	3.4	Passed
	SA2	2023	3.4	Passed
	SA1	2024	37.7	Passed
Station 4 SM Esplanade	SA1	2023	2.5	Passed
	SA2	2023	2.5	Passed
	SA1	2024	43.7	Passed
Station 5 Teppanyaki Area	SA1	2023	5	Passed
	SA2	2023	5.0	Passed
	SA1	2024	23.7	Passed
Station 6 SM Moa Eye Area	SA1	2023	1.2	Passed
	SA2	2023	1.2	Passed
	SA1	2024	11.2	Passed
DENR National Ambient Air Quality Guideline Values (NAAQGV) for 60 minutes			**300**	

Source/Reference: CMR and CMVR (2023 to 2024), & Delchem Environmental Services (DES01242024-1)

Ambient Noise Monitoring

The Noise Level Environmental Monitoring Plan (EMoP) indicated in the EIS 2017 is presented in Table 6.8 while the baseline data for noise which was conducted in 2013 and 2014 is shown in Table 6.9.

The noise sampling stations for the Compliance Monitoring Report (CMR) of the project is shown in Table 6.10 while the results are presented in Table 6.11. The noise sampling locations of the baseline data in 2013 and 2014 (Table 6.9) and the CMR stations (Table 6.11) were based on the original configuration of Pasay 360. These data are presented to show the historical performance of the Project. These monitoring stations have been updated in this EPRMP (See Figure 6.2) to consider the existing environment and Project reconfiguration.

It has to be noted that weekly internal noise monitoring is being conducted internally and this is being reported on the contractor's internal monitoring report. Based on onsite observations, noise sources are not attributed to the Project reclamation activities thats why the frequency of noise monitoring was conducted weekly instead of daily. In addition, the proximity of activities has sufficient distance and that the monitoring frequency will be adjusted depending on the proximity to nearby receptors. Major sources of noise came from commercial establishment. The frequency of noise monitoring has been updated in the EPRMP. Based on the quarterly environmental report of CHEC, the noise monitoring was also continuously conducted and reported quarterly on a weekly basis at the five (5) established locations of the Project. Additional daily Noise Quality Monitoring was conducted to monitor dredging activity in the first quarter of this year. Average noise levels are all in compliant with the OSH standards of 85dBA and DOLE standards of 90dBA.

Based on the historical data for Noise, all sampling stations in different monitoring periods have shown exceedances with the National Pollution Control Commission (NPCC) noise standard during nighttime and evening monitoring. Notable source of noise indicated in the CMRs are the noise coming from the people passing by and the waves came from the sea. The EIS Noise EMoP 2017 has been updated in the EMoP section of this EPRMP (See Section 6.2) in order to consider the modifications that has been made for this project and the current environmental conditions.

Table 6.8: EIS Environmental Monitoring Plan for Noise

Parameter to be Monitored	Sampling & Measurement Plan			EQPL MANAGEMENT SCHEME					
				EQPL RANGE			MANAGEMENT MEASURE		
	Method	Frequency	Location	ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
Noise	Meter	Daily	Downwind at nearest existing establishments or buildings	Of minor significance because of absence of noise generators and because construction activities will be undertaken at sea and not at land.					

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.9: EIS Noise Baseline Data (2013 and 2014)

Station	Location	Date/Time of Sampling	MIN (dBA)	MAX (dBA)	MEAN (dBA)	MEDIAN (dBA)	NPCC standard for Class B
1	NE part of the proposed Pasay Reclamation and Extension Project, in front of Coconut Palace	January 28-29, 2013 (Daytime)	63.8	76.7	69.1	69.0	**65**
2	In front of SM – Mall of Asia (MOA), Pasay City		53.1	66.7	57.0	56.4	**65**
3	Near the mouth of Parañaque River, Parañaque City		51.6	60.8	54.5	54.2	**65**
1	NE part of the proposed Pasay Reclamation and Extension Project, in front of Coconut Palace		58.4	68.7	64.1	64.2	**65**
2	In front of SM – Mall of Asia (MOA), Pasay City		60.3	80.5	70.1	70.2	**65**
1	NE part of the proposed Pasay Reclamation and Extension Project, in front of Coconut Palace	August 2014 (Daytime)	53.3	80.9	69.9	69.8	**65**
2	In front of SM – Mall of Asia (MOA), Pasay City		67.0	81.5	75.3	75.6	**65**
3	Near the mouth of Parañaque River, Parañaque City		69.1	83.7	74.5	74.3	**65**



EIS 2017 Noise Monitoring Stations (2013 and 2014)

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.10: CMR Noise Monitoring Stations

Station	Location	Latitude	Longitude
1	Coconut Palace Area	N 14° 55' 29"	E 120° 9' 50"
3	West side of Lime Hotel	N 14° 54' 81"	E 120° 9' 80"
4	SM Esplanade	N 14° 54' 18"	E 120° 9' 80"
5	Teppanyaki Area	N 14° 53' 13"	E 120° 97' 96"
6	SM Moa Eye Area	N 14° 53' 31"	E 120° 9' 79"



CMR Noise Monitoring Stations (2021 to 2024)

Source/Reference: CMR and CMVR (2021 to 2024)

Table 6.11: CMR Results of Noise Level Monitoring (2021 to 2024)

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
CMR Station 1 Coconut Palace Area						
Q2	2021	17 to 21 July	60.0	62.0	58.0	This is the baseline average data of Noise Quality conducted in 5 consecutive days from July 17 to 21 2021
Q3	2021	3 to 7 September 2021	55.0	56.0	46.0	This is the 2nd baseline average data of Noise Quality conducted in 5 consecutive days from Sept3 to 7 2021
Q3	2023	24-Aug-23	-	-	56.7	Minimal noise came from the generator. No reclamation activities during the monitoring period due to suspension order.
Q1	2024	24-Jan-24	48.7	-	-	-
CMR Station 2						
Q2	2021	17 – 21 July 2021	54.0	59.0	55.0	This is the baseline average data of Noise Quality conducted in 5 consecutive days from July 17 to 21 2021; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2021	3 – 7 September 2021	52.0	56.0	46.0	This is the 2nd baseline average data of Noise Quality conducted in 5 consecutive days from Sept 3 to 7 2021; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
CMR Station 3 West side of Lime Hotel						
Q3	2021	3 to 7 September 2021	57.0	62.0	53.0	This is the 1st baseline average data of Noise Quality conducted in 10 consecutive

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
						days from Sept3 to 12 2021
Q2	2022	April	52.0	60.0	49.0	For April; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	May	54.0	57.0	54.0	For May; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	June	56.0	62.0	54.0	For June; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	July	58.5	59.6	58.0	For July; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	August	58.4	60.2	59.7	For August; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	September	59.6	67.7	61.8	For September; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	October	60.6	61.4	53.3	For Oct; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	November	59.8	58.0	58.2	For Nov; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	December	53.2	55.0	55.5	For Dec; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
Q3	2023	24-Aug-23	-	-	52.9	Minimal noise came from the soft whistle of the wind. No reclamation activities during the monitoring period due to suspension order.
Q1	2024	24-Jan-24	54.7	-	-	-
CMR Station 4 SM Esplanade						
Q3	2021	3 to 12 Sept 2021	56.0	60.0	51.0	This is the 1st baseline average data of Noise Quality conducted in 10 consecutive days from Sept 3 to 122021;
Q2	2022	April	56.0	65.0	48.0	For April; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	May	48.0	54.0	53.0	For May; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	June	54.0	57.0	51.0	For June; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	July	55.4	56.8	56.7	For July; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	August	57.3	57.4	59.0	For August; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	September	59.2	63.3	62.2	For Sept; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	October	62.8	58.9	54.2	For Oct; we follow OSH Noise Standards of 80 dBA and DOLE

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
						Noise Standards of 90dBA
Q4	2022	November	56.7	56.5	56.6	For Nov; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	December	54.4	53.9	55.9	For Dec; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2023	24-Aug-23	-	-	51.1	Minimal noise aside from the soft whistle of wind. No reclamation activities during the monitoring period due to suspension order.
Q1	2024	24-Jan-24	64.5	-	-	
CMR Station 5 Teppanyaki Area						
Q4	2021	12 to 21 December	56.0	62.0	50.0	This is the baseline average data of Noise conducted in 10 consecutive days from Dec12 to 21, 2021
Q1	2022	March	53.0	59.0	49.0	For March; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	April	52.0	60.0	49.0	For April; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	May	53.0	62.0	49.0	For May; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	June	55.0	62.0	53.0	For June; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	July	53.3	61.4	53.7	For July; we follow OSH Noise

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
						Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	August	54.9	60.0	54.8	For August; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	September	55.4	60.4	53.6	For Sept; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	October	57.5	59.9	53.3	For Oct; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	November	55.7	58.4	52.1	For Nov; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	December	56.6	62.2	47.5	For Dec; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2023	23-Aug-23	-	-	56.9	Noise came from the Waves and Whistle of wind. No reclamation activities during the monitoring period due to suspension order.
Q1	2024	24-Jan-24	62.7	-	-	-
CMR Station 6 SM Moa Eye Area						
Q4	2021	12 to 21 December	60.0	65.0	52.0	This is the baseline average data of Noise conducted in 10 consecutive days from Dec 12 to 21, 2021
Q1	2022	March	58.0	64.0	49.0	For March; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
Q2	2022	April	56.0	65.0	48.0	For April; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	May	57.0	66.0	52.0	For May; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q2	2022	June	56.0	68.0	52.0	For June; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	July	57.6	65.1	54.1	For July; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	August	55.7	64.6	52.8	For August; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2022	September	56.4	65.6	56.7	For Sept; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	October	57.5	63.4	55.2	For Oct; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	November	56.4	63.6	57.7	For Nov; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q4	2022	December	55.5	63.7	51.7	For Dec; we follow OSH Noise Standards of 80 dBA and DOLE Noise Standards of 90dBA
Q3	2023	23-Aug-23	-	-	57.0	Noise came from the people passing by and

Quarter	Year	Date	Daytime	Evening	Nighttime	Remarks
						waves came from the sea. No reclamation activities during the monitoring period due to suspension order.
Q1	2024	24-Jan-24	61.9	-	-	-
Environmental Quality Standards for Noise in Class B - a section or contiguous area which zoned or used as a commercial. (Source: NPCC 1980)			**65**	**60**	**55**	

Source/Reference: CMR and CMVR (2021 to 2024) & Delchem Environmental Services (DES01242024-1)

6.1.3.2. COMPLIANCE TO WATER QUALITY MONITORING

The Water Quality Environmental Monitoring Plan (EMoP) indicated in the EIS 2017 is presented in Table 6.12 while the baseline data for the water quality which was conducted in 2012 and 2016 is shown in Table 6.13. The water quality sampling stations for the EIS Baseline and Compliance Monitoring Report (CMR) of the project is shown in Figure 6.1. The water quality monitoring (CMR) results is presented in Table 6.14 to Table 6.23. The water sampling locations of the baseline data in 2012 and 2016 and the CMR stations as shown in Figure 6.1 were based on the original configuration of Pasay 360. These data are presented to show the historical performance of the Project. These monitoring stations have been updated in this EPRMP (See Figure 6.2) to consider the existing environment and Project reconfiguration.

Based on the historical data, parameters such as Color, Chromium, Mercury, Oil and Grease, Lead and Arsenic have results that does not exceed the DAO 2016-08 Water Quality Guideline Values for Class SB marine waters. TSS in OF3 have only exceeded the TSS values once during Q2 of 2023 at 57 mg/L which is close to the guideline value of 50 mg/L while TSS in OF2 have only exceeded the TSS values only once during Q4 of 2022 at 106 mg/L. Both of these sampling stations are located the farthest from any Project activity. BOD have also exceeded once during the monitoring at OF1 on Q1 2023. Temperature values from 31 to 32 which exceeded the guideline value of 30 have been recorded only once in B1, B2, B3. M1, M2, M3 and OF1 while twice in C1, OF2 and OF3. pH values were also recorded at least once at C1, B3, M1, M3 and OF2; and twice at OF2, M2, B2 and B1. Overall, the CMR monitoring have complied to the monitoring conditions stated in the 2017 EMoP. The EIS EMoP has been updated in this EPRMP to consider the current existing condition of the project and its proposed modifications.

Table 6.12: EIS Environmental Monitoring Plan for Water Quality

Parameter to be Monitored	Sampling & Measurement Plan			EQPL MANAGEMENT SCHEME					
				EQPL RANGE			MANAGEMENT MEASURE		
	Method	Frequency	Location	ALERT	ACTION	LIMIT	ALERT	ACTION	LIMITT
BOD_5	Azide Modification Dilution Technique (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Not considered relevant because domestic wastes are from construction crews only who are based on barges or sea going vessels					
Total Suspended Solids (TSS)	Gravimetric (Dried at 103-105o C) (USEPA method 3010)	Quarterly		90 % of the prescribed limit	95 % of the prescribed limit	At least 100 % prescribed limit	Inspection of activities	Corrective Actions, e.g. silt traps	Temporary stoppage until corrections made
Color	(USEPA method 3010)	Quarterly		Not considered significant, no color modifying substances to be discharged					
Temperature	Thermometer (USEPA method 3010)	Quarterly		Not considered significant, no thermal effects					
pH	pH probe (USEPA method 3010)	Quarterly		Not considered significant, no acid or bases in effluents					
O & G	Std Method	During reclamation works	At strategic points	90 % of the prescribed limit	95 % of the prescribed limit	At least 100 % prescribed limit	Inspection of activities	Corrective Actions, e.g. silt traps	Temporary stoppage until corrections made
Arsenic	SDDC, Spectrophotometric								
Chromium	Flame AAS								
Lead	Flame AAS								
Mercury	Manual Cold Vapor AAS								

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)



Figure 6.1 Water Quality EIS and CMR Monitoring Stations
Source/Reference: EIS 2017 and CMR Monitoring Stations (2022 to 2024)

Table 6.13: EIS Water Quality Baseline Data (2012 and 2016)

Code	Sampling Date	pH	Color	TDS	Oil and Grease	Ammonia-N	Cyanide, Free	Nitrate, -N	Phosphate	Salinity as NaCl	Fecal Coliform	Arsenic	Chromium	Lead	Mercury	TSS	Total Coliform	BOD5	COD	Chloride	DO	Cadmium
	Units	-	PCU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100mL	mg/L	mg/L	mg/L	°C	mg/L	MPN/100mL	mg/L	mg/L	mg/L	mg/L	mg/L
1	11 Nov 2012	9.05	75	18,900	0.40	0.12	0.15	0.11	0.04	17,900	17	0	0	0	0	-	-	-	-	-	-	-
2	11 Nov 2012	8.9	25	21,000	0.41	0.05	0.15	0.09	0.04	19,600	4.0	0	0	0	0	-	-	-	-	-	-	-
3	11 Nov 2012	8.80	25	21,000	0.36	0.04	0.14	0.03	0.04	21,000	2.0	0	0	0	0	10	-	-	-	-	-	-
4	11 Nov 2012	8.16	25	19,500	0.42	2.7	0.13	0.17	0.28	17,000	170	0	0	0	0	12	-	-	-	-	-	-
5	11 Nov 2012	7.3	-	29,600	0.52	0.08	0.30	0	0.04	25,800	350	0	0	0	0	0	-	-	-	-	-	-
6	11 Nov 2012	9.6	-	-	0.9	-	-	0.08	0.02	-	<1.8	<0.01	<0.003	-	<0.0001	29	<1.8	8	797	10,000	9.5	<0.006
7	11 Nov 2012	7.94	-	28,600	0.54	3.4	0.24	0	0.23	26,600	14,000	0	0	0	0	-	-	-	-	-	-	-
8	11 Nov 2012	9.4	-	-	0.8	-	-	0.2	0.04	-	<1.8	<0.01	<0.003	-	<0.0001	27	<1.8	7	797	9,570	9.3	<0.006
9	11 Nov 2012	9.2	-	-	0.8	-	-	0.3	0.02	-	<1.8	<1.8	<0.003		<1.8	26	<1.8	7	998	9,970	9.7	<1.8
10	7 January 2016	-	-	-	-	-	-	-	-	-	28,000	-	<0.003	<0.05	-	-	160,000	33	-	-	-	-
11	7 January 2016	-	-	-	-	-	-	-	-	-	170	-	<0.003	<0.05	-	-	170	5	-	-	-	-
12	7 January 2016	-	-	-	-	-	-	-	-	-	<1.8	-	<0.003	<0.05	-	-	<1.8	16	-	-	-	-
13	7 January 2016	-	-	-	-	-	-	-	-	-	350	-	<0.003	<0.05	-	-	350	5	-	-	-	-
14	7 January 2016	-	-	-	-	-	-	-	-	-	240	-	<0.003	<0.05	-	-	240	5	-	-	-	-
DAO 2016-08 and DAO 2021-19[b] WQG Values, Class – SB		**7.0-8.5**	**-**	**-**	**2**	**0.06[b]**	**0.02**	**10**	**0.2[b]**	**-**	**100[b]**	**0.01**	**0.05**	**0.01**	**0.001**	**50**	**-**	**Not applicable**	**-**	**Not applicable**	**Min. 6**	**0.003**
DAO 2016-08 and DAO 2021-19[b] QG Values, Class – SC		**6.5-8.5**	**-**	**-**	**3**	**0.06[b]**	**0.1**	**10**	**0.2[b]**	**-**	**200[b]**	**0.02**	**0.05**	**0.05**	**0.002**	**80**	**-**	**Not applicable**	**-**	**Not applicable**	**Min 5**	**0.005**

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.14: CMR Water Quality Station – C1

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	1	10	<0.02	25	<0.0004	<1.0	<0.01	4	0.0014	8.1
Q4	2022	14-Dec	<1	<5	<0.02	29	<0.0004	<1.0	<0.01	7	<0.0007	9.0
Q1	2023	10-Mar	<1	<5	<0.02	28	<0.0004	<1.0	<0.01	4	<0.0007	7.8
Q2	2023	09-Jun	<1	<5	<0.01	31	<0.0004	<1.0	<0.0007	4	<0.01	8.5
Q3	2023	11-Aug	<1	5	<0.01	30	<0.0004	<1	<0.007	6	<0.01	8.5
Q4	2023	13-Oct	2	5	<0.01	30	<0.0004	<1	<0.007	4	<0.01	8.30
Q1	2024	12-Jan	<1	<5	<0.01	26	<0.0004	<1	<0.007	4	<0.01	8.20
Q2	2024	4-Apr	3	<5	<0.01	31	<0.0004	<1	<0.007	3	<0.01	8.4
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.15: CMR Water Quality Station – B1

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	9	5	<0.02	25	<0.0004	<1.0	<0.01	8	0.0010	8.2
Q4	2022	14-Dec	<1	5	<0.02	28	<0.0004	<1.0	<0.01	9	<0.0007	9.5
Q1	2023	10-Mar	2	5	<0.02	27	<0.0004	<1.0	<0.01	8	<0.0007	8
Q2	2023	09-Jun	3	<5	<0.01	32	<0.0004	<1.0	<0.0007	5	<0.01	8.7
Q3	2023	11-Aug	<1	10	<0.01	26	<0.0004	<1.0	<0.007	12	<0.01	8.1
Q4	2023	13-Oct	3	10	<0.010	31	<0.0004	<1.0	<0.007	6	<0.01	8.2
Q1	2024	12-Jan	<1	<5	<0.01	27	<0.0004	<1	<0.007	8	<0.01	8.0
Q2	2024	4-Apr	7	<5	<0.01	30	<0.0004	<1	<0.007	6	<0.01	8.0
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.16: CMR Water Quality Station – B2

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	3	10	<0.02	25	<0.0004	<1.0	<0.01	9	0.0011	8.4
Q4	2022	14-Dec	<1	5	<0.02	29	<0.0004	<1.0	<0.01	7	<0.0007	9.3
Q1	2023	10-Mar	1	<5	<0.02	27	<0.0004	<1.0	<0.01	3	<0.0007	7.9
Q2	2023	09-Jun	4	<5	<0.01	31	<0.0004	<1.0	<0.0007	8	<0.01	8.7
Q3	2023	11-Aug	<1	5	<0.01	30	<0.0004	<1.0	<0.007	4	<0.01	8.1
Q4	2023	13-Oct	3	5	<0.010	30	<0.0004	<1.0	<0.007	4	<0.01	8.4
Q1	2024	12-Jan	<1	<5	<0.01	26	<0.0004	<1	<0.007	6	<0.01	8.0
Q2	2024	4-Apr	3	<5	<0.01	30	<0.0004	<1	<0.007	14	<0.01	8.4
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.17: CMR Water Quality Station – B3

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	3	10	<0.02	25	<0.0004	<1.0	<0.01	9	0.0011	8.3
Q4	2022	14-Dec	<1	<5	<0.02	30	<0.0004	<1.0	<0.01	9	<0.0007	9.1
Q1	2023	10-Mar	<1	<5	<0.02	27	<0.0004	<1.0	<0.01	6	<0.0007	7.9
Q2	2023	09-Jun	<1	<5	<0.01	31	<0.0004	<1.0	<0.0007	10	<0.01	8.1
Q3	2023	11-Aug	1	10	<0.01	31	<0.0004	<1.0	<0.007	8	<0.01	8.2
Q4	2023	13-Oct	2	10	<0.010	31	<0.0004	<1.0	<0.007	4	<0.01	8.2
Q1	2024	12-Jan	<1	<5	<0.01	27	<0.0004	<1	<0.007	6	<0.01	8.2
Q2	2024	4-Apr	4	<5	<0.01	30	<0.0004	<1	<0.007	12	<0.01	8.2
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.18: CMR Water Quality Station – M1

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	2	10	<0.02	25	<0.0004	<1.0	<0.01	7	0.0099	8.3
Q4	2022	14-Dec	<1	<5	<0.02	28	<0.0004	<1.0	<0.01	10	<0.0007	7.8
Q1	2023	10-Mar	1	<5	<0.02	27	<0.0004	<1.0	<0.01	5	<0.0007	7.9
Q2	2023	09-Jun	3	<5	<0.01	31	<0.0004	<1.0	<0.0007	4	<0.01	8.9
Q3	2023	11-Aug	<1	10	<0.01	30	<0.0004	<1.0	<0.007	8	<0.01	8.1
Q4	2023	13-Oct	2	5	<0.010	32	<0.0004	<1.0	<0.007	5	<0.01	8.3
Q1	2024	12-Jan	<1	<5	<0.01	27	<0.0004	<1	<0.007	6	<0.01	8.2
Q2	2024	4-Apr	3	<5	<0.01	30	<0.0004	<1	<0.007	9	<0.01	8.2
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.19: CMR Water Quality Station – M2

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	3	10	<0.02	25	<0.0004	<1.0	<0.01	9	0.0008	8.4
Q4	2022	14-Dec	<1	<5	<0.02	29	<0.0004	<1.0	<0.01	8	<0.0007	9.1
Q1	2023	10-Mar	<1	<5	<0.02	27	<0.0004	<1.0	<0.01	7	<0.0007	7.8
Q2	2023	09-Jun	4	<5	<0.01	32	<0.0004	<1.0	<0.0007	7	<0.01	8.6
Q3	2023	11-Aug	<1	5	<0.01	30	<0.0004	<1.0	<0.007	7	<0.01	7.8
Q4	2023	13-Oct	2	5	<0.010	30	<0.0004	<1.0	<0.007	5	<0.01	8.3
Q1	2024	12-Jan	<1	<5	<0.01	27	<0.0004	<1	<0.007	5	<0.01	7.9
Q2	2024	4-Apr	<1	<5	<0.01	30	<0.0004	<1	<0.007	10	<0.01	8.2
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.20: CMR Water Quality Station – M3

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	2	10	<0.02	25	<0.0004	<1.0	<0.01	8	0.0012	8.3
Q4	2022	14-Dec	<1	<5	<0.02	29	<0.0004	<1.0	<0.01	8	<0.0007	9.1
Q1	2023	10-Mar	<1	<5	<0.02	27	<0.0004	<1.0	<0.01	3	<0.0007	7.8
Q2	2023	09-Jun	<1	<5	<0.01	31	<0.0004	<1.0	<0.007	6	<0.01	7.2
Q3	2023	11-Aug	1	5	<0.01	33	<0.0004	<1.0	<0.007	9	<0.01	8.0
Q4	2023	13-Oct	1	5	<0.010	31	<0.0004	<1.0	<0.007	5	<0.01	8.3
Q1	2024	12-Jan	<1	<5	<0.01	27	<0.0004	<1	<0.007	5	<0.01	8.1
Q2	2024	4-Apr	4	<5	<0.01	30	<0.0004	<1	<0.007	10	<0.01	8.3
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.21: CMR Water Quality Station – OF1

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	22	10	<0.02	25	<0.0004	<1.0	<0.01	15	0.0015	7.4
Q4	2022	14-Dec	31	25	<0.02	28	<0.0004	<1.0	<0.01	8	<0.0007	9.2
Q1	2023	10-Mar	54	20	<0.02	28	<0.0004	<1.0	<0.01	18	<0.0007	7.2
Q2	2023	09-Jun	4	15	<0.01	30	<0.0004	<1.0	<0.0007	25	<0.01	8.8
Q3	2023	11-Aug	17	25	<0.01	30	<0.0004	<1.0	<0.007	7	<0.01	8.0
Q4	2023	13-Oct	68	20	<0.010	30	<0.0004	1.1	<0.007	6	<0.01	7.4
Q1	2024	12-Jan	36	<5	<0.01	28	<0.0004	<1	<0.007	6	<0.01	7.5
Q2	2024	4-Apr	71	20	<0.01	31	<0.0004	<1	<0.007	11	<0.01	7.6
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.22: CMR Water Quality Station – OF2

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	28	10	<0.02	25	<0.0004	<1.0	<0.01	31	0.0015	7.7
Q4	2022	14-Dec	129	50	<0.02	30	<0.0004	1.1	<0.01	106	<0.0007	7.1
Q1	2023	10-Mar	2	<5	<0.02	27	<0.0004	<1.0	<0.01	7	<0.0007	7.8
Q2	2023	09-Jun	2	5	<0.01	33	<0.0004	<1.0	<0.0007	25	<0.01	8.6
Q3	2023	11-Aug	4	25	<0.01	33	<0.0004	<1.0	<0.007	7	<0.01	7.6
Q4	2023	13-Oct	22	20	<0.010	32	<0.0004	1.2	<0.007	4	<0.01	7.6
Q1	2024	12-Jan	<1	<5	<0.01	32	<0.0004	<1	<0.007	7	<0.01	7.5
Q2	2024	4-Apr	17	<5	<0.01	30	<0.0004	<1	<0.007	10	<0.01	8.1
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

Table 6.23: CMR Water Quality Station – OF3

Quarter	Year	Date	BOD	Color	Chromium, Cr^{+6}	Temp	Mercury, Hg	O&G	Lead, Pb	TSS	Arsenic, As	pH
		Units	mg/L	TCU	mg/L	°C	mg/L	mg/L	mg/L	mg/L	mg/L	-
Q3	2022	17-Aug	26	10	<0.02	25	<0.0004	<1.0	<0.01	42	0.0014	7.6
Q4	2022	14-Dec	47	5	<0.02	30	<0.0004	<1.0	<0.01	12	<0.0007	6.9
Q1	2023	10-Mar	1	<5	<0.02	28	<0.0004	<1.0	<0.01	8	<0.0007	7.8
Q2	2023	09-Jun	4	5	<0.01	32	<0.0004	<1.0	<0.0007	57	<0.01	8.7
Q3	2023	11-Aug	11	20	<0.01	33	<0.0004	<1.0	<0.007	10	<0.01	7.3
Q4	2023	13-Oct	66	15	<0.010	32	<0.0004	<1.0	<0.007	5	<0.01	7.6
Q1	2024	12-Jan	39	15	<0.01	28	<0.0004	<1	<0.007	8	<0.01	7.7
Q2	2024	4-Apr	20	15	<0.01	31	<0.0004	<1	<0.007	16	<0.01	8.0
DAO 2016-08 Water Quality Guideline Values Class SB			**-**	**50**	**0.05**	**26 to 30**	**0.001**	**2**	**0.01**	**50**	**0.01**	**7.0 to 8.5**

Source/Reference: CMR and CMVR (2022 to 2024)

6.1.4. COMPLIANCE TO IEC CONDITIONS

The generic IEC Plan/ Framework in 2017 is presented in Table 6.24 while the CMVR reported compliance to the ECC Condition No. 2: Undertake an effective and continuing Information, Education and Communication (IEC) Program to inform and educate all stakeholders, especially its local residents, employees of commercial and government establishments within the site and vicinity, on the Project's mitigating measures embodied in its EIS and the conditions stipulated in this Certificate are presented in Table 6.25. The IEC Plan/Program implemented, and future implementation are presented in Section 5 of this EPRMP.

Table 6.24: Generic IEC Plan/Framework (EIS 2017)

Target Sector	Major Topic/s of concern in Relation to Project	IEC Scheme/ Strategy/ Method	Information Medium	Indicative Time/ Frequency	Indicative Cost
General Public • LGUs (Bgys to Municipality) NGOs., • Church, • School • Fisherfolk • Barangay Leaders • Impact establishments such as Phil. Sofitel Hotel etc.,	• Nature of the Proposed Project • Impacts on environment and health o Floods o Liquefaction o Marine Ecology • Socio-Economic benefits • Socio-Economic impacts particularly to fisherfolks • Climate Change Mitigation • Climate Change Adaptation	Group Method Consultations o Send invitations to various stakeholders and impact sectors o Continuous discussion and consultation with the stakeholders to know their issues and concerns Public Consultation Social Development Program Local Printed Media	Focus Group Discussion / Power Point Presentation Printed Materials	Before construction Phase	To be determined
Professional society and individuals	Continuing consultation	Group Method	Focus Group Discussion Power Point Presentation	To be determined	To be determined
Prospective MMT Members (if formed) CENRO	Environment and Health	Group Method	Focus Group Discussion Power Point Presentation	Same	Same
MMT Members (if formed)	The Project EIA Water and Marine Ecology Quality Management	Group method Individual	Printed materials Focus Group Discussions	Same	To be determined

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.25: Compliance to EIS 2017 Generic IEC Plan/Framework

Monitoring Period	Evidence	Remarks
SA1 2024 CMVR (January to June 2024)	Proponent has engaged ALPAS Consultancy to conduct IEC activities. Annex 7 – IEC Documentation	IEC conducted with stakeholders (Pasay residents, newly elected Barangay officials, youth, senior citizens, business sector, and government sectors) Continuous conduct of IEC with Pasay Libertad Anglers' Association. a) Newly elected Pasay City Barangay Officials – February 26 & 29, 2024, April 25 & 29, and June 4, 11 & 25, 2024 b) Business Sectors – January 16 and February 27, 2024 c) Youth – March 5, 2024 d) Senior Citizens – April 22, 2024 e) Government Sector – May 02, 2024 f) Pasay City Hall employees – June 19, 2024
SA2 2023 CMVR (July to December 2023)	IEC activities were conducted jointly with Pasay 265 and the LGU within monitoring period Annex 16: IEC Activities Documentation	IEC conducted to employees of Pasay City General Hospital, newly elected barangay officials and youth leaders. Continuous conduct of IEC with Pasay Libertad Anglers' Association. a) Pasay LGU employees on July 20-21, 2023 b) Pasay Barangay officials on September 18, 20, 27, and October 5 and 11, 2023 c) SK Officials on November 16 and 28,2023
SA1 2023 CMVR (January to June 2023)	IEC activities were conducted jointly with Pasay 265 and the LGU Annex 14: IEC Activities Documentation	IEC conducted with the LGU Offices from Feb to Apr 2023. Continuous conduct of IEC with Pasay Libertad Anglers' Association.
SA2 2022 CMVR (July to December 2022)	Focus group discussion with members of Pasay Libertad Anglers Association was held on Nov. 19, 2022 Annex 11: Pasay Libertad Anglers Association (PLAA) documentation	-

Source/Reference: Compliance Monitoring Validation Report for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 CMVR, SA1 2023 CMVR, SA2 CMVR 2023 and SA1 CMVR)

6.1.5. COMPLIANCE TO SDP CONDITIONS

The Preliminary Social Development (SDP) Plan/Framework in 2017 EIS is presented in Table 6.26 while the CMVR reported compliance to the ECC Condition No. 3: Provide detailed Social Development Plan (SDP) based on the framework submitted in the EIS and shall be submitted sixty days (60) from the receipt of this Certificate are presented in Table 6.27. The Social Development Plan/Framework (Implemented and Future Implementation) are presented in Section 5 of this EPRMP.

Table 6.26: Preliminary Social Development (SDP) Plan/Framework (EIS 2017)

CONCERN	Responsible Community Member / Beneficiary	Government Agency/ Non government Agency and Services (indicate specific services)	PROPONENT	Indicative Timeline	Source of fund
1. Livelihood / Employment (Men, Women, Youth & elderly) • On the Job Training especially for the Youth • Educational Assistance e.g. skills training, continuing education • Livelihood Projects/Enhancement, e.g. small-scale fishing; fisherman's wharf	Qualified Project Affected Men, Women, Youth & Elderly Registered and native residents of Pasay	• Barangay Council • Municipal Council • TESDA BFAR	Community Relations Officer	Construction	LGU – IRA/ Proponent
2. Health and Safety	Barangay Kagawad for Health • Project-affected Community(ies)	• MHO • Barangay Disaster Management	Community Relations Officer	Construction	Same
3. Education and Recreation	Barangay Kagawad for Education • Project-affected Families	• DepEd	Community Relations Officer	Construction	Same
4. Environment and Sanitation • Environmental Actions • Tree planting • Marine Pollution Prevention and Coastal Clean - up • Climate Change and Disaster preparedness	Barangay Kagawad for Environment • Project Affected Community	• ENRO • MHO	Community Relations Officer	Construction	Same
5. Peace and order	Barangay Kagawad for Peace and order • Project Affected Community	• LGU • PNP	Chief Security Officer	Construction	Same

Source/Reference: Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Table 6.27: Compliance to EIS (2017) SDP Plan/Framework

Monitoring Period	Evidence	Remarks
SA1 2024 CMVR (January to June 2024)	On 01 June 2023, the Proponent submitted SDP to EMB, for EMB's approval. Ongoing implementation of SDP by the Proponent. JV Partner supplements SDP PPAs of the Proponent through different activities Annex 81 – SDP Submission to EMB Annex 9 – SDP documentation Annex 103 – LGU Social Development Programs	Continuous PLAA Financial Assistance (January to June 2024) Continuous sponsorship and participation in environmental and sustainability activities. Conduct of consultative meetings participated by JV Partner, Proponent, PHCC and Libra Law dated 29 April and 2 May 2024.
SA2 2023 CMVR (July to December 2023)	On 01 June 2023, the Proponent submitted SDP to EMB, for EMB's approval. Ongoing implementation of SDP by the Proponent. JV Partner supplements SDP PPAs of the Proponent through different activities Annex 14: SDP Submission to EMB Annex 15: SDP Documentation	Continuous PLAA Financial Assistance (08 July to 30 Dec) Assistance to the other environmental and sustainability projects of the LGU
SA1 2023 CMVR (January to June 2023)	On June 2023, The Proponent submitted SDP to EMB, for EMB's approval. Ongoing implementation of SDP by the Proponent. Partner supplements SDP PPAs of The Proponent through different activities. Annex 12: SDP Submission to EMB Annex 13: SDP Activity Documentation	PLAA Project Employment (18 Feb 2023, 10 Mar 2023) Safety, Security and Environmental Number (PCG - PLAA 03 Mar 2023) Conduct of Needs assessment, Welfare Assistance, and Financial Literacy (to Mar 2023)
SA1 2023 CMVR (January to June 2023)	-	On 01 June 2023, Proponent submitted SDP to EMB, for EMB's approval. Ongoing implementation of SDP by Proponent. JV Partner supplements

Monitoring Period	Evidence	Remarks
		SDP PPAs of Proponent through different activities.
SA2 2022 CMVR (July to December 2022)	SM implemented several programs in support of the Social Development Program of Pasay. Annex 34: Social Development Program Documentation	-

Source/Reference: Compliance Monitoring Validation Report for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 CMVR, SA1 2023 CMVR, SA2 CMVR 2023 and SA1 CMVR

6.1.6. COMPLAINTS MANAGEMENT SYSTEM

The proponent and the contractor have already established a Grievance Redress Mechanism (GRM) to address grievances received towards the project. The complaints management include:

- The complaint receiving setup;
- Case investigation;
- Implementation of corrective measures; communication with the complainant/ public; and
- Complaint documentation.

The complaints management report included in the CMVR is presented in Table 6.28. Based on these reports, there were no formal complaints received from SA2 2022 to SA1 2024.

Table 6.28: Complaints Management

Monitoring Period	Evidence	Remarks
SA1 2024 CMVR (January to June 2024)	The Proponent and contractor established a grievance mechanism to address grievances received towards the project. Annex 84: Complaints Management Complaint Documentation Realistic and sufficient budget for conducting the environmental monitoring and audit activities EMF has been	No complaint was received during the monitoring period.
SA2 2023 CMVR (July to December 2023)	The Proponent and contractor established a grievance mechanism to address grievances received towards the project. Annex 20: Complaints Management	No formal complaint received during this monitoring period.
SA1 2023 CMVR (January to June 2023)	The Proponent and contractor established grievance mechanism to address grievances received towards the project.	No formal complaints received in monitoring period

Monitoring Period	Evidence	Remarks
	Annex 17: Complaints Management	
SA2 2022 CMVR (July to December 2022)	Documentation of Complaints Management Plan/Program Annex 15: Complaints Management in MMT Manual of Operations (MOO)	None received complaints in monitoring period

Source/Reference: Compliance Monitoring Validation Report for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 to SA1 2024 CMVR)

6.2. SELF-MONITORING PLAN

The primary purpose of the self-monitoring plan is to ensure:

- Project compliance with the Environmental Compliance Certificate (ECC) condition;
- Project compliance with the Environmental Management Plan (EMP) and commitments;
- Project compliance with the Environmental Monitoring Plan (EMoP);
- Project compliance with the Social Development Plan (SDP);
- Project compliance with the IEC Programs (IEC);
- Effectiveness on environmental measures on managing the impact; and
- Continual updating of EMP.

Table 6.30 presents the proposed updated Environmental Monitoring Plan with Environmental Quality Performance Levels (EQPL) for the project using the template prescribed in Annex 2-21 of DAO 03-30 while Figure 6.2 shows the location of the proposed air and noise, and water quality monitoring stations. The summary of changes of the parameters and frequency from the EIS 2017 to EPRMP 2024 is presented in Table 6.29. The updating of EMoP has been considered due to the project reconfiguration activities as discussed in Section 1, to reflect the revised water quality standards of Manila Bay as Class SB water, and to adjust sampling location, frequency, number of samples, and/or additional parameters for the Ambient Air, Noise and Water quality monitoring in order to monitor the effectiveness of the mitigating measures. The EMoP includes the scope of monitoring, environmental media, monitoring parameters, methodology, frequency, location, responsible person, and environmental quality performance level (EQPL) management scheme.

Two monitoring reports are periodically being submitted to the online EMB website and these are the following:

- Compliance Monitoring Report (CMR) – A semi-annual report of the Project's compliance with the conditions of the ECC which shall be submitted online (EMB MC 2018-04) on or before:
  - 1st Semi-Annual – July 15; and
  - 2nd Semi-Annual – January 15.
- Self-Monitoring Report (SMR) – A quarterly report of the project's compliance with the environmental standards specific to environmental laws which should be submitted online on or before:
  - 1st Quarter – April 15;
  - 2nd Quarter – July 15;

- 3rd Quarter – October 15; and
- 4th Quarter – January 15.

On the other hand, a completed Project Environmental Monitoring and Audit Prioritization Scheme (PEMAPS) Questionnaire is presented in the **Appendix I**. The PEMAPS provides EMB a monitoring strategy and to determine monitoring priority rank of a project that will be assigned to, which provides guidance to the public on the applicable monitoring schemes for the Proposed Project. The PEMAPS is also being submitted as attachment on the semi - annual CMR.

Table 6.29: Summary of EMoP Changes from 2017 EIS to 2024 EPRMP

EIA Module	Parameters to be Monitored	Method	Frequency	Location
Air Quality				
EIS 2017	TSP	1 – Hour High Volume Sampler / Gravimertic (USEPA method5)	Semi Annually	Downwind at nearest existing establishments or buildings
EMoP 2024	24-hr TSP and 24-hr PM10	High Volume – Gravimetric Method	Quarterly	see Figure 6.2
Noise				
EIS 2017	Noise	Meter	Daily	Downwind at nearest existing establishments or buildings
EMoP 2024	Daytime Noise	Meter	Quarterly Weekly (internal)	see Figure 6.2
Marine Ecology				
EIS 2017	Marine Species	Underwater Survey	During Reclamation works	Near the site where construction activities, e.g. dredging or filling are conducted
EMoP 2024		Ocular Survey; Interview Survey with Fisherfolks		
Water Quality				
EIS 2017	BOD_5	Azide Modification Dilution Technique (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	BOD_5	5-day BOD Test	Quarterly	see Figure 6.3
EIS 2017	-	-	-	-
EMoP 2024	Sediment Plume	Visual monitoring/ Drone survey	Daily	see Figure 6.3
EIS 2017	Total Suspended Solids (TSS)	Gravimetric (Dried at 103-105o C) (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	TSS	Gravimetric (Dried at 103- 105oC)	Monthly and as needed based on the daily	see Figure 6.3

EIA Module	Parameters to be Monitored	Method	Frequency	Location
			visual monitoring of Plume	
EIS 2017	-	-	-	-
EMoP 2024	Turbidity	Nephelometric	Monthly and as needed based on the daily visual monitoring of Plume	see Figure 6.3
EIS 2017	-	-	-	-
EMoP 2024	Transparency	Manual -Secchi disc	Monthly and as needed based on the daily visual monitoring of Plume	see Figure 6.3
EIS 2017	Color	(USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	Color	Visual comparison	Quarterly	see Figure 6.3
EIS 2017	Temperature	Thermometer (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	Temperature	Laboratory and field (in-situ)	Quarterly	see Figure 6.3
EIS 2017	pH	pH probe (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities
EMoP 2024	pH	Electrometric	Quarterly	see Figure 6.3
EIS 2017	O & G	Std Method	During reclamation works	At strategic points
EMoP 2024	Oil and Grease	Liquid-Liquid, Partition - Gravimetric	Quarterly	see Figure 6.3
EIS 2017	Arsenic	SDDC, Spectrophotometric	During reclamation works	At strategic points
EMoP 2024	Arsenic	ICP-OES	Quarterly	see Figure 6.3
EIS 2017	Chromium	Flame AAS	During reclamation works	At strategic points
EMoP 2024	Chromium	Colorimetric	Quarterly	see Figure 6.3
EIS 2017	Lead	Flame AAS	During reclamation works	At strategic points
EMoP 2024	Lead	ICP-OES	Quarterly	see Figure 6.3
EIS 2017	Mercury	Manual Cold Vapor AAS	During reclamation works	At strategic points
EMoP 2024	Mercury	Cold Vapor AAS	Quarterly	see Figure 6.3

EIA Module	Parameters to be Monitored	Method	Frequency	Location
People				
EIS 2017	Employment of local qualified residents	Record of contractors	Entire reclamation period	NA
	Payment of compensation workers	Payment Records	Entire reclamation period	NA
EMoP 2024	Occupational safety incidents	Recording of safety incidents	Daily	Reclamation /Construction site
	Oil Spill incidents	Recording of Oil Spill Incidents	Daily	Reclamation /Construction site
	Employment of local qualified residents	Record of contractors	Entire reclamation period	NA

Table 6.30: Environmental Monitoring Program (Updated for EPRMP)

Key Environmental Aspects per Project Phase Activities	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost	Environmental Quality Performance Levels (EQPL) Management Scheme					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
PRE-CONSTRUCTION PHASE													
Based on the actual geo-technical investigation of the seabed in the project site, the area is totally devoid (zero) of corals and the silt and mud was measured at an average depth of 4 meters. It was deemed that no disturbance of corals and marine ecology during the geotechnical survey of the seabed. Deemed not applicable in as much as the pre-construction phase activities were essentially all completed.													
SITE PREPARATION PHASE													
Removal of scraps, debris at sea bed. Recovery of artifacts	Historic Relics - Impacts on Physical Cultural Resources	Artifacts	Visual	During entire activity	At specific sites recovery	Environmental Unit	Part of construction cost	Follow approved Unexploded Ordinance (UXO) procedure. Contact relevant authorities for accidental finds.					
CONSTRUCTION PHASE (Dredging, Construction of Containment Walls and Temporary Support Facilities, Filling Operation, Related construction activities at temporary working areas, Stabilization and other Horizontal Development Structures)													
Air	Ambient Air Quality –Degradation of Air Quality (Dust)	24-hr TSP	High Volume – Gravimetric Method	Quarterly	S-1, A1, A-3, S-4, S-5, S-6 (see Figure 6.2)	Environmental Unit	Php 720,000	170 micrograms per normal cubic meter (ug/NCM)	190 ug/NCM	215 ug/NCM	Standby water truck in place. Conduct dust suppression at dust emission source.	Investigate or inspect cause of dust dispersion, determine and address the root cause and apply dust mitigating measures.	Stop activity that causes immense dust emanation and conduct dust control measures
		24-hr PM10						105 ug/NCM	125 ug/NCM	140 ug/NCM	Standby water truck in place. Conduct dust suppression at dust emission source.	Investigate or inspect cause of dust dispersion, determine and address the root cause and apply dust mitigating measures.	Stop activity that causes immense dust emanation and conduct dust control measures
	Noise –Increase in Noise Level	Daytime Noise	Meter	Quarterly Weekly (Internal)	S-1, A1, A-3, S-4, AS-5, S-6 (see Figure 6.2)	Environmental Unit (EU)	Php 20,000 Part of the internal monitoring cost of the contractor	Noise complaint lodged by community and/or by contractor or employees.			Investigate or inspect cause of noise complaint, determine and address the root cause and apply noise mitigating measures Internal Noise monitoring.		
Land	Generation of Solid Waste	Most active works will be at sea. All types of waste except (Sewage Treatment Plant (STP) products) will be properly segregated and collected by an approved Waste Service Provider (WSP). STP Disposal of all vessels will be properly monitored. Dredged waste materials will be disposed at an identified disposal area (PCG approved/ permitted) outside Manila Bay Other land-based produced waste shall be collected by an approved WSP.												
Water	Degradation of Water Quality	Sediment Plume	Visual monitoring/ Drone survey	Daily	3 Monitoring Stations (800 meters from	Environmental Unit	Arrangement with contractor	Plume reaches 200m from the nearest project boundary	Plume reaches 500m from the nearest	Plume reaches 800m from the nearest	Upon reaching alert level, identify the area where the source of plume comes	Upon reaching the action level, prepare to conduct turbidity sampling	Stop activity within the area where the source of plume comes

Key Environmental Aspects per Project Phase Activities	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost	Environmental Quality Performance Levels (EQPL) Management Scheme					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
					the Project Boundary) which is based on the sediment plume modeling (See Appendix S)				project boundary	project boundary	from. Continuous visual monitoring.	in the monitoring station at 800m	from. Resampling every hour until the plume returns to alert level. Activity may resume
	Degradation of Water Quality	TSS	Gravimetric (Dried at 103-105°C) Water Sampling/ Collection for Laboratory Analysis	Monthly and as needed based on the daily visual monitoring of Plume		Environmental Unit	Php 150,000	27 mg/L	36 mg/ L	45 mg/L	Upon reaching alert level, continuous visual monitoring at the sampling station until the reduction of the plume is evident. See Appendix S – Turbidity Management Plan	Upon reaching the action level, suspension at source. Resampling should occur every hour until the plume returns to alert level. Activity may resume. See Appendix S – Turbidity Management Plan	Stop activity within the area where the source of plume comes from. Resampling every hour until the plume returns to alert level. Activity may resume See Appendix S – Turbidity Management Plan
	Degradation of Water Quality	Transparency	Manual -Secchi disc	Monthly and as needed based on the daily visual monitoring of Plume		Environmental Unit	Php 5,000 per monitoring	disk not visible at 100cm depth	disk not visible at 50cm depth	disk not visible at 20cm depth			
	Degradation of Water Quality	Turbidity	Nephelometric/ Handheld Turbidity Meter	Monthly and as needed based on the daily visual monitoring of Plume		Environmental Unit	Php 44,000	90 NTU	120 NTU	140 NTU			
	Degradation of Water Quality	Oil and Grease	Liquid-Liquid, Partition - Gravimetric	Quarterly	At identified monitoring points (see Figure 6.3) Mid Depth	Environmental Unit	Php 29,000	1.5 mg/L	1.7 mg/L	1.8 mg/L	EU to manage O&G issues including monitoring and corrective action implementation. Inspection of activity causing O&G issues Continue monitoring of activity	Continue water quality monitoring and reporting of exceedances	Action to be discussed with MMT and stakeholders
			In case of Incident	As needed	3 Depths (Surface, Middle, Bottom)						In case of incident, - Implementation of Environmental Emergency Response Plan (EERP) and Oil Spill Contingency Plan (OSCP, Appendix O.3)		
	Degradation of Water Quality	Arsenic	ICP-OES	Quarterly		Environmental Unit	PhP 195,000	0.0064 mg/L	0.0072 mg/L	0.008 mg/L	Environ mental Unit	Continued water quality	Action to be discussed

Key Environmental Aspects per Project Phase Activities	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost	Environmental Quality Performance Levels (EQPL) Management Scheme					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
	Degradation of Water Quality	Chromium	Colorimetric		At identified monitoring points (see Figure 6.3)	Environmental Unit		0.01 mg/L	0.02 mg/L	0.03 mg/L	(EU) to manage all parameter issues including monitoring and corrective action implementation. Inspection of activity causing water quality issues Continued monitoring of activity	monitoring and reporting of exceedances	with MMT and stakeholders
	Degradation of Water Quality	Lead	ICP-OES			Environmental Unit		0.0064 mg/L	0.0072 mg/L	0.008 mg/L			
	Degradation of Water Quality	Mercury	Cold Vapor AAS			Environmental Unit		0.00064 mg/L	0.00072 mg/L	0.0008 mg/L			
	Degradation of Water Quality	BOD5	5-day BOD Test			Environmental Unit	PhP 7,000	Not considered relevant because domestic wastes are from construction crews only who are based on barges or sea going vessels					
	Degradation of Water Quality	pH	Electrometric			Environmental Unit	Php 6,000	At least 75% of the DAO 2016-08 Water Quality Guidelines	At least 85% of the DAO 2016-08 Water Quality Guidelines	At least 95% of the DAO 2016-08 Quality Guidelines	Investigate if changes in water quality may be possibly attributed with the construction activities.	Identify the sources of the changes in the water quality and if there are any activities associated with these changes. If yes, strict implementation of buffer areas	Temporarily halt construction activities to identify and resolve sources of any drastic changes in water quality.
	Degradation of Water Quality	Temp	Laboratory and field (in-situ)			Environmental Unit	Php 6,000						
	Degradation of Water Quality	Color, True	Visual comparison			Environmental Unit	Php 8,500	35 TCU	40 TCU	45 TCU			
	Marine Ecology – Threat to Marine Species	Marine species	Ocular Survey; Interview Survey with Fisherfolks	During Reclamation works	Near the site where construction activities, e.g. dredging or filling are conducted	Environmental Unit	PhP 250,000	Zero incident of fish kill caused by the Project.			Conduct Incident investigation and report to EMB in accordance to prescribed EMB incident report form. Action to be discussed with MMT and stakeholders		
People	Possible accidents, incidence and near misses	Occupational safety incidents	Recording of safety incidents	Daily	Reclamation /Construction site	HSE Officer	Part of Project contractor cost	Zero accident	One First Aid Incident Case	One Medical Aid Incident Case	Conduct incident investigation and reporting of near miss incidents and safety observations	Conduct incident investigation. Provide remedial measures for the root causes of the incident. Apply First Aid Treatment.	Recording of incidents
	Degradation of water quality, threat to marine ecology, and threat to safety of People	Oil Spill Incidents	Recording of Oil Spill Incidents	Daily	Reclamation /Construction site	HSE Officer	Part of Project contractor cost	Zero Oil Spill Incident			Continuous monitoring and ensure implementation of PCG approved Oil Spill Contingency Plan (Appendix O.3)		

Key Environmental Aspects per Project Phase Activities	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost	Environmental Quality Performance Levels (EQPL) Management Scheme					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
	Generation of Livelihood/ Jobs	Employment of local qualified residents	Record of contractors	Entire reclamation period	NA	Project Manager	Part of the operation cost	Negative feedback to the proponent	Formal complaint by the hired workers		Proponent to investigate	Review the operation protocol & reconsider the complian, if applicable	Bring notice to DOLE

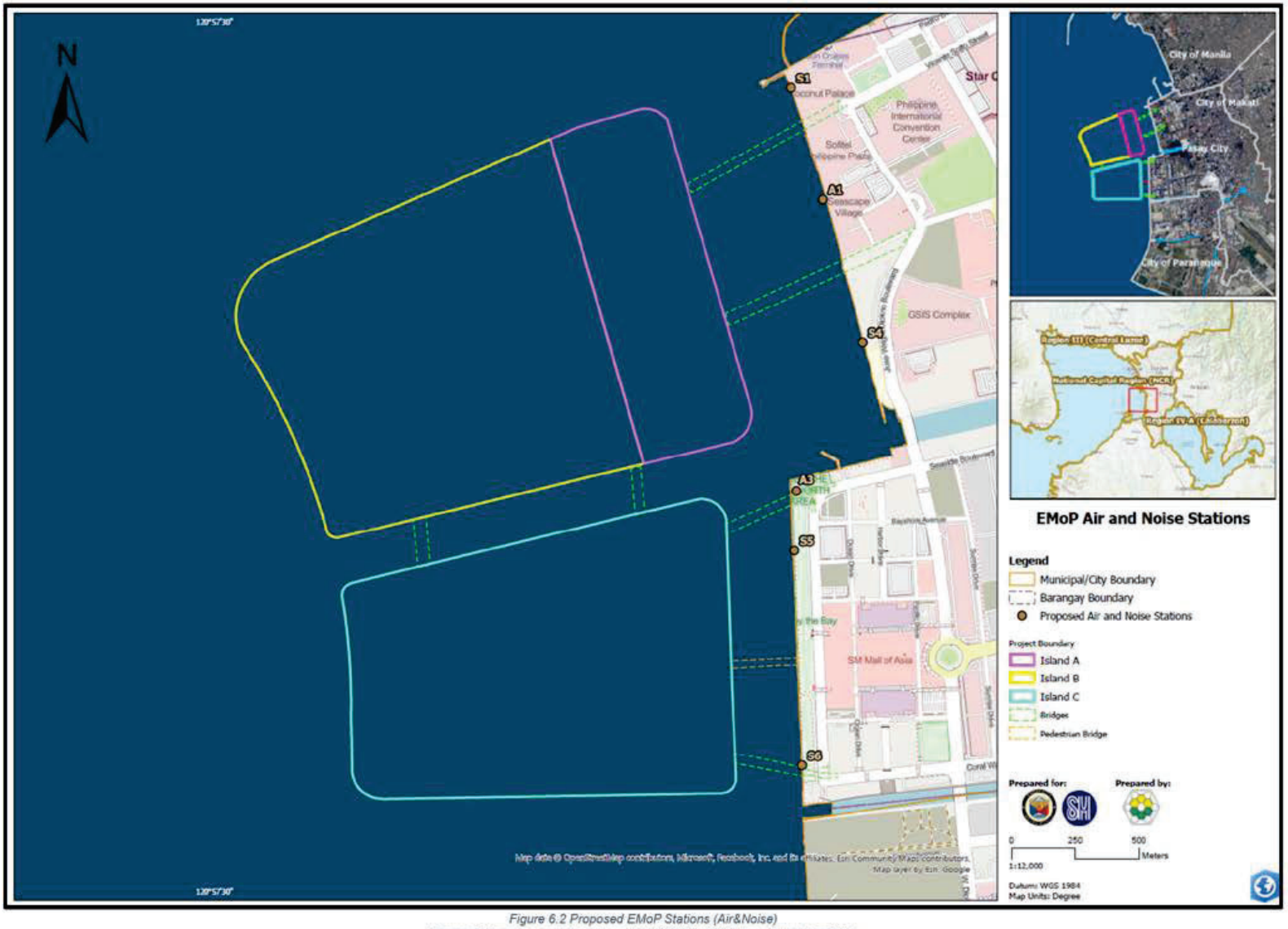


Figure 6.2 Proposed EMoP Stations (Air&Noise)
Source/ Reference: Admin Boundary – NAMRIA/PSA, 2020 | Open Street Map 2024

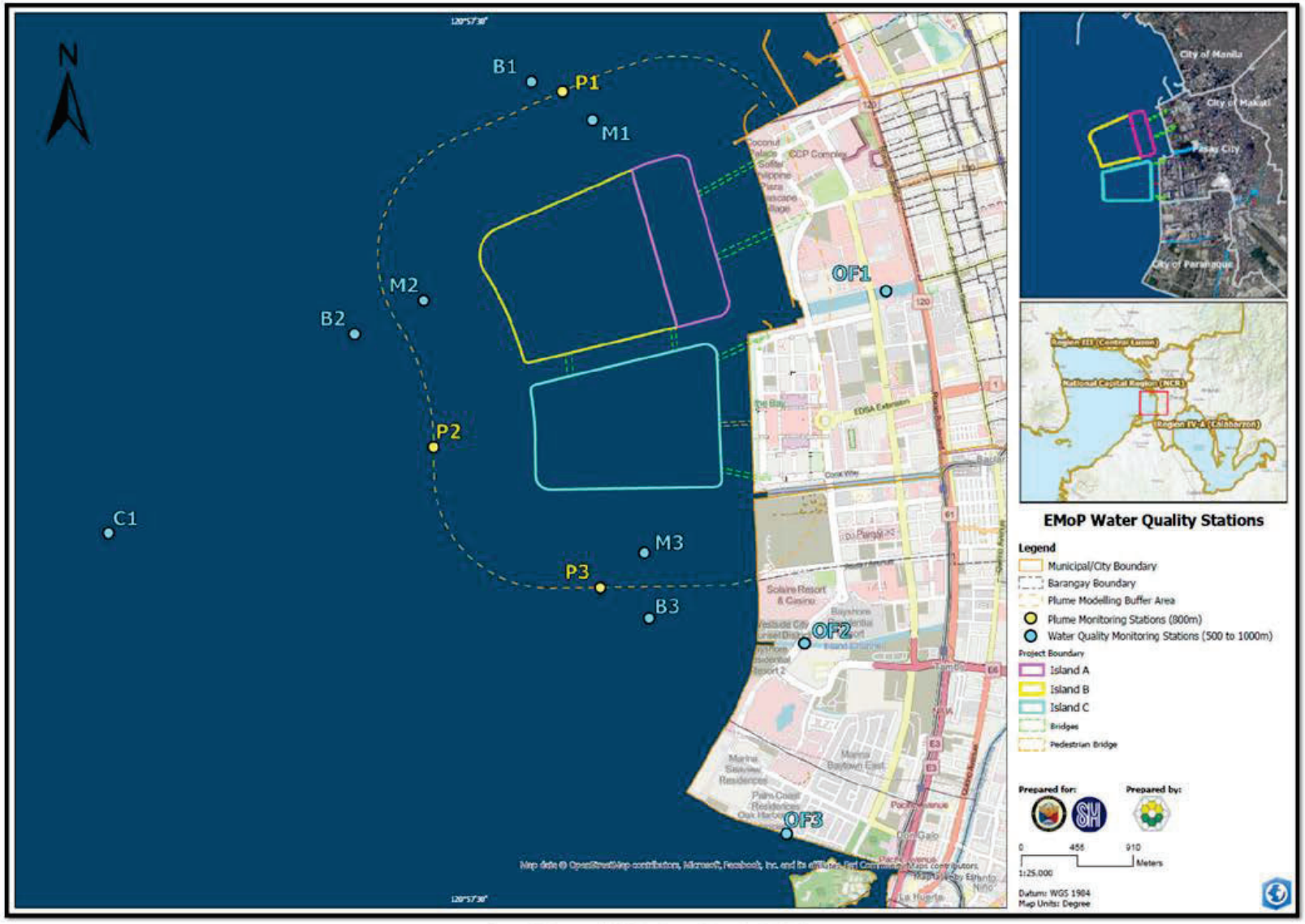


Figure 6.3 Proposed EMoP Stations – Water Quality Stations
Source/ Reference: Admin Boundary – NAMRIA/PSA, 2020 | Open Street Map 2024

6.3. MULTI-SECTORAL MONITORING FRAMEWORK

The composition of Multi-Partite Monitoring Team (MMT) is guided by DAO 2017-15, Section 16 Rationalization of the MMT Existence, Composition and Leadership, Section IV. A. I of DAO 2018-18: and with the ECC condition No. 9.2. Table 6.31 shows the MMT composition for this project that meets the criteria of the said reference. The representative from the Philippine Reclamation Authority (PM) is the current MMT chair for this project.

Table 6.31: MMT Composition

MMT Member	MMT Members (based on the MMT MOA dated 02 September 2021)
The LGU representatives: o A representative from the Provincial Environment and Natural Resources Office (PENRO) o The Rural Health Unit (RHU) Chief and o Concerned Barangay Captain(s)	• Pasay City Environmental and Natural Resources Officer (Pasay CENRO) • Pasay City Health Officer • Punong Barangay of Barangay 76 Zone 10, City of Pasay
One (1) representative from the LGU-accredited local NGO(s) with mission/s specifically related to environmental management and/or to the type and impacts of the proposed undertaking/project may be designated as representative to the MMT. In cases, where there is no such NGOs, it shall be open to other NGOs.	• YAHAD Consumer and Credit Cooperative
Maximum of two (2) representatives from locally recognized community leaders who can represent vulnerable sectors including women and senior citizens and representatives from academe may be included as member of the MMT in addition to the LGU-accredited NGO.	• Representative from locally recognized community leader – Urban Poor Council
Maximum of three (3) representatives from government agencies with related mandate on the type of project and its impacts during project implementation shall be included in the MMT membership, it not yet included.	• Philippine Reclamation Authority (PRA) • Philippine Coast Guard (PCC) • Bureau of Fisheries and Aquatic Resources (BFAR) • Department of Environment and Natural Resources – National Capital Region

The general roles and responsibilities of the MMT are indicated in DAO 2017-15 and in the Memorandum of Agreement (MMT MOA) on the creation of the MMT for this project as stated below:

1. Monitor project compliance with the conditions stipulated in the ECC and the EMP;
2. Validate proponent's conduct of self-monitoring;

3. Receive complaints, gather relevant information to facilitate determination of validity of complaints or concerns about the project and timely transmit to the proponent and EMB recommended measures to address the complaint;

4. Prepare, integrate & disseminate simplified monitoring reports to community stakeholders; and

5. Make regular and timely submission of MMT Report based on the EMB-prescribed format which is the Compliance Monitoring Validation Report.

The summary of compliance to MMT Condition of the ECC which is found in the CMVR report prepared by the MMT members is shown in Table 6.32 and in ECC Condition No. 9.2: Multi-partite Monitoring Team (MMT) composed of representative(s) from the proponent, local environmental Non- Government Organization (NGO) concerned, the Manila Bay Coordinating Office, PAGASA, DPWH and other concerned government agencies shall be organized consistent with DAO 2003-30. The MMT shall primarily oversee and report to EMB Central Office full compliance of proponent with the EMP/ EMoP, other commitments, as well as mitigation measures that are contained in the EIS documents and conditions herein enumerated as included in Table 4.1.

Table 6.32: Compliance to MMT (2022 to 2024)

Monitoring Period	Evidence	Remarks
SA1 2024 CMVR (January to June 2024)	MMT has been established and conducted regular monitoring. Annex 22: Signed MMT MOA Annex 21: Submitted MOO to EMB CO Annex 104: Acknowledgement Letter of 2024 AWFP submission dated 4 July 2024 Annex 105: 2024 AWFP and MMT Resolution	MMT MOA signed on 02 September 2021. MOO submitted on 13 March 2023. MOO was resubmitted to the EMB on 21 June 2024 based on EMB's comments on February 2024. The MMT passed a resolution removing Alouette Foundation as MMT Member (MMT Resolution No. 2023-002). The 2024 AWFP was submitted to the EMB on 4 July 2024.
SA2 2023 CMVR (July to December 2023)	MMT has been established and conducted regular monitoring. Annex 9: Signed MMT MOA Annex 10: Submitted MOO to EMB CO	MMT MOA signed on 02 September 2021 MOO pending approval officially submitted to EMB CO on 13 March 2023

SA1 2023 CMVR (January to June 2023)	MMT has been established and conducted regular monitoring Annex 8: MOA of Multi-partite Monitoring Team Annex 9: Submitted MOO to EMB CO	MMT MOA signed on 02 September 2021 MOO pending approval. Officially submitted and received by EMB CO on 13 March 2023.
SA2 2022 CMVR (July to December 2022)	Annex 10: Memorandum of Agreement of Multi-Partite Monitoring Team	Formed on 3rd Quarter Meeting: September 20, 2022

Source/Reference: Compliance Monitoring Validation Report for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 CMVR, SA1 2023 CMVR, SA2 2023 CMVR and SA1 CMVR)

6.4. ENVIRONMENTAL MONITORING AND GUARANTEE FUND

Establishment of the Environmental Monitoring Fund (EMF)

The EMF is a fund that the proponent shall commit to establish to support the activities of the MMT.

The Proponent (City of Pasay) through its JV partner, SM Smart City Infrastructure and Development Corp. had already open an account in a reputable bank in the country for the EMF, as committed in the MMT MOA. The EMF amounting into at least ONE MILLION PESOS (Php 1,000,000) will be used to finance the initial organizational activities of the MMT for the Project based on the Work and Financial Plan.

The mode of fund administration is through the appointment of Fund Administrator, that was decided upon by the project proponent in consultation with the MMT and considering the MMT's independence. The Fund Administrator accepted the fund administration and management responsibilities as reflected in the MOO and became liable for any misapplication or inappropriate disbursements allowed to be charged against the EMF.

Environmental Guarantee Fund (EGF)

The EGF shall be established and used exclusively for the following purposes:
1. The immediate rehabilitation of areas affected by proven damages to the environment and the resulting deterioration of environmental quality as a direct consequence of project construction, operation and abandonment;
2. The just compensation of parties and communities affected by the proven negative impacts of the Project;
3. The conduct of scientific or research studies related to the PROJECT that will aid in the prevention or rehabilitation of accidents and/or environmental damages; and
4. For contingency clean-up activities, environmental enhancement measures, damage prevention programs and social equity measures (e. g. livelihood, social development programs) including the necessary IEC and capability building activities related to the Project.

There shall be two (2) components of the EGF as follows:

EGF Trust Fund

The Pasay City Government, through its Private Sector Partner or Project Developer, shall open an account for the EGF Trust Fund in the amount of TEN MILLION PESOS (Php. 10,000,000.00) in the form of performance bond the earnings / interests of which shall accrue to the same Fund. The Trust Fund will be used to compensate aggrieved parties for any proven damages to life or property, undertake community-based environmental programs, conduct environmental research aimed at strengthening measures to prevent environmental damage and to finance restoration and rehabilitation of environmental quality of the project-affected area.
The Trust Fund shall also be renewed upon every expiration. The proponent shall immediately inform EMB Central and RO should it fail to renew the Trust Fund (e. g. insurance policy) on its stated expiration date or should the Trust Fund be cancelled or voided by the Insurer because of non-payment of the required premiums or any other cause allowed by the Insurance Code of pertinent issuances of the insurance Commission.

EGF Cash Fund

The PASAY CITY GOVERNMENT, through its Private Sector Partner or Project Developer, shall open an account for the EGF Cash Fund at a reputable bank in the area in the amount of TEN MILLION PESOS (Php. 10,000,000.00) which shall be earmarked for immediate rehabilitation and compensation of affected communities in case of proven damage or project-related accidents. it shall also be used to cover the operational costs of the EOF Committee. This Cash fund shall be placed in an interest-bearing account and such interest shall accrue to the same Cash Fund. The Fund shall be replenished to its original amount annually or whenever the amount goes below 50% of the amount.

Provided further that in the event of insufficiency of both the EOF Trust Fund and the EGF Cash Fund to answer for expenses, the Proponent shall shoulder the amount of any such insufficiency.

7. ABANDONMENT / DECOMMISSIONING / REHABILITATION POLICY

7.1. ABANDONMENT / DECOMMISSIONING OF TEMPORARY FACILITIES

7.1.1. AFTER RECLAMATION WORKS

Temporary facilities during the reclamation phase which include the temporary waste facilities and storages, construction signages, jetty, wharf, rock and steel pipe stockpiles, temporary access roads/ bridge/s from mainland to Project islands and between islands, etc. shall be maintained to give way or to be continuously reused for the horizontal development. Should there be needed to abandon or move the facilities the following shall be employed:

- Properly manage and dismantled all temporary facilities;
- Develop waste management procedures and sort materials according to types;
- Reusable materials may be sold to junk shop or donated to the community;
- All other waste shall be segregated and dispose properly;
- Solid and Hazardous waste shall be properly hauled by a DENR accredited waste haulers;
- Portalets shall be properly siphoned and collected by the siphoning contractor;
- The inventory of waste produced as well as the certificate of treatment, hauling records, manifest form, etc. shall be reported in SMR and CMR; and
- Conduct land and water restoration and rehabilitation activities, if applicable.

The Projects estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC which is to "*Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures*".

7.1.2. AFTER HORIZONTAL DEVELOPMENT

Temporary facilities during the project development stage/ construction phase which include the temporary waste facilities and storages, construction signages, jetty, wharf, stockpiles, access roads, etc. shall be properly removed from the project area to give way of the project operations. During the abandonment phase of the temporary facilities, the Project Proponent as well as their contractor shall:

- Properly manage and dismantled all temporary facilities;
- Develop waste management procedures and sort materials according to types;
- Reusable materials may be sold to junk shop or donated to the community;
- All other waste shall be segregated and dispose properly;
- Solid and Hazardous waste shall be properly hauled by a DENR accredited waste haulers;
- Portalets shall be properly siphoned and collected by the siphoning contractor;
- The inventory of waste produced as well as the certificate of treatment, hauling records, manifest form, etc. shall be reported in SMR and CMR;

- Silt management and control shall be implemented during the decommissioning of temporary access roads/ bridge/s from mainland to Project islands and between islands; and
- Conduct land and water restoration and rehabilitation activities, if applicable.

The Projects estimated date of completion is July 2028. A Decommissioning Plan shall be submitted one (1) year prior to date of completion, in accordance with Condition 10.3 of the ECC which is to "*Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures*".

7.2. ABANDONMENT / DECOMMISSIONING OF THE PROJECT

The project is consistent with the Pasay City long-term zoning and land use development, noting that the Proponent is the LGU itself. The Abandonment and Decommissioning Plan in general will include management plan for the projected cumulative/long term project impacts such as remediation of contaminated soil and water resources, land restoration, proper dismantling/abandonment of facilities/ equipment and other necessary activities.

Decommissioning/Abandonment/Rehabilitation

The proposed decommissioning plan envisaged in terms of the following:

- **Procedures for the decommissioning of the project components;**

  The project components are largely the reclaimed land including the infrastructures therein constructed e.g. roads open spaces, drainage culverts, electrical and water lines, etc.

- **Transport/disposal of equipment and other materials used in the plant's operation;**

  The equipment and other materials used in the reclamation and dredging works would have been returned or claimed back by the contractors.

- **Remediation of contaminated soil and water resources due to spills and leakage of chemicals and other materials used in the operation;**

  There are no spills and leakages during the process of soil stabilization and hence this aspect is not relevant.

- **Alternatives for the future use of abandoned area;**

  The proponent and its Joint Venture Partners can bid out the project to private sectors for their use.

- **Consistency with long term zoning and land use development plan of the municipality;**

- **Rehabilitation/ restoration plans, if any.**

The proposed Project including the reconfiguration is limited to the dredging, reclamation and horizontal land development. The future locators will have a separate ECC applications, EMP and EMoP for their application and compliances which is separate and independent from this Project. The proposed reclamation Project will form islands intended to be permanent part of Pasay City land area. The reclamation island is essential to the growth and development of Pasay City which bears the problems associated with expanding economic activities and population growth which result into urban congestion.

Seventy percent (70%) of the total land area will be devoted to mixed-land use while the remaining thirty percent (30%) will be devoted to open space development. The Project will create hundreds of thousands of job opportunities including those from fishing communities. Moreover, the Project will spur economic activities and generate for the National Government and the City Government of Pasay billions of pesos in public revenues, which can be devoted to public services. Abandoning the Proposed Project may lead to unemployment, urban congestion, and decline of local benefits in the City of Pasay. Maintenance activities once it reaches its project life is more probable than abandonment.

However, should there be a need to abandon, change ownership or to rehabilitate the Proposed Project, or change in LGU land use plan, necessary permits and approval will be secured to the DENR EMB. The Proposed Project will be properly rehabilitated following the guidelines in the revised procedural manual of DAO 2003-30, Land Use Plan of Pasay City or whatever that is deemed available that is applicable at the time of decommissioning. A letter of request to relief the ECC, including the decommissioning/ abandonment/ rehabilitation plan will be prepared and submitted to DENR EMB for at least six months prior to its abandonment. Abandonment Plan in general will include management plan for the projected cumulative/long term project impacts such as:

- Remediation of contaminated soil and water resources (if any) should there be potential leakage in fuel storage, chemical storage and hazardous waste storage;
- Coordination with the LGU zoning officer regarding the proposed land and water use;
- proper dismantling/abandonment of the project components;
- Clean-up, sorting, proper disposal and hauling of Solid and Hazardous Waste via DENR EMB accredited haulers;
- Reusable materials may be donated to the community or deliver or sold to junk shops; and
- Land and water restoration activities.

8. INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

The Pasay City together with its joint venture partner, the SM Smart City Infrastructure and Development Corporation (SM SCIDC) has established an Environmental Unit (EU) for purposes of monitoring the Project and submitting reports to the Environmental Management Bureau (EMB) on environmental compliances of the Project. The original EU was established by JV Partner on 11 January 2022 and a new EU was established on 28 July 2023, Endorsement letter from Pasay was received by DENR EMB on 01 August 2023.

The established EU continues to ensure effective performance of the Project including its reconfiguration activities to its Environmental Management Plan (EMP), Environmental Monitoring Plan (EMoP) and to the conditions of Environmental Compliance Certificate (ECC). The EU coordinates to the management of its contractor, China Harbour Engineering Company (CHEC), for the environmental compliances and mitigating measures. The management framework for the implementation of the ECC, EMP and EMoP is shown Figure 8.1. There are several parties responsible for the implementation of the EMP. The main responsibility and accountability in the successful implementation of the EMP lies on the Project Proponent, the City of Pasay, as indicated in the ECC of the reclamation project. It will liaise with SM Smart City Infrastructure and Development Corporation (SM SCIDC), its Joint Venture Partner (JVP)/ Project Developer, in the compliance of environmental requirements including the implementation of the ECC conditions, Environmental Monitoring Plan (EMoP) and submission of the Compliance Monitoring Report (CMR) and Self-Monitoring Report (SMR) to the DENR-EMB and related regulatory bodies. SM Smart City through its Environmental Unit is responsible in ensuring the compliance with the ECC conditions and EMoP implementation before, during, and after project completion.

The established EU will continue to address relevant environmental and social issues that may possibly arise during the project implementation. The EU shall report directly to the general manager on the status of the monitoring and compliance activities and recommends mitigating measures when necessary.

In compliance to the requirements of the DENR and with the ECC condition No. 10: An Environmental Unit (EU) shall be established to completely handle the environment related aspects of the Project in addition to the Monitoring requirements as specified in the Environmental Management Plan (EMP)/Environmental Monitoring Plan (EMoP). The EU shall:

- Monitor actual Project impacts vis-à vis the predicted impacts management measures in the EIS;
- Ensure that monitoring and submission of reports to EMB (Central Office and NCR) are carried out as required;
- Submit Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures;
- Submit the geographical coordinates of actual area approved by PRA to be reclaimed prior to Project construction; and

- Conduct continuing consultation with the stakeholders in updating EMP and EMoP that shall include necessary baseline data, geohazard and disaster risk reduction and management and ground settlement monitoring of the reclaimed area.

Both the Proponent and Project Developer will be responsible for ensuring that all employees, officers, contractors and subcontractors associated with the project are familiar with the EMP, ECC and relevant permits. Both of which will have its own Managing Head and PCO. The City Government of Pasay will be responsible for securing EMB-permits under its name and submission of the required compliance reports to EMB with the assistance of SM SCIDC and its Contractor. They should also ensure that requirements of environmental legislation committed to ensuring environmentally sound practices are implemented in all activities. Pasay City authorization with the contractor with the submission of SMR and other permit acquisition is attached as Appendix M.3.

Specific management responsibilities are summarized in **Table 8.1**.

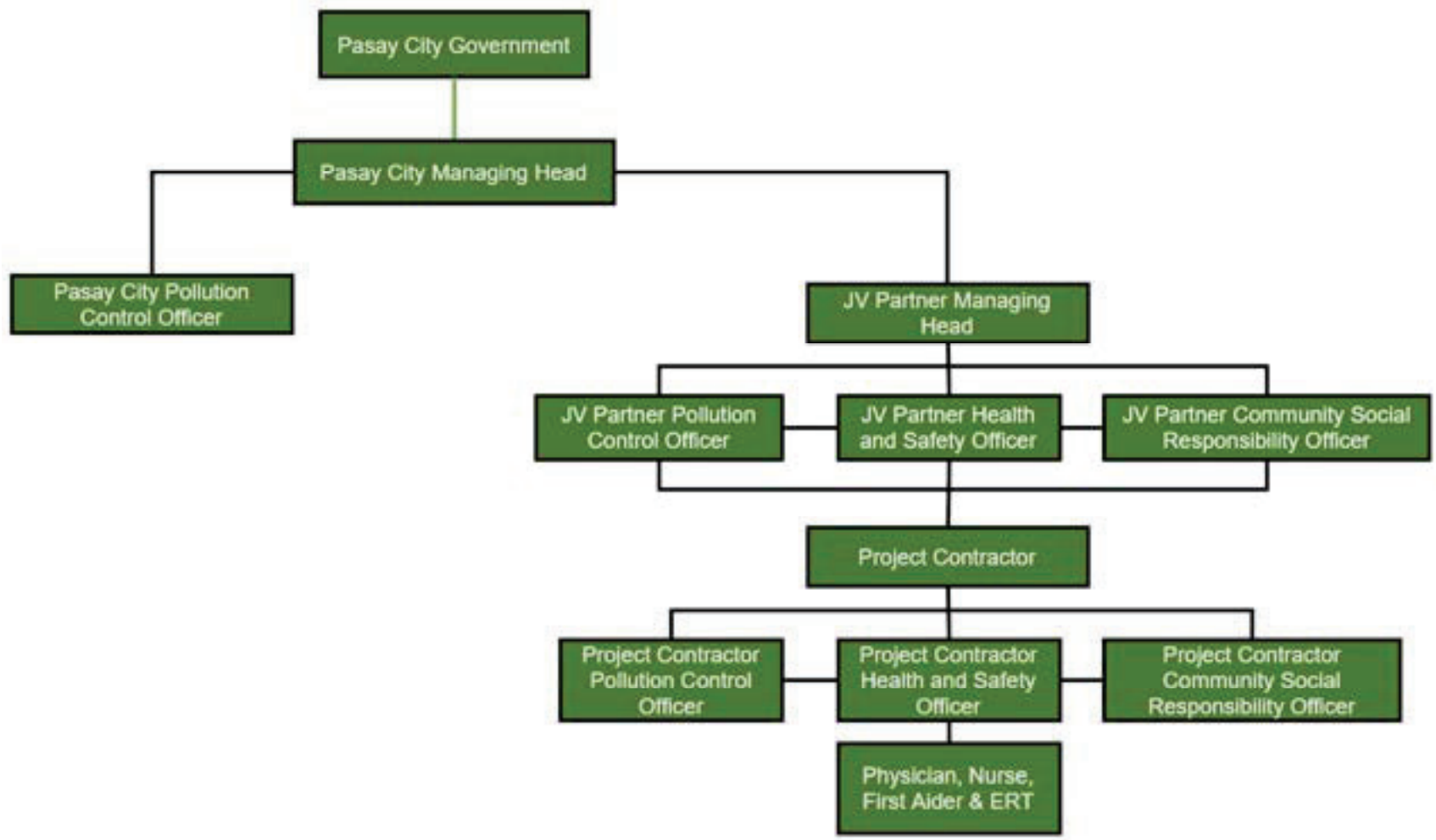


Figure 8.1 Environmental Unit / Organizational Chart for the Project Implementation

Table 8.1 EMP Management Roles and Responsibilities

Role	Responsibilities
Pasay City Proponent/ Permit Holder/ Project Owner	• Ensure that the Project Developer implements and monitors the EMP, ECC conditions and other environmental regulations and requirements. • Ensure that appropriate and adequate resources are allocated for the effective implementation and maintenance of the EMP. • Ensure that periodic reviews of environmental performance are conducted by the Project Developer. • Ensure that the Project Developer reports to DENR-EMB and other relevant regulators, any major environmental incidents that may have a significant impact on the surrounding environment.
SM SCIDC Project Developer	• Ensure that the Project Consultant implements and monitors the EMP, ECC conditions and other environmental regulations and requirements. • Ensure that all supervisory and management staff involved in the project are aware and understand their responsibilities under this EMP. • Allocate appropriate and adequate resources for the effective implementation and maintenance of the EMP. • Ensure that periodic reviews of environmental performance are conducted by the Project Consultant. • Report any major environmental incidents to DENR-EMB and other relevant regulators, any major environmental incidents that may have a significant impact on the surrounding environment. • Ensure that their employees and contractors receive the relevant environmental instruction in relation to the EMP and understand their obligations and duties. • Provide necessary directives to Project Contractor, directly and indirectly.
Contractor (China Harbour Engineering Construction)	• Responsible for the adequacy, stability and safety of all the Contractor's operations and activities • Submit to the Employer all the necessary approvals, licenses and permits for the commencement of the works • Ensure that all personnel including subcontractors adhere to these requirements. • Ensure that the appropriate requirements are incorporated into the reclamation plans and activities. • Ensure that personnel involved in the project, including subcontractors and visitors, have received necessary environmental training/ induction so that they understand their roles under the EMP. • Carry out all work in accordance with the procedures outlined in the EMP. • Make sure adherence to all environmental safeguards and precautions are in place, at a minimum, in accordance with the monitoring requirements outlined in the EMP. • Ensure proper maintenance, inspection and monitoring of equipment • Report all environmental incidents directly to the Project Consultant, in accordance to the severity of the incident. Preliminary reporting to be submitted within 24 hours

Below are the key roles of the Managing Head, Pollution Control Officer, Health, Safety and Environment (HSE) and CSR personnel in accordance with the applicable rules and regulations that is being practiced for this project:

Managing Head (DAO 2014-02)

- Appoint and request for the accreditation of a PCO;
- In case of resignation/termination of the PCO, the Managing Head shall appoint/designate a new PCO and inform in writing the concerned EMB Regional Office within 15 calendar days and seek accreditation for the new PCO within 30 calendar days from the date of resignation/termination. The Managing Head shall immediately assume the responsibilities as interim PCO until such time that a new PCO shall have been accredited; and
- Sign the reports prepared by the PCO.

Pollution Control Officer (Section 10 of DAO 2014-02)

1) Together with the Managing Head, ensure compliance with the requirements of PD 1586, RA 6969, RA 8749, RA 9003, RA 9275, their respective implementing rules and regulations (IRRs), and other pertinent rules and regulations;
2) Identify significant environmental aspects and impacts of the establishment's operational activities and recommend possible mitigating measures in the formulation/preparation and/or review of the Environmental Management Plan and Contingency Plan:
3) Attend to all permitting and registration requirements of the establishment prior to the construction, installation, or operation of pollutant sources and control facilities;
4) Ensure the proper performance, operation, and maintenance of environmental management facilities or systems of the establishment such as the following:
    - Wastewater treatment facilities;
    - Air pollution control devices referred to in DAO 2000-03;
    - Hazardous waste management storage areas (permanent or temporary);
    - Solid waste segregation/management facilities (i.e. MRFs, sanitary landfills, composting facilities, etc,); and
    - Environmental monitoring devices such as the Continuous Emission Monitoring Systems, Air Monitoring Stations, effluent flow metering/measuring devices, groundwater monitoring wells, and other environmental monitoring devices.
5) Ensure that the hazardous waste disposed offsite are covered by a Permit to Transport; each transport is covered by a hazardous waste manifest duly signed by the transporter and TSD facility; and with corresponding Certificate of Treatment (COT) duly signed by the TSD facility. Copies of the signed hazardous waste manifest and COT shall be submitted to the concerned EMB Regional Office in accordance with DENR Adm. Or. No. 2004-36;
6) Ensure that transport vehicles are properly operated and maintained (applicable only for hazardous wastes transporter);
7) Ensure that hazardous wastes Treatment Storage and Disposal (TSD) facilities are properly operated and maintained (applicable only for hazardous wastes TSD facility);
8) Monitor compliance to the requirements specified in the Environmental Compliance Certificate and the commitments stipulated in the Environmental Management and Monitoring Plans or Environmental Performance Report and Management Plans, and report the same in the Compliance Monitoring Report (CMR);
9) Monitor activities pertaining to the installation or construction of pollution source and control facilities to ensure compliance with the National Emission Standards for Source

Specific Air Pollutants and National Ambient Air Quality Standards and report monitoring results to DENR as part of the Self-Monitoring Report (SMR);

10) Monitor activities pertaining to the operation and maintenance of pollution control facilities to ensure compliance with the Effluent Standards and report monitoring results to DENR as part of the SMR;
11) Monitor the use of chemicals, especially those listed under the Priority Chemical List (PCL) and those with Chemical Control Orders (CCO) and the generation of solid and hazardous wastes. Monitoring data shall be submitted as part of the SMR and the PCL Compliance Certificate;
12) Monitor the importation or distribution of chemicals, especially those listed under the PCL and those with CCO and the generation of solid and hazardous wastes. Monitoring data shall be submitted as part of the SMR and the PCL Compliance Certificate (applicable only for importers or distributors of chemicals);
13) Promptly submit CMRs and SMRs, duly accomplished and signed by the PCOs, approved and certified correct by the Managing Head, and notarized;
14) Report in writing within twenty-four (24) hours from the occurrence of any of the following environmental incident to the concerned EMB Regional Office, as the case may be:
    - Breakdown of any pollution source and/or control facility or monitoring instruments; or
    - Releases (e.g. leaks, spills, etc.) of chemicals or hazardous wastes (listed in Annex 1 of this Order as well as the Priority List of Hazardous Substances as published by the Agency for Toxic Substances and Disease Registry of the Department of Health & Human Services of the Unites States of America) to environmental media.
15) Report in writing within twenty-four (24) hours from securing of the results of laboratory analysis or from online monitoring instruments any exceedance to effluent and/or emission standards;

- The report covering Items 14 and 15 above shall include the following:
    - Date/time of the incident;
    - Cause(s) of the incident; and
    - Description of the incident detailing the following:
        - Estimated amount of chemicals or hazardous wastes, emissions, and/or effluents released to the receiving environment; and
        - Interim/contingency measures to mitigate any potential negative impacts.
    - The managing Head Shall sign the the Report prepared by the PCO. Annex 4 shows the Environmental Incident Report format.

16) Submit to the Pollution Adjudication Board a copy of the SMR duly received by the respective EMB Regional Office (applicable only for establishments with pending case);
17) Attend, as duly authorized representatives of the establishment, technical conferences, hearings, and meetings especially on matters pertaining to pollution cases of the establishment where he/she is employed;
18) As a liaison officer to EMB, keep himself/herself abreast with the requirements of the Department;
19) Coordinate regulatory programs and activities with the city/provincial/municipal governments (if applicable);
20) Initiate and intensify environmental management activities including awareness campaign within their organization; and
21) Participate in multi-partite monitoring (MMT) team activities and meetings, where applicable.

Health and Safety Committee (Rule 1040 of DOLE OSHS)

- Plans and develops accident prevention programs for the establishment;
- Directs the accident prevention efforts of the establishment in accordance with the safety programs safety performance and government regulations in order to prevent accidents from occurring in the workplace.
- Conducts safety meetings at least once a month;
- Reviews reports of inspection, accident investigations and implementation of program;
- Submits reports to the manager on its meetings and activities;
- Provides necessary assistance to government inspecting authorities in the proper conduct of their activities such as the enforcement of the provisions of this Standards;
- Initiates and supervises safety training for employees; and
- Develops and maintains a disaster contingency plan and organizes such emergency service units as may be necessary to handle disaster situations pursuant to the emergency preparedness manual for establishments of the Office of Civil Defense.

Community Relations Officer / Corporate Social Responsibility (CSR) Manager

- Lead in the implementation the IEC and SDP;
- Coordination with B/CLGUs with the proposed plans for IEC and SDP;
- Ensure that financial resources required by the IEC and SDP are available and on-time;
- Ensure that HSE personnel are updated on SDP and IEC programs;
- Ensure that the upper management is briefed / updated on SDP and IEC programs; and
- Ensure that any feedback (positive / negative) on the company from the community is disseminated to the company.

Complaints Management / Grievance Redress Mechanism

The proponent and the contractor have already established a Grievance Redress Mechanism (GRM) to address grievances received towards the project. The complaints management include:

- The complaint receiving setup;
- Case investigation;
- Implementation of corrective measures; communication with the complainant/ public; and
- Complaint documentation.

9. REFERENCES

AECOM. The SM Reclamation Master Development Plan Report for the Pasay-Paranaque reclamations (2016)

Azanza, R. V. and Miranda, L. N. 2001.Phytoplankton composition and Pyrodinium bahamense toxic blooms in Manila, Bay Philippines. J. Shellfish Res. 20: 1251–1255.

Barangay 76, Pasay City Profile.

Bautista Bartolome, Bautista Leyo, Punongbayan Jane, Rasdas Ariel, Nillos Jun-Jun, Punongbayan Raymundo, Thenhaus Paul, Hanson Stanley, Algermissen, Estimates of the Regional Ground-Motion Hazard in the Philippines

Besana, G.M., Daligdig, J.A., Panol, D.A., Balbuena, E.S., Sikat, B., and Punongbayan, R.S., Active Faults in the Philippines, October 2000

Besana, G.M., Daligdig, J.A., Hydrological and Meteorological Hazards in Metro Manila, 1993

Besana, G.M., Daligdig, J.A., Seismological Hazards in Metro Manila, 1993

Besana, G.M., Daligdig, J.A., Torres, R. C., Volcanic Hazards in Metro Manila, 1993

Carpenter, K and V. Niem, eds (1998). FAO Species Identification Guide, Vol. 1: Seaweeds, corals, bivalves and gastropods.

China Harbour Engineering Company Ltd. (CHEC). Pasay Reclamation Development Project Environmental Emergency Response Plan (EERP), October 2021

China Harbour Engineering Company Ltd. (CHEC). Pasay-SM Reclamation Development Project Emergency Response Plan, January 2021

China Harbour Engineering Company Ltd. (CHEC). Self-Monitoring Report (Q2 2021 to Q4 2023)

Commission on Higher Education. List of Higher Education Institutions AY 2023-2024 as of 15 January 2024. Accessed on 18 May 2024. https://ched.gov.ph/list-of-higher-education-institutions-2/

Delchem Environmental Services. Ambient Air and Noise Monitoring Reports
Department of Education. Schools Division Office – Pasay City.

Department of Health. DOH Manual of Standards for Primary Care Facilities Philippines (13 April 2020).

Department of Education. Masterlist of Schools. Retrieved 16 May 2024. https://www.deped.gov.ph/wp-content/uploads/2021/06/SY-2020-2021-Masterlist-of-Schools-Address-only-1-1.pdf

Department of Finance – Bureau of Local Government Finance. LGU Income Classification per DOF Order No. 23-08, dated 29 July 2008.

Department of Environment and Natural Resources (2017). Operational Plan for the Manila Bay Coastal Strategy 2017-2022.

Del Hoyo, J., Andrew, E., & Sargatal, J. (1992). Handbook of the Birds of the World. Barcelona: Lynx Edicions.

Engineering, Geological and Geohazard Assessment Report. Proposed 360-Hectare Reclamation Project Along Coast of Manila Bay, Pasay City, 2017

Elmer, A. D. E. (2009). Leaflets of Philippine botany. General Books LLC.

English, S. C., Wilkinson and V. Baker, Editors (1997). Survey manual for tropical marine resources. 2nd ed. Australian Institute of Marine Sciences, Queensland, 390 p.

Farnsworth, M. (2024, February 27). Whiskered tern: Unveiling the secrets of this fascinating bird. The World's Rarest Birds. https://theworldsrarestbirds.com/whiskered-tern/#:~:text=Behavior%20and%20Diet%20of%20the%20Whiskered%20Tern%201,3%20Dietary%20Composition%20...%204%20Nesting%20Behavior%20

Ferrer, A. J., Francisco, H., Carmelita, B., Hopanda, J., & Predo, C. (2017). Gender Differences in Participation, Roles, and Attitude towards Mariculture Operation: A Case Study in the Philippines. Asian Fisheries Science. 30S. 83-102. 10.33997/j.afs.2017.30.S1.004.

Fisherfolks and farmers remain to have the highest poverty incidences among the basic sectors in 2021. (2023). Philippine Statistics Authority. https://www.psa.gov.ph/content/fisherfolks-and-farmers-remain-have-highest-poverty-incidences-among-basic-sectors-2021

Francisco, B.S. Reports on marine ecology baseline assessments for various reclamation projects in nearshore Manila Bay prepared by (2020 to 2024)

Hazard Hunter PH. Hazard Assessment. hazardhunter.georisk.gov.ph

Household Characteristics (2020 Census of Population and Housing). (2023). *Philippine Statistics Authority.* https://psa.gov.ph/content/household-characteristics-2020-census-population-and-housing

Kizamaya. (n.d.). Little Egret - facts, diet, habitat & pictures on Animalia.bio. https://animalia.bio/little-egret

M. Radermacher et.al. The Art of Screening Effectiveness of Silt Screens. https://www.iadc-dredging.com/wp-content/uploads/2017/02/article-the-art-of-screening-effectiveness-of-silt-screens-terra-et-aqua-132-1.pdf

Magurran, A.E. (Ed.) (2011). *Biological Diversity: Frontiers in Measurement and Assessment.* Oxford University Press.

Merrill, E. D. (2015). A Flora of Manila. Fb&c Limited.

Merrill, E. D. (1922). An enumeration of Philippine flowering plants. Bureau of printing.

Mines and Geosciences Bureau, Geology and Mineral Resources of the Philippines, Volume One, 1982

Mines and Geosciences Bureau, 1:50,000 Geological Map of Manila

MMT members for the Pasay 360 project. Compliance Monitoring Validation Report (CMVR) for Pasay 360-hectare Reclamation Project of Pasay City LGU and SM SCIDC (SA2 2022 CMVR, SA1 2023 CMVR and SA2 2023 CMVR)

Modified from Metro Manila Authority. (1985), PHIVOLCS Hydrological and Meteorological Hazards in Metro Manila

National Economic and Development Authority (2020). *Manila Bay Sustainable Development Master Plan*.

National Mapping & Resource Information Authority, 1:50,000 Topographic Map of Manila

IUCN 2024. The IUCN Red List of Threatened Species. Version 2023-1. https://www.iucnredlist.org

Ostrea Mineral Laboratories, Inc (OMLI). Baseline Ambient Air & Noise Level Monitoring Report For Manila Bay Reclamation Project (2024)

Ostrea Mineral Laboratories, Inc (OMLI). Certificate of Analysis (2024)

Pasay City Comprehensive Land Use Plan 2014-2022

Pasay City Comprehensive Land Use Plan 2023-2034

Pasay City Draft Comprehensive Land Use Plan 2023-2034 – Volume 1: Land Use Plan and Volume 3: Sectoral Studies.

Pasay City Ecological Profile – Updating of Mandated Plans Project.

Pasay City Government and SM SCIDC. Compliance Monitoring Report (SA2 2021, SA1 2022, SA2 2022, SA1 2023 and SA2 2023)

Pasay City Government and Technotrix Consultancy Services, inc. EIS Final Report for the Proposed 360 hectares Reclamation Project (October 2017)

Pascual, Alfred. City Planning and Development Office - City Government of Las Piñas. Las Piñas City. (29 June 2018)

Pelser, P.B., Barcelona, J.F. and Nickrent, D.L. (2011) Co's Digital Flora of the Philippines. http://www.philippineplants.org

PLANADES and PRIMEX. Coastal Habitat and Fisheries Final Report. 2022.

Primavera, J. H. (2009). Field guide to Philippine mangroves. Zoological Society of London-Philippines.

Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Climatological Data

Philippine Institute of Volcanology and Seismology, Disaster Prevention and Mitigation in Metropolitan Manila, 1993

Philippine Institute of Volcanology and Seismology, Department of Science and Technology, Disaster Prevention and Mitigation in Metropolitan Manila, UNCHS (Habitat) Project INT/90/701, March 1993

Philippine Institute of Volcanology and Seismology, Several Geohazard and Hydrological Hazard Maps

Philippine Seismic Zone Map in accordance to the Seismic Studies of Torregoza, Sugito and Nojima of the Gifu University in Japan and PHIVOLCS

Philippine Statistics Authority. 2020 Census of Population and Housing Report No. 4 – Urban Population. Published in June 2022. Accessed on 27 May 2024. https://library.psa.gov.ph/cgi-bin/koha/opac-detail.pl?biblionumber=15806.

Philippine Statistics Authority. 2020 Census of Population and Housing. Accessed on 29 May 2024. https://psada.psa.gov.ph/catalog/Household-based_Censuses/about

Philippine Statistics Authority. Census of Population 2015. Accessed on 15 May 2024. https://psada.psa.gov.ph/catalog/168/get-microdata

Philippines. "Administrative Order No. 16, s. 2019." *Official Gazette of the Republic of the Philippines*. Last modified February 19, 2019. Accessed June 17, 2024. https://www.officialgazette.gov.ph/2019/02/19/administrative-order-no-16-s-2019/.

Planning and Development Research Foundation, Inc., and Pacific Rim Innovation and Management Exponents, Inc. Environmental and Coastal Studies for Pasay Reclamation Projects: Social Development Plan (August 2022)

Project NOAH, Compilation of Storm Surge Occurrences in the Philippines, February 4, 2014

Ramsar Sites Information Service. https://rsis.ramsar.org/ris/2124

Republic of the Philippines Department of Environment and Natural Resources. (n.d.). https://bmb.gov.ph/downloads/WRD/WC/WC2020/stat_and_lists_of_wildlife/fauna/dao-2019-09.pdf

Republic of the Philippines Department of Environment and Natural Resources. (n.d.). https://www.philippineplants.org/Resources/dao-2017-11.pdf

RMS Petroleum Technology & Waste Management Corporation. Oil Spill Contingency Plan, August 2021

Rojo, J. P. (1999). Revised Lexicon of Philippine Trees. Forest Products Research and Development Institute, Department of Science and Technology.

Royal HaskoningDHV, Detailed Engineering Design Report - Reclamation & Coastal Works (2019)

Royal HaskoningDHV, Geotechnical Interpretation Report: Detailed Engineering Design Pasay and Parañaque Reclamation Development, 2017

Royal HaskoningDHV, Hydrodynamic and Morphologic Modeling Study for Pasay and Parañaque Reclamation Development, February, 2017

Royal HaskoningDHV, Hydrodynamic modelling studies (May 2024)

Royal HaskoningDHV, PRDP and PQRD Hinterland Flood Risk Study (May 2024)

Royal HaskoningDHV, Sediment Plume Modelling (September 2024)

Sangguniang Panlunsod ng Pasay, Resolution No. 3764, S2016, 2014 – 2022 Comprehensive Land Use Plan of Pasay City, 2016

Sitoy, H. S., Young, A. L., & Tabbu, M. Y. (1983). Raft culture of mussels.
Tigbauan, Iloilo, Philippines: Aquaculture Department, Southeast Asian Fisheries Development Center.

Solidum, R. Jr. Earthquake Hazards and Risk Scenario form Metro Manila and Vicinity: The Need for Whole of Society Preparedness (May 20, 2015)

Supreme Court of the Philippines. "G.R. No. 221697: People of the Philippines vs. Benjamin Mañalac y Jomalesa and Noel Fernandez y Gamboa." Supreme Court E-Library. Accessed May 15, 2024. https://elibrary.judiciary.gov.ph/thebookshelf/showdocs/1/48335.

Surbana International Consultants Pte Ltd. Pre-feasibility Studies for Navotas Coastal Bay (November 2013)

The Philippine Registry of Cultural Property (PRECUP). https://ncca.gov.ph/philippine-registry-cultural-property-precup (2024)

Thenhaus, P.C., Hanson. S.L., Algermissen, S.T., Bautista, B.C., Bautista, M.L.P., Punongbayan, B., Rasdas, A.R., Nillos, T.E. and Punongbayan, R.S., *Estimates of the Regional Ground-Motion Hazard in the Philippines, Natural Disaster Mitigation in the Philippines* – Proceedings, Department of Science and Technology – Philippine Institute of Volcanology and Seismology, October 19 -20, 1994

Thomson, L. & Evans, B. 2019. *Terminalia catappa*. The IUCN Red List of Threatened Species 2019: e.T61989853A61989855. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T61989853A61989855.en. Accessed on 06 May 2024.

Torell, E., Castro, J., Lazarte, A., & Bilecki, D. (2020). Analysis of Gender Roles in Philippine Fishing Communities. Journal of International Development, 33(1). 10.1002/jid.3520

Universal Testing Laboratory and Inspection, Inc. Soil investigation of Proposed Four E-com Building at the Mall of Asia

Velasco, M. T. (2019). Pasay City: Rise of the Travel City (June 2019).

Wang, Z., Li, N., Gao, S. & An, S. (2020). Response of wintering waterbird diversity to reclamation history and post-reclamation habitat along Yellow Sea coast. https://doi.org/10.1111/1749-4877.12464

Volume 1, 7th Edition of National Structural Code of the Philippines (NSCP), 2015

Youth. (2024). UNESCO. https://www.unesco.org/en/youth

Data/Map Sources:

Bureau of Soils and Water Management

Mines and Geosciences Bureau (MGB)

National Mapping and Resource Information Authority (NAMRIA)

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

Philippine Institute of Volcanology and Seismology (PHIVOLCS)



ENVIRONMENTAL PERFORMANCE REPORT AND MANAGEMENT PLAN

FINAL REPORT

APPENDICES

SEPTEMBER 2024

CITY GOVERNMENT OF PASAY

For the amendment of the ECC issued for Pasay 360 (ECC-CO-1601-0003)

LIST OF APPENDICES

Appendix A Proof of Authority Over the Project Site

- A.1 Memorandums of Agreement ("MOA") between Philippine Reclamation Authority ("PRA") and the City Government of Pasay ("Pasay City") on which the total land area to be reclaimed is 360 hectares.
- A.2 Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc (60 and 300 ha)
- A.3 Area Clearance: AC-NCR-2019-003
- A.4 ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017
- A.5 BFAR Authorization to implement the Comprehensive Coastal and Sea Use Plan
- A.6 PRA Board Resolution Series of 2024

Appendix B Sworn Statement Accountability of The Proponent

Appendix C Sworn Statement of Accountability of The Preparers

Appendix D Project Geographic Coordinates Approved by PRA

Appendix E Geotechnical Studies

- E.1 Geohazard Assessment (HazardHunterPH)
- E.2 Geotechnical Interpretation Report

Appendix F Water Quality Laboratory Certificates

Appendix G Ambient Air and Noise Report

Appendix H Graphs Results of Manta Tow Benthic Observations Pathways (April 2024)

Appendix I Project Environmental Monitoring and Audit Prioritization Scheme

Appendix J Hydrodynamic Modelling Study

Appendix K Flooding Impact Study

Appendix L DENR EMB Letter Dated 21 Jun 2024 – Submission of EPRMP and Pasay City Endorsement of Response to JV Partner for the Submission of EPRMP

Appendix M Proof of SMR and CMR Submissions
- M.1 SMR and CMR Submissions
- M.2 SMR and CMR Annex Download Link
- M.3 Pasay Authorization to the Contractor

Appendix N Proof of EPRMP Public Participation

Appendix O Permits and Clearances
- O.1 Hazardous Waste Generator's Certificate
- O.2 LLDA Clearance
- O.3 PCG approved Oil Spill Contingency Plan
- O.4 Permit to Operate of Generator Sets
- O.5 Special Waste Permit to Dump/ Discharge Waste &/ OR Other Matter

Appendix P Sediment Plume Modelling

Appendix Q Household Perception Survey

Appendix R EPRMP Checklist

Appendix S Turbidity Management Plan

Appendix T Supplemental Information Report

APPENDIX A.
PROOF OF AUTHORITY OVER THE PROJECT SITE

A.1. Memoranda of Agreement (MOA) between Philippine Reclamation Authority (PRA) and the City Government of Pasay (Pasay City) on which the total land area to be reclaimed is 360 hectares
A.2. Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc.
A.3. Area Clearance: AC-NCR-2019-003
A.4. ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017
A.5. BFAR Authorization to Implement the Comprehensive Coastal and Sea Use Plan
A.6. PRA Board Resolution Series of 2024

APPENDIX A.1

Memorandum of Agreement (MOA) between Philippine Reclamation Authority (PRA) and the City Government of Pasay (Pasay City) on which the total land area to be reclaimed is 360 hectares

A.1. Memoranda of Agreement (MOA) Between Philippine Reclamation Authority (PRA) and the City Government of Pasay (Pasay City) on which the Total Land Area to be Reclaimed is 360 Hectares

MEMORANDUM OF AGREEMENT

THE PUBLIC IS INFORMED:

This Memorandum of Agreement executed between:

The **PHILIPPINE RECLAMATION AUTHORITY** [Public Estates Authority], a government corporation created by P.D. No. 1084 as amended, with office address at the 7th & 8th Floors, Legaspi Towers 200, Paseo de Roxas, Makati City, Metro Manila and herein represented by its General Manager and CEO **PETER ANTHONY A. ABAYA**, duly authorized for this purpose under PRA Board Resolution Nos. 4643, 4655 and 4662, Series of 2016 (Attached as Annex A to A2 hereof), herein referred to as **"PRA"**.

- and -

PASAY CITY, a political unit of the Republic of the Philippines, with office address at the Pasay City Hall, F.B. Harrison St., Pasay City, represented herein by its duly elected Local Chief Executive, **MAYOR ANTONINO G. CALIXTO**, duly authorized for this purpose under Sangguniang Panlungsod Resolution No. 3109, Series of 2013 (Annex B hereof) herein referred to as the **"CITY"**.

ANTECEDENTS

Presidential Decree No. 3-A, dated January 11, 1973, mandates that all reclamation of foreshore and offshore areas shall be limited to the National Government or any person authorized by it in a proper contract.

PRA is the government agency primarily responsible for integrating and coordinating all reclamation projects and all reclamation projects shall be approved by the President of the Philippines upon the recommendation of the PRA pursuant to Presidential Decree No. 1084 as amended by Executive Order No. 525.

On June 24, 2006, Her Excellency President Gloria Macapagal-Arroyo issued Executive Order No. 543, Series of 2006, delegating to the PRA the authority of the President to approve reclamation projects.

The **CITY**, a chartered city pursuant to Republic Act (RA) No. 183 and RA No. 437, is authorized to undertake reclamation and development of land within its jurisdiction by dredging, filling or other means pursuant to Republic Act No. 7160 or the Local Government Code of 1991 out of the City's funds or resources, direct or otherwise;

Among the local government units in the Greater Manila area, the **CITY** has one of the smallest land areas, comprising of only 19 square kilometers more or

less, and is in dire need for additional land area to accommodate growing demands for residential, commercial and institutional sites due to thriving population and commercial activities in the City;

The **CITY** intends to undertake a three hundred (300) hectare Reclamation and Development Project ("Project") in the foreshore and offshore areas of Pasay City fronting the Mall of Asia Complex, the CCP and the Financial Center Area beginning from the northern bank of Redemptorist Channel up towards the north in the offshore vicinity of Gloria Maris in CCP, into a mixed-used, commercial, residential, institutional centers and tourism estate;

The **CITY** submitted to PRA pertinent documents for the Project and after review and evaluation, the PRA found the **PROJECT** feasible;

On November 13, 2013, His Excellency President Benigno S. Aquino III issued Executive Order No. 146, transferring the power to approve reclamation projects from the PRA Board to the National Economic and Development Authority (NEDA) Board.

Section 5 (a) of the Transitory Provision of EO 146 states that the EO shall apply to all reclamation projects, including those initiated by LGUs and all other government agencies/government owned or controlled corporations for which there are no contracts/agreements yet executed between the government entity concerned and a private sector proponent prior to the effectivity of this Order.

The Office of the President, through Executive Secretary Paquito N. Ochoa Jr., in a letter dated March 13, 2016, confirmed that since the 300-Hectare Pasay City Reclamation Project is covered by an implementing agreement between the City of Pasay and the concerned private party at the time EO 146 took effect, the Project is governed by Executive Order No. 543, Series of 2006, and its Implementing Rules and Regulations, and not by the subsequent EO 146.

The Office of the Government Corporate Counsel, the statutory counsel of the **PRA,** in its Contract Review No. 262, Series of 2016, has found this MOA in order subject to incorporation of its comments which were incorporated hereto.

NOW THEREFORE, for and in consideration of the foregoing premises, the parties hereto do hereby enter into this Memorandum of Agreement, with the following terms and conditions:

ARTICLE I
DEFINITION OF TERMS

As used in this MOA, and in subsequent agreements complementing this MOA, unless the context indicates otherwise, the following shall be understood to mean:

a) **MOA** shall refer to this MEMORANDUM OF AGREEMENT.

b) **Cause** referred under Article VIII (Suspension and Termination of the Project) which is not attributable to the **CITY** or **PRA** shall refer to any of the following:

   i. Force majeure and fortuitous event which shall be interpreted to mean an event which the **CITY** could have not foreseen, or which though foreseen, was inevitable.

ii. Outbreak of war;

iii. Judicial orders/decisions which will prevent the **CITY** or **PRA** from performing their obligations under the Agreement based on, but not limited, to the following circumstances;

a. Changes in law and National Government policies.

b. Orders, directives, policies or resolutions of local government units or duly authorized government committees/bodies.

c. Refusal of any government agency from issuing the required permits necessary for the implementation of the Project.

c) **Certificate of Completion of Reclamation Works** refers to the document to be issued by **PRA** to the **CITY** attesting to the completion of the reclamation works and its compliance with all approved plans and specifications.

d) **Certificate of Project Acceptance** refers to the document to be issued by the **PRA** to the **CITY** upon completion of the reclamation and development works attesting to the completion of the project and its compliance with all approved plans and specifications.

e) **Developer** refers to an individual, partnership, corporation, joint venture, consortium, or any entity with juridical personality contracted by the **CITY** to finance and undertake the actual reclamation and development works of the Project as defined herein.

f) **Development Cost** shall mean all costs and expenses to complete the horizontal development works of the Project estimated in the amount of Nine Billion Pesos (Php9,000,000,000.00).

g) **Horizontal Development** also known as "Service Land Development" shall refer to the provision of primary roads, bridges, if any, support infrastructure for utilities and facilities, such as but not limited to drainage, power line, telecommunication, water supply and the like.

h) **Land Use and Allocation Plan** shall mean the plan that identifies in the Master Development Plan the location, size, and land use of each party's land share in the Project.

i) **Land Form Plan** shall refer to the reclamation sketch plan of the Project showing the boundaries and technical description.

j) **Master Development Plan** shall mean the plan prepared by the **CITY** and approved by PRA detailing the overall horizontal development of the Project and intended land uses.

k) **Net Saleable Area (NSA)** shall mean the total area of the Project less roads, parks, other open spaces and areas for utilities as prescribed under the Master Development Plan.

l) **NOTICE TO PROCEED** refers to the clearance/permit issued by PRA conferring to the **CITY** the authority to implement a reclamation project in accordance with approved plans and specifications subject to existing laws, rules and regulations on reclamation.

m) **Project** or the Pasay City Reclamation and Development Project shall refer to the Rawland Reclamation and Horizontal Development of the three hundred (300) hectares, more or less, of foreshore and offshore areas of Pasay City, all in accordance with the approved Land Form Plan and Master Development Plan and specification.

n) **Project Cost** shall mean all costs and expenses related to complete the Project amounting to an estimated cost of Fifty Four Billion Five Hundred Million Pesos (Php54,500,000,000.00) as indicated in the Project Description that the Pasay City had submitted to PRA for approval of the Project.

o) **Reclamation Cost** shall mean all costs and expenses related to complete the rawland reclamation component of the Project amounting to an estimated cost of Forty Five Billion Five Hundred Million Pesos (Php45,500,000,000.00).

p) **Rawland Reclamation** refers to the process of filling up the 300 hectares area as defined in the Project Description through the use of dredge-fill and/or land-fill materials to finished elevation of at least four (4) meters above mean lower low water level (MLLW), properly contained and consolidated in accordance with approved plans.

q) **Reclamation and Development Schedule** shall refer to the phasing of and indicating therein the duration within which the Rawland Reclamation works and Horizontal Development works shall be undertaken and completed.

ARTICLE II
DOCUMENTS COMPRISING THIS MOA

The following Contract Documents are hereby made integral part of this Agreement:

ANNEX C: Preliminary Land Allocation Plan and Preliminary Land Form Plan

ANNEX D: Conceptual Development Plan

Annex E: PRA Guidelines for the Feasibility Study

ARTICLE III
THE PROJECT

The Pasay City Reclamation and Development Project ("Project") shall refer to the rawland reclamation and horizontal development of approximately Three Hundred (300) hectares of foreshore and offshore areas of Pasay City fronting the Mall of Asia Complex, the CCP and the Financial Center Area beginning from

the northern bank of Redemptorist Channel up towards the north in the offshore vicinity of Gloria Maris in CCP, into a mixed-used, commercial, residential, institutional centers and tourism estate as shown in the attached Annex C.

ARTICLE IV
SCOPE OF UNDERTAKING

A. **Joint undertaking**

The **PARTIES** hereto shall:

1. Cooperate with each other in the planning and in ensuring the implementation of the Project;

2. Conduct public information dissemination campaign about the Project and undertake public consultation/hearing as maybe necessary for the smooth prosecution and implementation of the same;

3. Protect and support the Project against any opposition, negative campaign, litigation and the like;

4. Enter into contract and any supplemental arrangements, to implement the details of this MOA including amendments thereto, as may be necessary and/or required by existing laws;

5. Secure and comply with the necessary permits, clearances, administrative and government consents, permits, licenses, authorization from concerned government agencies as may be required for the implementation of the Project.

B. **Individual undertakings**

B.1 **PRA Undertaking**

1. Undertake general supervision and monitoring of all activities related to planning, implementation, and other functions necessary for the smooth prosecution and completion of the Project for the purpose of ensuring compliance by the **CITY** with the land form plan, Master Development Plan, Land Use and Allocation Plan and all other detailed studies, plans and specification as approved by **PRA** and other concerned government agencies;

2. Review pertinent studies and approve all plans within a maximum period of one hundred eighty (180) days from submission by the **CITY** of the complete studies/plans as specified in Article IV B.2 (3) hereof as pre-requisite for the Rawland Reclamation works of the Project;

3. Secure the title to the completed reclaimed land and thereafter convey the same to the **CITY** pursuant to existing laws, rules, and regulations and in accordance with the approved sharing and land allocation plan in relation to Article X hereof;

4. Monitor and enforce compliance by the **CITY** with safety and environmental laws/orders, labor laws and other applicable laws, rules and regulation;

5. Assist the City in identifying possible sources of filling materials;

6. Issue the Certificate of Completion of Reclamation Works upon completion of the rawland reclamation works in accordance with approved plans and specifications;

7. Issue the Certificate of Project Acceptance upon completion of the reclamation and horizontal development works in accordance with approved plans and specifications.

B.2 **PASAY CITY Undertaking:**

1. Undertake the actual Rawland Reclamation and Horizontal Development works, in accordance with the approved Master Development Plan, specifications and timeframe and finance all costs pertaining thereto, including but not limited to costs of securing permits and licenses, clearing of the project site, reclamation and land development works and provide the technology, equipment, machinery, manpower and personnel, expertise, and other support facilities necessary to complete the **PROJECT**.

2. At its option, the **CITY** may enter into other contract/s or agreements allowed under existing laws to carry out and comply with all its undertakings under this MOA; provided that all the rights and interests of the PRA under this agreement shall not in any way be affected or be prejudiced by the future contracts of the **CITY**.

3. Unless mutually extended by both parties, the **CITY** shall submit the following requirements not later than eighteen (18) months from the date of effectivity of this MOA, for review and approval by the PRA, as basis for the issuance of the **NOTICE TO PROCEED** to the **CITY** to be issued within sixty (60) working days from the time of review mentioned in provision B.1 (2) hereof of the complete documents as specified below:

   a) Final Land-form plan with technical description;

   b) Detailed Engineering Design, Reclamation Plans including Reclamation Methodology and Specifications;

   c) Final Site Development, Land Use and Land Allocations Plans;

   d) Detailed Reclamation and Land Development Schedule, Project Phasing (if any) and PERT / CPM;

   e) Detailed Feasibility Study prepared as per PRA Guidelines herein attached as Annex "E";

ANTONINO G. CALIXTO

PETER ANTHONY A. ABAYA

f) Hydrographic, topographic and bathymetric plans/maps of the reclamation site and immediate vicinity as well as of the marine borrow pit areas, as the case maybe;

g) The following Detailed engineering studies: i. Mathematical Modelling, ii. Hydraulic Modelling, iii Geotechnical Investigation, iv. Engineering Geological and Geohazard Assessment v. Climate Change Adaptation Strategy;

h) Environmental Clearance Certificate (ECC) for the Project and copies of the EIA/EIS or equivalent document as required by DENR for the issuance of the ECC;

i) Drainage plan vis-à-vis the land form plan and in relation to existing drainage system for submission to DPWH, City Engineer and/or MMDA subject to modifications, if any;

j) GSQP or other permits to be issued by the Department of Environment and Natural Resources (DENR) or other concerned government agencies or instrumentalities, if necessary, covering the identified sources of dredgefill materials other than the GSQP issued to PRA for San Nicolas Shoal, as the case maybe;

k) DENR Area Clearance and endorsement of other concerned government agencies.

4. The Notice to Proceed (NTP) to be issued by PRA shall be the basis for the **CITY** and/or its Developer to implement the Project in accordance with the Reclamation and Development Schedule.

5. Identify the source of filling materials for the Project and shall also be responsible to look for alternative source/s in case the source of filling materials previously identified is inadequate and to comply with all government requirements for securing the necessary clearances/permits for the utilization thereof.

6. Help enforce the restrictions and criteria of the approved Master Development plan and land use and allocation plan.

7. Integrate the approved final Master Development Plan of the Project into the City's Land Use Plan.

8. Maintain and secure the Project Area and immediate vicinity at its own cost at all times during the implementation period of the PROJECT.

9. Undertake other works and/or services as may be necessary in accordance with the approved plans, specifications and timeframe.

10. Ensure that the Project site is cleared of all marine structures such as fish pens and fish traps and all other obstructions which may impede the execution of the works of the Project;

11. From date of issuance by **PRA** to the **CITY** of the NTP, submit to **PRA** quarterly progress reports for monitoring the implementation of the Project.

12. Unless mutually extended by the parties, submit to PRA the following documents pertaining to the horizontal development works within eighteen (18) months from completion of the reclamation work based on the approved Reclamation and Development Schedule:

    a) Detailed Engineering Design and Plans of major roads including utilities;

    b) Environmental Compliance Certificate (ECC) and Environmental Impact Statement (EIS) for Land Development Works;

    c) Updated Site Development Plan, Land Use Plan and Land Allocation Plan, if necessary;

    d) Geotechnical Investigation Report;

    e) Detailed Quantity Take-off and Cost Estimates;

    f) Detailed Construction Schedule/ PERT/CPM;

    g) Other engineering studies which may be necessary to substantiate/support the detailed engineering design of the major roads and utilities.

13. As an enhancement of the Government share, the **CITY** undertakes to reclaim, at its own cost, an additional thirty (30) hectares which shall be adjacent or contiguous to the Project subject to separate application and approval process with the **PRA** and compliance with applicable laws, rules and regulations. The 30 hectares shall be exclusively devoted for public parks, roads and open spaces to be shared by the **CITY** and **PRA** at 70%-30% in favor of the **PRA**.

ARTICLE V
PROJECT COMPLETION

A. Unless mutually extended by both parties, the Project shall be completed within a period of not exceeding seven (7) years from the time of the issuance by **PRA** of the Notice to Proceed to the **CITY** in accordance with the Reclamation and Development Schedule.

The timetables set forth in the Reclamation and Development Schedule may be extended for such period of time and under such reasonable and equitable terms as may be agreed upon in writing by the parties. The running of such period shall be suspended automatically by the occurrence of a fortuitous event or force majeure which shall be deemed to include, without limitation, natural disaster and catastrophes beyond the control of

man, including adverse weather conditions caused by storms and typhoons, and shall commence to run again upon the cessation of such fortuitous event or force majeure.

B. Upon completion of the rawland reclamation works and after PRA's evaluation and final inspection, the PRA shall issue the Certificate of Completion of Reclamation Works if it finds the completed works to be conforming with all the approved plans and specifications.

C. The horizontal development works shall be implemented and completed in accordance with the Reclamation and Development Schedule. Upon completion of the horizontal development works, the **CITY** shall submit to **PRA** a Final Report.

D. **PRA** shall determine compliance of the reclamation and development works with the approved plans and specifications and issue the Certificate of Project Acceptance to the **CITY** if it finds the reclamation and development works to be fully compliant with the said approved plans and specifications.

ARTICLE VI
REGULATORY FUNCTIONS and SUPERVISION FEE

A. In the exercise of its regulatory functions as mandated by law, **PRA** shall issue Notice/s of Violations and orders/directives to the **CITY**, for any violations/deviations committed by it and/or its contractor/developer/partner during the implementation of the reclamation project up to and including horizontal development.

B. In consideration of its regulatory functions over all reclamation projects nationwide and pursuant to existing policies, guidelines, and procedures, the PRA shall charge the **CITY** a regulatory fee of two and one-half (2.5%) of the estimated reclamation cost of Forty Five Billion (Php45,000,000,000.00) or equivalent to One Billion Two Hundred Seventy Four Million Pesos (P1,274,000,000.00) inclusive of VAT, to be paid by the **CITY** with the following schedule:

1) Php45,500,000.00 of the regulatory fee shall be paid by the **CITY** to PRA within sixty (60) days from signing of this MOA as advance payment to form part of the first progress billing.

2) The balance shall be paid based on the accomplishment report to be submitted by the **CITY**. Payment shall be due within thirty (30) days from receipt by the **CITY** of the billing issued by PRA. An interest of 2% per annum shall be charged by **PRA** for any delayed payment.

C. For the monitoring and supervision of the horizontal development works of the Project, the PRA shall charge the **CITY** a supervision fee of 1% of the development cost estimated at Nine billion pesos (Php9,000,000,000.00) as submitted in the Project Description or Php100,800,000.00 inclusive of VAT, and which will be paid by the **CITY** to PRA based on the following schedule:

1) The **CITY** shall pay to **PRA** an advance of Php3,600,000.00 upon submission to PRA of the documents mentioned in Article IV (B.2) (12) herein and which will form part of the progress billing.

2) The balance shall be paid based on the accomplishment report to be submitted by the **CITY**. Payment shall be due within thirty (30) days from receipt by the **CITY** of the billing issued by PRA. An interest of 2% per annum shall be charged by PRA for any delayed payment.

ARTICLE VII
THIRD PARTY ENGINEERING SUPERVISION CONSULTANT

A third party engineering supervision consultant, to be selected by the **CITY** or through its Developer, shall be engaged to provide the fulltime engineering supervision services for the construction works, the cost of which shall not form part of the Project Cost, but shall nevertheless be still borne by the CITY. The third party consultant shall be responsible for the day to day monitoring of the progress of reclamation works and horizontal development works of the Project. Upon completion of the Project, the third party engineering consultant shall certify as to the completeness and accuracy of the Project design, methodology and specification and shall recommend to the **PRA** and the **CITY** the issuance of Certificate of Completion and Final Acceptance of the Project to the Developer. However, such Certification by the third party engineering consultant shall be without prejudice to the PRA's own technical and engineering evaluation and assessment of the Project's completion and acceptability.

ARTICLE VIII
SUSPENSION AND TERMINATION OF THE PROJECT

A. **Termination due to default of the CITY**

1. The PRA shall terminate this MOA for default when any of the following conditions attend its implementation:

1.1 Due to the **CITY**'s (or through its Developer) fault and while the Project is on-going, it has incurred negative slippage of fifteen percent (15%) or more after a verification has been conducted by both parties, regardless of whether or not previous warnings and notices have been issued to the **CITY** to improve its performance;

1.2 In the event the **CITY**:

i. fails to award to a Developer the Project within six (6) months from the date of this MOA unless it cannot award the Project due to justifiable cause.

ii. does not execute the Project in accordance with the provisions of this MOA or persistently or flagrantly neglects to carry out its obligations under this MOA;

iii. abandons the project, refuses or fails to comply with a valid instruction of the PRA or fails to proceed expeditiously and without delay, or rectify any violations identified, despite a written notice by PRA;

iv. neglects or refuses to remove materials or to perform new work to rectify or replace those which have been classified as rejected, defective or unsuitable; or

v. fails to commence reclamation works after one year from the issuance of NTP.

B. **Termination due to the fault of PRA**

In the event that PRA fails, refuses or does not execute the Project in accordance with the terms and conditions of this MOA, and other allied agreements executed to implement the same, the CITY and the appointed Developer shall be entitled to avail all legal remedies against PRA to protect their interest.

C. **Termination for Other Causes**

In the event that the **CITY** is prevented from completing the Rawland Reclamation and/or Horizontal Development of the Project due to a cause which is not attributable to the **CITY** or **PRA** and if the cause does not cease within one (1) year from its inception, this MOA may be terminated upon mutual consent of the parties, whereupon the parties shall settle all their respective obligations up to the time of termination and whatever is accomplished prior to the termination of the Agreement shall be shared by the PRA and the **CITY** in accordance with Article IX hereof. However, if the said cause shall cease within the period of one (1) year from its inception, without prejudice to Article V hereof, this Agreement shall only be suspended and each party shall be relieved of their respective obligations for the duration of the suspension.

In case of suspension or termination hereof, the **PRA** shall be free and harmless from any liability that may arise therefrom such as but not limited to demobilization and remobilization expenses, manpower and equipment on standby expenses, costs for various permits, technical and environmental studies. The CITY however may avail of all the legal remedies available to protect its interest against a third-party that prevented it from completing the Project.

ARTICLE IX
UTILIZATION OF THE RECLAMATION AREA AND SHARING ARRANGEMENT

A. The parties agree to share on the reclaimed land as follows:

	Saleable	Roads and Parks/Open Spaces
PRA	12.67%	21%
Pasay City	57.33%	9%
	70.0%	30.0%

B. The respective land shares of the **CITY** and **PRA** shall be pre-identified in and pre-determined on the Land Use and Allocation Plan as prerequisite to issuance by PRA of the Notice to Proceed (NTP).

C. It is understood that the reclaimed area shall be subject to actual survey after the reclamation works have been completed and adjustments shall be made to conform to the approved sharing scheme.

D. Each party's share on roads, parks and open spaces shall be titled in each party's respective names.

E. Should there be a need to modify or revise the development plans, the **CITY** shall notify the **PRA** by preparing and submitting to the latter such modification or revision for its approval, subject to the provisions stipulated in this Agreement.

F. In the event that the National Government will need additional areas for roads within the Project to improve and enhance the circulation system/network and environmental condition in the City and neighboring communities, notwithstanding that such necessity/order is initiated/issued by a National Government Agency and/or its instrumentality, the **CITY** shall be solely responsible at its cost in complying with the said requirement.

ARTICLE X
TITLING OF THE RECLAIMED LAND

A. For purposes of titling, the reclaimed land shall be divided into Phases. Each Phase shall be equivalent to ten (10%) of the total Project area ("Phase").

B. The PRA shall be responsible for securing the Original Certificate of Title (OCT) for each Phase. Upon receipt of the OCT, and if a phase has attained an elevation of at least four (4) meters MLLW, and depending on whether or not horizontal works have been completed, the PRA shall convey within thirty (30) days the following land share of the CITY:

Phase with complete Horizontal Development in accordance with the approved plans	Phase with incomplete Horizontal Development works
The PRA shall convey 85% of the CITY's share and PRA shall retain the 15% saleable lot of the CITY's share.	The PRA shall convey only 80% of the CITY's share and PRA shall retain the 20% saleable lot of the CITY's share. Five percent (5%) of the above retained area shall be conveyed as soon as the horizontal development works of the Phase of the Project area has been completed in accordance with the approved plans.

The processing of acceptance will only commence upon completion of the reclamation and development works of 75% of total Project area. After acceptance, two-thirds (2/3) of the retained area will be released to the CITY.

C. With respect to the enhanced share of the Government as mentioned in Article IV (B.2) (13), the same shall be subject to a separate agreement to be executed between the parties.

ARTICLE XI
LIMIT OF LIABILITY

A. The **CITY** hereby warrants and holds **PRA** free and harmless from any and all liabilities, suits, actions, claims or damages arising from any death or injuries to persons or damage to or loss of properties or property rights, any environmental damage or any loss resulting from or caused by the **CITY** or the private party contracted by the **CITY** if there be any in the implementation of the Project.

B. **PRA** shall not be held liable for damages in cases of suspension or stoppage of work due to civil disturbance, act of war, act of Government or force majeure rendering it impossible for the **CITY** to proceed with the Project.

ARTICLE XII
GENERAL PROVISIONS

A. **Mutual Cooperation**

The parties shall perform all acts and execute and deliver all documents or instruments required or necessary to fully implement or consummate the transactions contemplated by and the intent underlying this MOA.

B. **Separability**

The provisions of this MOA are separable, and in the event that any one or more of the provisions of this agreement shall be determined or held to be invalid, illegal, unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein shall not in any way be affected and shall continue to be valid and enforceable to the fullest extent permitted by law.

C. **Material Adverse Change**

In the event that, at any time prior to the complete performance by the **CITY** of its obligations under this MOA, there shall occur an extraordinary change in circumstances adversely affecting the construction and/or real estate development business in the country or the ability of the **CITY** to perform its obligations under this agreement, and which change is of such nature and magnitude as to be manifestly beyond the contemplation of the parties when they entered into this agreement, including, but not limited to, 200% or more increase in costs of labor and materials as verified by an industry regulator i.e., Department of Trade and Industry or Department of

Labor, then the period fixed for the **CITY**'s performance of its obligations hereunder may be extended under such terms as may be equitably agreed upon in writing by the parties. The foregoing shall be without prejudice to the right of the parties to negotiate in good faith for other mutually acceptable alternative arrangements in respect of the subject of this MOA.

D. **Waiver**

No failure or delay on the part of the party exercising any right, power or remedy accruing to it upon any breach or default of the other party under this MOA shall impair any such right, power, or remedy nor shall it be construed as a waiver of any breach or default thereafter occurring; nor shall any single or partial exercise of any such right or power preclude any other or partial exercise of any such right or power hereunder. Any waiver, permit, consent or approval of any kind of character on the part of a party of any breach of any provision or condition of this MOA must be in writing and shall be effective only to the extent in such writing specifically set forth.

E. **Entire Understanding**

This MOA, and the documents referred herein or executed concurrently herewith, constitute the entire understanding between the parties and supersede any prior understanding or agreement with regard to the subject matter hereof. There are no representations, agreements, arrangements or understanding, oral or written, between the parties hereto relating to the subject matter hereof which are not fully expressed herein. Any amendment hereto or revision hereof shall be in writing, signed by or on behalf of the party to be bound or burdened thereby.

F. **Assignment**

This MOA shall not be assignable by either party hereto without the prior written consent of the other party.

G. **Settlement of Disputes**

All dispute, controversies, or differences arising out of or in connection with this MOA (including without limitation, questions of interpretation of any of the provisions of this agreement) shall be amicably settled by mutual consultation within thirty (30) days after written notice thereof has been given by the complaining party. Should the parties fail to agree within such period, the dispute shall be submitted for arbitration pursuant to the Administrative Code of 1987.

H. **Notices**

All notices and other communications required or permitted to be given in writing and delivered by personal or registered mail and addressed to such party as follows:

PHILIPPINE RECLAMATION AUTHORITY
7th Floor, Legaspi Towers 200
Paseo de Roxas, Makati City

PASAY CITY
City Hall Building
F.B. Harrison Street
Pasay City

I. **Governing Law**

This MOA shall be governed in all respects, including validity, construction, performance and effect, by laws of the Republic of the Philippines.

J. **Government Rules and Regulations**

This MOA will be subject to the existing government rules and regulations and the review of the Office of the Government Corporate Counsel (OGCC). The comments and suggestions of the OGCC shall form part of this MOA.

K. **Effectivity**

This MOA shall be effective from the signing hereof and confirmation by the PRA Board of Directors.

IN WITNESS WHEREOF, the parties hereunto affix their respective signatures on this ___ day of _____ 2016, Makati City, Philippines.

PHILIPPINE RECLAMATION AUTHORITY
By:

PETER ANTHONY A. ABAYA
General Manager & CEO

PASAY CITY
By:

ANTONINO G. CALIXTO
City Mayor

SIGNED IN THE PRESENCE OF

(Signature over printed name)

Roberto T. Muldong
(Signature over printed name)

ACKNOWLEDGEMENT

Republic of the Philippines)
City of Makati) s.s.
PASAY CITY

I certify that on this date before me, a notary public duly authorized in the city named above to take acknowledgments, personally appeared:

	Competent Evidence of Identity
PETER ANTHONY A. ABAYA	Philippine Passport No. XX4688777 Expiry Date : May 11, 2019 Issued at : DFA Manila
ANTONINO G. CALIXTO	Philippine Passport EB95708013 Expiry Date : Nov.12, 2018

Who are personally known to me to be the same persons described in the foregoing instrument, who acknowledged before me that the signatures on the instrument were voluntarily affixed by them for the purposes stated therein, and who declared to me that they have executed the instrument as their free and voluntary act and deed.

This instrument consisting of _____ (____) pages including the page where the acknowledgement is written has been signed each and every page by the parties and their witnesses.

WITNESS MY HAND AND SEAL this ____ day of 07 JUL 2016 2016.

Doc. No. 425;
Page No. 86;
Book No. LO;
Series of 2016.

ATTY. VIMALYN M. POTOT-BALURAN
Notary Public
Until December 31, 2016
PTR No. 4716213; 1/04/16 Pasay City
IBP O.R. No. 057932; 1/04/16; Lifetime Member
Commission No. 15-01, 1/28/16; Pasay City
Attorney's Roll No. 61610
MCLE Compliance No. V-0021304-01/31/18

APPENDIX A.2

Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc.

A.2a. Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc. Covering 300 Hectares

CONTRACTUAL JOINT VENTURE AGREEMENT

This **AGREEMENT**, entered into by and between-

The **CITY OF PASAY**, a local government unit duly organized and existing under and by virtue of Philippine laws, with address at Pasay City Hall, F. B. Harrison St., Pasay City, represented by its Mayor, **ANTONINO G. CALIXTO**, hereinafter referred to as the **Project Owner**,

-and-

SM LAND, Inc., a corporation duly organized and existing under and by virtue of Philippine laws with office address at Harbor Drive, Mall of Asia Complex, Pasay City, represented by **DAVID L. RAFAEL**, hereinafter called the **Project Developer**,

WITNESSETH THAT:

WHEREAS, the **Project Owner** is duly authorized under its charter and under the provisions of Republic Act No. 7160 otherwise known as The Local Government Code of 1991 to undertake reclamation and development projects within its jurisdiction;

WHEREAS, among the cities in the Greater Manila area, the **Project Owner** has one of the smallest land areas, comprising of only 19 square kilometers more or less, and in dire need for additional land area to accommodate growing demands for residential, commercial and institutional sites due to thriving population and commercial activities in the City;

WHEREAS, the **Project Developer** has offered its experience, expertise and financial capability to implement the reclamation project and to perform the desired raw land reclamation and horizontal development at no cost to the **Project Owner**;

WHEREAS, the **Project Owner**, after subjecting the unsolicited proposal of the **Project Developer** to competitive challenge, and after complying with the legal procedures in the selection of a joint venture

partner, has awarded the reclamation project to the **Project Developer** subject to the terms and conditions embodied in this Agreement;

NOW THEREFORE, for and in consideration of the foregoing premises and the mutual commitments, obligations and undertakings assumed and accepted hereunder, the parties have agreed as follows:

Section 1. DEFINITION OF TERMS

Whenever used in this Agreement, the following terms shall be understood to mean:

a. **"Agreement"** refers to this Joint Venture Agreement including all attachments made as an integral part hereof;

b. **"Formal Acceptance"** refers to the written acknowledgment by the **Project Owner** that the completed project is in accordance with the plans and specifications and that it has been duly turned over to the **Project Owner;**

c. **"DENR"** refers to the Department of Environment and Natural Resources including the divisions, bureaus and offices under it;

d. **"Horizontal Development"** refers to the provision of facilities such as roads, bridges if any, sidewalks, open spaces, drainage, power line, telecommunication, water supply and similar facilities;

e. **"Horizontal Development Cost"** refers to all costs and expenses necessary or incidental to complete the horizontal development works of the project estimated to be in the amount of P 9 billion pesos;

f. **"MOA"** refers to the Memorandum of Agreement to be executed between the Philippine Reclamation Authority (PRA) and the **Project Owner;**

g. **"Parties"** refers to Pasay City and SM Land, Inc. as joint venture partners;

h. **"PRA"** refers to the Philippine Reclamation Authority, formerly known as Public Estates Authority, created under Presidential Decree 1084;

i. **"Project"** refers to the completion of raw land reclamation and horizontal development of the three (300) hectares more or less of foreshore and offshore areas of Pasay City, in accordance with the approved plans and specifications attached hereto, as further described in section 3 hereof;

j. **"Project Cost"** refers to all expenses and costs to complete the project consisting of the raw land reclamation cost and horizontal development cost, estimated to be in the total amount of P 54.5 billion pesos;

k. **"Raw Land Reclamation"** refers to the process of filling up the 300 hectares area through the use of dredge-fill and /or land fill materials to an elevation of 3.25 meters above mean lower low water level (MLLW), contained and consolidated in accordance with the approved plans;

l. **"Raw Land Reclamation Cost"** refers to all costs and expenses to complete the raw land reclamation component of the project, estimated to amount to P 45.5 billion pesos;

m. **"Usable Area"** refers to the area of the Project after reclamation, excluding roads, parks, open spaces and other areas for utilities, which can be sold or devoted to commercial, residential, institutional or other related uses.

Section 2. DOCUMENTS FORMING PART OF THE AGREEMENT

The following documents are hereby made integral part of this Agreement:

Annex A - Pasay City Sangguniang Panlungsod Resolution 3046 S2013
Annex B – SM Land Inc. Board Resolution
Annex C - Master Development Plan
Annex D - Land Form Plan
Annex E - Land Allocation Plan

Annex F - Location Plan
Annex G – Project Description
Annex H – Estimated Cost of Reclamation
Annex I - Reclamation and Development Schedule

Section 3. SCOPE OF THE JOINT VENTURE AGREEMENT

3.1. This Joint Venture Agreement involves the reclamation and horizontal development of 300 hectares more or less, of foreshore and offshore areas of Manila Bay located at western part of the jurisdiction of Pasay City.

3.2. The land use development of the project shall include mixed-use commercial/residential districts, commercial development, institutional centers, public use and other related uses in accordance with the Master Development Plan.

3.3. The estimated Project Cost involved in this Joint Venture Agreement is **P54.5 billion pesos** consisting of raw land reclamation cost of **P45.5 billion pesos** and horizontal development cost of **P9 billion pesos.**

Section 4. OBLIGATIONS OF THE PARTIES

4.1. **The Project Owner shall -**

a. Contribute to the joint venture its rights and privileges to implement the reclamation project, both raw land reclamation and site development, to the exclusion of any other person or entity;

b. Initiate, coordinate, and secure with PRA the necessary clearances, approvals and permits, and facilitate execution of a Memorandum of Agreement with the PRA for the undertaking of the project;

c. Assist the **Project Developer** in securing and obtaining all government permits, licenses and authorizations necessary for the uninterrupted and full implementation of the project;

d. Provide road right of way and other easement rights from other parties necessary for the project, the cost of which shall be paid by the **Project Developer;**

4

e. Make representations and coordinate with PRA, DENR and other concerned government offices, for the issuance of the necessary Proclamation, Special Patent and Certificates of Title for the areas covered by the project;

f. Comply with the Land Allocation Plan in the land distribution of the reclaimed area; and

g. Execute the necessary documents for the full implementation of the Project.

4.2. **The Project Developer shall -**

a. Prepare or cause to be prepared at its expense all necessary documents for submission to concerned government agencies for the approval and implementation of the Project;

b. Provide all funds for fees and assessments that may be required by the PRA and other agencies to secure approvals, permits and clearances for the implementation of the Project;

c. Fully finance all raw land reclamation and horizontal development works pursuant to the approved Land Form Plan and Master Development Plan;

d. Provide the manpower, equipment, machinery, technology, management and all other support facilities for the full implementation of the Project;

e. Provide and identify the source of filling materials for the project, including alternative sources in case the source of filling materials previously identified be inadequate, and comply with all government requirements for securing the necessary permits and clearances for the utilization thereof;

f. Ensure that all foreshore and offshore areas of the project shall be cleared of all structures and all other obstructions which may impede or in any way interfere with the performance of works for the project;

g. Implement the reclamation Project in accordance with the approved Master Development Plan;

h. Provide the funds necessary for the survey and titling of the reclaimed land;

5

l. Assist the **Project Owner** in facilitating the issuance of Proclamation, Special Patent, and Certificates of Title from concerned government offices;

j. Secure comprehensive insurance coverage for the project including contractor's all risk, workmen's compensation and third party liability and provide the **Project Owner** with copies of all policies of insurance effected by it;

k. Post performance security equivalent to 10% of Project Cost before commencement of reclamation works, which performance security shall be assignable to PRA if the latter so requires;

l. Obtain such other insurance and security that may be required by the PRA or any other government agency; and

m. Execute all documents that may be necessary for the full implementation of the project.

4.3. Common Obligations of the Parties

The **Parties** hereto shall-

a. Conduct public information campaign and consultations to promote acceptability of the project and its implementation;

b. Provide assistance to secure and comply with the necessary permits, clearances, consents, and licenses from concerned government agencies as may be required for the implementation of the Project;

c. Cooperate with each other in all stages of the Project to ensure smooth pursuit of all project activities;

d. Protect and support the Project against any objection, negative propaganda, litigation and similar opposition; and

e. Communicate to the other party any information that may affect the Project or its timely implementation and completion;

Sec. 5. SUPERVISION OF THE PROJECT

The Parties shall form a Project Supervision Team (formerly **Project Management Team)** with five members composed of three (3) representatives from the **Project Owner** and two representatives (2)

6

from the **Project Developer** and one (1) representative from the Philippine Reclamation Authority. The Project Management Team shall meet regularly to monitor and manage all activities of the Project, including the preparation of necessary documents, application and issuance of permits and clearances, performance of actual reclamation and development works, and all other tasks necessary to be accomplished for the implementation and completion of the project. The Project Management Team shall be the contact and information center between the Project Owner and the Project Developer for all the necessary information, discussion, decision-making and mutual cooperation that the Project may require.

Sec. 6. IMPLEMENTATION OF THE PROJECT

6.1. Issuance of Reclamation Permit

6.1.1. Immediately after the execution of this Agreement, the Parties shall coordinate and negotiate with PRA the execution of a Memorandum of Agreement (MOA) between PRA and the **Project Owner** involving the issuance of reclamation permit and project implementation.

6.1.2. After the execution of the MOA with the PRA, the **Project Owner** shall authorize and require the **Project Developer** to complete all requirements, including but not limited to the approval and issuance by the DENR of an Environmental Compliance Certificate (ECC) and Environmental Impact Assessment (EIA). All expenses incidental to the completion of the requirements and the issuance of the ECC and EIA shall be for the account of the **Project Developer.**

6.1.3. The **Project Developer** shall also complete all requirements of other government agencies, if any, prior to issuance of the Reclamation Permit by the PRA.

6.1.4. Upon issuance by PRA of the Reclamation Permit, the **Project Owner** shall within five (5) days from receipt thereof issue to the **Project Developer** the Notice to Proceed. The **Project Developer** shall then post a performance security bond equivalent to ten (10%) percent of the Project Cost before commencement of reclamation works.

6.2. Actual Reclamation and Horizontal Development

6.2.1. The **Project Developer** shall commence the reclamation and development upon issuance by the Project Owner of the Notice to Proceed inclusive of all the necessary approvals and reclamation and development permits by appropriate government offices and agencies which has jurisdiction over the project and shall complete the project within a period of seven (7) years from commencement of the reclamation of works. The approved Schedule of Reclamation and Development shall be followed by the **Project Developer** except when it is prevented from doing so by **force majeure** which shall be deemed to refer to natural disaster, storms and typhoons, acts of any court or government agency, change in laws, rebellion, or other causes similar to the foregoing which is beyond the reasonable control of the Parties. The occurrence of such **force majeure** shall automatically extend the period for completion of the project and the periods specified in the Schedule of Reclamation and Development, provided that the **Project Developer** shall promptly notify the **Project Owner** of the delay caused by the occurrence of such event.

6.2.2. The **Project Developer** shall commence and complete the implementation of the reclamation works according to the Schedule of Reclamation and Development, which will involve activities for mobilization, reclamation, soil improvement, construction of breakwaters and containment structures, and other necessary works;

6.2.3. The **Project Developer** shall also perform the works for horizontal development In accordance with the Schedule of Reclamation and Development;

6.2.4. The **Project Developer** shall submit a monthly accomplishment report to the **Project Owner** from the commencement of actual works, and comply with the demand of the **Project Owner** to submit a report at any time deemed necessary by the latter;

6.2.5. The **Project Developer** shall notify the **Project Owner** of the completion of raw land reclamation to enable the latter, in coordination with PRA, to inspect the reclaimed land;

8

6.2.6. Upon completion of all raw land reclamation and horizontal development works, the **Project Developer** shall submit a final report to the **Project Owner.**

6.2.7. The **Project Owner** shall have a period of 30 days from submission of the final report within which to verify faithful compliance by the **Project Developer** with the plans and specifications. The **Project Owner** shall make a Formal Acceptance of the reclamation and horizontal development works if it finds the completed project in accordance with the plans and specifications.

6.3. Issuance of Proclamation, Special Patent and Certificates of Title

6.3.1. Upon completion of the reclamation works, the **Project Developer** shall cause the survey of the reclaimed land and comply with all the requirements as may be imposed for the issuance of Proclamation, Special Patent and Certificates of Title.

6.3.2. The Parties shall apply for and coordinate with PRA, DENR and other government agencies the issuance of all approvals, Proclamation, Special Patent and Certificates of Title to be issued in accordance with existing laws and procedures. Upon receipt by the **Project Owner** of the Certificates of Title under its name, it shall within ten (10) days therefrom, convey to the **Project Developer** the portion pertaining to the latter. The **Project Owner** shall execute, sign and deliver to the **Project Developer** the necessary Deed of Conveyance or similar Deeds, and the titles and documents necessary in order to convey to the **Project Developer** the titles of the **Project Owner** over the portion of the reclaimed land pertaining to the **Project Developer** as payment of its services under this Joint Venture Agreement, and finally to enable the Project Developer to transfer the titles of the said portion in the name of the **Project Developer.**

Sec. 7. DISTRIBUTION OF PROCEEDS

Pursuant to the Land Allocation Plan (Annex E), the reclaimed area shall be distributed as follows:

9

	Area Allocated	Percentage
Pasay City Share (inclusive of the share that the National Government may require)	63 hectares	21%
Project Developer/ SMLI share	147 hectares	49%
Roads/ Open spaces	90 hectares	30%
Total Reclaimed Area	300 hectares	100%

The distribution plan is without prejudice to any reasonable adjustment on the share of the PRA upon its final approval.

Sec. 8. RESCISSION OF THE AGREEMENT AND SUSPENSION OF THE PROJECT

8.1. Rescission Due to Default or Breach

Subject to the provisions of section 10 hereof on **Dispute Resolution**, either Party may rescind this Agreement prior to its completion upon default or breach by the other party of a material provision of this Agreement. Such rescission of this Agreement shall not affect any accrued rights of the non-defaulting-party or the liabilities of the defaulting-party nor shall it affect any provision hereof which is expressly or by implication intended to continue after such cancellation. The defaulting-party shall indemnify and be liable to the non-defaulting party for all costs, damages, liabilities and expenses which the non-defaulting-party shall incur as a result of the default or breach.

8.2. In case of rescission of this Agreement by the **Project Owner** due to the default or breach of the **Project Developer**, the **Project Owner** shall have the right to continue the Project on its own or through another developer, subject to the provision of Section 8.1 hereof.

8.3. Suspension of the Project

If due to a cause which is not attributable to any of the Parties, the **Project Developer** is prevented from completing the raw land reclamation and /or horizontal development of the Project, or when any of the Parties is prevented from performing any of its main obligations due to such cause, this Agreement or such affected part of it shall only be suspended and the rights and obligations of the parties shall be restored upon the cessation of the cause.

Sec. 9. LIABILITY

9.1. The **Project Developer** shall hold the **Project Owner**, its officers and employees free and harmless from any claims or suits of any third party arising from the performance of raw land reclamation and horizontal development works. The **Project Developer** shall be solely liable for payment of wages, benefits and compensations of employees it will hire for purposes of the Project.

9.2. Nothing in this Agreement shall be construed as constituting either party an agent or representative of the other, it being understood that this Agreement is only intended to govern the relationship of the parties for the accomplishment of the Project.

Section 10. DISPUTE RESOLUTION

The Parties hereto agree that in the event of any dispute or difference between them arising out of this Agreement or in the interpretation of its provisions, they shall endeavor to meet together in an effort to resolve such dispute amicably. In appropriate cases, the Parties may execute a supplementary agreement to clarify issues. If a dispute cannot be settled by mutual discussion within thirty (30) days form commencement of discussions, the Parties shall refer the matter for Mediation-Arbitration in accordance with the Alternative Dispute Resolution Act of 2004 and other applicable laws and rules.

Section 11. MISCELLANEOUS PROVISIONS

11.1. Representations

Each of the party herein hereby represents and warrants that: a) it has full power and authority to make, execute and deliver this Agreement,

and has taken or will take all necessary actions or legal steps in connection therewith; b) this Agreement constitutes its legally binding obligations; c) the performance of this Agreement is consistent with its charter documents and any of its contracts, and not in violation of laws, ordinances, rules and regulations; d) there is no pending litigation, arbitration, or investigation which will adversely affect its ability to fulfill its obligations under this Agreement.

11.2. Assignment

No party to this Agreement shall assign, transfer or subcontract this Agreement nor assign any of its rights, obligations or duties to any other party without the prior written consent of the other party.

11.3. Notice

Any notice to be given by any of the Parties under this Agreement shall be in writing and shall be sent to the following addresses:

To the **Project Owner** - Office of the City Mayor
Pasay City Hall
F. B. Harrison St., Pasay City

To **Project Developer** - SM Land, Inc.
10/F One E-Com Center, Sunset Avenue
Mall of Asia Complex, Pasay City

11.4. Governing Law

The provisions of this Agreement shall be governed and interpreted in all aspects by and under the laws of the Republic of the Philippines.

IN WITNESS WHEREOF, the parties hereunto affix their signatures on this 15 NOV 2013 day of November 2013 at Pasay City, Philippines.

12

The City of Pasay	SM LAND, INC.
By:	By:
ANTONINO G. CALIXTO City Mayor	**DAVID L. RAFAEL** Senior Vice President

Signed in the presence of:

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES)
CITY OF PASAY) S.S.

BEFORE ME, a Notary Public for and in Pasay City, personally appeared the following:

	Government Issued ID	Place/Date Issued
ANTONINO G. CALIXTO	DL # N14-73-020221	Valid until 5-10-2014
DAVID L. RAFAEL	SSS No. 03-5501247-1	

known to me to be the same persons who executed the foregoing Joint Venture Agreement and they acknowledged to me that the same is their voluntary act and deed and that of the corporations they represent.

13

The instrument consisting of fourteen (14) pages, including the page/s where the Acknowledgment is written has been signed on each and every page by the parties and their witnesses in my presence.

WITNESS MY HAND AND SEAL this 15 NOV 2013 day of November 2013 at Pasay City, Philippines.

Doc. No.: 426
Page No.: 87
Book No.: 07
Series of 2013

ATTY. VINALYN M. POTOT - BALURAN
NOTARY PUBLIC
UNTIL DECEMBER 31, 2013
PTR NO. 11[illegible] - 13, NAVAL, BILIRAN
IBP NO.[illegible]13, BILIRAN CHAPTER
COMMISSION [illegible], 6 - 30 - 13, PASAY CITY
ROLL NO. [illegible]
MCLE COMPLIANCE NO. IV - 0020543, 5 - 30 - 13

14

A.2b. Contractual Joint Venture Agreement of the City of Pasay and SM Land, Inc. Covering 60 Hectares

CONTRACTUAL JOINT VENTURE AGREEMENT

This **AGREEMENT**, entered into by and between-

The **CITY OF PASAY**, a local government unit duly organized and existing under and by virtue of Philippine laws, with address at Pasay City Hall, F. B. Harrison St., Pasay City, represented by its Mayor, **ANTONINO G. CALIXTO**, hereinafter referred to as the **Project Owner**,

-and-

SM LAND, INC., a corporation duly organized and existing under and by virtue of Philippine laws with office address at 10/F One E-com Center, Harbor Drive, Mall of Asia Complex, Pasay City, represented by its Senior Vice-President, **DAVID L. RAFAEL**, hereinafter called the **Project Developer**,

WITNESSETH THAT:

WHEREAS, the **Project Owner** is duly authorized under its charter and under the provisions of Republic Act No. 7160 otherwise known as The Local Government Code of 1991 to undertake reclamation and development projects within its jurisdiction;

WHEREAS, the **Project Owner** has submitted and obtained from the Philippine Reclamation Authority (PRA) the approval of a reclamation project in Manila Bay, Pasay City covering an area of 60 hectares more or less, involving raw land reclamation and horizontal development;

WHEREAS, among the cities in the Greater Manila area, the **Project Owner** has the smallest land area, comprising of only 19 square kilometers more or less, and in dire need for additional land area to accommodate growing demands for residential, commercial and institutional sites due to thriving population and commercial activities in the City;

WHEREAS, the approved reclamation project, while consisting of 60 hectares, will form part of an existing reclamation area in Manila Bay, Pasay City, and will merely align and connect the unfinished and protruding reclaimed sites along the bank of Libertad Channel up towards north over a span of about 1,290 meters terminating at the offshore vicinity of Gloria Maris in CCP and along SM Mall of Asia;

1

WHEREAS, the **Project Developer** has offered its experience, expertise and financial capability to implement the reclamation project and to perform the desired raw land reclamation and horizontal development at no cost to the **Project Owner**;

WHEREAS, the **Project Owner**, after subjecting the unsolicited proposal of the **Project Developer** to competitive challenge, and after complying with the legal procedures in the selection of a joint venture partner, has awarded the reclamation project to the **Project Developer** subject to the terms and conditions embodied in this Agreement;

NOW THEREFORE, for and in consideration of the foregoing premises and the mutual commitments, obligations and undertakings assumed and accepted hereunder, the parties have agreed as follows:

Section 1. DEFINITION OF TERMS

Whenever used in this Agreement, the following terms shall be understood to mean:

a. **"Agreement"** refers to this Joint Venture Agreement including all attachments made as an integral part hereof;

b. **"Formal Acceptance"** refers to the written acknowledgment by the **Project Owner** that the completed Project is in accordance with the plans and specifications and that it has been duly turned over to the **Project Owner**;

c. **"DENR"** refers to the Department of Environment and Natural Resources including the divisions, bureaus and offices under it;

d. **"Horizontal Development"** refers to the provision of facilities such as roads, bridges if any, sidewalks, open spaces, drainage, power line, telecommunication, water supply and similar facilities;

e. **"Horizontal Development Cost"** refers to all costs and expenses necessary or incidental to complete the horizontal development works of the Project estimated to be in the amount of P1.8 Billion;

f. **"MOA"** refers to the Memorandum of Agreement to be executed between the Philippine Reclamation Authority (PRA) and the **Project Owner**;

g. **"Parties"** refers to Pasay City and SM Land, Inc. as joint venture partners;

h. **"PRA"** refers to the Philippine Reclamation Authority, formerly known as Public Estates Authority, created under Presidential Decree 1084;

i. **"Project"** refers to the completion of raw land reclamation and horizontal development of the sixty (60) hectares more or less of foreshore and offshore areas

of Pasay City, in accordance with the approved plans and specifications attached hereto, as further described in Section 3 hereof;

j. **"Project Cost"** refers to all expenses and costs to complete the Project consisting of the raw land reclamation cost and horizontal development cost, estimated to be in the total amount of P10.1 Billion;

k. **"Raw Land Reclamation"** refers to the process of filling up the 60 hectares area through the use of dredge-fill and /or land fill materials to an elevation of 3.25 meters above mean lower low water level (MLLW), contained and consolidated in accordance with the approved plans;

l. **"Raw Land Reclamation Cost"** refers to all costs and expenses to complete the raw land reclamation component of the Project, estimated to amount to P8.3 Billion;

m. **"Usable Area"** refers to the area of the Project after reclamation, excluding roads, parks, open spaces and other areas for utilities, which can be sold or devoted to commercial, residential, institutional, office or other related uses.

Section 2. DOCUMENTS FORMING PART OF THE AGREEMENT

The following documents are hereby made an integral part of this Agreement:

Annex A - Pasay City Sangguniang Panlungsod Resolution 2905

Annex B – SM Land Inc. Board Resolution

Annex C - Master Development Plan

Annex D - Land Form Plan

Annex E - Land Allocation Plan

Annex F – Location Plan

Annex G – Project Description

Annex H - Estimated Cost of Reclamation

Annex I - Reclamation and Development Schedule

Section 3. SCOPE OF THE JOINT VENTURE AGREEMENT

3.1. This Joint Venture Agreement involves the reclamation and horizontal development of 60 hectares more or less, of foreshore and offshore areas of Manila Bay located at the northern part of the jurisdiction of Pasay City, starting from the bank of the Libertad Channel up towards north over a span of about 1,290 meters

terminating at the offshore vicinity of Gloria Maris in CCP pursuant to the Land Form Plan.

3.2. The land use development of the Project shall include mixed-use, office, commercial/residential districts, commercial development, institutional centers, public use and other related uses in accordance with the Master Development Plan.

3.3. The estimated Project Cost involved in this Joint Venture Agreement is P10.1 Billion consisting of raw land reclamation cost of P8.3 Billion and horizontal development cost of P1.8 Billion.

Section 4. OBLIGATIONS OF THE PARTIES

4.1. **The Project Owner shall -**

a. Contribute to the joint venture its rights and privileges to implement the reclamation project, both raw land reclamation and site development, to the exclusion of any other person or entity;

b. Initiate, coordinate, and secure with PRA the necessary clearances, approvals and permits, and facilitate execution of a Memorandum of Agreement with the PRA for the undertaking of the Project;

c. Assist the **Project Developer** in securing and obtaining all government approval/permits, licenses and authorizations necessary for the uninterrupted prosecution and full implementation of the Project;

d. Provide road right of way and other easement rights from other parties necessary for the Project, the cost of which shall be paid by the **Project Developer**;

e. Make representations and coordinate with PRA, DENR and other concerned government offices, for the issuance of the necessary approval/permit for the project, Proclamation, Special Patent and issuance of Certificates of Title for the areas covered by the Project;

f. Comply with the Land Allocation Plan in the land distribution of the reclaimed area.

g. Execute all the necessary documents for the full implementation of the Project.

4.2. **The Project Developer shall -**

a. Prepare or cause to be prepared at its expense all necessary documents for submission to concerned government agencies for the approval and implementation of the Project;

b. Provide all funds for fees and assessments that may be required by the PRA and other agencies to secure approvals, permits and clearances for the prosecution and implementation of the Project;

c. Fully finance all raw land reclamation and horizontal development works pursuant to the approved Land Form Plan and Master Development Plan;

d. Provide the manpower, equipment, machinery, technology, management and all other support facilities for the full implementation of the Project;

e. Provide and identify the source of filling materials for the Project, including alternative sources in case the source of filling materials previously identified be inadequate, and comply with all government requirements for securing the necessary permits and clearances for the utilization thereof;

f. Ensure that all foreshore and offshore areas of the Project shall be cleared of all structures and all other obstructions which may impede or in any way interfere with the performance of works for the project

g. Implement the reclamation Project in accordance with the approved Master Development Plan;

h. Provide the funds necessary for the survey and titling of the reclaimed land;

i. Assist the **Project Owner** in facilitating the issuance of Proclamation, Special Patent, and Certificates of Title from concerned government offices;

j. Secure comprehensive insurance coverage for the Project including contractor's all risk, workmen's compensation and third party liability and provide the **Project Owner** with copies of all policies of insurance effected by it;

k. Post performance security equivalent to 10% of Project Cost before commencement of reclamation works, which performance security shall be assignable to PRA if the latter so requires;

l. Obtain such other insurance and security that may be required by the PRA or any other government agency; and

m. Execute all documents that may be necessary for the full implementation of the Project.

4.3. **Common Obligations of the Parties**

The **Parties** hereto shall-

a. Conduct public information campaign and consultations to promote acceptability of the Project and its implementation;

b. Provide assistance to secure and comply with the necessary approval/permits, clearances, consents, and licenses from concerned government agencies as may be required for the prosecution and implementation of the Project;

c. Cooperate with each other in all stages of the Project to ensure smooth pursuit of all project activities;

d. Protect and support the Project against any objection, negative propaganda, litigation and similar opposition;

e. Communicate to the other party any information that may affect the Project or its timely implementation and completion;

Sec. 5. SUPERVISION OF THE PROJECT

The Parties shall form a **Project Supervision Team** (formerly Project Management Team) with five members composed of two (2) representatives from the **Project Owner,** two (2) representatives from the **Project Developer** and one (1) representative from the Philippine Reclamation Authority (PRA). The Project Supervision Team shall meet regularly to monitor and supervise the Project Developer in all activities of the Project, including the preparation of necessary documents, application and issuance of permits and clearances, performance of actual reclamation and development works, and all other tasks necessary to be accomplished for the implementation and completion of the Project. The Project Supervision Team shall be the contact and information center between the Project Owner and the Project Developer for all the necessary information, discussion, and mutual cooperation that the Project may require.

Sec. 6. IMPLEMENTATION OF THE PROJECT

6.1. **Issuance of Reclamation Permit**

6.1.1. Immediately after the execution of this Agreement, the Parties shall coordinate and negotiate with PRA the execution of a Memorandum of Agreement (MOA) between PRA and the **Project Owner** involving the issuance of reclamation permit and project implementation.

6.1.2. After the execution of the MOA with the PRA, the **Project Owner** shall authorize and require the **Project Developer** to complete all requirements, including but not limited to the approval and issuance by the

DENR of an Environmental Compliance Certificate (ECC) and Environmental Impact Assessment (EIA). All expenses incidental to the completion of the requirements and the issuance of the ECC and EIA shall be for the account of the **Project Developer.**

6.1.3. The **Project Developer** shall also complete all requirements of other government agencies, if any, prior to issuance of the Reclamation Permit by the PRA.

6.1.4. Upon issuance by PRA of the Reclamation Permit, the **Project Owner** shall within five (5) days from receipt thereof issue to the **Project Developer** the Notice to Proceed. The **Project Developer** shall then post a performance security bond equivalent to ten (10%) percent of the Project Cost before commencement of reclamation works.

6.2. **Actual Reclamation and Horizontal Development**

6.2.1. The **Project Developer** shall commence the reclamation and development upon issuance by the Project Owner of the Notice to Proceed inclusive of all the necessary approvals and reclamation and development permits by appropriate government offices and agencies which has jurisdiction over the project and shall complete the Project within a period of five (5) years from commencement of the reclamation of works. The approved Reclamation and Development Schedule shall be followed by the **Project Developer** except when it is prevented from doing so by **force majeure** which shall be deemed to refer to natural disaster, storms and typhoons, acts God or lawful order of any court or government agency, change in laws, rebellion, or other causes similar to the foregoing which is beyond the reasonable control of the Parties. The occurrence of such **force majeure** shall automatically extend the period for completion of the Project and the periods specified in the Reclamation and Development Schedule, provided that the **Project Developer** shall promptly notify the **Project Owner** of the delay caused by the occurrence of such event.

6.2.2. The **Project Developer** shall commence and complete the implementation of the reclamation works according to the Reclamation and Development Schedule, which will involve activities for mobilization, reclamation, soil improvement, construction of breakwaters and containment structures, and other necessary works;

6.2.3. The **Project Developer** shall also perform the works for horizontal development in accordance with the Reclamation and Development Schedule;

6.2.4. The **Project Developer** shall submit a monthly accomplishment report to the **Project Owner** from the commencement of actual works, and comply with the demand of the **Project Owner** to submit a report at any time deemed necessary by the latter;

6.2.5. The **Project Developer** shall notify the **Project Owner** of the completion of raw land reclamation to enable the latter, in coordination with PRA, to inspect the reclaimed land;

6.2.6. Upon completion of all raw land reclamation and horizontal development works, the **Project Developer** shall submit a final report to the **Project Owner.**

6.2.7. The **Project Owner** shall have a period of 30 days from submission of the final report within which to verify faithful compliance by the **Project Developer** with the plans and specifications. The **Project Owner** shall make a Formal Acceptance of the reclamation and horizontal development works if it finds the completed Project in accordance with the plans and specifications.

6.3. Issuance of Proclamation, Special Patent and Certificates of Title, Real Property Taxes, Formation of Subdivision Association, and Upkeep and Maintenance of the Project

6.3.1. Upon completion of the reclamation works, the **Project Developer** shall cause the survey of the reclaimed land and comply with all the requirements as may be imposed for the issuance of Proclamation, Special Patent and Certificates of Title.

6.3.2. The Parties shall apply for and coordinate with PRA, DENR and other government agencies the issuance of all approvals, Proclamation, Special Patent and Certificates of Title to be issued in accordance with existing laws and procedures. Upon receipt by the **Project Owner** of the Certificates of Title under its name, it shall, within ten (10) days therefrom, convey to the **Project Developer** the portion of the reclaimed lands pertaining to the latter. The **Project Owner** shall execute, sign and deliver to the **Project Developer** the necessary Deed of Conveyance or similar Deeds, and the titles and documents necessary in order to convey to the **Project Developer** the titles of the **Project Owner** over the portion of the reclaimed land pertaining to the **Project Developer** as payment of its services under this Joint Venture Agreement, and finally to enable the **Project Developer** to transfer the titles of the said portion in the name of the **Project Developer**.

6.3.3 The **Project Owner** is exempted from Real Property Taxes and the Real Property Taxes due on the portion of reclaimed land pertaining to the **Project Developer** shall therefore accrue only from the date of issuance of the Transfer Certificates of Title in the name of the **Project Developer** or its designated assignee.

6.3.4 If the **Project Owner** refuse to accept the developed property being turned over by the **Project Developer**, a top independent appraiser mutually acceptable to both **Project Owner** and **Project Developer**, shall be requested to appraise the Project/Subdivision to find out if the development undertaken by the **Project Developer** conforms with the **Project Owner's** approved plans and specifications. Should the independent appraiser reports/certifies that the **Project Owner** unreasonably refuse to accept the property, the Project having conformed with the agreed plans and specifications, the property is deemed accepted by the **Project Owner** and that costs of appraisal shall be borne by the **Project Owner**. On the other hand, should the **Project Owner's** non-acceptance of the turn-over is found to be based on meritorious grounds as certified by the top independent appraiser, the **Project Developer** should continue with the development works until the developed property is acceptable to the **Project Owner** or as deemed accepted by the **Project Owner** as certified by the top independent appraiser and that costs of appraisal shall be for the account of the **Project Developer**.

6.3.5 The parties agree, subject to the approval of the PRA, that as soon as the horizontal development of the Project has been completed, the Project/Subdivision Association (Association) shall be organized for and in their behalf and on behalf of all prospective owners of the land in the Project. The **Project Owner** is not required to be a member of the Association, provided, that, in the event the Project Owner will dispose its allocated land to private entities the new owners are automatically considered members of the association. Membership to the Association shall be mandatory to all prospective owners of the land in the Project (except the Project Owner) who shall be bound by the Articles and By-Laws of the Association and by the rules and regulations of the Association. This condition shall be annotated on all the titles of lots in the Project.

Sec. 7. DISTRIBUTION OF PROCEEDS

Pursuant to the Land Allocation Plan (Annex E), the reclaimed area shall be distributed as follows:

	Area allocated	Percentage
Pasay City /PRA /National Government	30.6 hectares	51%
Project Developer	29.4 hectares	49%
Total Reclaimed Area	60 hectares	100%

Sec. 8. RESCISSION OF THE AGREEMENT AND SUSPENSION OF THE PROJECT

8.1. **Rescission Due to Default or Breach**

Subject to the provisions of Section 10 hereof on **Dispute Resolution**, either Party may rescind this Agreement prior to its completion upon default or breach by the other party of a material provision of this Agreement. Such rescission of this Agreement shall not affect any accrued rights of the non-defaulting party or the liabilities of the defaulting-party nor shall it affect any provision hereof which is expressly or by implication intended to continue after such cancellation. The defaulting party shall indemnify and be liable to the non-defaulting party for all costs, damages, liabilities and expenses which the non-defaulting party shall incur as a result of the default or breach.

8.2. In case of rescission of this Agreement by the **Project Owner** due to the default or breach of the **Project Developer**, the **Project Owner** shall have the right to continue the Project on its own or through another developer, subject to the provision of Section 8.1 hereof.

8.3. **Suspension of the Project**

If due to a cause which is not attributable to any of the Parties, the **Project Developer** is prevented from completing the raw land reclamation and /or horizontal development of the Project, or when any of the Parties is prevented from performing any of its main obligations due to such cause, this Agreement or such affected part of it shall only be suspended and the rights and obligations of the parties shall be restored upon the cessation of the cause.

Sec. 9. LIABILITY

9.1. The **Project Developer** shall hold the **Project Owner**, its officers and employees free and harmless from any claims or suits of any third party arising from the performance of raw land reclamation and horizontal development works. The **Project Developer** shall be solely liable for payment of wages, benefits and compensations of employees it will hire for purposes of the Project.

9.2. Nothing in this Agreement shall be construed as constituting either party an agent or representative of the other, it being understood that this Agreement is only intended to govern the relationship of the parties for the accomplishment of the Project.

Section 10. DISPUTE RESOLUTION

The Parties hereto agree that in the event of any dispute or difference between them arising out of this Agreement or in the interpretation of its provisions, they shall endeavor to meet together in an effort to resolve such dispute amicably. In appropriate cases, the Parties may execute a supplementary agreement to clarify issues. If a dispute cannot be settled by mutual discussion within thirty (30) days from commencement of discussions, the Parties shall refer the matter for Mediation-Arbitration in accordance with the Alternative Dispute Resolution Act of 2004 and other applicable laws and rules.

Section 11. MISCELLANEOUS PROVISIONS

11.1. **Representations**

Each of the party herein hereby represents and warrants that: a) it has full power and authority to make, execute and deliver this Agreement, and has taken or will take all necessary actions or legal steps in connection therewith; b) this Agreement constitutes the legally binding obligations of the parties, their successors-in-interest or assigns; c) the performance of this Agreement is consistent with its charter documents and any of its contracts, and not in violation of laws, ordinances, rules and regulations; d) there is no pending litigation, arbitration, or investigation which will adversely affect its ability to fulfill its obligations under this Agreement;

11.2. **Assignment**

No party to this Agreement shall assign, transfer or subcontract this Agreement nor assign any of its rights, obligations or duties to any other party without the prior written consent of the other party.

11.3. **Reclamation of Additional Areas**

Subject to applicable laws and guidelines, including the rules on procurement and/or competitive challenge, the parties hereby acknowledge that any additional expansion of the reclaimed land covered by the Project that may be needed in the future shall be discussed by the Parties with the view to have a mutual agreement.

11.4. The parties warrant that they did not, will not or have not, directly or indirectly, at any time offer or give or agree to give any person any gift or consideration of any kind or an inducement or reward for performing or refraining to do any act in relation to the obtaining or execution of this Agreement.

11.5. This Agreement shall be annotated at the back of the Certificates of Titles of the reclaimed land subject hereof;

11.6. If any term, provision or conditions of this Agreement is subsequently declared invalid, null or void, or contrary to law by the court of competent jurisdiction, the validity of the other terms, provisions or conditions not affected by such declaration of nullity, shall remain valid and binding upon the parties, their successor or assigns.

11.7. **Notice**

Any notice to be given by any of the Parties under this Agreement shall be in writing and shall be sent to the following addresses:

To the Project Owner - Office of the City Mayor
Pasay City Hall
F. B. Harrison St., Pasay City

To Project Developer - SM Land, Inc.
10/F One E-Com Center, Harbor Drive
Mall of Asia Complex, Pasay City

11.8. **Governing Law**

The provisions of this Agreement shall be governed and interpreted in all aspects by and under the laws of the Republic of the Philippines.

IN WITNESS WHEREOF, the parties hereunto affix their signatures on this OCT 23 2012 of October, 2012, at Pasay City, Philippines.

The CITY OF PASAY

By:

ANTONINO G. CALIXTO
City Mayor

SM LAND, INC.

By:

DAVID L. RAFAEL
Senior Vice-President

Signed in the presence of:

12

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES)
CITY OF PASAY) S.S.

BEFORE ME, a Notary Public for and in Pasay City, personally appeared the following;

	Identification	Place/Date Issued
ANTONINO G. CALIXTO	DL#N14-78-030224	valid until 5-10-14
DAVID L. RAFAEL	SSS No. 03-5501247-1	

known to me to be the same persons who executed the foregoing Joint Venture Agreement and they acknowledged to me that the same is their voluntary act and deed and that of the corporations they represent.

The instrument consisting of thirteen (13) pages including the page where the Acknowledgment is written has been signed on each and every page by the parties and their witnesses in my presence.

WITNESS MY HAND AND SEAL this OCT 2 3 2012 day of _____, 2012 at Pasay City, Philippines.

Doc. No.: 305
Page No.: 82
Book No.: XVI
Series of 2012

ATTY. CHRISTINE DUGENIO
NOTARY PUBLIC
UNTIL DECEMBER 31 2012
PTR NO. 0272632 1/11/12LP
IBP NO. 878344 1/5/12 RSM
ROLL NO. 40987 TIN 155393900

13

APPENDIX A.3

Area Clearance: AC-NCR-2019-003

A.3. Area Clearance: AC-NCR-2019-003

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

PHILIPPINE RECLAMATION AUTHORITY
RECEIVED
AUG 16 2019
TIME: 4:47 PM
BY: Tracy

Atty. ALBERTO C. AGRA
Chairman
Philippine Reclamation Authority (PRA)

ATTY. JANILO E. RUBIATO
General Manager and CEO
Philippine Reclamation Authority (PRA)

RE: Area Clearance for the 360-Hectare Reclamation Project in Manila Bay

Gentlemen:

In partial compliance with PRA Administrative Order No. 2007-02, the City is hereby forwarding the official copy of the Area Clearance dated 15 August 2019 duly signed by DENR Secretary Roy Cimatu for the proposed 360-hectare reclamation project in the Manila Bay.

We hope that the foregoing submission is in order.

Should you have any questions, you may address the same to the City Legal Officer, Atty. Severo C. Madrona Jr., who may be reached at Pasay City Hall, F.B. Harrison St. or by Telephone at (02) 8333729.

Thank you.

Very truly yours,

IMELDA CALIXTO-RUBIANO
City Mayor

Republic of the Philippines
Department of Environment and Natural Resources
Visayas Avenue, Diliman, Quezon City
Trunk line (632) 929-66-26 • 929-6620 • 929-6635 • 929-4028
Voice-Over-Internet-Protocol (VOIP) Trunkline (632) 755-3330

AREA CLEARANCE FOR THE PROPOSED 360-HECTARE PASAY RECLAMATION PROJECT
(AC-NCR-2019-003)

After a thorough review of the requirements submitted and assessment of the suitability of the area for reclamation based on its status, appropriate use and potential impact to the environment, including mitigation and enhancement measures, the APPLICANT, the **LOCAL GOVERNMENT UNIT - CITY OF PASAY**, is hereby granted this Area Clearance, for the proposed **360-Hectare Pasay Reclamation Project** located along Manila Bay within the municipal waters of the City of Pasay by the Department of Environment and Natural Resources.

This Area Clearance is issued with the following details:

PROJECT DESCRIPTION

This Area Clearance covers the reclamation project by the City of Pasay named **360-Hectare Pasay Reclamation Project.** The project shall be undertaken for the purpose of establishing an integrated community with areas for tourism, office, residential, commercial, and other non-industrial mixed uses. The project entails the reclamation of two land masses with an approximate area of 360 hectares, which will be located off the coast of Manila Bay near Coconut Palace and at the back of Mall of Asia. It is centered approximately at Latitude 14°33'N and Longitude 120°59'E.

This Area Clearance is issued in accordance with the requirements of Executive Order (EO) No. 672 dated 09 October 2007, E.O. No. 146 dated 13 November 2013, E.O. No. 74 dated 01 February 2019 and DENR Administrative Order (DAO) No. 2018-14 dated 10 July 2018, which provides the Guidelines on the Issuance of Area Clearance for Reclamation Projects and Proclamation/Special Patents over Reclaimed Lands.

Non-compliance with any of the conditions and issues/considerations shall be dealt with in accordance with Section 23 of DAO 2018-14.

CERTIFIED TRUE/XEROXED COPY
OF ORIGINAL
MYRNA C. QUIPIT
Records Officer 25-10-2019

Prior to the implementation of the reclamation project, the proponent must strictly comply with the conditions imposed by the different agencies as expressed in their respective letters, for which conditions mentioned are beyond the mandate of DENR. In addition to these conditions, all issues/considerations as enumerated below must be addressed and ensured by the proponent.

CONDITIONS FROM CONCERNED GOVERNMENT AGENCIES:

1. **Philippine Reclamation Authority (PRA)**
   - That they underscored that the "no objection" clearance is not equivalent to the "Reclamation Permit" and "Notice to Proceed" which they require prior to the actual reclamation works.

2. **Philippine Ports Authority (PPA)**
   - That the proposed reclamation project shall neither obstruct anchorage operations in the Manila Bay nor block the entrance navigational channels, fairways and berths of South Harbor; and
   - The port components of the proposed reclamation project, if any, shall be subject to the written consent of the Authority and the detailed feasibility study and plans shall be submitted for approval prior to implementation.

3. **Bureau of Fisheries and Aquatic Resources (BFAR)**
   - Submission of the Pasay City comprehensive sea use plan or coastal resources management plan;
   - Provision of your marine spatial plan that will take into consideration the Pasay City waters as an ecosystem unit of the whole Manila Bay ecosystem and interactions *vis a vis* reclamation project;
   - Copy of environmental assessment study that will show minimal or no negative impact on the fisheries spawning and nursery grounds located on the eastern side of Manila Bay;
   - Copy of mitigation study with recommended mitigation measures; and
   - Provision of financial package for affected fisherfolks to make up for their loss of livelihood.

4. **Department of Public Works and Highways (DPWH)**
   - That the Department requests copy of plans and other details regarding the projects to serve as their reference in case there will be future projects near the site.

5. **Department of Information and Communications Technology (DICT)**
   - That the Department requests that they be included in the appropriate negotiations for the laying of ducts and subducts for the installation of optic fiber cables.

CERTIFIED TRUE/XEROXED COPY
OF ORIGINAL
Records Officer
16 AUG 2019

6. **Philippine Navy (PN)**
   - That the Philippine Navy stated that there are no foreseeable negative implications to the operational requirement in Manila Bay on the Philippine Navy Headquarters yacht basin, whichrequirement can be deviated once actual reclamation commence; and
   - Philippine Navy in a letter dated 02 June 2019 provided the minimum requirements specifications/dimension of channels between the proposed areas to be reclaimed by the different LGUs for the safe passage of their watercrafts/vessels which should be 500 meters width between reclamation projects, 15 meters water depth measured from the lowest tide, and 50 meters vertical clearance measured from the highest tide.

ISSUES AND CONSIDERATIONS:

1. **Engineering Geological and Geo-hazard Assessment Report (EGGAR)**

The study was undertaken to assess the proposed project area to determine its susceptibility to natural and man-made hazards and its suitability for the intended purpose.

The EGGAR identified the several potential hazards that must be considered by the proponent, to name a few:

- There are several channels and rivers present along the Manila mastline. Some of these channels area situated close to the proposed land reclamations. From north to south these are Libertad Channel, Redemptorist outfall, Seaside outfall and Parañaque River. The proposed reclamation project in Pasay City is about 120 meters north of Libertad Channel. Due to the planned reclamation works, said channels will be lengthened and there will be additional channel with a north-south orientation between the existing coastline;
- Per geologic hazard assessment, the area investigated is prone to ground shaking hazard due to the presence of several earthquake generators in the region;
- The proposed reclamation project will undergo backfilling and is considered to be highly susceptible to differential settlement and subsidence due to natural and anthropogenic causes. The cumulative effects can be very damaging to the project if not properly addressed in the engineering design;
- The proposed project being a reclamation area located along the shoreline of the Manila Bay is inherently susceptible to liquefaction. It falls on the delineated areas of high hazard for liquefaction by PHILVOCS;
- Moreover, the project site, being located along the coast Manila Bay, is susceptible to tsunami due to the presence of an active subduction zone – Manila Trench located west of the area and other active faults and/or earthquake generators such as West Valley Fault and Lubang Fault;
- The location of the reclaimed land will be such that it will be the nearest to the [illegible] relative to pre-existing sites. This makes it most vulnerable to storm

CERTIFIED TRUE/XEROXED COPY
OF ORIGINAL
Records Officer
16 AUG 2019

surge and flooding. It is therefore imperative that an appropriate drainage system should be constructed by the project proponent taking into consideration the mean amount of rainfall in the project area; and

- It is recommended in the EGGAR that buildings and structures that would be constructed on the proposed reclamation site must be able to withstand an earthquake with at least 7.2 magnitude. It should also be founded on the solid bedrock and appropriate foundation design should be put in place to mitigate these hazards. Fill materials must be fully engineered and compacted/densified to ensure stability. The engineering design should provide adequate channels, drainages, and runoff discharges to the open sea. Continuous monitoring of structural defenses should be implemented.

All recommendations stated in the EGGAR must be ensured/complied by the proponent.

2. Potential Environmental Impacts, and Mitigation/Enhancement Measures

The proponent must strictly comply with all the commitments, mitigating measures and monitoring requirements contained in the Environmental Impact Statement (EIS), particularly in the Environmental Management and Monitoring Plans (EMMoPs), and as prescribed in the issued ECC. If there would be any changes in the project area configuration, the proponent must coordinate with the Environmental Management Bureau for the amendment of the ECC.

The Environmental Impact Statement (EIS) of the project is specific to the impact of the Manila Waterfront City Reclamation Project to the environment. It does not provide documentation of comprehensive studies on environmental baseline conditions of the contiguous area, and does not include assessment of the carrying capacity of Manila Bay to absorb cumulative impacts in relation to other proposed reclamation projects in the area.

Moreover, the Environmental Impact Study (EIS) submitted to the EMB covered environmental impacts on the four (4) major modules: land, water, air and people during the construction of land mass and land development phase. The proponent should conduct further environmental impact study on the future vertical development once it will be introduced taking into consideration air pollution, traffic congestion, solid waste management, water quality management, and influx of migrant workers and tourists, among others.

3. Source of Filling Materials

Per submitted project description, this reclamation project would require a total volume of more or less 126 million cubic meters of filling materials which is proposed to be sourced from PRA offshore burrow area at San Nicolas Shoal.

The provisions of DAO 2000-25 dated 09 March 2000 provides that the PEA (now PRA) shall be responsible for the identification of Borrow Areas as sources of Dredgefill

CERTIFIED TRUE/XEROXED COPY
OF ORIGINAL
MYRNA G. GOPEZ
Records Officer
16 AUG 2019

Materials for all Government Reclamation Projects, *subject to verification by DENR* with respect to environmental concerns. Considering that the identified source of this project is the San Nicolas Shoal, and as per information gathered from the Mines and Geosciences Bureau, San Nicolas Shoal has limited supply of filling materials, the identification of borrow areas as source of filling materials for reclamation projects within Manila Bay must be further evaluated/reviewed by PRA in coordination with concerned offices within the DENR.

4. **Studies Relative to Manila Bay**

- **NEDA Draft Master Plan Report**

The draft Master Plan Report from the National Economic and Development Authority (NEDA) relative to the Manila Bay Sustainable Development Master Plan mentioned the following considerations to be included in the design, to wit:

- Land reclamation plans should include both horizontal and vertical plans to show how the necessary water supply, electricity, waste water collection and treatment, transport services etc, will be provided without causing negative impacts on the region's services availability; and
- Land reclamation plans should include combined environmental impact assessment

Anchoring on the findings and recommendations of the NEDA study, the proponent should consider a responsible and integrative reclamation approach promoting generous corporate social responsibility.

- **The Economics of Ecosystems and Biodiversity (TEEB)**

The Economics of Ecosystems and Biodiversity (TEEB) study presented four (4) management scenarios with benefits and costs analysis, present value of costs, and present value of net benefits. For the management scenario "with reclamation," that in terms of services provided by the ecosystem, the possible loss will be compensated if there will be higher ecosystem services for rehabilitation and protection, compared to no rehabilitation and protection. Hence, higher, appropriate, and sustainable rehabilitation and protection services must be ensured by the proponent.

On the aspect of equity, the report mentioned that the likely losers are the informal settlers, fishers, hotels with diminished sunset views, and commercial establishments at the current, premium seaside locale. The high potential gains from reclaimed land could enable revenues to be generated for the compensation of the losers for which the payment mechanisms need to be properly designed.

Both studies did not provide any reference nor recommendation as regards to the qualified areas where reclamations should be placed within Manila Bay.

CERTIFIED TRUE/XEROXED COPY
OF ORIGINAL
Records Officer 16 AUG 2019

5. **Distance between the Existing Manila Bay Land Mass and the Proposed First Island of the Project; Width Channel between the Proposed Reclamation Islands (including its distance to other Projects)**

As per projection of the project site using the given technical descriptions, the determined distance are as follows:

- The proposed 60-hectare first reclamation island has a distance of approximately 3 meters from the GSIS Complex, approximately 32 meters from Gloria Maris, approximately 256 meters from SM Ferry Terminal, and its northern end appears to be adjoining/overlapping the Paseo Palisoc Circle;
- The proposed 300-hectare second reclamation island has an approximately 207 meters from Conrad Hotel, approximately 177 meters away from the proposed Pasay Harbor Reclamation Project, and the middle island portion is directly across the Libertad Channel; and
- The width channel between the 60-hectare and the 300-hectare proposed reclamation islands is approximately 206 meters.

Considering the foregoing information, the proponent must ensure that there is enough space so as not to impede the natural flow of water in the area. Likewise, the proponent must coordinate with the Philippine Navy (PN) relative to the minimum requirement of 500 meters width channel in case there is a need for PN watercraft/vessel to pass between channels.

This Area Clearance is without prejudice to any considerations and additional conditions that may be imposed to address concerns that may arise based on studies and development.

This Area Clearance is valid for five (5) years from date of issue subject to the provisions of DAO 2018-14.

Issued this AUG 15 2019 at DENR, Quezon City, Philippines.

Approved by:

ROY A. CIMATU
Secretary

SENRO56851

CERTIFIED TRUE/XEROXED COPY
OF ORIGINAL
Records Officer
16 AUG 2019

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

PASAY THE TRAVEL CITY
the Pearl begins here!

029-0187 / 819-10-23

DENR-NCR
OFFICE OF THE REGIONAL DIRECTOR
DOC. NO.
RECEIVED | RELEASED
BY:
DATE:
TIME:

AUTHORIZATION

This authorizes **ATTY. SEVERO C. MADRONA, JR., ATTY. VINALYN POTOT-BALURAN, ATTY. SHEALTIEL TAPLAC-ROXAS** and **RAUL DOMINIC B. SALAO**, all from the City Legal Office, LGU-Pasay City to receive the official copy of the Area Clearance dated 15 August 2019 duly signed by DENR Secretary Roy Cimatu for the proposed 360-hectare reclamation project in the Manila Bay.

Pasay City, 16 August 2019.

IMELDA CALIXTO-RUBIANO
City Mayor

Department of Environment and Natural Resources
National Capital Region

AUG 1 6 2019

HON. IMELDA CALIXTO-RUBIANO
City Mayor
Pasay City Hall, F.B. Harrison St.,
Pasay City

Subject: Area Clearance (AC) for 360-Hectare Pasay Reclamation Project

Dear Honorable Mayor Calixto-Rubiano:

This refers to the Area Clearance application of the LGU-City of Pasay filed on 15 October 2018 by then Mayor Antonino G. Calixto, for the proposed *360-Hectare Pasay Reclamation Project* covering an approximate area of 360 hectares, under a Joint Venture Agreement (JVA) with SM Prime Holdings Inc.

Please be informed that the **Area Clearance No. AC-NCR-2019-003** has been issued for the said project by the DENR on 15 August 2019. The original copy of the said Area Clearance along with the project's case folder is hereto attached.

Thank you.

Very truly yours,

JACQUELINE A. CAANCAN, *CESO V*
Regional Executive Director

LTR20190816-6294

National Ecology Center, East Avenue, Diliman, Quezon City
Telephone Nos. (632)373-3433 / (632)374-0106 / Trunkline: (632)755-3330 loc. 3215, 3212, 3206
Website: www.ncr.denr.gov.ph

APPENDIX A.4

ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017

A.4. ECC-CO-1601-0003 by DENR EMB Central Office on 24 October 2017

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

ENVIRONMENTAL COMPLIANCE CERTIFICATE
(Issued pursuant to Presidential Decree No. 1586 and its IRR)
ECC-CO-1601-0003

THIS IS TO CERTIFY THAT THE PROPONENT, *Pasay City Government* as represented by its City Mayor, ***Honorable Antonino G. Calixto***, is granted this Environmental Compliance Certificate (ECC) for the **Reclamation Project** located along the Coast of Manila Bay, City of Pasay by the Department of Environment and Natural Resources (DENR) through the Environmental Management Bureau (EMB).

SUBJECT ONLY to the conditions and restrictions set in this ECC and in the attached documents labeled as Annexes A and B.

This Certificate is issued with the following detail:

PROJECT DESCRIPTION

The project shall cover the **reclamation and horizontal land development of three hundred sixty (360) hectares** along the Coast of Manila Bay, City of Pasay. The project is bounded by the coordinates as listed in its Environmental Impact Statement (EIS).

The proposed project will include construction of major/primary internal access roads and bridges, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems.

This Certificate is issued in compliance with the requirements of Presidential Decree No. 1586 and its Implementing Rules and Regulations. Non-compliance with any of the provisions shall be a sufficient cause for its cancellation and/or imposition of a fine in an amount not to exceed Fifty Thousand Pesos (PhP 50,000.00) for every violation thereof. The Department, however, is not precluded from reevaluating, adding, removing, and correcting any deficiencies or errors that may be found after issuance of this Certificate.

Issued at DENR, Quezon City, Philippines, this _____.

ENGR. METODIO U. TUPPELLA
Director

STATEMENT OF ACCOUNTABILITY

I, ***Honorable Antonino G. Calixto,*** Mayor of Pasay City Government and proponent of this 360-hectare Reclamation Project located along the Coast of Manila Bay, City of Pasay take full responsibility in complying with all conditions contained in this Environmental Compliance Certificate (ECC).

Signature

TIN 148978266

Subscribed and sworn to before me in this 25 OCT 2017, the above-named affiant taking oath presenting his _____ No. _____ issued on _____ at _____.

DOC. NO. 285
PAGE NO. 58
BOOK NO. 67
SERIES OF 2017

ATTY. VINALON M. POTOT-BALURAN
Signature of Administering Officer
Until December 31, 2018
PTR No. 5383054, 1/03/17, Pasay City
IBP O.R. No. 1053328, 12/09/16, Biliran Chapter
Commission No. 17-08, 1/24/17, Pasay City
Attorney's Roll No. 56543
MCLE Compliance No. VI-0001504, 5/13/16

SEMR052668

ENVIRONMENTAL COMPLIANCE CERTIFICATE
360-hectare Reclamation Project
Pasay City Government
Along the Coast of Manila Bay, City of Pasay

Page 3 of 7

24 OCT 2016

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph. / Email: mail@emb.gov.ph

ECC-CO-1601-0003

Honorable Antonino G. Calixto
City Mayor
PASAY CITY GOVERNMENT
F.B. Harrison St., Pasay City

SUBJECT: ENVIRONMENTAL COMPLIANCE CERTIFICATE

Dear **Sir**:

This refers to your submitted Environmental Impact Statement (EIS) in connection with your Environmental Compliance Certificate (ECC) application for your proposed **360-hectare Reclamation Project** located along the coast of Manila Bay, City of Pasay.

After satisfying the requirements in the said application and upon recommendation of the Environmental Management Bureau (EMB), this Department has decided to grant an ECC to the above-mentioned project.

With the issuance of the ECC, you are expected to fully implement the measures presented in the EIS intended to protect and mitigate the project's predicted adverse impacts on community health, welfare and the environment. Environmental considerations shall be incorporated in all phases and aspects of the project.

This Certificate does not create any right nor be used as an authorization to implement the project, you may proceed with the implementation only after securing all the necessary and relevant permits from other pertinent Government Agencies. This Office shall be monitoring the project periodically to ensure strict compliance with the stipulations cited in the attached ECC.

Please be guided accordingly.

Very truly yours,

By the Authority of the Secretary:

ENGR. METODIO G. TUPAZ JR.
Director

Cc: EMB Regional Office – NCR
Philippine Reclamation Authority (PRA)
DENR – NCR
National Museum - Cultural Properties Division
NHCP - Historical Preservation Division
DOH

Philippine Navy
Philippine Coast Guard
DA – BFAR
DPWH
DOLE
MMDA Central Office

Protect the environment... Protect life...

Annex A

I. CONDITIONS

ENVIRONMENTAL MANAGEMENT

All commitments, mitigating measures and monitoring requirements, especially those contained in the Environmental Impact Statement (EIS), particularly in the Environmental Management and Monitoring Plans (EMMoPs) as approved by the EMB, shall be instituted to minimize any adverse impact to the environment throughout the project implementation including among others the following, *to wit*:

1. Submission of a Coastal Ecosystem Management Plan/Program and Environmental Management Plan (EMP) consistent with; (a) DENR Manila Bay Coastal Strategy and its Operational Plan, (b) Continuing Supreme Court Mandamus on Manila Bay, (c) PRA laws and policies, (d) PRA Boulevard 2000 Integrated Framework Plan, and (e) the City of Manila and Pasay related rules and regulations one hundred twenty (120) days prior to project implementation;

2. Undertake an effective and continuing Information, Education and Communication (IEC) Program to inform and educate all stakeholders, especially its local residents, employees of commercial and government establishments within the site and vicinity, on the project's mitigating measures embodied in its EIS and the conditions stipulated in this Certificate;

3. Provide a detailed Social Development Program (SDP) based on the framework submitted in the EIS and shall be submitted sixty (60) days from receipt of this Certificate;

4. Conduct a more detailed geotechnical marine soil investigation and seismic risk analysis to be consider in the final engineering design for submission to EMB Central Office before any horizontal development activity;

GENERAL CONDITIONS

5. Proper storm drainage system, concrete culverts, and other flood and erosion control measures shall be provided during the construction phase to adequately protect the receiving water body from siltation, physico-chemical/marine pollution and further protect the surrounding communities from environmental degradation;

6. Adequate land area shall be allotted for the construction of a centralized sewage treatment facility to be able to treat all the wastewater that will be generated by the locators prior to discharge;

7. Submit a reforestation and carbon sink program using endemic/indigenous species to mitigate greenhouse gas (GHG) emissions in line with the DENR's thrust on GHG emission reduction programs. The program's status of implementation shall be submitted to EMB Central Office every six (6) months as part of its compliance monitoring report;

8. Submit a detailed Master Plan to cover the entire reclamation projects one (1) year prior to project construction;

SENR052668

9. The proponent shall set up the following:

   9.1 A readily available Environmental Guarantee Fund (EGF) which can be replenished anytime to cover the following:
   a) expenses for further environmental assessments;
   b) compensation, indemnification for whatever damages to life and property that may be caused by the project; and
   c) rehabilitation and/or restoration of areas affected by the project's implementation.

   9.2 A Multi-partite Monitoring Team (MMT) composed of representative(s) from the proponent, local environmental Non-Government Organization (NGO) concerned, the Manila Bay Coordinating Office, PAGASA, DPWH and other concerned government agencies shall be organized consistent with DAO 2003-30. The MMT shall primarily oversee and report to EMB Central Office full compliance of proponent with the EMP/EMoP, other commitments, as well as mitigation measures that are contained in the EIS documents and conditions herein enumerated; and

   9.3 A replenishable Environmental Monitoring Fund (EMF) to cover all costs attendant to the operation and monitoring activities of the MMT including but not limited to capability building, training, actual sampling and laboratory analysis. Said provisions must be consistent with the DAO 2003-30.

   The amount and mechanics of the EGF, EMF, and the establishment of the MMT shall be determined by EMB Central Office and the proponent in consultation with EMB Regional Office, through an integrated Memorandum of Agreement (MOA) which shall be submitted to the EMB Central Office for approval within ninety (90) days upon receipt hereof;

10. An Environmental Unit (EU) shall be established to completely handle the environment related aspects of the project in addition to the monitoring requirements as specified in the Environmental Management Plan (EMP)/Environmental Monitoring Plan (EMoP). The EU shall:

   10.1 Monitor actual project impacts vis-á-vis the predicted impacts and management measures in the EIS;

   10.2 Ensure that monitoring and submission of reports to EMB (Central Office and NCR) are carried out as required;

   10.3 Submit a Decommissioning Plan one (1) year prior to completion of reclamation activity. It shall include rehabilitation and clean-up measures;

   10.4 Submit the geographical coordinates of the actual area approved by PRA to be reclaimed prior to project construction; and

   10.5 Conduct a continuing consultation with the stakeholders in updating EMP and EMoP that shall include necessary baseline data, geohazard and disaster risk reduction and management and ground settlement monitoring of the reclaimed area.

11. Ensure that its contractors and subcontractors properly comply with the relevant conditions of this Certificate including those regulations covering the entire activity of the project;

II. RESTRICTIONS

12. The proponent shall notify the EMB Central Office the location and source of filling materials;

13. The proponent shall use filling materials from legal suppliers/suppliers that secure necessary government permits;

14. No activity shall be undertaken unless the following documents are submitted to this Office within one hundred twenty (120) days prior to project implementation;

    a. Clearance/notice to proceed (NTP) duly issued by the Philippine Reclamation Authority (PRA);
    b. Area Clearance issued by the DENR; and
    c. Approval from the National Economic and Development Authority in accordance with Executive Order No.146 and the Implementing Rules and Regulation thereof.

15. No other activities shall be undertaken other than what was stipulated in the EIS document. Expansion of the project/construction of other structures or any change in the activity beyond those stated in the EIS shall be subject to a new Environmental Impact Assessment; and

16. Transfer of Ownership of this project carries these same conditions and restrictions for which written notification must be made by herein grantee to EMB within fifteen (15) days from such transfer.

O.R. No. : 6694949
Date : 10 December 2015
Processing Fee : ₱ 6,060.00

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
SENR052668

Annex B

PROJECT ASSESSMENT PLANNING TOOL

For the assistance of the Proponent and Government agencies concerned in the management of the project and for better coordination in mitigation of the impact of the project on its surrounding areas and to the environment. The EMB recommends the following to the parties and authorities concerned for proper appreciation and action.

OTHER REGULATORY REQUIREMENTS	*RESPONSIBLE AGENCY*
1. Proponent needs to comply with: a. Sanitation Code of the Philippines b. Labor Code of the Philippines including occupational health and safety standards. c. Building Structures, Drainage and Flood Control System, Reclamation practices in accordance with the Building Code of the Philippines d. Coastal/Marine community development program (if any)	 DOH DOLE, BWC LGU- CPDO, DPWH, PRA DA-BFAR
2. Solid Waste Management System need to be in placed in coordination with LGU;	LGU
3. The proponent shall coordinate prior to the initial stage of project implementation on the assessment of the presence of artifacts following the rules and protocols of the concerned agencies, i.e. National Museum – Cultural Properties Division, National Historical Commission of the Philippines (NHCP) – Historic Preservation Division and Philippine Navy for artifacts and bombs.	National Museum - CPD NHCP - HPD Philippine Navy
4. The proponent shall secure approval of its project Oil Spill Contingency Plan (OSCP) from the Philippine Coast Guard (PCG) before project implementation, and shall ensure that all vessels the project will use will secure government permits.	PCG Manila & Pasay LGUs
5. Submission of Engineering Geological and Geohazard Assessment Report	MGB
ENVIRONMENTAL PLANNING RECOMMENDATIONS FOR THE PROPONENT	
6. Proponent needs to give priority employment to qualified residents of the affected communities. Adequate public information for jobs available to local residents in the affected areas needs to be provided.	
7. Proponent needs to design and construct access roads and bridges of the project site with minimal land and ecological disturbance and with adequate drainage. Proponent needs to implement a Roadway Maintenance and Transport Management Plan, which will include maintenance of public and private roads within the project site.	
8. The Proponent needs to address environmental risks, and come up with contingency measures in case of accidents, equipment malfunctions, machine failures, oil spills, and other emergencies including security risks.	

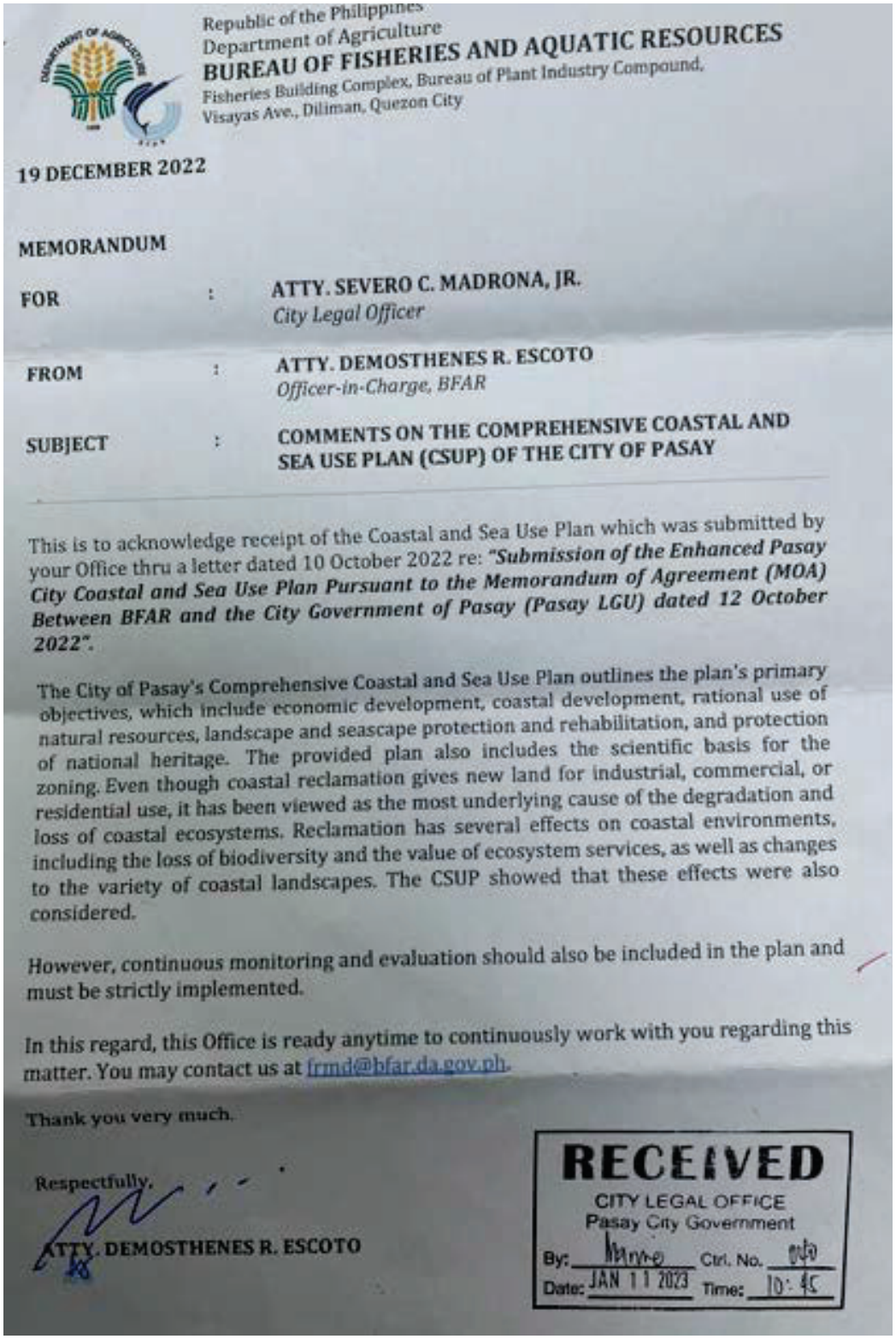
ATTY. MICHAEL DRAKE P. MATIAS
Chief, EIAM Division

ENGR. METODIO U. TIBBELLA
Director

APPENDIX A.5

BFAR Authorization to Implement the Comprehensive Coastal and Sea Use Plan

A.5. BFAR Authorization to Implement the Comprehensive Coastal and Sea Use Plan



Republic of the Philippines
Department of Agriculture
BUREAU OF FISHERIES AND AQUATIC RESOURCES
Fisheries Building Complex, Bureau of Plant Industry Compound,
Visayas Ave., Diliman, Quezon City

19 DECEMBER 2022

MEMORANDUM

FOR : **ATTY. SEVERO C. MADRONA, JR.**
City Legal Officer

FROM : **ATTY. DEMOSTHENES R. ESCOTO**
Officer-in-Charge, BFAR

SUBJECT : **COMMENTS ON THE COMPREHENSIVE COASTAL AND SEA USE PLAN (CSUP) OF THE CITY OF PASAY**

This is to acknowledge receipt of the Coastal and Sea Use Plan which was submitted by your Office thru a letter dated 10 October 2022 re: ***"Submission of the Enhanced Pasay City Coastal and Sea Use Plan Pursuant to the Memorandum of Agreement (MOA) Between BFAR and the City Government of Pasay (Pasay LGU) dated 12 October 2022"***.

The City of Pasay's Comprehensive Coastal and Sea Use Plan outlines the plan's primary objectives, which include economic development, coastal development, rational use of natural resources, landscape and seascape protection and rehabilitation, and protection of national heritage. The provided plan also includes the scientific basis for the zoning. Even though coastal reclamation gives new land for industrial, commercial, or residential use, it has been viewed as the most underlying cause of the degradation and loss of coastal ecosystems. Reclamation has several effects on coastal environments, including the loss of biodiversity and the value of ecosystem services, as well as changes to the variety of coastal landscapes. The CSUP showed that these effects were also considered.

However, continuous monitoring and evaluation should also be included in the plan and must be strictly implemented.

In this regard, this Office is ready anytime to continuously work with you regarding this matter. You may contact us at frmd@bfar.da.gov.ph.

Thank you very much.

Respectfully,

ATTY. DEMOSTHENES R. ESCOTO

RECEIVED
CITY LEGAL OFFICE
Pasay City Government
By: _____ Ctrl. No. 0150
Date: JAN 11 2023 Time: 10:45

APPENDIX A.6

PRA Board Resolution Series of 2024

Republic of the Philippines
OFFICE OF THE PRESIDENT
PHILIPPINE RECLAMATION AUTHORITY
7th floor, Legaspi Towers 200 Bldg., 107 Paseo de Roxas St., Legaspi Village, 1226 City of Makati
Tel.No.: (02) 8459-5000 , Facsimile No.: (02) 8815-2662
Website: www.pea.gov.ph , Email: info@pea.gov.ph

BAGONG PILIPINAS

SECRETARY'S CERTIFICATE

SO THE PUBLIC MAY KNOW:

I, **MARK ARTHUR M. CATABONA,** of legal age, Filipino, with office address at 8th Floor, Legaspi Towers 200 Building, 107 Paseo de Roxas, Legaspi Village, Makati City, after having been duly sworn to in accordance with law, do hereby certify that:

1. I am the Board Secretary V of the Philippine Reclamation Authority (PRA);

2. At the Special Meeting of the PRA Board of Directors on 04 September 2024 duly called for the purpose, a quorum being present and acted throughout, the following resolution was unanimously adopted by the members of the Board present, with the concurrence of the Chairman, and is now in full force and effect, to wit:

RESOLUTION NO. 6065
Series of 2024

APPROVAL OF THE PROPOSED REVISED LANDFORM CONFIGURATION AND TECHNICAL DESCRIPTION OF THE 360-HECTARE PASAY RECLAMATION AND DEVELOPMENT PROJECT

***WHEREAS**, the Philippine Reclamation Authority (PRA), through Board Resolution No. 5864, Series of 2023, approved the Proposed Landform Reconfiguration of the 360-Hectare Pasay Reclamation Project (Pasay 360) featuring the 300-meter-wide water channel from the Pasay City mainland;*

***WHEREAS**, the proposal from the City and its joint venture partner, SM Smart City Infrastructure and Development Corporation (SM SCIDC), was a commitment by the latter with the Department of Environment and Natural Resources (DENR) during the review process conducted relative to the project's Environmental Compliance Certificate (ECC) and Area Clearance (AC) for purposes of compliance with the ECC terms and conditions;*

***WHEREAS**, on 26 April 2024, the City Government of Pasay and SM SCIDC submitted the adjusted technical description of Pasay 360, which represents approximately 476-meter wider channel between the Pasay City mainland and Island A of Pasay 360;*

NOW, THEREFORE, BE IT RESOLVED, AS IT IS HEREBY RESOLVED**, that upon recommendation of the Management in its Memorandum for the Board of Directors dated 22 July 2024, the **Proposed

Revised Landform Configuration and Technical Description of Pasay 360, *copy attached as* ***Annex "A"*** *and made as an integral part hereof, is hereby* ***APPROVED****;*

RESOLVED FURTHER*, that the foregoing approval is contingent on the immediate commitment of SM SCDIC to construct a bridge that will connect the Philippine International Exhibition Center from Island A to the mainland Pasay;*

RESOLVED FURTHER*, that in view of the foregoing approval,* ***the endorsement of the same to the Secretary of the DENR and the Office of the President*** *is also hereby* ***APPROVED****; and*

RESOLVED FINALLY*, that the PRA shall give its final approval upon favorable approval of the DENR of the Amended ECC subject to the following conditions:*

1. *Submission by the City Government of Pasay and SM SCIDC of the Detailed Engineering Design Report relative to the revised landform configuration along with its hydrodynamic modeling, construction plans, and work methodology;*

2. *Conduct of joint verification survey with the City Government of Pasay and SM SCIDC and install perimeter markers to delineate the metes and bounds of the approved revised landform of Pasay 360; and*

3. *Submission of SMSCIDC's commitment for connectivity and construction of at least one (1) bridge at their expense before the opening of the PIEC in December 2027.*

3. The foregoing resolution has not been repealed, amended nor modified, and remains to be valid and subsisting as of date hereof.

Signed on 04 September 2024 in Makati City, Metro Manila.

MARK ARTHUR M. CATABONA
Board Secretary V

CONFORME:

HON. IMELDA CALIXTO-RUBIANO
City Mayor
Pasay City
Sept. 27, 2024

MR. CELEDONIO A. PILE JR
Chief Executive Officer
Pasay Harbor City Corporation

MR. GLENN D. ANG
President
SM Smart City Infrastructure and Development Corporation

Revised Land Configuration of Pasay 360-has. Reclamation Project

0 0.5 1 1.5 2 km



Legend:

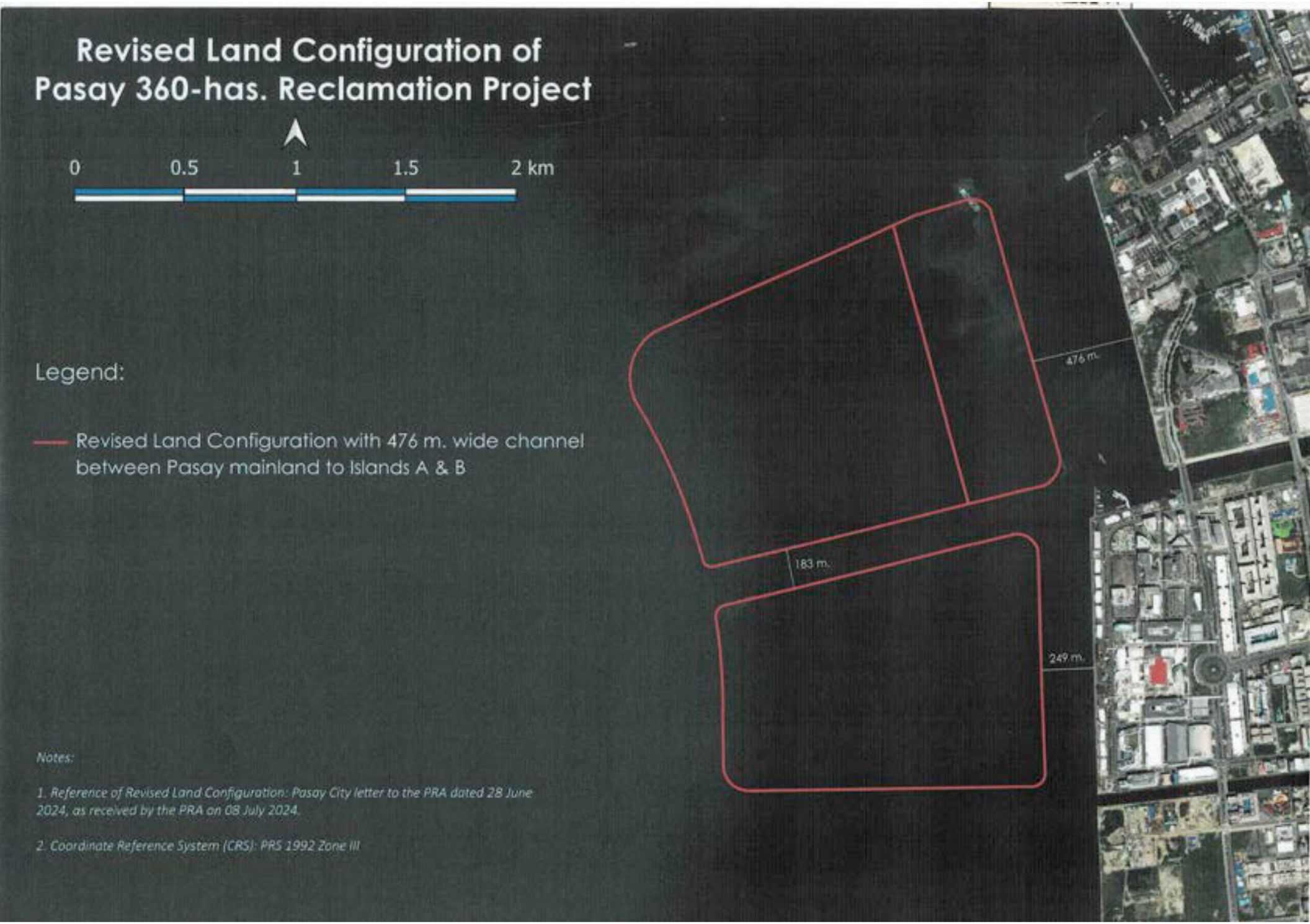
- Revised Land Configuration with 476 m. wide channel between Pasay mainland to Islands A & B
- Land Configuration with 300 m. wide channel between Pasay mainland to Islands A & B
- Landform based on Original EIS

Notes:

1. Reference: Revised Land Configuration (476 m. channel): Pasay City letter to the PRA dated 28 June 2024, as received by the PRA on 08 July 2024

2. Coordinate Reference System (CRS): PRS 1992 Zone III

Revised Land Configuration of Pasay 360-has. Reclamation Project



Legend:

— Revised Land Configuration with 476 m. wide channel between Pasay mainland to Islands A & B

Notes:

1. Reference of Revised Land Configuration: Pasay City letter to the PRA dated 28 June 2024, as received by the PRA on 08 July 2024.

2. Coordinate Reference System (CRS): PRS 1992 Zone III

APPENDIX B. SWORN STATEMENT OF ACCOUNTABILITY OF THE PROPONENT

SWORN STATEMENT OF ACCOUNTABILITY OF THE PROPONENT

This is to certify that all information and commitments in this **Environmental Performance Report and Management Plan** of the **"reclamation and horizontal land development of three hundred sixty (360) hectares" or the "360-hectare Reclamation Project"** (the **"Pasay 360"** Project) of the **Pasay City Government** are accurate and complete to the best of our knowledge, and that an objective and thorough assessment of the Project was undertaken in accordance with the dictates of professional and reasonable judgement. Should I/we learn of any information which would make this **Environmental Performance Report and Management Plan** report inaccurate, I shall immediately bring the said information to the attention of the DENR-EMB.

I hereby certify that no DENR-EMB personnel was directly involved in the preparation of this **Environmental Performance Report and Management Plan** other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 and EMB MC 2014-005.

We hereby bind ourselves jointly and solidarity to answer any penalty that may be imposed arising from any misrepresentation or failure to state material information in this **Environmental Performance Report and Management Plan**.

In witness whereof, I hereby set my hand this JUL 31 2024 day of _____ at PASAY CITY.

Atty. Severo C. Madrona Jr.
City Legal Officer
Pasay City Government

SUBSCRIBED AND SWORN TO before me this JUL 31 2024 day of _____ 2024, affiant exhibiting his/her Driver's License no. [illegible] issued at _____ on _____. Valid until 2028/02/19

Doc No. 461
Page No. 94
Book No. V
Series of 2024

ATTY. RONHEL VINN A. PAPA
Notary Public for Pasay City
Until December 31, 2024
IBP OR No. 324349/ 04-Dec-2023 / Roll No. 73157
PTR OR No. 8457592 1/04/24 / TIN# 743-448-049
MCLE Compliance No. VIII-0025922 valid until 14 April 2025

APPENDIX C.
SWORN STATEMENT OF ACCOUNTABILITY OF THE PREPARER

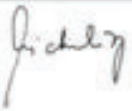
SWORN STATEMENT OF ACCOUNTABILITY OF PREPARERS

This is to certify that all information in this **Environmental Performance Report and Management Plan** for the **"reclamation and horizontal land development of three hundred sixty (360) hectares"** or the **"360-hectare Reclamation Project"** (the **"Pasay 360"** Project) of **Pasay City Government** are accurate and complete to the best of our knowledge, and that an objective and thorough assessment of the Project was undertaken in accordance with the dictates of professional and reasonable judgement. Should we learn of any information which would make this **Environmental Performance Report and Management Plan** inaccurate, we shall immediately bring the said information to the attention of the DENR-EMB.

We hereby certify that no DENR-EMB personnel was directly involved in the preparation of this **Environmental Performance Report and Management Plan** for the **Pasay 360** Project other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 and EMB MC 2014-005.

We hereby bind ourselves jointly and solidarity to answer any penalty that may be imposed arising from any misrepresentation or failure to state material information in this **Environmental Performance Report and Management Plan** for the **Pasay 360** Project.

In witness whereof, we hereby set out our hands this ____ of SEP 05 2024 at QUEZON CITY

Name	Role	EIA Preparer Registration Number	Technical Study Conducted	Signature
Dr. Tabassam Raza	Project Director	N/A	Environmental Impact Assessment	
Dr. Jose Regunay	Team Leader/ Environmental Management Specialist	N/A	Land Use Baseline Study, Impact Assessment, Environmental Management Plan	
EnP. Michelle Yu	Project Coordinator/ Environmental Management Associate	534	Land Use	
Dr. Mark Anthony Morales	Internal Reviewer	N/A	Environmental Impact Assessment	
Jay Richard Siasoco	Sr. Environmental Specialist	662	Environmental Impact Assessment – Land Use	
Engr. Ernesto Flores	Sr. Environmental Specialist	129	Environmental Impact Assessment – Ambient Air & Noise and Water Quality	
Engr. Patrick Caddarao	EIA Specialist and Consolidator	315	Report consolidation	
Clarence Rei Nabing	Research Associate	623	Research assistant – Water Quality	
Amel Mendoza	Geologist	624	Geology/Geomorphology, Geohazards,	

SWORN STATEMENT OF ACCOUNTABILITY OF PREPARERS

Name	Role	EIA Preparer Registration Number	Technical Study Conducted	Signature
			Hydrology and Hydrogeology	
Jan Paolo Pollisco	Biodiversity Specialist	276	Terrestrial Ecology	
Benjamin Francisco	Marine Ecologist	038	Marine Ecology	
Aileen Siasoco	Social Specialist	625	People, SDP and IEC	

SUBSCRIBED AND SWORN TO before me this SEP 05 2024 day of 2024, affiants exhibiting their Community Tax Certificate, Passport Numbers, or Tax Identification Numbers as follows:

Name of Preparer	ID	TIN / CTC Number / Passport Number	Date of Issue
Dr. Tabassam Raza	Passport	LU9894022	August 03, 2020
Dr. Jose Regunay	Driver's License	TIN 118145455	September 13, 2019
EnP. Michelle Yu	PRC Environmental Planner	0004540	February 21, 2019
Dr. Mark Anthony Morales	Passport	P9559574A	November 15, 2018
Jay Richard Siasoco	Driver's License	D16-97-162476	August 22, 2022
Engr. Ernesto M. Flores	Driver's License	N25-10-031093	April 12, 2019
Engr. Patrick Caddarao	PRC Chemical Engineer	0027512	December 8, 2010
Clarence Rei Nabing	Driver's License	D03-17-000676	January 13, 2022
Arnel Mendoza	PRC Geologist	0000567	March 9, 1979
Jan Paolo Pollisco	PRC Forester	0009308	August 10 2009
Benjamin Francisco	Unified Multi-Purpose ID	0003-3814432-4	
Aileen Siasoco	PRC ID Social Worker	0031058	October 19, 2018

Doc No. 306
Page No. 62
Book No. XVII
Series of 2024

ATTY. CONCEPCION P. VILLAREÑA
Notary Public for Quezon City
Until December 31, 2025
PTR No. 5965783 / January 4, 2024 Q.C.
IBP No. 349995 / Jan. 04, 2024 / Q.C.
Roll No. 39667 / 05-09-1995
MCLE VII-0019694 / 09/21/2021
Adm. Matter No. NP-021 (2024-2025)

APPENDIX D. PROJECT GEOGRAPHIC COORDINATES APPROVED BY PRA



ISLAND "B" - PHASE 1 CONTINUATION

LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
1-2	S 15° 41' E	934.40 M.	1	496650.111	1609574.387	14° 33' 12.6495" N	120° 58' 12.9921" E
2-3	S 69° 40' W	831.86 M.	2	496902.810	1608674.808	14° 32' 43.3803" N	120° 58' 21.4382" E
3-4	N 15° 31' W	878.05 M.	3	496122.811	1608385.689	14° 32' 33.9687" N	120° 57' 55.3845" E
4-1	N 65° 48' E	835.61 M.	4	495887.982	1609231.751	14° 33' 01.4965" N	120° 57' 47.5348" E

(SEE ISLAND "C" TABULATION ON THE NEXT PAGE)

Tie lines from MOA BM1. to Corner Marked "1":

ISLAND	BEARINGS	DIST.
TECHNICAL DESCRIPTIONS		
A	N 34° 11' W	1,618.19M.
B-PHASE 1	N 34° 11' W	1,618.19M.
B-PHASE 2	N 56°13' W	789.88M.
C	S 78° 47' W	346.84M.

PRS 92 ZONE 3 - BENCHMARKS

POINT	EASTING	NORTHING
BM1	497559.095	1608235.629
BM2	497582.513	1607634.572
BM3	497604.696	1606975.851
CP-1	497779.886	1608994.202
CP-2	497700.120	1609305.557
CP-3	497567.030	1609743.126

ISLAND "A"

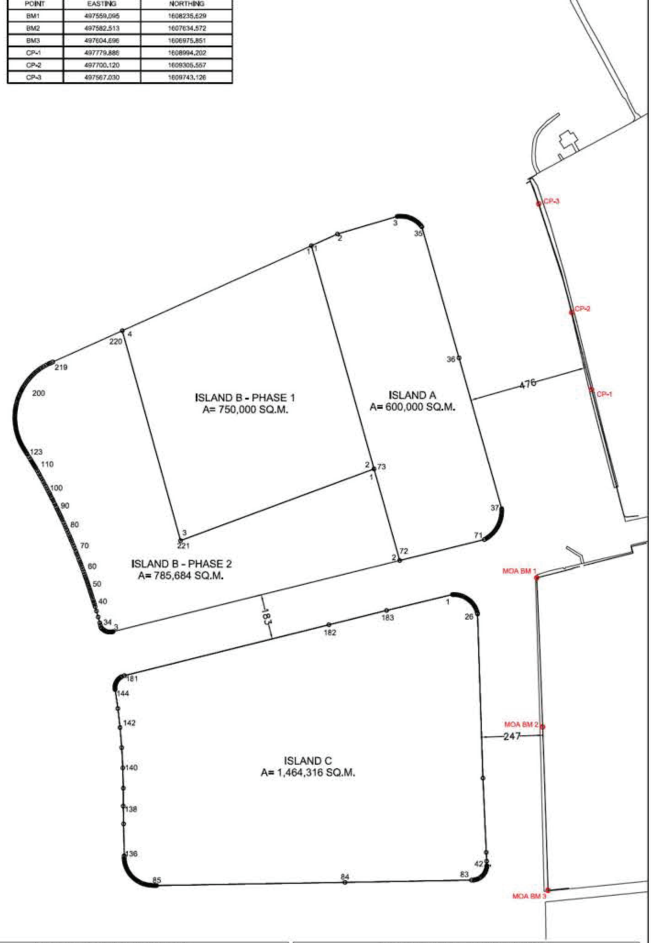
LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
1-2	N 65° 48' E	115.62 M.	1	496650.111	1609574.387	14° 33' 12.6495" N	120° 58' 12.9921" E
2-3	N 73° 38' E	250.23 M.	2	496755.570	1609621.793	14° 33' 14.1926" N	120° 58' 16.5148" E
3-4	N 82° 14' E	3.91 M.	3	496995.664	1609692.301	14° 33' 16.4879" N	120° 58' 24.5350" E
4-5	N 88° 46' E	3.41 M.	4	496999.536	1609692.829	14° 33' 16.5051" N	120° 58' 24.6644" E
5-6	S 89° 54' E	3.43 M.	5	497002.943	1609692.902	14° 33' 16.5075" N	120° 58' 24.7782" E
6-7	N 87° 37' E	3.55 M.	6	497006.371	1609692.896	14° 33' 16.5073" N	120° 58' 24.8927" E
7-8	N 89° 36' E	3.55 M.	7	497009.922	1609693.044	14° 33' 16.5122" N	120° 58' 25.0113" E
8-9	S 88° 26' E	3.55 M.	8	497013.475	1609693.069	14° 33' 16.5130" N	120° 58' 25.1300" E
9-10	S 86° 27' E	3.55 M.	9	497017.028	1609692.971	14° 33' 16.5098" N	120° 58' 25.2487" E
10-11	S 87° 29' E	3.63 M.	10	497020.575	1609692.751	14° 33' 16.5027" N	120° 58' 25.3672" E
11-12	S 83° 06' E	3.07 M.	11	497024.203	1609692.592	14° 33' 16.4975" N	120° 58' 25.4884" E
12-13	S 83° 54' E	3.63 M.	12	497027.253	1609692.223	14° 33' 16.4855" N	120° 58' 25.5903" E
13-14	S 78° 33' E	4.04 M.	13	497030.864	1609691.837	14° 33' 16.4730" N	120° 58' 25.7109" E
14-15	S 76° 02' E	3.28 M.	14	497034.819	1609691.036	14° 33' 16.4470" N	120° 58' 25.8430" E
15-16	S 74° 35' E	3.55 M.	15	497038.002	1609690.245	14° 33' 16.4212" N	120° 58' 25.9494" E
16-17	S 66° 54' E	3.77 M.	16	497041.428	1609689.300	14° 33' 16.3905" N	120° 58' 26.0638" E
17-18	S 70° 38' E	3.55 M.	17	497044.897	1609687.820	14° 33' 16.3424" N	120° 58' 26.1797" E
18-19	S 68° 39' E	3.55 M.	18	497048.249	1609686.641	14° 33' 16.3040" N	120° 58' 26.2917" E
19-20	S 70° 44' E	3.82 M.	19	497051.559	1609685.347	14° 33' 16.2619" N	120° 58' 26.4023" E
20-21	S 64° 42' E	3.55 M.	20	497055.167	1609684.086	14° 33' 16.2209" N	120° 58' 26.5228" E
21-22	S 60° 57' E	3.56 M.	21	497058.379	1609682.567	14° 33' 16.1715" N	120° 58' 26.6301" E
22-23	S 60° 44' E	3.55 M.	22	497061.491	1609680.838	14° 33' 16.1153" N	120° 58' 26.7341" E
23-24	S 55° 25' E	3.33 M.	23	497064.591	1609679.101	14° 33' 16.0588" N	120° 58' 26.8376" E
24-25	S 56° 47' E	3.55 M.	24	497067.332	1609677.211	14° 33' 15.9973" N	120° 58' 26.9292" E
25-26	S 54° 48' E	3.55 M.	25	497070.306	1609675.265	14° 33' 15.9340" N	120° 58' 27.0286" E
26-27	S 52° 50' E	3.55 M.	26	497073.210	1609673.216	14° 33' 15.8673" N	120° 58' 27.1256" E
27-28	S 50° 51' E	3.55 M.	27	497076.041	1609671.069	14° 33' 15.7975" N	120° 58' 27.2202" E
28-29	S 48° 52' E	3.55 M.	28	497078.797	1609668.826	14° 33' 15.7245" N	120° 58' 27.3123" E
29-30	S 46° 54' E	3.55 M.	29	497081.474	1609666.488	14° 33' 15.6484" N	120° 58' 27.4017" E
30-31	S 44° 55' E	3.55 M.	30	497084.069	1609664.060	14° 33' 15.5694" N	120° 58' 27.4884" E
31-32	S 42° 56' E	3.55 M.	31	497086.578	1609661.543	14° 33' 15.4876" N	120° 58' 27.5722" E
32-33	S 40° 58' E	3.55 M.	32	497088.999	1609658.942	14° 33' 15.4029" N	120° 58' 27.6531" E
33-34	S 38° 59' E	3.55 M.	33	497091.329	1609656.258	14° 33' 15.3156" N	120° 58' 27.7309" E
34-35	S 39° 02' E	3.59 M.	34	497093.564	1609653.495	14° 33' 15.2257" N	120° 58' 27.8056" E
35-36	S 15° 48' E	549.25 M.	35	497095.825	1609650.708	14° 33' 15.1350" N	120° 58' 27.8812" E
36-37	S 15° 48' E	631.86 M.	36	497245.451	1609122.231	14° 32' 57.9401" N	120° 58' 32.8820" E
37-38	S 01° 32' E	4.50 M.	37	497417.582	1608514.270	14° 32' 38.1590" N	120° 58' 38.6346" E
38-39	S 01° 08' E	4.45 M.	38	497417.703	1608509.772	14° 32' 38.0126" N	120° 58' 38.6387" E
39-40	S 00° 51' W	4.45 M.	39	497417.791	1608505.320	14° 32' 37.8678" N	120° 58' 38.6416" E
40-41	S 02° 49' W	4.45 M.	40	497417.726	1608500.867	14° 32' 37.7229" N	120° 58' 38.6395" E
41-42	S 04° 48' W	4.45 M.	41	497417.506	1608496.419	14° 32' 37.5782" N	120° 58' 38.6322" E
42-43	S 06° 47' W	4.45 M.	42	497417.134	1608491.981	14° 32' 37.4338" N	120° 58' 38.6197" E
43-44	S 08° 46' W	4.45 M.	43	497416.608	1608487.559	14° 32' 37.2899" N	120° 58' 38.6022" E
44-45	S 10° 44' W	4.45 M.	44	497415.930	1608483.158	14° 32' 37.1467" N	120° 58' 38.5795" E
45-46	S 12° 43' W	4.45 M.	45	497415.100	1608478.782	14° 32' 37.0043" N	120° 58' 38.5518" E
46-47	S 14° 42' W	4.45 M.	46	497414.119	1608474.438	14° 32' 36.8629" N	120° 58' 38.5191" E
47-48	S 16° 41' W	4.45 M.	47	497412.989	1608470.131	14° 32' 36.7228" N	120° 58' 38.4814" E
48-49	S 18° 39' W	4.45 M.	48	497411.712	1608465.865	14° 32' 36.5840" N	120° 58' 38.4387" E
49-50	S 20° 38' W	4.45 M.	49	497410.287	1608461.645	14° 32' 36.4466" N	120° 58' 38.3912" E
50-51	S 22° 37' W	4.45 M.	50	497408.718	1608457.478	14° 32' 36.3111" N	120° 58' 38.3387" E
51-52	S 24° 36' W	4.45 M.	51	497407.005	1608453.367	14° 32' 36.1773" N	120° 58' 38.2816" E
52-53	S 26° 34' W	4.45 M.	52	497405.152	1608449.317	14° 32' 36.0455" N	120° 58' 38.2197" E
53-54	S 28° 33' W	4.45 M.	53	497403.160	1608445.334	14° 32' 35.9159" N	120° 58' 38.1531" E
54-55	S 30° 32' W	4.45 M.	54	497401.031	1608441.422	14° 32' 35.7886" N	120° 58' 38.0821" E
55-56	S 32° 31' W	4.45 M.	55	497398.769	1608437.587	14° 32' 35.6638" N	120° 58' 38.0065" E
56-57	S 34° 29' W	4.45 M.	56	497396.376	1608433.831	14° 32' 35.5416" N	120° 58' 37.9266" E
57-58	S 36° 28' W	4.45 M.	57	497393.864	1608430.160	14° 32' 35.4221" N	120° 58' 37.8424" E
58-59	S 38° 27' W	4.45 M.	58	497391.207	1608426.579	14° 32' 35.3056" N	120° 58' 37.7540" E
59-60	S 40° 26' W	4.45 M.	59	497388.438	1608423.091	14° 32' 35.1921" N	120° 58' 37.6615" E
60-61	S 42° 24' W	4.45 M.	60	497385.550	1608419.701	14° 32' 35.0818" N	120° 58' 37.5650" E
61-62	S 44° 23' W	4.45 M.	61	497382.547	1608416.413	14° 32' 34.9748" N	120° 58' 37.4647" E
62-63	S 46° 22' W	4.45 M.	62	497379.432	1608413.230	14° 32' 34.8712" N	120° 58' 37.3607" E
63-64	S 48° 21' W	4.45 M.	63	497376.209	1608410.157	14° 32' 34.7712" N	120° 58' 37.2530" E
64-65	S 50° 19' W	4.45 M.	64	497372.882	1608407.197	14° 32' 34.6749" N	120° 58' 37.1419" E
65-66	S 52° 08' W	4.46 M.	65	497369.454	1608404.353	14° 32' 34.5823" N	120° 58' 37.0274" E
66-67	S 53° 26' W	4.45 M.	66	497365.932	1608401.615	14° 32' 34.4932" N	120° 58' 36.9098" E
67-68	S 56° 26' W	4.45 M.	67	497362.358	1608398.964	14° 32' 34.4069" N	120° 58' 36.7904" E
68-69	S 57° 30' W	4.47 M.	68	497358.654	1608396.506	14° 32' 34.3269" N	120° 58' 36.6667" E
69-70	S 60° 13' W	4.45 M.	69	497354.885	1608394.105	14° 32' 34.2488" N	120° 58' 36.5408" E
70-71	S 61° 10' W	4.47 M.	70	497351.020	1608391.893	14° 32' 34.1768" N	120° 58' 36.4117" E
71-72	S 76° 07' W	350.62 M.	71	497347.103	1608389.737	14° 32' 34.1066" N	120° 58' 36.2809" E
72-73	N 15° 41' W	383.58 M.	72	497006.545	1608305.525	14° 32' 31.3650" N	120° 58' 24.9052" E
73-1	N 15° 41' W	934.40 M.	73	496902.810	1608674.808	14° 32' 43.3803" N	120° 58' 21.4382" E

ISLAND "B" - PHASE 2

LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
1-2	S 15° 41' E	383.58 M.	1	496902.810	1608674.808	14° 32' 43.3803" N	120° 58' 21.4382" E
2-3	S 76° 04' W	1,190.97 M.	2	497006.545	1608305.525	14° 32' 31.3650" N	120° 58' 24.9052" E
3-4	S 73° 42' W	0.67 M.	3	495850.606	1608018.800	14° 32' 22.0292" N	120° 57' 46.2940" E
4-5	S 75° 30' W	2.08 M.	4	495849.967	1608018.613	14° 32' 22.0231" N	120° 57' 46.2727" E
5-6	S 78° 44' W	2.84 M.	5	495847.953	1608018.093	14° 32' 22.0062" N	120° 57' 46.2054" E
6-7	S 82° 33' W	2.97 M.	6	495845.170	1608017.538	14° 32' 21.9881" N	120° 57' 46.1125" E
7-8	S 85° 36' W	1.68 M.	7	495842.227	1608017.153	14° 32' 21.9756" N	120° 57' 46.0142" E
8-9	S 88° 20' W	2.47 M.	8	495840.549	1608017.024	14° 32' 21.9714" N	120° 57' 45.9581" E
9-10	N 88° 38' W	2.15 M.	9	495838.077	1608016.951	14° 32' 21.9690" N	120° 57' 45.8756" E
10-11	N 86° 24' W	1.26 M.	10	495835.932	1608017.002	14° 32' 21.9706" N	120° 57' 45.8039" E
11-12	N 84° 29' W	1.77 M.	11	495834.674	1608017.082	14° 32' 21.9732" N	120° 57' 45.7619" E
12-13	N 81° 41' W	2.39 M.	12	495832.910	1608017.254	14° 32' 21.9788" N	120° 57' 45.7029" E
13-14	N 78° 53' W	1.88 M.	13	495830.549	1608017.600	14° 32' 21.9900" N	120° 57' 45.6241" E
14-15	N 76° 08' W	2.29 M.	14	495828.706	1608017.962	14° 32' 22.0018" N	120° 57' 45.5625" E
15-16	N 73° 52' W	1.18 M.	15	495826.482	1608018.511	14° 32' 22.0197" N	120° 57' 45.4882" E
16-17	N 72° 11' W	1.38 M.	16	495825.351	1608018.838	14° 32' 22.0303" N	120° 57' 45.4504" E
17-18	N 69° 50' W	2.21 M.	17	495824.037	1608019.260	14° 32' 22.0440" N	120° 57' 45.4065" E
18-19	N 67° 07' W	1.92 M.	18	495821.967	1608020.021	14° 32' 22.0686" N	120° 57' 45.3374" E
19-20	N 64° 49' W	1.57 M.	19	495820.194	1608020.769	14° 32' 22.0931" N	120° 57' 45.2781" E
20-21	N 62° 31' W	1.93 M.	20	495818.771	1608021.438	14° 32' 22.1146" N	120° 57' 45.2306" E
21-22	N 60° 10' W	1.85 M.	21	495817.059	1608022.329	14° 32' 22.1438" N	120° 57' 45.1734" E
22-23	N 57° 37' W	2.23 M.	22	495815.624	1608023.152	14° 32' 22.1706" N	120° 57' 45.1255" E
23-24	N 55° 06' W	1.62 M.	23	495813.743	1608024.345	14° 32' 22.2094" N	120° 57' 45.0626" E
24-25	N 52° 45' W	1.94 M.	24	495812.411	1608025.274	14° 32' 22.2396" N	120° 57' 45.0182" E
25-26	N 50° 18' W	1.78 M.	25	495810.870	1608026.446	14° 32' 22.2777" N	120° 57' 44.9667" E
26-27	N 48° 16' W	1.33 M.	26	495809.499	1608027.584	14° 32' 22.3148" N	120° 57' 44.9209" E
27-28	N 51° 35' W	1.71 M.	27	495808.508	1608028.469	14° 32' 22.3436" N	120° 57' 44.8877" E
28-29	N 47° 00' W	1.51 M.	28	495807.165	1608029.534	14° 32' 22.3782" N	120° 57' 44.8429" E
29-30	N 41° 18' W	2.01 M.	29	495806.064	1608030.560	14° 32' 22.4116" N	120° 57' 44.8061" E
30-31	N 38° 40' W	1.57 M.	30	495804.738	1608032.070	14° 32' 22.4607" N	120° 57' 44.7618" E
31-32	N 36° 49' W	1.32 M.	31	495803.756	1608033.298	14° 32' 22.5007" N	120° 57' 44.7290" E
32-33	N 32° 39' W	0.76 M.	32	495802.966	1608034.353	14° 32' 22.5350" N	120° 57' 44.7026" E
33-34	N 23° 24' W	1.10 M.	33	495802.557	1608034.991	14° 32' 22.5557" N	120° 57' 44.6889" E
34-35	N 15° 38' W	8.43 M.	34	495802.120	1608036.001	14° 32' 22.5886" N	120° 57' 44.6743" E
35-36	N 15° 10' W	10.70 M.	35	495799.849	1608044.120	14° 32' 22.8528" N	120° 57' 44.5984" E
36-37	N 15° 32' W	24.09 M.	36	495797.050	1608054.444	14° 32' 23.1887" N	120° 57' 44.5049" E
37-38	N 16° 04' W	24.75 M.	37	495790.596	1608077.657	14° 32' 23.9439" N	120° 57' 44.2891" E
38-39	N 16° 31' W	18.64 M.	38	495783.749	1608101.443	14° 32' 24.7178" N	120° 57' 44.0602" E
39-40	N 16° 50' W	10.24 M.	39	495778.447	1608119.315	14° 32' 25.2993" N	120° 57' 43.8830" E
40-41	N 17° 01' W	6.75 M.	40	495775.481	1608129.121	14° 32' 25.6184" N	120° 57' 43.7839" E

ISLAND "B" - PHASE 2 CONTINUATION

LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
41-42	N 17° 10' W	7.58 M.	41	495773.506	1608135.577	14° 32' 25.8284" N	120° 57' 43.7179" E
42-43	N 17° 19' W	6.47 M.	42	495771.269	1608142.820	14° 32' 26.0641" N	120° 57' 43.8431" E
43-44	N 16° 50' W	9.99 M.	43	495769.342	1608149.001	14° 32' 26.2652" N	120° 57' 43.5787" E
44-45	N 17° 41' W	7.75 M.	44	495766.119	1608158.456	14° 32' 26.5728" N	120° 57' 43.4709" E
45-46	N 15° 56' W	7.00 M.	45	495763.766	1608165.836	14° 32' 26.8129" N	120° 57' 43.3923" E
46-47	N 17° 59' W	6.98 M.	46	495761.847	1608172.563	14° 32' 27.0318" N	120° 57' 43.3282" E
47-48	N 18° 07' W	6.26 M.	47	495759.693	1608179.200	14° 32' 27.2477" N	120° 57' 43.2562" E
48-49	N 18° 16' W	7.51 M.	48	495757.744	1608185.154	14° 32' 27.4415" N	120° 57' 43.1910" E
49-50	N 18° 25' W	6.00 M.	49	495755.389	1608192.287	14° 32' 27.6735" N	120° 57' 43.1123" E
50-51	N 18° 34' W	7.76 M.	50	495753.492	1608197.984	14° 32' 27.8589" N	120° 57' 43.0489" E
51-52	N 18° 43' W	7.15 M.	51	495751.022	1608205.338	14° 32' 28.0982" N	120° 57' 42.9664" E
52-53	N 18° 53' W	7.46 M.	52	495748.729	1608212.106	14° 32' 28.3184" N	120° 57' 42.8897" E
53-54	N 19° 01' W	6.28 M.	53	495746.316	1608219.163	14° 32' 28.5479" N	120° 57' 42.8091" E
54-55	N 19° 10' W	7.78 M.	54	495744.270	1608225.096	14° 32' 28.7410" N	120° 57' 42.7407" E
55-56	N 19° 19' W	6.03 M.	55	495741.717	1608232.440	14° 32' 28.9800" N	120° 57' 42.6553" E
56-57	N 19° 27' W	6.89 M.	56	495739.722	1608238.131	14° 32' 29.1651" N	120° 57' 42.5887" E
57-58	N 19° 37' W	7.65 M.	57	495737.425	1608244.631	14° 32' 29.3766" N	120° 57' 42.5119" E
58-59	N 19° 47' W	9.84 M.	58	495734.858	1608251.834	14° 32' 29.6109" N	120° 57' 42.4261" E
59-60	N 20° 02' W	10.82 M.	59	495731.526	1608261.095	14° 32' 29.9123" N	120° 57' 42.3147" E
60-61	N 20° 15' W	10.18 M.	60	495727.819	1608271.265	14° 32' 30.2432" N	120° 57' 42.1908" E
61-62	N 20° 27' W	9.93 M.	61	495724.296	1608280.817	14° 32' 30.5539" N	120° 57' 42.0731" E
62-63	N 20° 39' W	7.78 M.	62	495720.827	1608290.117	14° 32' 30.8565" N	120° 57' 41.9571" E
63-64	N 20° 48' W	6.64 M.	63	495718.084	1608297.395	14° 32' 31.0933" N	120° 57' 41.8655" E
64-65	N 20° 57' W	7.19 M.	64	495715.726	1608303.603	14° 32' 31.2953" N	120° 57' 41.7867" E
65-66	N 21° 08' W	10.55 M.	65	495713.156	1608310.318	14° 32' 31.5138" N	120° 57' 41.7008" E
66-67	N 22° 36' W	10.34 M.	66	495709.353	1608320.154	14° 32' 31.8338" N	120° 57' 41.5737" E
67-68	N 22° 09' W	7.62 M.	67	495705.378	1608329.700	14° 32' 32.1444" N	120° 57' 41.4408" E
68-69	N 20° 53' W	7.05 M.	68	495702.506	1608336.755	14° 32' 32.3739" N	120° 57' 41.3449" E
69-70	N 21° 18' W	14.12 M.	69	495699.994	1608343.342	14° 32' 32.5882" N	120° 57' 41.2609" E
70-71	N 21° 54' W	9.50 M.	70	495694.863	1608356.498	14° 32' 33.0163" N	120° 57' 41.0894" E
71-72	N 22° 24' W	10.74 M.	71	495691.319	1608365.317	14° 32' 33.3032" N	120° 57' 40.9710" E
72-73	N 22° 37' W	10.25 M.	72	495687.226	1608375.246	14° 32' 33.6262" N	120° 57' 40.8342" E
73-74	N 22° 49' W	7.23 M.	73	495683.284	1608384.707	14° 32' 33.9340" N	120° 57' 40.7024" E
74-75	N 22° 58' W	6.80 M.	74	495680.480	1608391.373	14° 32' 34.1509" N	120° 57' 40.6087" E
75-76	N 23° 07' W	7.38 M.	75	495677.827	1608397.635	14° 32' 34.3547" N	120° 57' 40.5201" E
76-77	N 23° 16' W	6.59 M.	76	495674.932	1608404.420	14° 32' 34.5754" N	120° 57' 40.4233" E
77-78	N 23° 27' W	10.77 M.	77	495672.328	1608410.478	14° 32' 34.7725" N	120° 57' 40.3363" E
78-79	N 23° 40' W	9.97 M.	78	495668.043	1608420.358	14° 32' 35.0940" N	120° 57' 40.1931" E
79-80	N 23° 54' W	11.45 M.	79	495664.043	1608429.486	14° 32' 35.3909" N	120° 57' 40.0594" E
80-81	N 24° 07' W	10.15 M.	80	495659.405	1608439.955	14° 32' 35.7316" N	120° 57' 39.9044" E
81-82	N 24° 21' W	10.30 M.	81	495655.256	1608449.219	14° 32' 36.0330" N	120° 57' 39.7658" E
82-83	N 24° 35' W	13.63 M.	82	495651.011	1608458.604	14° 32' 36.3383" N	120° 57' 39.6239" E
83-84	N 24° 50' W	7.23 M.	83	495645.341	1608470.993	14° 32' 36.7414" N	120° 57' 39.4344" E
84-85	N 24° 58' W	7.16 M.	84	495642.303	1608477.557	14° 32' 36.9549" N	120° 57' 39.3329" E
85-86	N 25° 08' W	7.22 M.	85	495639.281	1608484.046	14° 32' 37.1661" N	120° 57' 39.2319" E
86-87	N 25° 16' W	6.28 M.	86	495636.215	1608490.584	14° 32' 37.3788" N	120° 57' 39.1294" E
87-88	N 25° 25' W	7.31 M.	87	495633.534	1608496.263	14° 32' 37.5635" N	120° 57' 39.0398" E
88-89	N 25° 34' W	7.48 M.	88	495630.395	1608502.869	14° 32' 37.7785" N	120° 57' 38.9349" E
89-90	N 25° 44' W	6.91 M.	89	495627.166	1608509.616	14° 32' 37.9980" N	120° 57' 38.8271" E
90-91	N 25° 52' W	6.85 M.	90	495624.168	1608515.840	14° 32' 38.2005" N	120° 57' 38.7268" E
91-92	N 26° 04' W	10.74 M.	91	495621.177	1608522.006	14° 32' 38.4011" N	120° 57' 38.6269" E
92-93	N 26° 15' W	6.71 M.	92	495616.458	1608531.657	14° 32' 38.7151" N	120° 57' 38.4692" E
93-94	N 26° 26' W	10.60 M.	93	495613.492	1608537.673	14° 32' 38.9108" N	120° 57' 38.3701" E
94-95	N 26° 37' W	7.10 M.	94	495608.818	1608547.076	14° 32' 39.2167" N	120° 57' 38.2139" E
95-96	N 26° 46' W	6.95 M.	95	495605.638	1608553.420	14° 32' 39.4231" N	120° 57' 38.1076" E
96-97	N 26° 57' W	9.71 M.	96	495602.506	1608559.630	14° 32' 39.6252" N	120° 57' 38.0030" E
97-98	N 27° 08' W	7.61 M.	97	495598.106	1608568.287	14° 32' 39.9068" N	120° 57' 37.8559" E
98-99	N 27° 17' W	6.52 M.	98	495594.635	1608575.061	14° 32' 40.1272" N	120° 57' 37.7399" E
99-100	N 27° 26' W	7.70 M.	99	495591.646	1608580.857	14° 32' 40.3158" N	120° 57' 37.6400" E
100-101	N 27° 37' W	10.21 M.	100	495588.097	1608587.694	14° 32' 40.5382" N	120° 57' 37.5214" E
101-102	N 27° 50' W	10.22 M.	101	495583.362	1608596.744	14° 32' 40.8327" N	120° 57' 37.3632" E
102-103	N 28° 04' W	11.07 M.	102	495578.589	1608605.781	14° 32' 41.1267" N	120° 57' 37.2037" E
103-104	N 28° 18' W	10.15 M.	103	495573.383	1608615.545	14° 32' 41.4443" N	120° 57' 37.0297" E
104-105	N 28° 31' W	11.21 M.	104	495568.573	1608624.480	14° 32' 41.7350" N	120° 57' 36.8690" E
105-106	N 28° 45' W	10.10 M.	105	495563.221	1608634.329	14° 32' 42.0555" N	120° 57' 36.6902" E
106-107	N 28° 58' W	10.04 M.	106	495558.363	1608643.185	14° 32' 42.3436" N	120° 57' 36.5278" E
107-108	N 29° 09' W	7.14 M.	107	495553.500	1608651.972	14° 32' 42.6295" N	120° 57' 36.3653" E
108-109	N 29° 20' W	10.71 M.	108	495550.024	1608658.205	14° 32' 42.8323" N	120° 57' 36.2492" E
109-110	N 29° 34' W	10.27 M.	109	495544.777	1608667.542	14° 32' 43.1360" N	120° 57' 36.0738" E
110-111	N 29° 44' W	5.98 M.	110	495539.709	1608676.478	14° 32' 43.4268" N	120° 57' 35.9044" E
111-112	N 31° 37' W	4.11 M.	111	495536.745	1608681.668	14° 32' 43.5956" N	120° 57' 35.8054" E
112-113	N 31° 43' W	2.18 M.	112	495534.590	1608685.168	14° 32' 43.7095" N	120° 57' 35.7334" E
113-114	N 31° 43' W	3.32 M.	113	495533.447	1608687.019	14° 32' 43.7697" N	120° 57' 35.6952" E
114-115	N 31° 43' W	4.93 M.	114	495531.700	1608689.845	14° 32' 43.8616" N	120° 57' 35.6368" E
115-116	N 31° 43' W	3.23 M.	115	495529.107	1608694.043	14° 32' 43.9982" N	120° 57' 35.5502" E
116-117	N 31° 43' W	3.12 M.	116	495527.408	1608696.792	14° 32' 44.0877" N	120° 57' 35.4934" E
117-118	N 31° 43' W	3.79 M.	117	495525.770	1608699.443	14° 32' 44.1739" N	120° 57' 35.4387" E
118-119	N 31° 43' W	3.78 M.	118	495523.778	1608702.668	14° 32' 44.2788" N	120° 57' 35.3721" E
119-120	N 31° 43' W	3.71 M.	119	495521.791	1608705.884	14° 32' 44.3835" N	120° 57' 35.3057" E
120-121	N 31° 43' W	3.67 M.	120	495519.842	1608709.038	14° 32' 44.4861" N	120° 57' 35.2406" E
121-122	N 31° 43' W	3.78 M.	121	495517.913	1608712.159	14° 32' 44.5876" N	120° 57' 35.1761" E
122-123	N 31° 43' W	9.85 M.	122	495515.926	1608715.375	14° 32' 44.6922" N	120° 57' 35.1097" E
123-124	N 31° 43' W	12.79 M.	123	495510.749	1608723.755	14° 32' 44.9649" N	120° 57' 34.9367" E
124-125	N 31° 43' W	5.21 M.	124	495504.027	1608734.635	14° 32' 45.3188" N	120° 57' 34.7121" E
125-126	N 31° 43' W	5.87 M.	125	495501.290	1608739.064	14° 32' 45.4629" N	120° 57' 34.6207" E
126-127	N 31° 43' W	4.37 M.	126	495498.206	1608744.057	14° 32' 45.6254" N	120° 57' 34.5176" E
127-128	N 31° 43' W	3.71 M.	127	495495.906	1608747.778	14° 32' 45.7464" N	120° 57' 34.4407" E
128-129	N 32° 23' W	2.92 M.	128	495493.957	1608750.933	14° 32' 45.8491" N	120° 57' 34.3756" E
129-130	N 32° 08' W	4.09 M.	129	495492.395	1608753.395	14° 32' 45.9291" N	120° 57' 34.3234" E
130-131	N 31° 13' W	3.51 M.	130	495490.221	1608756.857	14° 32' 46.0418" N	120° 57' 34.2508" E
131-132	N 30° 20' W	3.92 M.	131	495488.401	1608759.861	14° 32' 46.1395" N	120° 57' 34.1899" E
132-133	N 29° 28' W	3.28 M.	132	495486.422	1608763.243	14° 32' 46.2495" N	120° 57' 34.1238" E
133-134	N 28° 38' W	3.65 M.	133	495484.808	1608766.098	14° 32' 46.3425" N	120° 57' 34.0699" E
134-135	N 27° 46' W	3.61 M.	134	495483.061	1608769.298	14° 32' 46.4466" N	120° 57' 34.0115" E
135-136	N 27° 01' W	2.72 M.	135	495481.381	1608772.488	14° 32' 46.5503" N	120° 57' 33.9554" E
136-137	N 26° 15' W	3.60 M.	136	495480.145	1608774.912	14° 32' 46.6292" N	120° 57' 33.9141" E
137-138	N 25° 17' W	4.50 M.	137	495478.554	1608778.138	14° 32' 46.7342" N	120° 57' 33.8609" E
138-139	N 24° 27' W	2.46 M.	138	495476.632	1608782.205	14° 32' 46.8665" N	120° 57' 33.7967" E
139-140	N 23° 41' W	3.99 M.	139	495475.616	1608784.440	14° 32' 46.9392" N	120° 57' 33.7627" E
140-141	N 22° 51' W	2.99 M.	140	495474.013	1608788.094	14° 32' 47.0581" N	120° 57' 33.7091" E
141-142	N 21° 59' W	4.19 M.	141	495472.852	1608790.849	14° 32' 47.1477" N	120° 57' 33.6703" E
142-143	N 21° 00' W	4.11 M.	142	495471.283	1608794.734	14° 32' 47.2741" N	120° 57' 33.6179" E
143-144	N 20° 14' W	2.22 M.	143	495469.812	1608798.567	14° 32' 47.3988" N	120° 57' 33.5688" E
144-145	N 19° 35' W	3.31 M.	144	495469.044	1608800.651	14° 32' 47.4666" N	120° 57' 33.5431" E
145-146	N 18° 46' W	3.47 M.	145	495467.935	1608803.769	14° 32' 47.5681" N	120° 57' 33.5060" E
146-147	N 17° 55' W	3.68 M.	146	495466.818	1608807.057	14° 32' 47.6751" N	120° 57' 33.4687" E
147-148	N 17° 03' W	3.54 M.	147	495465.685	1608810.562	14° 32' 47.7891" N	120° 57' 33.4308" E
148-149	N 16° 12' W	3.46 M.	148	495464.648	1608813.944	14° 32' 47.8991" N	120° 57' 33.3961" E
149-150	N 15° 21' W	3.64 M.	149	495463.682	1608817.270	14° 32' 48.0073" N	120° 57' 33.3638" E
150-151	N 14° 30' W	3.52 M.	150	495462.716	1608820.784	14° 32' 48.1217" N	120° 57' 33.3316" E
151-152	N 13° 33' W	4.47 M.	151	495461.836	1608824.189	14° 32' 48.2325" N	120° 57' 33.3021" E
152-153	N 12° 37' W	3.30 M.	152	495460.790	1608828.533	14° 32' 48.3738" N	120° 57' 33.2671" E
153-154	N 11° 47' W	3.68 M.	153	495460.069	1608831.752	14° 32' 48.4785" N	120° 57' 33.2431" E
154-155	N 10° 57' W	3.28 M.	154	495459.318	1608835.358	14° 32' 48.5959" N	120° 57' 33.2179" E
155-156	N 10° 09' W	3.29 M.	155	495458.695	1608838.577	14° 32' 48.7006" N	120° 57' 33.1971" E
156-157	N 09° 00' W	6.37 M.	156	495458.114	1608841.819	14° 32' 48.8061" N	120° 57' 33.1777" E
157-158	N 07° 44' W	4.23 M.	157	495457.118	1608848.107	14° 32' 49.0106" N	120° 57' 33.1444" E
158-159	N 06° 51' W	3.17 M.	158	495456.549	1608852.300	14° 32' 49.1471" N	120° 57' 33.1253" E
159-160	N 06° 06' W	3.10 M.	159	495456.172	1608855.443	14° 32' 49.2494" N	120° 57' 33.1127" E



ISLAND "B" - PHASE 2 CONTINUATION

LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
160-161	N 05° 17' W	3.69 M.	160	495455.842	1608858.527	14° 32' 49.3497" N	120° 57' 33.1017" E
161-162	N 04° 25' W	3.49 M.	161	495455.502	1608862.206	14° 32' 49.4694" N	120° 57' 33.0903" E
162-163	N 03° 30' W	4.15 M.	162	495455.232	1608865.690	14° 32' 49.5828" N	120° 57' 33.0812" E
163-164	N 02° 33' W	3.89 M.	163	495454.978	1608869.835	14° 32' 49.7177" N	120° 57' 33.0727" E
164-165	N 01° 40' W	3.44 M.	164	495454.805	1608873.726	14° 32' 49.8443" N	120° 57' 33.0669" E
165-166	N 00° 49' W	3.59 M.	165	495454.705	1608877.163	14° 32' 49.9561" N	120° 57' 33.0636" E
166-167	N 00° 03' E	3.72 M.	166	495454.654	1608880.757	14° 32' 50.0730" N	120° 57' 33.0618" E
167-168	N 00° 56' E	3.64 M.	167	495454.657	1608884.475	14° 32' 50.1940" N	120° 57' 33.0619" E
168-169	N 01° 46' E	3.34 M.	168	495454.716	1608888.118	14° 32' 50.3125" N	120° 57' 33.0638" E
169-170	N 02° 58' E	6.74 M.	169	495454.819	1608891.457	14° 32' 50.4212" N	120° 57' 33.0673" E
170-171	N 04° 11' E	3.42 M.	170	495455.169	1608898.191	14° 32' 50.6403" N	120° 57' 33.0789" E
171-172	N 05° 01' E	3.45 M.	171	495455.419	1608901.598	14° 32' 50.7512" N	120° 57' 33.0872" E
172-173	N 05° 50' E	3.34 M.	172	495455.721	1608905.039	14° 32' 50.8631" N	120° 57' 33.0973" E
173-174	N 06° 42' E	3.93 M.	173	495456.060	1608908.366	14° 32' 50.9714" N	120° 57' 33.1086" E
174-175	N 07° 35' E	3.49 M.	174	495456.519	1608912.273	14° 32' 51.0985" N	120° 57' 33.1239" E
175-176	N 08° 24' E	3.28 M.	175	495456.980	1608915.733	14° 32' 51.2111" N	120° 57' 33.1393" E
176-177	N 09° 13' E	3.63 M.	176	495457.459	1608918.977	14° 32' 51.3167" N	120° 57' 33.1553" E
177-178	N 10° 07' E	3.83 M.	177	495458.041	1608922.560	14° 32' 51.4332" N	120° 57' 33.1747" E
178-179	N 11° 00' E	3.51 M.	178	495458.714	1608926.333	14° 32' 51.5560" N	120° 57' 33.1971" E
179-180	N 11° 48' E	3.17 M.	179	495459.383	1608929.776	14° 32' 51.6680" N	120° 57' 33.2195" E
180-181	N 12° 40' E	4.15 M.	180	495460.031	1608932.878	14° 32' 51.7690" N	120° 57' 33.2411" E
181-182	N 13° 59' E	6.86 M.	181	495460.942	1608936.928	14° 32' 51.9008" N	120° 57' 33.2715" E
182-183	N 15° 36' E	6.60 M.	182	495462.601	1608943.588	14° 32' 52.1175" N	120° 57' 33.3268" E
183-184	N 17° 14' E	7.02 M.	183	495464.376	1608949.944	14° 32' 52.3243" N	120° 57' 33.3861" E
184-185	N 18° 29' E	3.38 M.	184	495466.454	1608956.645	14° 32' 52.5423" N	120° 57' 33.4555" E
185-186	N 19° 21' E	3.99 M.	185	495467.525	1608959.849	14° 32' 52.6466" N	120° 57' 33.4912" E
186-187	N 20° 16' E	3.53 M.	186	495468.849	1608963.617	14° 32' 52.7692" N	120° 57' 33.5354" E
187-188	N 21° 05' E	3.32 M.	187	495470.072	1608966.931	14° 32' 52.8771" N	120° 57' 33.5762" E
188-189	N 22° 19' E	6.97 M.	188	495471.265	1608970.027	14° 32' 52.9778" N	120° 57' 33.6161" E
189-190	N 23° 33' E	3.39 M.	189	495473.910	1608976.473	14° 32' 53.1876" N	120° 57' 33.7044" E
190-191	N 24° 26' E	3.98 M.	190	495475.263	1608979.577	14° 32' 53.2886" N	120° 57' 33.7496" E

ISLAND "B" - PHASE 2 CONTINUATION

LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
191-192	N 25° 42' E	6.68 M.	191	495476.908	1608983.198	14° 32' 53.4064" N	120° 57' 33.8045" E
192-193	N 26° 55' E	3.43 M.	192	495479.804	1608989.213	14° 32' 53.6021" N	120° 57' 33.9012" E
193-194	N 27° 48' E	3.95 M.	193	495481.358	1608992.274	14° 32' 53.7018" N	120° 57' 33.9531" E
194-195	N 28° 37' E	2.89 M.	194	495483.198	1608995.765	14° 32' 53.8154" N	120° 57' 34.0145" E
195-196	N 29° 27' E	4.11 M.	195	495484.580	1608998.298	14° 32' 53.8978" N	120° 57' 34.0607" E
196-197	N 30° 21' E	3.42 M.	196	495486.601	1609001.876	14° 32' 54.0142" N	120° 57' 34.1282" E
197-198	N 31° 36' E	7.02 M.	197	495488.330	1609004.828	14° 32' 54.1103" N	120° 57' 34.1859" E
198-199	N 33° 14' E	6.59 M.	198	495492.010	1609010.809	14° 32' 54.3049" N	120° 57' 34.3088" E
199-200	N 34° 54' E	7.29 M.	199	495495.624	1609016.324	14° 32' 54.4844" N	120° 57' 34.4295" E
200-201	N 36° 37' E	7.05 M.	200	495499.794	1609022.302	14° 32' 54.6789" N	120° 57' 34.5687" E
201-202	N 38° 16' E	6.76 M.	201	495504.002	1609027.964	14° 32' 54.8632" N	120° 57' 34.7093" E
202-203	N 39° 55' E	7.06 M.	202	495508.186	1609033.268	14° 32' 55.0358" N	120° 57' 34.8490" E
203-204	N 41° 37' E	7.07 M.	203	495512.715	1609038.681	14° 32' 55.2120" N	120° 57' 35.0002" E
204-205	N 43° 19' E	7.19 M.	204	495517.408	1609043.965	14° 32' 55.3839" N	120° 57' 35.1570" E
205-206	N 45° 00' E	6.86 M.	205	495522.340	1609049.195	14° 32' 55.5541" N	120° 57' 35.3217" E
206-207	N 46° 40' E	7.11 M.	206	495527.194	1609054.049	14° 32' 55.7121" N	120° 57' 35.4838" E
207-208	N 48° 25' E	7.47 M.	207	495532.364	1609058.925	14° 32' 55.8708" N	120° 57' 35.6565" E
208-209	N 50° 02' E	5.96 M.	208	495537.950	1609063.881	14° 32' 56.0321" N	120° 57' 35.8430" E
209-210	N 51° 38' E	7.46 M.	209	495542.520	1609067.713	14° 32' 56.1568" N	120° 57' 35.9957" E
210-211	N 53° 23' E	7.22 M.	210	495548.366	1609072.341	14° 32' 56.3074" N	120° 57' 36.1909" E
211-212	N 55° 05' E	7.00 M.	211	495554.162	1609076.647	14° 32' 56.4476" N	120° 57' 36.3845" E
212-213	N 56° 50' E	7.53 M.	212	495559.903	1609080.653	14° 32' 56.5780" N	120° 57' 36.5763" E
213-214	N 58° 32' E	6.74 M.	213	495566.208	1609084.774	14° 32' 56.7121" N	120° 57' 36.7869" E
214-215	N 60° 35' E	10.39 M.	214	495571.955	1609088.291	14° 32' 56.8266" N	120° 57' 36.9788" E
215-216	N 63° 08' E	10.89 M.	215	495581.004	1609093.392	14° 32' 56.9926" N	120° 57' 37.2811" E
216-217	N 65° 09' E	5.48 M.	216	495590.721	1609098.314	14° 32' 57.1528" N	120° 57' 37.6056" E
217-218	N 66° 04' E	5.53 M.	217	495595.697	1609100.618	14° 32' 57.2278" N	120° 57' 37.7718" E
218-219	N 67° 35' E	7.14 M.	218	495600.751	1609102.862	14° 32' 57.3009" N	120° 57' 37.9407" E
219-220	N 65° 48' E	307.69 M.	219	495607.350	1609105.585	14° 32' 57.3895" N	120° 57' 38.1611" E
220-221	S 15° 31' E	878.05 M.	220	495887.982	1609231.750	14° 33' 01.4965" N	120° 57' 47.5348" E
221-1	N 69° 40' E	831.86 M.	221	496122.811	1608385.689	14° 32' 33.9687" N	120° 57' 55.3845" E

S

Sketch Plan

OF

RECLAMATION OF PASAY 60 AND PASAY 300

AS PREPARED FOR

PASAY CITY GOVERNMENT
(PROJECT PROPONENT)

AND SM SMART CITY INFRASTRACTURE AND DEVELOPMENT CORPORATION
(PRIVATE JOINT VENTURE PARTNER)

SITUATED IN THE

BARANGAY OF :
CITY OF : PASAY
PROVINCE OF : METRO MANILA
ISLAND OF : LUZON
CONTAINING AN AREA OF:
3,600,000 SQ.M.

COORDINATE SYSTEM : PRS92 ZONE 3
BEARINGS : TRUE
SCALE : 1:15,000

0 150 450 900 1500

C E R T I F I C A T I O N

I hereby certify that this is a true and correct Sketch Plan of Island A (60 hectares), B & C (300hectares) herein plotted based from the Technical Descriptions as taken from the client's reclamation design boundary.

This is issued thru the request of the above-named for reference purposes only.

Certified Correct:

Date Prepared: November 21, 2024

Prepared by:

RAYMUND ARNOLD S. ALBERTO
Geodetic Engineer

License No. 4048 Date: 03-10-1994
PTR No. 5567367 Date: 01-09-2024

Sketch Plan

OF

RECLAMATION OF PASAY 60 AND PASAY 300

AS PREPARED FOR

PASAY CITY GOVERNMENT
(PROJECT PROPONENT)

AND SM SMART CITY INFRASTRACTURE AND DEVELOPMENT CORPORATION
(PRIVATE JOINT VENTURE PARTNER)

SITUATED IN THE

BARANGAY OF :
CITY OF : PASAY
PROVINCE OF : METRO MANILA
ISLAND OF : LUZON
CONTAINING AN AREA OF:
3,600,000 SQ.M.

COORDINATE SYSTEM : PRS92 ZONE 3
BEARINGS : TRUE
SCALE : 1:15,000

0 150 450 900 1500

N
S

CERTIFICATION

I hereby certify that this is a true and correct Sketch Plan of Island A (60 hectares), B & C (300hectares) herein plotted based from the Technical Descriptions as taken from the client's reclamation design boundary.

This is issued thru the request of the above-named for reference purposes only.

Certified Correct:
Date Prepared: November 21, 2024

Prepared by:

RAYMUND ARNOLD S. ALBERTO
Geodetic Engineer

License No. 4048 Date: 03-10-1994
PTR No. 5567367 Date: 01-09-2024

ISLAND "C"							
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
1-2	N 87° 53' E	3,42 M.	1	497218.879	1608168.158	14° 32' 26,8963" N	120° 58' 31,9986" E
2-3	N 89° 52' E	3,42 M.	2	497222.293	1608168.285	14° 32' 26,9005" N	120° 58' 32,1127" E
3-4	S 88° 08' E	3,42 M.	3	497225.711	1608168.293	14° 32' 26,9007" N	120° 58' 32,2268" E
4-5	S 86° 08' E	3,42 M.	4	497229.126	1608168.181	14° 32' 26,8971" N	120° 58' 32,3409" E
5-6	S 84° 09' E	3,42 M.	5	497232.535	1608167.951	14° 32' 26,8897" N	120° 58' 32,4548" E
6-7	S 82° 09' E	3,42 M.	6	497235.934	1608167.602	14° 32' 26,8783" N	120° 58' 32,5684" E
7-8	S 80° 09' E	3,42 M.	7	497239.319	1608167.136	14° 32' 26,8632" N	120° 58' 32,6814" E
8-9	S 78° 09' E	3,42 M.	8	497242.686	1608166.551	14° 32' 26,8441" N	120° 58' 32,7939" E
9-10	S 76° 10' E	3,42 M.	9	497246.031	1608165.850	14° 32' 26,8214" N	120° 58' 32,9056" E
10-11	S 74° 10' E	3,42 M.	10	497249.349	1608165.033	14° 32' 26,7948" N	120° 58' 33,0165" E
11-12	S 72° 10' E	3,42 M.	11	497252.636	1608164.101	14° 32' 26,7645" N	120° 58' 33,1263" E
12-13	S 70° 11' E	3,42 M.	12	497255.889	1608163.054	14° 32' 26,7304" N	120° 58' 33,2350" E
13-14	S 68° 11' E	3,42 M.	13	497259.104	1608161.896	14° 32' 26,6928" N	120° 58' 33,3423" E
14-15	S 66° 11' E	3,42 M.	14	497262.276	1608160.626	14° 32' 26,6514" N	120° 58' 33,4483" E
15-16	S 63° 12' E	6,83 M.	15	497265.402	1608159.246	14° 32' 26,6066" N	120° 58' 33,5527" E
16-17	S 60° 12' E	3,42 M.	16	497271.501	1608156.165	14° 32' 26,5063" N	120° 58' 33,7565" E
17-18	S 58° 12' E	3,42 M.	17	497274.466	1608154.467	14° 32' 26,4511" N	120° 58' 33,8555" E
18-19	S 56° 13' E	3,42 M.	18	497277.371	1608152.666	14° 32' 26,3925" N	120° 58' 33,9526" E
19-20	S 54° 13' E	3,42 M.	19	497280.211	1608150.766	14° 32' 26,3307" N	120° 58' 34,0474" E
20-21	S 52° 13' E	3,42 M.	20	497282.983	1608148.768	14° 32' 26,2657" N	120° 58' 34,1400" E
21-22	S 50° 14' E	3,42 M.	21	497285.684	1608146.675	14° 32' 26,1976" N	120° 58' 34,2303" E
22-23	S 48° 14' E	3,42 M.	22	497288.310	1608144.488	14° 32' 26,1265" N	120° 58' 34,3180" E
23-24	S 46° 14' E	3,42 M.	23	497290.858	1608142.212	14° 32' 26,0524" N	120° 58' 34,4032" E
24-25	S 44° 14' E	3,42 M.	24	497293.326	1608139.849	14° 32' 25,9756" N	120° 58' 34,4856" E
25-26	S 42° 15' E	3,42 M.	25	497295.710	1608137.401	14° 32' 25,8959" N	120° 58' 34,5652" E
26-27	S 40° 15' E	3,42 M.	26	497298.008	1608134.871	14° 32' 25,8136" N	120° 58' 34,6420" E
27-28	S 37° 15' E	6,83 M.	27	497300.216	1608132.263	14° 32' 25,7287" N	120° 58' 34,7158" E
28-29	S 34° 16' E	3,42 M.	28	497304.352	1608126.824	14° 32' 25,5518" N	120° 58' 34,8540" E
29-30	S 32° 16' E	3,42 M.	29	497306.276	1608124.000	14° 32' 25,4599" N	120° 58' 34,9182" E
30-31	S 30° 16' E	3,42 M.	30	497308.101	1608121.111	14° 32' 25,3659" N	120° 58' 34,9792" E
31-32	S 28° 17' E	3,42 M.	31	497309.823	1608118.160	14° 32' 25,2699" N	120° 58' 35,0368" E
32-33	S 26° 17' E	3,42 M.	32	497311.442	1608115.151	14° 32' 25,1720" N	120° 58' 35,0909" E
33-34	S 23° 18' E	6,83 M.	33	497312.956	1608112.087	14° 32' 25,0723" N	120° 58' 35,1414" E
34-35	S 20° 18' E	3,42 M.	34	497315.658	1608105.811	14° 32' 24,8681" N	120° 58' 35,2317" E
35-36	S 17° 18' E	6,83 M.	35	497316.843	1608102.606	14° 32' 24,7638" N	120° 58' 35,2713" E
36-37	S 14° 19' E	3,42 M.	36	497318.876	1608096.082	14° 32' 24,5516" N	120° 58' 35,3392" E
37-38	S 12° 19' E	3,42 M.	37	497319.721	1608092.771	14° 32' 24,4438" N	120° 58' 35,3675" E
38-39	S 01° 51' E	661,70 M.	38	497320.450	1608089.433	14° 32' 24,3352" N	120° 58' 35,3918" E
39-40	S 02° 37' E	299,64 M.	39	497341.825	1607428.081	14° 32' 02,8162" N	120° 58' 36,1087" E
40-41	S 02° 28' E	35,69 M.	40	497355.508	1607128.752	14° 31' 53,0767" N	120° 58' 36,5671" E
41-42	S 02° 00' E	17,79 M.	41	497357.040	1607093.092	14° 31' 51,9164" N	120° 58' 36,6185" E
42-43	S 02° 31' W	2,08 M.	42	497357.660	1607075.312	14° 31' 51,3378" N	120° 58' 36,6392" E
43-44	S 04° 30' W	2,08 M.	43	497357.568	1607073.229	14° 31' 51,2700" N	120° 58' 36,6362" E
44-45	S 06° 30' W	2,08 M.	44	497357.404	1607071.151	14° 31' 51,2024" N	120° 58' 36,6307" E
45-46	S 08° 29' W	2,08 M.	45	497357.168	1607069.080	14° 31' 51,1350" N	120° 58' 36,6228" E
46-47	S 10° 29' W	2,08 M.	46	497356.861	1607067.018	14° 31' 51,0680" N	120° 58' 36,6126" E
47-48	S 12° 28' W	2,08 M.	47	497356.481	1607064.968	14° 31' 51,0012" N	120° 58' 36,5999" E
48-49	S 14° 28' W	2,08 M.	48	497356.031	1607062.933	14° 31' 50,9350" N	120° 58' 36,5849" E
49-50	S 16° 27' W	2,08 M.	49	497355.511	1607060.914	14° 31' 50,8693" N	120° 58' 36,5675" E
50-51	S 18° 27' W	2,08 M.	50	497354.920	1607058.915	14° 31' 50,8043" N	120° 58' 36,5478" E
51-52	S 20° 26' W	2,08 M.	51	497354.261	1607056.938	14° 31' 50,7400" N	120° 58' 36,5258" E
52-53	S 22° 26' W	2,08 M.	52	497353.533	1607054.985	14° 31' 50,6764" N	120° 58' 36,5015" E
53-54	S 24° 25' W	2,08 M.	53	497352.737	1607053.058	14° 31' 50,6137" N	120° 58' 36,4749" E
54-55	S 26° 25' W	2,08 M.	54	497351.876	1607051.160	14° 31' 50,5519" N	120° 58' 36,4461" E
55-56	S 28° 24' W	2,08 M.	55	497350.948	1607049.293	14° 31' 50,4912" N	120° 58' 36,4152" E
56-57	S 30° 24' W	2,08 M.	56	497349.957	1607047.459	14° 31' 50,4315" N	120° 58' 36,3821" E
57-58	S 32° 23' W	2,08 M.	57	497348.902	1607045.661	14° 31' 50,3730" N	120° 58' 36,3468" E
58-59	S 34° 23' W	2,08 M.	58	497347.786	1607043.900	14° 31' 50,3157" N	120° 58' 36,3095" E
59-60	S 36° 22' W	2,08 M.	59	497346.609	1607042.180	14° 31' 50,2597" N	120° 58' 36,2702" E
60-61	S 38° 21' W	2,08 M.	60	497345.373	1607040.501	14° 31' 50,2051" N	120° 58' 36,2290" E
61-62	S 40° 21' W	2,08 M.	61	497344.079	1607038.867	14° 31' 50,1519" N	120° 58' 36,1858" E
62-63	S 42° 20' W	2,08 M.	62	497342.730	1607037.278	14° 31' 50,1002" N	120° 58' 36,1407" E
63-64	S 44° 20' W	2,08 M.	63	497341.326	1607035.737	14° 31' 50,0501" N	120° 58' 36,0938" E
64-65	S 46° 19' W	2,08 M.	64	497339.869	1607034.246	14° 31' 50,0015" N	120° 58' 36,0451" E
65-66	S 48° 19' W	2,08 M.	65	497338.361	1607032.807	14° 31' 49,9547" N	120° 58' 35,9948" E
66-67	S 50° 18' W	2,08 M.	66	497336.805	1607031.420	14° 31' 49,9096" N	120° 58' 35,9428" E
67-68	S 52° 18' W	2,08 M.	67	497335.201	1607030.089	14° 31' 49,8663" N	120° 58' 35,8892" E
68-69	S 54° 17' W	2,08 M.	68	497333.551	1607028.814	14° 31' 49,8248" N	120° 58' 35,8342" E
69-70	S 56° 17' W	2,08 M.	69	497331.859	1607027.597	14° 31' 49,7852" N	120° 58' 35,7776" E
70-71	S 61° 15' W	8,33 M.	70	497330.125	1607026.440	14° 31' 49,7475" N	120° 58' 35,7197" E
71-72	S 66° 14' W	2,08 M.	71	497322.820	1607022.433	14° 31' 49,6171" N	120° 58' 35,4757" E
72-73	S 68° 13' W	2,08 M.	72	497320.912	1607021.593	14° 31' 49,5898" N	120° 58' 35,4120" E
73-74	S 70° 13' W	2,08 M.	73	497318.976	1607020.820	14° 31' 49,5646" N	120° 58' 35,3473" E
74-75	S 72° 12' W	2,08 M.	74	497317.015	1607020.114	14° 31' 49,5416" N	120° 58' 35,2818" E
75-76	S 74° 12' W	2,08 M.	75	497315.030	1607019.477	14° 31' 49,5209" N	120° 58' 35,2155" E
76-77	S 76° 11' W	2,08 M.	76	497313.024	1607018.909	14° 31' 49,5024" N	120° 58' 35,1485" E
77-78	S 78° 11' W	2,08 M.	77	497311.000	1607018.412	14° 31' 49,4862" N	120° 58' 35,0809" E
78-79	S 80° 10' W	2,08 M.	78	497308.959	1607017.985	14° 31' 49,4723" N	120° 58' 35,0128" E
79-80	S 82° 10' W	2,08 M.	79	497306.905	1607017.629	14° 31' 49,4607" N	120° 58' 34,9442" E
80-81	S 84° 09' W	2,08 M.	80	497304.840	1607017.345	14° 31' 49,4515" N	120° 58' 34,8752" E
81-82	S 86° 09' W	2,08 M.	81	497302.767	1607017.133	14° 31' 49,4446" N	120° 58' 34,8059" E
82-83	S 87° 08' W	5,00 M.	82	497300.687	1607016.992	14° 31' 49,4400" N	120° 58' 34,7365" E
83-84	S 89° 00' W	510,10 M.	83	497295.696	1607016.743	14° 31' 49,4318" N	120° 58' 34,5698" E
84-85	S 89° 03' W	759,54 M.	84	496785.676	1607007.779	14° 31' 49,1378" N	120° 58' 17,5340" E
85-86	S 89° 41' W	4,10 M.	85	496026.240	1606995.182	14° 31' 48,7237" N	120° 57' 52,1672" E
86-87	N 89° 59' W	3,83 M.	86	496022.137	1606995.160	14° 31' 48,7230" N	120° 57' 52,0301" E
87-88	N 89° 07' W	4,02 M.	87	496018.309	1606995.161	14° 31' 48,7230" N	120° 57' 51,9023" E
88-89	N 87° 32' W	3,90 M.	88	496014.293	1606995.222	14° 31' 48,7250" N	120° 57' 51,7681" E
89-90	N 86° 28' W	3,87 M.	89	496010.401	1606995.390	14° 31' 48,7304" N	120° 57' 51,6381" E
90-91	N 84° 28' W	3,92 M.	90	496006.534	1606995.629	14° 31' 48,7382" N	120° 57' 51,5089" E
91-92	N 84° 29' W	3,94 M.	91	496002.627	1606996.007	14° 31' 48,7504" N	120° 57' 51,3784" E
92-93	N 83° 18' W	3,94 M.	92	495998.708	1606996.386	14° 31' 48,7627" N	120° 57' 51,2475" E
93-94	N 81° 20' W	3,94 M.	93	495994.798	1606996.846	14° 31' 48,7777" N	120° 57' 51,1169" E
94-95	N 79° 22' W	3,94 M.	94	495990.905	1606997.440	14° 31' 48,7970" N	120° 57' 50,9869" E
95-96	N 77° 24' W	3,94 M.	95	495987.035	1606998.166	14° 31' 48,8206" N	120° 57' 50,8576" E
96-97	N 75° 26' W	3,94 M.	96	495983.193	1606999.025	14° 31' 48,8485" N	120° 57' 50,7293" E
97-98	N 73° 28' W	3,94 M.	97	495979.382	1607000.016	14° 31' 48,8807" N	120° 57' 50,6020" E
98-99	N 71° 30' W	3,94 M.	98	495975.607	1607001.136	14° 31' 48,9172" N	120° 57' 50,4759" E
99-100	N 69° 32' W	3,94 M.	99	495971.873	1607002.385	14° 31' 48,9578" N	120° 57' 50,3511" E
100-101	N 67° 34' W	3,94 M.	100	495968.184	1607003.762	14° 31' 49,0026" N	120° 57' 50,2279" E
101-102	N 65° 36' W	3,94 M.	101	495964.544	1607005.264	14° 31' 49,0514" N	120° 57' 50,1063" E
102-103	N 63° 38' W	3,94 M.	102	495960.958	1607006.890	14° 31' 49,1043" N	120° 57' 49,9865" E
103-104	N 61° 41' W	3,94 M.	103	495957.430	1607008.638	14° 31' 49,1611" N	120° 57' 49,8687" E
104-105	N 59° 43' W	3,94 M.	104	495953.964	1607010.507	14° 31' 49,2219" N	120° 57' 49,7529" E
105-106	N 57° 45' W	3,94 M.	105	495950.564	1607012.493	14° 31' 49,2865" N	120° 57' 49,6393" E
106-107	N 55° 47' W	3,94 M.	106	495947.234	1607014.594	14° 31' 49,3549" N	120° 57' 49,5281" E
107-108	N 53° 49' W	3,94 M.	107	495943.979	1607016.808	14° 31' 49,4269" N	120° 57' 49,4193" E
108-109	N 51° 51' W	3,94 M.	108	495940.801	1607019.133	14° 31' 49,5025" N	120° 57' 49,3132" E
109-110	N 49° 53' W	3,94 M.	109	495937.704	1607021.566	14° 31' 49,5816" N	120° 57' 49,2097" E
110-111	N 47° 55' W	3,94 M.	110	495934.693	1607024.103	14° 31' 49,6642" N	120° 57' 49,1091" E
111-112	N 45° 57' W	3,94 M.	111	495931.771	1607026.742	14° 31' 49,7501" N	120° 57' 49,0115" E
112-113	N 43° 59' W	3,94 M.	112	495928.941	1607029.479	14° 31' 49,8391" N	120° 57' 48,9169" E
113-114	N 42° 01' W	3,94 M.	113	495926.207	1607032.312	14° 31' 49,9313" N	120° 57' 48,8256" E
114-115	N 40° 03' W	3,94 M.	114	495923.571	1607035.238	14° 31' 50,0264" N	120° 57' 48,7375" E
115-116	N 38° 05' W	3,94 M.	115	495921.037	1607038.251	14° 31' 50,1245" N	120° 57' 48,6529" E
116-117	N 36° 07' W	3,94 M.	116	495918.608	1607041.350	14° 31' 50,2253" N	120° 57' 48,5717" E
117-118	N 34° 09' W	3,94 M.	117	495916.287	1607044.531	14° 31' 50,3288" N	120° 57' 48,4942" E
118-119	N 32° 12' W	3,94 M.	118	495914.076	1607047.789	14° 31' 50,4348" N	120° 57' 48,4203" E

ISLAND "C"							
TECHNICAL DESCRIPTIONS			PRS 92 COORDINATES			WGS 84 COORDINATES	
LINES	BEARINGS	DIST.	POINTS	EASTING	NORTHING	LATITUDE	LONGITUDE
119-120	N 30° 14' W	3,94 M.	119	495911.978	1607051.121	14° 31' 50,5432" N	120° 57' 48,3502" E
120-121	N 28° 16' W	3,94 M.	120	495909.996	1607054.523	14° 31' 50,6539" N	120° 57' 48,2840" E
121-122	N 26° 18' W	3,94 M.	121	495908.132	1607057.991	14° 31' 50,7667" N	120° 57' 48,2217" E
122-123	N 24° 20' W	3,94 M.	122	495906.387	1607061.521	14° 31' 50,8815" N	120° 57' 48,1634" E
123-124	N 22° 22' W	3,94 M.	123	495904.765	1607065.109	14° 31' 50,9983" N	120° 57' 48,1092" E
124-125	N 20° 24' W	3,94 M.	124	495903.267	1607068.751	14° 31' 51,1167" N	120° 57' 48,0591" E
125-126	N 18° 26' W	3,94 M.	125	495901.894	1607072.441	14° 31' 51,2368" N	120° 57' 48,0133" E
126-127	N 16° 28' W	3,94 M.	126	495900.649	1607076.176	14° 31' 51,3584" N	120° 57' 47,9716" E
127-128	N 14° 30' W	3,94 M.	127	495899.533	1607079.952	14° 31' 51,4812" N	120° 57' 47,9343" E
128-129	N 12° 32' W	3,94 M.	128	495898.547	1607083.764	14° 31' 51,6052" N	120° 57' 47,9014" E
129-130	N 10° 34' W	3,94 M.	129	495897.692	1607087.608	14° 31' 51,7303" N	120° 57' 47,8728" E
130-131	N 08° 36' W	3,94 M.	130	495896.970	1607091.479	14° 31' 51,8563" N	120° 57' 47,8486" E
131-132	N 06° 38' W	3,94 M.	131	495896.381	1607095.372	14° 31' 51,9829" N	120° 57' 47,8289" E
132-133	N 04° 41' W	3,94 M.	132	495895.925	1607099.283	14° 31' 52,1102" N	120° 57' 47,8137" E
133-134	N 02° 43' W	3,94 M.	133	495895.604	1607103.207	14° 31' 52,2379" N	120° 57' 47,8030" E
134-135	N 00° 45' W	3,94 M.	134	495895.418	1607107.140	14° 31' 52,3658" N	120° 57' 47,7967" E
135-136	N 01° 13' E	3,94 M.	135	495895.367	1607111.077	14° 31' 52,4939" N	120° 57' 47,7950" E
136-137	N 01° 01' W	128,56 M.	136	495895.451	1607115.014	14° 31' 52,6220" N	120° 57' 47,7978" E
137-138	N 01° 15' W	71,66 M.	137	495893.158	1607243.554	14° 31' 56,8046" N	120° 57' 47,7204" E
138-139	N 00° 16' E	72,26 M.	138	495891.589	1607315.194	14° 31' 59,1355" N	120° 57' 47,6675" E
139-140	N 01° 22' W	81,76 M.	139	495891.929	1607387.455	14° 32' 01,4867" N	120° 57' 47,6784" E
140-141	N 03° 07' W	81,76 M.	140	495889.972	1607469.187	14° 32' 04,1461" N	120° 57' 47,6125" E
141-142	N 04° 52' W	81,76 M.	141	495885.529	1607550.822	14° 32' 06,8023" N	120° 57' 47,4636" E
142-143	N 06° 33' W	76,92 M.	142	495878.604	1607632.284	14° 32' 09,4529" N	120° 57' 47,2317" E
143-144	N 08° 11' W	76,92 M.	143	495869.829	1607708.706	14° 32' 11,9396" N	120° 57' 46,9381" E
144-145	N 08° 01' W	1,73 M.	144	495858.871	1607784.846	14° 32' 14,4168" N	120° 57' 46,5716" E
145-146	N 06° 03' W	1,73 M.	145	495858.630	1607786.555	14° 32' 14,4725" N	120° 57' 46,5635" E
146-147	N 04° 04' W	1,73 M.	146	495858.448	1607788.271	14° 32' 14,5283" N	120° 57' 46,5575" E
147-148	N 02° 06' W	1,73 M.	147	495858.326	1607789.992	14° 32' 14,5843" N	120° 57' 46,5534" E
148-149	N 00° 07' W	1,73 M.	148	495858.263	1607791.717	14° 32' 14,6404" N	120° 57' 46,5513" E
149-150	N 01° 52' E	1,73 M.	149	495858.260	1607793.442	14° 32' 14,6965" N	120° 57' 46,5511" E
150-151	N 03° 51' E	1,73 M.	150	495858.316	1607795.167	14° 32' 14,7527" N	120° 57' 46,5530" E
151-152	N 05° 49' E	1,73 M.	151	495858.432	1607796.889	14° 32' 14,8087" N	120° 57' 46,5569" E
152-153	N 07° 48' E	1,73 M.	152	495858.607	1607798.605	14° 32' 14,8645" N	120° 57' 46,5627" E
153-154	N 09° 47' E	1,73 M.	153	495858.841	1607800.315	14° 32' 14,9202" N	120° 57' 46,5705" E
154-155	N 11° 45' E	1,73 M.	154	495859.134	1607802.016	14° 32' 14,9755" N	120° 57' 46,5803" E
155-156	N 13° 44' E	1,73 M.	155	495859.486	1607803.705	14° 32' 15,0305" N	120° 57' 46,5920" E
156-157	N 15° 43' E	1,73 M.	156	495859.895	1607805.381	14° 32' 15,0850" N	120° 57' 46,6057" E
157-158	N 17° 42' E	1,73 M.	157	495860.363	1607807.042	14° 32' 15,1391" N	120° 57' 46,6213" E
158-159	N 19° 40' E	1,73 M.	158	495860.887	1607808.686	14° 32' 15,1926" N	120° 57' 46,6388" E
159-160	N 21° 39' E	1,73 M.	159	495861.468	1607810.311	14° 32' 15,2454" N	120° 57' 46,6582" E
160-161	N 23° 38' E	1,73 M.	160	495862.105	1607811.915	14° 32' 15,2976" N	120° 57' 46,6795" E
161-162	N 25° 36' E	1,73 M.	161	495862.796	1607813.496	14° 32' 15,3491" N	120° 57' 46,7026" E
162-163	N 27° 35' E	1,73 M.	162	495863.542	1607815.052	14° 32' 15,3997" N	120° 57' 46,7274" E
163-164	N 29° 34' E	1,73 M.	163	495864.341	1607816.582	14° 32' 15,4495" N	120° 57' 46,7541" E
164-165	N 31° 32' E	1,73 M.	164	495865.192	1607818.083	14° 32' 15,4984" N	120° 57' 46,7826" E
165-166	N 33° 31' E	1,73 M.	165	495866.095	1607819.553	14° 32' 15,5462" N	120° 57' 46,8127" E
166-167	N 35° 30' E	1,73 M.	166	495867.048	1607820.992	14° 32' 15,5930" N	120° 57' 46,8445" E
167-168	N 37° 28' E	1,73 M.	167	495868.050	1607822.397	14° 32' 15,6387" N	120° 57' 46,8780" E
168-169	N 39° 27' E	1,73 M.	168	495869.099	1607823.766	14° 32' 15,6833" N	120° 57' 46,9130" E
169-170	N 41° 26' E	1,73 M.	169	495870.196	1607825.099	14° 32' 15,7267" N	120° 57' 46,9496" E
170-171	N 43° 24' E	1,73 M.	170	495871.338	1607826.393	14° 32' 15,7688" N	120° 57' 46,9878" E
171-172	N 45° 23' E	1,73 M.	171	495872.523	1607827.646	14° 32' 15,8096" N	120° 57' 47,0274" E
172-173	N 47° 22' E	1,73 M.	172	495873.752	1607828.858	14° 32' 15,8490" N	120° 57' 47,0684" E
173-174	N 49° 20' E	1,73 M.	173	495875.021	1607830.027	14° 32' 15,8871" N	120° 57' 47,1108" E
174-175	N 51° 19' E	1,73 M.	174	495876.330	1607831.152	14° 32' 15,9237" N	120° 57' 47,1545" E
175-176	N 53° 18' E	1,73 M.	175	495877.677	1607832.230	14° 32' 15,9587" N	120° 57' 47,1995" E
176-177	N 55° 16' E	1,73 M.	176	495879.061	1607833.262	14° 32' 15,9923" N	120° 57' 47,2457" E
177-178	N 57° 15' E	1,73 M.	177	495880.479	1607834.245	14° 32' 16,0243" N	120° 57' 47,2931" E
178-179	N 59° 14' E	1,73 M.	178	495881.930	1607835.178	14° 32' 16,0547" N	120° 57' 47,3415" E
179-180	N 61° 12' E	1,73 M.	179	495883.413	1607836.061	14° 32' 16,0834" N	120° 57' 47,3911" E
180-181	N 69° 07' E	12,05 M.	180	495884.925	1607836.892	14° 32' 16,1105" N	120° 57' 47,4416" E
181-182	N 76° 03' E	849,99 M.	181	495896.184	1607841.187	14° 32' 16,2503" N	120° 57' 47,8176" E
182-183	N 76° 03' E	239,54 M.	182	496721.077	1608046.216	14° 32' 22,9262" N	120° 58' 15,3708" E
183-1	N 76° 24' E	272,98 M.	183	496953.544	1608103.996	14° 32' 24,8074" N	120° 58' 23,1358" E

APPENDIX E. GEOTECHNICAL STUDIES

E.1. Geohazard Assessment (HazardHunterPH)
E.2. Geotechnical Interpretation Report

APPENDIX E.1

E.1. Geohazard Assessment (HazardHunterPH)

E.1. Geohazard Assessment (HazardHunterPH)

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

DATE	18 April 2024, 2:49 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

View document online

SEISMIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Ground Rupture	**Safe; Approximately 9.1 km west of the Valley Fault System: West Valley Fault**	Active faults are faults that have moved within the last 10,000 years. An active fault may show evidence or may have documented history of recent movements. Ground rupture is a displacement along an active fault trace that reaches the surface. Ground rupture hazard assessment is the distance to the nearest known active fault. The recommended buffer zone, or Zone of Avoidance, against ground rupture hazard is at least 5 meters on both sides of the active fault or from its zone of deformation.
Ground Shaking	**Prone**	All sites may be affected by ground shaking in the event of an earthquake and can be mitigated by following the provisions of the National Building code and the Structural code of the Philippines.
Liquefaction	**Area is outside administrative boundaries**	Liquefaction is a phenomenon wherein the ground, especially near the river, lake and coasts, behaves like liquid similar to quicksand due to very strong shaking.
Earthquake-Induced Landslide	**Area is outside administrative boundaries**	Earthquake-induced landslides are the downward slope movement of rocks, solid and other debris commonly triggered by strong shaking.
Tsunami	**Area is not covered by current hazard maps**	A tsunami is a series of sea waves commonly generated by under-the-sea earthquakes.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

BAGONG PILIPINAS

View document online

DATE	18 April 2024, 2:49 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

VOLCANIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Nearest Active Volcano	**Approximately 59.6 km north of Taal**	Active volcanoes are those that erupted within historical times (within the last 600 years). Accounts of these eruptions were documented by man within the last 10,000 years based on the analyses of material from young volcanic deposits.
Permanent Danger Zone	**Onwater**	N/A
Lahar	**N/A; Area is outside administrative boundaries; Area is outside administrative boundaries**	Lahars (an Indonesian term), sometimes called volcanic mudflows or debris flows, are slurries of volcanic sediment, debris and water that cascade down a volcano's slopes through rivers and channels. Lahars in tropical areas are mainly generated by torrential rainfall on unconsolidated deposits from a past eruption. Lahar Hazard assessments are long-term lahar hazard projections based on the volcano's morphology, eruption history, as well as its tendency for rapid morphologic changes during periods of intense and/or prolonged rainfall, or after a major lahar event.
Lava Flow	**N/A; Area is outside administrative boundaries; Area is outside administrative boundaries**	Lava flows are rivers of incandescent of molten rock or lava moving downslope or away from an eruption vent. Lava flows composed of low silica magma have low viscosities and tend to flow at high speeds (kilometers per hour), while those composed of high silica magma have high viscosities and tend to move slowly (kilometers per day). Areas prone to lava flow hazard are based on the extent of lava deposits from historical eruptions of the volcano.
Pyroclastic Flow	**N/A; Area is outside administrative boundaries**	Pyroclastic density currents range from pyroclastic flows to pyroclastic surges depending mainly on particle concentrations, with pyroclastic flows being denser and therefore ground-hugging currents. Areas prone to pyroclastic density currents are based on historical medium-scale eruptions of the volcano. Current pyroclastic hazard limits may be exceeded during larger-scale Plinian eruptions.
Ballistic Projectiles	**Area is outside administrative boundaries**	Ballistic projectiles are large particle tephra ejected straight out of the volcanic vents.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

BAGONG PILIPINAS

View document online

DATE	18 April 2024, 2:49 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

VOLCANIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Base Surge	**Area is outside administrative boundaries**	Base surge is a special class of pyroclastic density current that are mobile and water-vapor-rich pyroclastic surges. They are generated by explosive phreatomagmatic eruptions. Base surge from the Main Crater of Taal Volcano can travel downslope in all direction and even across the Taal Lake. Areas prone to base surge hazard are based on the 1754 Main Crater eruption of Taal Volcano.
Volcanic Tsunami	**Area is outside administrative boundaries**	Volcanic tsunami occur in caldera lakes when water is displaced by deformation of the lake floor caused by rising magma or the entry of pyroclastic density currents (PDCs) or landslides into the lake, or in seas when water is displaced by PDCs or debris avalanches from volcanoes. Such tsunamis are unlike those generated by large magnitude offshore earthquakes, which are long-period waves generated by fault displacement or deformation of the seafloor. Areas immediately prone to seiche are those along the lakeshore of Taal and Buhi Lake
Ashfall	**Prone**	In case of future eruptions, the site may be affected by ash fallout, depending on the scale of eruption and prevailing wind direction at the time of eruption. Generally, ashfall is heavier near the active vent and thins out indefinitely away from the eruption center.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU

View document online

DATE 18 April 2024, 2:49 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Flood	**Area is outside administrative boundaries**	The implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for areas that are susceptible to various flood depths. Site-specific studies including the assessment for other types of hazards should also be conducted to address potential foundation problems.
Rain-Induced Landslide	**Area is outside administrative boundaries**	Implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for landslide-susceptible areas. This includes performing site-specific studies to address potential foundation/slope stability problems. Monitoring of signs/evidences of ground movement such as tension cracks, tilted trees and fences, and bulging road sections in areas that are moderately to critically susceptible to landslides should be done regularly and reported to local authorities and/or the MGB.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- The possibility of both rain-induced landslide and flooding occurring is not disregarded. Because of the composite nature of MGB's 1:10,000-scale Rain-induced Landslide and Flood Susceptibility Maps, it spatially prioritizes the more frequently occurring and most damaging hazards in an area. Continuous updating is being done.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, or for the assessment of sites for development, request for an Official Geohazard Certification or Site Investigation on Rain-induced Landslide and Flood hazards from the Mines and Geosciences Bureau (MGB) by sending an email to central@mgb.gov.ph.

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU

View document online

DATE	18 April 2024, 2:49 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, or for the assessment of sites for development, request for an Official Geohazard Certification or Site Investigation on Rain-induced Landslide and Flood hazards from the Mines and Geosciences Bureau (MGB) by sending an email to central@mgb.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE 18 April 2024, 2:49 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Severe Wind	**Area is outside administrative boundaries (20-year return period); Area is outside administrative boundaries (500-year return period)**	The Regional Severe Wind Hazard Map represents the 3-second peak gust wind speed measured at 10-meter height (above ground) over open and flat terrain. This does not take into account the local factors such as topography, terrain roughness and shielding from neighbouring structures. The Regional Severe Wind Hazard is expressed in terms of Return Periods(RPs) of Tropical Cyclone winds. Return period means the repeat interval, or the estimate of likelihood and severity of severe wind event. Return periods are then translated into Annual Exceedance Probabilities (AEPs) which are the chance that a given severe wind hazard level will be equalled or exceeded in any year. At higher return periods, the wind speeds are stronger but are less frequent. At lower return periods, the wind speeds are less intense but are more frequent. The Regional severe wind hazard maps are used to update the wind zoning map of the Philippines and as reference in designing building structures. For those areas identified as high risk to wind damage, building codes/regulations must be strictly implemented to mitigate severe wind risks. For already developed areas, retrofitting is encouraged – the methods applied in this study can be used to set out a cost-benefit study for retrofitting older, more vulnerable building types to increase their resilience to severe winds.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an Official Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to piias@pagasa.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE 18 April 2024, 2:49 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Storm Surge	**Area is not covered by current hazard maps**	A storm surge ("daluyong ng bagyo") is the abnormal rise in sea level that occurs during tropical cyclones or "bagyo". It happens when a very strong tropical cyclone blows-off excessive amounts of seawater toward low-lying coastal communities. It is catastrophic and life-threatening because a storm surge can cause massive inland flooding, sometimes in unimaginable heights. It is even more dangerous when the storm surge coincides with a high tide. For storm surge-prone communities, the most important considerations are 1) the strength of the tropical cyclone, 2) the height of the surge, and 3) if the community is located in a low-lying areas.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an Official Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to plias@pagasa.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE	18 April 2024, 2:49 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an Official Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to piias@pagasa.dost.gov.ph.

View document online

DATE	18 April 2024, 2:49 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97376, 14.54862

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

NEAREST CRITICAL FACILITIES

CRITICAL FACILITY NAME	TYPE	DISTANCE FROM SPECIFIED LOCATION
Gotamco Es	Public Elementary School	2.1 km
Philippine School For The Deaf	Public Secondary School	2.4 km
Cuyegkeng Health Center	Government Health Facility	2 km
Miraculous Medal Emergency Medical Clinic	Private Health Facility	2 km
Roxas Blvd; Pasay City (Ione District)	Primary Road Network	2.3 km
Roxas Blvd; Pasay City (Ione District)	Secondary Road Network	1.7 km

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- All computations are based on the available exposure data and the coordinates of the user's selected location
- Schools data obtained from Department of Education (2015)
- Health facilities data obtained from Department of Health (2016)

This is a system-generated report. It does not require any signature if it has been issued without any alteration.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

View document online

DATE	18 April 2024, 2:56 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.96715, 14.54634

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

SEISMIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Ground Rupture	**Safe; Approximately 9.7 km west of the Valley Fault System: West Valley Fault**	Active faults are faults that have moved within the last 10,000 years. An active fault may show evidence or may have documented history of recent movements. Ground rupture is a displacement along an active fault trace that reaches the surface. Ground rupture hazard assessment is the distance to the nearest known active fault. The recommended buffer zone, or Zone of Avoidance, against ground rupture hazard is at least 5 meters on both sides of the active fault or from its zone of deformation.
Ground Shaking	**Prone**	All sites may be affected by ground shaking in the event of an earthquake and can be mitigated by following the provisions of the National Building code and the Structural code of the Philippines.
Liquefaction	**Area is outside administrative boundaries**	Liquefaction is a phenomenon wherein the ground, especially near the river, lake and coasts, behaves like liquid similar to quicksand due to very strong shaking.
Earthquake-Induced Landslide	**Area is outside administrative boundaries**	Earthquake-induced landslides are the downward slope movement of rocks, solid and other debris commonly triggered by strong shaking.
Tsunami	**Area is not covered by current hazard maps**	A tsunami is a series of sea waves commonly generated by under-the-sea earthquakes.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at odi@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

BAGONG PILIPINAS

View document online

DATE	18 April 2024, 2:96 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.76319, 14.94654

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

VOLCANIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Nearest Active Volcano	**Approximately 59.4 km north of Taal**	Active volcanoes are those that erupted within historical times (within the last 600 years). Accounts of these eruptions were documented by man within the last 10,000 years based on the analyses of material from young volcanic deposits.
Permanent Danger Zone	**Onwater**	N/A
Lahar	**N/A; Area is outside administrative boundaries; Area is outside administrative boundaries**	Lahars (an Indonesian term), sometimes called volcanic mudflows or debris flows, are slurries of volcanic sediment, debris and water that cascade down a volcano's slopes through rivers and channels. Lahars in tropical areas are mainly generated by torrential rainfall on unconsolidated deposits from a past eruption. Lahar Hazard assessments are long-term lahar hazard projections based on the volcano's morphology, eruption history, as well as its tendency for rapid morphologic changes during periods of intense and/or prolonged rainfall, or after a major lahar event.
Lava Flow	**N/A; Area is outside administrative boundaries; Area is outside administrative boundaries**	Lava flows are rivers of incandescent of molten rock or lava moving downslope or away from an eruption vent. Lava flows composed of low silica magma have low viscosities and tend to flow at high speeds (kilometers per hour), while those composed of high silica magma have high viscosities and tend to move slowly (kilometers per day). Areas prone to lava flow hazard are based on the extent of lava deposits from historical eruptions of the volcano.
Pyroclastic Flow	**N/A; Area is outside administrative boundaries**	Pyroclastic density currents range from pyroclastic flows to pyroclastic surges depending mainly on particle concentrations, with pyroclastic flows being denser and therefore ground-hugging currents. Areas prone to pyroclastic density currents are based on historical medium-scale eruptions of the volcano. Current pyroclastic hazard limits may be exceeded during larger-scale Plinian eruptions.
Ballistic Projectiles	**Area is outside administrative boundaries**	Ballistic projectiles are large particle tephra ejected straight out of the volcanic vents.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

BAGONG PILIPINAS

View document online

DATE	18 April 2024, 2:96 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.76319, 14.94654

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

VOLCANIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Base Surge	**Area is outside administrative boundaries**	Base surge is a special class of pyroclastic density current that are mobile and water-vapor-rich pyroclastic surges. They are generated by explosive phreatomagmatic eruptions. Base surge from the Main Crater of Taal Volcano can travel downslope in all direction and even across the Taal Lake. Areas prone to base surge hazard are based on the 1394 Main Crater eruption of Taal Volcano.
Volcanic Tsunami	**Area is outside administrative boundaries**	Volcanic tsunami occur in caldera lakes when water is displaced by deformation of the lake floor caused by rising magma or the entry of pyroclastic density currents (PDCs) or landslides into the lake, or in seas when water is displaced by PDCs or debris avalanches from volcanoes. Such tsunamis are unlike those generated by large magnitude offshore earthquakes, which are long-period waves generated by fault displacement or deformation of the seafloor. Areas immediately prone to seiche are those along the lakeshore of Taal and Buhi Lake
Ashfall	**Prone**	In case of future eruptions, the site may be affected by ash fallout, depending on the scale of eruption and prevailing wind direction at the time of eruption. Generally, ashfall is heavier near the active vent and thins out indefinitely away from the eruption center.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU

View document online

DATE	18 April 2024, 2:56 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.96715, 14.54634

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Flood	**Area is outside administrative boundaries**	The implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for areas that are susceptible to various flood depths. Site-specific studies including the assessment for other types of hazards should also be conducted to address potential foundation problems.
Rain-Induced Landslide	**Area is outside administrative boundaries**	Implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for landslide-susceptible areas. This includes performing site-specific studies to address potential foundation/slope stability problems. Monitoring of signs/evidences of ground movement such as tension cracks, tilted trees and fences, and bulging road sections in areas that are moderately to critically susceptible to landslides should be done regularly and reported to local authorities and/or the MGB.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- The possibility of both rain-induced landslide and flooding occurring is not disregarded. Because of the composite nature of MGB's 1:10,000-scale Rain-induced Landslide and Flood Susceptibility Maps, it spatially prioritizes the more frequently occurring and most damaging hazards in an area. Continuous updating is being done.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, or for the assessment of sites for development, request for an Official Geohazard Certification or Site Investigation on Rain-induced Landslide and Flood hazards from the Mines and Geosciences Bureau (MGB) by sending an email to central@mgb.gov.ph.

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU

View document online

DATE	18 April 2024, 2:90 pm
LOCATION	7utside PSA administrative boundaries
COORDINATES	120.30619, 14.94054

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, or for the assessment of sites for development, request for an 7fficial Geohazard Certification or Site Investigation on Rain-induced Landslide and Flood hazards from the Mines and Geosciences Bureau (MGB) by sending an email to central@mgb.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE 18 April 2024, 2:90 pm
LOCATION 7utside PSA administrative boundaries
COORDINATES 120.60519, 14.94034

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Severe Wind	**Area is outside administrative boundaries (20-year return period); Area is outside administrative boundaries (500-year return period)**	The Regional Severe Wind Hazard Map represents the 3-second peak gust wind speed measured at 10-meter height (above ground) over open and flat terrain. This does not take into account the local factors such as topography, terrain roughness and shielding from neighbouring structures. The Regional Severe Wind Hazard is expressed in terms of Return Periods(RPs) of Tropical Cyclone winds. Return period means the repeat interval, or the estimate of likelihood and severity of severe wind event. Return periods are then translated into Annual Exceedance Probabilities (AEPs) which are the chance that a given severe wind hazard level will be equalled or exceeded in any year. At higher return periods, the wind speeds are stronger but are less frequent. At lower return periods, the wind speeds are less intense but are more frequent. The Regional severe wind hazard maps are used to update the wind zoning map of the Philippines and as reference in designing building structures. For those areas identified as high risk to wind damage, building codes/regulations must be strictly implemented to mitigate severe wind risks. For already developed areas, retrofitting is encouraged – the methods applied in this study can be used to set out a cost-benefit study for retrofitting older, more vulnerable building types to increase their resilience to severe winds.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an 7fficial Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to piias@pagasa.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE 18 April 2024, 2:56 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.96715, 14.54634

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Storm Surge	**Area is not covered by current hazard maps**	A storm surge ("daluyong ng bagyo") is the abnormal rise in sea level that occurs during tropical cyclones or "bagyo". It happens when a very strong tropical cyclone blows-off excessive amounts of seawater toward low-lying coastal communities. It is catastrophic and life-threatening because a storm surge can cause massive inland flooding, sometimes in unimaginable heights. It is even more dangerous when the storm surge coincides with a high tide. For storm surge-prone communities, the most important considerations are 1) the strength of the tropical cyclone, 2) the height of the surge, and 3) if the community is located in a low-lying areas.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an Official Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to plias@pagasa.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE	18 April 2024, 2:90 pm
LOCATION	7 utside PSA administrative boundaries
COORDINATES	120.60519, 14.94034

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an 7 fficial Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to piias@pagasa.dost.gov.ph.

View document online

DATE	18 April 2024, 2:56 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.96715, 14.54634

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

NEAREST CRITICAL FACILITIES

CRITICAL FACILITY NAME	TYPE	DISTANCE FROM SPECIFIED LOCATION
Gotamco Es	Public Elementary School	2.9 km
Philippine School For The Deaf	Public Secondary School	3 km
Cuyegkeng Health Center	Government Health Facility	2.7 km
Miraculous Medal Emergency Medical Clinic	Private Health Facility	2.7 km
Roxas Blvd; Pasay City (Ione District)	Primary Road Network	2.9 km
Roxas Blvd; Pasay City (Ione District)	Secondary Road Network	2.4 km

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- All computations are based on the available exposure data and the coordinates of the user's selected location
- Schools data obtained from Department of Education (2015)
- Health facilities data obtained from Department of Health (2016)

This is a system-generated report. It does not require any signature if it has been issued without any alteration.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

View document online

DATE	18 April 2024, 3:01 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.97045, 14.53467

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

SEISMIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Ground Rupture	**Safe; Approximately 9.1 km west of the Valley Fault System: West Valley Fault**	Active faults are faults that have moved within the last 10,000 years. An active fault may show evidence or may have documented history of recent movements. Ground rupture is a displacement along an active fault trace that reaches the surface. Ground rupture hazard assessment is the distance to the nearest known active fault. The recommended buffer zone, or Zone of Avoidance, against ground rupture hazard is at least 5 meters on both sides of the active fault or from its zone of deformation.
Ground Shaking	**Prone**	All sites may be affected by ground shaking in the event of an earthquake and can be mitigated by following the provisions of the National Building code and the Structural code of the Philippines.
Liquefaction	**Area is outside administrative boundaries**	Liquefaction is a phenomenon wherein the ground, especially near the river, lake and coasts, behaves like liquid similar to quicksand due to very strong shaking.
Earthquake-Induced Landslide	**Area is outside administrative boundaries**	Earthquake-induced landslides are the downward slope movement of rocks, solid and other debris commonly triggered by strong shaking.
Tsunami	**Area is not covered by current hazard maps**	A tsunami is a series of sea waves commonly generated by under-the-sea earthquakes.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at odi@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

BAGONG PILIPINAS

View document online

DATE	18 April 2024, : 901 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.73045, 14.5: 463

Note9When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

VOLCANIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Nearest Active Volcano	**Approximately 58.1 km north of Taal**	Active volcanoes are those that erupted within historical times (within the last 600 years). Accounts of these eruptions were documented by man within the last 10,000 years based on the analyses of material from young volcanic deposits.
Permanent Danger Zone	**Onwater**	N/A
Lahar	**N/A; Area is outside administrative boundaries; Area is outside administrative boundaries**	Lahars (an Indonesian term), sometimes called volcanic mudflows or debris flows, are slurries of volcanic sediment, debris and water that cascade down a volcano's slopes through rivers and channels. Lahars in tropical areas are mainly generated by torrential rainfall on unconsolidated deposits from a past eruption. Lahar Hazard assessments are long-term lahar hazard projections based on the volcano's morphology, eruption history, as well as its tendency for rapid morphologic changes during periods of intense and/or prolonged rainfall, or after a major lahar event.
Lava Flow	**N/A; Area is outside administrative boundaries; Area is outside administrative boundaries**	Lava flows are rivers of incandescent of molten rock or lava moving downslope or away from an eruption vent. Lava flows composed of low silica magma have low viscosities and tend to flow at high speeds (kilometers per hour), while those composed of high silica magma have high viscosities and tend to move slowly (kilometers per day). Areas prone to lava flow hazard are based on the extent of lava deposits from historical eruptions of the volcano.
Pyroclastic Flow	**N/A; Area is outside administrative boundaries**	Pyroclastic density currents range from pyroclastic flows to pyroclastic surges depending mainly on particle concentrations, with pyroclastic flows being denser and therefore ground-hugging currents. Areas prone to pyroclastic density currents are based on historical medium-scale eruptions of the volcano. Current pyroclastic hazard limits may be exceeded during larger-scale Plinian eruptions.
Ballistic Projectiles	**Area is outside administrative boundaries**	Ballistic projectiles are large particle tephra ejected straight out of the volcanic vents.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

BAGONG PILIPINAS

View document online

DATE	18 April 2024, : 901 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.73045, 14.5: 463

Note9When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

VOLCANIC HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Base Surge	**Area is outside administrative boundaries**	Base surge is a special class of pyroclastic density current that are mobile and water-vapor-rich pyroclastic surges. They are generated by explosive phreatomagmatic eruptions. Base surge from the Main Crater of Taal Volcano can travel downslope in all direction and even across the Taal Lake. Areas prone to base surge hazard are based on the 1354 Main Crater eruption of Taal Volcano.
Volcanic Tsunami	**Area is outside administrative boundaries**	Volcanic tsunami occur in caldera lakes when water is displaced by deformation of the lake floor caused by rising magma or the entry of pyroclastic density currents (PDCs) or landslides into the lake, or in seas when water is displaced by PDCs or debris avalanches from volcanoes. Such tsunamis are unlike those generated by large magnitude offshore earthquakes, which are long-period waves generated by fault displacement or deformation of the seafloor. Areas immediately prone to seiche are those along the lakeshore of Taal and Buhi Lake
Ashfall	**Prone**	In case of future eruptions, the site may be affected by ash fallout, depending on the scale of eruption and prevailing wind direction at the time of eruption. Generally, ashfall is heavier near the active vent and thins out indefinitely away from the eruption center.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
If you require detailed hazard analyses that necessitate technical guidance from our researchers, email your request to Dr. Teresito C. Bacolcol at od@phivolcs.dost.gov.ph and geology@phivolcs.dost.gov.ph.

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU

View document online

DATE 18 April 2024, 3:01 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.97045, 14.53467

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Flood	**Area is outside administrative boundaries**	The implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for areas that are susceptible to various flood depths. Site-specific studies including the assessment for other types of hazards should also be conducted to address potential foundation problems.
Rain-Induced Landslide	**Area is outside administrative boundaries**	Implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for landslide-susceptible areas. This includes performing site-specific studies to address potential foundation/slope stability problems. Monitoring of signs/evidences of ground movement such as tension cracks, tilted trees and fences, and bulging road sections in areas that are moderately to critically susceptible to landslides should be done regularly and reported to local authorities and/or the MGB.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- The possibility of both rain-induced landslide and flooding occurring is not disregarded. Because of the composite nature of MGB's 1:10,000-scale Rain-induced Landslide and Flood Susceptibility Maps, it spatially prioritizes the more frequently occurring and most damaging hazards in an area. Continuous updating is being done.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, or for the assessment of sites for development, request for an Official Geohazard Certification or Site Investigation on Rain-induced Landslide and Flood hazards from the Mines and Geosciences Bureau (MGB) by sending an email to central@mgb.gov.ph.

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU

View document online

DATE	18 April 2024, 9:01 pm
LOCATION	Outside PSA administrative boundaries
COORDINATES	120.73046, 14.69453

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, or for the assessment of sites for development, request for an Official Geohazard Certification or Site Investigation on Rain-induced Landslide and Flood hazards from the Mines and Geosciences Bureau (MGB) by sending an email to central@mgb.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE 18 April 2024, 3:01 pm
LOCATION 9utside PSA administrative boundaries
COORDINATES 120.O7046, 14.63457

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Severe Wind	**Area is outside administrative boundaries (20-year return period); Area is outside administrative boundaries (500-year return period)**	The Regional Severe Wind Hazard Map represents the 3-second peak gust wind speed measured at 10-meter height (above ground) over open and flat terrain. This does not take into account the local factors such as topography, terrain roughness and shielding from neighbouring structures. The Regional Severe Wind Hazard is expressed in terms of Return Periods(RPs) of Tropical Cyclone winds. Return period means the repeat interval, or the estimate of likelihood and severity of severe wind event. Return periods are then translated into Annual Exceedance Probabilities (AEPs) which are the chance that a given severe wind hazard level will be equalled or exceeded in any year. At higher return periods, the wind speeds are stronger but are less frequent. At lower return periods, the wind speeds are less intense but are more frequent. The Regional severe wind hazard maps are used to update the wind zoning map of the Philippines and as reference in designing building structures. For those areas identified as high risk to wind damage, building codes/regulations must be strictly implemented to mitigate severe wind risks. For already developed areas, retrofitting is encouraged – the methods applied in this study can be used to set out a cost-benefit study for retrofitting older, more vulnerable building types to increase their resilience to severe winds.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an 9fficial Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to piias@pagasa.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE 18 April 2024, 3:01 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.97045, 14.53467

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

HAZARD	ASSESSMENT	EXPLANATION AND RECOMMENDATION
Storm Surge	**Area is not covered by current hazard maps**	A storm surge ("daluyong ng bagyo") is the abnormal rise in sea level that occurs during tropical cyclones or "bagyo". It happens when a very strong tropical cyclone blows-off excessive amounts of seawater toward low-lying coastal communities. It is catastrophic and life-threatening because a storm surge can cause massive inland flooding, sometimes in unimaginable heights. It is even more dangerous when the storm surge coincides with a high tide. For storm surge-prone communities, the most important considerations are 1) the strength of the tropical cyclone, 2) the height of the surge, and 3) if the community is located in a low-lying areas.

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- For site-specific evaluation or construction of critical facilities, detailed engineering assessment and onsite geotechnical engineering survey may be required.

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an Official Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to plias@pagasa.dost.gov.ph.

Republic of the Philippines
Department of Science and Technology
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION

View document online

DATE	18 April 2024, 3:01 pm
LOCATION	9utside PSA administrative boundaries
COORDINATES	120.O7046, 14.63457

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

HYDRO-METEOROLOGICAL HAZARDS ASSESSMENT

This is a system-generated report. It does not require any signature if it has been issued without any alteration.
To obtain an official document for legal purposes, request for an 9fficial Report from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) by sending an email to piias@pagasa.dost.gov.ph.

View document online

DATE 18 April 2024, 3:01 pm
LOCATION Outside PSA administrative boundaries
COORDINATES 120.97045, 14.53467

Note: When scanning the QR code, the assessment results in the website might vary from the results stated in this report due to updates in the data in the GeoRiskPH database. You may refer to the report available upon scanning the QR code for the updated assessment results

NEAREST CRITICAL FACILITIES

CRITICAL FACILITY NAME	TYPE	DISTANCE FROM SPECIFIED LOCATION
Philippine School For The Deaf	Public Elementary School	2.7 km
Philippine School For The Deaf	Public Secondary School	2.7 km
Dr. Elvira M. Lagrosa Health Center	Government Health Facility	2.7 km
San Juan De Dios Educational Foundation Inc.	Private Health Facility	2.4 km
Roxas Blvd; Pasay City (Ione District)	Primary Road Network	2.3 km
Roxas Blvd; Pasay City (Ione District)	Secondary Road Network	2.3 km

Note:

- All hazard assessments are based on the available susceptibility maps and the coordinates of the user's selected location.
- Depending on the basemaps used and methods employed during mapping, discrepancies may be observed between location of hazards or exposure information and actual ground observations.
- In some areas, hazard assessment may be updated as new data become available for interpretation or as a result of major topographic changes due to onset of natural events.
- The selected location is outside PSA administrative boundaries and may have limited hazard coverage, which can result to inaccuracies in assessment.
- All computations are based on the available exposure data and the coordinates of the user's selected location
- Schools data obtained from Department of Education (2015)
- Health facilities data obtained from Department of Health (2016)

This is a system-generated report. It does not require any signature if it has been issued without any alteration.

E.2. Geotechnical Interpretation Report



REPORT

Geotechnical Interpretation Report: Detailed Engineering Design Pasay and Parañaque Reclamation Development

Client: SM Prime Holdings Inc.

Reference: BE8289/R0030/PN/Phil
Revision: 00/Final
Date: 05 September 2017

Royal HaskoningDHV
Enhancing Society Together

Project related

HASKONINGDHV

Unit 62 Level 6 Legaspi Suites Building
178 Salcedo Street Legaspi Village
Makati City 1229
Philippines
Water

+63 2 802 2160 / 61 **T**
info@ph.rhdhv.com **E**
royalhaskoningdhv.com **W**

Document title: Geotechnical Interpretation Report: Detailed Engineering Design Pasay and Parañaque Reclamation Development
Document short title: Geotechnical Interpretation Report
Reference: BE8289/R0030/PN/Phil
Revision: 00/Final
Date: 05 September 2017
Project name: Pasay and Parañaque Reclamation Development
Project number: BE8289
Author(s): Prima Nilasari, Ruud Steenbakkers, Carolina Sigarán-Loría

Drafted by: Prima Nilasari; Carolina Sigarán-Loría

Checked by: Ruud Steenbakkers

Date / initials:

Approved by: Wouter de Hamer

Date / initials:

Classification
Project related

Disclaimer
No part of these specifications/printed matter may be reproduced and/or published by print, photocopy, microfilm or by any other means, without the prior written permission of HaskoningDHV; nor may they be used, without such permission, for any purposes other than that for which they were produced. HaskoningDHV accepts no responsibility or liability for these specifications/printed matter to any party other than the persons by whom it was commissioned and as concluded under that Appointment.

Project related

Royal HaskoningDHV

Table of Contents

1	**EXECUTIVE SUMMARY**	**2**
2	**INTRODUCTION**	**3**
2.1	Purpose and Scope	3
2.2	Reading Guide	3
3	**SITE CONDITION**	**5**
3.1	Coordinates and Datum	5
3.2	Units	5
3.3	Bathymetry	5
3.4	Groundwater Conditions	5
4	**SITE SURVEY**	**7**
4.1	Introduction	7
4.2	Scope and Execution of Geotechnical Investigation	7
4.2.1	Field Work	7
4.2.2	Laboratory Testing	8
4.3	Scope and Execution of Geophysical Survey	8
5	**GROUND CONDITION**	**10**
6	**EVALUATION OF GEOTECHNICAL PARAMETERS**	**12**
6.1	Summary of Geotechnical Design Parameters	12
6.2	Soil Index and Classification Properties	14
6.3	Consolidation Parameters	14
6.3.1	Preconsolidation Pressure and Preoverburden Pressure	14
6.3.2	Compression Index	14
6.3.3	Recompression Index	14
6.3.4	Coefficient of Secondary Compression	14
6.3.5	Coefficient of Consolidation	14
6.4	Strength Parameters	15
6.4.1	Undrained Shear Strength	15
6.4.2	Drained Shear Stength	16
6.5	Dynamic Soil Parameters	16
6.5.1	Shear Modulus and Damping	16
6.5.2	Shear Wave Velocity	20
6.5.3	Design Shear Wave Velocity	23

7	**OUTSTANDING INFORMATION**	**25**
8	**CONCLUSIONS AND RECOMMENDATIONS**	**27**
8.1	Conclusions	27
8.2	Recommendations	27

Royal HaskoningDHV

Abbreviations

Abbreviations	Description
ASTM	American Standard Test Method
BH	Borehole
BS	British Standard
CD	Chart Datum (= +0.00 m MSL)
CPTu	Cone Penetration Test with pore water pressure measurement
CU	Consolidated Undrained (Triaxial Test)
DS	Disturbed Sample
DSB	Direct Shear Box tests
FSVT	Field Shear Vane Test
GI	Geotechnical Investigation
GIR	Geotechnical Interpretation Report
OCR	Over Consolidation Ratio
MSL	Mean Sea Level
POP	Pre Overburden Pressure
SBL	Seabed Level
SCPTu	Seismic Cone Penetration Test with pore water pressure measurement
SPT	Standard Penetration Test
UCS	Uni-axial Compressive Strength test
USCS	Unified Soil Classification System
UDS	Undisturbed Sample
UU	Unconsolidated Undrained (Triaxial Test)

Royal HaskoningDHV

1 EXECUTIVE SUMMARY

Geotechnical interpretation study has been carried out in the proposed new reclaimed land at Pasay-Parañaque area. Review was performed on the ground investigation campaign data received from geotechnical investigation by Kwan Sing Construction Corporate (KSCC) in 2016-2017 and geophysical survey by EGS in 2016.

This report updates the geotechnical interpretation study carried out in the schematic design report by taking into account the recent received data from geotechnical investigation campaign up to 9 June 2017.

The geological stratigraphy beneath the site has been found to be highly heterogeneous. In particular, three main soil units and three sub-units have been defined and the geotechnical design parameters for each soil unit have been determined in this report.

Table 1-1: Summary of main stratigraphy

Soil Unit	Soil Description	Thickness (m)
SU1	CLAY, silty, very soft to soft, greenish grey, with few shell fragments	1.5 – 21.0
SU2	CLAY, silty, firm, brown to greenish grey	0.7 – 3.3
SU3	Guadalupe Tuff Formation(GTF): Tuffaceous Rock – subdivided further into 3 sub-units:	
SU3A	SANDSTONE/SILTSTONE, interbedded with silt/clay, highly weathered to unweathered, weak to strong	0.4 – 29.6
SU3B	SILT, clayey, very stiff to hard, locally cemented, brown to greenish grey, contains pocket of sand (locally)	1.0 – 29.5
SU3C	SAND, silty, dense to very dense, locally cemented, brown to greenish grey, contains some gravel (locally)	0.5 – 15.0

Royal HaskoningDHV

2 INTRODUCTION

The Client has intention to develop a new and modern residential and commercial area in the newly Pasay and Parañaque land reclamation in Manila Bay. It is planned on sustainable design principles, and designed to international standards to provide a safe living environment on the land reclamation.

Previously, RHDHV has performed geotechnical interpretation study in the schematic design phase. As the GI has progressed, further geotechnical data has become available. This GIR updates the results of interpretation study.

2.1 Purpose and Scope

The purpose of this GIR is to present an evaluation of the geotechnical data obtained from 2016-2017 ground investigation campaign at project site. This GIR updates and replaces the interpretation study in the Schematic Design Report. Recently received information relating to the ongoing geotechnical investigation (especially laboratory testing) are outside the scope of this report and only data delivered before 9 June 2017 have been considered in this GIR. The information will later be used during construction phases together with additional ground investigation campaign, if deemed necessary.

The derived geotechnical parameters summarized in this GIR apply exclusively to the design of the newly land reclamation of Pasay-Paranaque. The information presented shall not be construed as to apply to any other non-specific structures located either within the site or in the vicinity of the site.

It should be noted that:

- for different geotechnical calculations, different parameter sets are required. Upper and lower boundary sets may differ depending on the field of application. For instance for a dredge-ability assessment more or less upper boundaries are required, to avoid underestimation of strength, while for bearing capacity calculations lower boundaries are required to avoid an overestimation of the subsoil strength (or bearing capacity).
- the geotechnical parameters are based on initial conditions encountered as existing during the soil investigation. Soil characteristics depend on applicable in situ stresses and are subject to change during construction work, such as softening during excavations and strength increase due to consolidation under embankment loads for instance. Adaptations applicable for construction phases are not taken into account in this interpretation but should be applied in the geotechnical design, if deemed necessary.
- the safety approach varies per calculation methods and therefore different geotechnical parameter sets (such as characteristic values, safe estimates or average values) are applicable.

2.2 Reading Guide

This GIR is organised as follows:

- Section 3 – Site Condition: presents a general overview of site condition based on the available information relating to the project site
- Section 4 – Ground Investigation: provides an overview of the scope of the 2016-2017 ground investigation campaign carried out for the project
- Section 5 – Geotechnical Condition: a summary of the ground conditions and identified stratigraphic units is presented
- Section 6 – Evaluation of Geotechnical Parameters: Summary tables of geotechnical design parameters assigned to each soil unit are presented

- Section 7 – Outstanding Information
- Section 8 – Conclusions and Recommendations: presents a summary of preceding sections and describes the limitations and anomalies identified in the factual data and recommendations

Royal HaskoningDHV

3 SITE CONDITION

3.1 Coordinates and Datum

Coordinates will be defined in UTM zone 51N WGS 84.

Most land levels and construction levels are based upon MSL. For this project, MSL is used as zero reference level for all future reports. The notation will be +x.xx m MSL or -x.xx m MSL.

3.2 Units

The units applied in this report have been taken from the international system of units. To these units, prefixes are used which are cube numbers of 10, like M (mega) = 10^6, G (giga) =10^9, besides the general prefixes as k (kilo) = 10^3 and m (milli) = 10^{-3} are suitable. For the gravitational acceleration, g = 9.81 m/s² is used. The SI-units generally applied are:

Table 3-1: List of units

Quantity	Unit	Symbol
length	meter	m
mass	kilogram	kg
force	newton	N
area	square meter	m^2
volume	cubic meter	m^3
force, weight	kilonewton	kN
weight per volume	kilonewton per cubic meter	kN/m^3
force per area (load)	kilonewton per square meter	kN/m^2
force per area (stress)	kilopascal	kPa

3.3 Bathymetry

The new land reclamation will be constructed on the existing seabed. Water depths vary from 4.0 meters to approximately 20.0 meters.

Dredging activity had been carried out within project site area in the past for the existing land reclamation construction purposes. This results a high variation in the seabed elevation. Deep pits with water depth of 17.0m to >20.0m are present in the North-East area and South-Central area.

3.4 Groundwater Conditions

Groundwater level was measured from the geotechnical investigation campaign. 17 no. dissipation tests were undertaken during CPTu located randomly at the project site. Most tests were undertaken within SU1 layer. Figure below shows pore water pressure profile from CPTu dissipation test compared with the hydrostatic pressure.

Royal HaskoningDHV

These data confirm that the measured pore water pressures are in line with the hydrostatic pressure; however from figure below it shows that some data have unrealistic high values and are considered outlined.

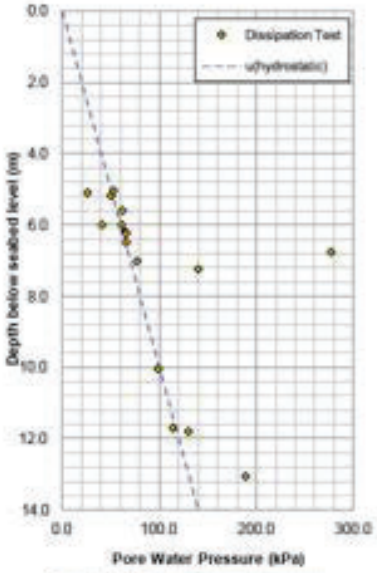


Figure 3-1: Profile of pore water pressure

4 SITE SURVEY

4.1 Introduction

To date, two site surveys have been conducted on the newly land reclamation location:

- Geotechnical investigation
- Geophysical survey

Detailed of the scope site surveys are given in the sections below.

4.2 Scope and Execution of Geotechnical Investigation

KSCC has been engaged by the Client to undertake the geotechnical investigation in the proposed Pasay and Parañaque Reclamation location. The investigation campaign is divided into two phases:

- Preliminary Phase
- Full Investigation Phase

The investigation campaign was commenced on December 2016 for preparation work. Field work was started on 4 January 2017 and completed on 9 June 2017 for both phases. At the moment of writing the laboratory work for Full Investigation Phase is still ongoing. Drawing No. BE8289-GEO-DED-PLAN-0001 shows the layout of the exploratory holes undertaken in this campaign.

The completed field and laboratory test results are provided in draft Final Factual Report (Appendix 3).

4.2.1 Field Work

The offshore investigations were performed from five (5) jack-up barges; 4 barges were utilized for drilling work (BH) and 1 barge was utilized for CPT. The field work consisted of:

- A total of 91 no. deep boreholes were performed in soil and rock layers:
  - Forty six (46) no. of bridge boreholes (BHb series), executed to depth of 40m below seabed level.
  - Twenty three (23) no. of reclamation boreholes (BHr series), executed to depth of 30m below seabed level.
  - Twenty one (21) no. of deep reclamation boreholes (BHd series), executed to depth of 40m below seabed level.
  - FVSTs are performed every 1.5m depth in very soft to soft soil layer using the tapered vane blades with 6.5cm diameter and 13cm height. Undisturbed and remoulded tests are performed.
  - SPTs (stiffer soil) are carried out every 1.5m depth.
  - (Un)disturbed samples were collected in each borehole with depth interval of 1.5m.
  - Classification of soil and rock are done in according to BS5930:1999.

- A total of 52 no. cone penetration tests (CPTs):
  - Thirty five (35) no. of CPTu's, executed to depth ranging from 1.7m to 23.3m from seabed level.
  - Seventeen (17) no. of SCPTu's, executed to depth ranging from 2.7m to 21.4m from seabed level. Seismic tests were performed in every one meter depth.
  - A total 17 no. of dissipation tests were carried out randomly in CPTu series.



- Ammonium
- N-Kjeldahl
- Nitrite
- Nitrate
- Nitrogen (total)

- Sediment sampling:
  - natural water content
  - grain size analysis
  - unit weight
- Turbidity:
  - Turbidity by turbidimetric method
  - Total Suspended Solids (TSS) by gravimetric method

Project related

Royal HaskoningDHV

5 GROUND CONDITION

The stratigraphy at the project site has been evaluated based on the interpretation of the soil descriptions given on the borehole logs, (S)CPTu and results of laboratory index and classification tests.

In total, 3 no. of main geotechnical soil units have been defined and are summarised in Table 5-1.

Table 5-1: Summary of stratigraphic unit defined at the project site

Soil Unit	Soil Description	Thickness (m)
SU1	CLAY, silty, very soft to soft, greenish grey, with few shell fragments	1.5 – 21.0
SU2	CLAY, silty, firm, brown to greenish grey	0.7 – 3.3
SU3	Guadalupe Tuff Formation (GTF): Tuffaceous Rock – subdivided further into 3 sub-units:	
SU3A	SANDSTONE/SILTSTONE, interbedded with silt/clay, highly weathered to unweathered, weak to strong	0.4 – 29.6
SU3B	SILT, clayey, very stiff to hard, locally cemented, brown to greenish grey, contains pocket of sand (locally)	1.0 – 29.5
SU3C	SAND, silty, dense to very dense, locally cemented, brown to greenish grey, contains some gravel (locally)	0.5 – 15.0

Note: thickness of SU3 presented above is based on the encountered layers in the boreholes excluding the one presents at the bottom of borehole (unproven thickness).

Appendix 8 presents the 3D representation of the encountered stratigraphy, 8 no. geotechnical cross-sections and 5 no. contour maps showing the elevation and thickness of each defined soil unit.

Cross Sections S-N 1, S-N 2 and S-N 3 (Drawing No. BE8289-GEO-DED-CROS-0002 to 0004) are located in the West, Central and East part of project area and oriented in South – North direction. Cross Sections W-E 1, W-E 2, W-E 3, W-E 4 and W-E 5 (Drawing No. BE8289-GEO-DED-CROS-0005 to 0009) are dividing project area from North to South and oriented in West – East direction.

SU1 is found in all exploratory holes and primarily investigated with CPTs and FVST; undisturbed samples of this unit for laboratory testing were collected. Field tests were not always able to measure the very soft to soft state of this unit. In most CPTs in the first one meter the cone resistance is reported to be 'zero' measurement. SU1 is found to vary in thickness from 1.5m to 21.0m across the whole site. The centre area of project site in West – East direction has the thickest SU1.

SU2 underlies the SU1 and does not exist in all areas. SU2 can be seen as 'transition layer' which separates the alluvial soil and tuffaceous rocks. SU2 is relatively thin with N-SPT values range from 6 to 15.

Guadalupe Tuff Formation (GTF) soil units are found below SU1 and SU2. The GTF layer has been further subdivided into 3 sub units defined in the table above. Due to sporadic volcanic activity in the past, sub units of GTF are highly varying in layering. SU3A majority consists of weak rock in highly weathered and destructured state and varies in grain size, through sandstone and siltstone, but claystone and conglomerate are locally found in this formation. Within SU3A layer, SU3B or SU3C is found and referred



to as locally as “fossil soils” where soil layers deposited and covered by the next phase of tuff deposition [12].

Project related

Royal HaskoningDHV

6 EVALUATION OF GEOTECHNICAL PARAMETERS

The geotechnical parameters presented in this section have been determined for the detailed engineering design of Pasay and Parañaque Reclamation Development. Should the proposed design change, this information would need to be re-appraised.

Geotechnical parameters are interpreted from in-situ tests and laboratory tests. The designer/geotechnical expert is however responsible for applying the correct parameters per geotechnical assessment and should take the project conditions, such as cyclic softening, excavations, etc. into account. Should the proposed design change significantly, this information would need to be re-evaluated.

Section 6.1 presents the summary tables of the geotechnical parameters determined from the assessment of data obtained from survey campaign stated in section 4, complimented with published values wherever possible.

Profiles of geotechnical parameters for each soil unit are included in Annex II.

6.1 Summary of Geotechnical Design Parameters

Table 6-1: Soil Index and Classification Properties

Soil Unit	Soil Description	Classification	No. of test	unit weight	Natural water content	Fines Content	Specific gravity	Plasticity Index	Liquid Limit	Plastic Limit
SU		USCS		γ_{wet}	w_n	FC	Gs	I_p	LL	PL
(-)	(-)	(-)	(-)	(kN/m³)	(%)	(%)		(%)	(%)	(%)
1	CLAY, silty, very soft to soft, greenish grey, with few shell fragments	CH	87	14.4	131	90	2.65	71	108	37
2	CLAY, silty, firm, brown to greenish grey	CH	8	14.9	92	92	2.64	76	118	42
3A	SANDSTONE/SILTSTONE, interbedded with siltclay, highly weathered to unweathered, weak to strong	-	75	17.1	43	61	2.63	-	-	-
3B	SILT, clayey, very stiff to hard, locally cemented, brown to greenish grey; contains pocket of sand (locally)	MH, CH	140	17.4	59	86	2.69	40	80	40
3C	SAND, silty, dense to very dense, locally cemented, brown to greenish grey, contains some gravel (locally)	-	52	18.9	35	28	2.71	-	-	-

Project related

Royal HaskoningDHV

Table 6-2: Consolidation Parameters

Soil Unit	Soil Description	No. of test	Void Ratio	Pre consolidation pressure	Over consolidation ratio	Preconsolidation Pressure	Compression Index	Recompression Index	Coefficient of secondary compression	Coefficient of consolidation
SU			e_0	Pc	OCR	POP	C_c	C_r	C_{α}	c_v
(-)	(-)	(-)	(-)	(kN/m²)	(-)	(kN/m²)	(-)	(-)	(-)	(m²/sec)
1	CLAY, silty, very soft to soft, greenish grey, with few shell fragments	25	3.22	35	0.8 to 5.3 (2.0)[1]	15 to 20	1.05	0.15	1.4E-02	7.5E-08
2	CLAY, silty, firm, brown to greenish grey	1	2.64	60	1.5	20	1.04	0.10	7.2E-03	1.8E-08
3B	SILT, clayey, very stiff to hard, locally cemented, brown to greenish grey, contains pocket of sand (locally)	21	1.48	246	1.0 to7.5 (2.0)[1]	150	0.62	0.04	5.5E-03	1.5E-07

Note:

[1] assumed for the seismic ground response analysis

Table 6-3: Strength Parameters

Soil Unit	Soil Description	No. of test	Undrained shear strength	Effective cohesion	Effective friction angle	In-situ stress ratio	Unconfined Compressive Strength	Point Load Index
SU			c_u	c'	φ'	k_0	UCS	$I_{S(50)}$
(-)	(-)	(-)	(kN/m²)	(kN/m²)	(deg)	(-)	(MPa)	(kPa)
1	CLAY, silty, very soft to soft, greenish grey, with few shell fragments	61	z=0 to 1.5m: 2 z>1.5m: $0.22\sigma'_{v0}$	0	17	0.70	-	-
2	CLAY, silty, firm, brown to greenish grey	8	30	0	20	0.66	-	-
3A	SANDSTONE/SILTSTONE, interbedded with silt/clay, highly weathered to unweathered, weak to strong	32	-	100	30	0.50	2.0 (1.4 - 2.3)	130 (20 - 630)
3B	SILT, clayey, very stiff to hard, locally cemented, brown to greenish grey, contains pocket of sand (locally)	95	150	0	26	0.64	-	-
3C	SAND, silty, dense to very dense, locally cemented, brown to greenish grey, contains some gravel (locally)	19	-	0	34	0.44	-	-

The following sections discuss more detailed evaluation of the geotechnical information identified in the tables above.

6.2 Soil Index and Classification Properties

Index properties of soil are measured on the undisturbed samples for each soil unit. In general, the selected parameters are based on the average values. Annex II presents the profiles of the measured data for SU1, SU2 and SU3.

Classification for each soil unit has been performed based on the particle size distribution and atterberg limits test. Figure II.1k, II.2k and II.3k in Annex II show profiles of fines content versus elevation and Figure II.1f, II.2f and II.3f in Annex II show the plasticity charts for classification of SU1, SU2 and SU3 respectively, as defined by the USCS.

6.3 Consolidation Parameters

6.3.1 Preconsolidation Pressure and Preoverburden Pressure

Figure II.1t, Figure II.2q and Figure II.3s in Annex II show profiles of preconsolidation pressure, p_c' for each soil unit determined from oedometer test. The selected parameters are based on the average values.

Preoverburden pressure, POP, is defined as the difference between the preconsolidation pressure and the effective in-situ vertical stress and presented in Figure II.1w, Figure II.2t and Figure II.3v in Annex II.

6.3.2 Compression Index

Figure II.1r, Figure II.2o and Figure II.3q in Annex II show profiles of compression index determined from oedometer test complimented by the associated correlations by Terzaghi & Peck (1967) and Nishida (1956). These profiles show good agreement between measurement and correlation data. The selected parameters are based on the average values.

6.3.3 Recompression Index

Figure II.1s, Figure II.2p and Figure II.3r in Annex II show profiles of recompression index determined from oedometer test complimented by the associated correlations by Nakase et al. (1988). Correlation data is within range of the measured data from laboratory. The selected parameters are based on the average values.

6.3.4 Coefficient of Secondary Compression

Figure II.1v, Figure II.2s and Figure II.3u in Annex II show profiles of coefficient of secondary compression, $C_{\alpha\varepsilon}$, complimented by correlation by Mesri & Godlewski (1977) which use average ratio of C_α/Cc of 0.05. C_α is secondary compression index with relation to coefficient of secondary compression of $C_{\alpha\varepsilon} = C_\alpha/(1+e_p)$. KSCC determine $C_{\alpha\varepsilon}$ for each loading stages applied during oedometer test according to British Standard. The chosen values per soil unit presented in Table 6-2 are based on the average values with take into account the future load after the land reclamation takes place.

6.3.5 Coefficient of Consolidation

Figure II.1u, Figure II.2r and Figure II.3t in Annex II show profiles of coefficient of consolidation, c_v. KSCC determine c_v for each loading stages applied during oedometer test. The chosen values per soil unit presented in Table 6-2 are based on the average values with take into account the future load after the land reclamation takes place.

Project related

Royal HaskoningDHV

6.4 Strength Parameters

6.4.1 Undrained Shear Strength

Profile of undrained shear strength of SU1 is presented in Figure II.1l (vs depth) and Figure II.1m (vs elevation) in Annex II. Undrained shear strength of SU1 is estimated from:

- CPTu data; where $c_u = q_t - \sigma_{v0}/N_k$ and $N_k = 20$
- FVST data; corrected values are presented, $c_u = \mu \times c_{u(FVST)}$; where $\mu = 0.7$ ($I_{p(SU1)} \approx 70\%$). The selection of an appropriate correction factor, μ, is based on the soil's plasticity index, I_p (Bjerrum, 1973), as determined from figure below.

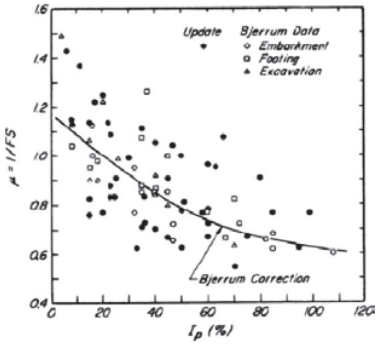


Figure 6-1: Bjerrum's field vane correction factor (Terzaghi, Peck, & Mesri, 1996)

- SPTs data; the corrected SPT data is correlated based on the correlation between soil's plasticity index, I_p, and the ratio c_u/N_{60} (Terzaghi et al., 1996), see figure below. The plasticity index of SU1 is approx. 70%. This means ratio of 4.5 can be used to determine the undrained shear strength of SU1.

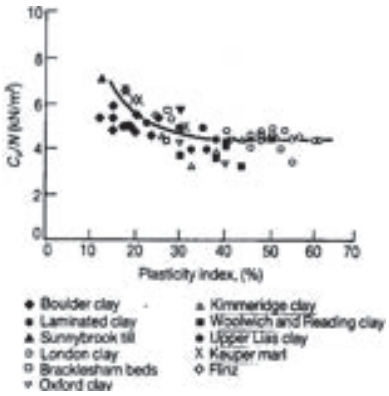


Figure 6-2: Correlation between plasticity index and ratio c_u/N_{60} (Terzaghi et al., 1996)

- Laboratory data; triaxial UU, triaxial CU and UCS

In Figure II.1l (Annex II), the design line is presented which is considered as moderately conservative values. The first 1.5m depth from seabed surface, 2 kPa is defined as s_u of SU1 and for depth greater than 1.5m the following equation (Mesri, 1975b; 1989) is applied:

$$\frac{c_{u(avg)}}{\sigma'_{vo}} = 0.22$$

Figure II.2l and Figure II.3l in Annex II show profiles of undrained shear strength of SU2 and SU3 versus depth. The design line is presented which is considered as moderately conservative values. Figure II.2m and Figure II.3m in Annex II show undrained shear strength data versus elevation. Undrained shear strength of SU2 and SU3 is estimated from:

- SPTs data; the corrected SPT data is correlated based on the correlation between soil's plasticity index, I_p, and the ratio c_u/N_{60} (Terzaghi et al., 1996), see Figure 6-2. The plasticity index of SU2 and SU3 are approx. 75% and 40% respectively. This means ratio of 4.5 can be used to determine the undrained shear strength of SU2 and SU3.
- Laboratory data; triaxial UU, triaxial CU and UCS

6.4.2 Drained Shear Stength

Figure II.1n and Figure II.3n in Annex II show profiles of effective friction angle, φ' for SU1 and SU3 determined from direct shear box and triaxial CU and CD tests. The selected design parameter is considered as moderately conservative values. There is no test conducted in soil unit 2 to determine the drained shear strength thus engineering judgment is applied based on the material characteristic.

6.5 Dynamic Soil Parameters

The main soil parameters used as input for the seismic ground response analyses are: unit weight, undrained shear strength, OCR, I_P, shear wave velocity (Vs) at small strain, shear modulus or nonlinear backbone (stress-strain) curves. The first four parameters are covered in the previous sections from this chapter and the last two in this section.

Besides the standard geotechnical tests, no laboratory tests were made to derive dynamic parameters. Seventeen (17) SCPTu tests were made in-situ to determine shear wave velocity (Vs) profiles (Drawing No. BE8289-GEO-DED-PLAN-0001). Section 4.2 lists all the field and laboratory tests executed to quantify the main parameters.

6.5.1 Shear Modulus and Damping

Soils are nonlinear under seismic loads. This means that its stiffness decreases and damping increases at larger shear strain amplitudes. This material behaviour is represented with modulus reduction curves, commonly named G-G_0 and hysteretic damping curves (Figure 6-3). These curves are regularly built with dynamic tests (e.g. cyclic triaxial, resonant column, torsional shear) but none of these is available for the project site. Therefore, the constitutive model proposed by Darendeli (2001) is used, in compliance with the latest ground response analysis guideline, PEER (2014) as follows:

- Initial small-strain shear modulus (G_0): derived after the shear wave velocity (Vs), defined in 6.5.2 and 6.5.3) as $G_0 = \rho(Vs)^2$;
- Maximum value of shear stress, corresponding to the shear strength;
- Variation of normalized secant shear modulus with the amplitude of cyclic shear strain using a hyperbolic function:

Project related

Royal HaskoningDHV

$$\frac{G(\gamma)}{G_0} = \frac{1}{1+\left(\frac{\gamma}{\gamma_r}\right)^{\alpha}} \qquad \text{(Equation 1)}$$

Where γ_r is a pseudo-reference shear strain and α a curvature coefficients. Darendeli (2001) sets these coefficients as: α = 0.92 and γ_r:

$$\gamma(\%) = \left(\phi_1 + \phi_2 + Ip * OCR^{\phi_3}\right) * \left(\sigma_0' / p_a\right)^{\phi_4} \qquad \text{(Equation 2)}$$

Where ϕ_1; ϕ_2; ϕ_3; ϕ_4 are constant coefficients.

The parameters used by the Darendeli (2001) model are: effective stress, plasticity and OCR. The generated G/G$_0$ curves are constrained at large strains range using the shear strength to fit the curves to a limiting shear stress corresponding to shear strength, after Groholski et al. (2015) and PEER (2014). This prevents underprediction of stresses at large strains and hysteretic damping is incorporated with non-Masing general quadratic/hyperbolic (GQ/H) model in DEEPSOIL (2016). The resultant G/G$_0$ and damping models are illustrated for two soil conditions: a) Native Soil (Figure 6-3 and Figure 6-4) and b) Design Condition (Figure 6-5 to Figure 6-8). These curves are provided with the respective depth at which the curves were retrieved.

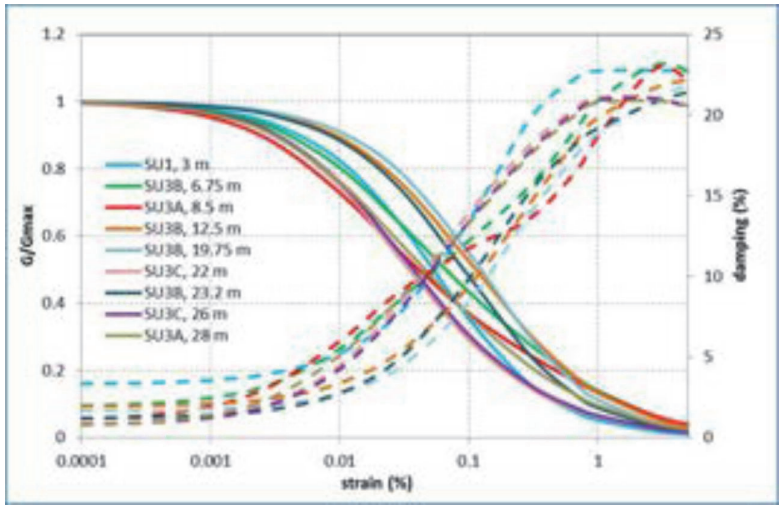


Figure 6-3: Example G-G$_0$ and damping curves from the Native Soil profile at SCPTu-01 (North from Island B)

Project related

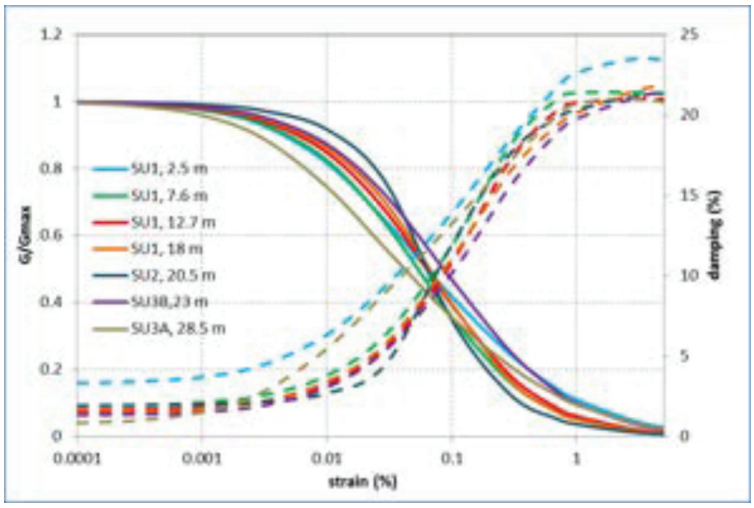


Figure 6-4: Example G-G$_0$ and damping curves from the Native Soil profile at SCPTu-02 (West from islands B and C)

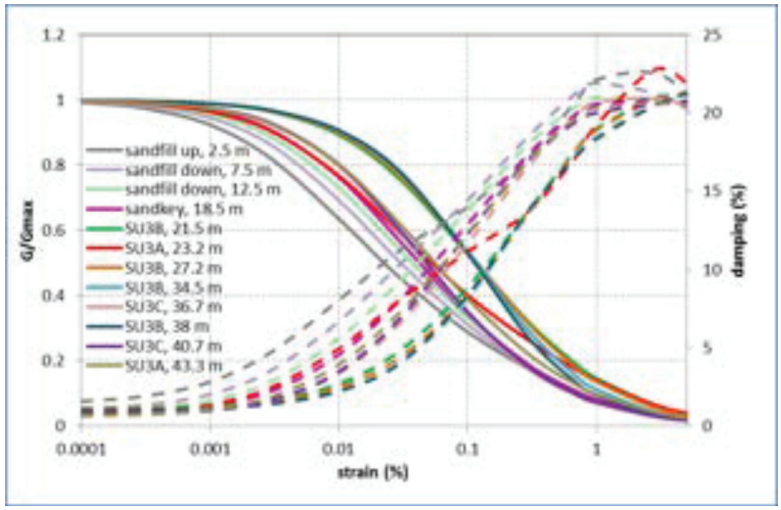


Figure 6-5: Example G-G$_0$ and damping curves from the Design Condition at SCPTu-01 (North from Island B) at crest

Project related

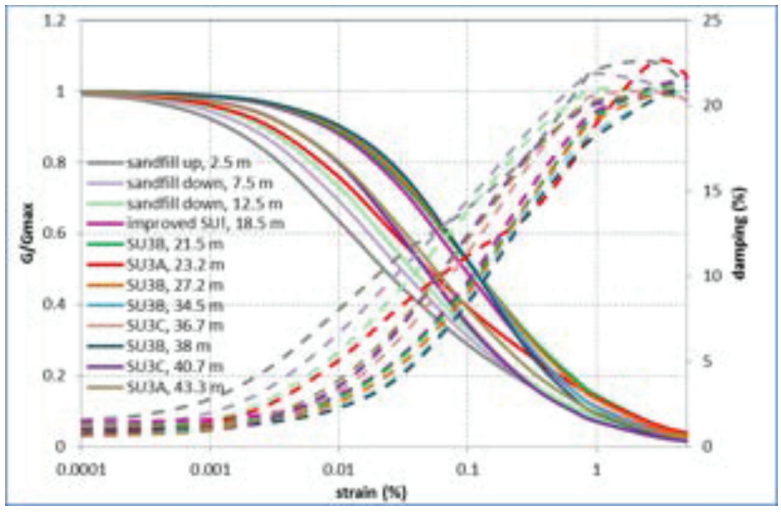


Figure 6-6: Example G-G_0 and damping curves from the Design Condition at SCPTu-01 (North from Island B) at reclamation

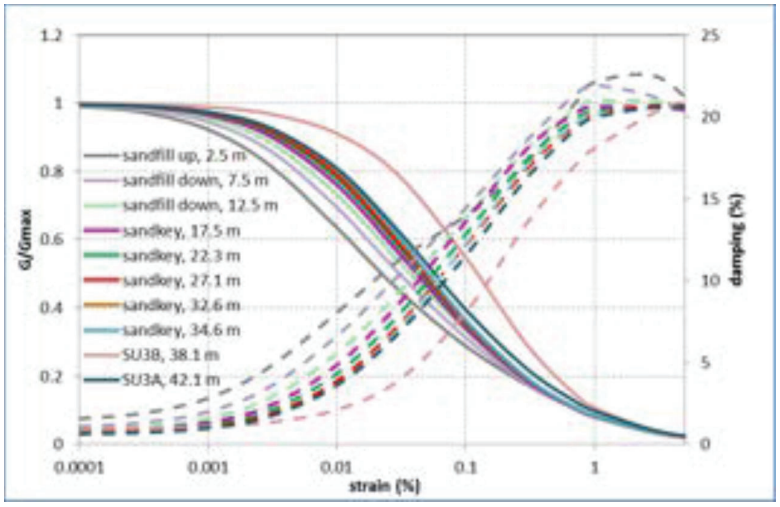


Figure 6-7: Example G-G_0 and damping curves from the Design Condition at SCPTu-02 (West from islands B and C) at cres.

Project related

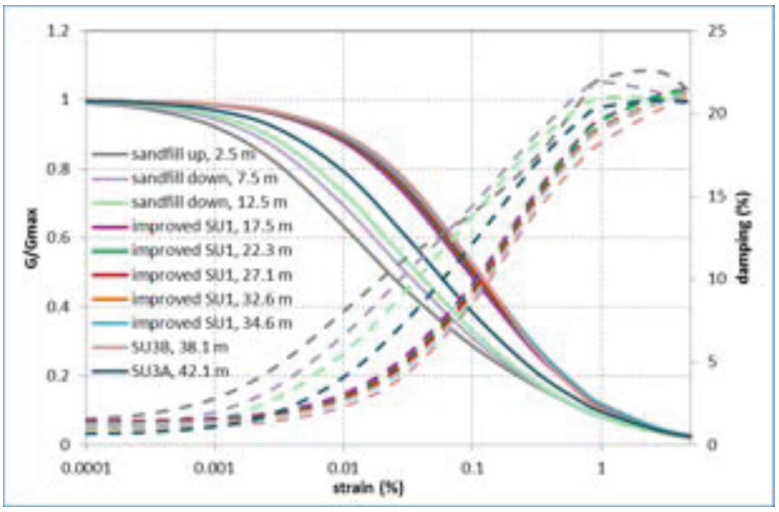


Figure 6-8: Example G-G_0 and damping curves from the Design Condition at SCPTu-02 (West from islands B and C) at reclamation

6.5.2 Shear Wave Velocity

Seventeen (17) SCPTu tests were made in-situ to determine shear wave velocity (Vs) profiles (see section 4.2) and reported by KSCC (2017a,b). These reached a maximum depth of 21.4 m below seabed. The SCPTu test measured values every 1 meter from the upper unit SU1 and in some cases the upper part from either SU2 or SU3. The interpreted Vs profiles from these tests were of limited use because they:

1 showed higher Vs values than expected for the local soils and showed large disagreement to the general trend of internationally accepted predictive models prescribed in guidelines (e.g. PEER, 2012);

2 did measured almost solely the upper soil unit, SU1;

3 remained at a superficial level, mostly shallower than 15 m;

4 show a large mismatch to correlations from literature (e.g. correlations recommended by PEER, 2012).

Given the limitations encountered with the Vs measurements from the SCPT's, a hybrid-approach was necessary to determine continuous Vs profiles to an adequate depth by combining predictive correlations based on CPT measurements for the upper meters and SPT measurements for the lower meters (Figure 6-10), as follows:

1 Use of CPT's. The CPT measured at the SCPT site and/or nearby locations were used to interpret Vs values. Two models recommended by PEER (2012) were compared for this: Robertson (2009) and Mayne (2006), and plotted together with the direct measurement from KSCC (2017a,b). Examples are illustrated in Figure 6-9.

2 Use of SPT's. The SPT measured closest to the former SCPT's (previous point) were used to derive Vs values. Two models recommended by PEER (2012) were compared for this: PEER (2012) and PEER (2010). The estimated values were plotted together with the CPT-interpreted Vs for each location (Figure 6-9).

3 Selection of models to use. Using engineering judgement, the Mayne (2006) is preferred for the CPT data and the PEER (2010) for the SPT data. Robertson (2009 in PEER, 2012) appears over-conservative and PEER (2010) is the model recommended in the latest ground response analysis guideline from PEER (2014).

4 Generalized model to implement in subsequent analysis. An approximated mean curve is interpreted as best estimate Vs profile to use in the subsequent seismic analysis (Figure 6-10). Ideally, upper and lower boundary conditions should be determined from the uncertainty of direct Vs measurements (PEER, 2014). Given the absence of direct measurements, the upper and lower boundary conditions are determined with bounding-type profiles, developed increasing and decreasing the reference Vs profile by a constant factor of +/-20%, after NEHRP (2015) and Cox et al. (2015).

Project related

Royal HaskoningDHV

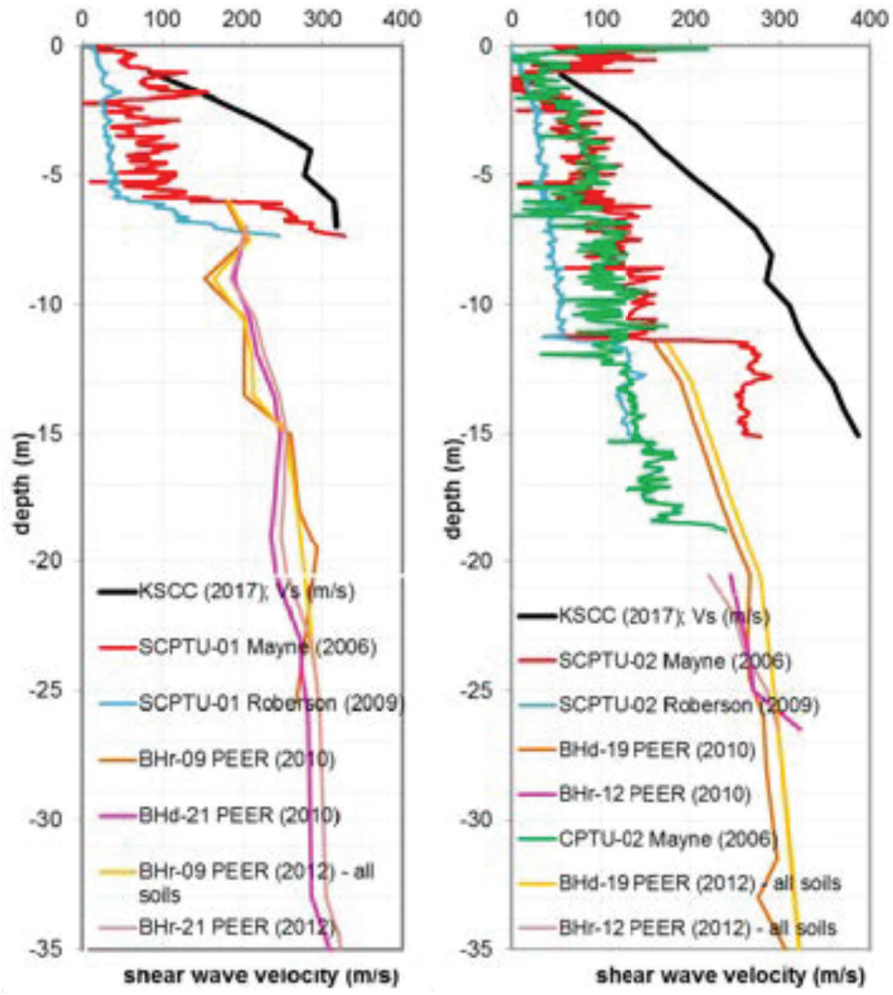


Figure 6-9: Interpreted Vs profiles after CPTu's (red, light blue and green lines) and after SPTs (magenta, pink, brown and orange) and measured Vs profile from SCPTu (black line) by KSCC (2017a,b). Left: SCPTu-01 location; Right: SCPTu-02 location

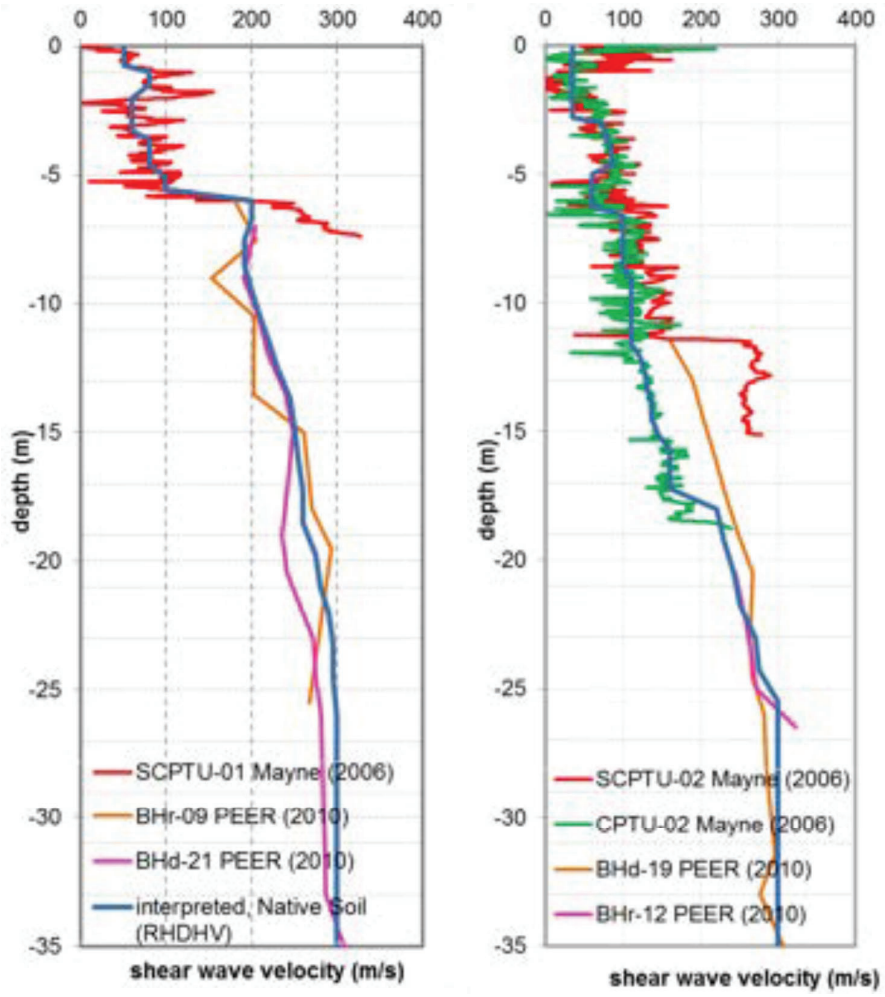


Figure 6-10: Interpreted Vs profiles used for the ground response analysis (blue line, see RHDHV, 2017) with interpreted Vs profiles after CPTu's (red and green lines) and after SPTs (magenta and brown). Left: SCPTu-01 location; Right: SCPTu-02 location.

6.5.3 Design Shear Wave Velocity

After consolidation (see section 5.3.1 Settlement), the induced effective stress increment will have an effect in the small strain stiffness which can be expressed in the Vs and G_0. This effect is expected for the upper softer soil unit SU1. This increase is quantified for this project first on the expected undrained shear strength. The undrained shear strength is correlated to Vs using the undrained shear strength correlation

from Dickenson (1994) provided by PEER (2012), Vs [m/sec] = 23*Su$^{0.475}$. The plasticity (*Ip*) is adjusted as well for the design condition such as fill and replacement material properties (see Chapter 5 Geotechnical Design). Two design profiles are illustrated in Figure 6-11. The locations used correspond to the ones used for the Native Soil condition, SCPTu-01 and SCPTu-02 at the North from Island B and West from islands B and C respectively. At each site, two Vs profiles are plotted together, one for the revetment Crest and the other for the Reclamation area (Figure 6-11).

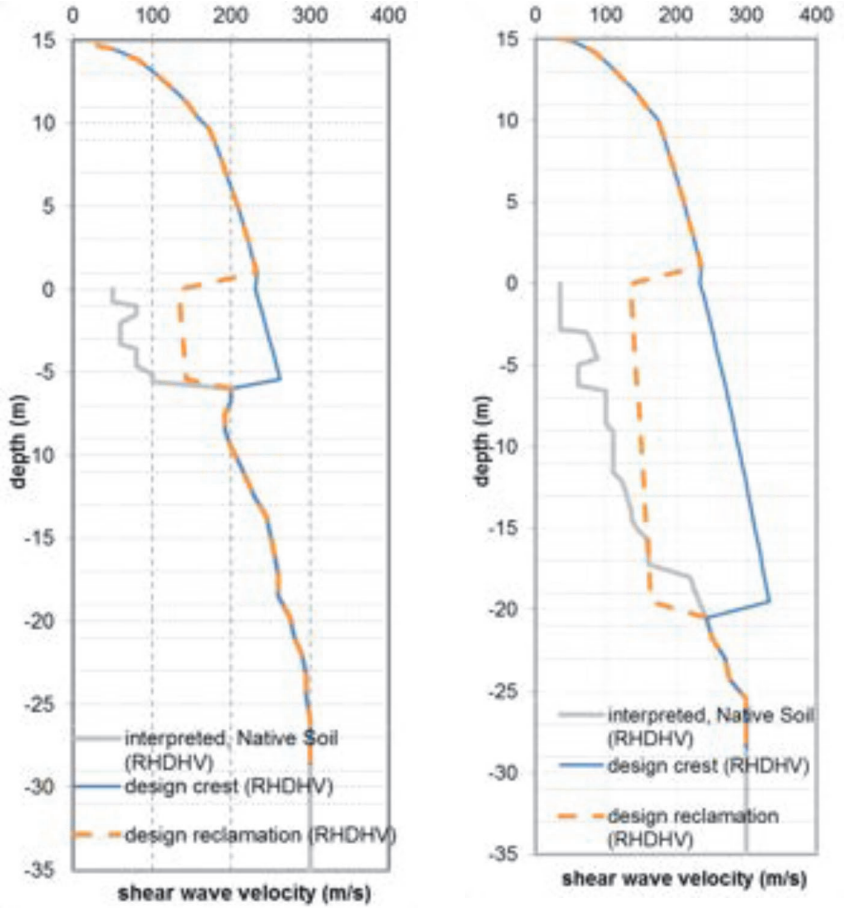


Figure 6-11: Interpreted Vs-Design Condition profiles used for the ground response analysis (see RHDHV, 2017). Blue line: Crest Section; orange dotted line: Reclamation Section; grey line: interpreted Native Soil condition, for reference. Left: SCPTu-01 location; Right: SCPTu-02 location.

Royal HaskoningDHV

7 OUTSTANDING INFORMATION

The outstanding information started from 9 June 2017 is listed below:

1. Final borehole log
   A total of 71 no. final borehole logs from Full Investigation phase still have to be submitted after being confirmed by laboratory testing. Draft borehole logs have been received by RHDHV from the field interpretation.

2. Result of laboratory test from Preliminary Phase, includes the following test on soil samples from 20 boreholes:
   a. Angularity
   b. Minimum and maximum densities
   c. Permeability
   d. Chemical test: total dissolved salts
   e. Mineralogy

3. Result of laboratory test from Full Investigation Phase, includes the following test on soil and rock samples:
   a. Index properties test, such as:
      - 260 no. moisture content, porosity and void ratio
      - 131 no. particle density (specific gravity)
      - 262 no. bulk and dry densities
      - 207 no. particle size distribution, including hydrometer test
      - 172 no. atterberg limit test
      - 55 no. carbonate content test
      - 27 no. chemical test
      - 49 no. mineralogy test
      - 6 no. minimum and maximum densities test
      - 38 no. angularity test
      - 21 no. permeability test
   b. Engineering properties test, such as:
      - 44 no. direct shear test
      - 34 no. Isotropically Cconsolidated drained triaxial Test
      - 71 no. Isotropically Consolidated Undrained triaxial compression test with measurement of pore pressure
      - 98 no. one dimensional compression and consolidation properties
      - 104 no. Undrained Unconsolidated triaxial compression test
      - 6 no. cyclic triaxial test
      - 42 no. unconfined compressive test on soil samples
      - 51 no. uniaxial compression strength test with determination of elastic modulus on rock samples
      - 102 no. point load test
      - 24 no. Brazilian tensile strength

Please note that the remaining number of the received result may vary when test are aborted on the assigned samples.

4. Final Factual Report

Final Factual Report incorporating all field and laboratory tests results will be submitted after the completion of all laboratory tests. Draft Final Factual Report can be found in Appendix 3. This report presents the factual data of the completed test so far.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Site investigations such as nearshore geotechnical investigation and geophysical survey have been conducted by EGS and KSCC in 2016-2017. At the moment of writing the report, the geotechnical investigation (laboratory testing of soil and rock samples) is still ongoing.

A review of the site investigation has been carried out. It can be concluded that the geotechnical condition at project site is highly varying, in terms of thickness and soil strata in Guadalupe Tuff Formation (GTF). The latter is explained. which highlights the sporadic of volcanic activities in the past in Manila Bay.

Based on the available survey results, three main soil units are defined: very soft to soft silty Clay (SU1), firm silty Clay (SU2) and Guadalupe Tuff Formation (SU3). SU3 is subdivided into three (3) sub-units: Sandstone/Siltstone (SU3A), very stiff to hard clayey Silt (SU3B) and dense to very dense silty Sand (SU3C).

8.2 Recommendations

The geotechnical parameters presented in this report are based on the initial conditions as existing during geotechnical investigation. The results from outstanding information are recommended to be reviewed in order to validate the study made in this report.

Ground characteristics depend on the applicable in-situ stresses and are subject to change during construction work, such as softening due to excavation and strength increase due to consolidation under surcharge loads for instance. Adaptations applicable for construction phases are not taken into account in this interpretation but should be applied in the geotechnical design; except for the study of dynamic soil parameters as explain in section 6.5.

Royal HaskoningDHV

Annex I – References

Project related

[1] KSCC, 2017a. Geotechnical investigation at Pasay-Parañaque, Nearshore Manila, Philippines. Full Investigation Phase Geotechnical Field Report (Draft). Technical Report, 19-June-2017.

[2] KSCC, 2017b. Geotechnical investigation at Pasay-Parañaque, Nearshore Manila, Philippines. Preliminary Phase Interim Report, 02-June-2017.

[3] RHDHV, 2017.

Codes, Standards & Guidelines

[4] NEHRP, 2015. NEHRP Recommended Seismic Provisions for New Buildings and Other Structures. FEMA P-1050-1/2015 Edition.

[5] PEER, 2014. Guidelines for performing hazard-consistent one-dimensional ground response analysis for ground motion prediction. PEER Report 2014/16.

[6] PEER, 2012. Guidelines for Estimation of Shear Wave Velocity Profiles. PEER Report 2012/08.

[7] PEER, 2010. Shear wave velocity as a statistical function of standard penetration test resistance and vertical effective stress at Caltrans Bridge Sites. PEER Report 2010/03.

Scientific publications and others

[8] Cox, B.R., Griffiths, S.C., Rahtje, E.M., Teague, D.P. 2015. Shear wave velocity uncertainty and its relation to variability in site response using a dispersion misfit approach. In: Proceedings from 6th International Conference on Earthquake Geotechnical Engineering, 1-4 November 2015, Christchurch, New Zealand.

[9] Darendeli, M.B., 2001. Development of a new family of normalized modulus reduction and material damping curves. PhD Thesis, Dept. of Civil Engineering, University of Texas at Austin, TX.

[10] DEEPSOIL, 2016. User Manual. Nonlinear and equivalent linear seismic site response of one-dimensional soil columns, June 22, 2016, Univ. of Illinois at Urbana-Champaign www.illinois.edu/~deepsoil

[11] Groholski, D.R., Hashash, Y.M.A., Musgrove, M., Harmon, J., Kim, B., 2015. Evaluation of 1-D nonlinear site response analysis using a generalized quadratic/hyperbolic strength-controlled constitutive model. In: Proceedings from 6th International Conference on Earthquake Geotechnical Engineering, 1-4 November, Christchurch, New Zealand.

[12] Dell, T., McClung, J. & Morales, E. Characterisation of the Reclaimed Soils in the Foreshore Area of Manila Bay, Philippines.

Project related

Royal HaskoningDHV

Annex II – Profiles of Geotechnical Parameters

Soil Unit 1: very soft to soft silty CLAY

Figure II.1a Profiles of natural water content, wn; for Soil Unit 1, estimated from undisturbed samples
Figure II.1b Profiles of plasticity index, IP; for Soil Unit 1, estimated from undisturbed samples
Figure II.1c Profiles of liquid limit, wL; for Soil Unit 1, estimated from undisturbed samples
Figure II.1d Profiles of plastic limit, wP; for Soil Unit 1, estimated from undisturbed samples
Figure II.1e Profiles of Liquidity Index, IL; for Soil Unit 1, estimated from undisturbed samples
Figure II.1f Plasticity Chart for Soil Unit 1, estimated from undisturbed samples
Figure II.1g Profiles of void ratio, e0; for Soil Unit 1, estimated from undisturbed samples
Figure II.1h Profiles of specific gravity, Gs; for Soil Unit 1, estimated from undisturbed samples
Figure II.1i Profiles of bulk unit weight, gbulk; for Soil Unit 1, estimated from undisturbed samples
Figure II.1j Profiles of dry unit weight, gdry; for Soil Unit 1, estimated from undisturbed samples
Figure II.1k Profiles of fines content, FC; for Soil Unit 1, estimated from undisturbed samples
Figure II.1l Design line of undrained shear strength, cu; for Soil Unit 1, estimated from in-situ tests and undisturbed samples
Figure II.1m Profiles of undrained shear strength, cu; for Soil Unit 1, estimated from in-situ tests and undisturbed samples
Figure II.1n Profiles of effective friction angle, φ'max; for Soil Unit 1, estimated from undisturbed samples
Figure II.1o Profiles of Young's Modulus, Eu; for Soil Unit 1, estimated from SCPTu and CPTu
Figure II.1p Profiles of Secant Modulus, E10; for Soil Unit 1, estimated from Triaxial tests
Figure II.1q Profiles of in-situ stress ratio, K0; for Soil Unit 1, estimated from SCPTu and CPTu
Figure II.1r Profiles of compression index, cc; for Soil Unit 1, estimated from undisturbed samples and correlations
Figure II.1s Profiles of recompression index, cr; for Soil Unit 1, estimated from undisturbed samples and correlations
Figure II.1t Profiles of preconsolidation pressure, pc; for Soil Unit 1, estimated from undisturbed samples
Figure II.1u Profiles of the coefficient of consolidation, cv; for Soil Unit 1, estimated from undisturbed samples
Figure II.1v Profiles of modified coefficient of secondary compression, cαε; for Soil Unit 1, estimated from undisturbed samples
Figure II.1w Profiles of preoverburden pressure, POP; for Soil Unit 1, estimated from undisturbed samples
Figure II.1x Profiles of overconsolidation ratio, OCR; for Soil Unit 1, estimated from undisturbed samples

Soil Unit 2: firm to stiff SILT/CLAY

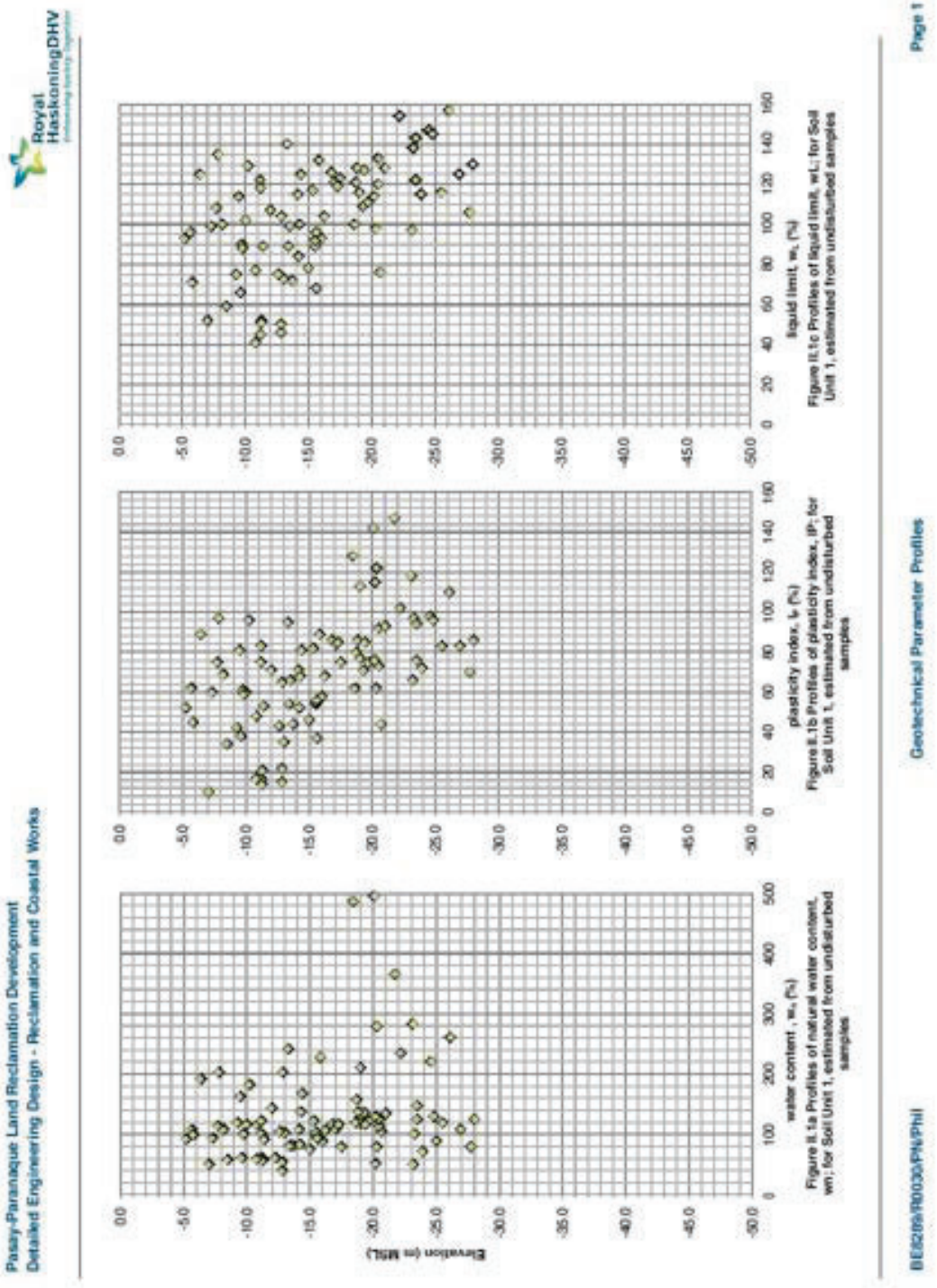
Figure II.2a Profiles of natural water content, wn; for Soil Unit 2, estimated from undisturbed samples
Figure II.2b Profiles of plasticity index, IP; for Soil Unit 2, estimated from undisturbed samples
Figure II.2c Profiles of liquid limit, wL; for Soil Unit 2, estimated from undisturbed samples
Figure II.2d Profiles of plastic limit, wP; for Soil Unit 2, estimated from undisturbed samples
Figure II.2e Profiles of Liquidity Index, IL; for Soil Unit 2, estimated from undisturbed samples
Figure II.2f Plasticity Chart for Soil Unit 2, estimated from undisturbed samples

Figure II.2g Profiles of void ratio, e0; for Soil Unit 2, estimated from undisturbed samples
Figure II.2h Profiles of specific gravity, Gs; for Soil Unit 2, estimated from undisturbed samples
Figure II.2i Profiles of bulk unit weight, gbulk; for Soil Unit 2, estimated from undisturbed samples
Figure II.2j Profiles of dry unit weight, gdry; for Soil Unit 2, estimated from undisturbed samples
Figure II.2k Profiles of fines content, FC; for Soil Unit 2, estimated from undisturbed samples
Figure II.2l Design line of undrained shear strength, cu; for Soil Unit 2, estimated from in-situ tests and undisturbed samples
Figure II.2m Profiles of undrained shear strength, cu; for Soil Unit 2, estimated from in-situ tests and undisturbed samples
Figure II.2n Profiles of Secant Modulus, E10; for Soil Unit 2, estimated from Triaxial tests
Figure II.2o Profiles of compression index, cc; for Soil Unit 2, estimated from undisturbed samples and correlations
Figure II.2p Profiles of recompression index, cr; for Soil Unit 2, estimated from undisturbed samples and correlations
Figure II.2q Profiles of preconsolidation pressure, pc; for Soil Unit 2, estimated from undisturbed samples
Figure II.2r Profiles of the coefficient of consolidation, cv; for Soil Unit 2, estimated from undisturbed samples
Figure II.2s Profiles of modified coefficient of secondary compression, cαε; for Soil Unit 2, estimated from undisturbed samples
Figure II.2t Profiles of preoverburden pressure, POP; for Soil Unit 2, estimated from undisturbed samples
Figure II.2u Profiles of overconsolidation ratio, OCR; for Soil Unit 2, estimated from undisturbed samples

Soil Unit 3: Guadalupe Tuff Formation

Figure II.3a Profiles of natural water content, wn; for Soil Unit 3, estimated from undisturbed samples
Figure II.3b Profiles of plasticity index, IP; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3c Profiles of liquid limit, wL; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3d Profiles of plastic limit, wP; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3e Profiles of Liquidity Index, IL; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3f Plasticity Chart for Soil Unit 3B, estimated from undisturbed samples
Figure II.3g Profiles of void ratio, e0; for Soil Unit 3, estimated from undisturbed samples
Figure II.3h Profiles of specific gravity, Gs; for Soil Unit 3, estimated from undisturbed samples
Figure II.3i Profiles of bulk unit weight, gbulk; for Soil Unit 3, estimated from undisturbed samples
Figure II.3j Profiles of dry unit weight, gdry; for Soil Unit 3, estimated from undisturbed samples
Figure II.3k Profiles of fines content, FC; for Soil Unit 3, estimated from undisturbed samples
Figure II.3l Design line of undrained shear strength, cu; for Soil Unit 3B, estimated from in-situ tests and undisturbed samples
Figure II.3m Profiles of undrained shear strength, cu; for Soil Unit 3B, estimated from in-situ tests and undisturbed samples
Figure II.3n Profiles of effective friction angle, φ'max; for Soil Unit 3, estimated from undisturbed samples
Figure II.3o Profiles of Secant Modulus, E10; for Soil Unit 3B, estimated from Triaxial tests
Figure II.3p Profiles of in-situ stress ratio, K0; for Soil Unit 3, estimated from undisturbed samples
Figure II.3q Profiles of compression index, cc; for Soil Unit 3B, estimated from undisturbed samples and correlations
Figure II.3r Profiles of recompression index, cr; for Soil Unit 3B, estimated from undisturbed

	samples and correlations
Figure II.3s	Profiles of preconsolidation pressure, pc; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3t	Profiles of the coefficient of consolidation, cv; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3u	Profiles of modified coefficient of secondary compression, cαε; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3v	Profiles of preoverburden pressure, POP; for Soil Unit 3B, estimated from undisturbed samples
Figure II.3w	Profiles of overconsolidation ratio, OCR; for Soil Unit 3B, estimated from undisturbed samples


Royal HaskoningDHV
Pasay-Paranaque Land Reclamation Development
Detailed Engineering Design - Reclamation and Coastal Works
Elevation (m MSL)
water content , w_n (%)
plasticity index, I_P (%)
liquid limit, w_L (%)
Figure II.1a Profiles of natural water content, wn; for Soil Unit 1, estimated from undisturbed samples
Figure II.1b Profiles of plasticity index, IP; for Soil Unit 1, estimated from undisturbed samples
Figure II.1c Profiles of liquid limit, wL; for Soil Unit 1, estimated from undisturbed samples
Geotechnical Parameter Profiles
Page 1

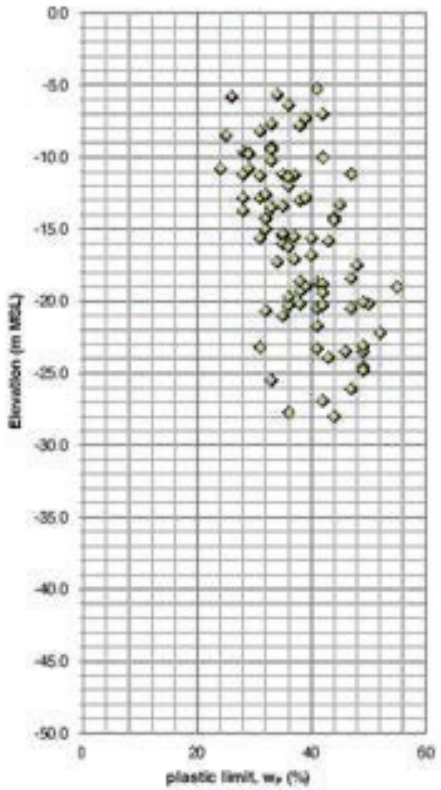


Figure II.1d Profiles of plastic limit, wP; for Soil Unit 1, estimated from undisturbed samples

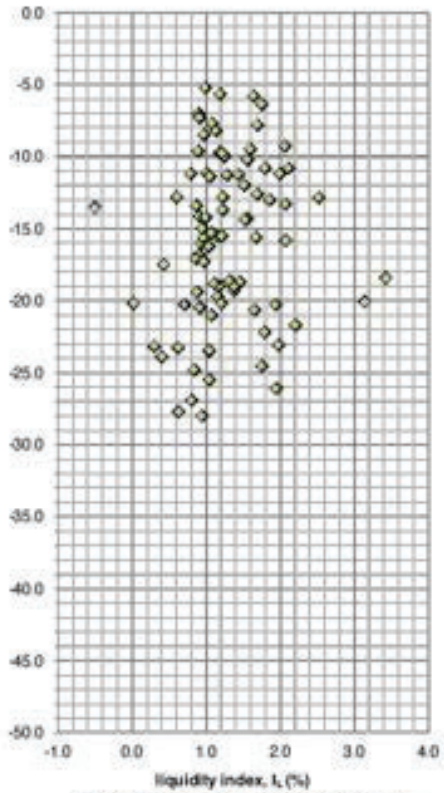


Figure II.1e Profiles of Liquidity Index, IL; for Soil Unit 1, estimated from undisturbed samples

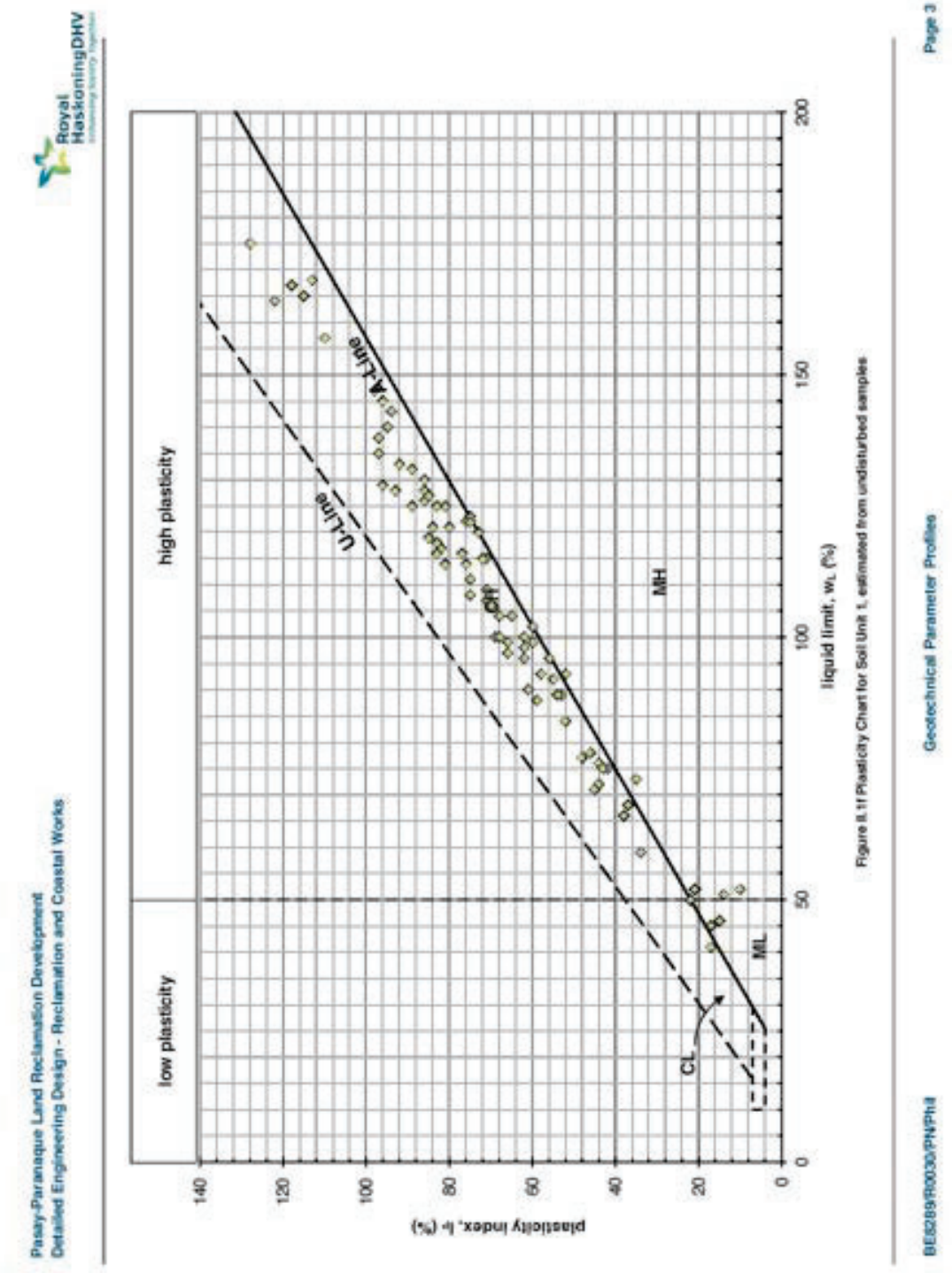


Figure II.1f Plasticity Chart for Soil Unit 1, estimated from undisturbed samples

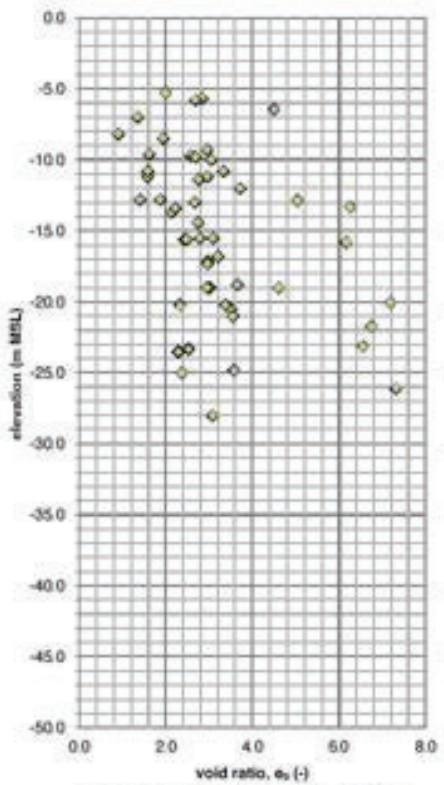


Figure II.1g Profiles of void ratio, e0; for Soil Unit 1, estimated from undisturbed samples

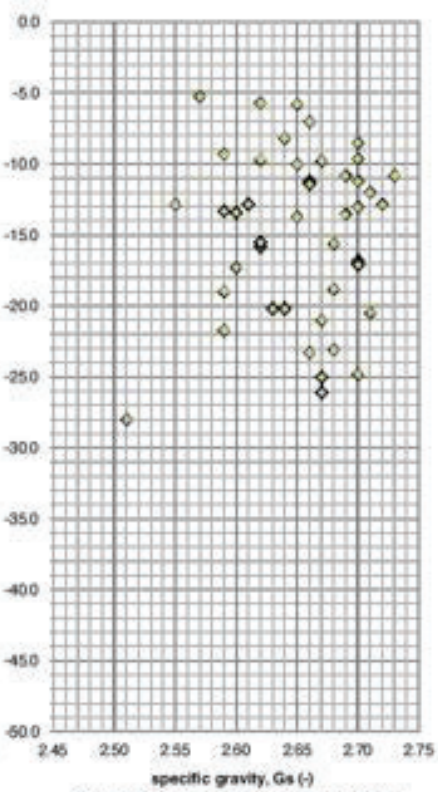


Figure II.1h Profiles of specific gravity, Gs; for Soil Unit 1, estimated from undisturbed samples

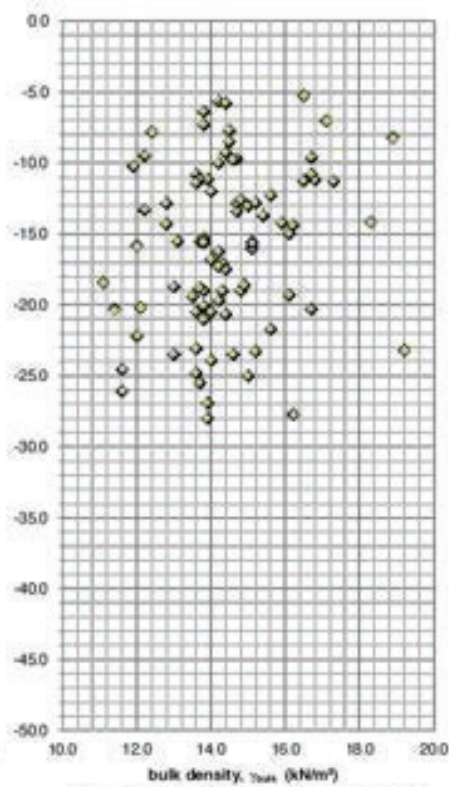
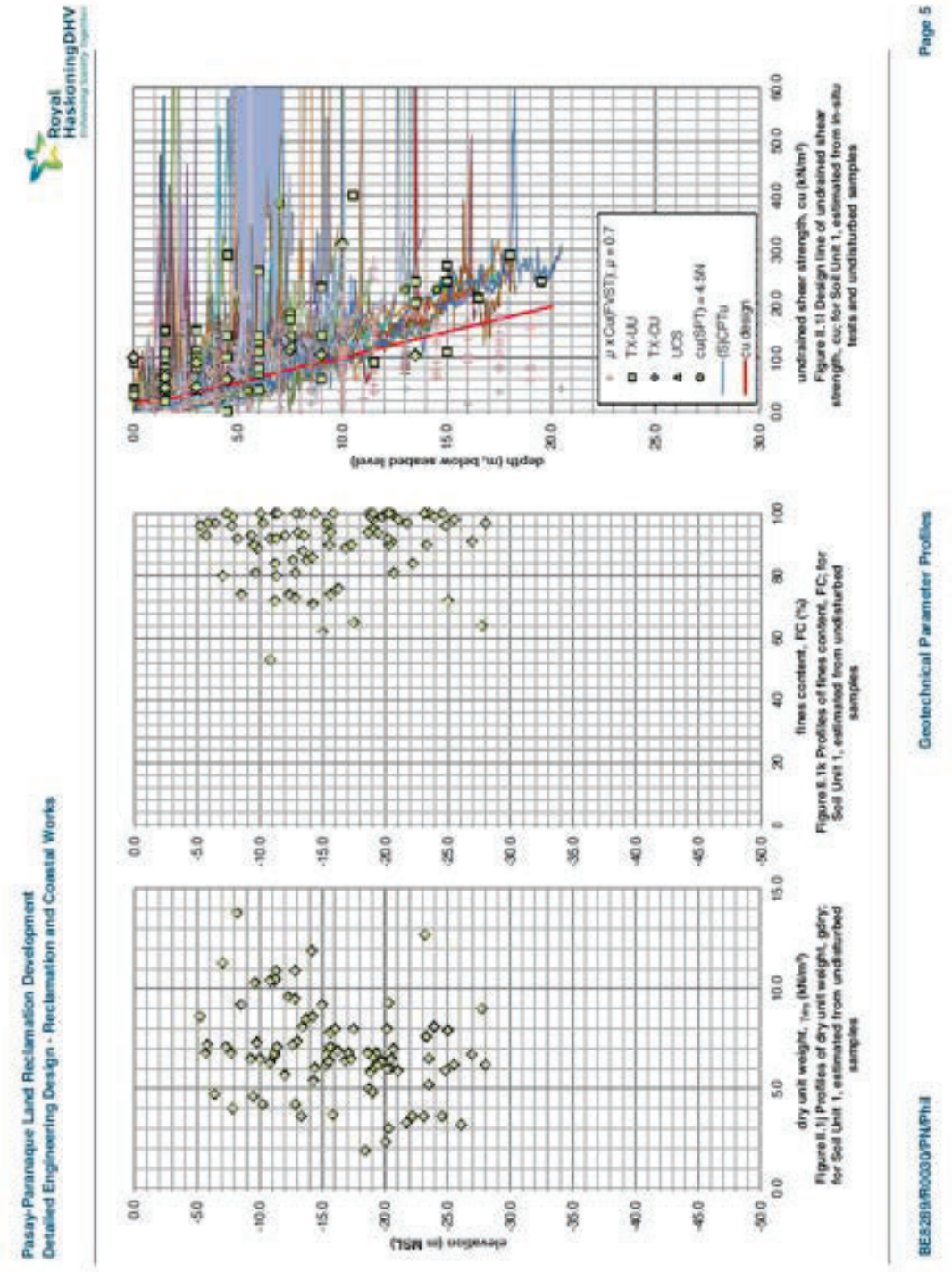


Figure II.1i Profiles of bulk unit weight, gbulk; for Soil Unit 1, estimated from undisturbed samples


Royal HaskoningDHV
Pasay-Parañaque Land Reclamation Development
Detailed Engineering Design - Reclamation and Coastal Works
Geotechnical Parameter Profiles
Page 5
BE8269/R0009/PNPhil
Figure 8.1i Profiles of dry unit weight, γdry; for Soil Unit 1, estimated from undisturbed samples
dry unit weight, γdry (kN/m³)
elevation (m MSL)
Figure 8.1k Profiles of fines content, FC; for Soil Unit 1, estimated from undisturbed samples
fines content, FC (%)
Figure 8.1l Design line of undrained shear strength, cu; for Soil Unit 1, estimated from in-situ tests and undisturbed samples
undrained shear strength, cu (kN/m²)
depth (m, below seabed level)
μ x Cu(FVST), μ = 0.7
TX-UU
TX-CU
UCS
cu(SPT) = 4.5N
(Su)CPTu
cu design

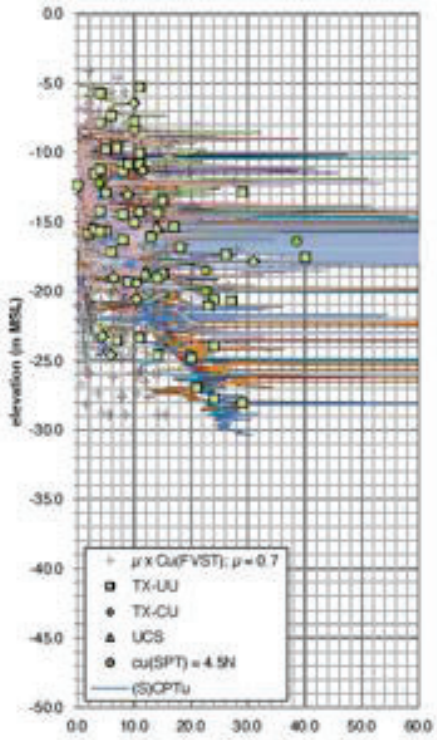


Figure II.1m Profiles of undrained shear strength, cu; for Soil Unit 1, estimated from in-situ tests and undisturbed samples

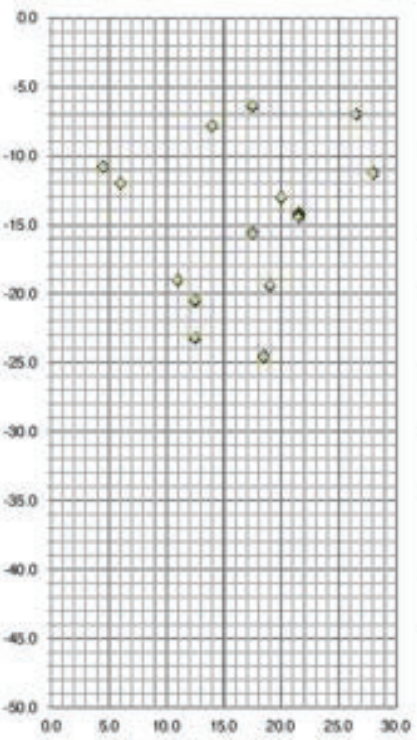


Figure II.1n Profiles of effective friction angle, φ'max; for Soil Unit 1, estimated from undisturbed samples

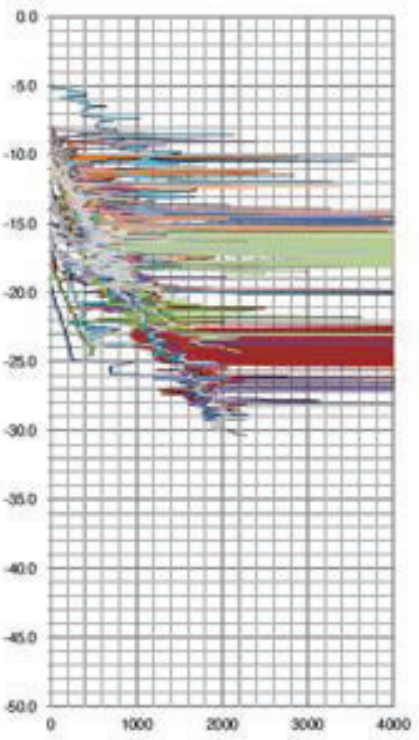


Figure II.1o Profiles of Young's Modulus, Eu; for Soil Unit 1, estimated from SCPTu and CPTu

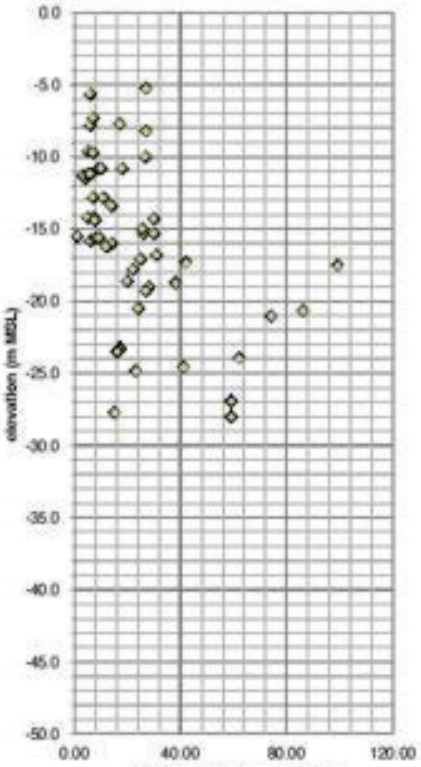


Figure II.1p Profiles of Secant Modulus, E10; for Soil Unit 1, estimated from Triaxial tests

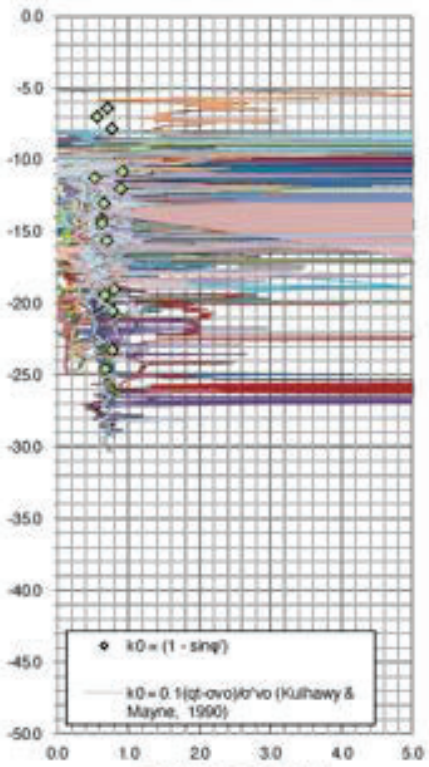


Figure II.1q Profiles of in-situ stress ratio, K0; for Soil Unit 1, estimated from SCPTu and CPTu

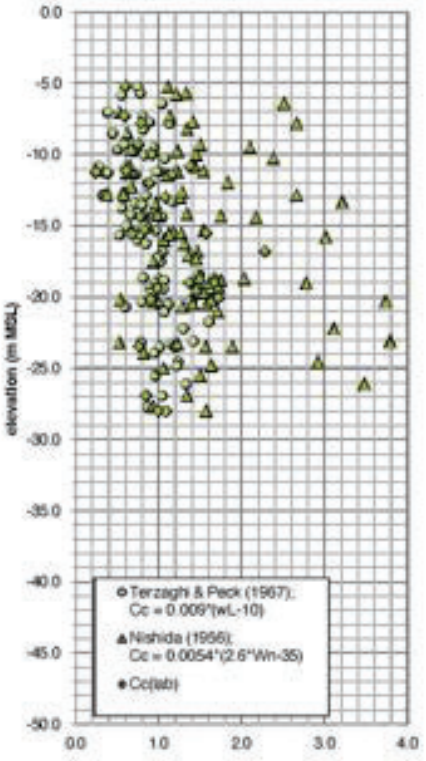


Figure II.1r Profiles of compression index, cc; for Soil Unit 1, estimated from undisturbed samples and correlations

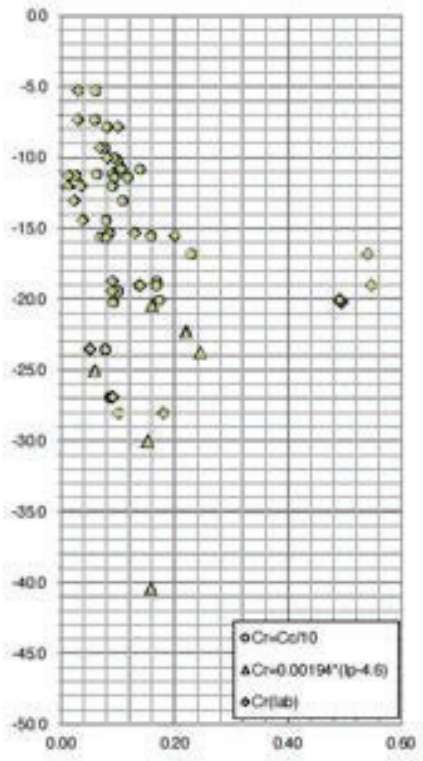


Figure II.1s Profiles of recompression index, cr; for Soil Unit 1, estimated from undisturbed samples and correlations

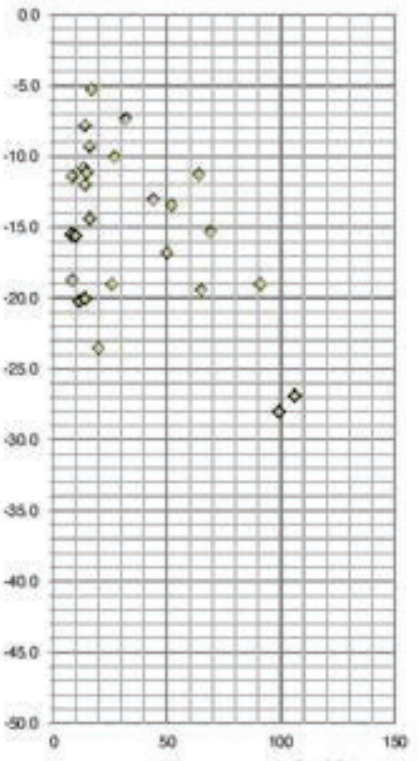


Figure II.1t Profiles of preconsolidation pressure, pc; for Soil Unit 1, estimated from undisturbed samples

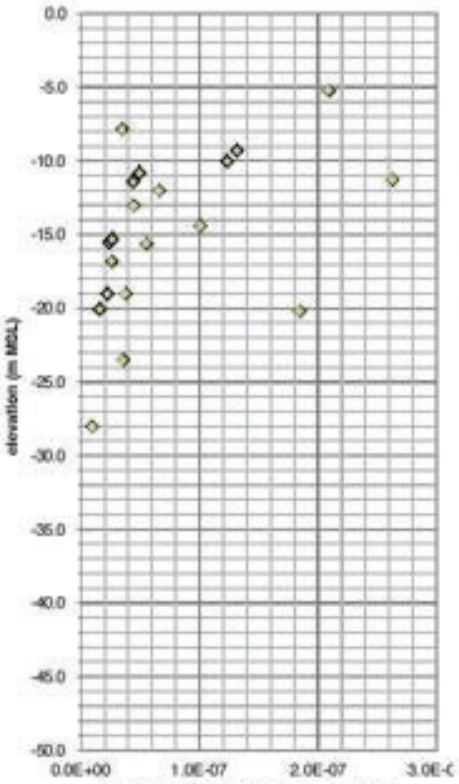


Figure II.1u Profiles of the coefficient of consolidation, cv; for Soil Unit 1, estimated fro n undisturbed samples

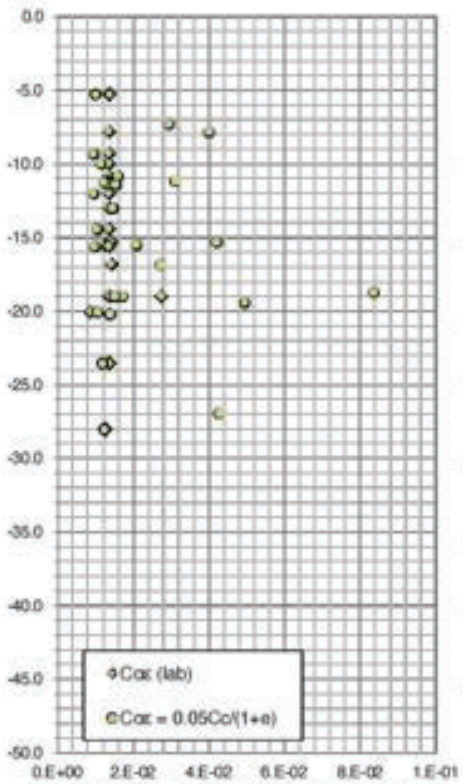


Figure II.1v Profiles of modified coefficient of secondary compression, cαc; for Soil Unit 1, estimated from undisturbed samples

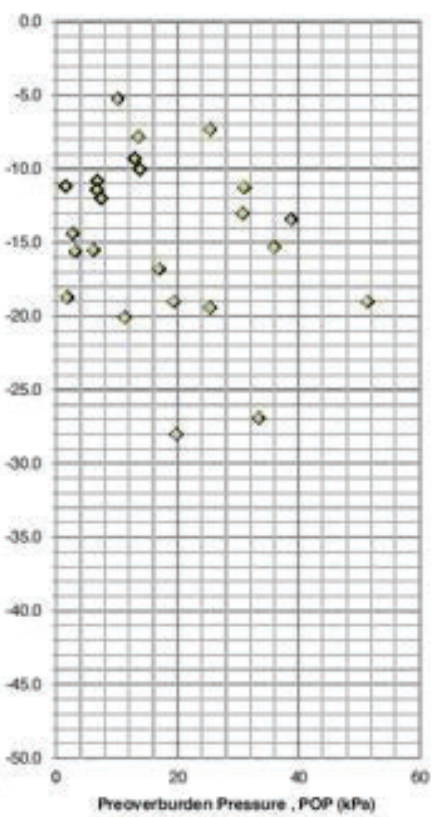


Figure II.1w Profiles of preoverburden pressure, POP; for Soil Unit 1, estimated from undisturbed samples

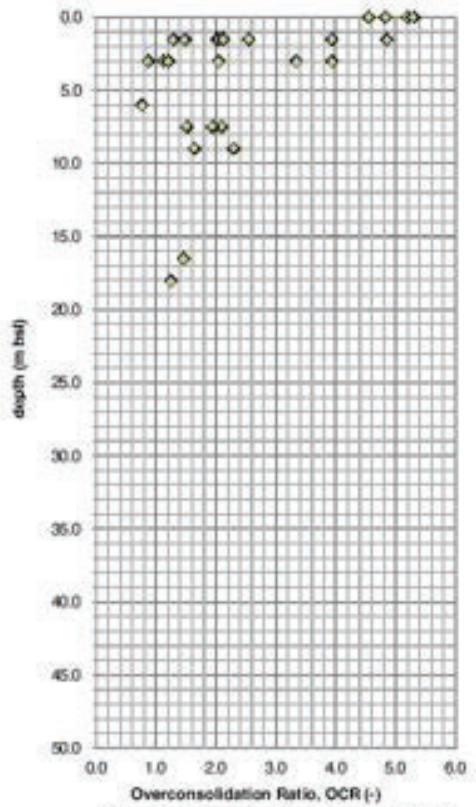


Figure II.1x Profiles of overconsolidation ratio, OCR; for Soil Unit 1, estimated from undisturbed samples

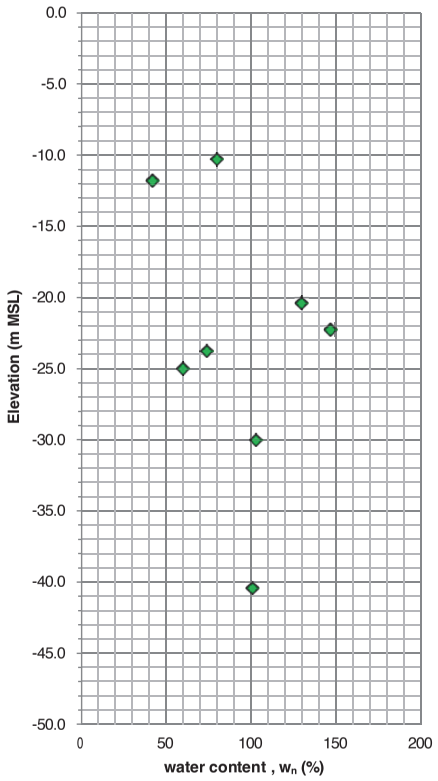


Figure II.2a Profiles of natural water content, wn; for Soil Unit 2, estimated from undisturbed samples

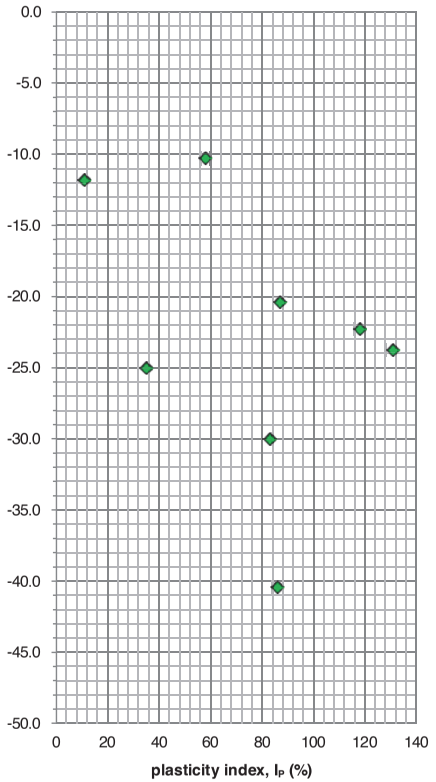


Figure II.2b Profiles of plasticity index, IP; for Soil Unit 2, estimated from undisturbed samples

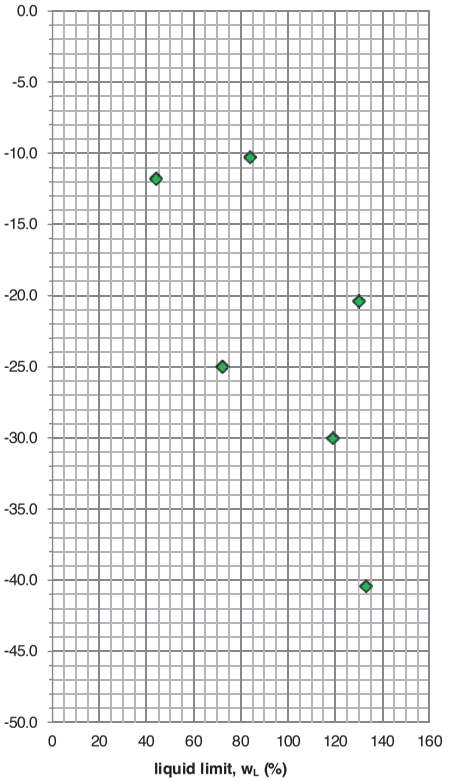


Figure II.2c Profiles of liquid limit, wL; for Soil Unit 2, estimated from undisturbed samples

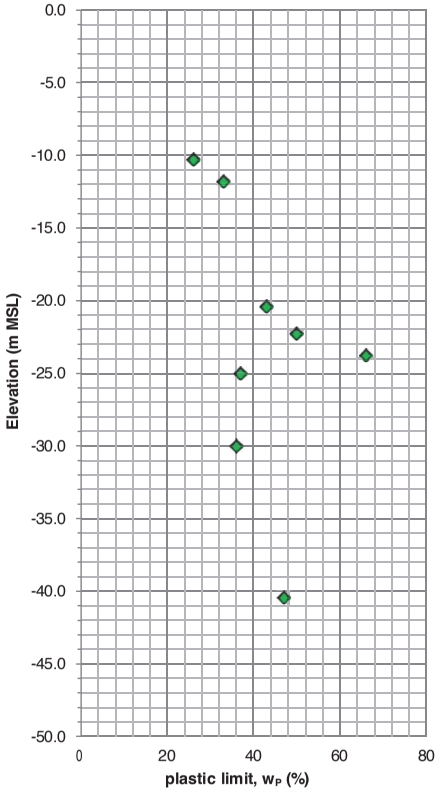


Figure II.2d Profiles of plastic limit, wP; for Soil Unit 2, estimated from undisturbed samples

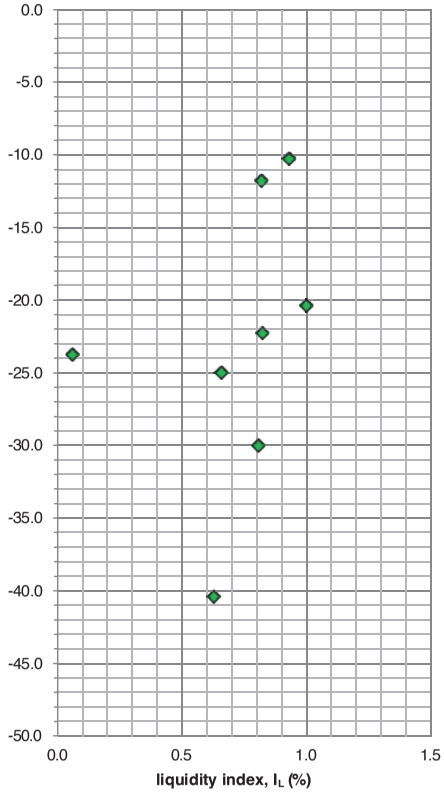


Figure II.2e Profiles of Liquidity Index, IL; for Soil Unit 2, estimated from undisturbed samples

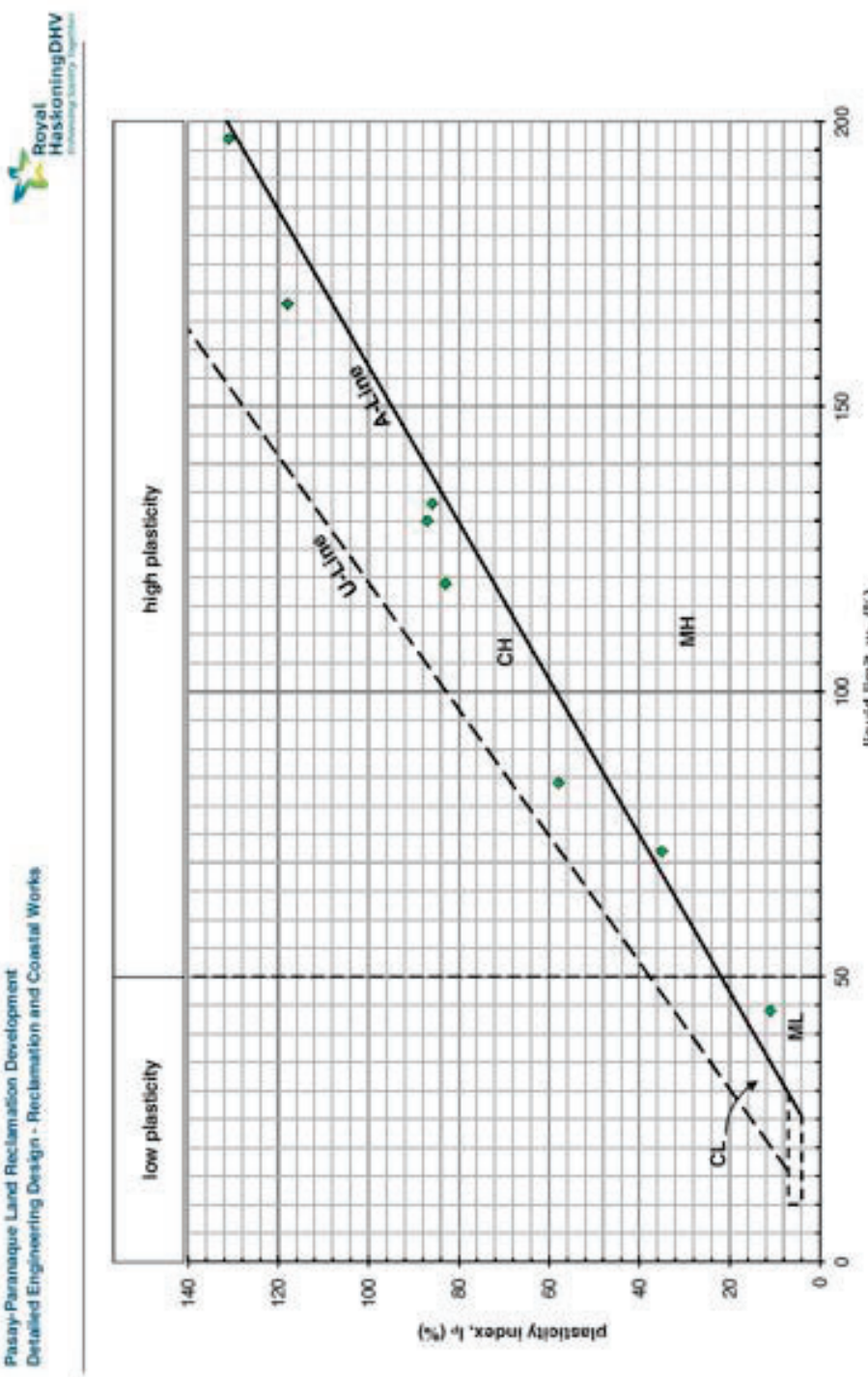


Figure II.2f Plasticity Chart for Soil Unit 2, estimated from undisturbed samples

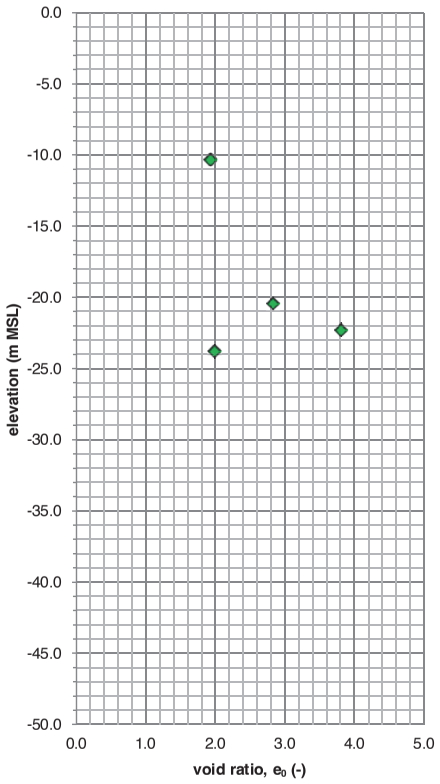


Figure II.2g Profiles of void ratio, e0; for Soil Unit 2, estimated from undisturbed samples

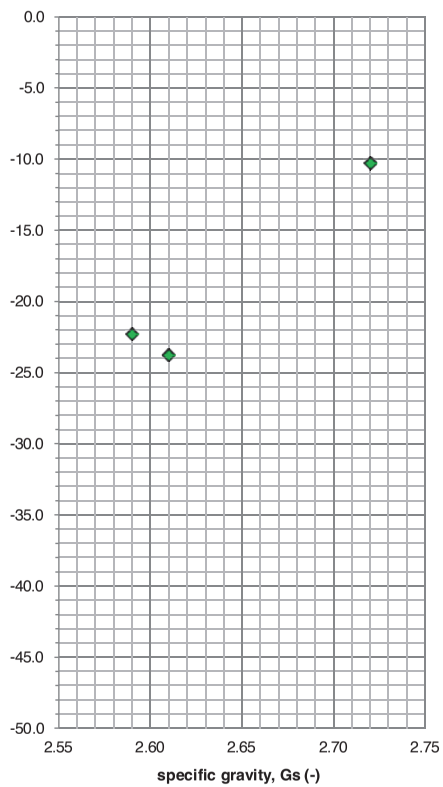


Figure II.2h Profiles of specific gravity, Gs; for Soil Unit 2, estimated from undisturbed samples

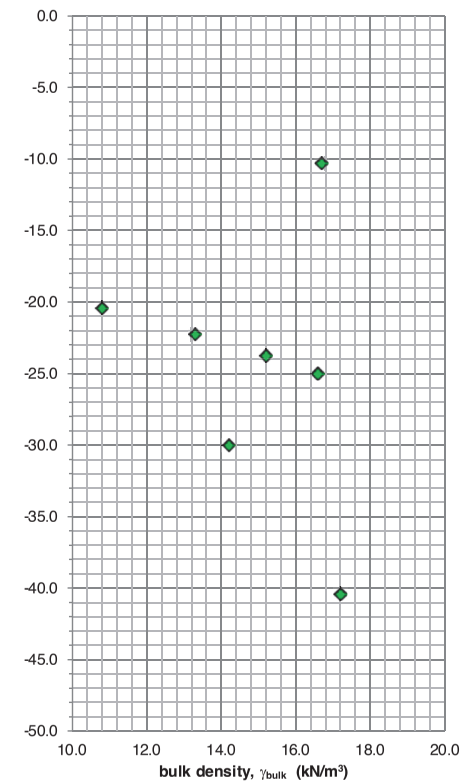


Figure II.2i Profiles of bulk unit weight, gbulk; for Soil Unit 2, estimated from undisturbed samples

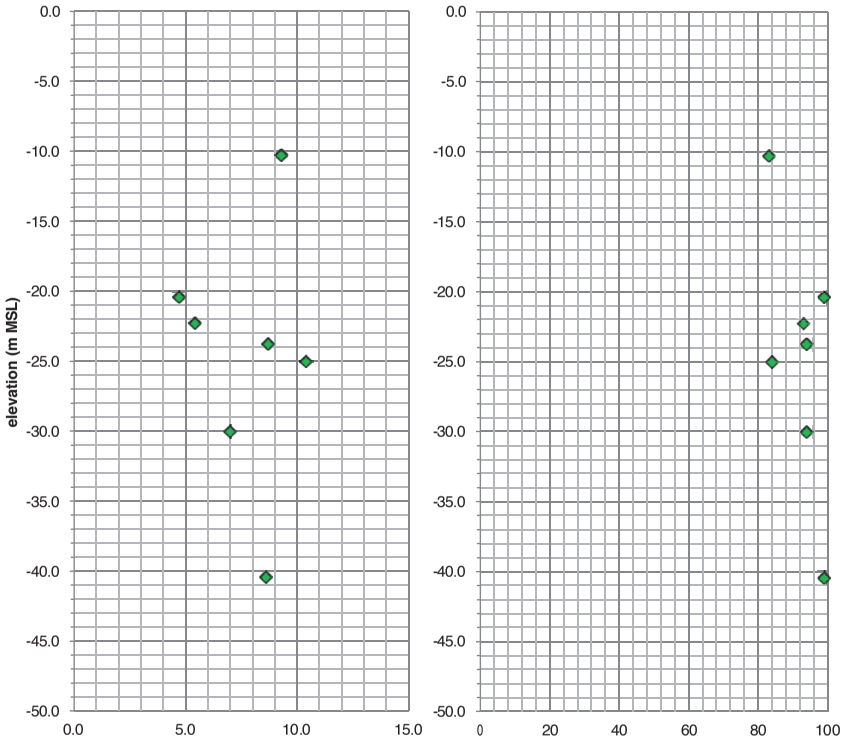


Figure II.2j Profiles of dry unit weight, gdry; for Soil Unit 2, estimated from undisturbed samples

Figure II.2k Profiles of fines content, FC; for Soil Unit 2, estimated from undisturbed samples

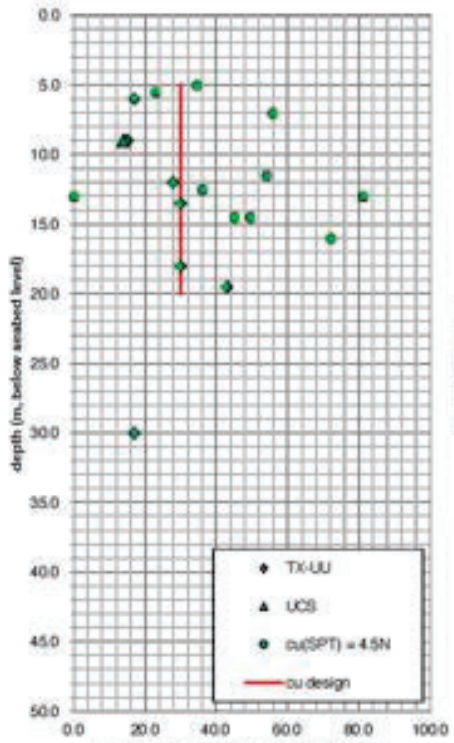


Figure II.2l Design line of undrained shear strength, cu; for Soil Unit 2, estimated from in-situ tests and undisturbed samples

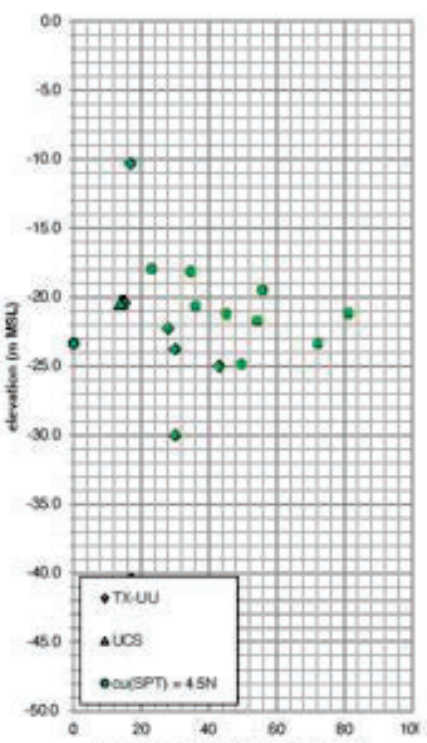


Figure II.2m Profiles of undrained shear strength, cu; for Soil Unit 2, estimated from in-situ tests and undisturbed samples

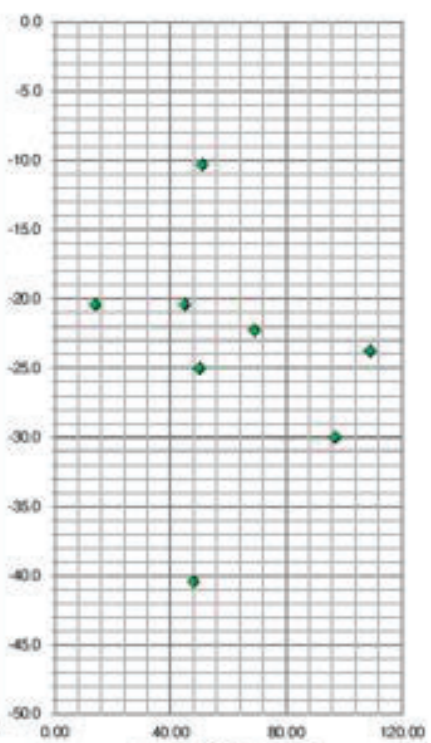


Figure II.2n Profiles of Secant Modulus, E50; for Soil Unit 2, estimated from Triaxial tests

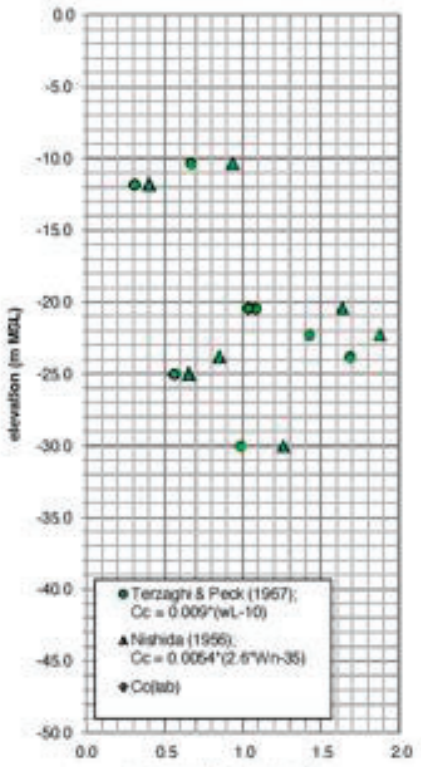


Figure II.2o Profiles of compression index, cc; for Soil Unit 2, estimated from undisturbed samples and correlations

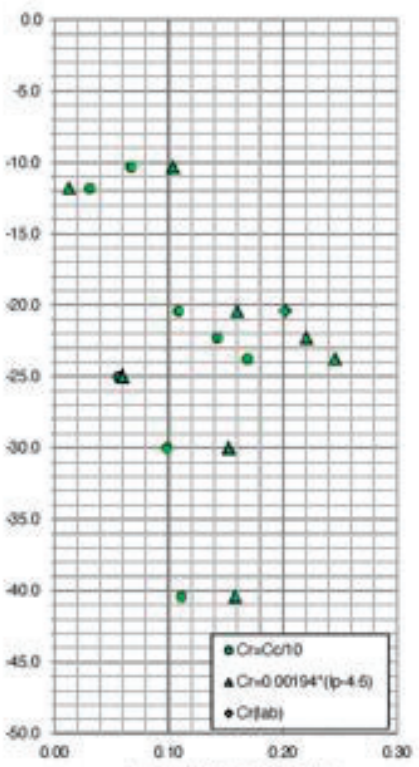


Figure II.2p Profiles of recompression index, cr; for Soil Unit 2, estimated from undisturbed samples and correlations

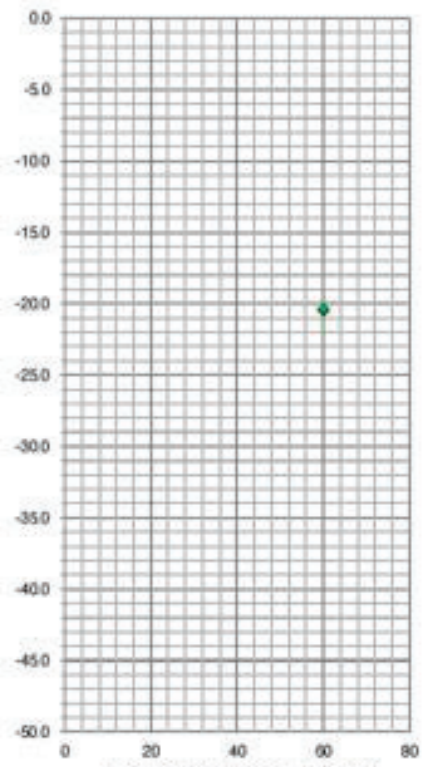


Figure II.2q Profiles of preconsolidation pressure, pc; for Soil Unit 2, estimated from undisturbed samples

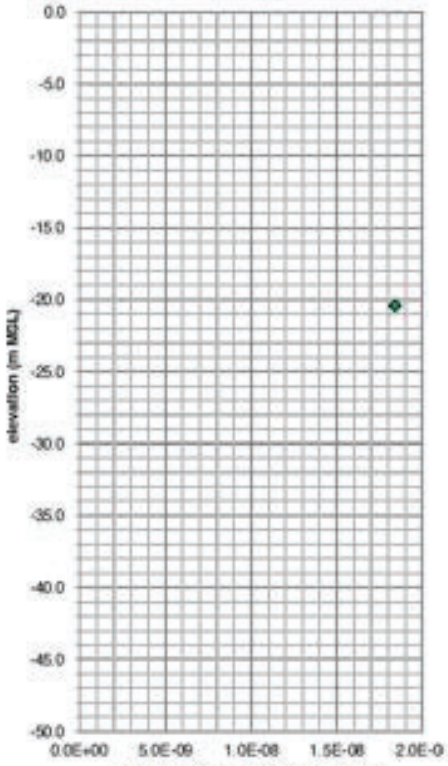


Figure 8.2r Profiles of the coefficient of consolidation, cv; for Soil Unit 2, estimated fro undisturbed samples

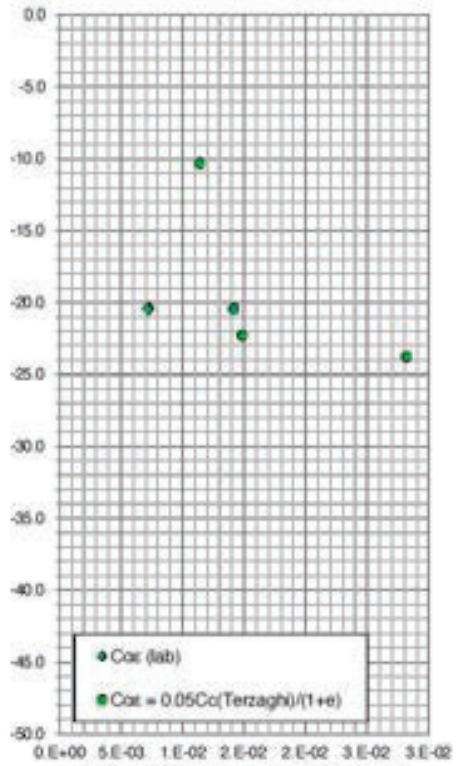


Figure 8.2s Profiles of modified coefficient of secondary compression, cαε; for Soil Unit 2, estimated from undisturbed samples

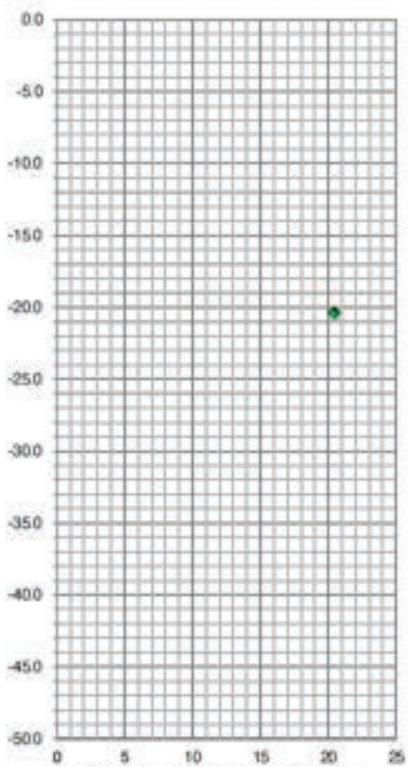


Figure 8.2t Profiles of preoverburden pressure, POP; for Soil Unit 2, estimated from undisturbed samples

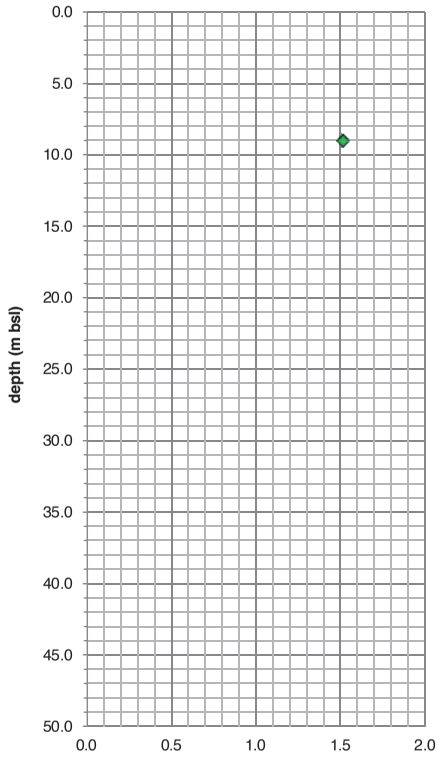


Figure II.2u Profiles of overconsolidation ratio, OCR; for Soil Unit 2, estimated from undisturbed samples

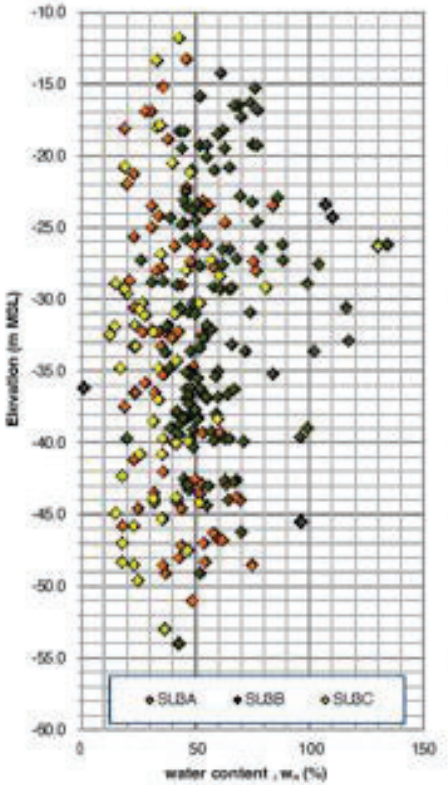


Figure II.3a Profiles of natural water content, wn; for Soil Unit 3, estimated from undisturbed samples

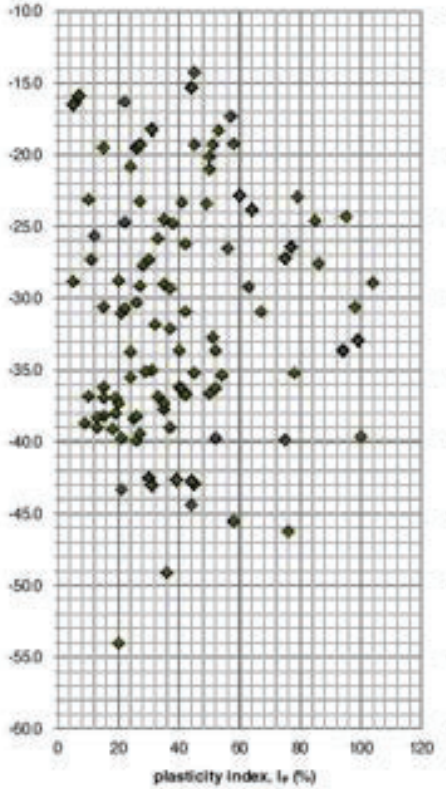


Figure II.3b Profiles of plasticity index, IP; for Soil Unit 3B, estimated from undisturbed samples

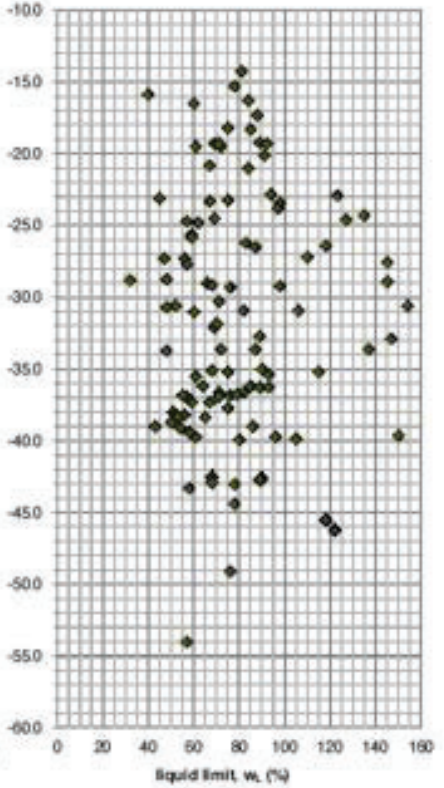


Figure II.3c Profiles of liquid limit, wL; for Soil Unit 3B, estimated from undisturbed samples

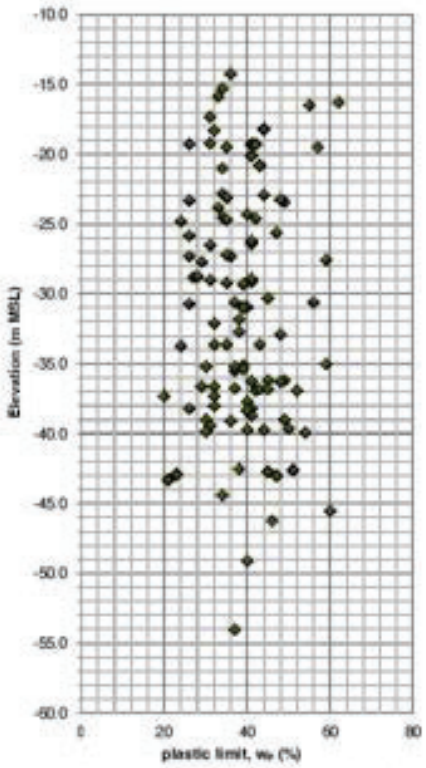


Figure II.3d Profiles of plastic limit, wP; for Soil Unit 3B, estimated from undisturbed samples

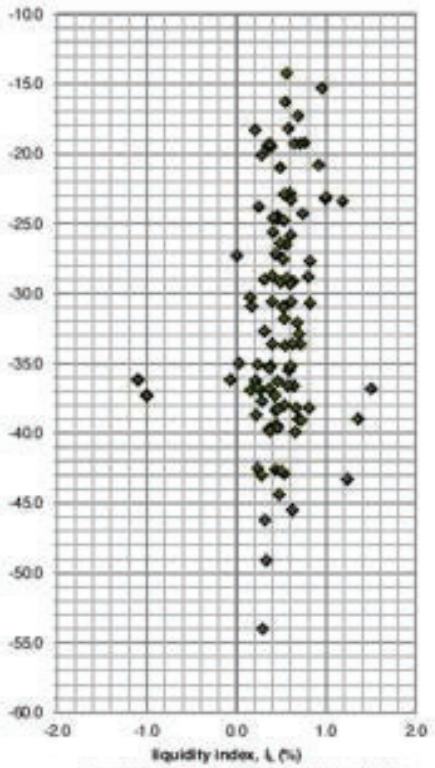
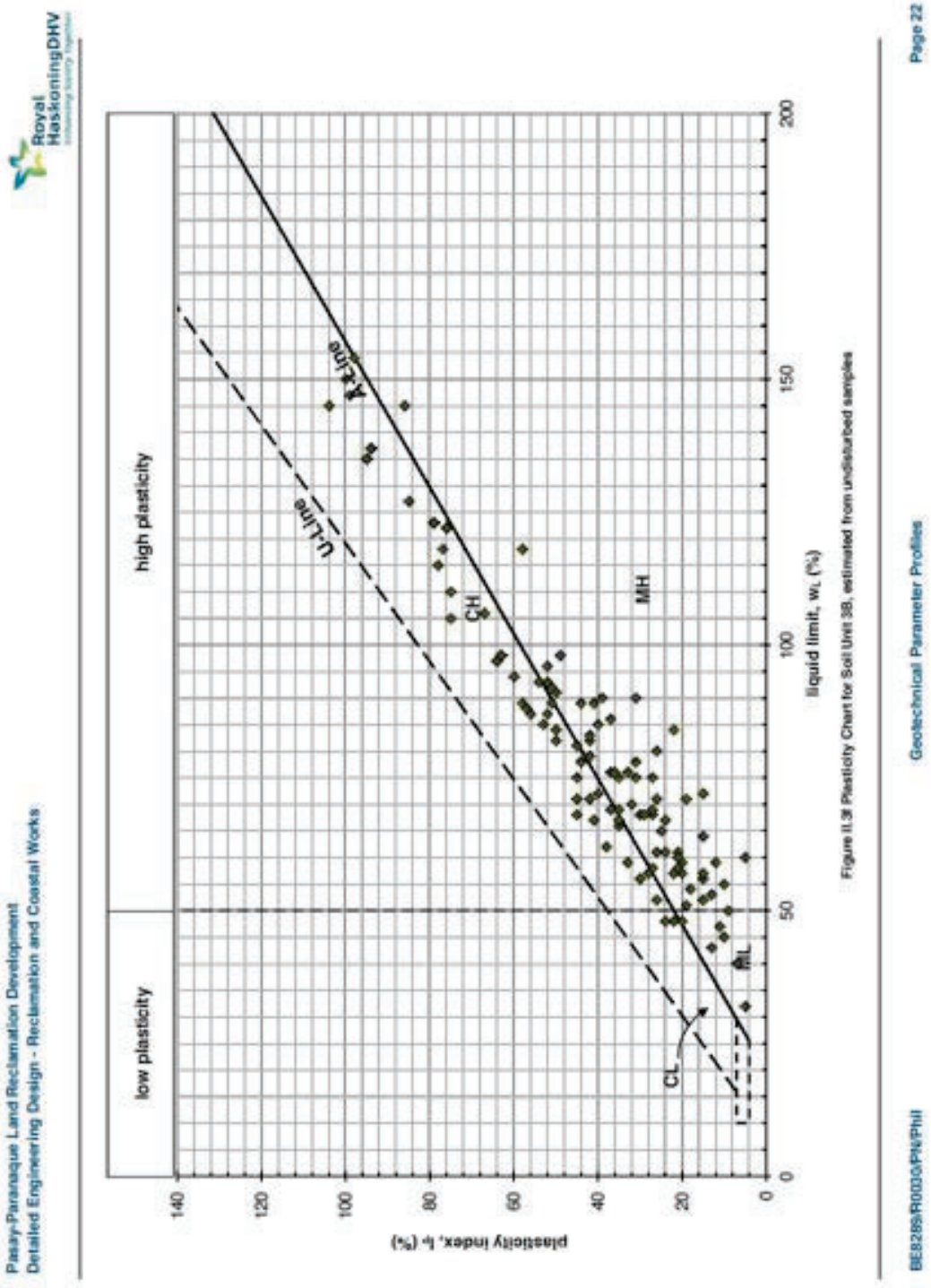


Figure II.3e Profiles of Liquidity Index, IL; for Soil Unit 3B, estimated from undisturbed samples


Royal HaskoningDHV
Pasay-Parañaque Land Reclamation Development
Detailed Engineering Design - Reclamation and Coastal Works
low plasticity
high plasticity
A-Line
U-Line
CH
MH
CL
ML
plasticity index, Ip (%)
liquid limit, wL (%)
0
20
40
60
80
100
120
140
0
50
100
150
200
Figure II.3f Plasticity Chart for Soil Unit 3B, estimated from undisturbed samples
BE8285/R0030/PN/PhII
Geotechnical Parameter Profiles
Page 22

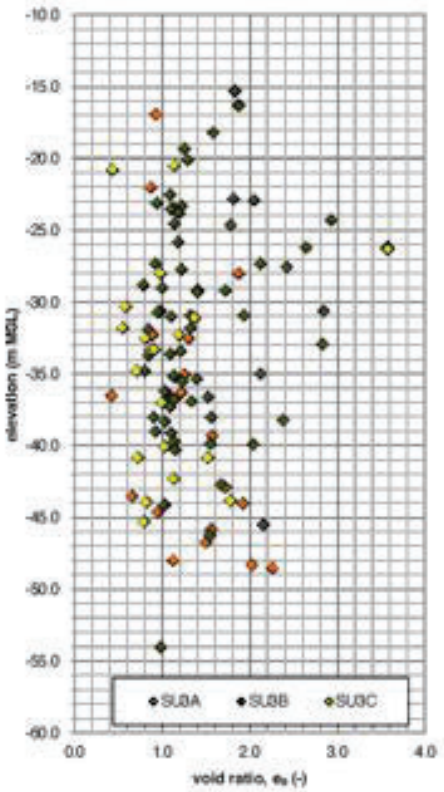


Figure II.3g Profiles of void ratio, e0; for Soil Unit 3, estimated from undisturbed samples

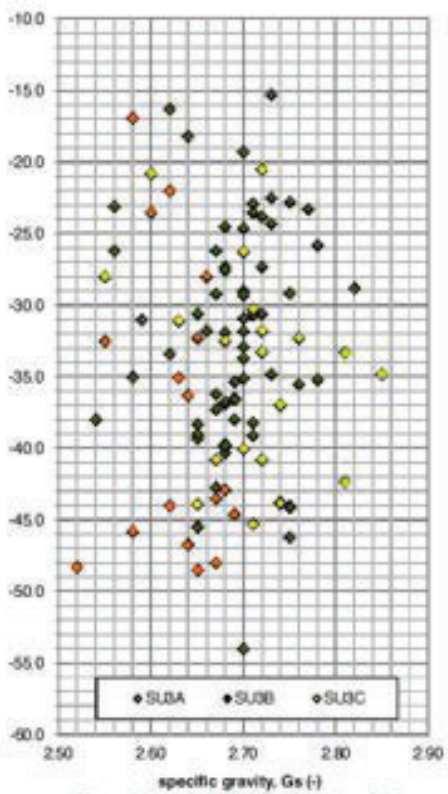


Figure II.3h Profiles of specific gravity, Gs; for Soil Unit 3, estimated from undisturbed samples

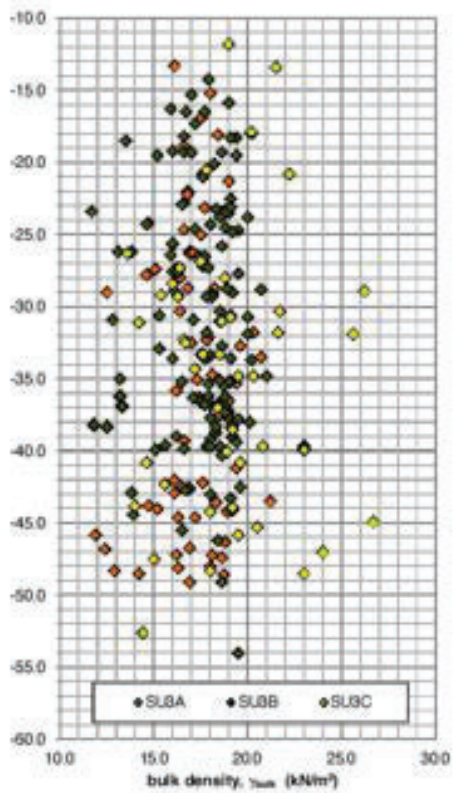


Figure II.3i Profiles of bulk unit weight, gbulk; for Soil Unit 3, estimated from undisturbed samples

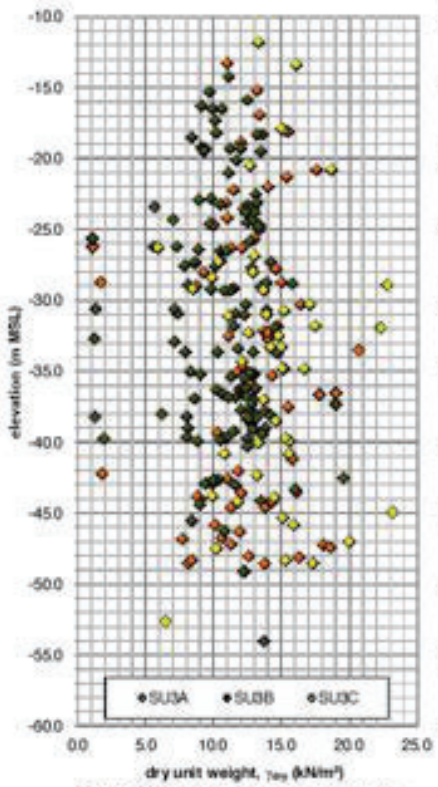


Figure II.3j Profiles of dry unit weight, gdry; for Soil Unit 3, estimated from undisturbed samples

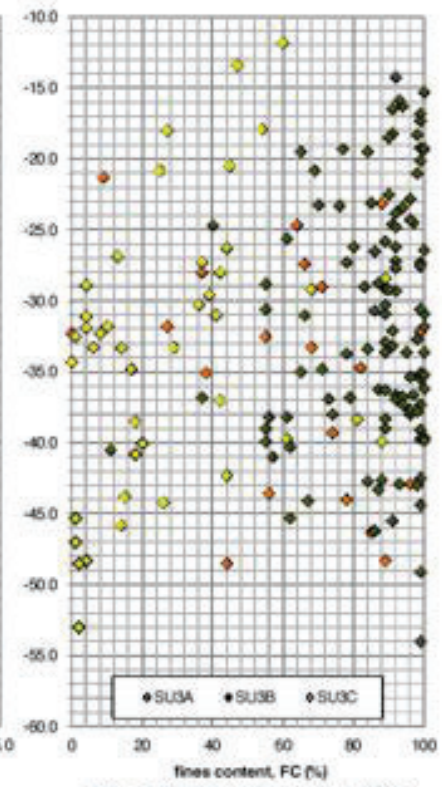


Figure II.3k Profiles of fines content, FC; for Soil Unit 3, estimated from undisturbed samples

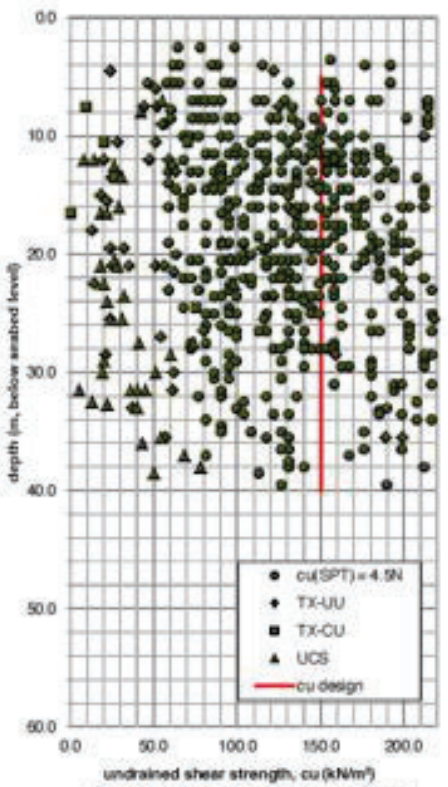


Figure II.3l Design line of undrained shear strength, cu; for Soil Unit 3B, estimated from in-situ tests and undisturbed samples

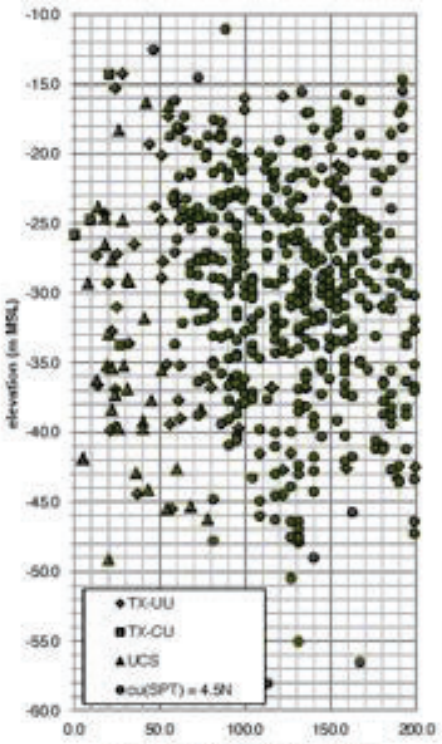


Figure 8.3m Profiles of undrained shear strength, cu; for Soil Unit 3B, estimated from in-situ tests and undisturbed samples

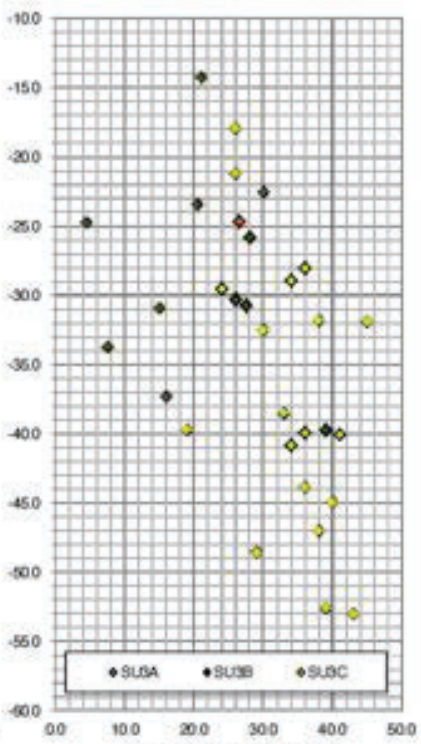


Figure 8.3n Profiles of effective friction angle, φ'max; for Soil Unit 3, estimated from undisturbed samples

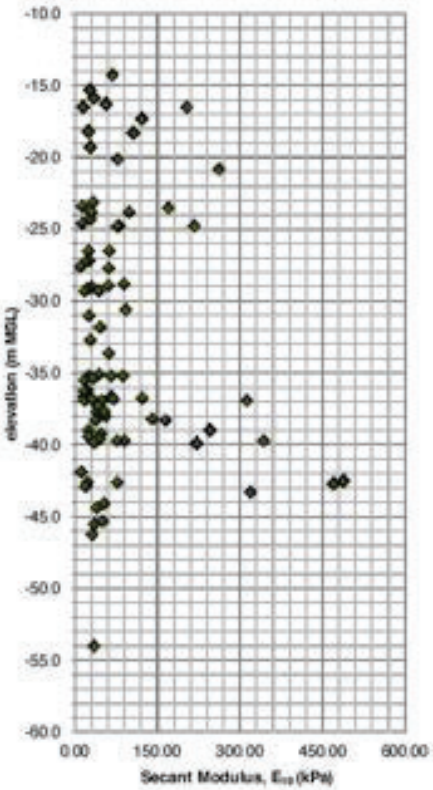


Figure 8.3o Profiles of Secant Modulus, E10; for Soil Unit 3B, estimated from Triaxial tests

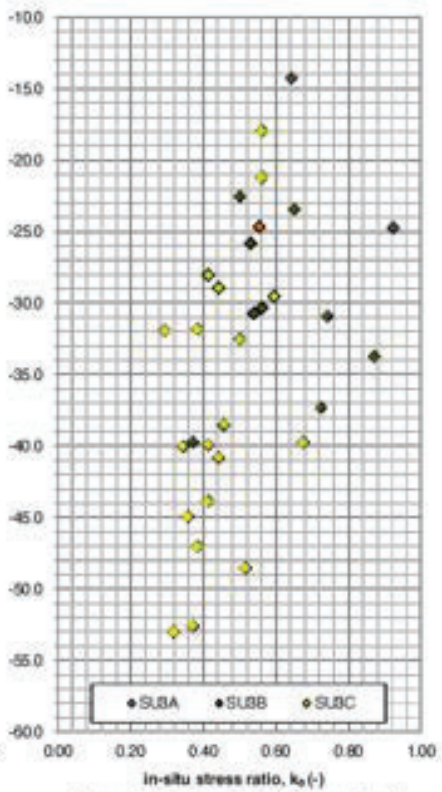


Figure 8.3p Profiles of in-situ stress ratio, K0; for Soil Unit 3, estimated from undisturbed samples

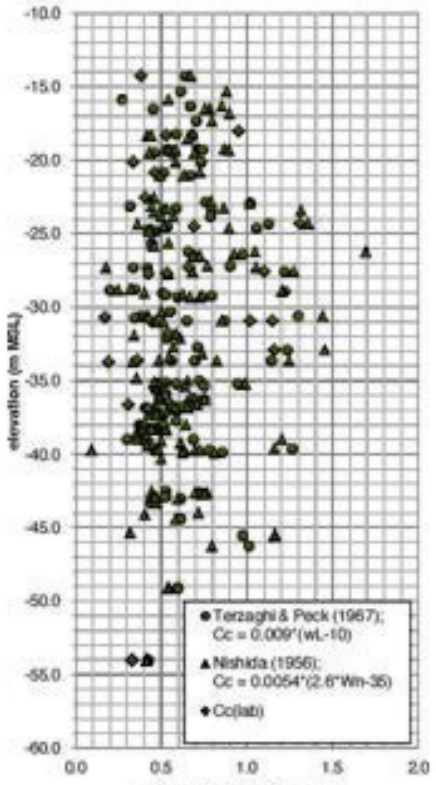


Figure 8.3q Profiles of compression index, cc; for Soil Unit 3B, estimated from undisturbed samples and correlations

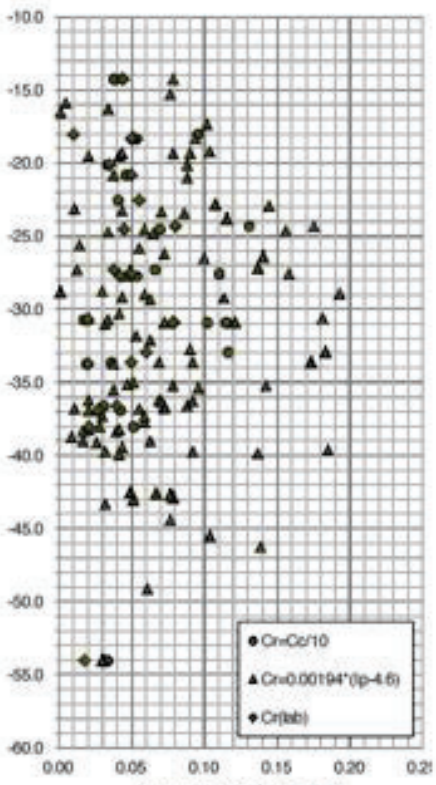


Figure 8.3r Profiles of recompression index, cr; for Soil Unit 3B, estimated from undisturbed samples and correlations

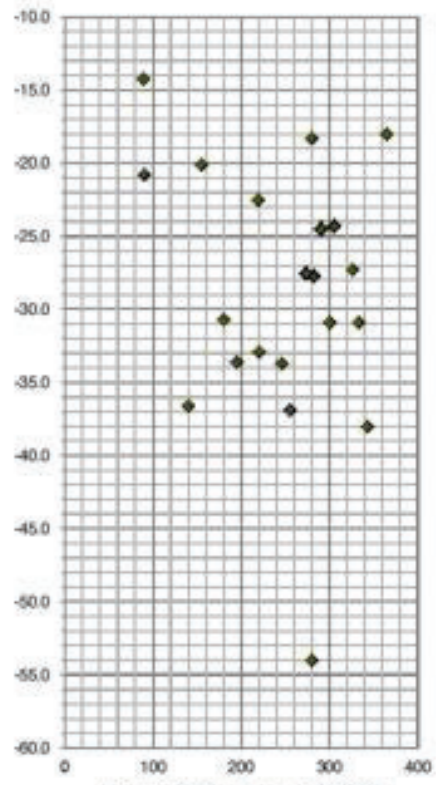


Figure 8.3s Profiles of preconsolidation pressure, pc; for Soil Unit 3B, estimated from undisturbed samples

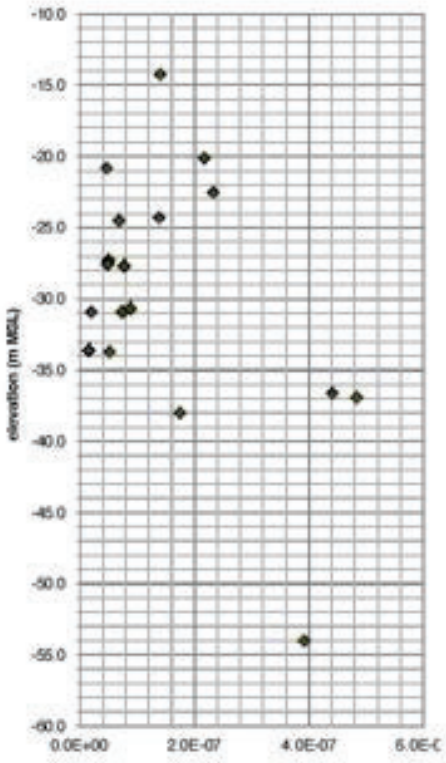


Figure II.3t Profiles of the coefficient of consolidation, cv; for Soil Unit 3B, estimated fr c undisturbed samples

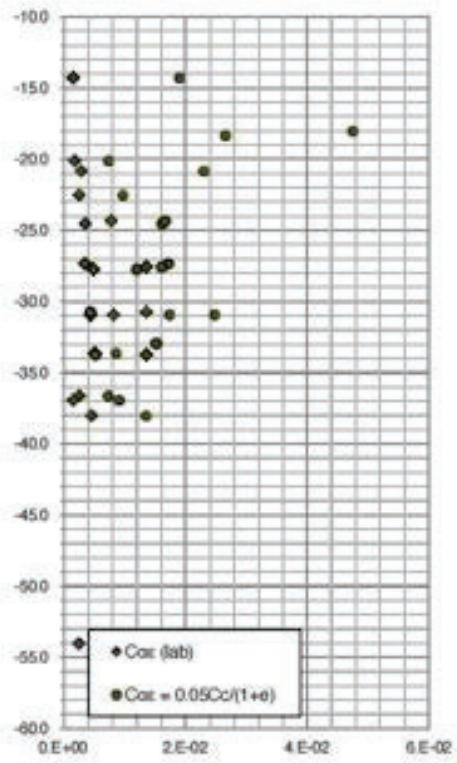


Figure II.3u Profiles of modified coefficient of secondary compression, cαε; for Soil Unit 3B, estimated from undisturbed samples

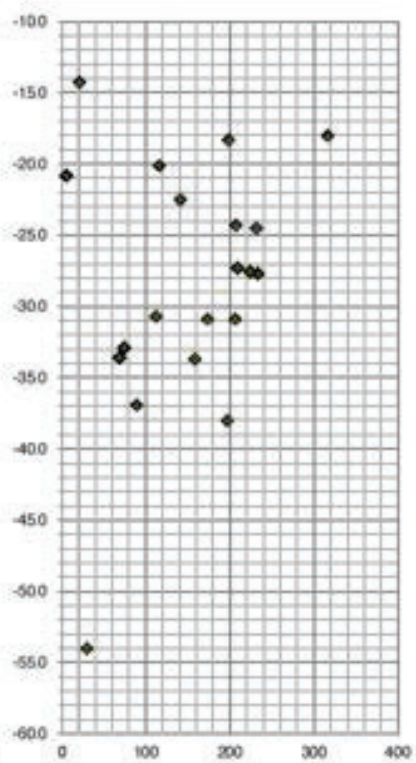


Figure II.3v Profiles of preoverburden pressure, POP; for Soil Unit 3B, estimated from undisturbed samples

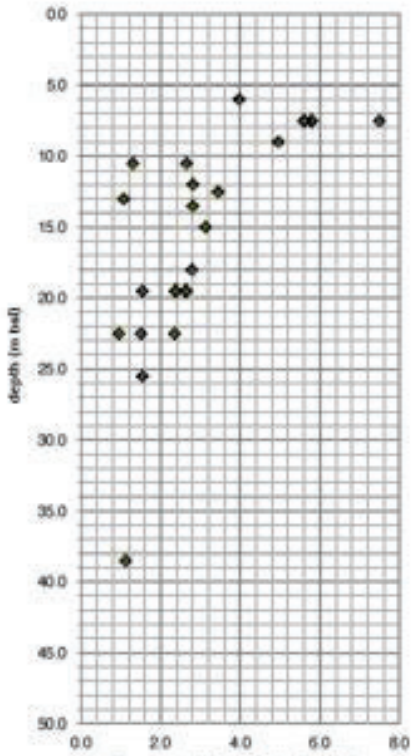


Figure II.3w Profiles of overconsolidation ratio, OCR; for Soil Unit 3B, estimated from undisturbed samples

APPENDIX F.
WATER QUALITY LABORATORY CERTIFICATES

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Sto. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-6058; (049) 539-0102; (02) 846-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-1	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 30°C	Biochemical Oxygen Demand (BOD)	4	mg/L	5 - Day BOD Test	-
pH 8.3	Chloride (Cl^-)	17709.1	mg/L	Argentometric	-
10:54AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.20	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.16	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	35 x 10^5	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]
	Total Suspended Solids (TSS)	20	mg/L	Gravimetric, dried at 103-105 °C	50

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; [a] USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007358
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

8-26077

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 669-9058; (049) 539-0132; (02) 848-8961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077A
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-2	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 31°C	Biochemical Oxygen Demand (BOD)	4	mg/L	5 - Day BOD Test	-
pH 8.3	Chloride (Cl^-)	19505.9	mg/L	Argentometric	-
10:41AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.10	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.08	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-19C774

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant [Fecal] Coliform	540	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 *
	Total Suspended Solids (TSS)	18	mg/L	Gravimetric, dried at 103-105 °C	50

Note : * DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA P. REFERENTE, RCh
PRC No. 0007898
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

B-26077A

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since
1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-260778
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-3	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 31°C	Biochemical Oxygen Demand (BOD)	4	mg/L	5 - Day BOD Test	-
pH 8.4	Chloride (Cl^-)	18561.8	mg/L	Argentometric	-
10:29AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.10	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.09	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-260778

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	54 x 10^3	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]
	Total Suspended Solids (TSS)	18	mg/L	Gravimetric, dried at 103-105 °C	50

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MRS. CRISTINA T. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALVIN A. P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

8-250779

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-6991
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077C
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-4	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 34°C	Biochemical Oxygen Demand (BOD)	7	mg/L	5 - Day BOD Test	-
pH 8.3	Chloride (Cl^-)	18134.3	mg/L	Argentometric	-
10:15AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.09	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.08	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077C

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	540	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]
	Total Suspended Solids (TSS)	15	mg/L	Gravimetric, dried at 103-105 °C	50

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007308
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-8861
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077D
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-5	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 30°C	Biochemical Oxygen Demand (BOD)	5	mg/L	5 - Day BOD Test	-
pH 8.4	Chloride (Cl^-)	19238.7	mg/L	Argentometric	-
09:56AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.09	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.06	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077D

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	4.5	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [a]
	Total Suspended Solids (TSS)	14	mg/L	Gravimetric, dried at 103-105 °C	50

Note : [a] DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13
Sample Submission : Sampled by OMLI Staff
Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.
Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERBANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALWIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

S-280770

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since
1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9068; (049) 539-0102; (02) 846-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077E
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-6	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 30°C	Biochemical Oxygen Demand (BOD)	4	mg/L	5 - Day BOD Test	-
pH 8.4	Chloride (Cl^-)	19725.6	mg/L	Argentometric	-
09:40AM	Chromium as Hexavalent Chromium (Cr^{+6})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	7	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.10	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.11	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077E

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	130	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]
	Total Suspended Solids (TSS)	20	mg/L	Gravimetric, dried at 103-105 °C	50

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Sto. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 846-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077F
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-7	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 29°C	Biochemical Oxygen Demand (BOD)	5	mg/L	5 - Day BOD Test	-
pH 8.3	Chloride (Cl^-)	25354.7	mg/L	Argentometric	-
09:30AM	Chromium as Hexavalent Chromium (Cr^{+6})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	7	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.10	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.07	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077F

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	<1.8	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 *
	Total Suspended Solids (TSS)	20	mg/L	Gravimetric, dried at 103-105 °C	50

Note : * DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007598
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 680-9068; (049) 539-0102; (02) 646-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077G
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-8	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 30°C	Biochemical Oxygen Demand (BOD)	4	mg/L	5 - Day BOD Test	-
pH 8.2	Chloride (Cl^-)	19013.1	mg/L	Argentometric	-
09:20AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.09	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.08	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077G

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	33	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 *
	Total Suspended Solids (TSS)	7	mg/L	Gravimetric, dried at 103-105 °C	50

Note : * DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

JVA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011780
Group Vice President for Operations

Not valid without OMLI dry seal

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ✔
Duplicate issue by request
Revision Copy

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077H
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-9	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 30°C	Biochemical Oxygen Demand (BOD)	8	mg/L	5 - Day BOD Test	-
pH 8.2	Chloride (Cl^-)	21352.6	mg/L	Argentometric	-
09:08AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	7	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.09	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.10	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077H

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	350	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 *
	Total Suspended Solids (TSS)	7	mg/L	Gravimetric, dried at 103-105 °C	50

Note : * DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007338
Laboratory Head

Approved by:

ALVIN F. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Sto. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9059; (049) 539-0102; (02) 846-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077I
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-10	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 30°C	Biochemical Oxygen Demand (BOD)	15	mg/L	5 - Day BOD Test	-
pH 8.1	Chloride (Cl^-)	22065.1	mg/L	Argentometric	-
08:56AM	Chromium as Hexavalent Chromium (Cr^{+6})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	7	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.09	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.08	mg/L	Stannous Chloride	0.2 *

Not valid without OMLI dry seal

B-26077I

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	920	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]
	Total Suspended Solids (TSS)	5	mg/L	Gravimetric, dried at 103-105 °C	50

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA T. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

B-29077

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 640-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ✔
Duplicate issue by request
Revision Copy

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077J
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
Marine Water					
SW-11	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
Temp 32°C	Biochemical Oxygen Demand (BOD)	48	mg/L	5 - Day BOD Test	-
pH 8.1	Chloride (Cl^-)	19274.3	mg/L	Argentometric	-
11:37AM	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05
	Color (True)	<5	CU	Visual Comparison	50
	Dissolved Oxygen (DO)	6	mg/L	DO Meter	6(Min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nitrate as NO_3-N *	0.09	mg/L	Colorimetric, Brucine	10
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2
	Phosphate as Phosphorus (Total, Reactive)	0.13	mg/L	Stannous Chloride	0.2*

Not valid without OMLI dry seal

B-26077J

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB
	Thermotolerant (Fecal) Coliform	35×10^5	MPN/100ml	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 *
	Total Suspended Solids (TSS)	15	mg/L	Gravimetric, dried at 103-105 °C	50

Note : * DAO 2021-19 Water Quality Guidelines Values, Class SB.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicrob
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALVIN P. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

B-260771

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-8058; (049) 539-0102; (02) 846-6961
Email : customer.service@ostrealabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077K
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB	DAO 2016-08 Water Quality Guidelines Values, Class C
Marine Water						
SW-12	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01	0.02
Libertad	Biochemical Oxygen Demand (BOD)	24	mg/L	5 - Day BOD Test	-	7
Pumping	Chloride (Cl^-)	242.5	mg/L	Argentometric	-	350
Station	Chromium as Hexavalent Chromium (Cr^{6+})	<0.01	mg/L	Colorimetric	0.05	0.01
Temp 33°C	Color (True)	25	CU	Visual Comparison	50	75
pH 7.7	Dissolved Oxygen (DO)	5	mg/L	DO Meter	6(Min)	5(min)
12:10PM	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01	0.05
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001	0.002
	Nitrate as NO_3-N *	0.12	mg/L	Colorimetric, Brucine	10	7
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2	2
	Phosphate as Phosphorus (Total, Reactive)	3.54	mg/L	Stannous Chloride	0.2 *	0.025 *

Not valid without OMLI dry seal

B-26077K

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB	DAO 2016-08 Water Quality Guidelines Values, Class C
	Thermotolerant (Fecal) Coliform	54 x 10⁰	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]	200 [b]
	Total Suspended Solids (TSS)	28	mg/L	Gravimetric, dried at 103-105 °C	50	80

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB and C.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicro
Microbiology Section Head

MA. CRISTINA T. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:

ALLEN F. BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

B-2SC77K

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-6951
Email : customer.service@ostreaabs.com.ph

DENR Recognized Laboratory with C.R. No. 011/2021

Original Issue ☑
Duplicate Issue by request ☐
Revision Copy ☐

CERTIFICATE OF ANALYSIS

Customer : E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORPORATION

Address : Quezon City, Metro Manila Philippines

Project Name : Proposed 360 ha Reclamation Project

Project Location : SM MOA Pasay

Attention : MR. PATRICK CADDARAO

Contact Information : pscaddarao@outlook.com

Date of Issue : 5/2/2024
BATCH : B-26077L
Date Received: 4/23/2024
Date Sampled: 4/23/2024
Date Analyzed: 4/23-29/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB	DAO 2016-08 Water Quality Guidelines Values, Class C
Marine Water						
SW-13	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01	0.02
Drainage	Biochemical Oxygen Demand (BOD)	247	mg/L	5 - Day BOD Test	-	7
Outfall	Chloride (Cl^-)	86.9	mg/L	Argentometric	-	350
Temp 34°C	Chromium as Hexavalent Chromium (Cr^{4+})	<0.01	mg/L	Colorimetric	0.05	0.01
pH 7.2	Color (True)	100	CU	Visual Comparison	50	75
12:49PM	Dissolved Oxygen (DO)	5	mg/L	DO Meter	6(Min)	5(min)
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01	0.05
	Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001	0.002
	Nitrate as NO_3 N *	0.25	mg/L	Colorimetric, Brucine	10	7
	Oil and Grease	<1.0	mg/L	Liquid-Liquid, Partition - Gravimetric	2	2
	Phosphate as Phosphorus (Total, Reactive)	6.51	mg/L	Stannous Chloride	0.2 *	0.025 *

Not valid without OMLI dry seal

B-26077L

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods	DAO 2016-08 Water Quality Guidelines Values, Class SB	DAO 2016-08 Water Quality Guidelines Values, Class C
	Thermotolerant (Fecal) Coliform	28 x 10⁶	MPN/100mL	Multiple Tube Fermentation Technique - Fecal Coliform Procedure	100 [b]	200 [b]
	Total Suspended Solids (TSS)	107	mg/L	Gravimetric, dried at 103-105 °C	50	80

Note : [b] DAO 2021-19 Water Quality Guidelines Values, Class SB and C.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is /are deemed accepted.

Total No. of Sample : 1 **Total Analysis** : 13

Sample Submission : Sampled by OMLI Staff

Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.; * USEPA Method 352.1.

Remarks : Results relate only to the item tested and received by the laboratory.

Certified Correct by:

CHRISTOPHER D. HERNANDEZ, RMicrob
Microbiology Section Head

MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007198
Laboratory Head

Approved by:

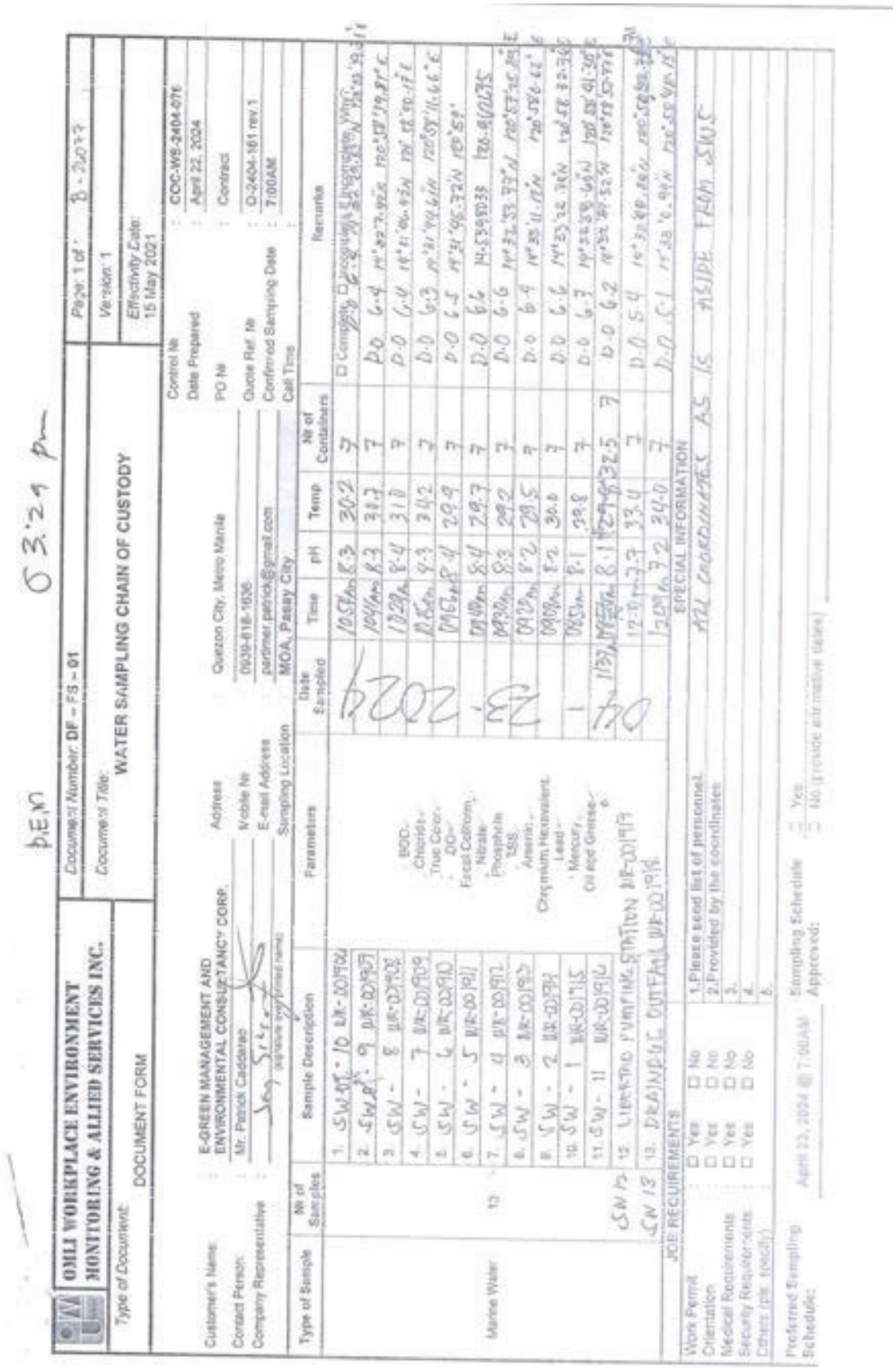
ALVIN JR BASCO, RCh
PRC No. 0011786
Group Vice President for Operations

Not valid without OMLI dry seal

B-2607L

This Report is the confidential property of the client named. Prior client approval is required to verify and confirm the information contained herein. Persons acting without diligent verification do so at their peril. Unless otherwise authorized, all reprographic, dissemination and publication rights are reserved, including downloads, digital and image files and representations.

Uninterrupted Total Quality Service Since 1976



OMJ WORKPLACE ENVIRONMENT MONITORING & ALLIED SERVICES INC.

Document Number: DF – FS – 01 | Page: 1 of 1 | B - 2023

Type of Document: DOCUMENT FORM

Document Title: WATER SAMPLING CHAIN OF CUSTODY

Version: 1

Effectivity Date: 15 May 2021

Customer's Name: E-GREEN MANAGEMENT AND ENVIRONMENTAL CONSULTANCY CORP.

Address: Quezon City, Metro Manila

Control No: COC-WS-2404-076

Date Prepared: April 22, 2024

PO No: Contract

Contact Person: Mr. Patrick Cadenas

Mobile No: 0939-818-1936

Quote Ref. No: Q-2404-161 rev.1

Company Representative: (signature over printed name)

E-mail Address: partner.patrick@gmail.com

Confirmed Sampling Date: 7:00AM

Sampling Location: MOA, Pasay City

Call Time:

Type of Sample	No of Samples	Sample Description	Parameters	Date Sampled	Time	pH	Temp	No of Containers	Remarks
Marine Water	13	1. SW-01 (0.5m depth)	BOD, Chloride, True Color, DO, Fecal Coliform, Nitrate, Phosphate, TSS, Arsenic, Chromium Hexavalent, Lead, Mercury, Oil and Grease	4/22/24	10:57am	8.3	30.2	7	☐ Complete ☐ Incomplete
		2. SW-02 (0.5m depth)			10:40am	8.3	31.2	7	
		3. SW-03 (0.5m depth)			10:28am	8.4	31.0	7	
		4. SW-04 (0.5m depth)			10:15am	8.3	34.2	7	
		5. SW-05 (0.5m depth)			09:58am	8.4	29.9	7	
		6. SW-06 (0.5m depth)			09:40am	8.4	29.7	7	
		7. SW-07 (0.5m depth)			09:20am	8.3	29.2	7	
		8. SW-08 (0.5m depth)			09:05am	8.2	29.5	7	
		9. SW-09 (0.5m depth)			08:50am	8.2	30.0	7	
		10. SW-10 (0.5m depth)			08:35am	8.1	29.8	7	
		11. SW-11 (0.5m depth)			08:20am	8.1	29.6	7	
		12. LIBERTAD PUMPING STATION WE-00191			12:00nn	7.2	33.1	7	
		13. DEALING'S OUTFALL WE-00192			12:20pm	7.2	34.0	7	

SW 12

SW 13

JOB REQUIREMENTS

Work Permit	☐ Yes ☐ No	1.Please send list of personnel	SPECIAL INFORMATION
Orientation	☐ Yes ☐ No	2.Provided by the coordinator	
Medical Requirements	☐ Yes ☐ No	3.	
Security Requirements	☐ Yes ☐ No	4.	
Others (pls. specify)		5.	

Preferred Sampling Schedule: April 23, 2024 @ 7:00AM

Sampling Schedule Approved:

☐ Yes

☐ No (provide alternative date)

OMJ WORKPLACE ENVIRONMENT MONITORING & ALLIED SERVICES INC.

Document Number: DF - FS - 01

Page: 1 of 1

Version: 1

Effectivity Date: 15 May 2021

Type of Document: DOCUMENT FORM

Document Title: WATER SAMPLING CHAIN OF CUSTODY

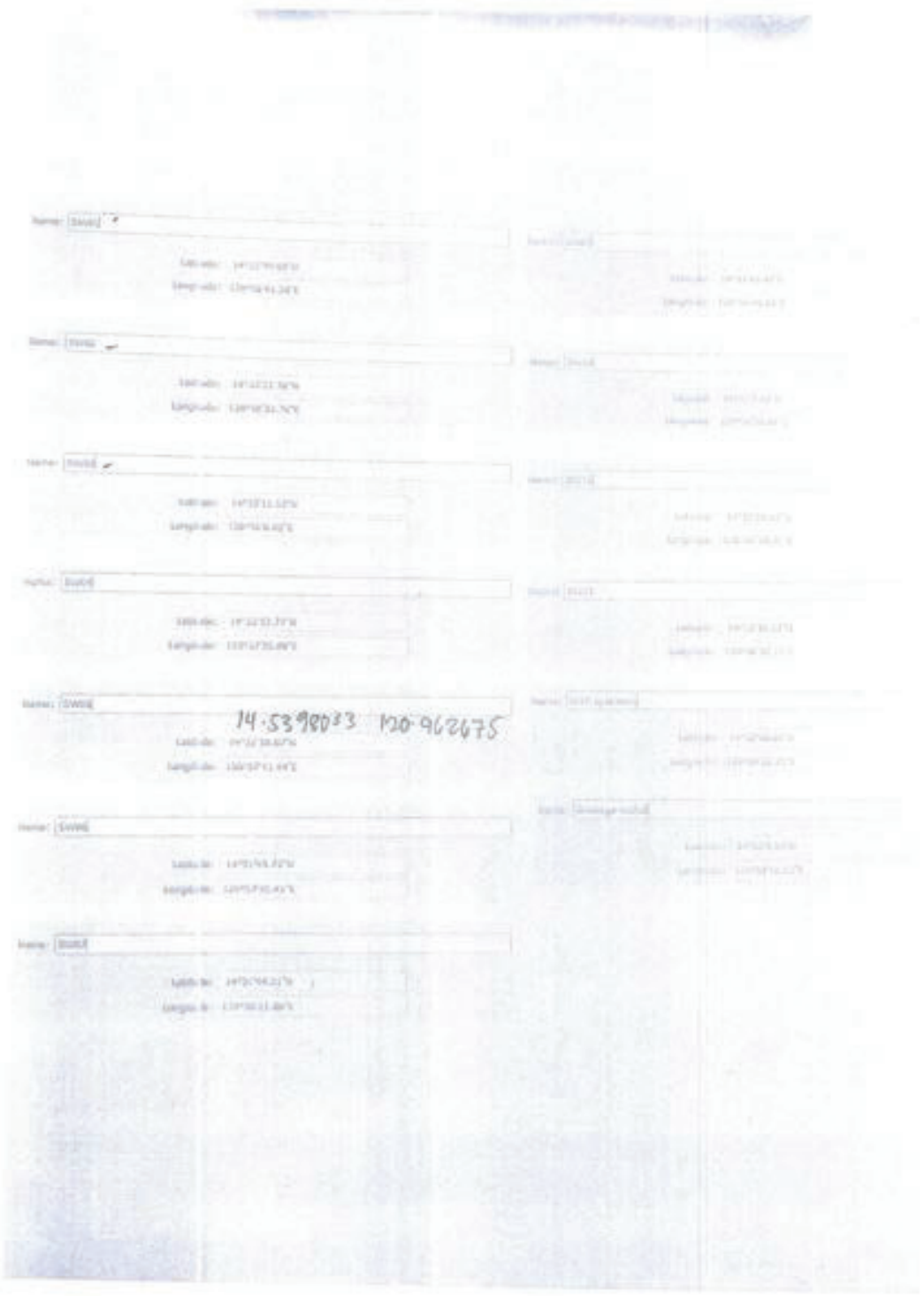
Sampled/ Picked-up by:

1. FORENIK SUMAGAYAN JR. EDUARDO BULAGAN JR.
2. DAVID BOYLE BALUNAN JR. RAYMUND REMIGIO JR.

Vehicle Details: Plate No. XZW041; Driver E. BULAGAN JR.; RDF Feeding: Initial 39434, Final 39573; Diesel: Liters 15.21, Amount 1100

Prepared by: Sales Coordinator — Received by: Sampling Coordinator — Received from Customer: — Received from Sampling Team: — Reviewed by: — Approved by:

Checked by: Sampling Coordinator


14.5398033 120.962675



SCOPE OF RECOGNITION AND DENR RECOGNIZED SIGNATORIES ARE SPECIFIED AND CAN BE VERIFIED AT https://emb.gov.ph/denr-recognized-environmental-laboratory/ AND ARE INTEGRAL PARTS OF THIS CERTIFICATE.

ISSUE DATE: MAY 03, 2024
EXPIRY DATE: MAY 03, 2027

ELR LABORATORY CODE NO. 04-09

Republic of the Philippines
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Visayas Avenue, Diliman, Quezon City

This

CERTIFICATE OF RECOGNITION

C.R. No. 011/2024

is hereby granted to

Ostrea Mineral Laboratories, Inc.

Brgy. Road, Bo. Mamplasan, Biñan, Laguna 4024

after having been assessed and found to comply with the documentation, analytical performance and other technical requirements of Administrative Order No. 63, series of 1998 (AO 63), Guidelines for the Designation of DENR Recognized Environmental Laboratories.

This certificate remains valid subject to continued compliance with the requirements of AO 63.

In testimony whereof, I have hereunto signed this Certificate at Quezon City, Philippines.

MARIA ANTONIA YULO LOYZAGA
Secretary

APPENDIX G.
AMBIENT AIR AND NOISE REPORT

echem ENVIRONMENTAL TESTING LABORATORY CORPORATION

Laboratory: Blk 22 Lot 6A, Golden Sun 999 Ind'l Park, Quezon Rd., San Pablo Libutad, San Simon, Pampanga
Satellite Office: G F ASCORP Bldg., Mc Arthur Highway, Dolores, City of San Fernando, Pampanga
Sales: Email:
Technical:

DENR Accreditation No 03-850-2325-LW-2 Valid until December 31, 2025
DENR C.A No. 074/2023 Valid until June 24, 2026

TEST REPORT

Client: China Harbour Engineering Company
Address: Ramos Magsaysay Center, Roxas Blvd., Malate, Manila
Contact Person: Not Supplied
COC Number: 2024-A0436

Test Report No.: TR-340-145
Date and Time Received: 31 Jan 2024 @09:11AM
Sampled By: PURE JESM
Report Date: 14 Feb 2024

Sample ID: S24-A31-007A
Sample Description: Station 1
Sample Matrix: Air
Sampling Date: 24 Jan 2024
Sampling Time: 02:45 PM-03:45 PM
Sampling Location: Ramos Magsaysay Center, Roxas Blvd., Malate, Manila

Parameter	Result	Unit	Method	Date Analyzed	Analyst
Total Suspended Particulate	2,100	ug	Gravimetric	02 Feb 2024	KTD

Sample ID: S24-A31-008A
Sample Description: Station 3
Sample Matrix: Air
Sampling Date: 24 Jan 2024
Sampling Time: 03:50 PM-04:50 PM
Sampling Location: Ramos Magsaysay Center, Roxas Blvd., Malate, Manila

Parameter	Result	Unit	Method	Date Analyzed	Analyst
Total Suspended Particulate	2,200	ug	Gravimetric	02 Feb 2024	KTD

Sample ID: S24-A31-009A
Sample Description: Station 4
Sample Matrix: Air
Sampling Date: 24 Jan 2024
Sampling Time: 12:30 PM-01:30 PM
Sampling Location: Ramos Magsaysay Center, Roxas Blvd., Malate, Manila

Parameter	Result	Unit	Method	Date Analyzed	Analyst
Total Suspended Particulate	1,500	ug	Gravimetric	02 Feb 2024	KTD

Sample ID: S24-A31-010A
Sample Description: Station 5
Sample Matrix: Air
Sampling Date: 24 Jan 2024
Sampling Time: 11:30 AM-12:20 PM
Sampling Location: Ramos Magsaysay Center, Roxas Blvd., Malate, Manila

Parameter	Result	Unit	Method	Date Analyzed	Analyst
Total Suspended Particulate	1,000	ug	Gravimetric	02 Feb 2024	KTD

Sample ID: S24-A31-011A
Sample Description: Station 6
Sample Matrix: Air
Sampling Date: 24 Jan 2024
Sampling Time: 09:45 AM-10:45 AM
Sampling Location: Ramos Magsaysay Center, Roxas Blvd., Malate, Manila

Parameter	Result	Unit	Method	Date Analyzed	Analyst
Total Suspended Particulate	900	ug	Gravimetric	02 Feb 2024	KTD

Notes & References:

Lodge, James P., Methods of Air Sampling and Analysis, Third Edition.
Code of Federal Regulations (40 CFR), Part 50, United States Environmental Protection Agency (US EPA)

Certified by:
14 Feb 2024
Lovely Vhoie O. Mendoza, RCh
PRC Reg. No. 138511

Approved by:
14 Feb 2024
Jay Jon M. Estavillo, RCh
QA/QC Manager, PRC No. 85532

Test results written in this report are based on the samples as received by the laboratory. No alteration or modification of this test report shall be binding against Echem unless in writing and signed by a duly authorized representative of the company. This report shall not be reproduced, except in full, without the written permission from the laboratory.

Not valid without company seal

TR-340-145 Page 1 of 1

CALCULATIONS OF TSP, SO_x AND NO_2 CONCENTRATIONS
CHINA HARBOUR ENGINEERING COMPANY
January 24, 2024

Station	Location	Mass of TSP µg	Volume of Air Sampled Ncm	TSP conc. µg/Ncm
1	Coconut Palace Area	2100	58.3	36.0
3	West side of Lime Hotel	2200	58.3	37.7
4	SM Esplanade	3500	80.1	43.7
5	Teppanyaki Area	1900	80.1	23.7
6	SM Moa Eye Area	900	80.1	11.2

4.0 SUMMARY OF RESULTS:

The ambient air sampling results are presented in Table 1. All supporting field data, analytical reports and calibration records are provided as attachments.

Table 1 Ambient Air Sampling Results

Station	LOCATION	TSP Conc. µg / Nm^3
1	Coconut Palace Area	36.0
3	West side of Lime Hotel	37.7
4	SM Esplanade	43.7
5	Teppanyaki Area	23.7
6	SM Moa Eye Area	11.2
DENR NAAQ Standards		**300**

4.0 SUMMARY OF RESULTS

The noise level measurement results are presented in Table 3. All supporting field data and calibration records are provided as attachments.

Table 3 Noise Level Monitoring Results

STN.	Location	Time	Noise Level, dBA	Category of the Area	DENR (dBA)	DOLE-OSH noise Standards
		Daytime (2000H-0500H				
1	Coconut Palace Area	January 24, 2024 1430H-1445H	48.7	Class B	65	90
3	West side of Lime Hotel	January 24, 2024 1650H-1705H	54.7	Class B	65	90
4	SM Esplanade	January 24, 2024 1330H-1345H	64.5	Class B	65	90
5	Teppanyaki Area	January 24, 2024 1220H-1235H	62.7	Class B	65	90
6	SM Moa Eye Area	January 24, 2024 1045H-1100H	61.9	Class B	65	90

Division of 24-hour period

Morning - 5:00 AM to 9:00 AM
Day Time - 9:00 AM to 6:00 PM
Evening - 6:00 PM to 10:00 PM
Night Time - 10:00 PM to 5:00 AM

Results of Analyses

Analytik Environment Consultancy Services
625, Guerrero St., Brgy. Addition Hills, 1550, City of Mandaluyong
Contact No.: 02-86972972

SN: F00121804.002
Date Received: 04/15/2024
Lab No. P00153170

Project Name: Ambient Air AE24 - 034
Attention: Ms. Rowchell D. De Las Alas

Test Description	Results	Units	MDL	Test Methods	Date Analyzed	By
Sample No.: P00153170-01 **Sample ID: AE24 - 034 - AQ1** -Air-			**DateSampled: 04-09-24 08:00** **Matrix: Air - Ambient**			
Nitrogen Dioxide	2.4	µg	0.22	Griess Saltzman Method	04/16/24	RRH
Particulate Matter @ 10 microns	50	µg	10*	Gravimetry (US CFR 40 Part 50 Appendix J / Compendium Method IO 3.1)	04/16/24	RRH
Sulfur Dioxide	1.4	µg	0.46	Pararosaniline Method (MASA Method 704 / US CFR Part 50)	04/16/24	RRH
Total Suspended Particulates	20,100	µg	100*	Gravimetry (US CFR Part 50 / Compendium IO 3.1)	04/16/24	RRH

MDL = Method Detection Limit/s
*IDL = Instrument Detection Limit/s
Results are reported "as received basis".
This report supersedes CRL Laboratory Report with SN: F00121804.001
Code of Federal Regulations (40 CFR), Part 50 to 51, Revised as of July 1, 2016 / 2018.
Methods of Air Sampling and Analysis by James P. Lodge, Jr., Third Edition
Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, Compendium Method IO-3.1, Selection, Preparation and Extraction of Filter Material, Center for Environmental Research Information Office of Research and Development U.S. Environmental Protection Agency Cincinnati, OH 45268, June 1999

Page 1 of 2
ID>>>>00527354>>>>

CRL Environmental Corporation

• **Laboratory:** Bldg. 2, Berthaphil Compound 1, Berthaphil, Inc. Industrial Park, Jose Abad Santos Ave., Clark Freeport Zone (CFZ) Pampanga, 2023 Philippines
Tel: (63 45) 599-3943 • (63 2) 8552-5100 • Fax: (63 45) 599-3963
Email: crl@crllabs.com • http://www.crllabs.com

Analyzed by:

Ronaldo R. Hubilla
PRC No.: 2665
Chemical Testing
Date: 08/07/2024

Certified by:

Ronald G. Espiritu
PRC No.: 9248
Chemical Testing
Date: 08/07/2024

Chas C. Arroyo
PRC No.: 6701
Chemical Testing
Date: 08/07/2024

Disclaimer: This report pertains only to the samples investigated and does not necessarily apply to other apparently identical or similar materials. This report is submitted for the exclusive use of the customer to whom it is addressed. Any reproduction of this report or use of this Laboratory's name for advertising or publicity purpose without authorization is prohibited. This analytical report is NOT VALID without the official dry seal of CRL Environmental Corporation.

P%>>>>0052735<>>>>

CRL Environmental Corporation

• **Laboratory:** Bldg. 2, Berthaphil Compound 1, Berthaphil, Inc. Industrial Park, Jose Abad Santos Ave., Clark Freeport Zone (CFZ) Pampanga, 2023 Philippines
Tel: (63 45) 599-3943 • (63 2) 8552-5100 • Fax: (63 45) 599-3903
Email: crl@crllabs.com • http://www.crllabs.com

Results of Analyses

Analytik Environment Consultancy Services
625, Guerrero St., Brgy. Addition Hills, 1550, City of Mandaluyong
Contact No.: 02-86972972

SN: F00121804.004
Date Received: 04/15/2024
Lab No. P00153170

Project Name: Ambient Air AE24 - 034
Attention: Ms. Rowchell D. De Las Alas

Test Description	Results	Units	MDL	Test Methods	Date Analyzed	By
Sample No.: P00153170-03			**DateSampled: 04-11-24 12:00**			
Sample ID: AE24 - 034 - AQ3			**Matrix: Air - Ambient**			
-Air-						
Nitrogen Dioxide	4.8	µg	0.22	Griess Saltzman Method	04/16/24	RRH
Particulate Matter @ 10 microns	80	µg	10*	Gravimetry (US CFR 40 Part 50 Appendix J / Compendium Method IO 3.1)	04/16/24	RRH
Sulfur Dioxide	2.4	µg	0.46	Pararosaniline Method (MASA Method 704 / US CFR Part 50)	04/16/24	RRH
Total Suspended Particulates	26,800	µg	100*	Gravimetry (US CFR Part 50 / Compendium IO 3.1)	04/16/24	RRH

MDL = Method Detection Limit/s
*IDL = Instrument Detection Limit/s
Results are reported "as received basis".
This report supersedes CRL Laboratory Report with SN: F00121804.001
Code of Federal Regulations (40 CFR), Part 50 to 51, Revised as of July 1, 2016 / 2018.
Methods of Air Sampling and Analysis by James P. Lodge, Jr., Third Edition
Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air, Compendium Method IO-3.1, Selection, Preparation and Extraction of Filter Material, Center for Environmental Research Information Office of Research and Development U.S. Environmental Protection Agency Cincinnati, OH 45268, June 1999

Page 1 of 2
FN>>>>00527356>>>>

CRL Environmental Corporation

• Laboratory: Bldg. 2, Berthaphil Compound 1, Berthaphil, Inc. Industrial Park, Jose Abad Santos Ave., Clark Freeport Zone (CFZ) Pampanga, 2023 Philippines
Tel: (63 45) 599-3943 • (63 2) 8332-3100 • Fax: (63 45) 599-3963
Email: crl@crllabs.com • http://www.crllabs.com

Analyzed by:

Ronaldo R. Hubilla
PRC No.: 2665
Chemical Testing
Date: 08/07/2024

Certified by:

Ronald G. Espiritu
PRC No.: 9248
Chemical Testing
Date: 08/07/2024

Chas C. Arroyo
PRC No.: 6701
Chemical Testing
Date: 08/07/2024

Disclaimer: This report pertains only to the samples investigated and does not necessarily apply to other apparently identical or similar materials. This report is submitted for the exclusive use of the customer to whom it is addressed. Any reproduction of this report or use of this Laboratory's name for advertising or publicity purpose without authorization is prohibited. This analytical report is NOT VALID without the official dry seal of CRL Environmental Corporation.

IND>>>>0052735G>>>>

CRL Environmental Corporation

• **Laboratory:** Bldg. 2, Berthaphil Compound 1, Berthaphil, Inc. Industrial Park, Jose Abad Santos Ave., Clark Freeport Zone (CFZ) Pampanga, 2023 Philippines
Tel: (63 45) 599-3943 • (63 2) 8552-5100 • Fax: (63 45) 599-3963
Email: crl@crllabs.com • http://www.crllabs.com

APPENDIX H.
RESULTS OF MANTA TOW BENTHIC OBSERVATIONS PATHWAYS (APRIL 2024)

Graphs Of Result of Ten (10) Manta Tow Benthic Observations Pathways

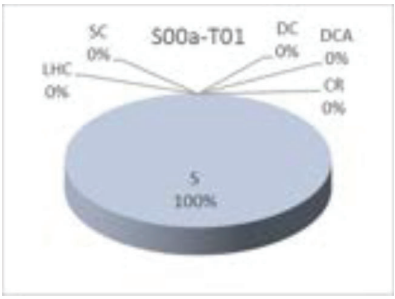


Figure 1. Reef and Substrate Composition for S00-T01

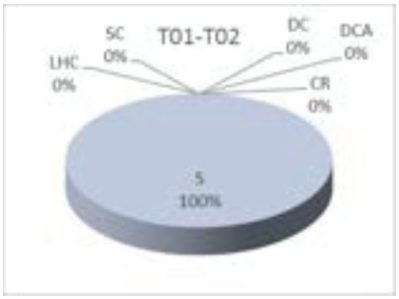


Figure 2. Reef and Substrate Composition for T01-T02

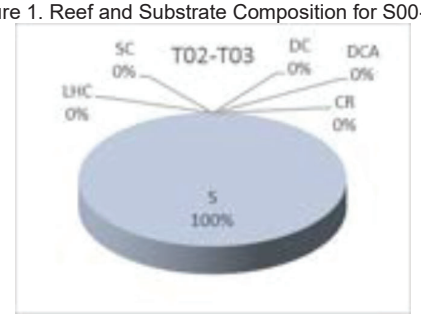


Figure 3. Reef and Substrate Composition for T02-T03

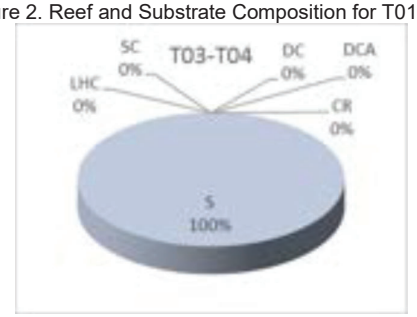


Figure 4. Reef and Substrate Composition for T03-T04

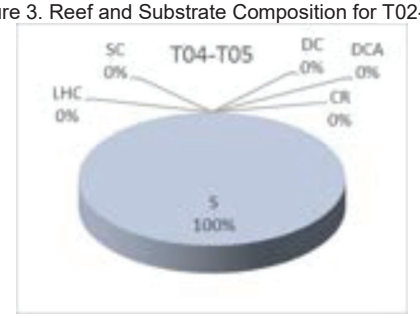


Figure 5. Reef and Substrate Composition for T04-T05

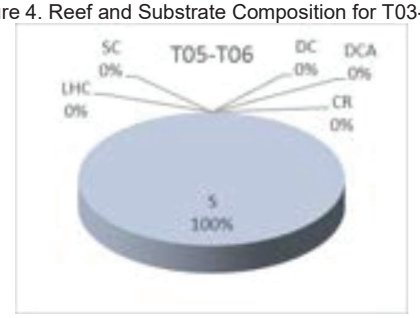


Figure 6. Reef and Substrate Composition for T05-T06

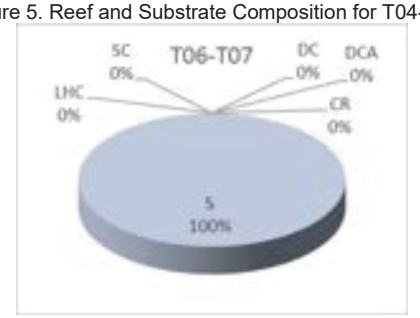


Figure 7. Reef and Substrate Composition for T06-T07

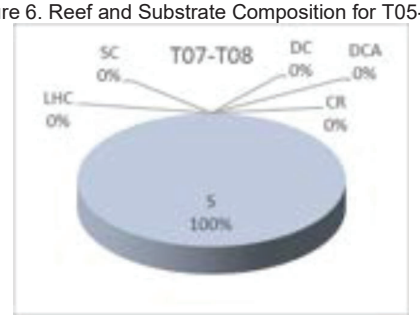


Figure 8. Reef and Substrate Composition for T07-T08

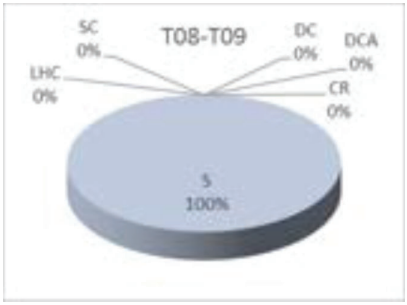


Figure 9. Reef and Substrate Composition for T08-T09

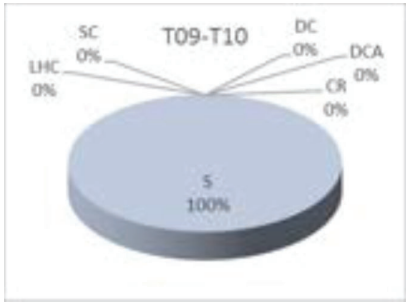
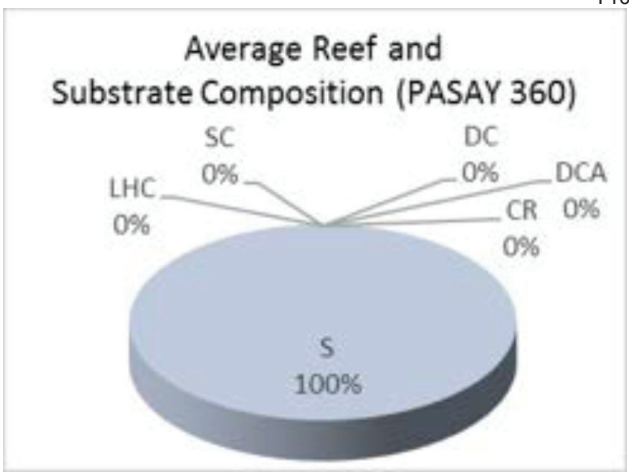


Figure 10. Reef and Substrate Composition for T09-T10



APPENDIX I.
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Project Name:

Project Location:

ECC Reference No.:

Proponent:

Pollution Control Officer:

Tel. No./Fax No./E-mail:

Project Type:

Project Status:

I. PROJECT CONSIDERATIONS

1.1 Size and Type

1.1.1 Size based on number of employees

Specify number of employees:

1.1.2 Type:

ECP (in either ECA or Non-ECA)

Non-ECP but in ECA

Non-ECP and Non-ECA

1.2 Waste Generation and Management

1.2.1 Enumerate Waste Type and Specify Quantity of Wastes generated in your facility. (Identify /Enumerate)

Category	Waste	Type		Quantity
		Hazardous	Non-Hazardous	

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Air	Waste 1			(units: MT/yr)
	Waste 2			
	Waste N			
Liquid				(units: m^3/yr)
Solid				(units: tons/yr)

1.3 Pollution Control System (PCS)

1.3.1 Enumerate PCS or Waste Management Method Used in your facility. (Identify /Enumerate)

Category	PCS/Waste Management Method Used	Remarks
Air	PCS 1	
	PCS 2	

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

	PCS N	
Liquid	Primary	
	Secondary	
	Tertiary	
Solid		

II. PATHWAYS

2.1 Prevailing wind towards barrio or city? (mark the corresponding point) Yes No

2.2 Rainfall (impacts surface & groundwater pathways)

2.2.1 Average annual net rainfall:

Specify amount:

2.2.2 Maximum 24-hour rainfall:

Specify amount:

2.3 Terrain (select one and mark) Flat Steep

2.4 Is the facility located in a flood-prone area? (select one and mark) Yes No

2.5 Ground Water

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Depth of groundwater table (meter) (select one and mark)

0 to less than 3

3 to 10

Greater than 10

III. RECEIVING MEDIA/RECEPTORS

3.1 Air (Distance to nearest community) (select one and mark)

0 to less than 0.5 km

0.5 to 1 km

Greater than 1 km

3.2 Receiving Surface Water Body

3.2.1 Distance to receiving surface water: (select one and mark)

0 to less than 0.5 km

0.5 to 1 km

Greater than 1 km

3.2.2 Size of population using receiving surface water
Specify number:

3.2.3 Fresh Water

3.2.3.1 Classification of fresh water: (select one and mark)

AA

A

B

C

D

3.2.3.2 Size of fresh water body:

Specify size:

3.2.3.3 Economic value of water use (may select more than one of the criteria below)

Drinking

Domestic

Recreational

Fishery

Industrial

Agricultural

3.2.4 Salt water

3.2.4.1 Classification of salt water (select one and mark)

SA

SB

SC

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

SD

3.2.4.2 Economic value of water use (may select more than one of the criteria below)

Fishery

Tourist zone or park

Recreational

Industrial

3.3 Ground Water

3.3.1 Distance to nearest recharge area (select one and mark)

0 to less than 0.5 km

0.5 to 1 km

Greater than 1 km

3.3.2 Distance to nearest well used (select one and mark)

0 to less than 0.5 km

0.5 to 1 km

Greater than 1 km

3.3.3 Groundwater use within the nearest well (may select more than one of the criteria below)

Drinking

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Industrial

Agricultural

3.4 Land

3.4.1 Indicate current/actual land uses within 0.5 km radius: (may select more than one of the criteria below)

Residential

Commercial/Institutional

Industrial

Agricultural/Recreational

Protected Area

3.4.2 Potential/proposed land uses within 0.5 km (may select more than one of the criteria below)

Residential

Commercial/Institutional

Industrial

Agricultural/Recreational

Protected Area

3.4.3 Number of affected Environmentally Critical Areas within 1 km:

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Specify number:

3.4.4 Distance to nearest ECA (select one and mark)

0 to less than 0.5km

0.5 to 1 km

Greater than 1 km

IV. ENVIRONMENTAL PERFORMANCE (FOR EXISTING PROJECTS FOR EXPANSION)

3.5 Compliance (pls. take note that this will be double-checked with PCD files)

Law	Violation (check if any)	Type (pls. specify number of times committed)				Type of Admin Violation	Additional Remarks/Status of Compliance
		STANDARD					
		Emission/Effluent/ Discharge	Ambient	Human Impact	Admin/ ECC		
RA 8749							
RA 9275							
RA 6969							
PD 1586							
RA 9003							

3.6 Number of Valid Complaints

3.6.1 Citizen and NGOs

ANNEX 2-7d
PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Specify number:

3.6.2 Others (other Govt. Agencies, Private Institutions)
Specify number:

(To be filled up by EMB Personnel)

RECOMMENDATION/S:

Assessed By:

Noted By:

ACCOUNTABILITY STATEMENT OF PROJECT PROPONENT

This is to certify that all information in the submitted **Project Environmental Monitoring and Audit Prioritisation Scheme (PEMAPS) Questionnaire** of **Pasay City Government** for the **"reclamation and horizontal land development of three hundred sixty (360) hectares"** or the **"360-hectare Reclamation Project"** (the **"Pasay 360"** Project) located **along the waters of Manila Bay in Barangay 76, Pasay City, Metro Manila, Philippines** is true, accurate and complete. Should I learn of any information, which makes this inaccurate, I shall bring said information to the appropriate Environmental Management Bureau Office.

In witness whereof, I hereby set out my hands this JUL 31 2024 day of 2024 at PASAY CITY.

Atty. Severo C. Madrona Jr.
City Legal Officer
Pasay City Government

SUBSCRIBED AND SWORN TO before me this JUL 31 2024 day of _____ 2024, affiant exhibiting his Driver's License no. N04-92-807[illegible] issued at _____ on _____ Valid until 2032/03/19

Doc No. 462
Page No. 94
Book No. V
Series of 2024

ATTY. RONHEL VINN A. PAPA
Notary Public for Pasay City
Until December 31, 2024
IBP OR No. 324349/ 04-Dec-2023 / Roll No. 73157
PTR OR No. 8457592 1/04/24 / TIN# 743-448-049
MCLE Compliance No. VII-0025922 valid until 14 April 2025

APPENDIX J. HYDRODYNAMIC MODELING STUDY

REPORT

Pasay 360-Hectare Reclamation Project

Hydrodynamic modelling studies

Client:	SM Smart City Infrastructure and Development Corporation
Reference:	SF1013-RHD-XX-XX-RP-X-0001
Status:	Final/C01
Date:	28 May 2024

Royal HaskoningDHV
Enhancing Society Together

Project related

PT. HASKONING INDONESIA

Arkadia Green Park, Tower G 10th floor
Jl. TB Simatupang No 88
Pasar Minggu
South Jakarta 12520
Water & Maritime
Trade register number: 56515154

+62 21 39711320 T
info@id.rhdhv.com E
royalhaskoningdhv.com W

Document title:	Pasay 360-Hectare Reclamation Project
Subtitle:	Hydrodynamic modelling studies
Reference:	SF1013-RHD-XX-XX-RP-X-0001
Status:	C01/Final
Date:	28 May 2024
Project name:	Pasay Harbour City Reclamation
Project number:	SF1013
Author(s):	Andaru Katri Lasrindy, Hidde Vader
Drafted by:	Andaru Katri Lasrindy, Hidde Vader
Checked by:	Olaf Scholl
Date:	28 May 2024
Approved by:	Michiel Smits
Date:	28 May 2024

Classification
Project related

Unless otherwise agreed with the Client, no part of this document may be reproduced or made public or used for any purpose other than that for which the document was produced. PT. Haskoning Indonesia accepts no responsibility or liability whatsoever for this document other than towards the Client.

Please note: this document contains personal data of employees of PT. Haskoning Indonesia. Before publication or any other way of disclosing, this report needs to be anonymized, unless anonymisation of this document is prohibited by legislation.

Project related

Royal HaskoningDHV

Table of Contents

1	**Introduction**	**1**
1.1	Project background	1
1.2	Report objective	1
1.3	Conventions and definitions	1
1.4	Report structure	3
2	**Layout revisions throughout this study and its impact**	**4**
3	**Available data**	**5**
3.1	Bathymetry	6
3.2	Water levels and tidal components	7
3.3	Wind	8
3.4	Currents	9
3.5	Climate change	10
4	**Water level data analysis**	**11**
4.1	Tidal analysis	11
4.1.1	Tidal signal reconstruction	11
4.1.2	Tidal constituents	13
4.1.3	Characteristic tidal levels	13
4.2	Extreme value analysis	14
4.3	Sea level rise projections	15
5	**Analysis of JMA Typhoon data**	**17**
5.1	Methodology	17
5.1.1	Estimating the parameters of the Holland B model	17
5.1.2	Resulting 2D wind and pressure fields	19
5.2	Selection of relevant typhoons	21
6	**Large scale typhoon hydrodynamic and wave modelling**	**23**
6.1	Scenarios	23
6.2	Model set-up	23
6.3	Model calibration	27
6.4	Typhoon surge levels	30
6.5	Typhoon significant wave heights	31
6.5.1	Uncorrected significant wave height	31
6.5.2	Significant wave height corrected for tidal level	32
6.5.3	Significant wave height corrected for tidal level and SLR	34
6.6	Typhoon wave period	35

6.7	Typhoon wave direction	36
6.8	Typhoon current speed	37
7	**Extreme hydraulic conditions**	**39**
7.1	Introduction	39
7.2	Extreme surge values	40
7.3	Extreme wave heights (corrected for tide)	42
7.4	Extreme significant wave height (corrected for tide and SLR)	44
7.5	Extreme current speed	44
7.6	Joint probability of surge and waves	46
7.7	Design water level	49
7.8	Design wave conditions	50
7.8.1	Peak wave conditions	50
7.8.2	Swell wave conditions	56
7.9	Design current speed	57
8	**Comparison design output 2017 vs. 2024**	**60**
8.1	Design water levels	60
8.2	Design wave conditions	61
9	**Wave penetration study**	**63**
9.1	Study approach	63
9.2	North-south channel	63
9.2.1	Spatial grids	63
9.2.2	Initial and boundary conditions	65
9.2.3	Remaining model settings	65
9.2.4	Model results for bed level -6m MSL	66
9.2.5	Model results for bed level -8m MSL	67
9.3	East-west channel	68
10	**Flushing Study**	**75**
10.1	Introduction	75
10.1.1	Objectives	75
10.1.2	Drainage System in Manila Bay	75
10.1.3	Seasons	76
10.2	Model Set-up	77
10.2.1	MIKE21 model	77
10.2.2	Model Settings	79
10.3	Scenarios for Wet and Dry Seasons	80
10.3.1	Design of the new channels	81
10.3.2	Breakwaters and Land Heads	82
10.4	Methodology	84

10.5 Water Exchange Criteria 85
10.6 Results Dry Season 85
10.7 Results Wet Season 94
10.8 Conclusions 99

11 Conclusions and recommendations 100
11.1 Conclusions 100
11.2 Recommendations 101

12 References 102

Table of Tables

Table 3-1: Overview of available data 5
Table 4-1: Amplitudes of the main tidal constituents 13
Table 4-2: Characteristic tidal levels 13
Table 5-1: The 35 selected typhoons and relevant parameters from the JMA database 22
Table 6-1: Numerical settings used in the hydrodynamic module of the MIKE 21 model 24
Table 6-2: Numerical settings used in the spectral wave module of the MIKE 21 model 26
Table 6-3: Corrected surge levels at various output points along PRDP 30
Table 6-4: Maximum spectral significant wave height (uncorrected) at various output points along PRDP 31
Table 6-5: Maximum spectral significant wave height (corrected for tide) at various output points along PRDP 33
Table 6-6: Maximum spectral significant wave height (corrected for tide and SLR) at various output points along PRDP 34
Table 6-7: Mean wave period at various output points along PRDP 35
Table 6-8: Mean wave direction at various output points along PRDP 36
Table 6-9: Maximum current speed at various output points along PRDP 37
Table 7-1: EVA results surge level (corrected) [m] 41
Table 7-2: EVA results wave height (corrected for tide) [m] 43
Table 7-3: EVA results spectral significant wave height (corrected for tide and SLR) [m] 44
Table 7-4: EVA results current speed [m/s] 46
Table 7-5: Uncertainty allowances for the design water level [6, 15] 49
Table 7-6: Derivation of design water level 50
Table 7-7: Approach adopted for the derivation of peak wave conditions for the different stretches of the reclamation project 52
Table 7-8: Peak design wave conditions (2025) for points along the northern boundary 53

Table 7-9: Peak design wave conditions (2025) for points along the western boundary 54
Table 7-10: Peak design wave conditions (2025) for points along the southern boundary 54
Table 7-11: Peak design wave conditions (2075) for points along the northern boundary 55
Table 7-12: Peak design wave conditions (2075) for points along the western boundary 55
Table 7-13: Peak design wave conditions (2075) for points along the southern boundary 55
Table 7-14: Design swell wave conditions 57
Table 7-15: Design current velocity (2025) [m/s] 58
Table 7-16: Design current velocity (2075) [m/s] 58
Table 8-1: Comparison of design water levels (excl. SLR) 2017 vs. 2024 60
Table 8-2: Comparison of design wave heights 2017 vs. 2024 62
Table 8-3: Comparison of mean wave period corresponding to the design wave heights 2017 vs. 2024 62
Table 9-1: Initial and boundary conditions for the SWASH model 65
Table 9-2: Summary of the physical and numerical parameters used in the SWASH simulations 66
Table 9-3: Significant wave heights at output points in the north-south channel for a channel with bed level of -6m MSL 67
Table 9-4: Significant wave heights at output points in the north-south channel for a channel with bed level of -8m MSL 68
Table 9-5: Significant wave heights at output points in the east-west channel based on expert judgement 74
Table 10-1: Discharges for various return periods (in m³/s) 77
Table 10-2: Final model parameters 79
Table 10-3: Model simulations for wet and dry seasons 81
Table 10-4: PIANC and USEPA water exchange criteria 85
Table 10-5: Summary of water exchange criteria for each scenario during the dry season 99
Table 12-1: Corrected surge levels at all output points along PRDP 105
Table 12-2: Maximum spectral significant wave height (uncorrected) at all output points along PRDP 106
Table 12-3: Maximum spectral significant wave height (incl. tide) at all output points along PRDP 107
Table 12-4: Maximum spectral significant wave height (incl. tide and SLR) at all output points along PRDP 108
Table 12-5: Mean wave period at all output points along PRDP 109
Table 12-6: Mean wave direction at all output points along PRDP 110
Table 12-7: Maximum current speed at all output points along PRDP 111
Table 12-8: EVA results surge [m] 116
Table 12-9: EVA results spectral significant wave height (corrected for tide) [m] 121

Table 12-10: EVA results spectral significant wave height (corrected for tide and SLR) [m] 126
Table 12-11: EVA results current speed [m/s] 131

Table of Figures

Figure 1-1: Revised layout as received from Client (left), and revised layout placed on top of current layout (right) 1
Figure 1-2: Example of a wind speed rose 2
Figure 2-1: Original layout at the start of this study used in the typhoon modelling (left), and latest layout adopted for the wave penetration and flushing studies (right) 4
Figure 3-1: Bathymetry within the model domain 6
Figure 3-2: Bathymetry near the project area 7
Figure 3-3: Water level measurement locations 8
Figure 3-4: Five most recent typhoons passing the project site within a radius of 200 km 9
Figure 3-5: Measured flow velocities at the ADCP location for measurement campaign in October – November 2014 9
Figure 3-6: Measured Depth Averaged current speed (left), surface current speed (right) 10
Figure 4-1: Original and reconstructed tidal signal 11
Figure 4-2: Residual tidal signal 11
Figure 4-3: Original and reconstructed tidal signal after adjustments to the original timeseries 12
Figure 4-4: Residual tidal signal after adjustments to the original timeseries 12
Figure 4-5: Linear sea level rise trend at Manila Bay derived using UTide 12
Figure 4-6: Moment ratio diagram of measured water levels (annual maxima) 14
Figure 4-7: Example of a GEV fit with PWM method on measured water levels (annual maxima) 15
Figure 4-8: Projections of the sea level rise in Manila Bay according to IPCC AR6 [4, 5] 16
Figure 4-9: Projection of the vertical land motion (VLM) in Manila Bay according to IPCC AR6 [4, 5] 16
Figure 5-1: Relationship between pressure difference and maximum sustained wind speed 18
Figure 5-2: Velocity profile estimate from values of r50, r30 and $V_G$max 19
Figure 5-3: Wind field at several timesteps for typhoon Angela (1995). Manila is indicated by the white star 20
Figure 5-4: All typhoons that pass Manila Bay (14.6°N, 120.8°E) within a 200 km radius and have sufficient data 21
Figure 6-1: The scenario considered for the derivation of the hydraulic conditions from the historical typhoons 23
Figure 6-2: Computational grid used in the MIKE 21 model 24
Figure 6-3: Average daily wind measurements at Manila station for the two seasons over the period 1960-2012 27

Figure 6-4: Example of the derivation of the storm surge level for the typhoon Nesat (2011) 27
Figure 6-5: Example of the derivation of the storm surge level for the typhoon Melor (2015) 28
Figure 6-6: Comparison of measured storm surge level ($SSLmeas.$) vs. storm surge level ($SSLmodel$) from the MIKE 21 model 28
Figure 6-7: Comparison of measured storm surge level ($SSLmeas.$) vs. corrected storm surge level ($SSLmodel$) from the MIKE 21 model 29
Figure 7-1: Selected output locations for the extreme value analysis 39
Figure 7-2: Moment ratio diagram of (corrected) surge levels at location 8 40
Figure 7-3: Example of a Weibull fit with maximum likelihood method on corrected typhoon surge level data at location 8 41
Figure 7-4: Moment ratio diagram of spectral significant wave height (corrected for tide) at location 8 42
Figure 7-5: GEV distribution for spectral significant wave height (corrected for tide) at location 8 43
Figure 7-6: Moment ratio diagram of current speed at location 8 45
Figure 7-7: Weibull distribution for current speed at location 8 45
Figure 7-8: Time evolution of storm surge and several relevant wave parameters for typhoon Angela (1995) at location 8 47
Figure 7-9: Time evolution of storm surge and several relevant wave parameters for typhoon Nari (2013) at location 8 48
Figure 7-10: Mean wave directions of all simulated typhoons for the points 5 and 27 51
Figure 7-11: Empirical relationships between mean wave period ($T_{m-1,0}$) and significant wave height (H_{m0}) for the northern side (left), western side (middle), and southern side (right) of the reclamation 53
Figure 8-1: Wave output locations from 2017 (purple) and from 2024 (black) 61
Figure 9-1: Model domain for the wave penetration study 64
Figure 9-2: Schematisation of the revetment in SWASH 64
Figure 9-3: Significant wave heights for the north-south channel with bed level of -6m MSL 67
Figure 9-4: Significant wave heights for the north-south channel with bed level of -8m MSL 68
Figure 9-5: Significant wave height in the 180m wide channel for the 1-year return period condition 69
Figure 9-6: Significant wave height in the 180m wide channel for the 25-year return period condition 70
Figure 9-7: Significant wave height in the 180m wide channel for the 100-year return period condition 71
Figure 9-8: Significant wave height in the 180m wide channel for the 1000-year return period condition 72
Figure 9-9: Significant wave height in the 300m wide channel for the 1000-year return period condition 73
Figure 10-1: Drainage system near Project site which are considered into the model 76

Figure 10-2: Average rainfall measurement at MCO Station in 1981-2010 [20] 76
Figure 10-3: Bathymetry of Manila Bay, with a close-up of the Pasay360 location on the right 78
Figure 10-4: MIKE21 Mesh; tidal boundary marked with red line 78
Figure 10-5: Mesh at Project Site surroundings (left) and channels between islands (right) 79
Figure 10-6: Overview scenarios layout for flushing studies and bathymetry at channels of Pasay360 Reclamation 82
Figure 10-7: Location of Pasay de Paliseo Groyne and land heads 83
Figure 10-8: Breakwaters and land heads adjacent to Project Site as weir elements in MIKE21 83
Figure 10-9: Predicted tide for dry (left) and wet (right) simulation 84
Figure 10-10: Initial concentration field (in kg/m^3) for all scenarios 85
Figure 10-11: Sediment concentration distribution (in kg/m^3) in time for scenario A in the dry season 86
Figure 10-12: Sediment concentration distribution (in kg/m^3) in time for scenario B in the dry season 87
Figure 10-13: Sediment concentration distribution (in kg/m^3) in time for scenario F in the dry season 88
Figure 10-14: Sediment concentration distribution (in kg/m^3) in time for scenario G in the dry season 89
Figure 10-15: Sediment concentration distribution (in kg/m^3) in time for scenario H in the dry season 90
Figure 10-16: Current speed at flood and ebb tide during dry season for Scenario A and Scenario B 91
Figure 10-17: Current speed at flood and ebb tide during dry season for Pasay360 Scenario F to Scenario H 92
Figure 10-18: Maximum current speed for each scenario 93
Figure 10-19: Sediment concentration distribution (in kg/m^3) in time for scenario A in the wet season 95
Figure 10-20: Sediment concentration distribution (in kg/m^3) in time for scenario B in the wet season 95
Figure 10-21: Sediment concentration distribution (in kg/m^3) in time for scenario F in the wet season 96
Figure 10-22: Sediment concentration distribution (in kg/m^3) in time for scenario G in the wet season 96
Figure 10-23: Sediment concentration distribution (in kg/m^3) in time for scenario H in the wet season 96
Figure 10-24: Maximum current for dry (left) and wet (right) seasons in Scenario A and B 97
Figure 10-25: Maximum current for dry (left) and wet (right) seasons in Pasay360 Scenario F to Scenario H 98
Figure 12-1: Weibull fit with ML method on corrected typhoon surge level data at location 1 112
Figure 12-2: Weibull fit with ML method on corrected typhoon surge level data at location 2 112

Figure 12-3: Weibull fit with ML method on corrected typhoon surge level data at location 3 112
Figure 12-4: Weibull fit with ML method on corrected typhoon surge level data at location 4 112
Figure 12-5: Weibull fit with ML method on corrected typhoon surge level data at location 5 113
Figure 12-6: Weibull fit with ML method on corrected typhoon surge level data at location 6 113
Figure 12-7: Weibull fit with ML method on corrected typhoon surge level data at location 7 113
Figure 12-8: Weibull fit with ML method on corrected typhoon surge level data at location 8 113
Figure 12-9: Weibull fit with ML method on corrected typhoon surge level data at location 9 113
Figure 12-10: Weibull fit with ML method on corrected typhoon surge level data at location 10 113
Figure 12-11: Weibull fit with ML method on corrected typhoon surge level data at location 11 114
Figure 12-12: Weibull fit with ML method on corrected typhoon surge level data at location 12 114
Figure 12-13: Weibull fit with ML method on corrected typhoon surge level data at location 13 114
Figure 12-14: Weibull fit with ML method on corrected typhoon surge level data at location 14 114
Figure 12-15: Weibull fit with ML method on corrected typhoon surge level data at location 15 114
Figure 12-16: Weibull fit with ML method on corrected typhoon surge level data at location 16 114
Figure 12-17: Weibull fit with ML method on corrected typhoon surge level data at location 17 115
Figure 12-18: Weibull fit with ML method on corrected typhoon surge level data at location 24 115
Figure 12-19: Weibull fit with ML method on corrected typhoon surge level data at location 25 115
Figure 12-20: Weibull fit with ML method on corrected typhoon surge level data at location 26 115
Figure 12-21: Weibull fit with ML method on corrected typhoon surge level data at location 27 115
Figure 12-22: Weibull fit with ML method on corrected typhoon surge level data at location 28 115
Figure 12-23: GEV fit with PWM method on spectral significant wave height corrected for tide at location 1 117
Figure 12-24: GEV fit with PWM method on spectral significant wave height corrected for tide at location 2 117
Figure 12-25: GEV fit with PWM method on spectral significant wave height corrected for tide at location 3 117

Figure 12-26: GEV fit with PWM method on spectral significant wave height corrected for tide at location 4 117
Figure 12-27: GEV fit with PWM method on spectral significant wave height corrected for tide at location 5 118
Figure 12-28: GEV fit with PWM method on spectral significant wave height corrected for tide at location 6 118
Figure 12-29: GEV fit with PWM method on spectral significant wave height corrected for tide at location 7 118
Figure 12-30: GEV fit with PWM method on spectral significant wave height corrected for tide at location 8 118
Figure 12-31: GEV fit with PWM method on spectral significant wave height corrected for tide at location 9 118
Figure 12-32: GEV fit with PWM method on spectral significant wave height corrected for tide at location 10 118
Figure 12-33: GPD fit with MOM method on spectral significant wave height corrected for tide at location 11 119
Figure 12-34: GPD fit with MPS method on spectral significant wave height corrected for tide at location 12 119
Figure 12-35: GPD fit with MPS method on spectral significant wave height corrected for tide at location 13 119
Figure 12-36:GPD fit with MPS method on spectral significant wave height corrected for tide at location 14 119
Figure 12-37: GPD fit with MPS method on spectral significant wave height corrected for tide at location 15 119
Figure 12-38: GPD fit with MPS method on spectral significant wave height corrected for tide at location 16 119
Figure 12-39: GPD fit with MPS method on spectral significant wave height corrected for tide at location 17 120
Figure 12-40:GEV fit with PWM method on spectral significant wave height corrected for tide at location 24 120
Figure 12-41: GEV fit with PWM method on spectral significant wave height corrected for tide at location 25 120
Figure 12-42: GEV fit with PWM method on spectral significant wave height corrected for tide at location 26 120
Figure 12-43: GEV fit with PWM method on spectral significant wave height corrected for tide at location 27 120
Figure 12-44: GEV fit with PWM method on spectral significant wave height corrected for tide at location 28 120
Figure 12-45: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 1 122

Figure 12-46: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 2 122
Figure 12-47: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 3 122
Figure 12-48: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 4 122
Figure 12-49: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 5 123
Figure 12-50: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 6 123
Figure 12-51: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 7 123
Figure 12-52: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 8 123
Figure 12-53: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 9 123
Figure 12-54: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 10 123
Figure 12-55: GPD fit with MOM method on spectral significant wave height corrected for tide and SLR at location 11 124
Figure 12-56: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 12 124
Figure 12-57: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 13 124
Figure 12-58: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 14 124
Figure 12-59: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 15 124
Figure 12-60: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 16 124
Figure 12-61: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 17 125
Figure 12-62: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 24 125
Figure 12-63: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 25 125
Figure 12-64: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 26 125
Figure 12-65: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 27 125

Figure 12-66: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 28 125
Figure 12-67: GEV fit with PWM method on current speed at location 1 127
Figure 12-68: GEV fit with PWM method on current speed at location 2 127
Figure 12-69: GEV fit with PWM method on current speed at location 3 127
Figure 12-70: GEV fit with PWM method on current speed at location 4 127
Figure 12-71: GEV fit with PWM method on current speed at location 5 128
Figure 12-72: GEV fit with PWM method on current speed at location 6 128
Figure 12-73: GEV fit with PWM method on current speed at location 7 128
Figure 12-74: GEV fit with PWM method on current speed at location 8 128
Figure 12-75: GPD fit with MPS method on current speed at location 9 128
Figure 12-76: GPD fit with MPS method on current speed at location 10 128
Figure 12-77: GEV fit with PWM method on current speed at location 11 129
Figure 12-78: GEV fit with PWM method on current speed at location 12 129
Figure 12-79: GEV fit with PWM method on current speed at location 13 129
Figure 12-80: GEV fit with PWM method on current speed at location 14 129
Figure 12-81: GEV fit with PWM method on current speed at location 15 129
Figure 12-82: GEV fit with PWM method on current speed at location 16 129
Figure 12-83: GEV fit with PWM method on current speed at location 17 130
Figure 12-84: GPD fit with MOM method on current speed at location 24 130
Figure 12-85: GPD fit with MOM method on current speed at location 25 130
Figure 12-86: GPD fit with MOM method on current speed at location 26 130
Figure 12-87: GPD fit with MOM method on current speed at location 27 130
Figure 12-88: GPD fit with MOM method on current speed at location 28 130

Royal HaskoningDHV

1 Introduction

1.1 Project background

Royal HaskoningDHV has assisted SM Smart City Infrastructure and Development Corporation in the past in the design of the Pasay Parañaque (PRDP) coastal developments in Manila Bay in the Philippines. The original layout of the development comprised about 396ha divided over 3 islands. However, recent developments have led to a shift of the island boundaries of island A towards Island B, resulting into the combined island referred to as Island A+B, see Figure 1-1.

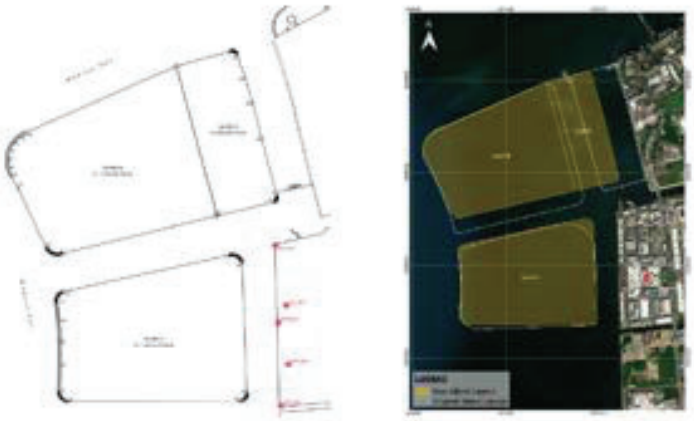


Figure 1-1 Revised layout as received from Client (left), and revised layout placed on top of current layout (right)

Due to the changed layout of PRDP islands, an update of the hydrodynamic modeling is required. In addition, the recent land reclamation development involving the Pasay Harbor City Cooperation (PHCC) necessitates a comprehensive reassessment of the hydraulic and hydrodynamic conditions along the island boundaries as the presence of PHCC is expected to offer a certain level of wave sheltering, potentially leading to a revision of the CHEC design. In the most optimistic scenario, the design adjustments could align it closely with the channel revetments, resulting in cost savings and potentially time savings.

1.2 Report objective

The main objective of this study is to provide an updated analysis of the hydraulic design conditions along the boundaries of the revised layout, as shown in Figure 1 1. This document covers the reanalysis of the modelling efforts necessary to determine the extreme hydraulic design conditions, including water levels, currents, and waves, along the new island boundaries as well as in the channels between the islands. Furthermore, a flushing study is included to re-evaluate the effects of the reclamation project on the coastal environment and water quality in the area.

1.3 Conventions and definitions

Units

All parameters and variables have units according to international SI conventions. All wave and wind directions referred to in this study are given in a nautical convention, which means that for wind and waves

Royal HaskoningDHV

the direction refers to the direction where the wind or waves are coming from and measured positive in degrees from true north. So, waves from a direction of 0°N are coming from the north and waves with direction 270°N are coming from the west.

Interpretation of wind- and wave roses

Wind and wave roses provide a quick way of summarising the directional wind- and wave condition statistics. The number in the centre of the rose represents the percentage of the time that calm conditions occur. The length of an arm of a rose represents the percentage of the time that winds or waves come from the direction sector that the arm points in. The length of each section of the arm represents the percentage of the time that winds or waves come from that direction and belong to a given speed or height class. The speed or height class is indicated by the fill colour of a section of the arm (see e.g. the wind rose and the bar scale in Figure 1-2).

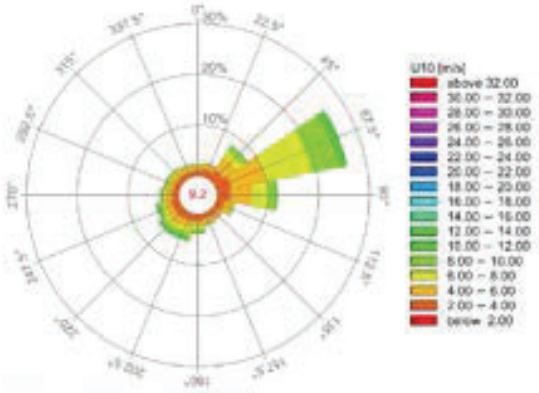


Figure 1-2: Example of a wind speed rose

Interpretation of current roses

Current roses provide a quick way of summarising the directional current condition statistics. The number in the centre of the rose represents the percentage of the time that calm conditions occur. The length of an arm of a rose represents the percentage of the time that currents flow towards the direction sector that the arm points in. The length of each section of the arm represents the percentage of the time that currents flow towards that direction and occur in a given speed class. The speed class is indicated by the fill pattern of a section of the arm.

Current directions

Current directions refer to the direction towards which the current is flowing. Directions of currents are always given as bearings (clockwise with respect to true north). The unit is degrees, where 360 degrees cover the circle. For example: current direction 90° means that the current is flowing towards the east.

Projection

For the modelling studies described in this report, a Transverse Mercator WGS1984 UTM Zone 51N projection is used. Using UTM is common practice for coastal modelling studies since large areas must be covered. The vertical datum is mean sea level (MSL); all modelling results are presented with respect to this datum, unless stated otherwise. Bathymetric data from different sources have been adapted to match the projection and model datum. The UTM 51N projection is given by the following parameters:

Royal HaskoningDHV

WGS_1984_UTM_Zone_51N
WKID: 32651 Authority: EPSG

Projection: Transverse Mercator
False Easting: 500000.0
False Northing: 0.0
Central Meridian: 123.0
Scale Factor: 0.9996
Latitude Of Origin: 0.0
Linear Unit: Meter (1.0)

Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984
Spheroid: WGS_1984
Semi-major Axis: 6378137.0
Semi-minor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

1.4 Report structure

The update of the hydraulic design conditions for the PRDP coastal developments requires several steps to be performed. The structure of this notes follows the logical order in which these activities are carried out, beginning with a brief discussion of the methodology for the numerical modelling of historical typhoons. Subsequently, the results of the typhoon surge and wave modelling exercise to derive extreme water levels, waves, and currents during historical typhoons are presented. These results are then used in an extreme value analysis (EVA) to derive the design water levels and wave parameters. As a last step, a comparison with the results from the modelling studies for the original layout is made to assess the impact of the recent developments in Manila Bay and the new island layout on the revetment design. In short, the structure of the report is as follows:

- Chapter 2: clarification of the layout revisions during this study
- Chapter 3: an overview of the available data.
- Chapter 0: water level data and sea level rise scenarios.
- Chapter 5: analysis of the most recent typhoon data from the Japan Meteorological Agency (JMA).
- Chapter 6: typhoon surge and wave modelling study to derive extreme water levels, waves, and currents during historical typhoons.
- Chapter 7: design water levels and wave parameters.
- Chapter 8: comparison with the results of the earlier study for the PRDP coastal developments conducted in 2017.
- Chapter 9: wave penetration study to model the wave propagation in the channels between the islands and to estimate the wave conditions for the more sheltered zones of the reclamation.
- Chapter 10: flushing study assessment with respect to the water quality impacts.
- Chapter 11: conclusion

Royal HaskoningDHV

2 Layout revisions throughout this study and its impact

Over the course of this study, the reclamation project underwent several layout revisions. Most of these changes focused on adjusting the dimensions of the channels between the islands. The initial layout for this study, depicted in Figure 2-1, featured north-south and east-west channels with a width of 300 meters and a bed level of -6 meters MSL. In the latest design, the north-south channel widened to 470 meters while maintaining a bed level of -6 meters MSL, with an option to deepen to -8 meters MSL. Meanwhile, the west-east channel retained its -6 meters MSL bed level but narrowed to 180 meters.

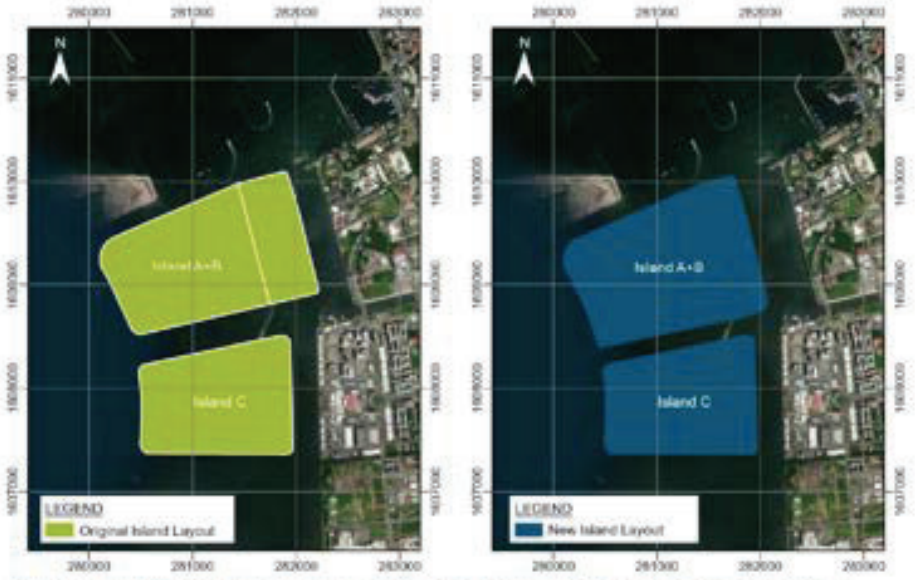


Figure 2-1: Original layout at the start of this study used in the typhoon modelling (left), and latest layout adopted for the wave penetration and flushing studies (right)

As such, the wave penetration modelling, required to assess the wave conditions in the channels, and the flushing study, essential for evaluating the water quality in the channels, had to be updated several times to align with the latest layout. The typhoon modelling study, however, remains unaffected, focusing solely on the outer boundaries of the reclamation, which remained unchanged. Consequently, there is no need to update the typhoon modelling results, and the figures in that section of the report still show the original layout established at the beginning of the study. The wave penetration and flushing studies, on the other hand, reflect the final layout of the reclamation project.

Royal HaskoningDHV

3 Available data

Data on the bathymetry, water levels, wind and wave conditions, etc. are required for the hydraulic modelling studies. The data were gathered from several sources of which an overview is given in Table 3-1.

Table 3-1: Overview of available data

Parameter	Source	Location	Time span
Bathymetry			
Bathymetric data survey	Aggregated RHDHV owned data	Manila Bay	-
Bathymetric data survey	EGS Asia Inc. (contracted by SMPHI) [1]	Bathymetry survey data at the project site	2016
C-Map	Jeppesen/DHI	Deep water bathymetry	-
Water levels			
Water level measurements at Manila Port	NAMRIA [2]	Water level recordings, hourly	1985-2021
Water level measurements at Manila Port	University of Hawaii Sea Level Centre [3]	Water level recordings, hourly	1984-2015
ADCP data	EGS Asia Inc. (contracted by SMPHI) [1]	Latitude: 14° 32' 50.136" N Longitude: 120° 58' 21.534" E Depth 13.8m	18-10-2014 till 21-11-2014
Tidal components			
International Hydrographic Organization station	International Hydrographic Organization	Corregidor Island	n/a
TPXO	Oregon State University	Entrance of Manila Bay	n/a
Wind			
Average daily wind Manila Bay	PAGASA (Philippine Meteorological Agency)	Station NAIA, Pasay City	1985-2019
JMA typhoon database	Japanese Meteorological Agency	East Asia	1951-2022
Currents			
ADCP data	EGS Asia Inc. (contracted by SMPHI) [1]	Latitude: 14° 32' 50.136" N Longitude: 120° 58' 21.534" E Depth 13.8m	18-10-2014 till 21-11-2014
Climate change			
IPCC global sea level projection	IPCC, AR6 2021 [4]	Global	-
IPCC regional/local sea level projection	NASA [5]	Manila Bay	-

Royal HaskoningDHV

3.1 Bathymetry

The bathymetry was constructed from a combination of various data sources. The offshore data was mostly retrieved from the MIKE C-map database that contains digital nautical charts from Jeppesen Norway. The data resolution varies from several hundred metres in deep waters to less than 10 metres in the project area. The bathymetry near the project area was further updated using bathymetric data obtained from bathymetric surveys.

The bathymetry used in the hydraulic studies spans from roughly 105° E to 130° E longitude and ranges from about 8° N to 26° N latitude. This large extent is used to properly model the storm trajectories and effects of the historical typhoons. Even storms that pass the project area at 100 km distance, may still impact the hydraulic conditions at the project site. Figure 3-1 shows that there is a large variation in water depth across the domain. The maximum water depth is about 3000 to 4000 m southwest of the Philippines, whereas northeast of the Philippines, the seabed can be found at depths greater than 7000 m MSL. In Manila Bay, however, the maximum water depth is about 50 m. And near the project area maximum water depth is even less, as Figure 3-2 shows.

As discussed in Section 1.1, the presence of the islands of the land reclamation project by PHCC (PHCC Island A and Island B) provides a certain degree of sheltering to the land reclamations of Pasay. Therefore, these islands, which are currently under construction, are included in the model bathymetry, as depicted in Figure 3-2.

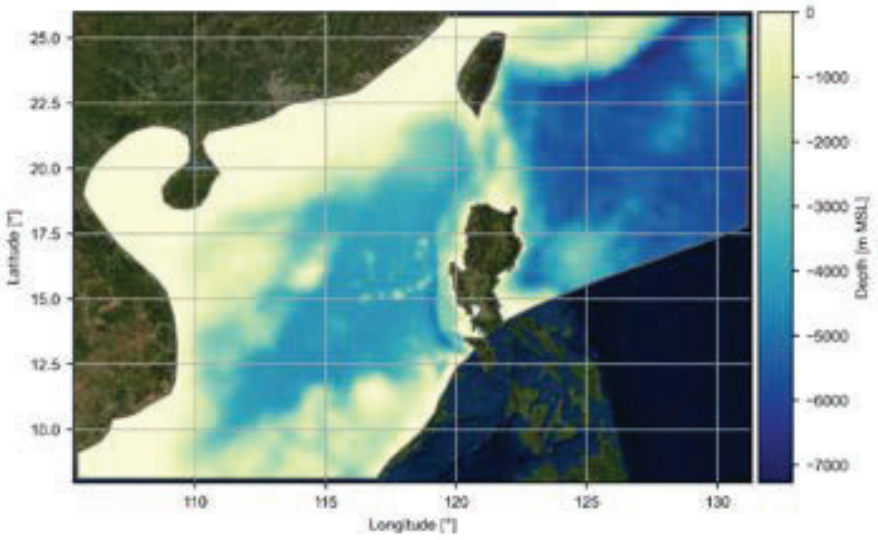


Figure 3-1: Bathymetry within the model domain

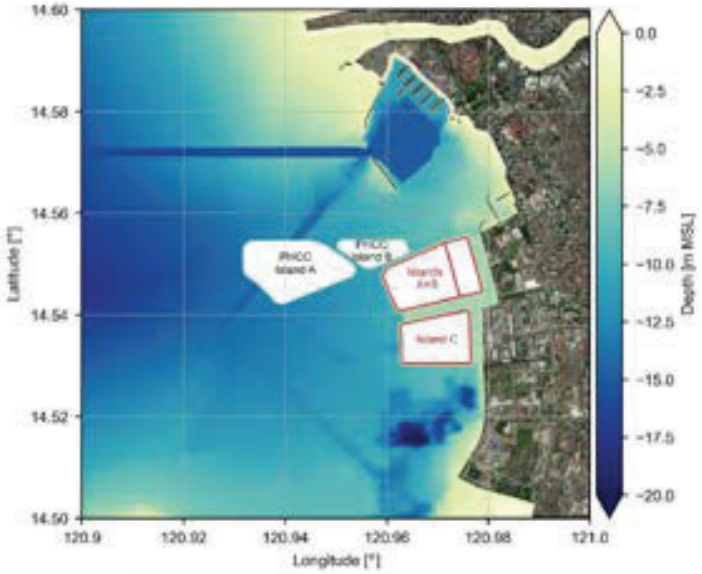


Figure 3-2: Bathymetry near the project area

3.2 Water levels and tidal components

Water level measurements are available for two locations in Manila Bay (Figure 3-3). The first location is the Manila Port measurement station at 281088.86 m E, 1613403.79 m N (14.585°N, 120.968°E). Two water level measurement datasets are available for this station: (1) hourly data from the National Mapping and Resource Information Authority (NAMRIA) covering a period of 36 years (1985-2020), and (2) hourly data from the University of Hawaii Sea Level Centre (UHSLC) for the period 1984-2020. Next to the data from this station, an acoustic Doppler current profiler (ADCP) was deployed at 281566.55 m E, 1609218.66 m N (14° 32' 50.136"N, 120° 58' 21.534"E). The ADCP recorded water levels and currents at a 20-minute interval between18-Oct-2014 and 21-Nov-2014.

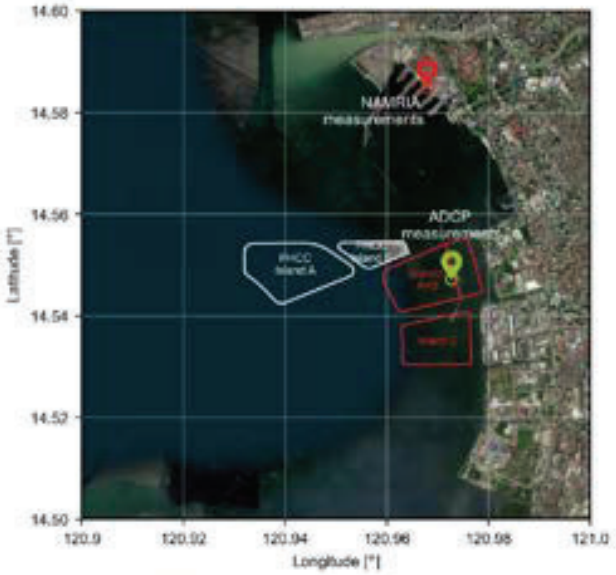


Figure 3-3: Water level measurement locations

Tidal components can be derived from the long-term water level measurements at Manila Port. The dataset of NAMRIA seems to be the most convenient dataset for this exercise as the dataset does not contain any unusual features. The measurements from UHSLC, on the other hand, include an unknown jump in the dataset around September 2017. This jump can be corrected for based on visual inspection, but this not the ideal situation as the cause of the jump remains unknown. Still, the measurements from UHSLC could be used as validation of the analysis. In addition, tidal components can also be obtained from the nearest International Hydrographic Organization (IHO) station at Corregidor Island (602308 m E, 3036714 m N, about 40 km southwest of the project area) or the TPXO model and DHI Global Model that provide the tidal constituents at the entrance of Manila Bay.

3.3 Wind

The storm data required to model the hydraulic conditions during historical typhoons was obtained from a Japan Meteorological Agency (JMA) database. The Regional Specialized Meteorological Centre (RSMC) Tokyo-Typhoon Center provides Best Track Data about typhoons in the West Pacific **from 1951 to 2022**. The database includes 6-hour time interval data of variables such as storm track, central pressure, maximum sustained wind speed, and radii of 50kt and 30kt wind speeds of the storm. However, data prior to 1977 only comprises storm track and central pressure data. As an example, the storm track of the five most recent storms that pass the project site within a radius of 200 km are depicted in Figure 3-4.

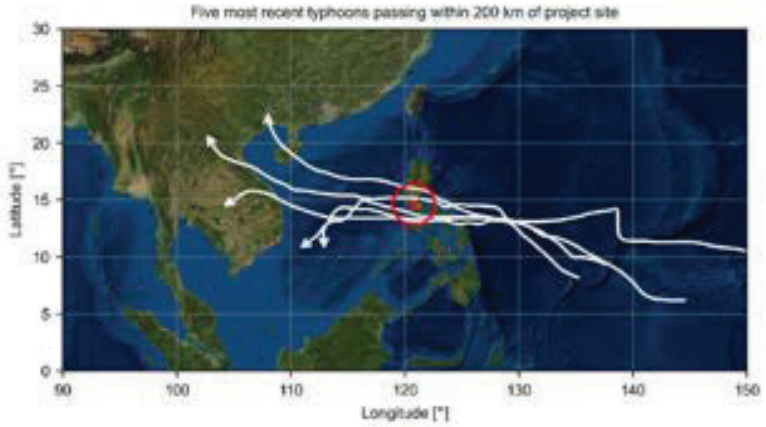


Figure 3-4: Five most recent typhoons passing the project site within a radius of 200 km

3.4 Currents

Current measurements were gathered in a met-ocean survey that was conducted between 18 October 2014 and 21 November 2014. An Acoustic Doppler Current Profiler (ADCP) was used to collect 20-minute interval data on water levels, current speeds, and directions. The ADCP was deployed within Project Site (see Figure 3-3). The depth at the measurement location was around -13.8mMSL.

The ADCP data suggest that the depth-averaged current speed is generally low. The maximum measured flow velocity is about 0.09 m/s with an average velocity of 0.03 m/s (Figure 3-5). The flow direction varies, with a mean direction towards the northeast (Figure 3-6). The highest flows that are measured appear to be the result of short term forcings, as the hourly averaged flow speed has a maximum of about 0.06 m/s (Figure 3-5).

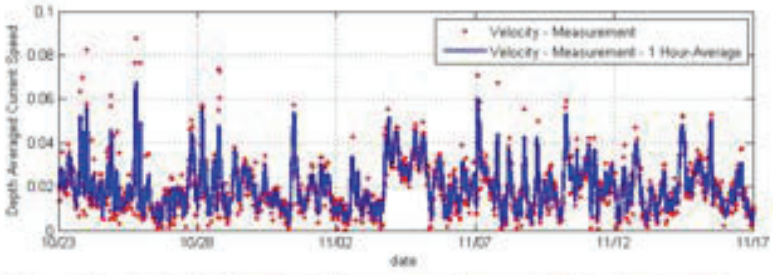


Figure 3-5: Measured flow velocities at the ADCP location for measurement campaign in October – November 2014

The wind during the measurement period was primarily coming from the northeast as it is in the Northeast (Amihan) monsoon or the dry season. Remarkably the current direction is directed towards the wind direction. The survey however shows that at the surface the currents can be higher (up to 0.3 m/s), this can be seen also in Figure 3-6. The direction of the currents in the top layer is mainly to the north and to the south. This direction does not always match the depth average flow direction.

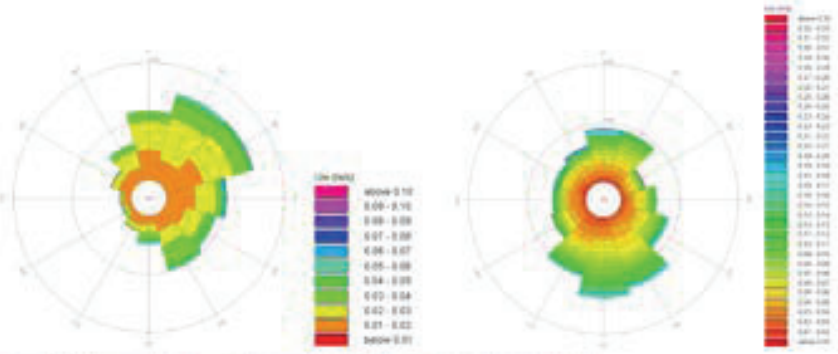


Figure 3-6: Measured Depth Averaged current speed (left), surface current speed (right)

This current measurement data has been used for calibration of hydrodynamic flow modelling in 2017 [6].

3.5 Climate change

In August 2021, the IPCC published their sixth assessment report (AR6) with new projections of global sea level rise [4]. AR6 does not only provide new sea level rise projections, but also a new set of pathways underlying these sea level rise projections. In previous reports, the IPCC presented the potential impacts of climate change for Representative Concentration Pathways (RCPs), which are possible scenarios of greenhouse gas (GHG) emissions and atmospheric concentrations, air pollutant emissions, and land use/cover for the 21st century [7, 8]. The latest report (AR6) makes use of Shared Socioeconomic Pathways (SSPs) in which alternative futures of socio-economic developments are described. These SSPs are combined with RCPs to develop future emission scenarios. For reference to earlier studies, the sea level rise projections for the SSP-RCPs, further referred to as SSPs, of AR6 that are labelled by the same radiative forcing for the year 2100 as the RCPs of AR5 were adopted, i.e. SSP2-4.5 where RCP4.5 would have been used in the past. Note that the SSPs and RCPs are not directly comparable as, for example, the trajectories of greenhouse gas emissions or concentrations differ.

Regional sea level rise projections based on AR6 were obtained using the NASA Sea Level Projection Tool [5]. This webtool offers global projections, regional projections on a regular global grid, and local projections at individual tide gauge locations. These projections are provided for all SSPs of AR6 for the period 2020 to 2150. The projections for Manila Bay are discussed in Chapter 0.

Royal HaskoningDHV

4 Water level data analysis

This chapter presents an analysis of the available water level data. Water level measurements are used to perform a tidal analysis and estimate the storm surge elevations during historical typhoons. The results of these analyses provide valuable input for the calibration of the hydraulic model used in later stages of this study. Furthermore, sea level rise projections for Manila Bay are discussed since sea level rise will have to be accounted for in the design of the land reclamation.

4.1 Tidal analysis

4.1.1 Tidal signal reconstruction

The water level measurements provided by NAMRIA were used for the reconstruction of the tidal signal. Using the Python-based adaptation of UTide (Unified Tidal Analysis and Prediction Functions [9]), the tidal signal was reconstructed to obtain the astronomical tide excluding storm surges. By subtracting this reconstructed signal from the original timeseries, the residual signal was obtained from which storm surge elevations can be estimated.

An initial analysis of the original timeseries with UTide shows that the residual signal varies substantially at the beginning and end of data gaps in the original timeseries (Figure 4-1 and Figure 4-2). These variations in the signal are likely caused by the neighbouring data gaps rather than storm surges. Therefore, the original timeseries was slightly modified for the period around data gaps where the residual signal shows implausible results.

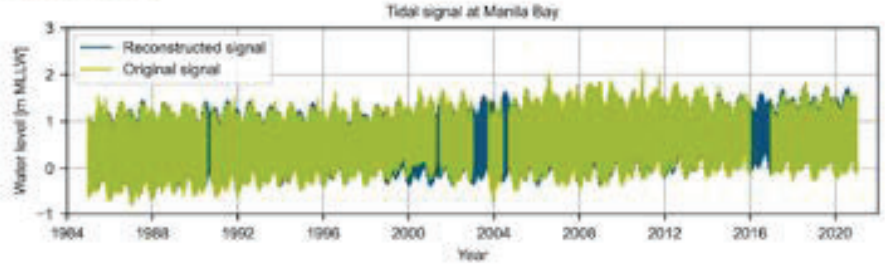


Figure 4-1: Original and reconstructed tidal signal

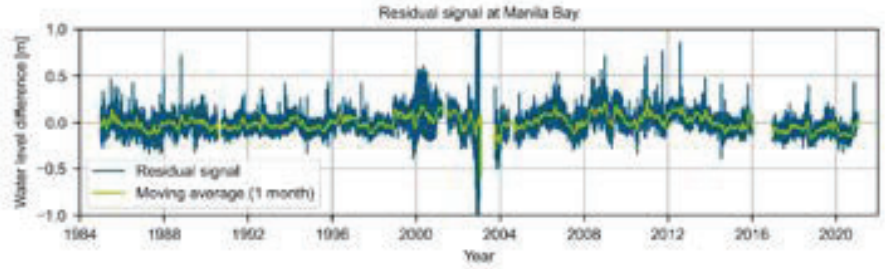


Figure 4-2: Residual tidal signal

Royal HaskoningDHV

The adjusted tidal signal and corresponding reconstructed signal are shown in Figure 4-3. Removing the data between 01-11-1999 and 29-06-2001 and between 01-11-2002 and 01-01-2004 results in a more robust residual signal (Figure 4-4) that is in line with what would be expected. The adjustments to the timeseries have little consequences for the analysis of the historical typhoons since none of the considered typhoons occurred during the time intervals for which the water level data was removed.

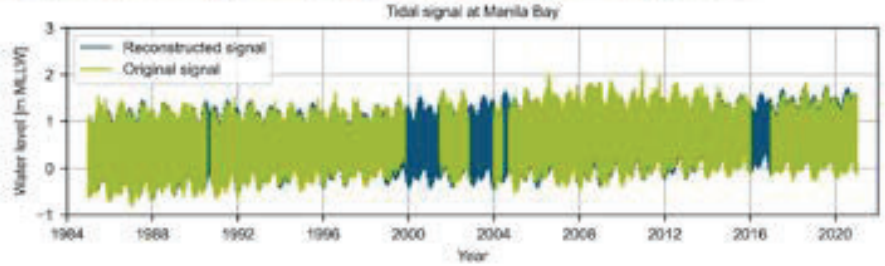


Figure 4-3: Original and reconstructed tidal signal after adjustments to the original timeseries

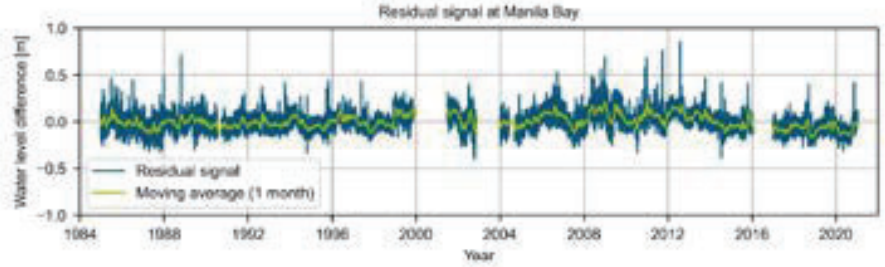


Figure 4-4: Residual tidal signal after adjustments to the original timeseries

UTide also provides a long-term trend of relative sea level rise. The long-term trend of sea level rise derived by UTide is depicted in Figure 4-5. The figure shows that the sea level has risen by about 45 cm over a period of 36 years, which amounts to a linear trend of roughly 12.5 mm / year.

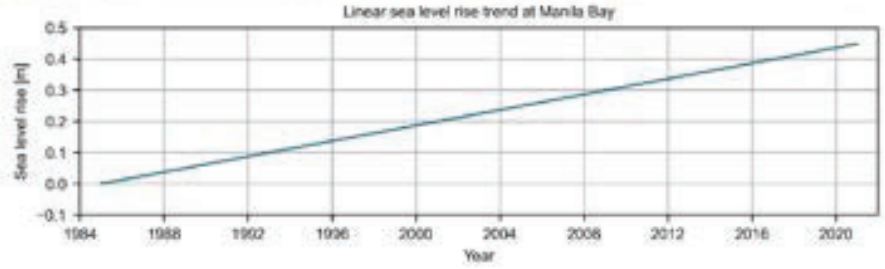


Figure 4-5: Linear sea level rise trend at Manila Bay derived using UTide

Royal HaskoningDHV

4.1.2 Tidal constituents

By means of a tidal harmonic analysis, the harmonic constituents of the tidal motion can be derived. The harmonic analysis was carried out for the water level measurements from NAMRIA using UTide. The calculated amplitudes of the main tidal components are listed in Table 4-1. The results of the analysis using the UHSLC measurements are also shown in the table for validation purposes. Table 4-1 shows that the amplitudes of the tidal constituents determined from the two measurement datasets are virtually identical, which suggests that the analysis of the tidal constituents is reliable.

Table 4-1: Amplitudes of the main tidal constituents

Tidal constituent		Amplitude NAMRIA [m]	Amplitude UHSLC [m]
K1	Lunar diurnal	0.30	0.30
O1	Lunar diurnal	0.28	0.28
M2	Principal lunar semidiurnal	0.19	0.19
SA	Solar annual	0.13	0.13
P1	Solar diurnal	0.10	0.09
S2	Principal solar semidiurnal	0.07	0.07
Q1	Larger lunar elliptic diurnal	0.05	0.05
N2	Larger lunar elliptic semidiurnal	0.04	0.04
K2	Lunisolar semidiurnal	0.02	0.02
MO1	Diurnal	0.02	0.02
SSA	Solar semi-annual	0.01	0.01

4.1.3 Characteristic tidal levels

Based on the reconstructed tidal signal, which includes storm surges, the characteristic tidal levels can be estimated. The characteristic tidal levels were calculated from the reconstructed signal after removing the linear trend of sea level rise. The resulting tidal levels based on the NAMRIA measurements and the measurements from UHSLC are presented in Table 4-2. The characteristic levels based on the NAMRIA dataset and UHSLC dataset are almost identical. The difference between the characteristic tidal levels is at most 2 cm. The NAMRIA dataset is used for the calibration of the model and the design conditions.

Table 4-2: Characteristic tidal levels

Characteristic level		NAMRIA [m]	UHSLC [m]
HAT	Highest Astronomical Tide	+1.12	+1.10
MHWS	Mean High Water Spring	+0.72	+0.72
MHHW	Mean Highest High Water	+0.51	+0.50
MHW	Mean High Water	+0.37	+0.37
MHWN	Mean High Water Neap	+0.25	+0.25
MSL	Mean Sea Level	0.00	0.00
MLW	Mean Low Water	-0.24	-0.24
MLWN	Mean Lowest Water Neap	-0.36	-0.36
MLLW	Mean Lowest Low Water	-0.46	-0.45
MLWS	Mean Lowest Water Spring	-0.66	-0.65
LAT	Lowest Astronomical Tide	-1.04	-1.01

Royal HaskoningDHV

4.2 Extreme value analysis

In the initial study conducted in 2017 [6], an extreme value analysis (EVA) was conducted using annual maxima of recorded water levels to serve as input for the derivation of the design water level. This analysis has been updated with the water level measurements from recent years (2016-2021).

The moment ratio diagram, depicted in Figure 4-6, presents insights into potential distributions. Skewness (third normalized moment) is graphed against kurtosis (fourth normalized moment). The data point (highlighted as a red square) closely aligns with either a lognormal or Generalized Extreme Value distribution (GEV), suggesting that one of these distributions would be suitable in this case. In addition, a GEV distribution is recommended for an annual maxima method (JCOMM Technical Report No. 58, 2011).

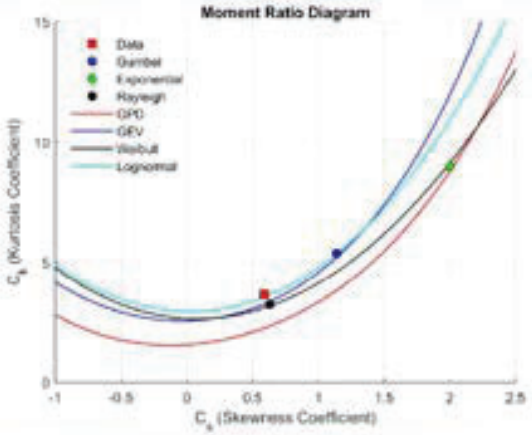


Figure 4-6. Moment ratio diagram of measured water levels (annual maxima)

Following an evaluation of goodness of fit and residual quantiles, the GEV distribution with the Probability Weighted Moments method (PWM) was chosen for estimating water levels associated with different return periods. The results from this EVA indicate that the estimated water level for a 100-year return period is approximately 1.55 m, while the water level for a 1000-year return period is around 1.74 m, see Figure 4-7. These values will be used in the derivation of the final design water levels, as discussed in Section 7.7.

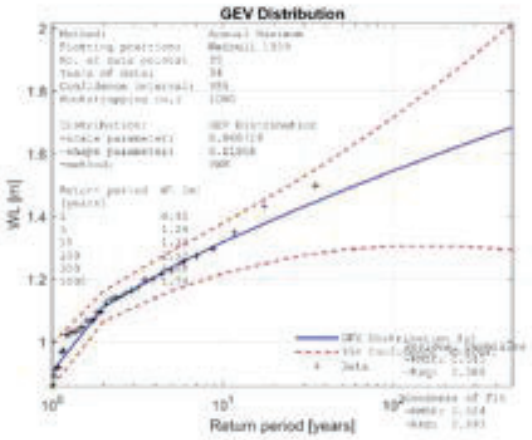


Figure 4-7: Example of a GEV fit with PWM method on measured water levels (annual maxima)

4.3 Sea level rise projections

The NASA Sea Level Projection Tool [5] was used to retrieve sea level rise projections for Manila Bay. The median and likely ranges (66% probability or more) of the mean sea level rise projections for Manila Bay are shown in Figure 4-8. From the figure, one can see that there is little difference in the projections for 2050 under both scenarios. The median values as well as the likely ranges are very similar. During the second half of the 21st century, the projections start to diverge. Under the SSP5-8.5 scenario, the sea level will have risen by 1.33 m (median value) in 2100 compared to the reference year 2005. In the SSP2-4.5 scenario, a sea level rise of 1.12 m is projected for 2100.

Comparison of the projections of AR6 of the IPCC with earlier projections in AR5 shows that there are substantial differences between the projections for the similar emission scenarios. In the new projections, the sea level rise in 2100 can be twice as high for a similar scenario. These large differences are most likely due to the inclusion of vertical land motion (VLM) in the new projections of regional sea level rise. In previous projections, only the glacio-isostatic adjustment (GIA) was included. The new projections, on the other hand, also include vertical land motion estimated by extrapolating the long-term background rate of change at tide gauges [4]. For some locations, this component is relatively small and the differences between the earlier and new projections are less evident. However, for Manila Bay the relative contribution of VLM to the total value of sea level rise can be in the order of 50% depending on the emission scenario. The projection of the VLM contribution to the total SLR is depicted in Figure 4-9 to illustrate the impact of the new approach by the IPCC for the new SLR projections.

For the land reclamation project Pasay 360, a projected sea level rise of 0.70 m will be accounted for. This value is based on the anticipated end of design life in 2075 and the upper bound of the likely range under the "middle of the road" scenario (SSP2-4.5) in which carbon emission remain at the present levels and start to decline mid-century. Note that this value refers to the relative sea level, i.e., including VLM. Figure 4-9 shows that the VLM amounts to about 28 cm over the period 2025-2075. So, in case absolute sea level rise is requested, a similar amount should be deducted from the adopted 70 cm. Note that these sea level rise values differ from Figure 4-5, because of different reference years (2005 and 1984, respectively).

Project related

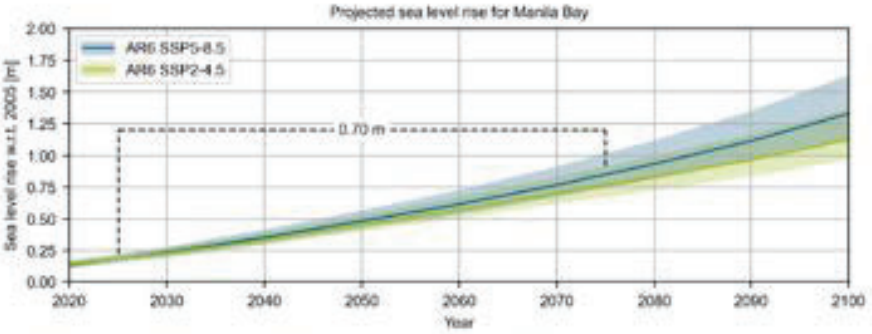


Figure 4-8: Projections of the sea level rise in Manila Bay according to IPCC AR6 [4, 5]

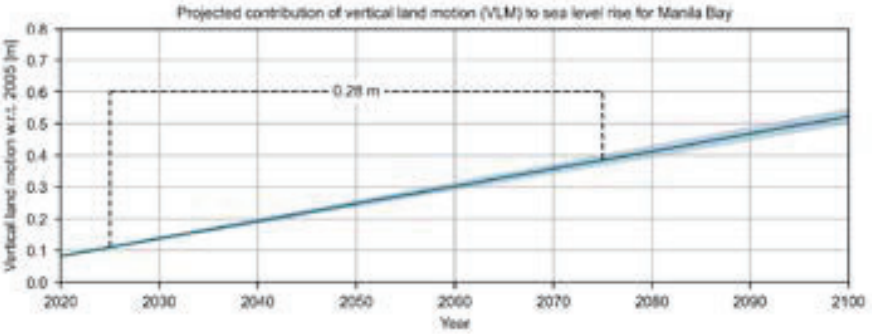


Figure 4-9: Projection of the vertical land motion (VLM) in Manila Bay according to IPCC AR6 [4, 5]

Royal HaskoningDHV

5 Analysis of JMA Typhoon data

This chapter describes the typhoon data from the Japan Meteorological Agency (JMA). The typhoon data is analysed to derive time-dependent, two-dimensional pressure and wind fields of historical typhoons, and to select relevant typhoons for the project location. First, the methodology to derive these two-dimensional pressure and wind fields is discussed. Then, historical typhoons with a substantial impact on the hydraulic conditions near the project site are selected. The two-dimensional pressure and wind fields of these typhoons serve as input for the numerical modelling of surge levels and waves in Chapter 6.

5.1 Methodology

5.1.1 Estimating the parameters of the Holland B model

Using a Holland B model, 2D pressure and wind fields were created based on the information on typhoons from the JMA database. This approach is commonly adopted in typhoon/hurricane modelling. Holland [10] showed that the gradient balance velocity V_G (m/s) for a stationary storm can be defined as [11]:

$$V_G = \sqrt{\left(\left(\frac{RMW}{r}\right)^B \frac{B\Delta p \exp\left[-\left(\frac{RMW}{r}\right)^B\right]}{\rho} + \frac{r^2 f^2}{4}\right)} - \frac{fr}{2} \qquad \text{Eq. (4-1)}$$

where ρ is the density of air (kg/m^3), f the Coriolis parameter (rad/s), RMW the radius to maximum wind speed (m), r the radius (m), Δp the pressure difference between the environmental pressure P_n and the minimum central pressure P_c (Pa), and B Holland's pressure profile parameter.

Note that the wind speed V_G in Equation (4-1) is designed as the gradient wind speed. The wind speed included in the JMA database is the 10-min averaged wind speed at 10 m height. According to the Shore Protection Manual (SPM), this wind speed can be converted to the gradient wind speed by multiplying with 1/0.88 (conversion from 10-minute to 1-minute average) and 1/0.865 (conversion from 10 m height to gradient wind speed) [12].

The parameters B and RMW can be estimated from the maximum sustained wind speed, and radii of 50kt and 30kt wind speeds in the JMA database. The procedure to derive these parameters is as follows:

1. Determine the maximum wind speed, either directly from the JMA data or based on an established relation in pressure difference, see Equation (4-2).
2. Determine the Holland B parameter from the relationship between the parameter B and the maximum gradient wind speed $V_{G;max}$.
3. Determine the parameter RMW by optimising the velocity profile based on the data points include in the JMA data.

The relationship between maximum gradient wind speed $V_{G;max}$ and B is given by:

$$V_{G;max} \approx \sqrt{\frac{B\Delta p}{e\rho}} \qquad \text{Eq. (4-2)}$$

Equation (4-2) shows that the maximum wind speed is proportional to the pressure difference. Using this relationship, a function was fitted to the storm data in the JMA database to obtain an estimate of the maximum wind speed of storms for which the maximum sustained wind speed is not included in the JMA database. The fitted function is shown in Figure 5-1.

Project related

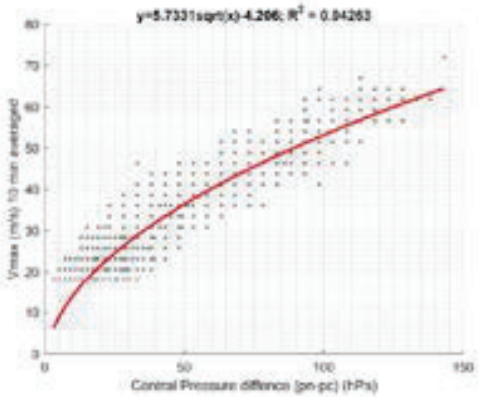


Figure 5-1: Relationship between pressure difference and maximum sustained wind speed

In the process of deriving the Holland B parameter, a correction factor c was introduced to account for the influence of the Coriolis force. This factor c is given by:

$$c = \left(\frac{r_{50}f}{2V_{G\,max}}\right)\ln\left(\frac{V_{G\,50}}{V_{G\,max}}+1\right) \qquad \text{Eq. (4-3)}$$

where c is the correction factor, r_{50} the 50kt wind speed radius, $V_{G\,max}$ maximum gradient wind speed, and $V_{G\,50}$ the 50kt gradient wind speed. The 30kt wind speed radius r_{30} and 30kt gradient wind speed $V_{G\,30}$ are used instead of r_{50} and $V_{G\,50}$ when only the 30kt wind speed radius is included in the JMA database.

Step 3 of the procedure comprises the estimation of parameter RMW by fitting a velocity profile to the 30kt, 50kt, and maximum wind speed radii given in the JMA database. In case only the 30kt wind speed radius r_{30} or only the 50kt wind speed radius r_{50} is given, the radius to the maximum sustained wind speed RMW can be estimated by numerically solving Equation (4-1) and Equation (4-2) with r_{30} (or r_{50}) as input. Storms in the JMA database for which only storm track information and no information on neither the 30kt nor the 50kt wind speed radius were ignored in the parameter estimation.

Following the steps described above, the radius to maximum wind speed RMW and the Holland B parameter were estimated for each storm in the JMA database. Figure 5-2 illustrates an example of the velocity profile that was obtained from the parameter estimation. The figure shows that the wind profile from the Holland-B model matches the wind speed values from the JMA database (i.e. maximum wind speed, and the velocity at 30 and 50 nautical miles from the typhoon centre) well.

Project related

Royal HaskoningDHV

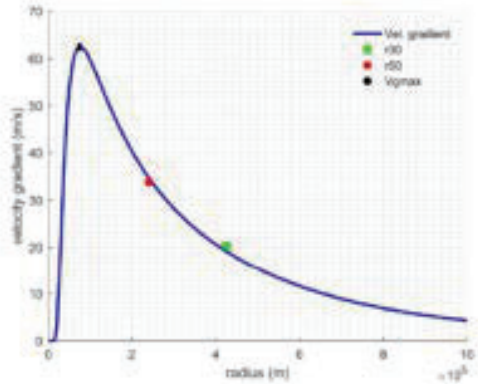


Figure 5-2: Velocity profile estimate from values of r50, r30 and Vgmax

5.1.2 Resulting 2D wind and pressure fields

Based on the derived values for the Holland *B* parameter and radius to maximum wind speed *RMW* and other parameters in the JMA database, 2D dynamic wind and pressure fields were generated for each typhoon using the Cyclone Wind Generation tool by DHI[1]. As an example, dynamic wind field for several timesteps for typhoon Angela (1995) is shown in Figure 5-3.

[1] http://www.dhigroup.com/

Project related

Royal HaskoningDHV

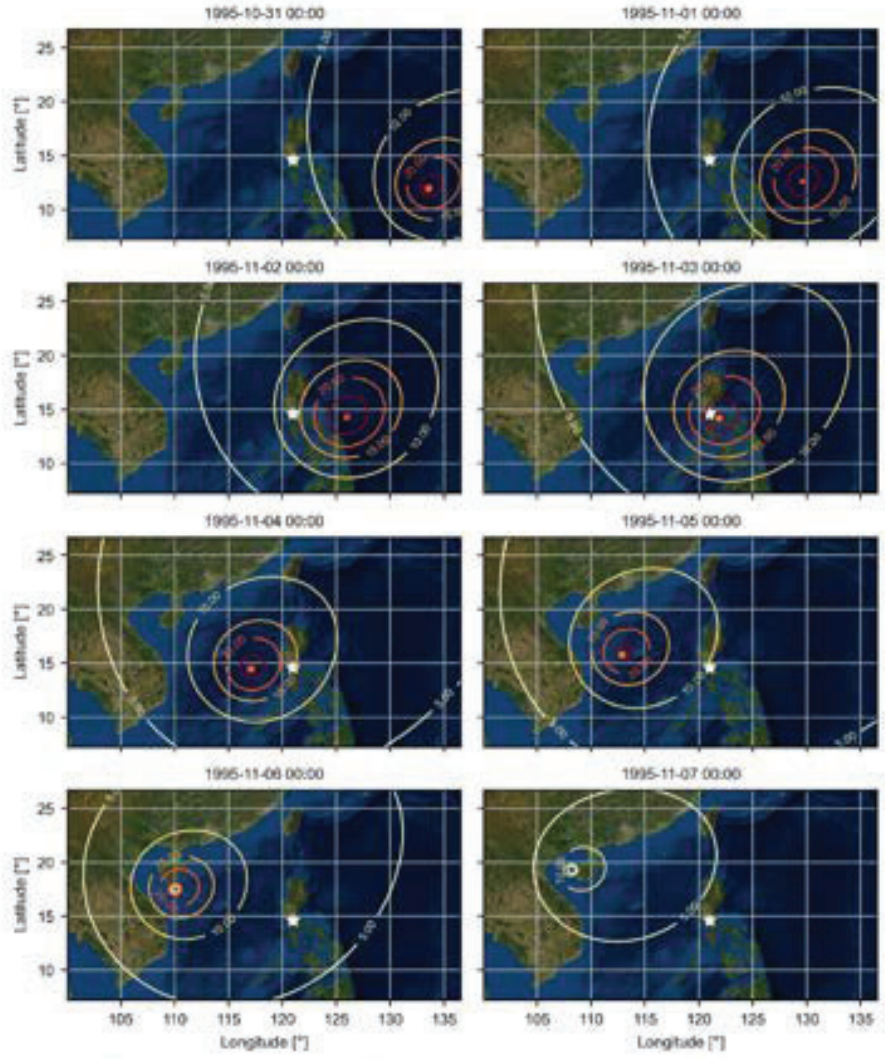


Figure 5-3: Wind field at several timesteps for typhoon Angela (1995). Manila is indicated by the white star

Royal HaskoningDHV

5.2 Selection of relevant typhoons

The radius of maximum wind speed *RMW* typically varies between 50 and 100 km for the typhoons in the JMA database. This means that maximum wind speeds will occur in Manila Bay when the passing distance of a typhoon is equal to or smaller than the radius of maximum wind speed of the respective typhoon. Therefore, all typhoons within a 200 km radius of Manila Bay and with sufficient data selected for the modelling exercise, see Figure 5-4. Typhoons with sufficient data are typhoons for which at least the 30kt or 50kt wind speed radius is included in the typhoon data record. This means that all typhoons that occurred before 1977 can be omitted in advance.

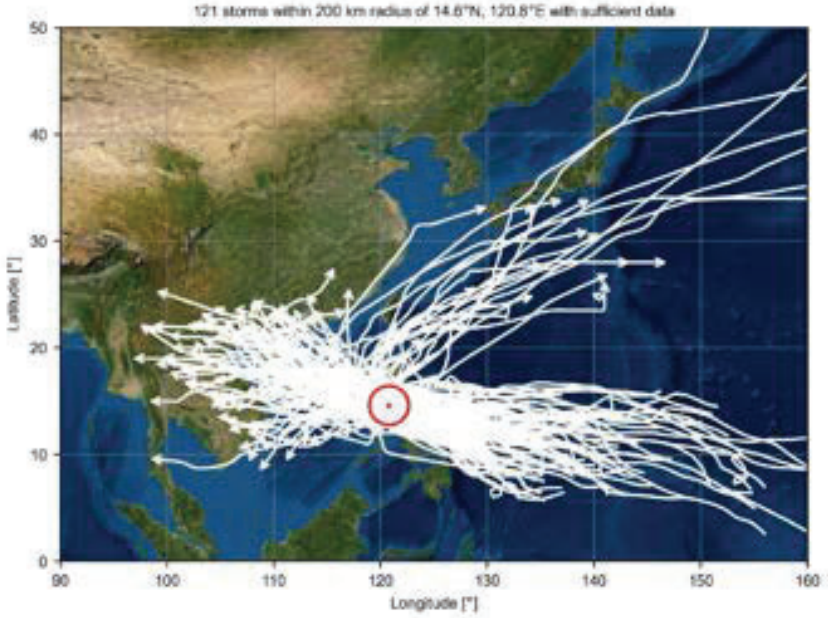


Figure 5-4: All typhoons that pass Manila Bay (14.6°N, 120.8°E) within a 200 km radius and have sufficient data

Out of the 121 typhoons that pass Manila Bay (14.6°N, 120.8°E) within a 200 km radius and have sufficient data, the 35 most severe storms minimum pressure and passing distance within the 200km radius were selected for the typhoon modelling exercise described in the next chapter. These 35 storms together with several key parameters are listed in Table 5-1.

Project related

Royal HaskoningDHV

Table 5-1: The 35 selected typhoons and relevant parameters from the JMA database

	Storm name	Year	Passing distance (km)	Max. wind speed (m/s)	Mean travelling speed (m/s)	Mean radius of max. wind (km)	Min. pressure (hPa)	Max. JMA grade
1	KIM	1977	56.2	46.3	6.4	63.3	935	5
2	RITA	1978	77.4	56.6	7.2	39.6	905	5
3	BETTY	1980	193.9	46.3	5.4	71.6	945	5
4	IRMA	1981	135.6	43.7	8.4	96.3	965	5
5	LEE	1981	135.8	36.0	8.5	30.0	960	5
6	FAYE	1982	108.2	36.0	4.1	56.2	960	5
7	VERA	1983	7.4	36.0	6.5	41.5	975	5
8	DOT	1985	94.6	46.3	6.6	65.0	925	5
9	BETTY	1987	96.9	46.3	7.2	58.5	935	5
10	NINA	1987	113.9	46.3	9.4	90.5	945	5
11	RUBY	1988	99.8	38.6	9.1	100.7	955	5
12	DAN	1989	60.5	33.4	11.1	111.1	970	5
13	HUBT	1989	124.4	33.4	4.0	113.1	970	5
14	YUNYA	1991	99.9	36.0	3.3	46.4	965	5
15	ELI	1992	152.4	30.9	9.8	92.6	975	4
16	FLO	1993	173.0	30.9	2.3	129.9	975	4
17	LOLA	1993	90.8	36.0	4.8	81.4	965	5
18	TERESA	1994	45.4	36.0	5.3	57.5	970	5
19	ANGELA	1995	30.9	43.7	7.0	82.6	945	5
20	BABS	1998	115.9	36.0	4.1	75.6	960	5
21	XANGSANE	2006	21.9	33.4	6.3	50.1	970	5
22	CHEBI	2006	135.4	46.3	6.0	34.0	940	5
23	DURIAN	2006	112.4	38.6	4.7	45.1	960	5
24	FENGSHEN	2008	30.4	38.6	4.8	50.1	965	5
25	CONSON	2010	30.9	33.4	6.6	45.7	975	5
26	NESAT	2011	190.5	38.6	6.9	88.5	960	5
27	NARI	2013	97.7	36.0	7.0	53.8	970	5
28	RAMMASUN	2014	52.7	43.7	7.8	33.4	945	5
29	KOPPU	2015	170.1	46.3	1.6	46.7	940	5
30	MELOR	2015	75.7	43.7	2.5	46.0	950	5
31	SARIKA	2016	150.7	48.9	7.0	37.3	935	5
32	NOCKTEN	2016	86.6	43.7	8.0	26.8	950	5
33	KAMMURI	2019	139.5	36.0	6.3	63.1	975	5
34	MOLAVE	2020	154.4	36.0	7.1	41.5	975	5
35	VAMCO	2020	59.0	36.0	8.0	66.1	970	5

Royal HaskoningDHV

6 Large scale typhoon hydrodynamic and wave modelling

The 2D pressure and wind fields of the typhoons selected in the previous chapter will be used to estimate the surge and wave conditions near the project area during these historical typhoons. In this chapter, these hydraulic conditions will be determined using a coupled wave and flow model. First, an overview of the scenarios for which model simulations were performed is given in Section 6.1. The model setup is discussed in Section 6.2. The calibration of the model is presented in Section 6.3. The model calibration is purely focused on the surge levels as information on waves and/or current velocities during the typhoon events is not available. Section 6.4 provides an overview of the resulting surge levels for all 35 typhoons. The results regarding wave heights, wave periods, wave directions, and current velocities are presented in Section 6.5, 6.6, 6.7, and 6.8, respectively. The complete overview of the results for all output points is included in Appendix A1.

6.1 Scenarios

For the updated hydraulic conditions near the project area, the scenario including the updated PRDP island layout and the presence of PHCC Islands A and B is considered. This scenario is shown in Figure 6-1.

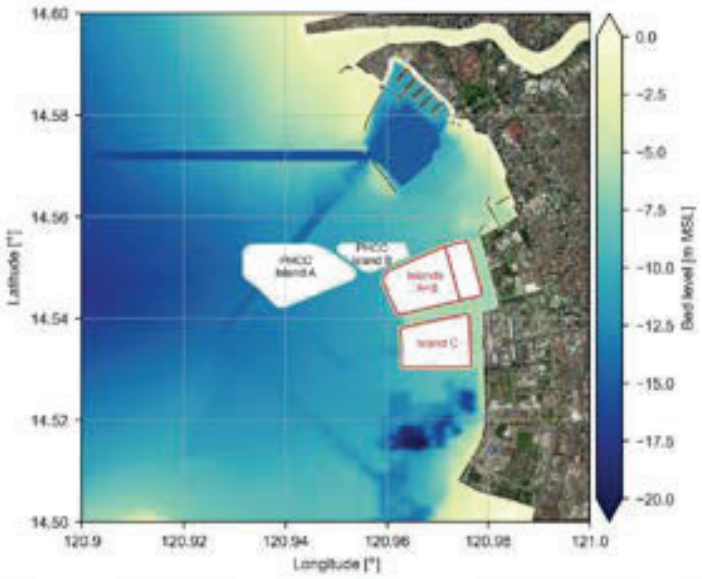


Figure 6-1: The scenario considered for the derivation of the hydraulic conditions from the historical typhoons

6.2 Model set-up

The numerical modelling of the typhoons was done using a coupled MIKE 21 hydrodynamic (HD) and spectral wave (SW) model with a flexible mesh (FM). This model allows users to simulate the mutual interaction between waves and currents through a dynamic coupling between a hydrodynamic module and a spectral wave module. In this study, the simulations were carried out in a two-dimensional (2D) model, which means that the hydrodynamic module solves the depth-integrated incompressible Reynolds averaged

Royal HaskoningDHV

Navier-Stokes equations, i.e. shallow water equations. In the spectral wave module, the fully spectral formulation was adopted. This formulation is based on the wave action conservation equation, in which the directional-frequency wave action spectrum is the dependent variable.

Computational grid

The model domain was constructed such that the storm tracks of all selected typhoons could be modelled. The model extent including the unstructured grid is depicted in Figure 6-2.

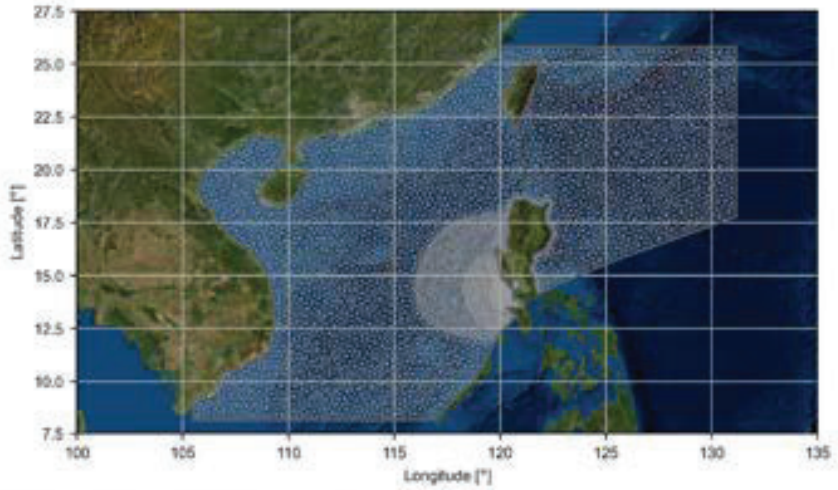


Figure 6-2: Computational grid used in the MIKE 21 model

The unstructured grid shown in Figure 6-2 includes refinements around Manila Bay and near the area of interest to improve the accuracy of the simulations. Artificial boundaries were introduced at the east and southeast part of the model to avoid open boundaries and improve the numerical stability of the model.

Numerical settings

The numerical settings of the hydrodynamic and wave module of the MIKE 21 model are given in Table 6-1 and Table 6-2, respectively. The simulation period varies per simulated typhoon as these typhoons also have different durations. The timestep was set to 180s but may be varying between 0.01s and 180s to ensure that the critical Courant-Friedrich-Lévy (CFL) number remains smaller than 0.8. Note that several model parameters are listed in both tables. This is because these parameters have to be specified in both modules of the MIKE 21 model.

Table 6-1: Numerical settings used in the hydrodynamic module of the MIKE 21 model

Model parameter			Value
General			
Simulation period			Varying per storm
Timestep			180 s
Solution technique	Instationary formulation	Time integration	Low order, fast algorithm

Royal HaskoningDHV

		Space discretisation	Low order, fast algorithm
		Minimum timestep	0.01 s
		Maximum timestep	180 s
		Critical CFL number	0.8
Depth	Type		No depth correction
Flood and Dry	Drying depth		0.005 m
	Wetting depth		0.1 m
Initial conditions	Type		Constant
	Surface elevation		0 m
	u velocity		0 m/s
	v velocity		0 m/s
Boundary conditions			All land boundaries
Decoupling			Excluded
Physical			
Density	Type		Barotropic
Eddy viscosity	Type		Smagorinsky formulation
	Format	Constant	0.28
Bed resistance	Type		Manning
	Format	Constant	32 $m^{1/3}/s$
Coriolis forcing	Type		Varying in domain
Wind forcing	Type		Wind, velocity components
	Format		Varying in time and domain
	Neutral pressure		1013 hPa
Ice coverage			Excluded
Tidal potential			Excluded
Precipitation			Excluded
Evaporation			Excluded
Infiltration			Excluded
Wave radiation	Type		From Spectral Wave simulation
Structures			
Dikes	Dike 1 and Dike 2	Type	Empirical formula
		Critical level difference	0.01 m
		Weir coefficient	1.838 $m^{1/2}/s$
		Constant crest level	0.5 m

Royal HaskoningDHV

Table 6-2 Numerical settings used in the spectral wave module of the MIKE 21 model

Model parameter			Value
General			
Spectral formulation	Fully spectral formulation		
Spectral discretisation	Frequency discretisation	Type	Logarithmic
		Number of frequencies	25
		Minimum frequency	0.055 Hz
		Frequency factor	1.1
	Directional discretisation	Type	360 degree rose
		Number of directions	16
Solution technique	Instationary formulation	Geographical space discretisation	Low order, fast algorithm
		Max. number of levels in transport calculation	32
		Number of steps in source calculation	1
		Minimum timestep	0.01 s
		Maximum timestep	180 s
Initial conditions	Type		Zero spectra
Physical			
Water level conditions	Type		Water level variation from hydrodynamic simulation
Current conditions	Type		Current variation from hydrodynamic simulation
Wind forcing	Type		Wind velocity components
	Format		Varying in time and domain
	Neutral pressure		101.3 hPa
Ice coverage			Excluded
Diffraction			Excluded
Energy transfer	Quadruplet-wave interaction		Included
	Triad-wave interaction		Excluded
Wave breaking	Breaking coefficient (γ)	Constant	0.8
Bottom friction	Nikuradse roughness (k_n)	Constant	0.001 m
White capping	Dissipation coefficient (C_{ds1})	Constant	2.1
	Dissipation coefficient (δ)	Constant	0.6
Structures			
Dikes	Dike 1 and Dike 2	Type	Empirical formula
		Critical level difference	0.01 m
		Weir coefficient	1.838 $m^{1/2}/s$
		Constant crest level	0.5 m

Monsoon wind

An analysis of the initial model results indicated that the model underpredicted the surge levels of several major typhoons, including Nesat (2011). Literature research [13] suggests that this underprediction may be because a possible coincidence of monsoon winds with typhoons was neglected. Therefore, a constant monsoon wind of 4 m/s from 210° N was included in the simulations for typhoons that occur during the southwest Monsoon (Habagat). This value was adopted from the research by Morin, Warnitchai, and Weesakul [13], see also Figure 6-3.

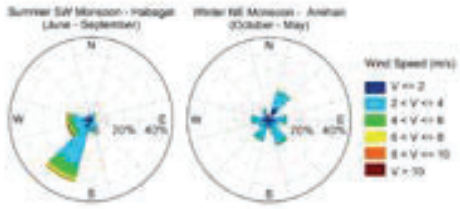


Figure 6-3: Average daily wind measurements at Manila station for the two seasons over the period 1980-2012

6.3 Model calibration

The water level measurements from NAMRIA over the period 1985-2021 [2] were used to calibrate the results of the MIKE 21 model. Measured storm surge levels were obtained from the residual signal shown in Figure 4-2. As an example, the estimated surge level during Nesat (2011) is shown in Figure 6-4.

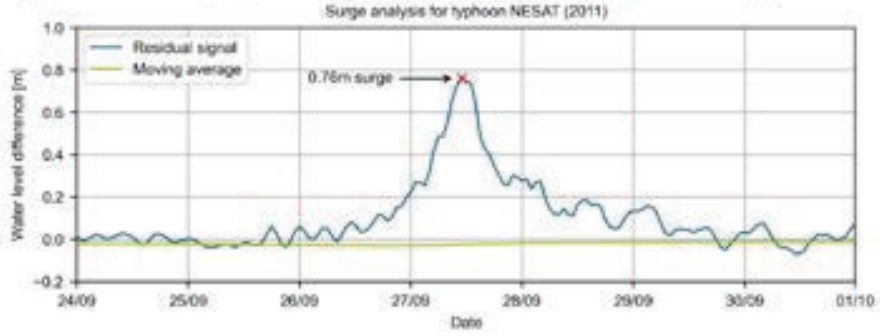


Figure 6-4: Example of the derivation of the storm surge level for the typhoon Nesat (2011)

Calibration of the MIKE 21 model was done for the scenario without any islands as this scenario is most comparable with the conditions for which the measurements were collected. The surge levels were derived for all storms that fall within the period of the measurements. This would mean that, in principle, 28 of the 35 typhoons may be included in the dataset for the calibration of the model. However, upon closer inspection of the water level measurements, it appears that data was missing for parts of the timeseries during which typhoons passed by the measurement stations, see for example the timeseries of typhoon Melor (2015) in Figure 6-5. There is a chance that the maximum surge levels occurred during the time interval for which measurement data is missing, and thus, the obtained surge levels may not be reliable. Typhoons for which data was missing between the start and end data stored in the JMA database were therefore excluded from the dataset used for the calibration of the model. In total, 24 out of the 35 storms were used for the calibration.

Project related

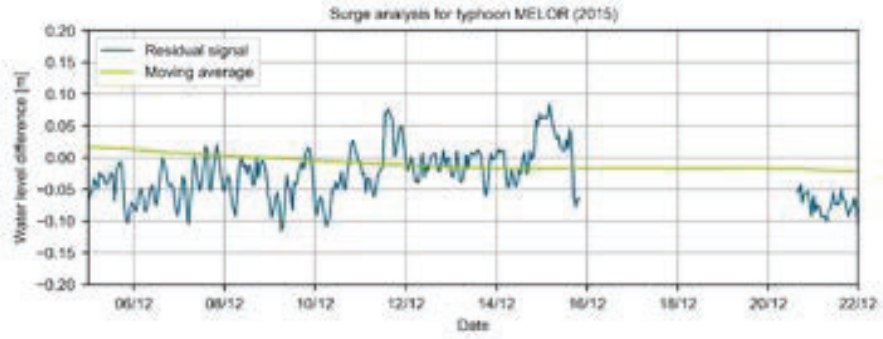
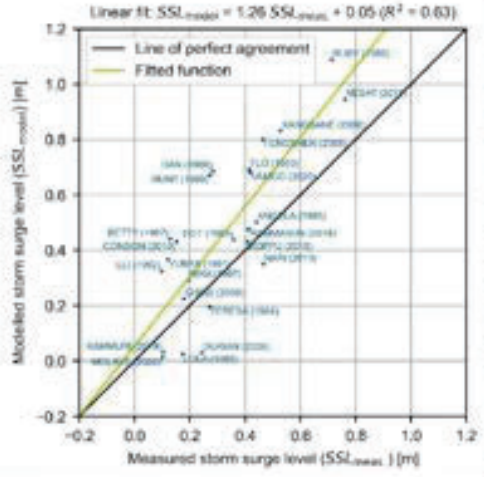


Figure 6-5: Example of the derivation of the storm surge level for the typhoon Melor (2015)

In Figure 6-6, the measured surge levels are compared with the surge levels obtained from the MIKE 21 model. The figure shows that the surge levels are overestimated for most of the typhoons. The maximum and mean differences between the measured surge level and modelled surge level are about 0.41 m (overestimation) and 0.14 m (overestimation), respectively.



Storm name	Year	$SSL_{meas.}$ [m]	SSL_{model} [m]	Diff. [m]
DOT	1985	0.36	0.44	0.08
BETTY	1987	0.13	0.44	0.31
NINA	1987	0.19	0.29	0.10
RUBY	1988	0.71	1.09	0.38
DAN	1989	0.28	0.69	0.40
HUNT	1989	0.27	0.67	0.40
YUNYA	1991	0.12	0.37	0.25
ELI	1992	0.10	0.32	0.23
FLO	1993	0.41	0.69	0.28
LOLA	1993	0.17	0.02	-0.15
TERESA	1994	0.27	0.20	-0.07
ANGELA	1995	0.44	0.50	0.06
XANGSANE	2006	0.53	0.83	0.30
CHEBI	2006	0.18	0.22	0.05
DURIAN	2006	0.24	0.03	-0.21
FENGSHEN	2008	0.46	0.80	0.34
CONSON	2010	0.15	0.43	0.28
NESAT	2011	0.76	0.95	0.19
NARI	2013	0.46	0.35	-0.11
RAMMASUN	2014	0.41	0.48	0.07
KOPPU	2015	0.41	0.43	0.02
KAMMURI	2019	0.10	0.03	-0.07
MOLAVE	2020	0.10	0.01	-0.09
VAMCO	2020	0.42	0.68	0.26

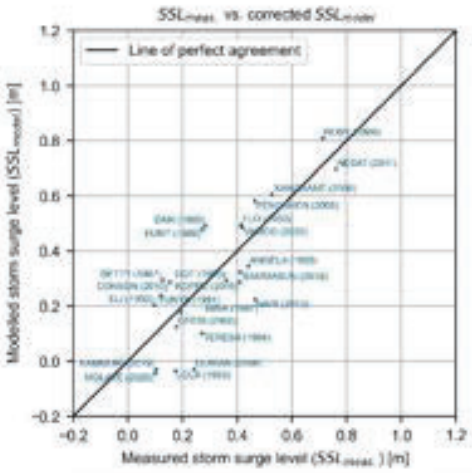
Figure 6-6: Comparison of measured storm surge level ($SSL_{meas.}$) vs. storm surge level (SSL_{model}) from the MIKE 21 model

Royal HaskoningDHV

By applying a correction to the modelled surge levels, the overestimation of surge levels may be reduced, and the overall accuracy of the model improved. The modelled surge levels were corrected using the following linear relationship:

$$SLL_{model} = 1.26\,SLL_{model;corr.} + 0.05 \rightarrow SLL_{model;corr.} = (SLL_{model} - 0.05)/1.26 \qquad \text{Eq. (5-1)}$$

The measured surge levels are again compared with the modelled surge levels, but now after the correction was applied to the modelled surge levels. Figure 6-7 shows that the modelled surge levels are much more aligned with the measured levels, especially for the more severe typhoons. After the correction, the maximum difference between the measured and modelled levels decreased to 0.27 m (underestimation). The mean difference was found to be 0.01 m (underestimation).



Storm name	Year	SSL [m]	SSL [m]	Diff. [m]
DOT	1985	0.36	0.31	-0.05
BETTY	1987	0.13	0.31	0.18
IRMA	1987	0.19	0.19	0.00
RUBY	1988	0.71	0.82	0.11
DAN	1989	0.28	0.50	0.22
HUNT	1989	0.27	0.49	0.22
YUNYA	1991	0.12	0.25	0.13
ELI	1992	0.10	0.22	0.12
FLO	1993	0.41	0.51	0.10
LOLA	1993	0.17	-0.02	-0.20
TERESA	1994	0.27	0.11	-0.16
ANGELA	1995	0.44	0.36	-0.08
XANGSANE	2006	0.53	0.62	0.09
CHEBI	2006	0.18	0.14	-0.04
DURIAN	2006	0.24	-0.02	-0.26
FENGSHEN	2008	0.46	0.59	0.13
CONSON	2010	0.15	0.30	0.15
NESAT	2011	0.76	0.71	-0.05
NARI	2013	0.46	0.24	-0.22
RAMMASUN	2014	0.41	0.34	-0.07
KOPPU	2015	0.41	0.30	-0.11
KAMMURI	2019	0.10	-0.02	-0.12
MOLAVE	2020	0.10	-0.03	-0.13
VAMCO	2020	0.42	0.50	0.08

Figure 6-7: Comparison of measured storm surge level (SSL) vs. corrected storm surge level (SSL) from the MIKE 21 model

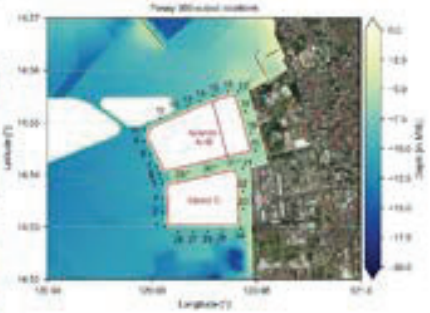
Royal HaskoningDHV

6.4 Typhoon surge levels

Surge levels, corrected following the relationship described in the previous section, were calculated at 31 locations near the project site. The results for 6 of those locations are presented in Table 6-3. These 6 points were selected for the presentation of the results because they provide a comprehensive picture of the variation in surge levels around the land reclamation. The model results for the other locations can be found in Appendix A1.1.

Table 6-3 Corrected surge levels at various output points along PRDM

			Corrected surge level [m]					
	Point		1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	0.93	0.94	0.94	0.94	0.96	0.97
2	RITA	1978	0.29	0.30	0.30	0.31	0.31	0.30
3	BETTY	1980	0.26	0.27	0.27	0.27	0.27	0.27
4	IRMA	1981	0.46	0.47	0.46	0.46	0.48	0.49
5	LEE	1981	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
6	FAYE	1982	0.15	0.16	0.17	0.18	0.18	0.15
7	VERA	1983	0.52	0.54	0.56	0.57	0.55	0.53
8	DOT	1985	0.28	0.28	0.28	0.28	0.28	0.29
9	BETTY	1987	0.02	0.02	0.02	0.03	0.02	0.01
10	NINA	1987	0.13	0.13	0.14	0.15	0.15	0.12
11	RUBY	1988	0.68	0.70	0.71	0.72	0.72	0.69
12	DAN	1989	0.39	0.40	0.42	0.43	0.42	0.38
13	HUNT	1989	0.45	0.46	0.45	0.46	0.46	0.47
14	YUNYA	1991	0.21	0.22	0.22	0.22	0.22	0.22
15	ELI	1992	0.19	0.19	0.19	0.19	0.20	0.19
16	FLO	1993	0.40	0.42	0.43	0.43	0.42	0.41
17	LOLA	1993	0.03	0.02	0.01	0.00	0.01	0.03
18	TERESA	1994	0.19	0.18	0.17	0.16	0.16	0.20
19	ANGELA	1995	0.35	0.35	0.35	0.35	0.35	0.35
20	BABS	1998	0.41	0.42	0.42	0.42	0.43	0.44
21	CHEBI	2006	-0.03	-0.03	-0.02	-0.02	-0.02	-0.03
22	DURIAN	2006	0.12	0.12	0.12	0.12	0.12	0.12
23	XANGSANE	2006	0.54	0.55	0.56	0.57	0.56	0.55
24	FENGSHEN	2008	0.55	0.57	0.57	0.57	0.56	0.58
25	CONSON	2010	0.24	0.24	0.25	0.26	0.26	0.23
26	NESAT	2011	0.57	0.58	0.60	0.60	0.61	0.58
27	NARI	2013	0.19	0.20	0.20	0.21	0.20	0.20
28	RAMMASUN	2014	0.26	0.26	0.28	0.29	0.28	0.26
29	KOPPU	2015	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
30	MELOR	2015	0.25	0.26	0.26	0.26	0.26	0.26
31	NOCKTEN	2016	0.08	0.08	0.08	0.09	0.08	0.08
32	SARIKA	2016	0.10	0.11	0.10	0.11	0.11	0.11
33	KAMMURI	2019	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02



Royal HaskoningDHV

34	MOLAVE	2020	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
35	VAMCO	2020	0.44	0.45	0.45	0.45	0.46	0.46

The largest storm surges occurred during typhoon Kim (1977). The results show that surge levels for this typhoon are substantially higher than the levels during any other typhoon. The maximum surge level during Kim (1977) is about 30% higher than the values for the typhoon with the second highest surge levels, e.g. Ruby (1988). For some typhoons, the table reports negative surge levels. This is most likely due to the correction that results in a decrease in surge levels. As a result, the values may become negative for typhoons with low surge levels.

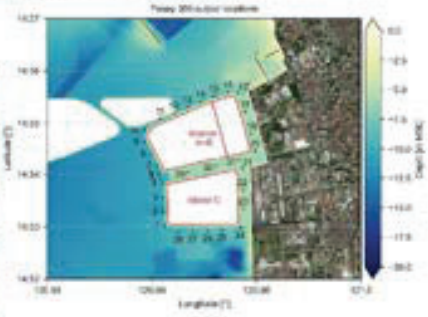
6.5 Typhoon significant wave heights

6.5.1 Uncorrected significant wave height

The model results for the maximum spectral significant wave heights during the 35 simulated typhoons are shown Table 6-4. The model results for all locations can be found in Appendix A1.2. However, note that the results for the locations in the channels are deemed unreliable as the model does not account accurately for refraction reflection and diffraction inside the channels. Maximum spectral significant wave heights are higher for the northern section of the revetment (point 15) as this section does not experience any sheltering effects from land masses.

Table 6-4 Maximum spectral significant wave height (uncorrected) at various output points along PRDP

			Max. H_{m0} [m]					
	Point		1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	4.15	3.80	3.56	2.71	4.38	2.82
2	RITA	1978	3.26	3.11	2.61	1.96	3.78	2.14
3	BETTY	1980	3.43	3.27	2.52	1.75	3.81	2.08
4	IRMA	1981	3.85	3.67	3.07	2.23	4.13	2.43
5	LEE	1981	0.83	0.65	0.73	0.63	0.92	0.72
6	FAYE	1982	1.38	1.25	1.35	1.12	1.64	1.25
7	VERA	1983	3.08	2.97	2.90	2.29	3.77	2.43
8	DOT	1985	3.37	3.12	2.73	2.05	3.80	2.15
9	BETTY	1987	1.11	0.80	0.88	0.76	1.48	0.95
10	NINA	1987	1.57	1.32	1.48	1.25	1.92	1.47
11	RUBY	1988	4.01	3.67	3.53	2.67	4.41	2.82
12	DAN	1989	2.23	2.10	2.15	1.71	2.69	1.90
13	HUNT	1989	3.79	3.49	2.88	2.14	4.03	2.25
14	YUNYA	1991	3.34	3.11	2.47	1.71	3.72	2.02
15	ELI	1992	2.13	2.08	1.93	1.47	2.45	1.49
16	FLO	1993	3.72	3.61	3.26	2.39	4.14	2.50
17	LOLA	1993	1.77	1.23	0.53	0.36	2.36	0.84
18	TERESA	1994	2.86	1.97	0.98	0.52	3.32	1.42
19	ANGELA	1995	2.10	1.55	1.82	1.54	2.83	1.74
20	BABS	1998	3.81	3.60	2.96	2.13	4.08	2.38
21	CHEBI	2006	0.63	0.48	0.47	0.38	1.02	0.45



Royal HaskoningDHV

22	DURIAN	2006	2.15	2.07	1.84	1.32	2.50	1.42
23	XANGSANE	2006	2.30	2.21	2.19	1.80	2.74	1.92
24	FENGSHEN	2008	3.66	3.47	3.16	2.37	4.11	2.43
25	CONSON	2010	1.29	0.96	1.15	1.00	1.71	1.18
26	NESAT	2011	4.00	3.98	3.57	2.66	4.35	2.80
27	NARI	2013	2.52	2.39	2.26	1.76	3.02	1.79
28	RAMMASUN	2014	2.18	2.13	2.11	1.65	2.60	1.81
29	KOPPU	2015	0.83	0.64	0.69	0.56	0.86	0.67
30	MELOR	2015	3.42	3.27	2.43	1.77	3.82	2.08
31	NOCKTEN	2016	0.62	0.48	0.55	0.49	0.66	0.52
32	SARIKA	2016	2.07	1.93	1.78	1.30	2.40	1.37
33	KAMMURI	2019	0.59	0.55	0.55	0.43	0.62	0.48
34	MOLAVE	2020	0.50	0.42	0.44	0.38	0.54	0.41
35	VAMCO	2020	3.71	3.39	2.81	2.12	4.03	2.18

6.5.2 Significant wave height corrected for tidal level

During high tide higher waves may exist due to the increase in water depth, and the opposite holds for low tide. Since the tidal motion is not included in typhoon model, a simple correction factor was applied to the wave height values at the output points based on the ratio between wave height and total water depth. The total water depth comprises the water depth w.r.t MSL plus the surge level at the time instance of maximum wave height:

$$c_{H_{max}} = \frac{H_{m0,model}}{water\ depth + surge} \qquad \text{Eq. (5-1)}$$

By multiplying the correction factor $c_{H_{max}}$ with the total water depth including the tidal level at the moment of the maximum wave height, an estimate of the spectral significant wave height including tide can be obtained:

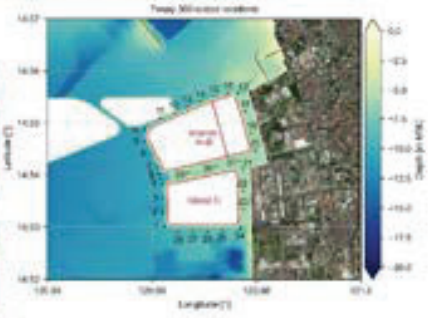
$$H_{m0,tide} = c_{H_{max}}(water\ depth + surge + tidal\ level) \qquad \text{Eq. (5-2)}$$

The resulting maximum spectral significant wave heights for the 35 typhoons are listed in Table 6-5. The model results for all locations can be found in Appendix A1.3. The results show that the impact of including the tide can have considerable impact on the values of the spectral significant wave height. The values may increase by almost 30 cm for some output points and typhoons (e.g. point 1 for Kim 1977) but may also decrease by more than 10 cm (e.g. point 4 and 14 for Nina 1987).

Royal HaskoningDHV

Table 6-5 Maximum spectral significant wave height (corrected for tide) at various output points along PRDP

			Max. H_{m0} (incl. tide) [m]					
	Point		1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	4.42	4.06	3.79	2.89	4.71	3.03
2	RITA	1978	3.27	3.12	2.62	1.96	3.79	2.14
3	BETTY	1980	3.42	3.28	2.57	1.78	3.82	2.08
4	IRMA	1981	3.81	3.68	3.08	2.24	4.09	2.44
5	LEE	1981	0.81	0.66	0.72	0.62	0.90	0.70
6	FAYE	1982	1.43	1.28	1.39	1.16	1.72	1.30
7	VERA	1983	3.08	2.97	2.96	2.29	3.77	2.43
8	DOT	1985	3.36	3.15	2.76	2.07	3.78	2.17
9	BETTY	1987	1.11	0.81	0.88	0.76	1.54	0.95
10	NINA	1987	1.47	1.22	1.38	1.18	1.80	1.42
11	RUBY	1988	4.16	4.02	3.66	2.77	4.60	2.94
12	DAN	1989	2.34	2.21	2.25	1.80	2.87	2.02
13	HUNT	1989	3.62	3.52	2.95	2.19	4.07	2.31
14	YUNYA	1991	3.32	3.15	2.60	1.84	3.69	2.06
15	ELI	1992	2.22	2.18	2.05	1.56	2.57	1.60
16	FLO	1993	3.75	3.64	3.25	2.41	4.10	2.52
17	LOLA	1993	1.70	1.18	0.51	0.34	2.26	0.80
18	TERESA	1994	2.81	1.95	1.02	0.52	3.27	1.40
19	ANGELA	1995	2.12	1.60	1.87	1.58	2.84	1.80
20	BABS	1998	3.81	3.62	2.99	2.16	4.10	2.39
21	CHEBI	2006	0.60	0.47	0.45	0.38	0.98	0.45
22	DURIAN	2006	2.31	2.21	1.93	1.39	2.72	1.50
23	XANGSANE	2006	2.23	2.15	2.13	1.75	2.65	1.86
24	FENGSHEN	2008	3.62	3.44	3.14	2.35	4.07	2.40
25	CONSON	2010	1.23	0.92	1.10	0.96	1.72	1.12
26	NESAT	2011	4.06	3.96	3.62	2.80	4.32	2.98
27	NARI	2013	2.49	2.39	2.26	1.76	3.01	1.78
28	RAMMASUN	2014	2.18	2.13	2.10	1.65	2.59	1.81
29	KOPPU	2015	0.85	0.66	0.71	0.57	0.88	0.68
30	MELOR	2015	3.60	3.45	2.54	1.83	4.05	2.20
31	NOCKTEN	2016	0.60	0.47	0.53	0.47	0.64	0.50
32	SARIKA	2016	2.07	1.98	1.83	1.34	2.40	1.42
33	KAMMURI	2019	0.57	0.57	0.57	0.45	0.86	0.46
34	MOLAVE	2020	0.53	0.41	0.46	0.40	0.56	0.43
35	VAMCO	2020	3.69	3.38	2.84	2.14	4.00	2.17



Royal HaskoningDHV

6.5.3 Significant wave height corrected for tidal level and SLR

In a similar fashion, sea level rise can also be included in the estimated maximum spectral significant wave heights. The same correction factor $c_{H_{max}}$ is used, but now a SLR value of 0.70 m is included next to the tidal level at the moment of the maximum wave height:

$$H_{max;SLR} = c_{H_{max}}(water\ depth + surge + tidal\ level + SLR) \qquad \text{Eq. (5-3)}$$

The resulting maximum spectral significant wave heights for the 35 typhoons are listed in Table 6-6. The model results for all locations can be found in Appendix A1.4. The results show that SLR has a substantial impact on the maximum spectral significant wave height. In the most extreme cases, the significant wave increases by 50-60 cm compared to the uncorrected spectral significant wave height.

Table 6-6: Maximum spectral significant wave height (corrected for tide and SLR) at various output points along PRDP

			Max. H_{max} (incl. tide and SLR) [m]					
	Point		1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	4.69	4.30	4.01	3.06	5.02	3.24
2	RITA	1978	3.49	3.33	2.79	2.08	4.08	2.30
3	BETTY	1980	3.65	3.49	2.74	1.90	4.11	2.24
4	IRMA	1981	4.07	3.92	3.28	2.38	4.41	2.62
5	LEE	1981	0.87	0.70	0.77	0.66	0.97	0.76
6	FAYE	1982	1.53	1.37	1.48	1.24	1.85	1.40
7	VERA	1983	3.28	3.16	3.15	2.44	4.05	2.60
8	DOT	1985	3.59	3.36	2.94	2.20	4.07	2.33
9	BETTY	1987	1.19	0.86	0.94	0.81	1.66	1.03
10	NINA	1987	1.58	1.31	1.48	1.26	1.96	1.53
11	RUBY	1988	4.42	4.26	3.88	2.94	4.93	3.16
12	DAN	1989	2.50	2.35	2.39	1.91	3.07	2.17
13	HUNT	1989	4.07	3.75	3.14	2.33	4.38	2.48
14	YUNYA	1991	3.54	3.36	2.76	1.95	3.98	2.22
15	ELI	1992	2.36	2.32	2.17	1.66	2.76	1.71
16	FLO	1993	4.00	3.87	3.46	2.56	4.41	2.71
17	LOLA	1993	1.82	1.27	0.54	0.36	2.45	0.87
18	TERESA	1994	3.01	2.08	1.08	0.56	3.53	1.51
19	ANGELA	1995	2.26	1.70	1.99	1.68	3.07	1.93
20	BABS	1998	4.06	3.85	3.18	2.30	4.41	2.56
21	CHEBI	2006	0.64	0.50	0.48	0.41	1.06	0.48
22	DURIAN	2006	2.46	2.35	2.05	1.47	2.92	1.61
23	KANGSANE	2006	2.39	2.29	2.27	1.86	2.86	2.00
24	FENGSHEN	2008	3.87	3.67	3.34	2.50	4.38	2.58
25	CONSON	2010	1.32	0.99	1.18	1.03	1.86	1.21
26	NESAT	2011	4.33	4.22	3.85	2.97	4.64	3.18
27	NARI	2013	2.66	2.54	2.41	1.88	3.25	1.92
28	RAMMASUN	2014	2.32	2.27	2.24	1.76	2.79	1.94
29	KOPPU	2015	0.90	0.78	0.75	0.61	0.95	0.73



Royal HaskoningDHV

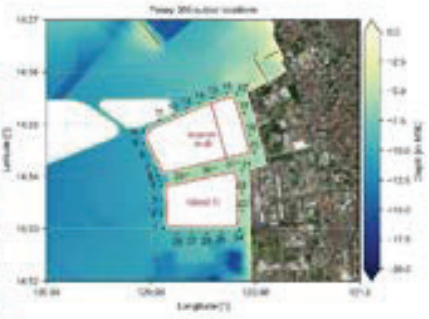
30	MELOR	2015	3.84	3.66	2.70	1.95	4.35	2.36
31	NOKTEN	2016	0.64	0.50	0.56	0.50	0.69	0.54
32	SARIKA	2016	2.22	2.11	1.95	1.43	2.59	1.53
33	KAMMURI	2019	0.61	0.61	0.60	0.47	0.93	0.50
34	MOLAVE	2020	0.56	0.44	0.49	0.43	0.61	0.46
35	VAMCO	2020	3.94	3.60	3.02	2.27	4.30	2.33

6.6 Typhoon wave period

The normative mean wave period ($T_{m-1,0}$) is defined as the mean wave period at the time instance when the spectral significant wave height is maximum. The values for $T_{m-1,0}$ are presented in Table 6-7. The model results for all locations can be found in Appendix A1.5.

Table 6-7 Mean wave period at various output points along FRSP

			Mean wave period [s]					
	Point		1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	8.08	7.82	7.39	6.23	7.73	6.50
2	RITA	1978	6.44	6.55	6.04	5.05	6.49	5.80
3	BETTY	1980	7.00	6.80	6.50	5.53	7.11	6.85
4	IRMA	1981	7.54	7.48	7.22	5.96	7.27	7.05
5	LEE	1981	3.11	5.10	3.72	3.26	3.29	2.80
6	FAYE	1982	4.11	5.16	4.62	3.95	4.00	3.33
7	VERA	1983	6.09	6.57	6.26	5.55	6.32	5.09
8	DOT	1985	8.67	6.65	6.30	5.41	8.66	6.01
9	BETTY	1987	3.11	5.92	3.45	3.29	3.00	2.85
10	NINA	1987	3.99	6.28	4.36	3.98	3.89	3.36
11	RUBY	1988	7.83	7.87	7.43	6.27	7.90	6.91
12	DAN	1989	5.90	6.64	5.93	4.94	5.45	4.57
13	HUNT	1989	7.94	7.64	7.11	6.03	7.67	6.99
14	YUNYA	1991	7.00	6.77	6.44	5.42	6.94	6.64
15	ELI	1992	5.21	5.25	5.07	4.40	5.31	4.31
16	FLO	1993	8.12	8.19	7.71	6.46	8.17	7.14
17	LOLA	1993	6.07	5.65	4.69	2.73	5.34	6.14
18	TERESA	1994	6.98	6.52	5.26	3.08	6.27	7.26
19	ANGELA	1995	6.26	3.85	4.12	3.94	5.28	3.54
20	BABS	1998	7.80	7.51	7.26	6.13	7.81	7.21
21	CHEBI	2006	4.12	6.87	5.93	3.11	3.64	2.18
22	DURIAN	2006	5.41	5.36	5.15	4.49	5.44	4.85
23	XANGSANE	2006	5.91	6.38	5.87	4.97	5.75	4.89
24	FENGSHEN	2008	7.65	7.54	7.20	6.33	7.60	6.73
25	CONSON	2010	3.22	3.28	3.51	3.36	4.12	3.02
26	NESAT	2011	8.26	8.16	7.93	6.62	8.21	6.97
27	NARI	2013	5.73	5.74	5.46	4.82	5.78	4.86



Royal HaskoningDHV

28	RAMMASUN	2014	6.22	6.94	5.93	5.00	5.82	4.59
29	KOPPU	2015	4.17	5.93	4.69	3.90	3.77	3.45
30	MELOR	2015	7.07	6.84	6.59	5.42	7.15	6.87
31	NOCKTEN	2016	2.51	5.79	2.77	2.72	2.69	2.37
32	SARIKA	2016	5.20	6.10	4.92	4.31	5.19	4.50
33	KAMMURI	2019	2.75	6.71	5.43	4.05	3.35	2.47
34	MOLAVE	2020	2.53	6.16	2.84	2.70	2.64	2.27
35	VAMCO	2020	7.28	6.84	6.22	5.40	7.05	6.92

6.7 Typhoon wave direction

As for the mean wave period, the normative mean wave direction is defined as the wave direction at the moment that the spectral significant wave height is maximum. The mean wave direction values are presented in Table 6-8. The model results for all locations can be found in Appendix A1.6.

Table 6-8: Mean wave direction at various output points along PRDM

			Mean wave direction [deg]					
	Point		1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	275	251	241	231	268	222
2	RITA	1978	262	257	245	234	254	234
3	BETTY	1980	269	262	247	236	260	237
4	IRMA	1981	279	260	247	236	274	235
5	LEE	1981	169	217	196	189	180	175
6	FAYE	1982	189	229	216	207	186	180
7	VERA	1983	237	242	233	225	223	209
8	DOT	1985	276	255	244	234	274	230
9	BETTY	1987	160	215	188	196	322	165
10	NINA	1987	180	225	201	204	177	176
11	RUBY	1988	256	254	244	233	240	228
12	DAN	1989	220	234	222	217	205	196
13	HUNT	1989	274	267	247	235	267	233
14	YUNYA	1991	270	262	247	236	263	237
15	ELI	1992	264	256	242	230	258	222
16	FLO	1993	259	256	245	233	241	228
17	LOLA	1993	280	279	272	191	294	245
18	TERESA	1994	280	276	259	194	288	241
19	ANGELA	1995	290	262	250	205	302	181
20	BABS	1998	278	262	248	236	256	237
21	CHEBI	2006	289	242	229	194	313	141
22	DURIAN	2006	268	260	246	236	264	233
23	XANGSANE	2006	235	241	229	221	219	207
24	FENGSHEN	2008	265	256	245	234	244	230
25	CONSON	2010	170	193	192	199	314	174
26	NESAT	2011	260	257	243	231	239	222



Royal HaskoningDHV

27	NARI	2013	271	251	240	231	240	223
28	RAMMASUN	2014	233	243	227	220	216	202
29	KOPPU	2015	176	214	199	201	176	175
30	MELOR	2015	269	262	248	234	258	237
31	NOCKTEN	2016	165	246	187	194	176	174
32	SARIKA	2016	273	255	244	234	273	231
33	KAMMURI	2019	164	242	221	209	318	170
34	MOLAVE	2020	163	239	185	192	174	171
35	VAMCO	2020	274	266	239	230	270	240

6.8 Typhoon current speed

Besides the wave conditions and period, the current speed is considered an important parameter for the design. The maximum depth-averaged current speeds during the typhoons are listed in Table 6-9. The model results for all locations can be found in Appendix A1.7.

Table 6-9 Maximum current speed at various output points along PRDP

	Point		Maximum current speed [m/s] 1	3	8	10	14	27
	Bed level [m MSL]		-10.07	-10.31	-10.46	-10.58	-8.76	-9.02
1	KIM	1977	0.44	0.38	0.40	0.23	0.45	0.72
2	RITA	1978	0.31	0.25	0.22	0.09	0.29	0.57
3	BETTY	1980	0.34	0.21	0.27	0.08	0.34	0.59
4	IRMA	1981	0.44	0.29	0.36	0.11	0.44	0.68
5	LEE	1981	0.15	0.17	0.24	0.06	0.19	0.25
6	FAYE	1982	0.18	0.24	0.34	0.09	0.16	0.34
7	VERA	1983	0.28	0.42	0.41	0.22	0.27	0.41
8	DOT	1985	0.37	0.28	0.29	0.14	0.29	0.55
9	BETTY	1987	0.26	0.27	0.32	0.10	0.38	0.43
10	NINA	1987	0.29	0.30	0.41	0.11	0.39	0.47
11	RUBY	1988	0.43	0.38	0.34	0.21	0.48	0.76
12	DAN	1989	0.29	0.31	0.41	0.14	0.27	0.30
13	HUNT	1989	0.44	0.27	0.32	0.12	0.40	0.68
14	YUNYA	1991	0.36	0.23	0.28	0.08	0.30	0.55
15	ELI	1992	0.16	0.18	0.20	0.08	0.11	0.25
16	FLO	1993	0.35	0.33	0.21	0.20	0.45	0.71
17	LOLA	1993	0.29	0.27	0.25	0.09	0.28	0.35
18	TERESA	1994	0.33	0.27	0.31	0.09	0.25	0.37
19	ANGELA	1995	0.38	0.34	0.42	0.15	0.28	0.29
20	BABS	1998	0.41	0.28	0.32	0.13	0.42	0.68
21	CHEBI	2006	0.22	0.20	0.21	0.08	0.26	0.32
22	DURIAN	2006	0.15	0.12	0.13	0.05	0.12	0.24
23	XANGSANE	2006	0.26	0.28	0.32	0.12	0.26	0.26
24	FENGSHEN	2008	0.29	0.29	0.26	0.18	0.34	0.62
25	CONSON	2010	0.28	0.24	0.32	0.09	0.32	0.40



Project related

Royal HaskoningDHV

26	NESAT	2011	0.47	0.34	0.32	0.23	0.53	0.80
27	HARI	2013	0.23	0.20	0.21	0.09	0.15	0.34
28	RAMMASUN	2014	0.21	0.26	0.35	0.12	0.25	0.30
29	KOPPU	2015	0.12	0.15	0.24	0.06	0.17	0.26
30	MELOR	2015	0.34	0.20	0.26	0.11	0.34	0.60
31	NOCKTEN	2016	0.16	0.16	0.18	0.07	0.20	0.30
32	SARIKA	2016	0.17	0.13	0.13	0.05	0.11	0.23
33	KAMMURI	2019	0.20	0.19	0.20	0.07	0.26	0.30
34	MOLAVE	2020	0.12	0.12	0.17	0.05	0.17	0.22
35	VAMCO	2020	0.39	0.31	0.30	0.15	0.31	0.56

Royal HaskoningDHV

7 Extreme hydraulic conditions

7.1 Introduction

The objective of this Chapter is to present tabulated design values for water level, wave conditions and current speeds. The starting point is an extreme value analysis (EVA) of the simulation results during typhoons which are presented in Chapter 6. The results of the EVA are presented for the selected points shown in Figure 7-1 for scenario C. In Section 7.2 to 7.5 the extreme values for the surge, waves, and current speeds are derived separately. In Section 7.6, the joint probability of surge and waves is discussed. Based on the EVA, design values are presented in the subsequent sections. In Section 7.7, the design values for the surge/water levels are derived from the results of the EVA. Besides surge values, design values are proposed for waves (Section 7.8) and current speeds (Section 7.9).

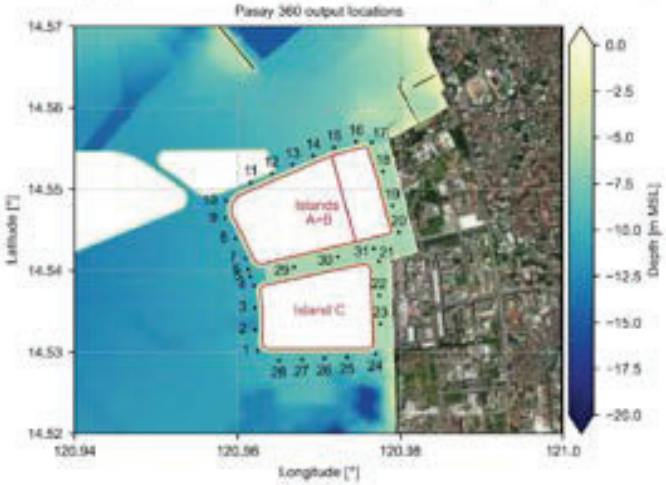


Figure 7-1: Selected output locations for the extreme value analysis

Royal HaskoningDHV

7.2 Extreme surge values

The modelled storm surge levels (Section 6.4) are input for the EVA. A moment ratio diagram of the corrected surge data gives an indication of suitable distributions, see Figure 7-2. The skewness or third normalized moment is plotted against the kurtosis or fourth normalised moment. The data point (red square) is close to a Weibull or a Generalized Extreme Value distribution (GEV). This indicates that one of these distributions would be suitable in this case.

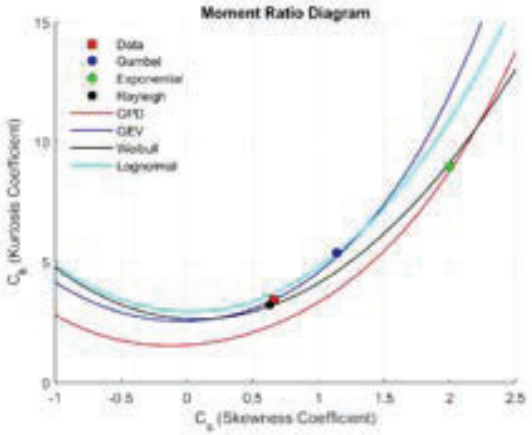


Figure 7-2: Moment ratio diagram of (corrected) surge levels at location 8

Various distributions have been fitted to determine extreme typhoon surge levels at location 8. Based on the goodness of fit and residual quantiles, the Weibull distribution with a Maximum Likelihood fitting method is selected to estimate extreme surge levels. This method is applied to all other locations as well. Maximum Likelihood is often the preferred fitting method for water level extreme value analyses [14].

From the extreme value analysis, the estimated 100-year return period surge height is 1.09 m, and the 1000-year return period surge height is around 1.54 m at location 8, see Figure 7-3. Note that because of the limited number of simulated storms for a given year, the results of the extreme value analysis should be treated with some caution and cannot be considered as exact. This will be further discussed in Section 7.7 when the final design water levels are presented.

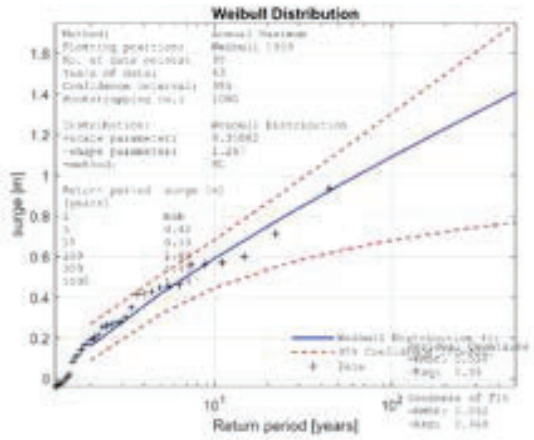


Figure 7-3: Example of a Weibull fit with maximum likelihood method on corrected typhoon surge level data at location 8

Table 7-1 shows the EVA results of the (corrected) surge levels. The locations of the output points can be seen in Figure 7-1. The 100-year return period surge varies around 1.0-1.1 m. Surge values are largely uniform along the perimeter of the reclamation site, with slightly higher values in the shallower areas. All EVA results can be found in Appendix A2.1.

Table 7-1: EVA results surge level (corrected) [m]

Return period [years]	Extreme surge (corrected) [m] at location					
	1	3	8	10	14	27
1	N/A	N/A	N/A	N/A	N/A	N/A
2	0.16	0.16	0.16	0.16	0.16	0.16
5	0.41	0.42	0.42	0.42	0.42	0.42
10	0.57	0.58	0.59	0.60	0.60	0.59
25	0.77	0.79	0.80	0.81	0.81	0.79
50	0.90	0.93	0.95	0.96	0.96	0.94
100	1.04	1.07	1.09	1.11	1.11	1.08
250	1.21	1.24	1.27	1.30	1.29	1.26
500	1.33	1.37	1.41	1.43	1.43	1.38
750	1.40	1.45	1.48	1.51	1.51	1.46
1000	1.45	1.50	1.54	1.57	1.56	1.51

Royal HaskoningDHV

7.3 Extreme wave heights (corrected for tide)

In a similar manner as for the surge data, extreme values for wave height can be derived from the simulated typhoons. To find a suitable distribution for extreme wave height, a moment ratio diagram was made, shown in Figure 7-4. The extreme wave events (red dot in the figure) are closest to a Generalized Extreme Value distribution (GEV) or a Generalized Pareto Distribution (GPD). For the estimation of the extreme spectral significant wave heights, either a GEV distribution or a GPD distribution was fitted, whichever was considered most suitable.

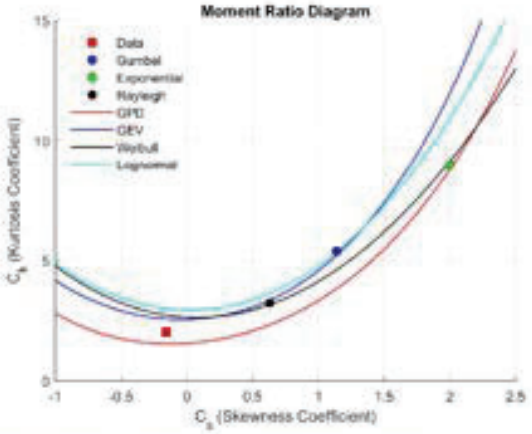


Figure 7-4: Moment ratio diagram of spectral significant wave height (corrected for tide) at location 8

An example of a GEV fit with the PWM method is shown in Figure 7-5 at location 8. For all locations along the western and southern boundaries, the GEV distribution with the PWM fitting method is chosen. For the points along the northern boundary, the GPD distribution with the MPS fitting method was selected.

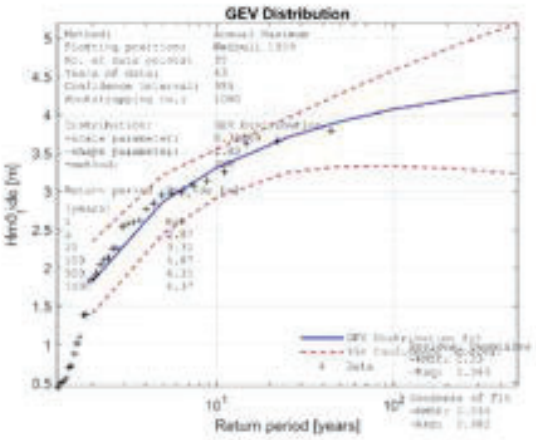


Figure 7-5: GEV distribution for spectral significant wave height (corrected for tide) at location 8

The resulting extreme values for spectral significant wave height are shown in Table 7-2. The given output locations can be viewed in Figure 7-1. Out of the results for the six presented locations, the 100-year return period spectral significant wave height is largest at location 5 at 4.85 m. The sheltering effect of the PHCC reclamations is clearly visible in the reduced wave heights for location 10. Similarly, the wave heights southeast of the reclamation, at location 27, are lower due to sheltering effects of the reclamation itself for waves coming from the west or northwest. All EVA results can be found in Appendix A2.2.

Table 7-2: EVA results wave height (corrected for tide) [m]

Return period [years]	Extreme spectral significant wave height (corrected for tide) [m] at location					
	1	3	8	10	14	27
1*	1.88	1.65	1.49	1.15	2.15	1.36
2	2.25	2.04	1.83	1.40	2.40	1.59
5	3.46	3.25	2.87	2.16	3.97	2.33
10	3.95	3.76	3.31	2.48	4.42	2.63
25	4.38	4.21	3.70	2.77	4.65	2.90
50	4.61	4.44	3.91	2.93	4.72	3.03
100	4.77	4.62	4.07	3.04	4.75	3.13
250	4.92	4.79	4.22	3.16	4.77	3.23
500	5.01	4.88	4.31	3.22	4.77	3.27
750	5.05	4.93	4.35	3.25	4.77	3.30
1000	5.07	4.95	4.37	3.27	4.77	3.31

**The 1-year condition was estimated by extrapolation of the frequency curve using the values up to a return period of 25 years.*

Royal HaskoningDHV

7.4 Extreme significant wave height (corrected for tide and SLR)

In the same way as for the extreme spectral significant wave height, an extreme value analysis is performed for the extreme spectral significant wave height including SLR. The resulting extreme values for the spectral significant wave height with SLR are shown in Table 7-3. All EVA results can be found in Appendix A2.3.

Table 7-3: EVA results spectral significant wave height (corrected for tide and SLR) [m]

Return period [years]	Extreme spectral significant wave height (corrected for tide and SLR) [m] at location					
	1	3	8	10	14	27
1*	2.02	1.76	1.59	1.23	2.34	1.47
2	2.41	2.17	1.95	1.49	2.60	1.71
5	3.69	3.46	3.05	2.29	4.27	2.50
10	4.21	4.00	3.52	2.64	4.73	2.82
25	4.66	4.47	3.93	2.94	4.97	3.10
50	4.9	4.72	4.15	3.10	5.04	3.24
100	5.07	4.91	4.32	3.23	5.06	3.35
250	5.23	5.09	4.48	3.34	5.08	3.45
500	5.32	5.18	4.57	3.41	5.08	3.50
750	5.36	5.23	4.61	3.44	5.08	3.52
1000	5.38	5.26	4.64	3.46	5.09	3.54

**The 1-year condition was estimated by extrapolation of the frequency curve using the values up to a return period of 25 years.*

7.5 Extreme current speed

In a similar manner as for the surge and wave height data, extreme values for current speed can be derived from the simulated typhoons. To find a suitable distribution for extreme current speed, a moment ratio diagram was made, shown in Figure 7-6. The extreme wave events (red dot in the figure) are closest to a Generalized Extreme Value distribution (GEV), a Weibull distribution, or a Generalized Pareto Distribution (GPD).

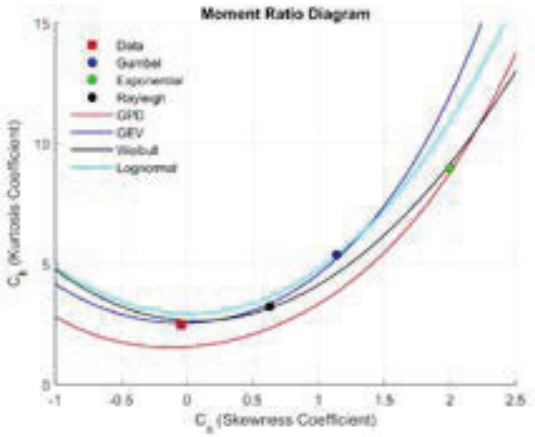


Figure 7-6: Moment ratio diagram of current speed at location 8

An example of a GEV fit with the PWM method is shown in Figure 7-7 at location 8. For all locations, either a GEV fit or a GPD fit was chosen, whichever was deemed most suitable.

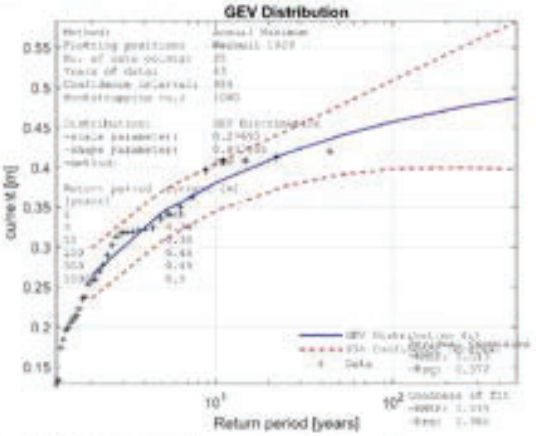


Figure 7-7: Weibull distribution for current speed at location 8

The resulting extreme values for current speed are shown in Table 7-4. The given output locations can be viewed in Figure 7-1. The highest current speeds are observed at location 27, which is at the southwestern tip of the reclamation. The high current velocities near the reclamation's corner may be attributed to substantial variations in wave heights to the west and south, leading to significant head differences within this area. All EVA results can be found in Appendix A2.4.

Project related

Royal HaskoningDHV

Table 7-4: EVA results current speed [m/s]

Return period [years]	Extreme current velocity [m/s] at location					
	1	3	8	10	14	27
1*	0.22	0.20	0.23	0.06	0.21	0.26
2	0.26	0.23	0.26	0.09	0.26	0.36
5	0.37	0.31	0.34	0.14	0.37	0.57
10	0.42	0.34	0.38	0.18	0.43	0.69
25	0.46	0.38	0.42	0.22	0.49	0.81
50	0.49	0.40	0.44	0.26	0.53	0.87
100	0.51	0.41	0.46	0.30	0.56	0.93
250	0.54	0.43	0.48	0.35	0.60	0.98
500	0.55	0.44	0.49	0.40	0.62	1.01
750	0.56	0.44	0.49	0.43	0.63	1.03
1000	0.56	0.45	0.50	0.45	0.64	1.04

**The 1-year condition was estimated by extrapolation of the frequency curve using the values up to a return period of 25 years*

7.6 Joint probability of surge and waves

The coincidence of storm surge and extreme wave heights could potentially aggravate the damage inflicted by typhoon surge levels. The wave height itself is also influenced by the surge levels as the total water depth can limit the wave heights in the nearshore zone. Hence, it is relevant to assess whether there is any correlation between surge levels and wave heights during typhoons.

The results of the model simulations show that the peak wave heights generally occur within several hours from the maximum surge level during typhoons. In Figure 7-8 and Figure 7-9, the evolution of surge level, wave height, and some other relevant wave parameters is depicted for several typhoons. Because of the apparent simultaneous occurrence of peak surge and peak wave height, the surge level and wave height of typhoons were treated as fully dependent for design purposes in this study.

Project related

Royal HaskoningDHV

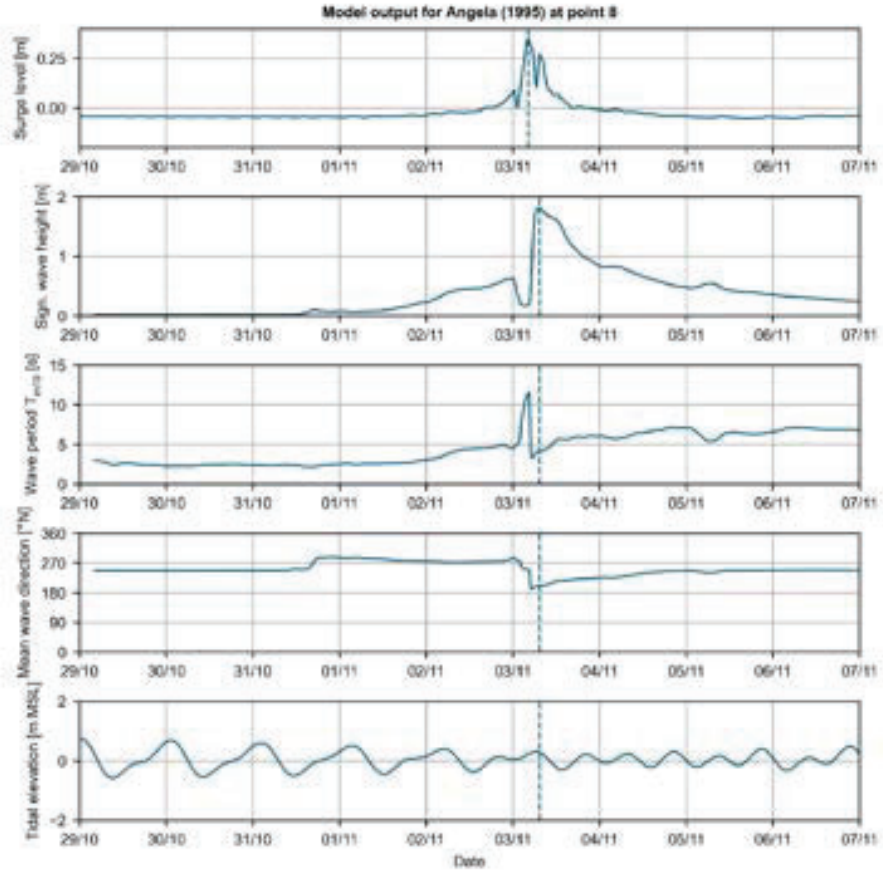


Figure 7-8 Time evolution of storm surge and several relevant wave parameters for typhoon Angela (1995) at location 8

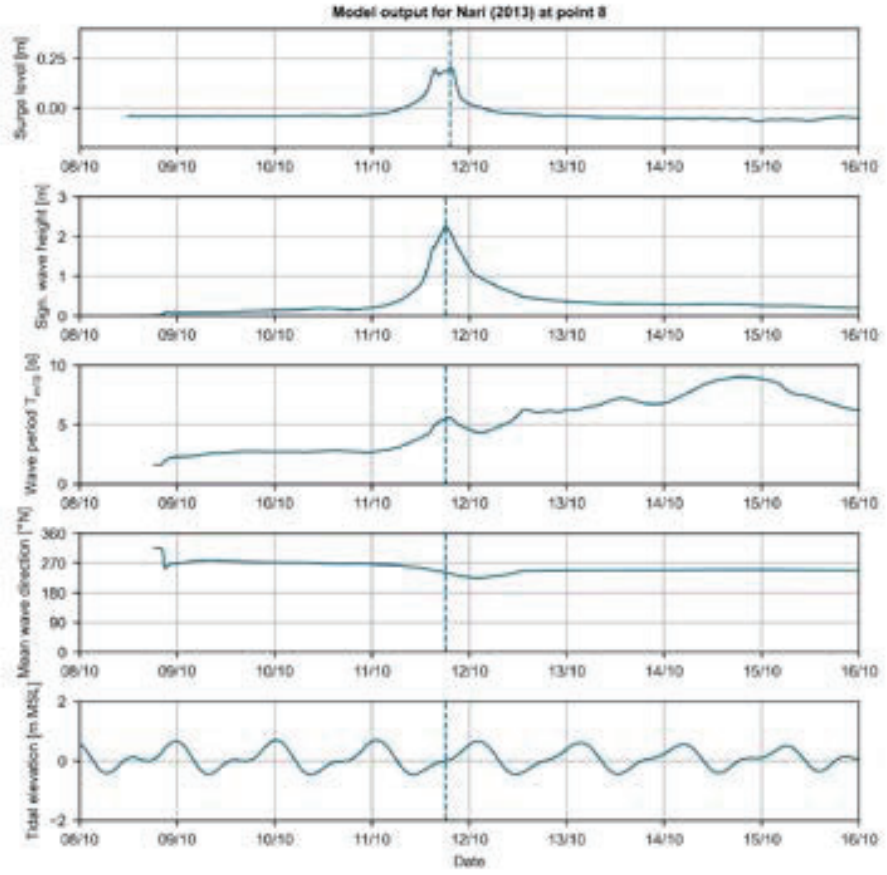


Figure 7-9 Time evolution of storm surge and several relevant wave parameters for typhoon Nari (2013) at location 8

The model results for the typhoons Angela (1995) and Nari (2013), were each picked because these typhoons show other interesting characteristics related to typhoon-induced storm surge and waves. For instance, the spectral significant wave height during typhoon Angela (1995) drops almost directly after it reached its maximum value. An explanation of this behaviour can be found in the wind data during the typhoon. A closer examination of the wind field of Angela (1995) shows that this drop occurs exactly at the moment when the eye of the typhoon passes Manila Bay, i.e. when the wind is relatively calm. The passage of the eye of the storm over Manila Bay also provides a possible explanation for the observed changes in wave period. The wind speed decreases significantly in the eye of the storm. This decrease in wind speed can lead to a reduction in wind sea waves (locally generated by the typhoon), while the longer-period waves (swell) that were generated far off continue to propagate into the bay and to the project site. As a result, the energy distribution in the wave spectrum shifts towards the lower frequencies (or longer periods), which can

lead to the observed increase in wave period. The subsequent decrease in wave period is caused by the increase of the wind sea component in the energy spectrum due to the high waves coming from the south.

Nari (2013) shows a peak in the mean wave period long after passage of the typhoon. This peak can be explained by the generation of swell waves by the typhoon outside Manila Bay. Despite their relatively modest wave height, these swell waves have the potential to cause damage to coastal structures. Consequently, these post-typhoon swell waves are also considered in the development of design conditions.

7.7 Design water level

The focus of this section is to provide the peak design water levels based on the information presented in Chapter 0. For consistency purposes, the methodology for the derivation of the design water is identical to the approach that was adopted in the study of 2017 [6]. This means that the results from the extreme value analysis of the annual maxima of the water level measurements described in Chapter 0 are combined with a SLR value and uncertainty factor to define the design water levels.

So, the design water level consists of an extreme water level, SLR value, and uncertainty factor to account for inherent atmospheric variations (aleatory uncertainty) and the statistical extrapolation (epistemic uncertainty):

$$Design\ water\ level = WL_{EVA} + SLR + uncertainty \qquad \text{Eq. (6-1)}$$

The water level component (WL_{EVA}) follows from the extreme value analysis of the measured water levels in Section 4.2. The SLR component equals the SLR value mentioned in Section4.3, i.e. 0.70 m in 2075. The values for the uncertainty factor follow from a statistical analysis of the water level measurements from NAMRIA that was done in earlier studies by RHDHV [6, 15] and from expert judgement by RHDHV. An overview of the values of each component of the total uncertainty factor is given in Table 7-5.

Table 7-5: Uncertainty allowances for the design water level [6, 15]

Return period [years]	Uncertainty due to statistical extrapolation (m)	Uncertainty due to measurement errors (m)	Uncertainty due to atmospheric variations (m)	Uncertainty allowance (m)
1	0.0	0.05	0.15	0.2
10	0.1	0.05	0.15	0.3
100	0.2	0.05	0.15	0.4
1000	0.3	0.05	0.15	0.5

Table 7-6 summarises how combining all the components result in the design water levels around the land reclamation for a 1-year return period up to 1000-year return period.

Royal HaskoningDHV

Table 7-6: Derivation of design water level

Return period [years]	Best estimate water level [m MSL]	SLR [m]	Uncertainty [m]	Design water level 2025 [m MSL]	Design water level 2075 [m MSL]
1	0.91	0.70	0.20	1.11	1.81
2	1.11	0.70	0.23	1.34	2.04
5	1.24	0.70	0.27	1.51	2.21
10	1.32	0.70	0.30	1.62	2.32
25	1.41	0.70	0.34	1.75	2.45
50	1.48	0.70	0.37	1.85	2.55
100	1.55	0.70	0.40	1.95	2.65
250	1.63	0.70	0.44	2.07	2.77
500	1.68	0.70	0.47	2.15	2.85
750	1.72	0.70	0.49	2.21	2.91
1000	1.74	0.70	0.50	2.24	2.94

7.8 Design wave conditions

For the design wave conditions of the coastal revetment, two situations are distinguished for design purposes:

- Wave characteristics during the passage of the typhoon, i.e. peak wave conditions, discussed in Section 7.8.1.
- Wave characteristics related to the swell waves after passage of the typhoon, presented in Section 7.8.2.

7.8.1 Peak wave conditions

Approach for the derivation of peak wave conditions

Peak wave heights are derived from the typhoon simulations. The results of the extreme value analysis of the typhoon simulations are translated into design values by correcting for uncertainties (e.g. statistical extrapolation, modelling errors, etc.). A distinction is made between the western side and the northern and southern parts of the reclamation. For the western side, the wave attack is more or less perpendicular as the dominant wave direction of the typhoons is west.

As the waves predominantly come from the west, the waves approach the northern and southern sections of the reclamation under a large angle. However, local bed refraction effects may alter the orientation of these incoming waves, as illustrated in Figure 7-10, depicting the mean wave direction for all simulated typhoons at point 5 (western side) and point 27 (southern side). As the waves pass the land reclamation, there is a reduction in the angle of incidence due to these refraction and diffraction effects. Considering these processes, it is suggested to adopt a maximum incoming wave angle of 30 degrees for the northern and southern sides of the coastal development.

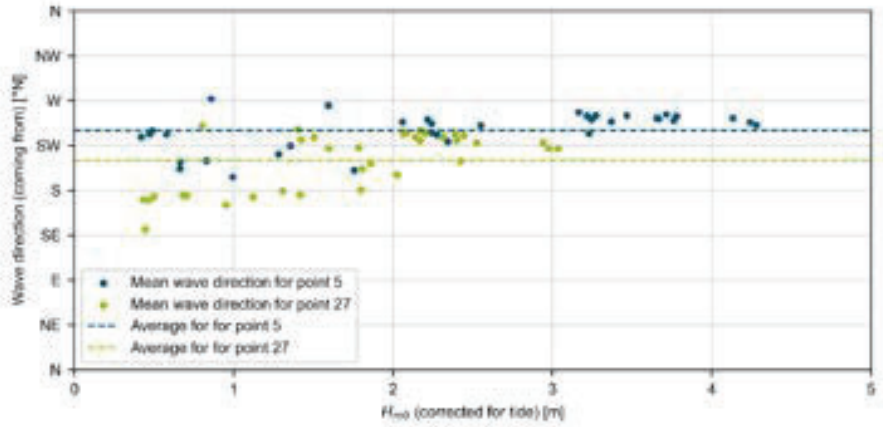


Figure 7-10: Mean wave directions of all simulated typhoons for the points 5 and 27

In addition, the northern and southern sides could also be exposed to waves generated by wind coming from the north and south, respectively. These waves with a more perpendicular approach will, however, be characterised by lower wave heights due to the shorter fetch for these directions.

To quantify the decrease in wave height resulting from this shorter fetch, a series of calculations using the empirical Bretschneider equations were carried out. By ascertaining the ratio of wave heights from the north or south in comparison to those from the west through Bretschneider calculations, the reduction factors for wave height can be estimated.

These formulae were first developed by Sverdrup and Munk and later revised by Bretschneider. The formula for the estimation of the wave height is as follows:

$$H_s = \frac{0.283 U_{10}^2 a_1}{g} \tanh\left(\frac{0.0125}{a_1}\left(\frac{gF}{U_{10}^2}\right)^{0.42}\right), a_1 = \tanh\left(0.530\left(\frac{gd}{U_{10}^2}\right)^{0.75}\right) \quad \text{Eq. (6-3)}$$

where H_s is the significant wave height, U_{10} the average wind speed at 10 m above MSL, g the gravitational acceleration (9.81 m/s²), F the fetch, and d the water depth (assumed constant).

The following conditions were used in the Bretschneider calculations to obtain the estimated reductions:

- Reference situation with wind from the west: fetch of 40 km, water depth of 10 m, wind speed of 30-50 m/s
- Situation with wind from the north:
  - Point 13: fetch of 6 km, water depth of 10 m, wind speed of 30-50 m/s
  - Point 14: fetch of 3.5 km, water depth of 10 m, wind speed of 30-50 m/s
  - Point 15: fetch of 3.5 km, water depth of 10 m, wind speed of 30-50 m/s
  - Point 16: fetch of 3.0 km, water depth of 10 m, wind speed of 30-50 m/s
  - Point 17: fetch of 3.0 km, water depth of 10 m, wind speed of 30-50 m/s
- Situation with wind from the south: fetch of 5.6 km, water depth of 10 m, wind speed of 30-50 m/s

Royal HaskoningDHV

The fetch for both the northern and southern sides was determined through the "effective fetch" approach. In this method, an effective fetch is calculated by considering the variation in fetch lengths within +/- 42 degrees from the perpendicular angle. Throughout these calculations, a constant water depth of 10 meters and wind speeds ranging from 30 to 50 m/s were maintained for all situations to evaluate the impact of only the fetch length.

The outcomes of these calculations indicate that the wave height on the southern side (point 24-28) is roughly 66–77% of the wave height in the reference scenario where the wind comes from the west. On the northern side, the wave height varies from 53 to 78%, depending on the wind speed and output location. It is important to note that the wind speeds employed in these calculations are at the upper boundary of the range for which the Bretschneider formulations are likely applicable. Nonetheless, it is suggested to apply a reduction factor based on these calculations into the peak design waves derived from the typhoon modelling for situations involving perpendicular wave incidence. This reduction is proposed to prevent excessive conservatism in the design. Based on these calculations, the following reduction factors are proposed:

- Point 13: 25%
- Point 14: 30%
- Point 15: 30%
- Point 16: 35%
- Point 17: 35%
- Point 24-28: 25%

An overview of the resulting approach for the derivation of the peak wave height conditions is provided in Table 7-7. As explained above, a distinction is made between the northern, western, and southern side of the reclamation project.

Table 7-7: Approach adopted for the derivation of peak wave conditions for the different stretches of the reclamation project

Location	Perpendicular wave attack	Oblique wave attack
Northern boundary	Model results -35% to -25%	Model results with oblique angle of incidence of 30°
Western boundary	Model results	N/A
Southern boundary	Model results -25%	Model results with oblique angle of incidence of 30°

Peak wave heights

The results of the extreme value analysis for waves can be found in Section 7.3 (H_{m0} corrected for tide) and Section 7.4 (H_{m0} corrected for tide and sea level rise).

The resulting design wave heights can be limited by shallow water. The maximum possible wave height is defined by 0.55 times the total water depth. This water depth consists of:

- Water depth at still water conditions (MSL), depends on the seabed level
- Surge level for the corresponding return period
- High tide water level (MHHW: 0.51 m)
- Relative SLR (0.70 m) for 2075

All calculated wave heights are checked for this depth-limitedness and adjusted accordingly if necessary.

Wave period

The wave periods corresponding to the peak design wave heights were estimated from the model results. The following well-known relationship between the wave period ($T_{m-1,0}$) and significant wave height (H_{m0}) for fully-developed wind-generated waves was fitted to the model results to obtain estimates for the wave periods:

Royal HaskoningDHV

$$T_{m-1,0} = aH_{m0}^{0.3}$$ Eq. (6-2)

with $T_{m-1,0}$ [s] the mean wave period and H_{m0} [m] the significant wave height. The relationship of Equation (6-2) was fitted to the model results for the locations of each side of the reclamation separately to determine the relationship more accurately as it is expected that the presence of the reclamations will affect the correlation between wave period and wave height.

Equation (6-2) was fitted to the model results for each side of the reclamation separately. This approach was chosen as the model results show that the presence of the reclamations affects the wave conditions along the boundaries of the project site. By fitting the relationship for each side separately, a more precise representation of the relationship between wave period and wave height may be obtained.

The results in Figure 7-10 show that the same value of 4 can be adopted for coefficient a in Equation (6-2) for both the western and southern sides of the reclamation. For the northern side, the coefficient a takes on a value of 3.6.

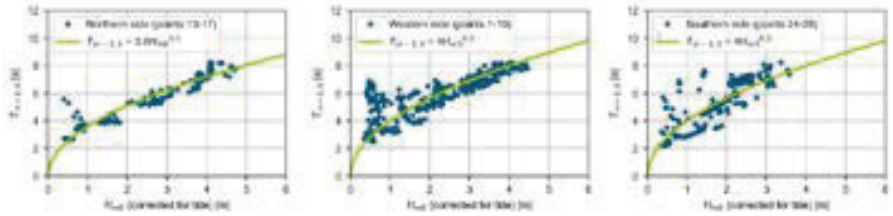


Figure 7-11: Empirical relationships between mean wave period ($T_{m-1,0}$) and significant wave height (H_{m0}) for the northern side (left), western side (middle), and southern side (right) of the reclamation

Peak wave conditions per reclamation side

Following the above-described method, the resulting design wave conditions can be derived for all sides of the land reclamation. The results for a number of locations along each of the sides are listed in Table 7-8, Table 7-9, and Table 7-10.

Table 7-8: Peak design wave conditions (2025) for points along the northern boundary

Return period [years]	Normal wave incidence				Oblique wave incidence (30 degrees maximum)			
	14		16		14		16	
	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]
1	1.51	4.42	1.40	4.26	2.15	5.28	2.16	5.29
2	1.68	4.67	1.55	4.49	2.40	5.58	2.39	5.57
5	2.78	6.00	2.59	5.80	3.97	7.17	3.99	7.18
10	3.09	6.33	2.87	6.10	4.42	7.57	4.42	7.57
25	3.28	6.49	3.01	6.25	4.65	7.76	4.63	7.75
50	3.30	6.54	3.04	6.28	4.72	7.82	4.68	7.79
100	3.33	6.56	3.06	6.30	4.75	7.85	4.71	7.81
250	3.34	6.58	3.07	6.31	4.77	7.86	4.72	7.82

Royal HaskoningDHV

500	3.34	6.58	3.07	6.31	4.77	7.86	4.72	7.82
750	3.34	6.58	3.07	6.31	4.77	7.86	4.72	7.82
1000	3.34	6.58	3.07	6.31	4.77	7.86	4.72	7.82

Table 7-9 Peak design wave conditions (2025) for points along the western boundary

Return period [years]	Normal wave incidence							
	1		3		8		10	
	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]
1	1.88	5.48	1.65	5.14	1.49	4.89	1.15	4.29
2	2.25	6.00	2.04	5.71	1.83	5.41	1.40	4.73
5	3.46	7.44	3.25	7.21	2.87	6.78	2.16	5.88
10	3.95	7.95	3.76	7.76	3.31	7.28	2.48	6.30
25	4.38	8.37	4.21	8.21	3.70	7.69	2.77	6.66
50	4.61	8.59	4.44	8.43	3.91	7.91	2.93	6.85
100	4.77	8.74	4.62	8.60	4.07	8.07	3.04	6.97
250	4.92	8.87	4.79	8.75	4.22	8.22	3.16	7.11
500	5.01	8.95	4.88	8.84	4.31	8.30	3.22	7.18
750	5.05	8.99	4.93	8.88	4.35	8.34	3.25	7.21
1000	5.07	9.01	4.95	8.90	4.37	8.36	3.27	7.23

Table 7-10 Peak design wave conditions (2025) for points along the southern boundary

Return period [years]	Normal wave incidence				Oblique wave incidence (30 degrees maximum)			
	25		27		25		27	
	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]
1	0.99	3.98	1.02	4.04	1.32	4.59	1.36	4.66
2	1.19	4.35	1.19	4.37	1.58	5.03	1.59	5.04
5	1.81	5.38	1.75	5.29	2.41	6.21	2.33	6.11
10	2.07	5.75	1.97	5.62	2.76	6.65	2.63	6.49
25	2.30	6.06	2.18	5.90	3.06	7.00	2.90	6.81
50	2.42	6.22	2.27	6.03	3.22	7.18	3.03	6.99
100	2.51	6.33	2.35	6.13	3.34	7.31	3.13	7.08
250	2.59	6.43	2.42	6.23	3.45	7.43	3.23	7.19
500	2.63	6.49	2.45	6.28	3.51	7.49	3.27	7.23
750	2.66	6.52	2.48	6.29	3.54	7.53	3.30	7.27
1000	2.66	6.53	2.48	6.30	3.55	7.54	3.31	7.28

Similarly, the design values for 2075 accounting for sea level rise are listed in Table 7-11, Table 7-12, and Table 7-13

Royal HaskoningDHV

Table 7-11: Peak design wave conditions (2075) for points along the northern boundary

Return period [years]	Normal wave incidence				Oblique wave incidence (30 degrees maximum)			
	14		16		14		16	
	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]
1	1.64	4.61	1.55	4.49	2.34	5.51	2.39	5.56
2	1.82	4.86	1.70	4.70	2.60	5.80	2.62	5.83
5	2.09	6.22	2.82	6.05	4.27	7.44	4.34	7.50
10	3.31	6.55	3.11	6.35	4.73	7.83	4.78	7.87
25	3.48	6.71	3.24	6.48	4.97	8.03	4.99	8.04
50	3.53	6.76	3.28	6.52	5.04	8.08	5.05	8.09
100	3.54	6.78	3.30	6.54	5.06	8.10	5.07	8.11
250	3.56	6.79	3.30	6.54	5.08	8.11	5.08	8.11
500	3.56	6.79	3.30	6.54	5.08	8.11	5.08	8.11
750	3.56	6.79	3.30	6.54	5.08	8.11	5.08	8.11
1000	3.56	6.80	3.31	6.55	5.09	8.12	5.09	8.12

Table 7-12: Peak design wave conditions (2075) for points along the western boundary

Return period [years]	Normal wave incidence							
	1		3		8		10	
	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]
1	2.02	5.68	1.76	5.31	1.59	5.05	1.23	4.43
2	2.41	6.21	2.17	5.89	1.95	5.59	1.49	4.88
5	3.69	7.68	3.46	7.44	3.05	6.99	2.29	6.05
10	4.21	8.21	4.00	8.00	3.52	7.50	2.64	6.50
25	4.66	8.63	4.47	8.46	3.93	7.93	2.94	6.86
50	4.90	8.85	4.72	8.69	4.15	8.15	3.10	7.04
100	5.07	9.01	4.91	8.86	4.32	8.31	3.23	7.19
250	5.23	9.15	5.09	9.02	4.48	8.47	3.34	7.31
500	5.32	9.23	5.18	9.10	4.57	8.55	3.41	7.39
750	5.36	9.26	5.23	9.15	4.61	8.59	3.44	7.42
1000	5.38	9.28	5.26	9.17	4.64	8.62	3.46	7.44

Table 7-13: Peak design wave conditions (2075) for points along the southern boundary

Return period [years]	Normal wave incidence				Oblique wave incidence (30 degrees maximum)			
	25		27		25		27	
	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]	H_{m0} [m]	$T_{m-1,0}$ [s]
1	1.07	4.13	1.10	4.20	1.42	4.77	1.47	4.85
2	1.28	4.52	1.28	4.53	1.70	5.22	1.71	5.23

Royal HaskoningDHV

5	1.94	5.57	1.88	5.48	2.59	6.44	2.50	6.32
10	2.22	5.96	2.12	5.82	2.96	6.88	2.82	6.72
25	2.46	6.27	2.33	6.10	3.28	7.24	3.10	7.04
50	2.59	6.43	2.43	6.24	3.45	7.43	3.24	7.20
100	2.68	6.55	2.51	6.34	3.57	7.56	3.35	7.32
250	2.77	6.65	2.59	6.43	3.69	7.68	3.45	7.43
500	2.81	6.71	2.63	6.48	3.75	7.75	3.50	7.48
750	2.84	6.73	2.64	6.50	3.78	7.78	3.52	7.50
1000	2.85	6.75	2.66	6.52	3.80	7.80	3.54	7.53

7.8.2 Swell wave conditions

The timeseries of the wave characteristics (height, period, direction) obtained from the typhoon simulation show that for some typhoons there is a second peak in the wave period 1-2 days after passage of the typhoon, see for instance typhoon Nari (2013) in Figure 7-9. This rise in wave period is likely associated with swell waves that are generated in the ocean during the typhoons and reach Manila Bay after the typhoon has passed. These long waves with a wave period typically around 10 s are generally low (significant wave height < 1 m). However, they may be relevant for the design of the reclamation since longer waves can result in substantial overtopping discharges. Therefore, a quick and high-level analysis of these swell was carried out.

The model results were investigated in more detail to identify the characteristics of these swell waves. The maximum mean wave period ($T_{m-1,0}$) in the days after the passage of the typhoons was collected for all storms and an extreme value analysis on these values was carried out. Swell characteristics were determined for the scenario without any islands (for point 14) to obtain characteristics that are realistic and can be accounted for in the designs for all sections of the project site. An allowance of +1 seconds was added to the results of the extreme value analysis to account for the uncertainty in the statistical extrapolation that comes with the limited number of swell events that were used in the extreme value analysis.

The typical significant wave height of the swell waves is less than 1 meter, with a maximum recorded value of 0.6 meters in the 23 storms where swell waves were identified (Dan, 1989). Due to the limited number of events and the very small values associated with significant wave height, distinguishing between extreme and non-extreme events becomes challenging, making the results of an extreme value analysis of wave heights unreliable. This lack of reliability is confirmed by the low goodness-of-fit R^2 (0.891) and residual quantiles R^2 (0.786) of the fitted GEV distribution. Therefore, an alternative method based on the steepness value (s_0) is proposed to estimate the corresponding significant wave height. The wave steepness is a common parameter for categorising swell or wind sea waves. Using the maximum steepness value of swell events (s_0 = 0.0075), the significant wave height corresponding to the mean wave period $T_{m-1,0}$ for various return periods was calculated, as shown in Table 7-14.

Royal HaskoningDHV

Table 7-14 Design swell wave conditions

Return period [years]	Mean wave period $T_{m-1,0}$ [s]	Significant wave height H_{m0} [m] (based on s_0 = 0.0075)
1	7.0	0.4
2	7.7	0.4
5	9.8	0.7
10	10.7	0.9
25	11.6	1.0
50	12.1	1.1
100	12.6	1.2
250	13.2	1.3
500	13.6	1.4
750	13.8	1.4
1000	14.0	1.5

**The 1-year condition was estimated by extrapolation of the frequency curve using the values up to a return period of 25 years.*

As these swell waves occur 1-2 days after the typhoon passage, the storm surge associated with the typhoons is not present anymore. This means that the 1-year water level could be adopted in combination with all wave conditions listed in Table 7-14. The swell waves originate from the west, entering Manila Bay from the Southern Chinese Ocean. Consequently, an oblique wave incidence, with a maximum angle of 30 degrees, is appropriate for the northern and southern sides. It is important to note that the swell conditions outlined in Table 7-14 have not been adjusted for future scenarios. The choice of a 1.5 m wave height (1000-year return period) and the 1-year water level is considered conservative, and no further allowances are deemed necessary for these values.

7.9 Design current speed

This section focuses on current speeds close to the project site. Current velocities are important since these can affect the stability of a structure and induce erosion close to the toe of the coastal protection structure. These current velocities close to the project site are induced by wind, wave breaking and tidal variation. There are some important restrictions to the model results which should be kept in mind for this section:

- The typhoon modelling does not include tidal variation;
- The current velocities are depth-averaged;
- The current velocities during typhoon conditions are not calibrated.

Because of these restrictions, the current velocities from the model results only give a very rough indication of the potential current velocities around the project site.

Section 7.5 provides an overview of the extreme current velocities at the output locations. From the model results (Section 6.8), the maximum current speed from the historical set of typhoons is 0.8 m/s during a period of 44 years (point 27 for Nesat, 2011). For most output points, this is higher than the current velocities for a return period of 1000 years, except for the points along the southern boundary of the reclamation. For those points, the speed of 0.80 m/s corresponds roughly to the values for a return period between 50 and 100 years.

Royal HaskoningDHV

Tidal variation is not included in these results; experience in a recent project [15] shows that the tidal variation results in low velocities in this part of Manila Bay (0.1 m/s at maximum). Future conditions may increase the wave heights due to increasing water depth. This will also increase the current speeds induced by wave breaking. Next, there is lack of calibration data to verify the current speeds during typhoon conditions. Therefore, +50% is added to the current velocity to allow for these uncertainties/changes in the future. For location 27, the extreme current speed for 1000 years is 1.04 m/s (see Table 7-4). The added tidal variation is 0.1 m/s, and the uncertainty allowance for future changes is 0.52 m/s (half of the extreme value). Therefore, the design current speed at this location for a 1000-year return period in the future (2075) is 1.66 m/s. The design current speeds for present-day conditions are given in Table 7-15. The design current speeds for future conditions (including the uncertainty allowance) are given in Table 7-16.

The design current speeds can be applied for the straight stretches of the coastal zone development. It is suggested to be careful with the values near the corners of the coastal zone development (near locations 10 and 28). At these locations, higher currents may develop due to differences in wave breaking processes (and thus head differences) along the coastal development.

Table 7-15: Design current velocity (2025) [m/s]

Return period [years]	Design current velocity (2025) [m/s] at location					
	1	3	8	10	14	27
1	0.32	0.30	0.33	0.16	0.31	0.36
2	0.36	0.33	0.36	0.19	0.36	0.46
5	0.47	0.41	0.44	0.24	0.47	0.67
10	0.52	0.44	0.48	0.28	0.53	0.79
25	0.58	0.48	0.52	0.32	0.59	0.91
50	0.59	0.50	0.54	0.36	0.63	0.97
100	0.61	0.51	0.56	0.40	0.66	1.03
250	0.64	0.53	0.58	0.45	0.70	1.08
500	0.65	0.54	0.59	0.50	0.72	1.11
750	0.66	0.54	0.59	0.53	0.73	1.13
1000	0.66	0.55	0.60	0.55	0.74	1.14

Table 7-16: Design current velocity (2075) [m/s]

Return period [years]	Design current velocity (2075) [m/s] at location					
	1	3	8	10	14	27
1	0.44	0.40	0.44	0.18	0.41	0.49
2	0.49	0.45	0.49	0.24	0.49	0.64
5	0.66	0.57	0.61	0.31	0.66	0.96
10	0.73	0.61	0.67	0.37	0.75	1.14
25	0.79	0.67	0.73	0.43	0.84	1.32
50	0.84	0.70	0.76	0.49	0.90	1.41
100	0.87	0.72	0.79	0.55	0.94	1.50
250	0.91	0.75	0.82	0.63	1.00	1.57

Project related

Royal HaskoningDHV

500	0.93	0.76	0.84	0.70	1.03	1.62
750	0.94	0.76	0.84	0.75	1.05	1.65
1000	0.94	0.78	0.85	0.78	1.06	1.66

Royal HaskoningDHV

8 Comparison design output 2017 vs. 2024

This study is an update of an earlier hydraulic modelling study carried out for the Pasay and Parañaque (PRDP) reclamation project in 2017 [6]. This chapter includes a comparison of the design output between 2017 and 2024. First, a comparison of the design water levels is presented in Section 8.1. Then, the design output regarding wave heights and wave periods is presented in Section 8.2.

8.1 Design water levels

The design water levels corresponding to various return periods, as determined in 2017 and in the current study (2024), are presented in Table 8-1. The water levels in the table have been presented without accounting for SLR to allow for a fair comparison. The results in Table 8-1 indicate that the differences between the values from 2017 and from the current study are small, in the order of a few centimetres. These small differences may be the result of including new annual maxima data spanning the years 2016 to 2020.

Table 8-1 Comparison of design water levels (excl. SLR) 2017 vs. 2024

Return period [years]	2017			2024		
	Best estimate water level [m MSL]	Uncertainty allowance [m]	Design water level [m MSL]	Best estimate water level [m MSL]	Uncertainty allowance [m]	Design water level [m MSL]
1	0.91	0.20	1.11	0.91	0.20	1.11
5	1.22	0.27	1.49	1.24	0.27	1.51
10	1.30	0.30	1.60	1.32	0.30	1.62
25	1.39	0.34	1.73	1.41	0.34	1.75
50	1.46	0.37	1.83	1.48	0.37	1.85
100	1.52	0.40	1.92	1.55	0.40	1.95
250	1.62	0.44	2.06	1.63	0.44	2.07
500	1.69	0.47	2.16	1.68	0.47	2.15
750	1.73	0.49	2.22	1.72	0.49	2.21
1000	1.77	0.50	2.27	1.74	0.50	2.24

Royal HaskoningDHV

8.2 Design wave conditions

A comparison between the results from 2017 and 2024 was performed for both the northern and western boundaries. However, values for the southern boundary cannot be directly compared due to the presence of an additional island south of island C in the study from 2017 (the former island D). The output points from 2017 and 2024 are illustrated in Figure 8-1.

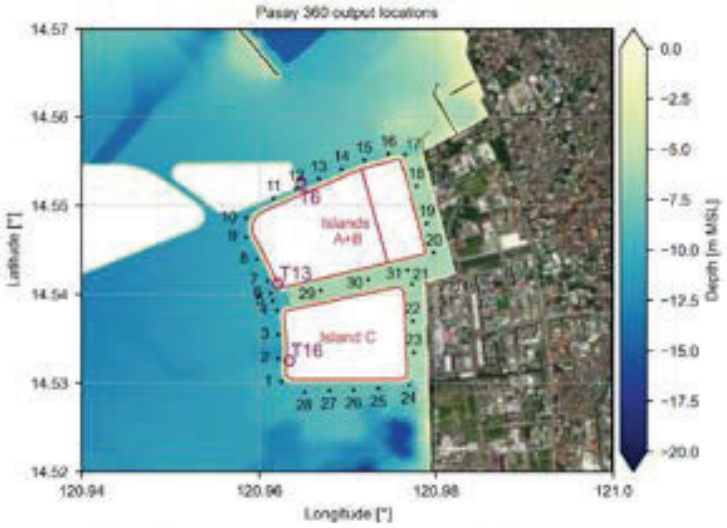


Figure 8-1: Wave output locations from 2017 (purple) and from 2024 (black)

The design wave heights determined in the study from 2017 and the results from this study are listed in Table 8-2. The table shows that the wave heights for the northern boundary are similar in magnitude, with the exception of the 1-year return period wave height. The same holds true for the western boundary. While there is a slight decrease in the design wave height in the more northern part of the western boundary (point 6), overall, the values are fairly similar, except for the 1-year return period wave height.

Several factors contribute to the observed differences. Firstly, the inclusion of an updated typhoon database with storms after 2015 could result in changes in the distribution and shape of the fitted distribution, thereby leading to changes in the return periods of wave heights. Secondly, the update of bathymetric data may influence the wave propagation processes. Additionally, a different approach in incorporating SLR was used in this study. In this approach, the impacts of both tidal effects and SLR on the water level are translated into a change in the design wave height. This modification is determined by the ratio of the wave height to the water depth, offering a more comprehensive consideration of factors compared to the 2017 approach, which only accounted for SLR. Lastly, the sheltering effects from PHCC Islands A and B are also considered in this study. This mainly has on impact on the more northern stretch of the western boundary.

Royal HaskoningDHV

Table 8-2: Comparison of design wave heights 2017 vs. 2024

Location	Northern boundary				Western boundary (island A+B)		Western boundary (island C)	
Model Yr.	2017		2024		2017	2024	2017	2024
WOP	T6	T6	13	14	T13	6	T16	2
Angle	300°	270°	Oblique	Oblique	270°	Normal	270°	Normal
1/1	3.21	4.35	2.38	2.34	4.38	1.76	4.10	1.85
1/25	4.74	4.97	5.12	4.97	5.24	4.45	5.15	4.57
1/100	4.92	5.04	5.23	5.06	5.36	4.89	5.27	5.00
1/1,000	4.96	5.06	5.26	5.09	5.41	5.24	5.33	5.33

A comparison of the mean wave period ($T_{m-1,0}$) is presented in Table 8-3. In the current study, the wave period is generally longer, which is due to the increased values of coefficient a in the relationship between wave height and wave period (Equation (6-2)) that was used to estimate the mean wave period.

Table 8-3: Comparison of mean wave period corresponding to the design wave heights 2017 vs. 2024

Location	Northern boundary				Western boundary (island A+B)		Western boundary (island C)	
Model Yr.	2017		2024		2017	2024	2017	2024
WOP	T6	T6	13	14	T13	6	T16	2
Angle	300°	270°	Oblique	Oblique	270°	Normal	270°	Normal
1/1	6.10	7.10	5.55	5.51	7.20	5.31	6.90	5.44
1/25	7.50	7.60	8.15	8.03	7.80	8.44	7.80	8.55
1/100	7.60	7.70	8.23	8.10	7.90	8.85	7.90	8.94
1/1,000	7.60	7.70	8.26	8.12	8.00	9.16	7.90	9.23

Royal HaskoningDHV

9 Wave penetration study

9.1 Study approach

Additional wave penetration modelling was carried out to assess the wave heights in the channels between the islands. The wave penetration into the channels was modelled using the open-source numerical model SWASH (Simulating WAves till SHore). SWASH is a phase-resolving model that was developed at the Delft University of Technology [16]. The model is based on the non-linear shallow water equations with a non-hydrostatic pressure term, and can be used to simulate non-hydrostatic, free-surface, rotational flows and transport phenomena in one, two, or three dimensions. SWASH is especially suitable for modelling situations in which processes such as reflection, diffraction, and wave breaking have to be accounted for. Therefore, this model was adopted to study the wave propagation in the channels.

Initially, model simulations were performed for both the north-south and east-west channels. In these simulations, both channels were 300m wide and had bed levels of -6m MSL. Over the course of this study, the dimensions of the channels changed. The north-south channel's width increased to 470m and the bed level was either -6m MSL or -8m MSL. The bed level of the east-west channel remained unchanged (-6m MSL), but the width reduced to 180m. In agreement with the Client, it was decided to adopt different approaches for the two channels. For the north-south channel new SWASH simulations were carried out for a 470m wide channel. For the east-west channel, the wave conditions in the channel were assessed based on expert judgement using the model results from the 2017 study [6] for a 180m wide channel and -4m MSL bed level and the more recent SWASH simulations for a 300m wide channel and bed level of -6m MSL.

9.2 North-south channel

9.2.1 Spatial grids

The computational grid's size and resolution were determined based on both wave conditions and computational limitations of the model. To accurately capture relevant wave transformation processes and minimise numerical dissipation, the spatial resolution was set to 2 meters in the horizontal direction and two vertical layers were used in all simulations. Figure 9-1 shows the model domain. For the north-south channel, the northern boundary of the model is positioned approximately 750m from the channel entrance. This distance ensures that waves have sufficient time to develop and stabilise before entering the channel.

Project related

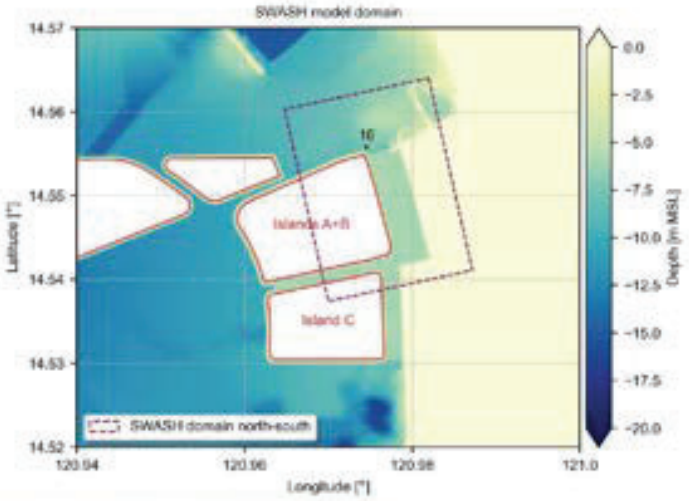


Figure 9-1: Model domain for the wave penetration study

The revetment along the island boundaries was schematised by means of a structure height grid, a porosity grid, and a stone size (D50) grid. The structure height grid includes varying heights based on the slope of the revetment relative to the bottom. The porosity of the revetment was set at 0.45, a typical value for rubble-mound structures. For the armour layer, a stone size (D50) of 0.5m was specified.

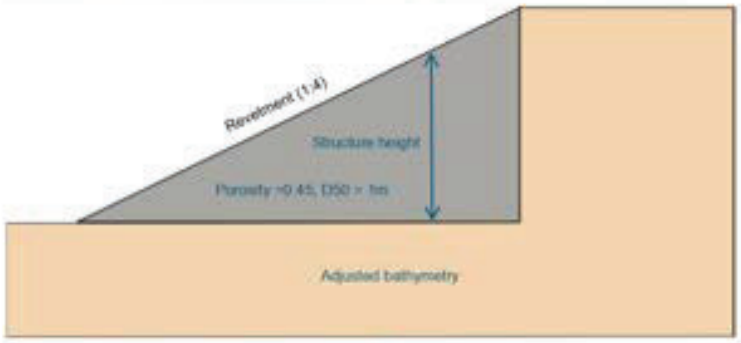


Figure 9-2: Schematisation of the revetment in SWASH

Royal HaskoningDHV

9.2.2 Initial and boundary conditions

The initial conditions for the models were set to zero, i.e. a water level of 0 meters and zero velocity in all directions. The bathymetry of the model was adjusted to incorporate the design water levels derived in Section 7.7.

JONSWAP spectra characterised by the significant wave heights and wave periods at the output point 16 (see Figure 9-1) were used as boundary conditions for the models. The wave heights were, however, scaled down to obtain stable simulations. Although this is a common approach in wave simulation studies, caution should be exercised when the wave heights approach the breaking wave height since linearly scaling becomes less valid in that case. Based on the found wave heights at the entrance and the channel bed level, this situation does not arise for the wave conditions selected for the north-south channel as the ratio of wave height versus water depth remains less than the set limit of 0.73 that is typically assumed to result in depth-induced breaking [17].

The wave periods T_{m-10} in Table 7-11 were converted to peak wave periods using the following relationship: $T_p = 1.1 \cdot T_{m-10}$ given in the Overtopping manual [18]. The wave period for the 1-year return period was, however, increased from 5s to 6s due to the limitations of the SWASH model. For shorter wave periods, excessive numerical dissipation will influence the results of the simulations.

To simulate a worst-case scenario, the mean wave direction at the wave generation boundary was aligned with the channel axis. Additionally, a weakly reflective boundary was imposed at the wave generation boundary to prevent artificial reflection. Finally, sponge layers with a thickness of 100 meters were added to the remaining boundaries of the model to prevent substantial changes in results due to reflection at those boundaries.

Table 9-1. Initial and boundary conditions for the SWASH model

Simulation	WL* [m]	H_{m0} [m]	T_p [s]	Wave dir. [°N]	Spectral shape	Dir. spreading [°]
1-year return period	1.53	1.5	5.0	348	JONSWAP (γ = 3.3)	20
25-year return period	2.17	1.5	7.1	348	JONSWAP (γ = 3.3)	20
100-year return period	2.37	1.5	7.2	348	JONSWAP (γ = 3.3)	20
1000-year return period	2.66	1.5	7.2	348	JONSWAP (γ = 3.3)	20

**The water level was implemented by adjusting the bed levels in the model.*

9.2.3 Remaining model settings

Besides the spatial grids, initial conditions and boundary conditions, several physical and numerical parameters have to be specified. Physical parameters that were specified are the bed friction coefficient, wave breaking parameters, and ambient viscosity to account for all forms of unresolved vertical mixing. The bed friction coefficient (Manning) was set to 0.016 $m^{-1/3}s$. Wave breaking was included by specifying a threshold of 0.73 at which wave breaking is initiated and a threshold of 0.3 at which wave breaking stops. The background viscosity was set to $3 \cdot 10^{-4}$ m^2/s which is within the recommended range in the SWASH manual [19].

Royal HaskoningDHV

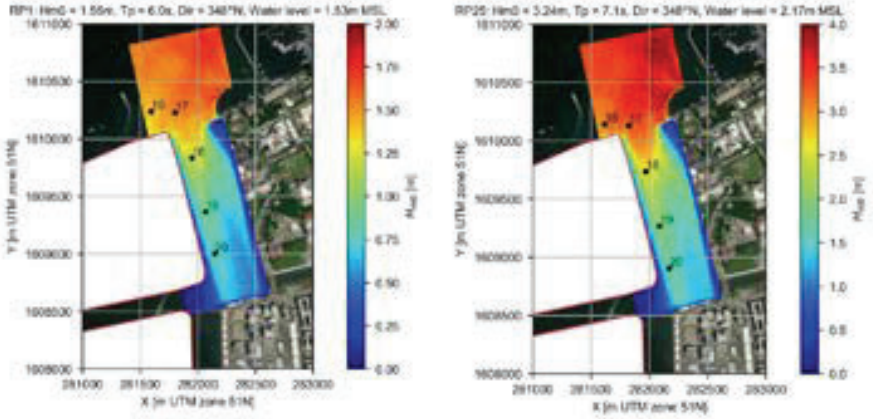
Regarding the numerics, parameters such as the duration of the simulation, time integration scheme, discretisation schemes of the advection terms of the momentum equations have to be provided. The adopted settings are listed in Table 9-2.

Table 9-2: Summary of the physical and numerical parameters used in the SWASH simulations

Model parameter	Parameter setting	SWASH code
Physical		
Bed friction (Manning)	$n = 0.016$ s/m$^{1/3}$	FRIC MANN 0.016
Wave breaking	$\alpha = 0.73$, $\beta = 0.3$	BREAK 0.73 0.3 1
Background viscosity	$\nu = 0.0003$ m^2/s	SET BACKVISC 3.e-4
Numerical		
Initial timestep and duration of simulation	$\Delta t = 0.08$ s, $t = 5000$ s	COMPUTE 000000.000 0.08 SEC 005000.000
Time integration scheme	Explicit, $Cfl_{min} = 0.1$, $Cfl_{max} = 0.5$	TIME 0.1 0.5
Momentum conservation	Upwind scheme	DISCRET UPW MOM MINMOD
Discretization advective terms	Upwind scheme	DISCRET UPW UMOM HOR BDF DISCRET UPW UMOM VERT NONE DISCRET UPW WMOM HOR BDF DISCRET UPW WMOM VERT FIRST
Discretization water depth	CORRDEP	DISCRET CORRDEP MUSCL

9.2.4 Model results for bed level -6m MSL

The results of the SWASH simulations for the north-south channel with a bed level -6m MSL are illustrated in Figure 9-3 and listed in Table 9-3. Note that the resulting wave heights were linearly scaled to match the significant wave heights corresponding to normal incidence waves for the respective return periods at the northern boundary of the reclamation.



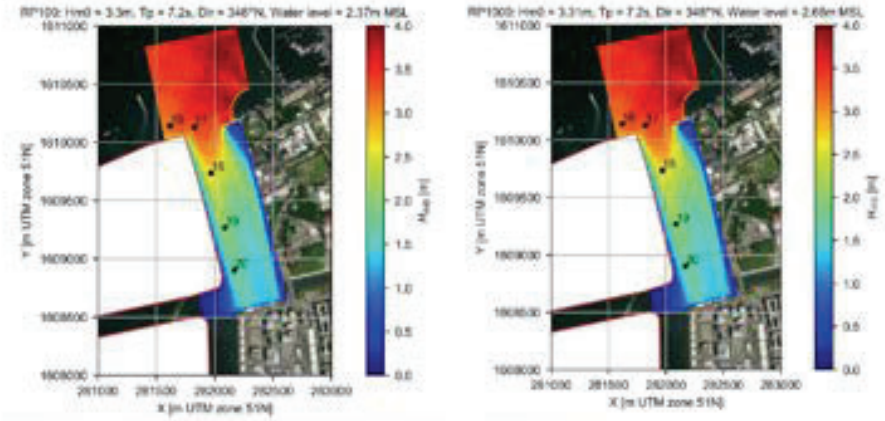


Figure 9-3: Significant wave heights for the north-south channel with bed level of -6m MSL

Table 9-3: Significant wave heights at output points in the north-south channel for a channel with bed level of -6m MSL

Return period [years]	Significant wave height H_{m0} [m] at location			
	Entrance	18	19	20
1	1.6	1.3	0.9	0.8
25	3.2	2.6	1.9	1.7
100	3.3	2.7	2.0	1.7
1000	3.3	2.7	2.0	1.7

The results presented in Figure 9-3 and Table 9-3 suggest a consistent pattern of wave height reduction across different return periods. After 400m into the channel (point 18), the wave heights decrease to approximately 80% of their original values. At a distance of 900m (point 19), the wave height reduces to roughly 60%. After 1200m (point 20), the remaining wave height stands at approximately 50% of the initial heights.

9.2.5 Model results for bed level -8m MSL

A SWASH simulation was carried out for a channel with a bed level of -8m MSL under the 1000-year return period condition. The outcomes, depicted in Figure 9-4 and listed in Table 9-4, reveal that the wave heights within the channel are similar to those found for a channel with a bed level of -6m MSL. The wave heights after distances of 400m, 900m, and 1200m, remain approximately 80%, 60%, and 50% of the wave height at the channel entrance.

There seems to be a subtle decrease in wave heights within the channel for the case with a bed level -8m MSL compared to the case of a channel with bed level of -6m MSL. A possible explanation lies in the process of wave shoaling near the entrance, where the bed exhibits a slope in the case of a channel with a bed level of -6m MSL. As waves approach the channel, their interaction with the gradually shallowing seabed causes a slight increase in wave height. However, this increase is not substantial, and it can be concluded that a

change in bed level from -6m MSL to -8m MSL does not result in significant changes in wave heights in the channel.

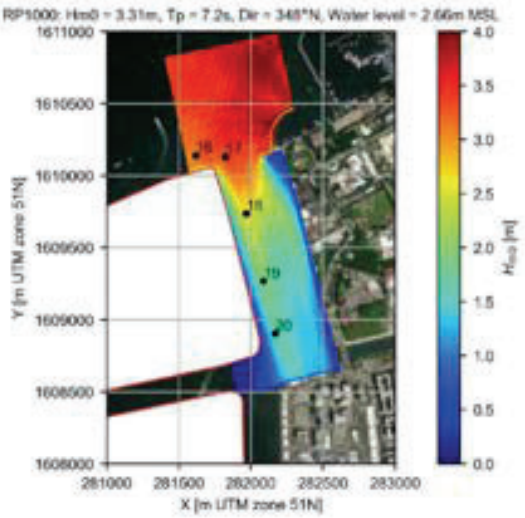


Figure 9-4: Significant wave heights for the north-south channel with bed level of -8m MSL

Table 9-4: Significant wave heights at output points in the north-south channel for a channel with bed level of -8m MSL

Return period [years]	Significant wave height H_{m0} [m] at location			
	Entrance	18	19	20
1000	3.3	2.6	1.9	1.6

9.3 East-west channel

The design wave conditions for the revetment along the east-west channel were based on expert judgement, informed by the wave penetration results from the 2017 study and the results of the simulations carried out for a 300m wide channel.

The findings from the 2017 study, depicted in Figure 9-5 to Figure 9-8, show that the wave height rapidly decreases when it enters the channel. The observed reductions in wave heights are consistent across the different return periods. This may well be attributed to the fact that the wave heights at the entrance of the channel are not significantly different for the various return periods; only the 1-year return period wave height is notably lower than the wave heights corresponding to the other three return periods. For the most extreme case, the 1000-year return period, the wave height is approximately 1.5m at 500m into the channel, 0.8m at 1000m, and 0.5m at 1500m. Expressed as percentages of the incoming wave height (5.41 meters), the remaining wave heights after these distances are approximately 30%, 15%, and 10%, respectively.

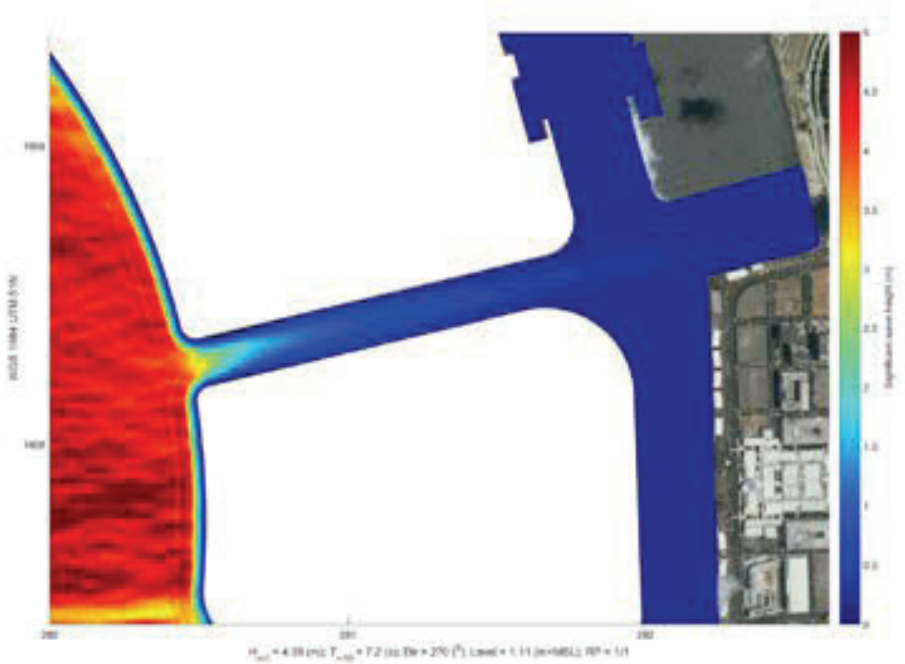


Figure 9-5 Significant wave height in the 180m wide channel for the 1-year return period condition

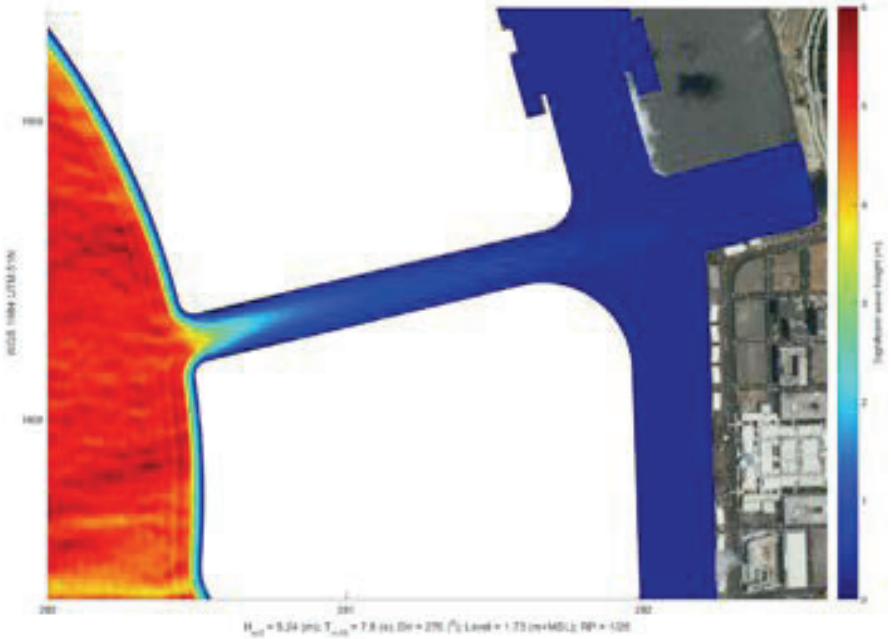


Figure 9-6 Significant wave height in the 180m wide channel for the 25-year return period condition

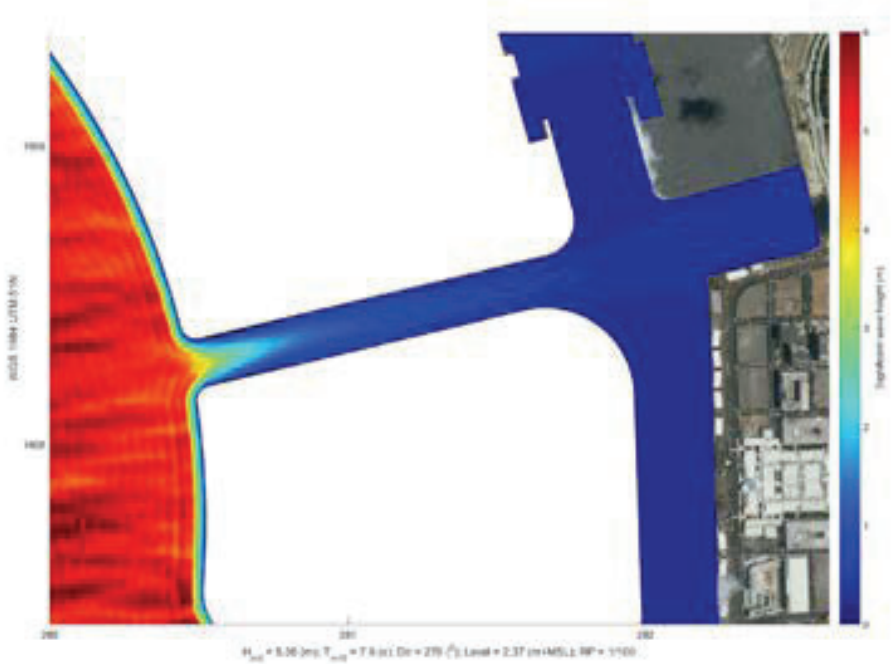


Figure 9-7: Significant wave height in the 180m wide channel for the 100 year return period condition

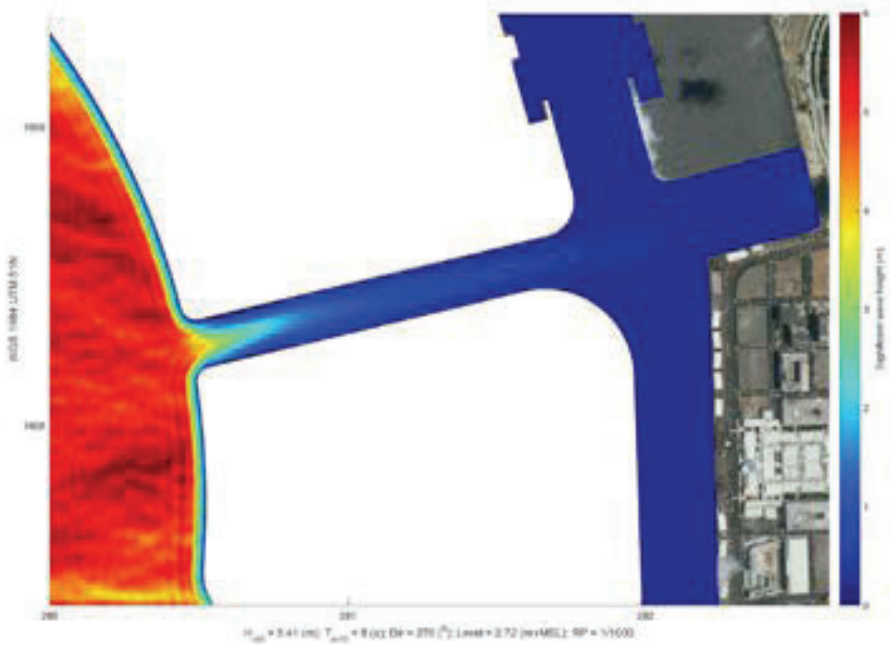


Figure 9-8: Significant wave height in the 180m wide channel for the 1000 year return period condition

The results for the 1000-year return period condition in a 300m wide channel with a bed level of -6m MSL are presented in Figure 9-9. According to the figure, the remaining wave heights at specific distances are as follows: at 500m (point 29), the remaining wave height is approximately 3.7m. At 1000m (point 30), the remaining wave height measures around 3.0m. Finally, at 1500m into the channel (point 31), the remaining wave height stands at approximately 2.8m. Expressed as percentages of the incoming wave height (5.33m), these remaining wave heights correspond to approximately 70%, 56%, and 53%, respectively.

Note that in this case, the ratio of wave height to water depth at the entrance of the channel is close to the limit of depth-induced breaking. As a result, the linearly scaled wave heights may be an overestimation of the actual wave heights in the channel.

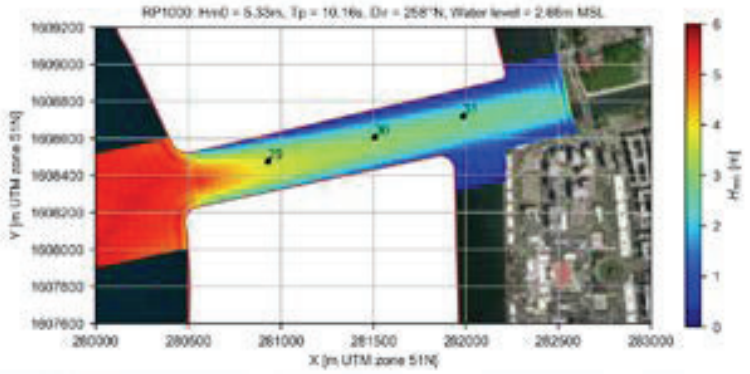


Figure 9-9: Significant wave height in the 300m wide channel for the 1000-year return period condition

A comparison of the results for a 180m wide channel (from the 2017 study) and for a 300m wide channel reveals that the channel width has a substantial impact on the wave penetration. In the wider 300m channel, wave heights turn out to be more than double those observed in the narrower 180m channel. Furthermore, the decrease in wave heights as waves propagate into the channel appears to be less pronounced for the 300m wide channel. Beyond 500m, the difference in remaining wave heights (as a percentage of the incoming wave height) between the 180m and 300m wide channel is roughly a factor 2. However, at 1500m, this difference increases to more than a factor 5. This suggests that considerably more wave energy penetrates further into the channel as the width increases.

The simulation results for the north-south channel suggest that the impact of bed level changes is relatively limited. The results for the north-south channel show that changing the bed level by 2m (from -6m MSL to -8m MSL) has a negligible effect on wave heights within the channel. However, the same does not necessarily hold for the west-east channel where the bed level changes from -4m MSL (2017 study) to -6m MSL (current channel depth) as the bed friction that causes dampening of the wave energy is not linearly related to the water depth. Hence, an increase in the amount of wave penetration may be expected for a 180m wide channel with a bed level of -6m MSL compared to the situation with a bed level of -4m MSL.

Overall, a conservative approach for estimating the wave heights in the east-west channel is preferred as it concerns an expert judgement. This approach involves finding a balance between the results for a 180m wide channel with a bed level of -4m MSL and the results for a 300m wide channel with a bed level of -6m MSL. Both the effect of a decrease in channel width from 300m to 180m as well as an increase in channel depth compared to the results for a 180m wide channel with a bed level of -4m MSL should be taken into consideration. Based on the simulation results, one can see that the rate of reduction changes as waves propagate into the channel. For the situation with a 180m wide channel and bed level of -4m MSL, the wave height reduces by 70% over the first 500m ($H_{m0;500} = 0.30H_{m0;entrance}$). Over the next 500m, the wave height reduces by 50% ($H_{m0;1000m} = 0.50H_{m0;500m}$). Over the last 500m, the wave height decreases by 33% ($H_{m0;1500m} = 0.67H_{m0;1000m}$). For the case of a 300m wide channel and bed level of -6m MSL, the reduction rates are 30% ($H_{m0;500} = 0.70H_{m0;entrance}$), 20% ($H_{m0;1000m} = 0.80H_{m0;500m}$), and 5% ($H_{m0;1500m} = 0.95H_{m0;1000m}$). As a conservative assumption, it is suggested to use the average reduction rates of both cases to come to wave height values for the case of a 180m wide channel with bed level of -6m MSL. This approach reflects a decrease in wave energy due to a reduced channel width compared to the situation of a 300m wide channel while also accounting for an increase in wave energy due to a lowered bed level compared to the case of a

180m wide channel width a bed level of -4m MSL. The resulting reduction rates are then 50% ($H_{m0;500m}$ = $0.50H_{m0;entrance}$), 35% ($H_{m0;1000m}$ = $0.65H_{m0;500m}$), and 20% ($H_{m0;1500m}$ = $0.80H_{m0;1000m}$). Consequently, the remaining wave heights at distances of 500m, 1000m, and 1500m, are estimated to be approximately 50%, 33%, and 26% of the initial incoming wave height. The resulting wave heights are included in Table 9-5.

Table 9-5: Significant wave heights at output points in the east-west channel based on expert judgement

Return period [years]	Significant wave height H_{m0} [m] at location			
	Entrance	29	30	31
1	1.9	1.0	0.6	0.5
25	4.6	2.3	1.5	1.2
100	5.0	2.5	1.6	1.3
1000	5.3	2.7	1.7	1.4

The wave period remains largely constant as waves propagate into shallower waters and into the channel. Therefore, it can be assumed that the same wave periods observed at the channel entrance apply to the design wave conditions within the channel.

Royal HaskoningDHV

10 Flushing Study

10.1 Introduction

In this chapter the flushing study is presented. As explained in Section 2, initially the layout for this study featured north-south and east-west channels with a width of 300 meters and a bed level of -6 meters MSL. In the latest design, the north-south channel widened to 470 meters while maintaining a bed level of -6 meters MSL, with an option to deepen to -8 meters MSL.

As the initial layout with 300m wide channels will not move forward, we will focus on the agreed scenarios as described in our proposal document *SF1013-RHD-CN-ZZ-ZZ-LT-0005 Proposal for additional flushing study Pasay 360 C02*:

- Scenario F: 470m wide channel between Island A+B and mainland, and all channel bed levels at -6m MSL;
- Scenario G: 470m wide channel at -8mMSL between Island A+B and mainland, the other 2 channels at -6m MSL; and
- Scenario H: 470m wide channel at -8mMSL between Island A+B and mainland, the other 2 channels at -6mMSL and with a bridge and land heads.

For comparison we have added Scenario A (no islands, base case) and Scenario B (original islands (A, B and C) size and locations from 2017).

10.1.1 Objectives

The objective of the flushing study is to provide insight into the flushing time of the water in the channels in between the proposed layout. This flushing time is used as an indication to estimate potential water quality issues due to the construction of the Pasay360 Reclamation, especially during the dry season. The simulation for wet season was also carried out to observe any substantial changes between the two seasons.

10.1.2 Drainage System in Manila Bay

There are 17 principal rivers and 11 major channels/outfalls draining into Manila Bay. Some of these systems are situated close to Pasay360 Reclamation. From north to south, these are Pasig River, Libertad Channel, Redemptorist Outfall, Seaside Outfall, and Parañaque River (see Figure 10-1). All these systems are included in the model.



Figure 10-1: Drainage system near Project site which are considered into the model

10.1.3 Seasons

Manila has a distinct seasonal climate regarding rainfall. The 30-year rainfall data at Manila Port Area (MCO) Station is plotted in Figure 10-2. The wettest period in a year occurs in August with an average precipitation amount of 432 mm. During the dry months (December to April), the average amount of rainfall per month is only 18 mm.

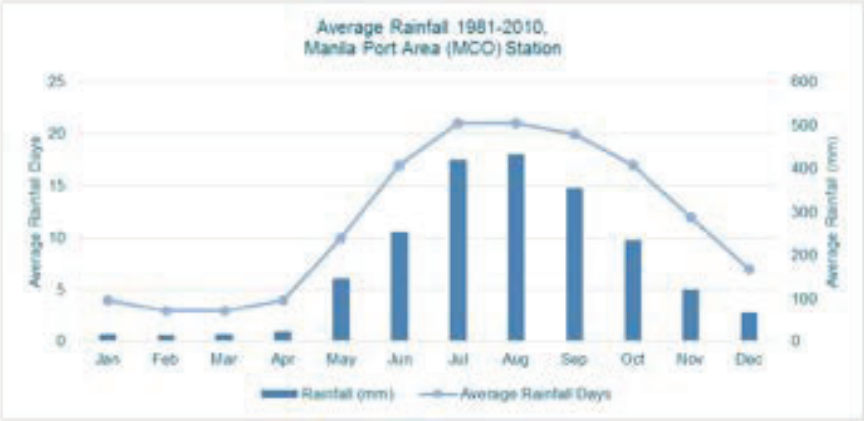


Figure 10-2: Average rainfall measurement at MCO Station in 1981-2010 [20]

Royal HaskoningDHV

River Discharges

The highest discharges from the outfalls / channels occur during periods with heavy rainfall. The most extreme rainfall is caused by typhoons and tropical storms. Typhoons in the Northwest Pacific can occur year-round, but there is a minimum in February and the first half of March, while the main season is from July to November with a peak in late August and early September [21].

The discharges in the return periods of 15, 25, 50, and 100 years for Libertad Channel, Redemptorist Outfall, Seaside Outfall, and Parañaque River were stated in the river management report for San Juan River by Woodfields Consultant, Inc. [22].

Pasig River is one of the main rivers draining into Manila Bay. The 1:100 years return period discharge of this river is considerably high, which reported to be 1400 m³/s in a study for flood management plan in Metro Manila conducted by Japan International Cooperation Agency (JICA) [23]. During the dry season, the annual Pasig River's discharge is expected at 50 m³/s [24], and 275 m³/s in the rainy season (comparable to 1:1 year) [25].

The river discharges of the channels and rivers near the project area for each return period are summarised in Table 10-1.

Table 10-1: Discharges for various return periods (in m³/s)

Outfalls	T = 15 yrs	T = 25 yrs	T = 50 yrs	T = 100 yrs
Libertad Channel	63 m³/s	66 m³/s	70 m³/s	75 m³/s
Redemptorist	47 m³/s	54 m³/s	64 m³/s	75 m³/s
Seaside	40 m³/s	45 m³/s	52 m³/s	59 m³/s
Paranaque Channel	525 m³/s	576 m³/s	638 m³/s	698 m³/s

10.2 Model Set-up

10.2.1 MIKE21 model

Following RHDHV 2017 study [6], the Hydrodynamic and Mud Transport Modules of a MIKE21 Flexible Mesh (FM) model was used for the flushing study. This MIKE21 model does provide more detail and a finer resolution near the project location compared to the MIKE21 wave-typhoon model. All models used throughout this study have used the same bathymetry. The MIKE C-MAP database was used together with bathymetric maps from available survey data. The resulting bathymetry is shown in Figure 10-3.

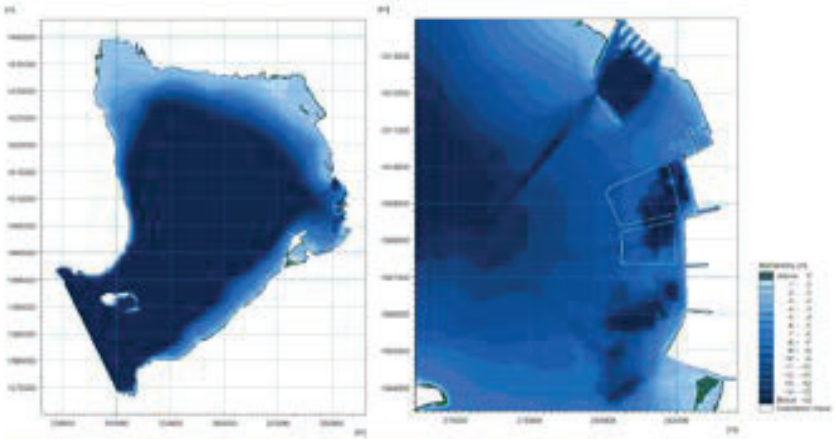


Figure 10-3: Bathymetry of Manila Bay, with a close-up of the Pasay360 location on the right

Figure 10-4 shows the model extent of the MIKE21 Model and the mesh in Manila Bay. At the southwest corner of the bay a tidal boundary is applied.

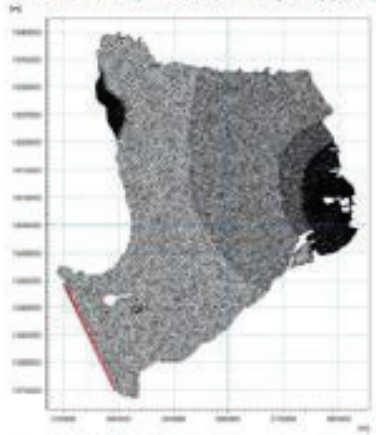


Figure 10-4: MIKE21 Mesh, tidal boundary marked with red line

Grid refinement was performed close to the project site to enhance the detail in the project area, while allowing coarse grid sizes at the outer side of the mesh to speed up the simulation time of the model. The smallest distance between the elements at the Project Site is 30 m for the model with the land reclamation, to allow for good resolutions of the flow in between the islands.

Project related

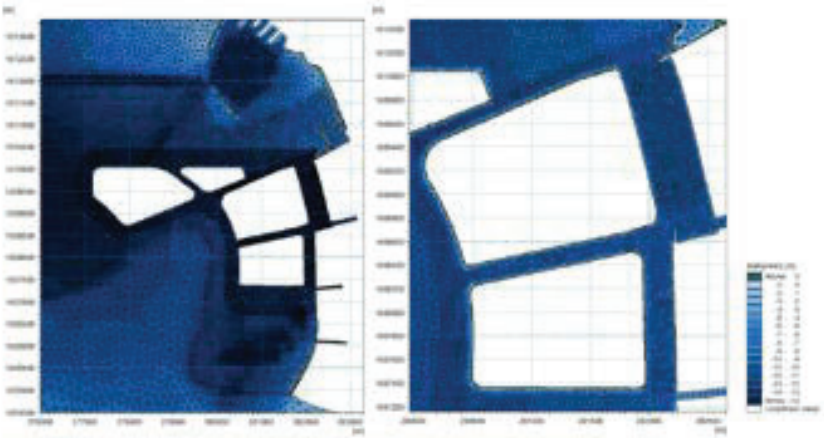


Figure 10-5: Mesh at Project Site surroundings (left) and channels between islands (right)

10.2.2 Model Settings

The hydrodynamic model has been calibrated against water level and current speed survey data that was collected during ADCP survey in October and November 2014 [6]. The settings of the calibrated model that were applied to the hydrodynamics of flushing study, are presented in Table 10-2.

Table 10-2: Final model parameters

Model parameter		Parameter setting
Equation		Shallow Water Equations
Solution Technique	Time Integration	Low Order, Fast algorithm
	Space Discretization	Low Order, Fast algorithm
	Minimum Time step	0.01s
	Maximum time	300
	Critical CFL Number	0.8
Depth Correction type		No depth correction
Flood and Dry	Drying Depth	0.005m
	Flooding Depth	0.05m
	Wetting Depth	0.10m
Density type		Function of salinity
Eddy Viscosity		Smagorinsky formulation, constant 0.28
Bed Resistance		Manning number, constant 32 m^(1/3)/s
Conolis Forcing		Varying in domain
Wind Forcing		Varying in time and domain (2D wind fields)
Friction	Friction Type	Varying with wind speed
	Linear variation	For speed: 7m/s, Friction: 0.001255
		For speed: 25m/s, Friction: 0.002425
Wave Radiation		None

Royal HaskoningDHV

Model parameter	Parameter setting
Boundary conditions	TPXO62

10.3 Scenarios for Wet and Dry Seasons

The main interest of the dry season scenarios is to see the impact of the changes in the water movement on its relation to the water quality inside the canals and the surrounding area of the Project Site. For this purpose, *"flushing time"* is used to estimate the impact of the land reclamation quantitatively. The calculated flushing times are one aspect for assessing the potential water quality impact. Water quality also depends on other environmental conditions (evaporation, temperature, etc.) and the actual loading in the water (i.e., discharge of sewerage water, nutrients, etc.).

Flushing time is defined as the ratio between the volume of water and the rate of renewal of this volume. It is widely used to investigate water quality aspects of modifications to coastal geometries and/or coastal developments [26]. The flushing time T_f can be considered as a first indicator for the water quality in the project area and the potential impacts since there are several other aspects which also play a role. It is noted that this flushing time is different from the residence time which is also often used for water quality assessments. *Residence time* can be defined as "the time it takes for any water parcel to leave the system through its boundaries".

A relevant scenario for investigating the *flushing time* in terms of water quality is a situation where flushing is minimal. In those conditions, environmental effects are to be expected. This condition will likely occur with low wind speeds, neap tide, and low discharge from the outlets and channels. Low wind speeds generally occur in the dry season period. During the dry season, winds come primarily from the northeast. Using these characteristics, a two-week predicted tide in February 2014 record was selected for the dry simulation, in combination with 2D ECMWF wind and pressure fields.

During the wet season, the main interest is to see the flow velocities changes in the extreme (non-typhoon) condition. Considering Figure 10-2, August is selected for the wet season. A two-week predicted tide in August 2014 with 2D ECMWF wind and pressure fields are applied as boundary conditions. Additional boundaries at Pasig River and source points were created at other rivers and channel locations. In the wet season scenarios, these boundaries were set to a constant discharge that is equal to T = 100yrs (see Table 10-1).

In the dry season scenarios, the Pasig River is assumed to be 50 m^3/s, the Parañaque River is assumed to have at base flow of 5 m^3/s, and others are all assumed to be zero.

The simulations carried out for future land reclamations are summarised in the table below. In addition to the Pasay360 simulations, a simulation for existing condition and without any islands (base case) and the original PRDP layout for Pasay islands (A, B, and C) with -4m MSL bed channel were conducted for comparison purpose.

Royal HaskoningDHV

Table 10-3: Model simulations for wet and dry seasons

Scenario ID	Island Overview	River/Channel Discharge	Wind field	Season
A1	Base case (no island)	1:100	Normal winds wet season	Wet Season
A2		Low Discharge	Normal winds dry season	Dry Season
B1	Original PRDP Island A, B, C	1:100	Normal winds wet season	Wet Season
B2		Low Discharge	Normal winds dry season	Dry Season
F1	Updated Pasay360 Island A&B and C (470m wide channel and all channel bed levels at -6mMSL) + PHCC Island A and B	1:100	Normal winds wet season	Wet Season
F2		Low Discharge	Normal winds dry season	Dry Season
G1	Updated Pasay360 Island A&B and C (470m wide channel at -8mMSL, the other 2 channels at -6mMSL) + PHCC Island A and B	1:100	Normal winds wet season	Wet Season
G2		Low Discharge	Normal winds dry season	Dry Season
H1	Updated Pasay360 Island A&B and C (470m wide channel at -8mMSL, the other 2 channels at -6mMSL, with a bridge and land heads) + PHCC Island A and B	1:100	Normal winds wet season	Wet Season
H2		Low Discharge	Normal winds dry season	Dry Season

10.3.1 Design of the new channels

The channels in the original Pasay layout are planned to be levelled to -4m MSL to speed up the flushing time in the system. In this study, two different adjustments on the bed level of channels are assessed. In Scenario F, the bed level is set at -6m MSL at all channels; while in Scenario G and Scenario H, two levels were applied. In the channel between Island A+B and mainland, bed level is set at -8m MSL and the rest at -6m MSL. A gentle slope of 1:25 is applied in the transition from -8m MSL to -6m MSL bed levels. The 180m wide channel between Island A+B and Island C is parallel to the Libertad Channel.

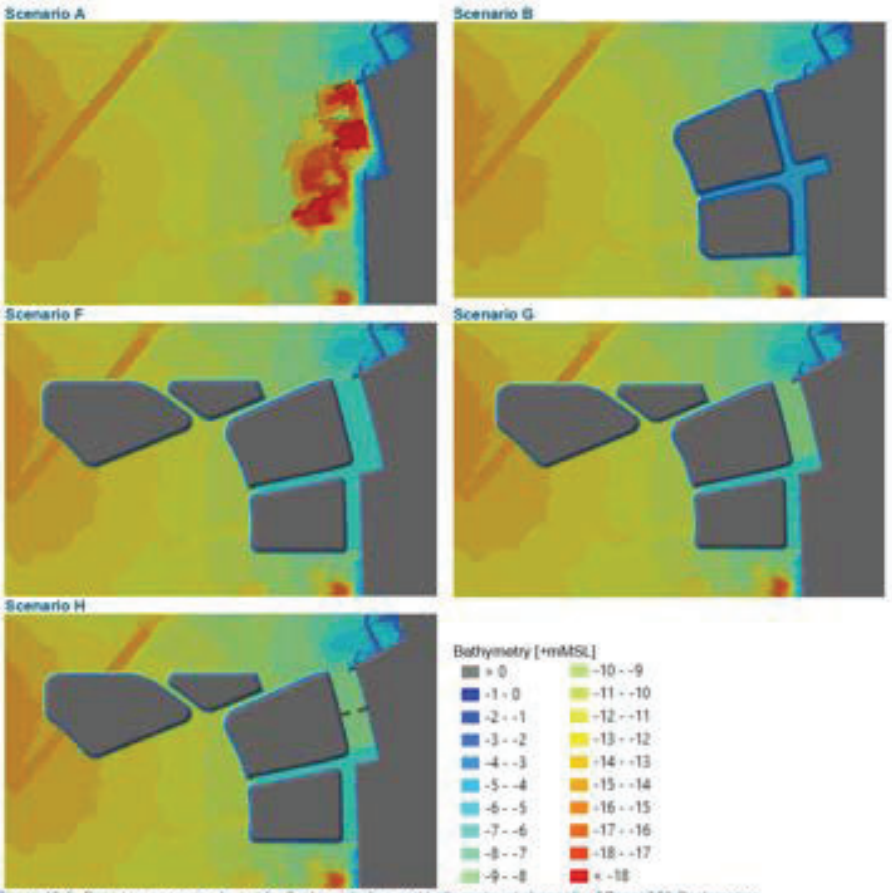


Figure 10-6: Overview scenarios layout for flushing studies and bathymetry at channels of Pasay360 Reclamation

10.3.2 Breakwaters and Land Heads

Satellite images show that several breakwaters are present within the area. These breakwaters will influence the flows and are therefore included as part of the land or as line (weir) elements in the model. Different from the 2017 study, it should be noted that the Pasay de Paliseo Groyne will not be demolished and is kept at its original location.

In Scenario H, land heads will be built as the base for a bridge connecting the new Island A+B with mainland (see Figure 10-7). These land heads will be paralleled to the Buendia Avenue. Both land heads are 145m long, leaving a 180m gap in between. The land heads have been incorporated into the model as line (weir) elements in the model.

The locations of breakwaters and land heads are presented in Figure 10-8.

Project related

Royal HaskoningDHV



Figure 10-7: Location of Pasay de Paliseo Groyne and land heads

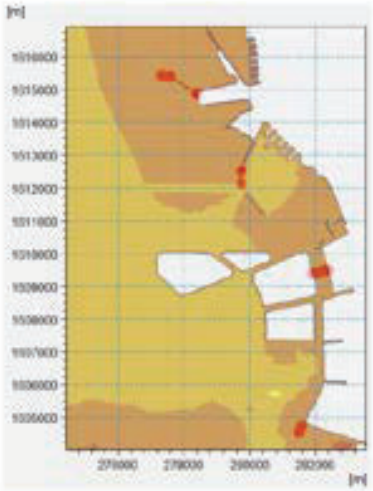


Figure 10-8: Breakwaters and land heads adjacent to Project Site as wor elements in MIKE21

Royal HaskoningDHV

10.4 Methodology

The detailed MIKE21 hydrodynamic model [6] is used as a basis for the flushing calculations. Tidal water levels at the boundary are generated from the tidal components of TXPO62 water level data [6]. Same 2D winds fields used in 2017 study from ECMWF were applied in this simulation. The month February which represents the dry season is in the mid of Amihan or Northeast monsoon, while August which selected for the wet season is within Hagabat or Southwest monsoon.

It is likely that the wind speeds at the canals/close to the shore will be lower due to effects of buildings/presence of the land reclamation, etc. This effect is not considered, but it is likely that the modelled wind speed is too high at these locations.

The simulation time was two weeks, which includes neap-spring conditions (Figure 10-9).

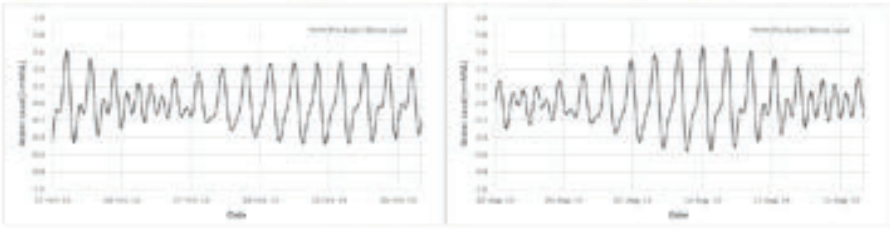


Figure 10-9: Predicted tide for dry (left) and wet (right) simulation

The time required to reduce the concentration in the modeled area is a measure for the flushing efficiency within the system. The definition provided by Geyer et al. (2000) has been applied to determine the flushing time:

$$C(t) = C_0 \cdot e^{-t/T_f} \qquad \text{Eq. (8-1)}$$

In which C(t) is the concentration after time t, C_0 is the initial concentration and T_f is the Flushing Time.

After a time $t=T_f$ the original concentration c_0 has dropped down to:

$$c(T) = c_0 e^{-1} \cong 0.37 c_0 \qquad \text{Eq. (8-2)}$$

The flushing time T_f is therefore equal to the time it takes for the initial concentration to have dropped to 37% of its original value.

For the simulations we have used an initial tracer concentration (with no settling velocity and no erodibility properties at the bed) as a conservative substance to estimate the flushing time in the area of interest, the channels of the land reclamation. The flushing time is determined based on depth-averaged computations of the flow circulation. Note that this is a simplified method, since it does not take 3D-dimensional flows into account. In the model simulations we have applied a scaled eddy formulation for dispersion with a factor of one, which is recommended by DHI for uncalibrated models.

The initial tracer concentration field is shown in Figure 10-10 (area with red colour) which is set at (an arbitrary value of) 100 kg/m³ at the inner channel between mainland and Pasay360 Reclamation, whereas the remainder has been set to 0 kg/m³.

Project related

Royal HaskoningDHV

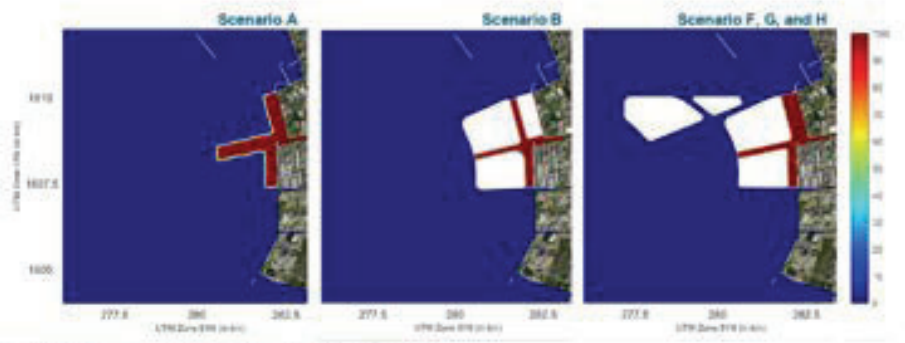


Figure 10-10: Initial concentration field (in kg/m³) for all scenarios

The flushing time has been determined based on the results of the two-week simulations. The approach has been proposed by Deltares [26]. The initial tracer concentration time series have been evaluated at each grid point. First, a 12-hours soft start is applied to remove initial short-term variations. Next, the flushing time has been determined at each grid point. The flushing time is defined here as the time at which the concentration has dropped to 37% of its original value (= 37% x 100 kg/m³ = 37 kg/m³).

10.5 Water Exchange Criteria

In terms of changes in water quality, the flushing time can be correlated to the water exchange parameter. Water exchange helps to deal with excess organic matter and nutrients by removing and diluting it. It gives the ecosystem the time to process these pollutions before they surpass limits that may lead to major problems like algal bloom and low oxygen levels. A criterion on water exchange has been suggested by the Permanent International Association of Navigation Congresses [27] which is based on the United States Environmental Protection Agency (USEPA) criteria:

Table 10-4: PIANC and USEPA water exchange criteria

Criteria	Description
Good	Flushing time required up to 6 tidal cycles (4 days)
Fair	Flushing time required up to 10 days
Poor	Flushing time required more than 10 days

10.6 Results Dry Season

The 2D plots of concentration at various moments in time are presented in Figure 10-12 to Figure 10-15 for Scenario A, B, and F to H during the dry season. These figures are based on the initial concentration fields in Figure 10-10.

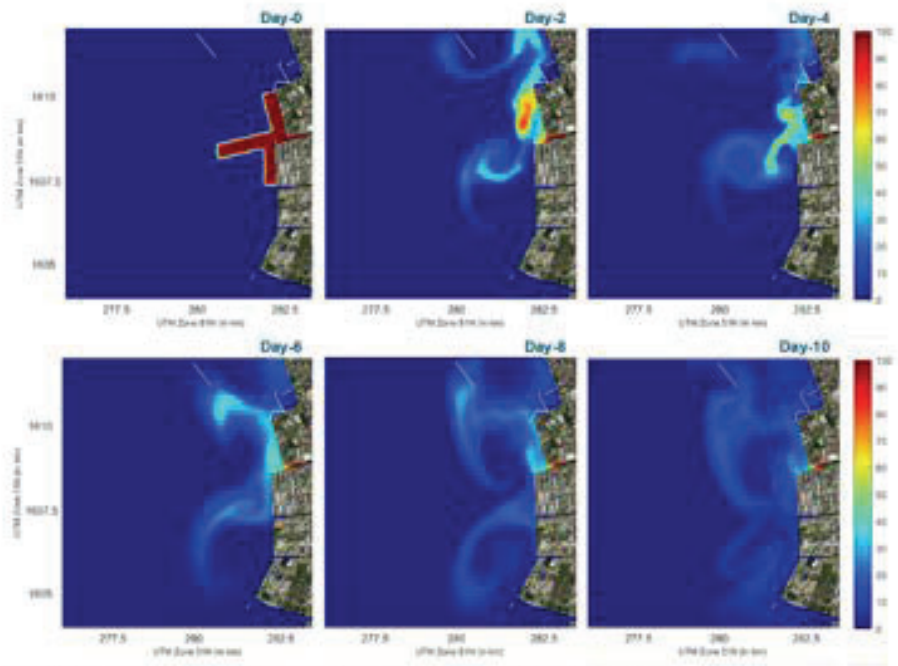


Figure 10-11 Sediment concentration distribution (in kg/m³) in time for scenario A in the dry season

Project related

Royal HaskoningDHV

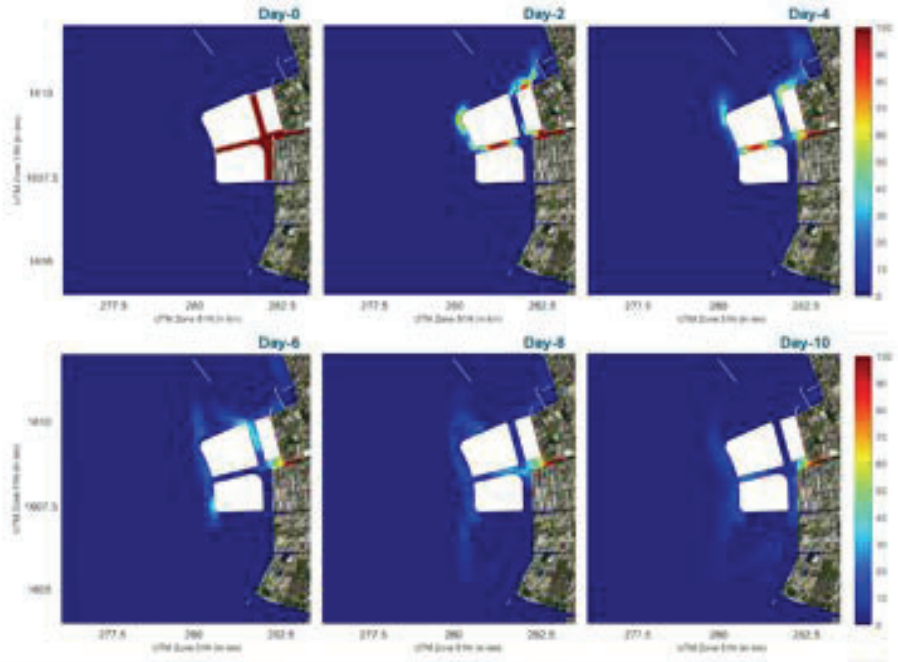


Figure 10-12 Sediment concentration distribution (in kg/m³) in time for scenario B in the dry season

Project related

Royal HaskoningDHV

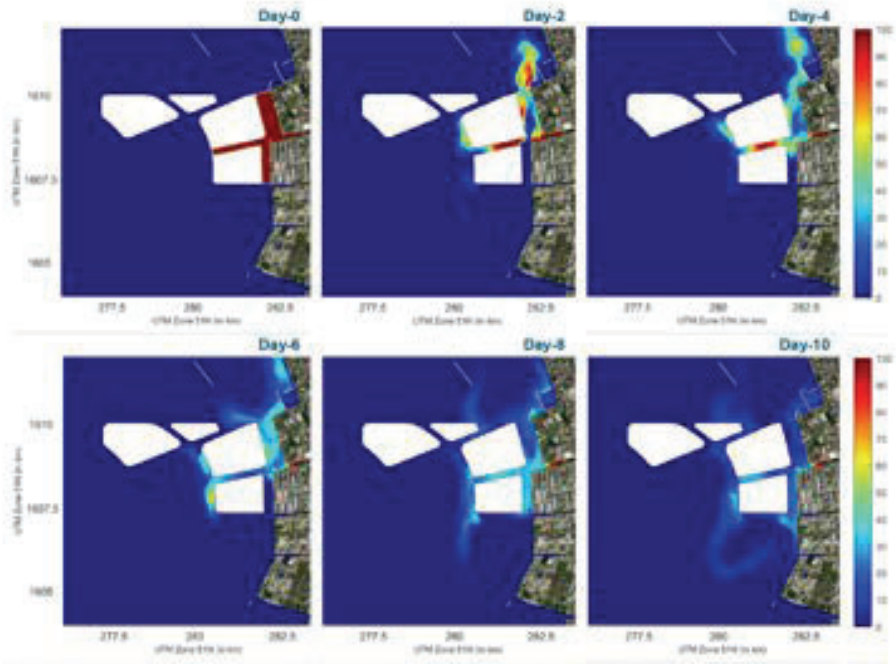


Figure 10-13: Sediment concentration distribution (in kg/m³) in time for scenario F in the dry season

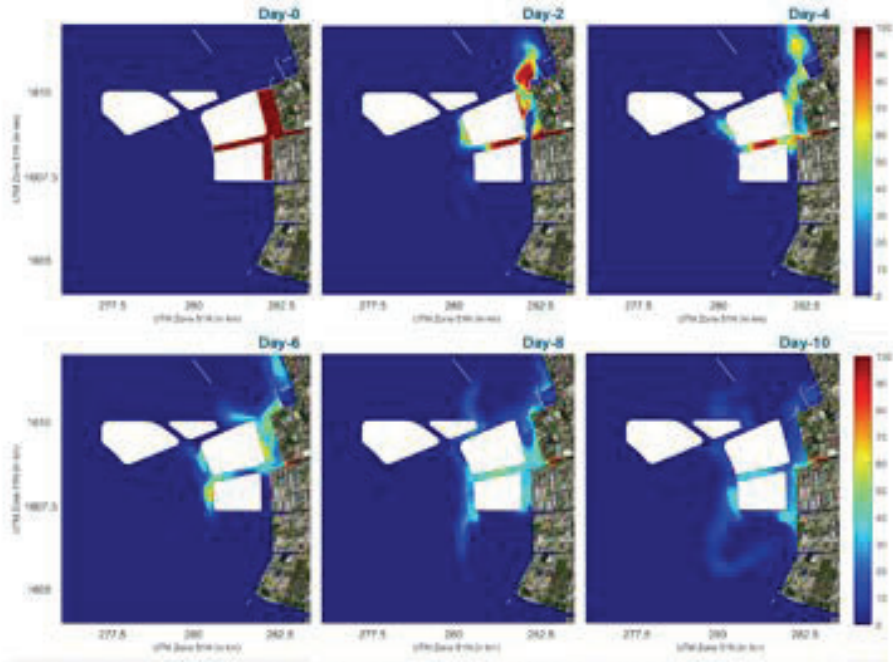


Figure 10-14: Sediment concentration distribution (in kg/m³) in time for scenario G in the dry season

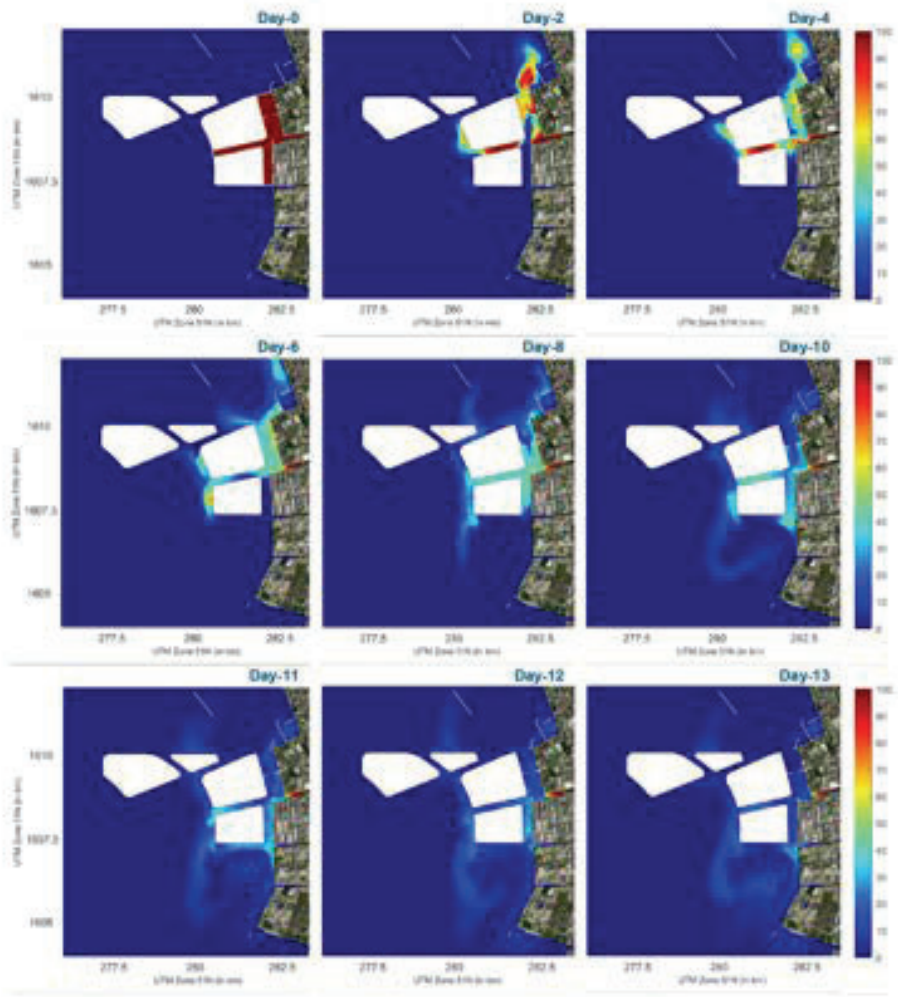


Figure 10-15. Sediment concentration distribution (in kg/m³) in time for scenario H in the dry season

In the two-week simulation for the dry season, the flushing time in all scenarios was unable to meet the PIANC and USPEA "Good" criteria as the concentration need more than 4 days to drop to 37 kg/m³. The flushing is met at Day-8 for Scenario A, at Day-6 for Scenario B, at Day-8 for Scenario F, at Day-10 for Scenario G, and at Day-11 for Scenario H.

In Scenario A, it can be observed that eddies occur in the exiting condition due to uneven bathymetry caused by past dredging activities. This phenomenon makes the concentration to stay longer within the Project site area. For the scenarios where there are reclaimed islands, high concentrations were washed out least near

the opening of channel between Island A+B and Island C (western channel), and between Island C and mainland (southern channel). These parts are where the water goes in and out into the channels system within the reclaimed islands. It takes time to flush out the concentration at those locations, as we can see in Figure 10-17. There is only a small tidal exchange at those locations without any (river) inflows from the land side.

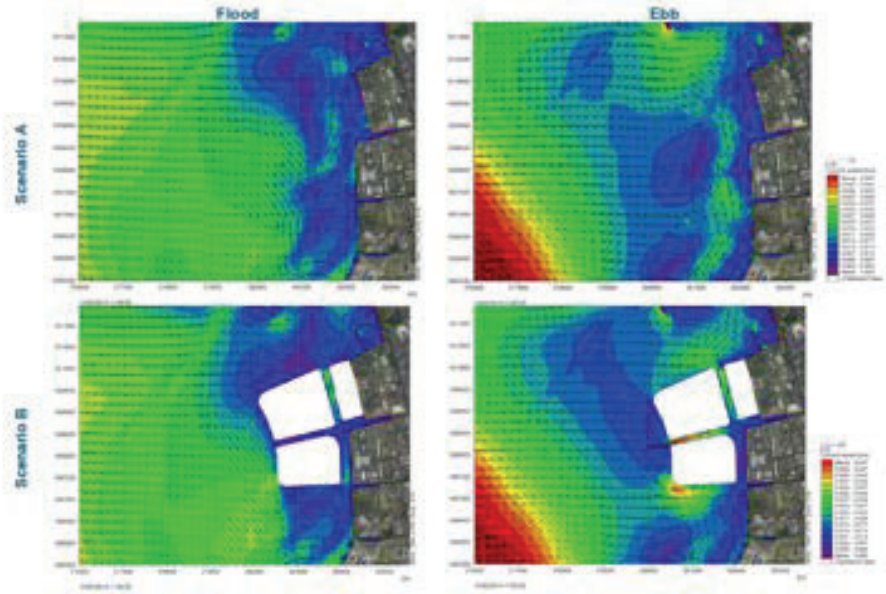


Figure 10-16. Current speed at flood and ebb tide during dry season for Scenario A and Scenario B

More volume of water goes into the system through the wider channel at the north, this inflow of water pushes the concentration out towards the south, so the concentration is released through the western and southern ends. This condition is influenced by the prevailing winds where it blows from northeast during the dry season.

Project related

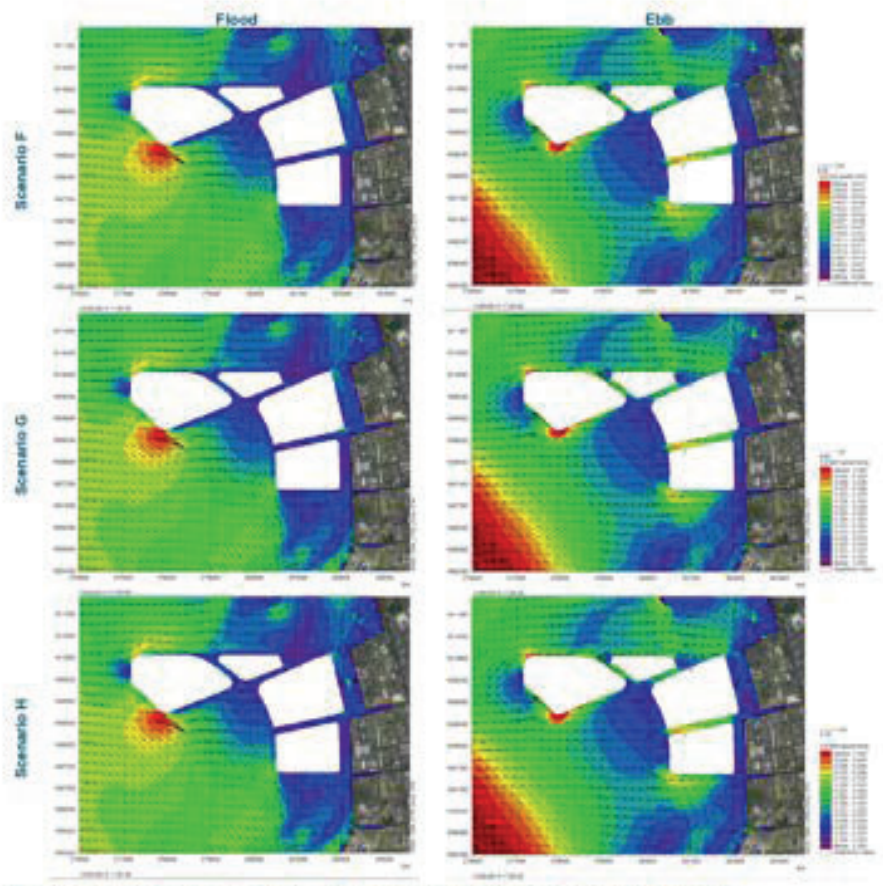


Figure 10-17: Current speed at flood and ebb tide during dry season for Pasay360 Scenario F to Scenario H

Royal HaskoningDHV

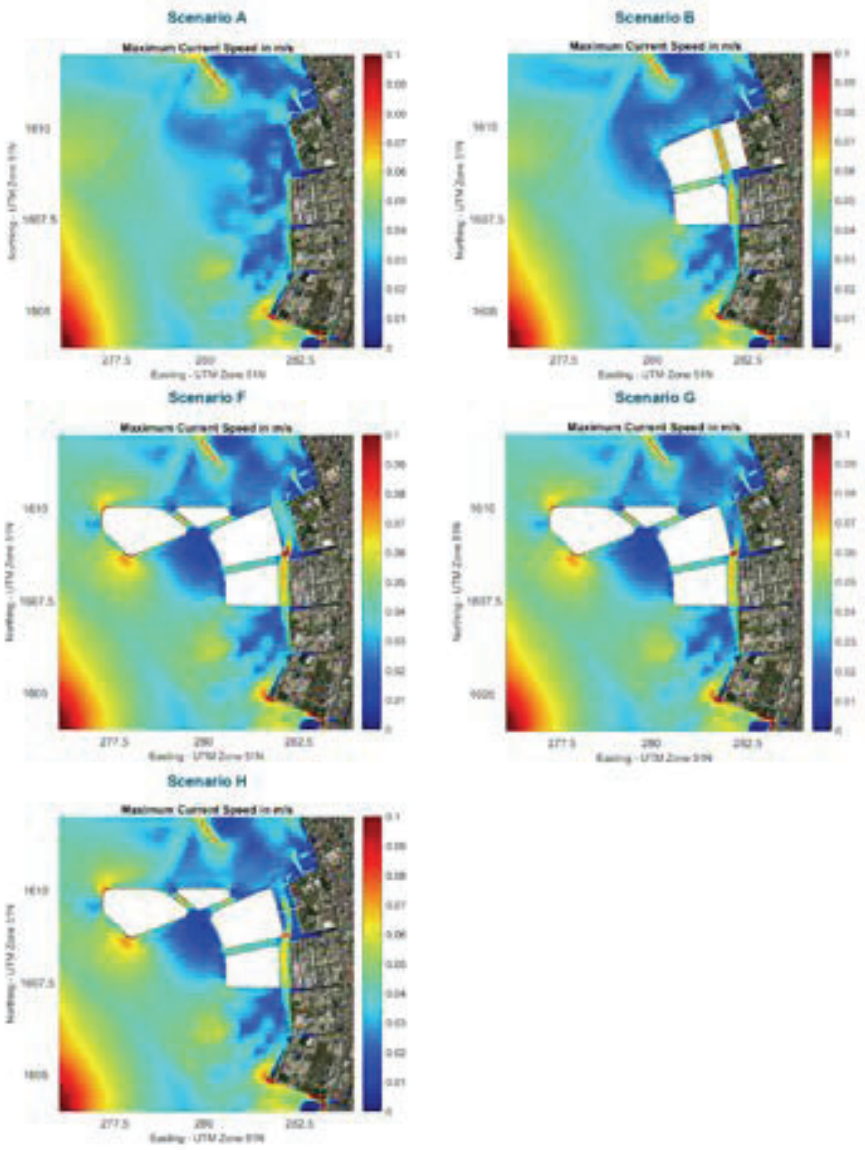


Figure 10-19: Maximum current speed for each scenario

Royal HaskoningDHV

Figure 10-18 shows that the current speed in the Project site is increased by having channels, if compared to the existing condition. In comparison between the island layout scenarios, the northern channel decreases in half from Scenario B to Scenario F. These changes are due to the changes in the geometry of both the reclaimed islands and the northern channel which is now wider and deeper. The bend from the northern channel to the southern channel slows down the water movement which was previously a straight channel in Scenario B.

The difference in bed level of the northern channel compared to with the western and southern channels hinder the water movement when the water is flowing from -8m MSL to -6m MSL (north to south). This is indicated by a slight decrease from the opening of northern channel to the intersection in Scenario G. The addition of land heads in Scenario H only makes the current go faster in the opening gap, but it slows the flow at the intersection and on the edge (banks) of the northern channel.

The changes described above from one scenario to another further increase the time it takes for the initial concentration to leave the system. Hence, flushing time is longer from Scenario B to H. As the flushing time in Scenario B, F, and G is still within 10 days, these Scenarios still fall in the "Fair" criteria for water exchange based on USEPA and PIANC. Scenario H however falls in the "Poor" criteria as it needs 11 days to reach the flushing time requirement.

An increase in exchange time represents an increase in the risk of water quality problems to occur. Longer water exchange means possibility of nutrient with a high primary production and risk of algal blooms resides longer in the system which can lead to a eutrophic system. Since these organisms use oxygen at night, the dissolved oxygen content will most likely drop causing possible low oxygen (hypoxic) conditions which might lead to death of fish and other organisms. Longer water exchange also means longer time for temperature in the water to cool down. An increase in temperature also increases the risk of hypoxia.

10.7 Results Wet Season

The 2D plots of concentration at various moments in time are presented in Figure 10-19 to Figure 10-23 for Scenario A B and F to H during the wet season. In this season, the movement of concentration is significantly faster due to higher current speeds. The wind is stronger than in the dry season and discharges from rivers / outfalls are higher resulting in higher flows. This condition allows the concentration to be flushed efficiently from the channels between Pasay360 islands. The flushing time can be reached way faster than the "Good" criteria requirement of 4 days, for all Scenarios.

Project related

Royal HaskoningDHV

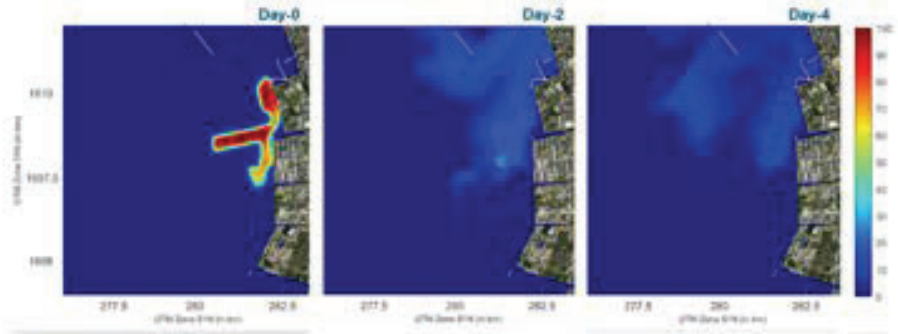


Figure 10-19: Sediment concentration distribution (in kg/m³) in time for scenario A in the wet season

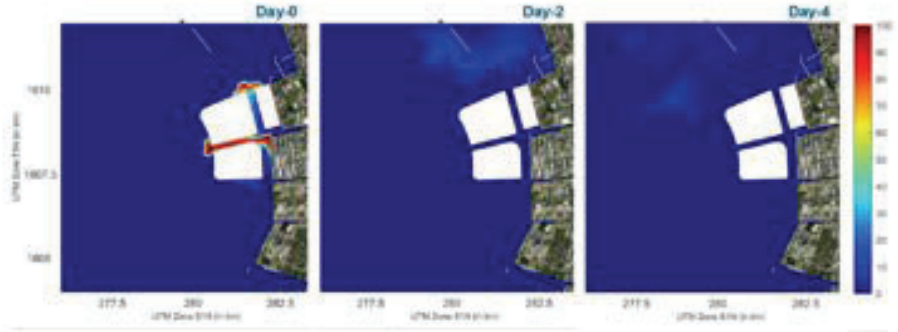


Figure 10-20: Sediment concentration distribution (in kg/m³) in time for scenario B in the wet season

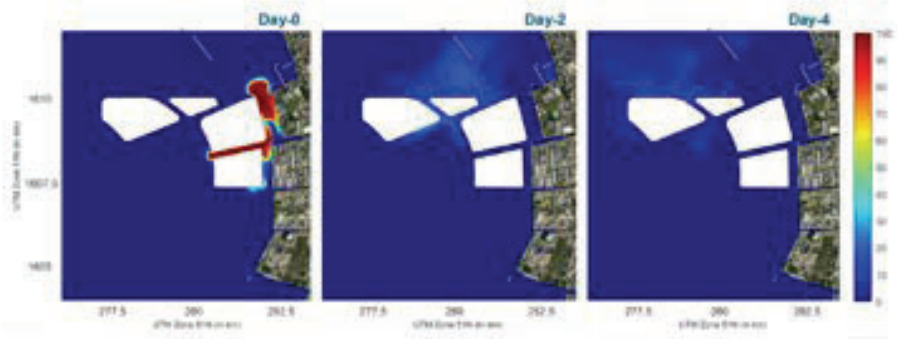


Figure 10-21: Sediment concentration distribution (in kg/m³) in time for scenario F in the wet season

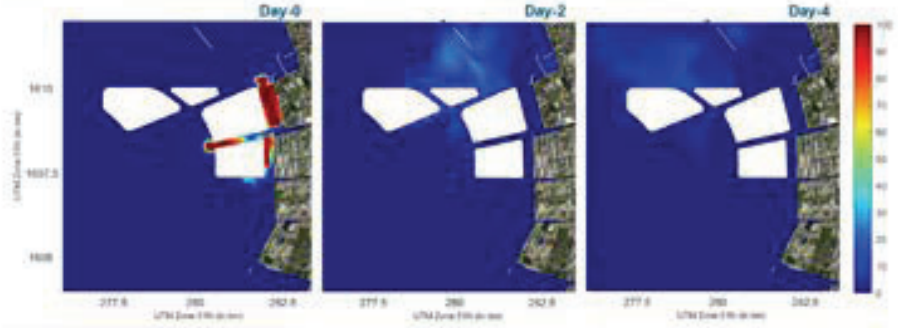


Figure 10-22: Sediment concentration distribution (in kg/m³) in time for scenario G in the wet season

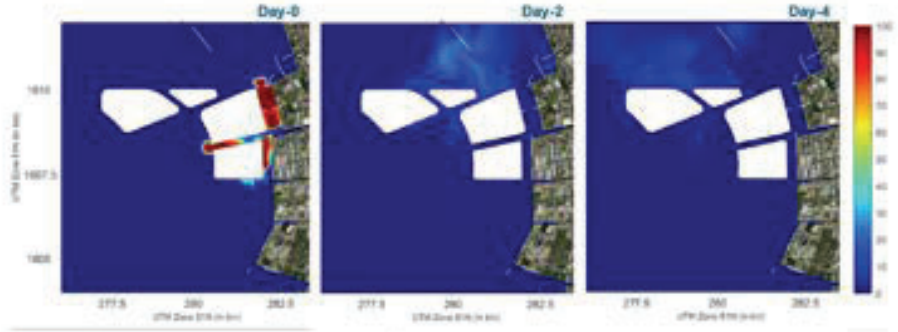


Figure 10-23: Sediment concentration distribution (in kg/m³) in time for scenario H in the wet season

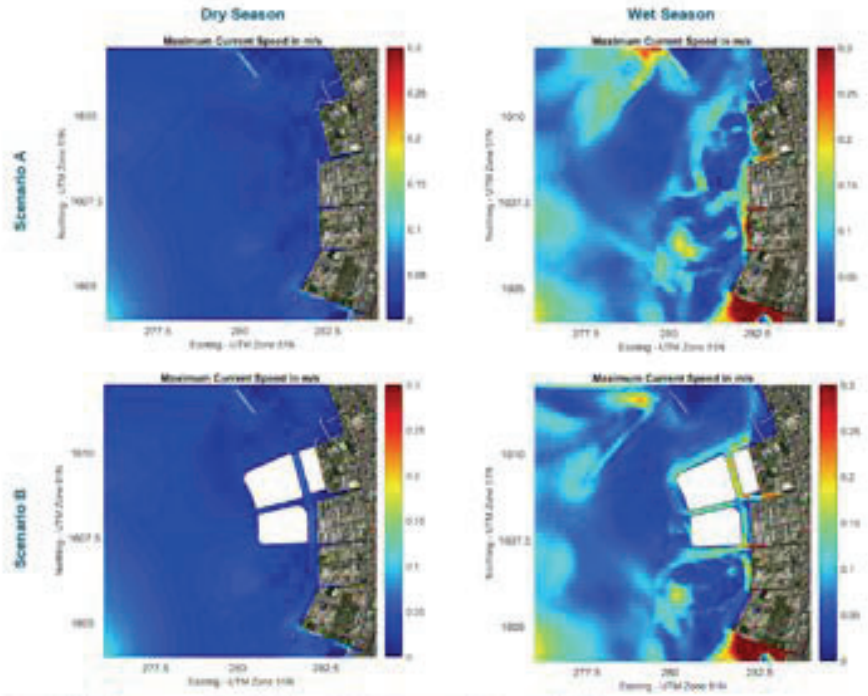


Figure 10-24: Maximum current for dry (left) and wet (right) seasons in Scenario A and B

Figure 10-24 and Figure 10-25 show the comparison of maximum current speed between dry and wet season for each scenario. The velocities along the channel areas vary. During the dry season, the velocity in the north-south channel is low, not exceeding 0.1m/s; and even lower in the east-west channel which is less than 0.05m/s.

During the wet season, flow velocities are higher in the channels due to higher wind and inflow from rivers at the mainland, especially from Libertad Channel and Redemptorist Outfall. Current velocity in the channels is reaching to 0.25m/s. These maximum flows occur during operational conditions, for channel design purposes the maximum current speeds during storm conditions in Chapter 7.9 should be adopted.

Outside Pasay360 reclamation, changes in velocity are minimal. Changes can only be observed in front of Manila Yacht area, where velocities increase from 0.10m/s to 0.18m/s with the changes from Scenario A to Scenario H. These higher velocities are caused by the increase in speed when water comes out of the mouth of the northern channel. Nevertheless, the speed in general is still relatively small (0.15m/s).

Project related

Royal HaskoningDHV

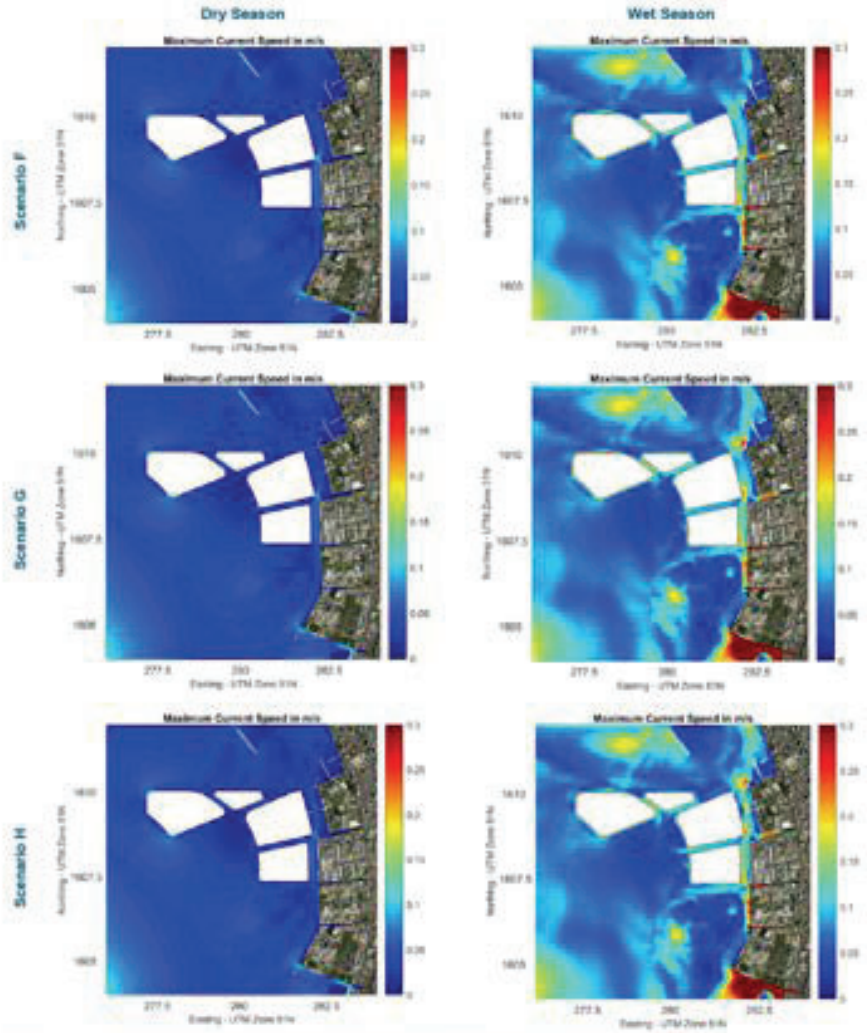


Figure 10-25: Maximum current for dry (left) and wet (right) seasons in Pasay360 Scenario F to Scenario H

Royal HaskoningDHV

10.8 Conclusions

Simulations have been carried out during the dry season scenario (low discharges, average winds, spring-neap cycle) and the wet season (high discharges, average winds, spring-neap cycle) to define the flushing times in the system. Simulations were done for the present situation and the situation with land reclamations.

Table 10-5: Summary of water exchange criteria for each scenario during the dry season

Scenario	Layout	Flushing Time	USEPA & PIANC water exchange criteria
A	Base case (no island)	Day-8	Fair
B	Oeignal PRDP Island A, B, C	Day-8	Fair
F	Updated Pasay360 Island A&B and C (470m wide channel and all channel bed levels at -6mMSL) + PHCC Island A and B	Day-8	Fair
G	Updated Pasay360 Island A&B and C (470m wide channel at -8mMSL, the other 2 channels at -6mMSL) + PHCC Island A and B	Day-10	Fair
H	Updated Pasay360 Island A&B and C (470m wide channel at -8mMSL, the other 2 channels at -6mMSL, with a bridge and land heads) + PHCC Island A and B	Day-11	Poor

The following can be concluded from the dry and wet season simulations:

- Water exchange in exiting condition where there are no islands is in "Fair" category.
- For scenario with future reclaimed islands, Scenario B, Scenario F, and Scenario G are still in "Fair" category for water exchange, with Scenario G already at the threshold.
- Scenario H does not meet the flushing requirements as the results show "Poor" water exchange.
- The flushing time is reached faster in the wet season, in which case it takes less than 4 days to reach the flushing time requirement, meaning that water exchange during the wet season is "Good" for all scenarios.
- The flow velocities only vary in the reclamation area and are minimal in the adjacent area of the Project Site. It is expected that during the wet season, the occurrence of high-discharge river flows, and higher wind conditions cause an increase in flow velocities in the future canal up to 0.25 m/s.

It is noted that the worst hydrodynamic scenario for the dry season has been considered in this flushing study, the drainage(s) might have higher discharge than assumed. As our focus is to see the impact of the Pasay360 development, the flushing time only considers the movement of the initial concentration that is introduced in the Pasay360 channels. From the results, the Pasay360 Project is expected to have limited effect on the water quality at its surroundings as only minimal changes were found in flow velocities.

Royal HaskoningDHV

11 Conclusions and recommendations

This report covers the modelling and analysis of the extreme hydraulic conditions (water level, waves, and currents) for the updated layout of the land reclamation project PRDP (Island A+B and Island C). The studies included in this report provide input for the design of these land reclamations. This chapter summarises the main conclusions of the report and concludes with some recommendations based on the findings of this study.

11.1 Conclusions

The following main conclusions can be drawn for each chapter of the report:

- **Chapter 4**: The analysis of the water level measurements at Manila Port consisted of the derivation of tidal constituents, characteristic tidal levels, and surge levels during historical typhoons. The tidal characteristics obtained from these measurements show good agreement with the values from other data sources (i.e. UHSLC dataset). These water level measurements are currently the only source to estimate surge values that can be used for the calibration of the numerical modelling of historical typhoons.

- **Chapter 5**: The data of the typhoons included in the database of the Japan Meteorological Agency (JMA) provided input for the estimation of wind and pressure fields using the Holland B model. Based on the results of this model, the 35 most severe typhoons were selected for the modelling of the extreme hydraulic conditions at the project site. These 35 typhoons all occurred after 1977 because this is the year that JMA started to include the parameters required for the reconstruction of the wind and pressure fields in their database.

- **Chapter 6**: The wave and flow conditions during the 35 typhoons were simulated using a coupled wave-hydrodynamic model (MIKE 21 Coupled FM). The modelled surge levels had to be corrected based on the surge levels obtained from the water level measurements since the comparison of the surge levels showed that the model regularly overestimated the surge levels. The wave and current output could, however, not be validated as there is no measurement data available for these variables. The modelling results indicated that peak surge levels typically coincide with peak wave heights, or they follow one another within several hours. This observation led to the advice to assume full dependency between the two parameters for design purposes.

- **Chapter 7**: Extreme value analyses were carried for the surge levels and wave characteristics after correcting for tide and sea level rise. The results of these extreme value analyses were used to derive design surge levels and design wave conditions. The design conditions were provided for extreme events having a return period ranging from 1 year to 1000 years. Both the design surge levels and wave conditions include uncertainty allowances and sea level rise. For the design wave conditions, two cases were considered: (1) extreme waves with normal wave incidence and (2) extreme waves with oblique wave incidence. For the first case, reduction factors based on Bretschneider formulae for the generation of wind waves were introduced for the boundaries (north and south) that are not parallel to the dominant wave direction of the typhoon-generated waves. For the second case, it is suggested to adopt an oblique angle of incidence of 30° in the design calculations for the coastal revetment. The next phase of the design process will prove which of these wave conditions will be governing.

- **Chapter 8**: A comparison of the design values from the study carried out in 2017 and the present study shows that there are small changes in the design water level and design wave conditions. The most important factors causing these changes included the availability of more recent water

level measurements, storm data, and bathymetric data, a different approach for incorporation the tidal elevation and SLR, and sheltering effects from PHCC islands A and B.

- **Chapter 9**: A wave penetration study, conducted using a SWASH model for the north-south channel and expert judgement for the east-west channel, showed a substantial reduction in wave heights as waves propagate into the channels. In the north-south channel, this reduction was observed to be consistent across various return periods, with negligible variations between scenarios with bed levels of -6m MSL and -8m MSL. For the east-west channel, expert judgement informed by previous SWASH simulations carried out for different channel dimensions, was applied to assess the wave conditions in the channel. The analysis concluded that a decrease in channel width (from the original 300m to 180m) would result in a substantial reduction in wave energy penetration into the channel.

- **Chapter 10**: A flushing study has been carried out to provide information on changes in currents and what it means to the water quality between different Pasay360 layouts. The simulations were run for a dry and wet season condition. The results show that with the revised island boundaries (model scenarios F and G) water quality criteria are met. During the dry season model runs the Scenario F and G fall in the "Fair" category of USEPA and PIANC water exchange, meaning the water exchange is sufficient.. As changes in the flow velocities outside the Project area are insignificant, we also expect little to no impact on the water quality to the surroundings.

11.2 Recommendations

Based on the findings of this report, the following recommendations may be considered:

- There is currently no information available to exclude tsunami risk from neither volcano activity nor landslides for Manila Bay. It is therefore recommended for the detailed design phase to verify that these root causes are not important for the project location.

- Due to the lack of wave data that allows for the validation of the modelled wave conditions, substantial uncertainty allowances are incorporated in the design conditions. An extensive and solid monitoring program to measure water levels and wave data during typhoon events is highly recommended to add more confidence to the modelling results and reduce the uncertainties currently included in the design values.

- The flushing study approach was selected due to limited information on the water quality parameters in the existing condition, from the adjacent rivers/channels/outfalls' inflows, and (if any) from the wastewater that will come from the reclamation outfalls to the channels. This flushing study provides the first indication of predicting possible water quality issues in the future development by only looking at the hydrodynamic changes and its impact to the water exchange, without taking into account the water quality parameters. It is recommended to introduce a real time monitoring to analyse the potential impact of the development on the water quality. Baseline data of the existing conditions in the outfall channels must be done prior to start of construction, wherein deviation can be easily monitored.

Royal HaskoningDHV

12 References

[1] EGS Asia Inc., "SM Mall of Asia reclamation master development plan bathymetric survey, Final Report," EGS Asia Inc., 2014.

[2] NAMRIA, *Water levels Manila Port (1985-2021)*, Provided by Client, 2021.

[3] UHSLC, "Station Explorer Water Levels 370 Manila," University of Hawaii Sea Level Centre, 2022. [Online]. Available: https://uhslc.soest.hawaii.edu/stations/?stn=370#levels.

[4] IPCC, "Climate Change 2021, The Physical Science Basis AR6," 2021.

[5] NASA, "IPCC AR6 Sea Level Projection Tool," 17 9 2021. [Online]. Available: https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool.

[6] Royal HaskoningDHV, "Pasay and Parañaque Reclamation Development - Hydraulic and Morphological Study," BE8289-R0009-WdH_Phl, 2017.

[7] IPCC, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Core Writing Team, R. Pachauri and L. Meyer, Eds., Geneva, Switzerland: IPCC, 2014.

[8] R. H. Moss, J. A. Edmonds, K. A. Hibbard, M. R. Manning, S. K. Rose, D. P. Van Vuuren, T. R. Carter, S. Emori, M. Kainuma, T. Kram, G. A. Meehl, J. F. Mitchell, N. Nakicenovic, K. Riahi, S. J. Smith, R. J. Stouffer, A. M. Thomson, J. P. Weyant and T. J. Wilbanks, "The next generation of scenarios for climate change research and assessment," *Nature*, vol. 463, no. 7282, pp. 747-756, 2010.

[9] D. Codiga, "Technical Report 2011-01: Unified Tidal Analysis and Prediction Using the UTide Matlab Functions," Graduate School of Oceanography, University of Rhode Island, Narragansett, RI, 2011.

[10] G. J. Holland, "An Analytic Model of the Wind and Pressure Profiles in Hurricanes," *Monthly Weather Review*, vol. 108, no. 8, pp. 1212-1218, 1980.

[11] P. J. Vickery and D. Wadhera, "Statistical Models of Holland Pressure Profile Parameter and Radius to Maximum Winds of Hurricanes from Flight-Level Pressure and H*Wind Data," 2009.

[12] USACE, Shore Protection Manual, 1984.

[13] V. Morin, P. Warnitchai and S. Weesakul, "Storm surge hazard in Manila Bay: Typhoon Nesat (Pedring) and the SW monsoon," *Natural Hazards*, 2016.

[14] S. Caires, "Extreme Value Analysis: Still Water Level," World Meteorological Organization; Intergovernmental Oceanographic Commission, 2011.

[15] Royal HaskoningDHV, "Solar City Reclamation Project - Hydrodynamic and Morphologic modelling study," BH9203-ZZ-XX-RP-Z-0001, 2020.

[16] The SWASH team, SWASH User Manual (Version 7.01), Delft University of Technology, 2021.

[17] Holthuijsen, L. H, Waves in Oceanic and Coastal Waters., 2007.

[18] EurOtop, Manual on wave overtopping of sea defences and related structures. An overtopping manual largely based on European research, but for worldwide application, J. Van der Meer, N. Allsop, T. Bruce, J. De Rouck, A. Kortenhaus, T. Pullen, H. Schüttrumpf, P. Troch and B. Zanuttigh, Eds., www.overtopping-manual.com, 2018.

[19] The SWASH team, SWASH User Manual (Version 7.01), Delft University of Technology, 2021.

[20] Philippines Atmospheric, Geophysical and Astronomical Services Administration, "Average rainfall measurement at Manila Port Area (MCO) Station in 1981-2010," 2017.

[21] NOAA, "FAQ When is hurricane season ?," 2 June 2016. [Online]. Available: http://www.aoml.noaa.gov/hrd/tcfaq/G1.html.

Royal HaskoningDHV

[22] Woodfields Consultant, Inc., "Review and Detailed Engineering Designs of Comprehensive River Management for San Juan River," 2015.

[23] JICA, "Data Collection Survey on Flood Management Plan in Metro Manila," 2014.

[24] Technotrix Consultancy Services, Inc., "Annex H - Environmental Impact Statement," 2018.

[25] G. Joan B., M. Marla C., S. Pum and K. Lee-Hyung, "The Water Quality of the Pasig River in the City of Manila, Philippines: Current Status, Management and Future Recovery," *KPubs Environmental Engineering Research*, pp. 173-179, 2010.

[26] Deltares, "Modelleerstrategieen voor beter, flexibeler en efficienter hydrodynamisch modelleren – Invetarisatie (in Dutch)," Delft, Netherlands, 2009.

[27] PIANC, "Protecting water quality in marinas," PIANC Report No.98-2008, 2008.

[28] Navionics S.r.l or its subsidiaries, "Navionics," [Online]. Available: https://www.navionics.com/. [Accessed 01 09 2021].

[29] M. v. Ormondt, K. Nederhoff and A. v. Dongeren, "Delft Dashboard: a quick set-up tool for hydrodynamic models," *Journal of Hydroinformatics*, vol. 22, no. 3, p. 510–527, 2020.

[30] Copernicus Marine Environment Monitoring Service (CMEMS), "Global Ocean Physics Reanalysis (GLOBAL_MULTIYEAR_PHY_001_030)".

[31] Hermess B.V., 2D spectra in the northern Red Sea: Fact sheet, 2022.

[32] Wood, "NEOM Environmental Regional Baseline Surveys. Data Processing of Metocean Data collected at Red Sea - NIC - South and Sindhala Data Buoy (July 2021)," 2021.

[33] Wood, "Marine Sediment Quality, Marine Water Conditions and Benthic Primary Producer Habitat - Sindalah," 2021.

[34] AECOM, "4800000128/002 Final Factual Geotechnical Investigation Report," 2022.

[35] B. Fox-Kemper, H. Hewitt, C. Xiao, G. Aðalgeirsdóttir, S. Drijfhout, T. Edwards, N. Golledge, M. Hemer, R. Kopp, G. Krinner, A. Mix, D. Notz, S. Nowicki, I. Nurhati, J. Ruiz, J. Sallée, A. Slangen and Y. Yu, "Ocean, Cryosphere and Sea Level Change," in *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou, Eds., Cambridge University Press, 2021.

[36] G. G. Garner, T. Hermans, R. E. Kopp, A. B. A. Slangen, T. L. Edwards, A. Levermann, S. Nowikci, M. D. Palmer, C. Smith, B. Fox-Kemper, H. T. Hewitt, C. Xiao, G. Aðalgeirsdóttir, S. S. Drijfhout, T. L. Edwards, N. R. Golledge, M. Hemer, R. E. Kopp, G. Krinner, A. Mix, D. Notz, S. Nowicki, I. S. Nurhati, L. Ruiz, J.-B. Sallée, Y. Yu, L. Hua, T. Palmer and B. Pearson, "IPCC AR6 Sea-Level Rise Projections," PO.DAAC, CA, USA, 2021.

[37] DHI, "Proposed New Manila International Airport: Design Water Level Assessment," Document No.: 62801643-RPT-12, 2019.

[38] DHI, "Assessment of Metocean Conditions in Manila Bay," 2014.

[39] S. Caires, "Extreme Value Analysis: Wave Data," World Meteorological Organization; Intergovernmental Oceanographic Commission, 2011.

[40] DHI, "MIKE 21 Boussinesq Wave Module - Scientific Documentation," 2017.

[41] AMH, "Interim/Progress Report for the Bacoor Bay Reclamation & Development Project: Hydrologic & Hydraulic (Flood Risk) Assessment. Ref No. NP18.045.014," 2018.

[42] JICA, "DATA COLLECTION SURVEY ON PARAÑAQUE SPILLWAY IN METRO MANILA IN THE REPUBLIC OF THE PHILIPPINES," JICA, 2018.

Royal HaskoningDHV

[43] DHI, "Hydraulic Study for Bacoor Bay Reclamation," 2020.

[44] G. Jacinto, L. S. M. Sotto, M. San Diego-McGlone, E. M., A. A. and T. Miller, "Hypoxia in Manila Bay, Philippines during the northeaast monsoon," *Marine Pollution Bulletion 63*, pp. 243-248, 2011.

[45] F. R. Obligacion, "A LAYPERSON'S GUIDE TO THE ENVIRONMENTAL IMPACT ASSESSMENT OF PASIG RIVER CLUSTER ONE ESTEROS IN THE PRE-REHABILITATION PHASE," 2022 October 2015. [Online]. Available: https://www.linkedin.com/pulse/manilas-pasig-river-dying-one-part-freddie-rabelas-obligacion.

[46] Parañaque City Government , "EIS: Proposed 286.86-HECTARE PARAÑAQUE RECLAMATION PROJECT," Parañaque City Government , 2020.

[47] ASEANO, "SURVEY ON PLASTIC LITTERS ALONG IMUS RIVER, CAVITE, PHILIPPINES," 2021.

[48] EGS (Asia), Inc., "BACOOR COASTAL TOWN & SCIENCE PARK: HYDROGRAPHIC, TOPOGRAPHIC, GRAB SAMPLING & METOCEAN SURVEY," 2018.

[49] ECMWF, "ERA-Interim," 10 2019. [Online]. Available: https://www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era-interim.

Project related

Royal HaskoningDHV

A1 Typhoon model results

This Appendix provides an overview of all the results from the hydrodynamic and wave modelling of the historical typhoons. A selection of these results is presented in Chapter 6.

A1.1 Corrected surge levels

Table 12-1: Corrected surge levels at all output points along PRDP

		Corrected surge at location [m]																					
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	25	26	27	28
KIM	1977	0.93	0.94	0.94	0.94	0.93	0.94	0.94	0.94	0.93	0.94	0.96	0.96	0.95	0.96	0.97	0.97	0.99	1.02	0.99	0.98	0.97	0.95
RITA	1978	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.31	0.33	0.34	0.30	0.31	0.31	0.31	0.33	0.32	0.31	0.30	0.30	0.29
BETTY	1980	0.26	0.26	0.27	0.26	0.26	0.26	0.27	0.27	0.26	0.27	0.28	0.30	0.27	0.27	0.27	0.28	0.29	0.30	0.28	0.28	0.27	0.26
IRMA	1981	0.46	0.47	0.47	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.48	0.49	0.47	0.48	0.48	0.49	0.50	0.53	0.51	0.50	0.49	0.47
LEE	1981	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
FAYE	1982	0.15	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.15	0.15	0.15	0.15	0.15
VERA	1983	0.52	0.53	0.54	0.54	0.54	0.55	0.55	0.56	0.56	0.57	0.60	0.61	0.58	0.55	0.55	0.55	0.56	0.55	0.54	0.53	0.53	0.53
DOT	1985	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.29	0.31	0.28	0.28	0.29	0.29	0.30	0.32	0.30	0.30	0.29	0.28
BETTY	1987	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02
NINA	1987	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.16	0.15	0.15	0.14	0.14	0.14	0.12	0.12	0.12	0.12	0.12
RUBY	1988	0.68	0.68	0.70	0.70	0.70	0.70	0.71	0.71	0.70	0.72	0.76	0.77	0.72	0.72	0.73	0.74	0.76	0.74	0.71	0.70	0.69	0.67
DAN	1989	0.39	0.39	0.40	0.41	0.41	0.41	0.41	0.42	0.43	0.43	0.44	0.44	0.43	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38	0.38
HURIT	1989	0.45	0.46	0.46	0.46	0.45	0.45	0.46	0.45	0.45	0.46	0.47	0.48	0.46	0.46	0.47	0.47	0.49	0.50	0.48	0.48	0.47	0.45
YUNYA	1991	0.21	0.22	0.22	0.22	0.21	0.22	0.22	0.22	0.22	0.22	0.23	0.24	0.22	0.22	0.22	0.23	0.24	0.25	0.23	0.23	0.22	0.21
ELI	1992	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.19
FLO	1993	0.40	0.41	0.42	0.41	0.42	0.42	0.43	0.43	0.42	0.43	0.47	0.48	0.42	0.42	0.43	0.43	0.45	0.45	0.42	0.42	0.41	0.40
LOLA	1993	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.04	0.03	0.03	0.03	0.03
TERESA	1994	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.21	0.21	0.21	0.20	0.20
ANGELA	1995	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35
BABS	1998	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.44	0.45	0.43	0.43	0.44	0.44	0.46	0.47	0.45	0.45	0.44	0.42
CHEBI	2006	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03
DURIAN	2006	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.12	0.12	0.12
XANG	2006	0.54	0.54	0.55	0.55	0.55	0.56	0.56	0.56	0.57	0.57	0.58	0.59	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.55	0.55	0.55
FENG	2008	0.55	0.56	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.58	0.59	0.55	0.56	0.56	0.56	0.57	0.60	0.59	0.58	0.58	0.57
CONSON	2010	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.25	0.25	0.23	0.23	0.23	0.23	0.23
NESAT	2011	0.57	0.57	0.58	0.58	0.58	0.59	0.60	0.60	0.59	0.60	0.65	0.66	0.60	0.61	0.62	0.63	0.65	0.63	0.60	0.59	0.58	0.56
NARI	2013	0.19	0.19	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.22	0.22	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.20	0.20	0.19
RAMM	2014	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.28	0.28	0.29	0.30	0.30	0.28	0.28	0.28	0.28	0.29	0.27	0.26	0.26	0.26	0.26
KOPPU	2015	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
MELOR	2015	0.25	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.28	0.29	0.26	0.26	0.27	0.27	0.28	0.29	0.27	0.27	0.26	0.25
NOCK	2016	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
SARIKA	2016	0.10	0.10	0.11	0.11	0.11	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.11	0.11	0.11	0.11	0.12	0.12	0.11	0.11	0.11	0.11
KAMMI	2019	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.02	-0.03
MOLAVE	2020	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
VAMCO	2020	0.44	0.45	0.45	0.45	0.44	0.45	0.45	0.45	0.45	0.45	0.47	0.48	0.45	0.46	0.47	0.47	0.48	0.49	0.47	0.47	0.46	0.44

Project related

Royal HaskoningDHV

A1.2 Spectral significant wave height (uncorrected)

Table 12-2: Maximum spectral significant wave height (uncorrected) at all output points along PRDP

		Max. Hs0 [m] at location																					
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	25	26	27	28
KIM	1977	4.15	4.07	3.60	4.17	4.02	3.87	3.63	3.66	3.49	2.71	1.03	0.49	4.55	4.39	4.38	4.30	4.19	2.91	2.97	2.88	2.82	3.34
RITA	1978	3.26	3.18	3.11	3.34	3.23	3.09	2.85	2.61	2.42	1.96	0.75	0.34	3.86	3.78	3.78	3.77	3.65	2.22	2.26	2.20	2.14	2.64
BETTY	1980	3.43	3.26	3.27	3.44	3.26	3.05	2.79	2.52	2.27	1.75	0.65	0.28	3.92	3.81	3.80	3.78	3.58	2.17	2.18	2.11	2.08	2.66
IRMA	1981	3.85	3.81	3.67	3.98	3.76	3.58	3.30	3.07	2.85	2.23	0.84	0.35	4.30	4.13	4.10	4.09	3.89	2.63	2.61	2.51	2.43	3.07
LEE	1981	0.83	0.69	0.65	0.65	0.67	0.68	0.68	0.73	0.77	0.63	0.15	0.07	0.98	0.92	0.86	0.80	0.74	0.50	0.62	0.68	0.72	0.80
FAYE	1982	1.38	1.23	1.25	1.27	1.32	1.33	1.31	1.35	1.36	1.12	0.32	0.13	1.72	1.64	1.59	1.55	1.45	0.98	1.14	1.22	1.25	1.36
VERA	1983	3.08	3.05	2.97	3.21	3.23	3.13	2.99	2.96	2.91	2.29	0.78	0.34	3.80	3.77	3.80	3.79	3.56	2.31	2.47	2.43	2.43	2.75
DOT	1985	3.37	3.19	3.12	3.43	3.34	3.19	2.95	2.73	2.60	2.05	0.73	0.31	3.93	3.80	3.81	3.80	3.62	2.22	2.26	2.20	2.15	2.63
BETTY	1987	1.11	0.84	0.80	0.79	0.82	0.83	0.82	0.88	0.95	0.76	0.18	0.13	1.59	1.48	1.37	1.30	1.24	0.62	0.77	0.86	0.95	1.08
NINA	1987	1.57	1.34	1.32	1.33	1.39	1.40	1.39	1.48	1.50	1.25	0.31	0.18	2.01	1.92	1.80	1.68	1.55	1.06	1.32	1.37	1.47	1.56
RUBY	1988	4.01	4.03	3.87	4.24	4.09	3.91	3.64	3.53	3.45	2.67	1.03	0.46	4.51	4.41	4.43	4.40	4.24	2.91	2.98	2.89	2.82	3.39
DAN	1989	2.23	2.14	2.10	2.17	2.23	2.22	2.17	2.15	2.10	1.71	0.50	0.23	2.72	2.69	2.69	2.66	2.49	1.67	1.88	1.88	1.90	2.08
HUNT	1989	3.79	3.68	3.49	3.72	3.57	3.42	3.08	2.88	2.74	2.14	0.79	0.31	4.19	4.03	4.01	3.96	3.71	2.36	2.37	2.30	2.25	2.91
YUNYA	1991	3.34	3.17	3.11	3.32	3.15	2.98	2.75	2.47	2.21	1.71	0.62	0.26	3.81	3.72	3.70	3.68	3.46	2.09	2.11	2.05	2.02	2.58
ELI	1992	2.13	2.21	2.08	2.12	2.12	2.10	2.05	1.93	1.80	1.47	0.52	0.24	2.45	2.45	2.49	2.51	2.41	1.44	1.51	1.55	1.49	1.80
FLO	1993	3.72	3.66	3.61	3.90	3.74	3.58	3.36	3.26	3.15	2.39	0.83	0.32	4.22	4.14	4.17	4.15	3.97	2.58	2.64	2.57	2.50	3.07
LOLA	1993	1.77	1.54	1.23	0.95	0.89	0.85	0.74	0.53	0.46	0.36	0.13	0.09	2.50	2.36	2.25	2.22	2.13	0.83	0.82	0.85	0.84	1.36
TERESA	1994	2.85	2.51	1.97	1.62	1.54	1.48	1.31	0.98	0.70	0.52	0.18	0.10	3.50	3.32	3.18	3.12	2.90	1.44	1.45	1.48	1.42	2.14
ANGELA	1995	2.10	1.87	1.55	1.62	1.70	1.70	1.69	1.82	1.83	1.54	0.45	0.24	2.98	2.83	2.70	2.65	2.54	1.37	1.68	1.67	1.74	1.82
BABS	1998	3.81	3.76	3.60	3.91	3.71	3.56	3.21	2.96	2.76	2.13	0.79	0.33	4.21	4.08	4.07	4.06	3.84	2.55	2.53	2.44	2.38	3.03
CHEDI	2006	0.63	0.53	0.48	0.48	0.48	0.48	0.48	0.47	0.48	0.38	0.13	0.06	1.12	1.02	0.94	0.89	0.86	0.28	0.36	0.40	0.45	0.55
DURIAN	2006	2.15	2.19	2.07	2.12	2.10	2.07	1.98	1.84	1.67	1.32	0.49	0.21	2.51	2.50	2.54	2.56	2.44	1.39	1.46	1.48	1.42	1.78
XANG	2006	2.30	2.28	2.21	2.31	2.34	2.31	2.26	2.19	2.14	1.80	0.57	0.23	2.76	2.74	2.76	2.78	2.54	1.72	1.88	1.87	1.92	2.11
FENG	2008	3.56	3.52	3.47	3.81	3.69	3.56	3.26	3.16	3.05	2.37	0.85	0.33	4.20	4.11	4.14	4.19	4.00	2.58	2.60	2.49	2.43	2.99
CONSON	2010	1.29	1.06	0.96	0.98	1.04	1.05	1.05	1.15	1.21	1.00	0.22	0.13	1.85	1.71	1.58	1.52	1.47	0.80	1.02	1.12	1.18	1.27
NESAT	2011	4.08	4.08	3.98	4.32	4.15	3.97	3.66	3.57	3.46	2.66	0.99	0.42	4.45	4.35	4.37	4.29	4.14	2.88	2.96	2.87	2.80	3.38
NARI	2013	2.52	2.52	2.39	2.59	2.55	2.48	2.36	2.26	2.16	1.76	0.62	0.26	3.00	3.02	3.10	3.08	2.91	1.72	1.80	1.78	1.79	2.07
RAMM	2014	2.18	2.17	2.13	2.20	2.24	2.21	2.15	2.11	2.04	1.63	0.51	0.21	2.61	2.60	2.62	2.62	2.44	1.64	1.79	1.78	1.81	2.00
KOPPU	2015	0.83	0.68	0.64	0.62	0.65	0.66	0.65	0.69	0.71	0.56	0.11	0.03	0.94	0.86	0.80	0.71	0.63	0.44	0.57	0.63	0.67	0.78
MELOR	2015	3.42	3.25	3.27	3.45	3.31	3.09	2.73	2.43	2.24	1.77	0.65	0.28	3.91	3.82	3.81	3.79	3.56	2.17	2.17	2.11	2.08	2.66
NOCK	2016	0.62	0.51	0.48	0.49	0.50	0.51	0.50	0.55	0.58	0.49	0.14	0.06	0.76	0.66	0.60	0.53	0.50	0.35	0.43	0.48	0.52	0.59
SARIKA	2016	2.07	2.09	1.93	2.00	2.00	1.97	1.90	1.78	1.63	1.30	0.48	0.21	2.42	2.40	2.41	2.43	2.35	1.32	1.40	1.44	1.37	1.69
KAMMI	2019	0.59	0.53	0.55	0.55	0.55	0.56	0.55	0.55	0.54	0.43	0.14	0.06	0.90	0.82	0.74	0.70	0.67	0.38	0.44	0.47	0.49	0.55
MOLAVE	2020	0.50	0.41	0.42	0.43	0.44	0.44	0.44	0.44	0.47	0.38	0.13	0.06	0.60	0.54	0.48	0.43	0.39	0.27	0.33	0.38	0.41	0.47
VAMCO	2020	3.71	3.56	3.39	3.41	3.18	3.05	2.91	2.81	2.68	2.12	0.72	0.35	4.18	4.03	3.96	3.91	3.80	2.29	2.27	2.21	2.19	2.84

Royal HaskoningDHV

A1.3 Spectral significant wave height (corrected for tide)

Table 12-3: Maximum spectral significant wave height (incl. tide) at all output points along PRDP

		Max. Hm0 (incl. tide) [m] at location																				
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	25	26	27	28
KIM	1977	4.42	4.30	4.06	4.46	4.28	4.12	3.87	3.79	3.71	2.89	1.12	0.53	4.87	4.71	4.72	4.67	4.57	3.15	3.19	3.11	3.03	3.58
RITA	1978	3.27	3.20	3.12	3.35	3.25	3.10	2.85	2.62	2.42	1.96	0.75	0.34	3.86	3.79	3.78	3.77	3.68	2.22	2.25	2.19	2.14	2.65
BETTY	1985	3.42	3.26	3.28	3.44	3.27	3.06	2.84	2.57	2.31	1.78	0.65	0.28	3.92	3.82	3.82	3.80	3.58	2.18	2.18	2.12	2.08	2.67
IRMA	1981	3.81	3.82	3.68	4.00	3.78	3.59	3.31	3.08	2.86	2.24	0.85	0.35	4.27	4.09	4.12	4.12	3.91	2.64	2.62	2.53	2.44	3.08
LEE	1981	0.81	0.68	0.66	0.66	0.66	0.67	0.67	0.72	0.75	0.62	0.15	0.07	0.96	0.90	0.84	0.78	0.73	0.49	0.60	0.66	0.70	0.78
FAYE	1982	1.43	1.27	1.28	1.31	1.35	1.37	1.35	1.39	1.41	1.16	0.33	0.14	1.79	1.72	1.65	1.62	1.51	1.02	1.20	1.27	1.30	1.41
VERA	1983	3.08	3.05	2.97	3.21	3.23	3.13	2.89	2.96	2.91	2.29	0.78	0.34	3.80	3.77	3.80	3.79	3.56	2.31	2.47	2.43	2.43	2.75
DOT	1985	3.36	3.18	3.15	3.46	3.37	3.22	2.96	2.76	2.63	2.07	0.74	0.31	3.91	3.78	3.86	3.85	3.67	2.25	2.28	2.22	2.17	2.66
BETTY	1987	1.11	0.85	0.81	0.80	0.83	0.84	0.83	0.88	0.95	0.76	0.18	0.13	1.65	1.54	1.42	1.36	1.30	0.63	0.77	0.86	0.95	1.08
NINA	1987	1.47	1.25	1.22	1.23	1.28	1.29	1.28	1.38	1.41	1.18	0.28	0.19	1.90	1.80	1.68	1.54	1.41	0.96	1.27	1.34	1.42	1.46
RUBY	1988	4.16	4.16	4.02	4.40	4.24	4.06	3.77	3.66	3.58	2.77	1.08	0.49	4.69	4.60	4.62	4.62	4.46	3.04	3.11	3.02	2.94	3.53
DAN	1989	2.34	2.23	2.21	2.28	2.34	2.33	2.28	2.25	2.21	1.80	0.54	0.24	2.89	2.87	2.86	2.85	2.68	1.77	2.01	2.01	2.02	2.21
HUNT	1989	3.82	3.71	3.52	3.82	3.67	3.50	3.16	2.96	2.81	2.19	0.80	0.32	4.23	4.07	4.13	4.10	3.75	2.43	2.44	2.36	2.31	2.93
YURIYA	1991	3.32	3.15	3.15	3.39	3.22	3.13	2.88	2.60	2.32	1.84	0.64	0.26	3.78	3.65	3.79	3.79	3.42	2.14	2.16	2.10	2.06	2.56
ELI	1992	2.22	2.29	2.18	2.23	2.24	2.22	2.17	2.05	1.82	1.56	0.56	0.25	2.56	2.57	2.63	2.66	2.55	1.53	1.60	1.63	1.60	1.89
FLO	1993	3.75	3.68	3.64	3.80	3.76	3.61	3.39	3.25	3.12	2.41	0.85	0.33	4.17	4.10	4.13	4.09	3.82	2.50	2.57	2.59	2.52	3.10
LOLA	1993	1.70	1.49	1.18	0.91	0.86	0.82	0.71	0.51	0.43	0.34	0.14	0.10	2.40	2.26	2.15	2.11	2.02	0.80	0.79	0.82	0.80	1.31
TERESA	1994	2.81	2.48	1.95	1.63	1.59	1.53	1.36	1.02	0.73	0.52	0.20	0.11	3.45	3.27	3.13	3.06	2.85	1.42	1.43	1.45	1.40	2.15
ANGELA	1995	2.12	1.88	1.60	1.66	1.75	1.75	1.74	1.87	1.87	1.58	0.47	0.25	3.00	2.84	2.71	2.67	2.56	1.41	1.72	1.73	1.80	1.88
BABS	1998	3.81	3.77	3.62	3.91	3.71	3.58	3.24	2.99	2.80	2.16	0.80	0.33	4.22	4.10	4.11	4.08	3.88	2.56	2.54	2.45	2.39	3.04
CHEBI	2006	0.60	0.51	0.47	0.47	0.47	0.47	0.46	0.45	0.48	0.36	0.13	0.06	1.07	0.98	0.89	0.85	0.81	0.28	0.36	0.41	0.45	0.55
DURIAN	2006	2.31	2.34	2.21	2.23	2.22	2.18	2.08	1.93	1.75	1.39	0.62	0.23	2.72	2.72	2.77	2.81	2.70	1.48	1.55	1.59	1.53	1.92
XANG	2006	2.23	2.22	2.15	2.24	2.28	2.25	2.20	2.13	2.09	1.75	0.55	0.22	2.68	2.65	2.68	2.68	2.44	1.66	1.82	1.80	1.86	2.05
FENG	2008	3.62	3.49	3.44	3.77	3.65	3.53	3.23	3.14	3.03	2.35	0.84	0.32	4.16	4.07	4.09	4.14	3.95	2.55	2.57	2.47	2.40	2.96
CONSON	2010	1.23	1.02	0.92	0.93	0.99	1.00	1.00	1.10	1.16	0.96	0.21	0.12	1.86	1.72	1.59	1.53	1.48	0.76	0.97	1.00	1.12	1.21
MESAT	2011	4.06	4.06	3.96	4.30	4.13	3.96	3.65	3.62	3.64	2.80	0.98	0.41	4.43	4.32	4.38	4.38	4.10	2.84	3.01	3.05	2.98	3.36
NARI	2013	2.49	2.51	2.39	2.58	2.55	2.47	2.36	2.26	2.15	1.76	0.62	0.26	2.99	3.01	3.09	3.08	2.91	1.72	1.80	1.77	1.78	2.07
RAMM	2014	2.18	2.17	2.13	2.21	2.24	2.22	2.15	2.10	2.04	1.65	0.51	0.21	2.80	2.59	2.62	2.62	2.44	1.64	1.79	1.79	1.81	2.00
KOPPU	2015	0.85	0.70	0.66	0.64	0.66	0.67	0.67	0.71	0.73	0.57	0.11	0.03	0.95	0.88	0.82	0.74	0.65	0.46	0.58	0.65	0.68	0.80
MELOR	2015	3.60	3.40	3.45	3.62	3.47	3.25	2.86	2.64	2.32	1.63	0.69	0.30	4.14	4.05	4.05	4.06	3.83	2.30	2.30	2.24	2.20	2.81
NOCK	2016	0.60	0.50	0.47	0.48	0.49	0.50	0.49	0.53	0.56	0.47	0.13	0.06	0.73	0.64	0.58	0.51	0.47	0.33	0.42	0.46	0.50	0.57
SARIKA	2016	2.07	2.09	1.98	2.06	2.06	2.03	1.96	1.83	1.68	1.34	0.50	0.22	2.62	2.40	2.41	2.42	2.35	1.37	1.45	1.50	1.42	1.69
KAMMI	2019	0.57	0.54	0.57	0.57	0.58	0.58	0.57	0.57	0.56	0.45	0.14	0.06	0.95	0.86	0.79	0.75	0.70	0.39	0.45	0.49	0.46	0.53
MOLAVE	2020	0.53	0.43	0.41	0.41	0.42	0.43	0.42	0.46	0.49	0.40	0.13	0.06	0.63	0.56	0.51	0.48	0.41	0.29	0.35	0.40	0.43	0.49
VAMCO	2020	3.69	3.54	3.38	3.39	3.17	3.08	2.94	2.84	2.71	2.14	0.73	0.34	4.16	4.00	3.93	3.89	3.77	2.28	2.26	2.21	2.17	2.83

Project related

Royal HaskoningDHV

A1.4 Spectral significant wave height (corrected for tide and SLR)

Table 12-4 Maximum spectral significant wave height (incl. tide and SLR) at all output points along PRDP

		Max. Hmo (incl. tide and SLR) [m] at location																					
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	25	26	27	28
KIM	1977	4.69	4.53	4.30	4.73	4.54	4.37	4.10	4.01	3.93	3.06	1.20	0.58	5.15	5.02	5.05	5.04	4.93	3.57	3.41	3.33	3.24	3.81
RITA	1978	3.49	3.38	3.33	3.57	3.46	3.31	3.05	2.79	2.58	2.08	0.81	0.38	4.15	4.08	4.08	4.10	3.99	2.40	2.43	2.37	2.30	2.84
BETTY	1980	3.65	3.45	3.49	3.67	3.49	3.26	3.03	2.74	2.46	1.90	0.70	0.31	4.21	4.11	4.12	4.13	3.91	2.35	2.35	2.28	2.24	2.86
IRMA	1981	4.07	4.05	3.92	4.27	4.03	3.82	3.53	3.28	3.04	2.38	0.92	0.39	4.58	4.41	4.44	4.48	4.26	2.85	2.82	2.72	2.62	3.30
LEE	1981	0.87	0.72	0.70	0.71	0.71	0.72	0.72	0.77	0.80	0.66	0.16	0.07	1.03	0.97	0.91	0.86	0.80	0.53	0.65	0.72	0.76	0.84
FAYE	1982	1.53	1.34	1.37	1.40	1.44	1.48	1.44	1.48	1.50	1.24	0.36	0.15	1.92	1.85	1.78	1.76	1.65	1.10	1.28	1.37	1.40	1.51
VERA	1983	3.26	3.23	3.16	3.42	3.44	3.34	3.18	3.15	3.09	2.44	0.84	0.38	4.08	4.05	4.09	4.12	3.88	2.49	2.65	2.61	2.60	2.94
DOT	1985	3.59	3.36	3.36	3.69	3.55	3.43	3.17	2.94	2.80	2.20	0.80	0.34	4.20	4.07	4.16	4.19	4.01	2.42	2.46	2.39	2.33	2.85
BETTY	1987	1.19	0.90	0.86	0.86	0.89	0.90	0.89	0.94	1.01	0.81	0.19	0.14	1.78	1.66	1.54	1.48	1.42	0.68	0.83	0.93	1.03	1.16
NINA	1987	1.58	1.33	1.31	1.32	1.37	1.39	1.37	1.48	1.51	1.26	0.31	0.21	2.05	1.96	1.83	1.69	1.56	1.05	1.38	1.45	1.53	1.58
RUBY	1988	4.42	4.39	4.26	4.67	4.50	4.31	4.00	3.88	3.75	2.94	1.16	0.54	5.01	4.93	4.96	4.99	4.83	3.26	3.33	3.24	3.15	3.76
DAN	1989	2.50	2.36	2.35	2.43	2.49	2.47	2.42	2.39	2.34	1.91	0.58	0.26	3.09	3.07	3.07	3.09	2.89	1.91	2.15	2.16	2.17	2.36
HUNT	1989	4.01	3.92	3.75	4.06	3.90	3.73	3.36	3.14	2.99	2.33	0.87	0.35	4.53	4.38	4.44	4.44	4.09	2.61	2.62	2.54	2.48	3.14
YUNYA	1991	3.54	3.34	3.36	3.61	3.43	3.32	3.07	2.76	2.46	1.95	0.69	0.29	4.07	3.98	4.09	4.12	3.75	2.31	2.32	2.26	2.22	2.75
ELI	1992	2.36	2.42	2.32	2.37	2.38	2.36	2.31	2.17	2.03	1.66	0.61	0.28	2.74	2.76	2.82	2.89	2.78	1.64	1.71	1.76	1.71	2.02
FLO	1993	4.00	3.90	3.67	4.06	4.01	3.85	3.61	3.46	3.31	2.56	0.92	0.36	4.48	4.41	4.45	4.46	4.17	2.71	2.77	2.79	2.71	3.31
LOLA	1993	1.62	1.58	1.27	0.97	0.92	0.88	0.76	0.54	0.47	0.36	0.15	0.11	2.59	2.45	2.33	2.31	2.22	0.87	0.85	0.89	0.87	1.41
TERESA	1994	3.01	2.63	2.08	1.78	1.70	1.63	1.44	1.08	0.77	0.56	0.21	0.12	3.71	3.53	3.39	3.34	3.12	1.53	1.54	1.57	1.51	2.27
ANGELA	1995	2.26	1.99	1.70	1.77	1.87	1.86	1.85	1.99	1.99	1.68	0.51	0.28	3.22	3.07	2.93	2.91	2.79	1.52	1.85	1.86	1.93	2.01
BABS	1998	4.06	3.99	3.85	4.17	3.96	3.81	3.45	3.18	2.98	2.30	0.86	0.37	4.53	4.41	4.43	4.44	4.21	2.76	2.73	2.64	2.58	3.25
CHEDI	2006	0.64	0.54	0.50	0.50	0.50	0.51	0.50	0.48	0.51	0.41	0.14	0.06	1.15	1.06	0.97	0.93	0.90	0.30	0.39	0.44	0.48	0.59
DURIAN	2006	2.46	2.47	2.35	2.38	2.36	2.32	2.22	2.05	1.86	1.47	0.66	0.26	2.90	2.92	2.97	3.05	2.93	1.59	1.66	1.71	1.61	2.05
XANG	2006	2.39	2.35	2.29	2.39	2.43	2.40	2.35	2.27	2.22	1.86	0.60	0.25	2.88	2.86	2.89	2.89	2.67	1.79	1.96	1.95	2.00	2.20
FENG	2008	3.87	3.69	3.67	4.02	3.89	3.76	3.45	3.34	3.22	2.50	0.91	0.36	4.46	4.38	4.41	4.50	4.31	2.75	2.76	2.68	2.58	3.17
CONSON	2010	1.32	1.09	0.99	1.00	1.07	1.07	1.07	1.18	1.24	1.03	0.23	0.13	2.00	1.86	1.72	1.67	1.63	0.82	1.05	1.15	1.21	1.31
NESAT	2011	4.33	4.30	4.22	4.58	4.40	4.21	3.88	3.65	3.65	2.97	1.06	0.46	4.75	4.64	4.71	4.75	4.46	3.07	3.23	3.27	3.19	3.60
NARI	2013	2.66	2.66	2.54	2.76	2.72	2.64	2.52	2.41	2.29	1.88	0.67	0.29	3.22	3.25	3.34	3.36	3.19	1.86	1.93	1.92	1.92	2.22
RAMM	2014	2.32	2.30	2.27	2.36	2.39	2.37	2.29	2.24	2.17	1.76	0.55	0.23	2.80	2.79	2.83	2.85	2.67	1.77	1.93	1.93	1.94	2.14
KOPPU	2015	0.90	0.74	0.70	0.68	0.71	0.72	0.71	0.75	0.78	0.61	0.12	0.03	1.03	0.95	0.88	0.80	0.71	0.50	0.63	0.70	0.73	0.86
MELOR	2015	3.64	3.59	3.46	3.85	3.69	3.43	3.04	2.70	2.46	1.95	0.75	0.33	4.43	4.35	4.35	4.40	4.16	2.48	2.47	2.40	2.36	3.01
NOCK	2016	0.64	0.53	0.50	0.51	0.52	0.53	0.52	0.56	0.60	0.50	0.15	0.07	0.79	0.69	0.63	0.56	0.52	0.36	0.45	0.50	0.54	0.61
SARIKA	2016	2.22	2.22	2.11	2.20	2.19	2.17	2.09	1.95	1.78	1.43	0.55	0.25	2.60	2.59	2.60	2.64	2.57	1.48	1.56	1.61	1.53	1.81
KAMMI	2019	0.61	0.57	0.61	0.61	0.62	0.62	0.61	0.60	0.59	0.47	0.15	0.07	1.02	0.93	0.85	0.81	0.77	0.42	0.49	0.52	0.50	0.68
MOLAVE	2020	0.56	0.45	0.44	0.44	0.45	0.46	0.45	0.49	0.52	0.43	0.14	0.07	0.68	0.61	0.55	0.44	0.45	0.31	0.38	0.43	0.46	0.53
VAMCO	2020	3.94	3.74	3.60	3.91	3.31	3.29	3.13	3.02	2.88	2.27	0.79	0.38	4.46	4.30	4.24	4.23	4.11	2.46	2.42	2.38	2.33	3.03

Royal HaskoningDHV

A1.5 Mean wave period values

Table 12-5: Mean wave period at all output points along PRDP

		Mean wave period [s] at location																					
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	25	26	27	28
KIM	1977	8.08	7.68	7.82	7.80	7.71	7.75	7.69	7.39	6.92	6.23	5.13	2.22	7.67	7.73	7.76	7.71	7.20	6.93	6.94	6.70	6.92	7.37
RITA	1978	6.44	6.52	6.55	6.46	6.44	6.41	6.29	6.04	5.68	5.05	4.04	2.11	6.43	6.49	6.50	6.54	6.25	5.78	5.81	5.88	5.80	6.67
BETTY	1980	7.09	6.82	6.86	6.84	6.52	6.66	6.69	6.50	6.15	5.53	4.21	2.01	7.00	7.11	7.25	7.32	6.88	6.63	6.82	6.90	6.85	7.29
RINA	1981	7.54	7.41	7.46	7.43	7.45	7.56	7.46	7.22	6.66	5.96	4.61	2.12	7.24	7.27	7.79	7.85	7.31	6.86	7.00	7.11	7.06	7.72
LEE	1981	3.11	3.78	5.10	4.96	4.04	4.08	4.01	3.72	3.53	3.26	2.96	1.82	3.03	3.29	3.45	3.66	3.49	3.53	3.08	3.06	2.80	2.94
FAYE	1982	4.11	4.80	5.16	5.01	4.92	4.97	4.90	4.62	4.32	3.95	3.45	1.91	3.84	4.00	4.48	4.59	4.36	4.15	3.76	3.62	3.33	3.55
VERA	1983	6.09	6.32	6.57	6.49	6.44	6.50	6.50	6.26	6.00	5.55	4.79	2.17	6.25	6.32	6.41	6.41	6.08	5.30	5.19	5.25	5.09	5.70
DOT	1985	6.87	6.97	6.65	6.63	6.62	6.60	6.48	6.30	5.96	5.41	4.39	2.09	6.64	6.66	6.86	6.87	6.45	5.97	6.04	6.16	6.01	6.64
BETTY	1987	3.11	5.05	5.92	5.75	5.39	5.42	5.29	3.45	3.44	3.29	1.77	1.66	3.99	3.90	3.84	3.91	3.88	4.88	4.06	2.82	2.85	2.97
NINA	1987	3.99	4.96	5.28	5.77	5.49	5.63	5.47	4.36	4.25	3.98	3.68	1.69	3.90	3.89	3.90	4.07	4.04	4.64	3.23	3.25	3.36	3.71
RUBY	1988	7.83	7.77	7.87	7.81	7.79	7.81	7.72	7.43	6.95	6.27	4.89	2.32	7.87	7.90	7.91	7.97	7.33	6.79	6.87	7.02	6.91	7.71
DAN	1989	5.90	6.21	6.64	6.46	6.31	6.40	6.33	5.93	5.45	4.94	4.26	1.95	5.39	5.45	5.57	5.64	5.30	5.35	4.85	4.90	4.57	5.24
HUNT	1989	7.94	7.52	7.64	7.46	7.53	7.45	7.33	7.11	6.74	6.03	4.87	2.11	7.59	7.67	7.79	7.86	7.39	6.77	6.91	7.09	6.99	8.09
YUNYA	1991	7.00	6.87	6.77	6.76	6.77	6.70	6.62	6.44	6.10	5.42	4.24	1.97	6.85	6.94	7.07	7.14	6.74	6.50	6.63	6.72	6.64	7.16
ELI	1992	5.21	5.07	5.25	5.26	5.25	5.27	5.21	5.07	4.80	4.40	3.63	1.99	5.24	5.31	5.39	5.44	5.22	4.67	4.75	4.85	4.31	5.24
FLO	1993	8.12	8.07	8.19	8.19	8.09	8.12	8.01	7.71	7.27	6.46	5.41	2.26	8.11	8.17	8.19	8.26	7.63	7.27	7.33	7.56	7.14	8.02
LOLA	1993	6.07	5.69	5.65	5.49	5.53	5.56	5.39	4.69	2.79	2.73	1.71	1.60	5.37	5.34	5.31	5.42	5.27	5.73	5.89	5.72	5.14	5.26
TERESA	1994	6.98	6.55	6.52	6.14	5.93	5.91	5.74	5.26	4.76	3.08	2.86	1.77	6.27	6.27	6.27	6.40	6.21	7.46	7.65	7.56	7.26	7.31
ANGELA	1995	6.26	5.65	3.85	3.92	3.87	4.00	4.08	4.12	4.13	3.94	2.86	1.88	5.39	5.28	5.21	5.30	5.15	3.50	3.44	3.54	3.54	3.65
BABS	1998	7.80	7.43	7.51	7.50	7.53	7.54	7.46	7.26	6.86	6.13	4.83	2.10	7.67	7.81	7.96	7.92	7.41	8.99	7.15	7.25	7.21	7.84
CHEDI	2006	4.12	3.68	6.87	6.64	6.52	6.01	6.42	5.93	3.34	3.11	3.33	1.79	3.70	3.64	3.61	3.65	3.64	9.84	3.21	3.09	2.18	2.31
DURIAN	2006	5.41	5.23	5.36	5.34	5.35	5.34	5.29	5.15	4.95	4.49	3.61	1.96	5.40	5.44	5.51	5.56	5.39	4.76	4.83	4.99	4.81	5.40
XANG	2006	5.91	6.01	6.38	6.26	6.17	6.23	6.17	5.87	5.52	4.97	4.34	2.15	5.63	5.75	5.86	5.95	5.64	5.25	4.90	5.11	4.69	5.50
FENG	2008	7.85	7.53	7.54	7.50	7.58	7.52	7.41	7.20	6.97	6.33	5.38	2.24	7.48	7.60	7.69	7.67	7.11	6.75	6.80	6.89	6.73	7.63
CONSON	2010	3.22	3.25	3.28	3.31	3.33	3.41	3.42	3.51	3.53	3.36	2.65	1.65	4.24	4.12	4.02	4.05	4.01	2.89	2.89	2.97	3.02	3.11
NESAT	2011	8.26	8.09	8.16	8.10	8.11	8.13	8.05	7.93	7.36	6.62	5.29	2.34	8.19	8.21	8.20	8.19	7.65	7.13	7.23	7.26	6.97	8.26
NARI	2013	5.73	5.62	5.74	5.71	5.71	5.72	5.66	5.46	5.24	4.82	3.99	2.05	5.73	5.79	5.85	5.93	5.65	4.89	4.92	5.02	4.86	5.47
RAMMI	2014	6.22	6.52	6.54	6.78	6.68	6.76	6.53	5.93	5.58	5.00	4.31	2.02	5.74	5.82	6.09	6.16	5.67	5.58	5.03	5.11	4.59	5.73
KOPPU	2015	4.17	4.96	5.93	5.82	5.46	5.47	5.30	4.69	4.30	3.96	4.15	1.89	3.50	3.77	4.20	4.65	4.30	5.46	4.38	4.18	3.45	3.86
MELOR	2015	7.07	6.85	6.84	6.93	6.97	6.91	6.77	6.59	5.99	5.42	4.27	2.01	7.04	7.15	7.24	7.31	6.92	6.65	6.83	6.92	6.87	7.31
NOCK	2016	2.51	2.62	5.79	5.55	5.45	5.45	5.30	2.77	2.80	2.72	2.96	1.84	2.65	2.69	2.69	5.29	2.68	2.26	2.27	2.33	2.37	2.42
SARIKA	2016	5.20	4.97	5.10	5.10	5.10	5.10	5.05	4.82	4.72	4.31	3.49	1.96	5.17	5.19	5.22	5.27	5.14	4.44	4.51	4.62	4.50	5.20
KAMMI	2019	2.75	5.67	6.71	6.58	6.44	6.46	6.24	5.43	4.81	4.05	3.44	1.83	3.40	3.35	3.33	3.37	3.42	5.72	4.96	4.96	2.47	2.62
MOLAVE	2020	2.53	2.74	6.16	5.95	5.83	5.93	5.84	2.84	2.80	2.70	3.04	1.78	2.56	2.64	2.72	5.59	2.75	10.29	2.27	2.31	2.27	2.40
VAMCO	2020	7.28	6.81	6.84	6.77	6.69	6.56	6.51	6.22	5.88	5.40	4.51	2.04	7.01	7.05	7.07	7.19	6.83	6.68	6.90	7.06	6.92	7.44

Royal HaskoningDHV

A1.6 Mean wave direction values

Table 12-6: Mean wave direction at all output points along PRDP

		Mean wave direction [deg N] at location																					
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	25	26	27	28
KIM	1977	275	274	261	253	246	247	245	241	235	231	233	246	272	268	228	221	224	224	222	225	222	236
RITA	1978	262	263	257	253	251	252	250	245	238	234	233	242	257	254	248	242	241	226	232	236	234	247
BETTY	1980	269	269	262	256	255	256	252	247	241	236	232	242	264	260	251	244	246	227	233	238	237	252
RINA	1981	279	266	260	257	255	254	252	247	240	236	232	241	277	274	248	239	239	225	231	236	235	250
LEE	1981	169	192	217	216	202	203	202	196	192	189	230	237	169	180	186	192	195	196	189	184	175	170
FAYE	1982	189	223	229	226	225	226	223	216	204	207	228	233	178	186	202	205	206	206	196	189	180	178
VERA	1983	237	244	242	239	237	239	238	233	227	225	230	231	224	223	220	217	216	213	213	214	209	221
DOT	1985	276	275	255	251	249	250	248	244	238	234	232	241	277	274	238	233	234	223	228	232	230	244
BETTY	1987	160	202	215	215	210	211	209	188	186	196	93	71	325	322	319	309	304	200	193	172	165	160
NINA	1987	180	207	225	220	216	219	216	201	197	204	227	105	173	177	182	188	193	202	185	178	176	177
RUBY	1988	256	259	254	250	248	250	248	244	237	233	234	242	244	240	232	228	229	223	226	230	228	241
DAN	1989	220	231	234	232	229	231	229	222	215	217	228	219	204	205	205	206	207	208	204	202	196	203
HUNT	1989	274	274	267	255	252	254	251	247	241	236	232	241	271	267	240	234	251	225	230	236	233	257
YUNYA	1991	270	270	262	257	255	254	252	247	242	236	232	243	267	263	250	243	248	227	233	238	237	253
ELI	1992	264	263	256	251	247	248	246	242	235	230	231	241	261	258	252	247	250	227	232	236	222	246
FLO	1993	259	262	256	252	250	251	249	245	238	233	231	240	245	241	232	226	227	223	227	231	228	242
LOLA	1993	286	287	279	274	272	273	272	272	179	191	73	75	298	294	290	281	278	227	233	240	245	264
TERESA	1994	286	285	276	269	265	266	263	259	254	194	239	247	292	288	283	273	270	226	232	239	241	263
ANGELA	1995	290	293	202	203	200	203	203	200	197	205	220	212	304	302	298	289	287	194	188	185	181	180
BABS	1998	278	268	262	259	256	256	252	248	241	236	232	242	262	256	246	242	242	226	232	237	237	252
CHEBI	2006	299	305	242	239	236	238	235	229	186	194	229	237	316	313	309	303	299	224	187	180	141	139
DURIAN	2006	268	267	262	253	251	252	250	246	241	236	232	241	266	264	258	253	253	226	232	237	233	252
MANG	2006	236	240	241	238	236	237	235	229	223	221	229	233	219	219	218	216	216	213	211	212	207	219
FENG	2008	265	265	256	252	252	252	250	245	239	234	231	240	248	244	237	231	229	223	227	232	230	249
CONSON	2010	170	184	193	196	193	195	195	192	189	199	224	85	316	314	312	308	301	190	184	179	174	170
NESAT	2011	260	263	257	254	253	254	251	243	236	231	233	242	244	239	229	223	227	224	225	226	222	246
NARI	2013	271	255	251	247	245	246	245	240	235	231	231	239	242	240	235	232	232	220	224	227	223	237
RAMM	2014	233	243	243	240	238	240	236	227	221	220	229	234	217	216	217	216	216	212	209	209	202	216
KOPPU	2015	176	199	214	214	209	210	207	199	194	201	227	234	167	176	185	193	195	200	191	185	175	172
MELOR	2015	269	268	262	258	255	256	253	248	239	234	232	242	262	258	251	244	244	227	233	238	237	252
NOCK	2016	165	180	246	242	240	240	237	187	185	194	229	238	167	176	183	222	192	191	185	180	174	168
SARIKA	2016	273	271	255	250	249	250	248	244	239	234	232	240	276	273	269	263	262	225	230	233	231	256
KAMMI	2019	164	227	242	240	236	237	233	221	211	209	229	237	322	318	313	306	300	215	213	213	170	165
MOLAVE	2020	163	176	239	237	234	235	234	185	183	192	229	237	167	176	182	216	192	223	185	179	171	165
VAMCO	2020	274	273	266	261	258	245	243	230	233	230	231	244	273	270	264	255	253	226	234	238	240	257

Royal HaskoningDHV

A1.7 Current speed values

Table 12-7: Maximum current speed at all output points along PRDP

		Max. current speed [m/s] at location																					
Name	Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	24	25	26	27	28
KIM	1977	0.44	0.32	0.38	0.29	0.43	0.44	0.46	0.40	0.37	0.23	0.17	0.20	0.34	0.45	0.49	0.53	0.29	0.32	0.58	0.67	0.72	0.75
RITA	1978	0.31	0.19	0.25	0.16	0.22	0.23	0.25	0.22	0.17	0.09	0.09	0.08	0.20	0.29	0.33	0.36	0.21	0.26	0.44	0.51	0.57	0.60
BETTY	1980	0.34	0.19	0.21	0.20	0.29	0.30	0.32	0.27	0.19	0.08	0.11	0.13	0.27	0.34	0.34	0.36	0.24	0.26	0.43	0.50	0.59	0.68
IRMA	1981	0.44	0.24	0.29	0.26	0.39	0.41	0.43	0.36	0.27	0.11	0.17	0.20	0.35	0.44	0.45	0.49	0.32	0.30	0.50	0.58	0.68	0.76
LEE	1981	0.15	0.15	0.17	0.13	0.17	0.19	0.22	0.24	0.20	0.06	0.12	0.14	0.18	0.19	0.18	0.22	0.19	0.10	0.20	0.28	0.26	0.23
FAYE	1982	0.18	0.19	0.24	0.18	0.23	0.27	0.30	0.34	0.28	0.09	0.12	0.15	0.15	0.16	0.19	0.30	0.27	0.15	0.27	0.37	0.34	0.32
VERA	1983	0.28	0.34	0.42	0.25	0.25	0.34	0.40	0.41	0.41	0.22	0.24	0.25	0.27	0.27	0.24	0.20	0.16	0.19	0.36	0.41	0.41	0.32
DOT	1985	0.37	0.21	0.28	0.22	0.31	0.32	0.34	0.29	0.24	0.14	0.11	0.12	0.23	0.29	0.33	0.35	0.23	0.26	0.42	0.49	0.55	0.61
BETTY	1987	0.26	0.27	0.27	0.18	0.22	0.26	0.29	0.32	0.27	0.10	0.18	0.20	0.36	0.38	0.33	0.40	0.34	0.17	0.36	0.50	0.43	0.41
NINA	1987	0.29	0.30	0.30	0.22	0.29	0.33	0.37	0.41	0.34	0.11	0.19	0.22	0.35	0.39	0.35	0.46	0.40	0.21	0.41	0.58	0.47	0.43
RUBY	1988	0.43	0.27	0.36	0.24	0.37	0.38	0.40	0.34	0.35	0.21	0.17	0.19	0.37	0.48	0.51	0.54	0.34	0.30	0.60	0.73	0.76	0.79
DAN	1989	0.29	0.26	0.31	0.23	0.29	0.33	0.37	0.41	0.37	0.14	0.17	0.18	0.27	0.27	0.26	0.31	0.27	0.19	0.25	0.35	0.30	0.34
HUNT	1989	0.44	0.22	0.27	0.23	0.37	0.38	0.39	0.32	0.23	0.12	0.17	0.20	0.32	0.40	0.41	0.43	0.30	0.29	0.48	0.58	0.66	0.75
YUNYA	1991	0.36	0.21	0.23	0.22	0.30	0.31	0.32	0.28	0.21	0.08	0.09	0.11	0.24	0.30	0.32	0.33	0.21	0.26	0.39	0.47	0.55	0.64
ELI	1992	0.16	0.15	0.18	0.10	0.11	0.15	0.18	0.20	0.17	0.08	0.09	0.10	0.12	0.11	0.14	0.16	0.12	0.13	0.19	0.22	0.25	0.29
FLO	1993	0.35	0.25	0.33	0.16	0.23	0.22	0.24	0.21	0.25	0.20	0.12	0.12	0.32	0.45	0.48	0.49	0.32	0.26	0.54	0.64	0.71	0.74
LOLA	1993	0.29	0.27	0.27	0.19	0.24	0.27	0.29	0.25	0.18	0.09	0.17	0.19	0.25	0.28	0.27	0.30	0.24	0.13	0.28	0.39	0.35	0.33
TERESA	1994	0.33	0.24	0.27	0.21	0.27	0.31	0.34	0.31	0.24	0.09	0.17	0.19	0.23	0.25	0.26	0.29	0.25	0.21	0.25	0.32	0.37	0.46
ANGELA	1995	0.38	0.32	0.34	0.25	0.30	0.34	0.38	0.42	0.38	0.15	0.18	0.21	0.30	0.28	0.23	0.28	0.24	0.18	0.21	0.22	0.29	0.37
BABS	1998	0.41	0.23	0.28	0.23	0.35	0.36	0.38	0.32	0.24	0.13	0.15	0.18	0.32	0.42	0.43	0.45	0.31	0.29	0.49	0.58	0.68	0.75
CHEBI	2005	0.22	0.21	0.20	0.14	0.16	0.18	0.19	0.21	0.17	0.08	0.14	0.17	0.25	0.28	0.25	0.29	0.24	0.11	0.25	0.37	0.32	0.30
DURIAN	2006	0.15	0.10	0.12	0.08	0.14	0.13	0.16	0.13	0.11	0.05	0.07	0.07	0.09	0.12	0.15	0.16	0.10	0.14	0.18	0.22	0.24	0.30
MANG	2006	0.26	0.25	0.28	0.17	0.19	0.25	0.29	0.32	0.31	0.12	0.17	0.18	0.21	0.26	0.24	0.26	0.21	0.13	0.22	0.30	0.26	0.27
FENG	2008	0.29	0.27	0.29	0.20	0.24	0.28	0.30	0.26	0.20	0.18	0.17	0.20	0.29	0.34	0.37	0.42	0.23	0.24	0.48	0.55	0.62	0.68
CONSON	2010	0.28	0.24	0.24	0.17	0.22	0.26	0.29	0.32	0.28	0.09	0.15	0.18	0.21	0.32	0.37	0.43	0.35	0.16	0.32	0.44	0.40	0.44
NESAT	2011	0.47	0.25	0.34	0.20	0.37	0.37	0.41	0.32	0.34	0.23	0.14	0.17	0.43	0.53	0.55	0.56	0.40	0.31	0.61	0.72	0.80	0.87
NARI	2013	0.23	0.16	0.20	0.12	0.18	0.18	0.20	0.21	0.18	0.09	0.11	0.11	0.13	0.15	0.19	0.21	0.15	0.18	0.27	0.32	0.34	0.41
RAMM	2014	0.21	0.23	0.26	0.18	0.22	0.27	0.31	0.35	0.31	0.12	0.16	0.18	0.21	0.25	0.25	0.24	0.23	0.17	0.23	0.30	0.30	0.32
KOPPU	2015	0.12	0.12	0.15	0.12	0.16	0.19	0.21	0.24	0.19	0.05	0.11	0.13	0.16	0.17	0.15	0.19	0.18	0.11	0.20	0.27	0.26	0.25
MELOR	2015	0.34	0.16	0.20	0.17	0.28	0.28	0.30	0.26	0.14	0.11	0.10	0.13	0.27	0.34	0.35	0.36	0.23	0.26	0.44	0.52	0.60	0.68
NOCK	2016	0.16	0.17	0.16	0.11	0.13	0.15	0.17	0.18	0.16	0.07	0.15	0.17	0.17	0.20	0.19	0.22	0.18	0.11	0.25	0.34	0.30	0.27
SARIKA	2016	0.17	0.10	0.13	0.09	0.12	0.13	0.15	0.13	0.11	0.05	0.07	0.08	0.09	0.11	0.13	0.15	0.12	0.13	0.18	0.20	0.23	0.29
KAMM	2019	0.20	0.20	0.19	0.13	0.14	0.16	0.18	0.20	0.16	0.07	0.14	0.16	0.23	0.26	0.24	0.25	0.20	0.10	0.24	0.35	0.30	0.27
MOLAVE	2020	0.12	0.13	0.12	0.09	0.12	0.14	0.16	0.17	0.14	0.05	0.11	0.13	0.15	0.17	0.15	0.19	0.17	0.08	0.18	0.25	0.22	0.20
VAMCO	2020	0.39	0.23	0.31	0.22	0.33	0.34	0.36	0.30	0.25	0.15	0.17	0.20	0.26	0.31	0.33	0.38	0.25	0.28	0.42	0.47	0.56	0.68

Royal HaskoningDHV

A2 Extreme value analysis results

This appendix provides all the results from the extreme value analyses (EVAs) performed in Chapter 0.

A2.1 Extreme surge results

The fitted extreme value distributions per location are shown in Figure 12-1 to Figure 12-22. The EVA results are shown in Table 12-8.

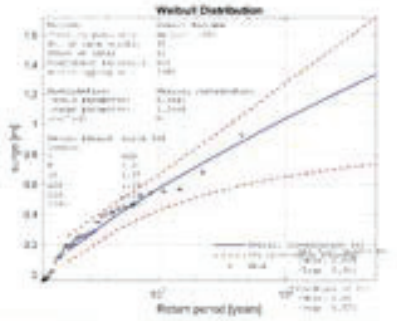


Figure 12-1 Weibull fit with ML method on corrected typhoon surge level data at location 1

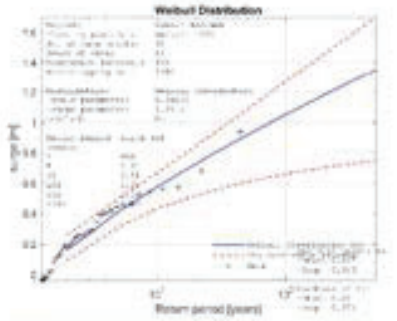


Figure 12-2 Weibull fit with ML method on corrected typhoon surge level data at location 2

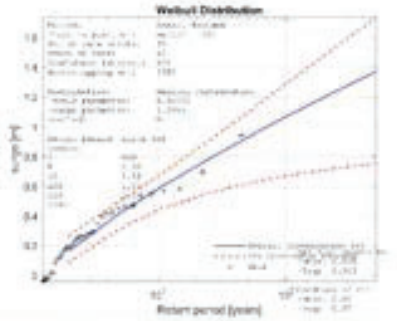


Figure 12-3 Weibull fit with ML method on corrected typhoon surge level data at location 3

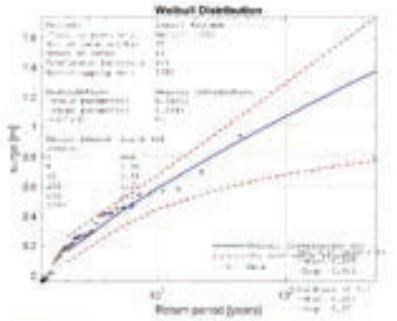


Figure 12-4 Weibull fit with ML method on corrected typhoon surge level data at location 4

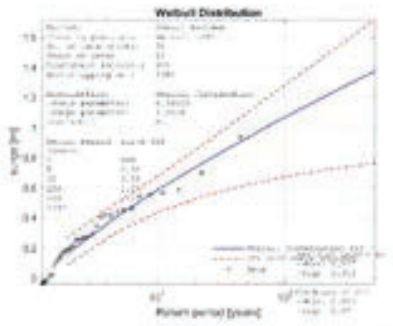


Figure 12-5: Weibull fit with ML method on corrected typhoon surge level data at location 5

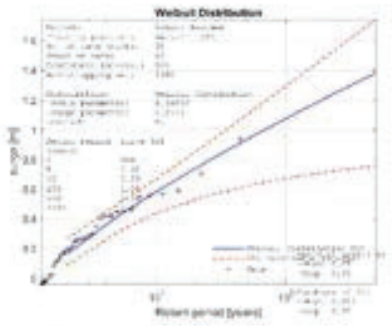


Figure 12-6: Weibull fit with ML method on corrected typhoon surge level data at location 6

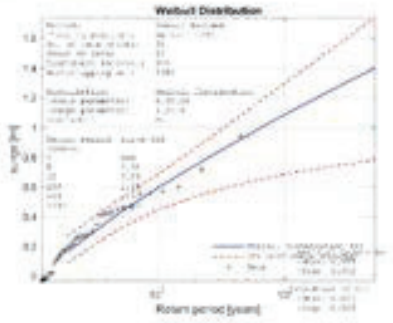


Figure 12-7: Weibull fit with ML method on corrected typhoon surge level data at location 7

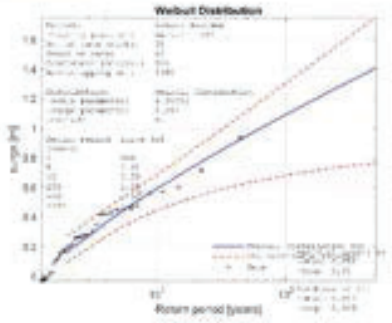


Figure 12-8: Weibull fit with ML method on corrected typhoon surge level data at location 8

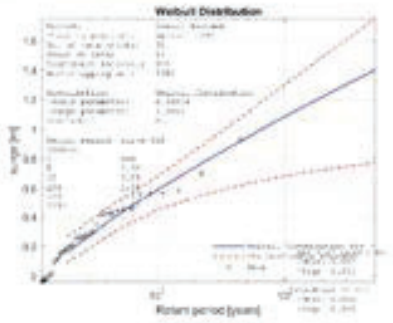


Figure 12-9: Weibull fit with ML method on corrected typhoon surge level data at location 9

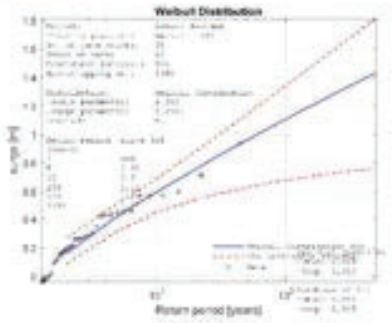


Figure 12-10: Weibull fit with ML method on corrected typhoon surge level data at location 10

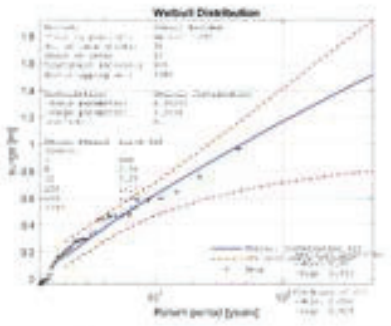


Figure 12-11: Weibull fit with ML method on corrected typhoon surge level data at location 11

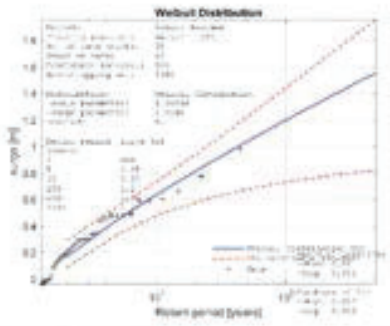


Figure 12-12: Weibull fit with ML method on corrected typhoon surge level data at location 12

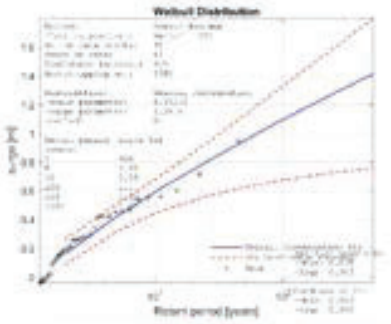


Figure 12-13: Weibull fit with ML method on corrected typhoon surge level data at location 13

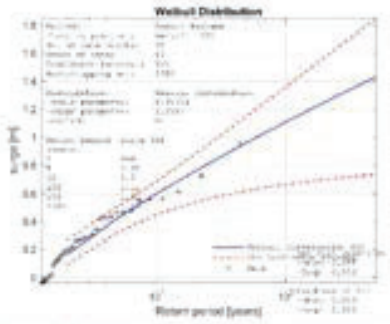


Figure 12-14: Weibull fit with ML method on corrected typhoon surge level data at location 14

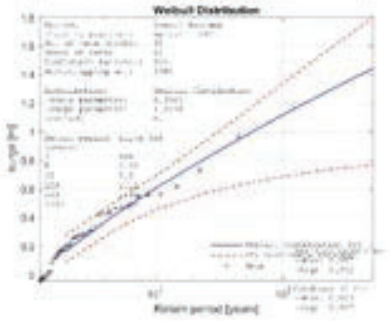


Figure 12-15: Weibull fit with ML method on corrected typhoon surge level data at location 15

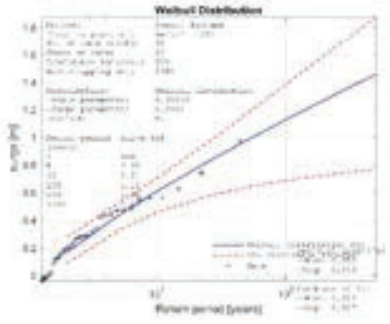


Figure 12-16: Weibull fit with ML method on corrected typhoon surge level data at location 16

Royal HaskoningDHV

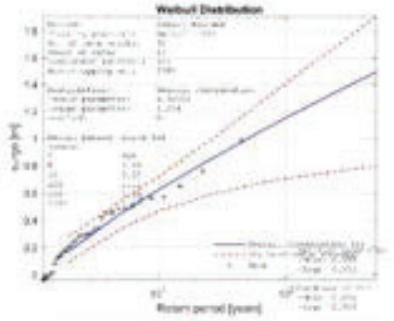


Figure 12-17: Weibull fit with ML method on corrected typhoon surge level data at location 17

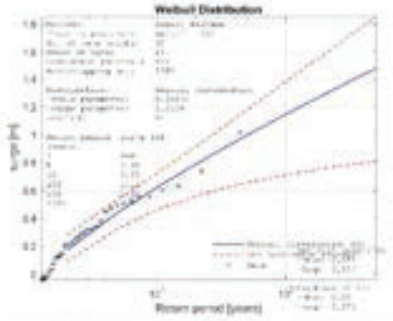


Figure 12-18: Weibull fit with ML method on corrected typhoon surge level data at location 24

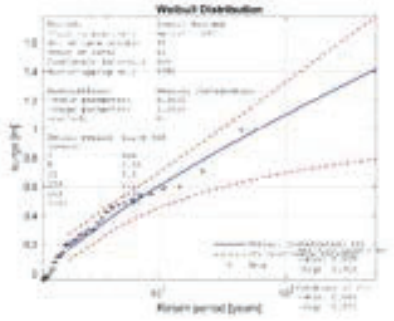


Figure 12-19: Weibull fit with ML method on corrected typhoon surge level data at location 25

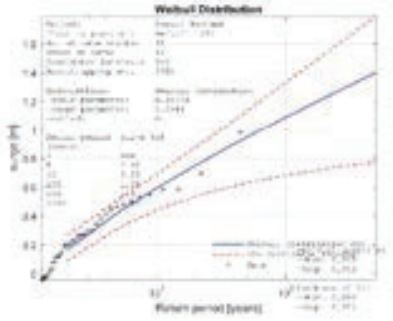


Figure 12-20: Weibull fit with ML method on corrected typhoon surge level data at location 26

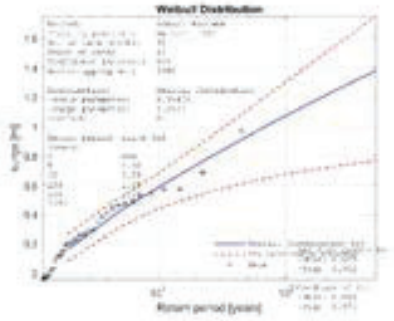


Figure 12-21: Weibull fit with ML method on corrected typhoon surge level data at location 27

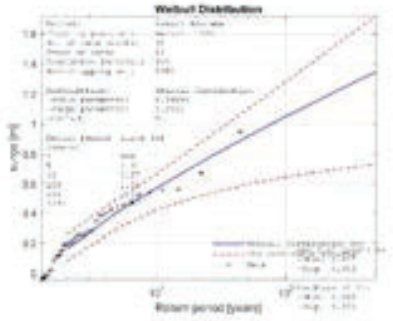


Figure 12-22: Weibull fit with ML method on corrected typhoon surge level data at location 28

Royal HaskoningDHV

Table 12-8: EVA results surge [m]

Location	Return period [years]									
	2	5	10	25	50	100	250	500	750	1000
1	0.16	0.41	0.57	0.77	0.90	1.04	1.21	1.33	1.40	1.45
2	0.16	0.41	0.58	0.78	0.92	1.05	1.23	1.35	1.42	1.47
3	0.16	0.42	0.58	0.79	0.93	1.07	1.24	1.37	1.45	1.50
4	0.16	0.42	0.58	0.79	0.93	1.07	1.24	1.37	1.45	1.50
5	0.16	0.42	0.58	0.79	0.93	1.07	1.25	1.37	1.45	1.50
6	0.16	0.42	0.59	0.79	0.94	1.08	1.25	1.38	1.46	1.51
7	0.16	0.42	0.59	0.80	0.95	1.09	1.27	1.40	1.48	1.53
8	0.16	0.42	0.59	0.80	0.95	1.09	1.27	1.41	1.48	1.54
9	0.16	0.42	0.59	0.80	0.95	1.09	1.27	1.40	1.48	1.53
10	0.16	0.42	0.60	0.81	0.96	1.11	1.30	1.43	1.51	1.57
11	0.17	0.44	0.63	0.85	1.01	1.17	1.37	1.52	1.60	1.66
12	0.17	0.45	0.64	0.87	1.04	1.20	1.41	1.56	1.64	1.71
13	0.16	0.42	0.59	0.80	0.95	1.10	1.28	1.42	1.49	1.55
14	0.16	0.42	0.60	0.81	0.96	1.11	1.29	1.43	1.51	1.56
15	0.16	0.43	0.60	0.82	0.97	1.12	1.31	1.45	1.52	1.58
16	0.16	0.43	0.61	0.82	0.98	1.13	1.32	1.46	1.54	1.59
17	0.17	0.44	0.62	0.84	1.00	1.15	1.35	1.49	1.57	1.63
24	0.17	0.44	0.62	0.84	1.00	1.15	1.34	1.48	1.56	1.61
25	0.17	0.43	0.60	0.81	0.96	1.10	1.28	1.42	1.49	1.55
26	0.16	0.42	0.59	0.80	0.95	1.09	1.27	1.40	1.48	1.53
27	0.16	0.42	0.59	0.79	0.94	1.08	1.26	1.38	1.46	1.51
28	0.16	0.41	0.57	0.77	0.91	1.05	1.22	1.35	1.42	1.47

Project related

Royal HaskoningDHV

A2.2 Extreme spectral significant wave height results (corrected for tide)

The fitted extreme value distributions per location are shown in Figure 12-23 to Figure 12-44. The EVA results are shown in Table 12-9.

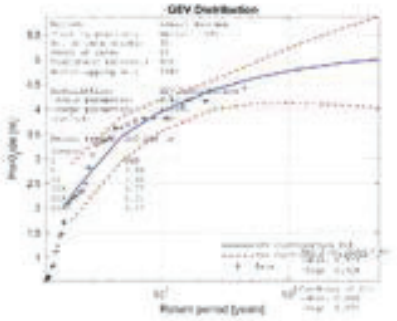


Figure 12-23: GEV fit with PWM method on spectral significant wave height corrected for tide at location 1

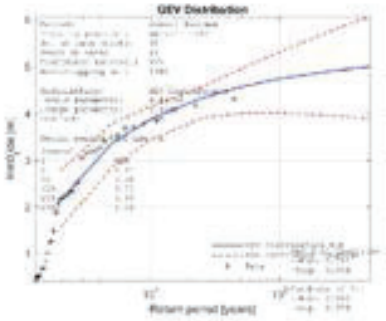


Figure 12-24: GEV fit with PWM method on spectral significant wave height corrected for tide at location 2

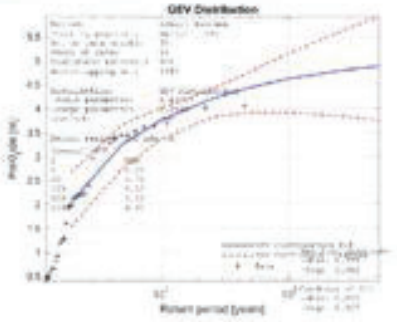


Figure 12-25: GEV fit with PWM method on spectral significant wave height corrected for tide at location 3

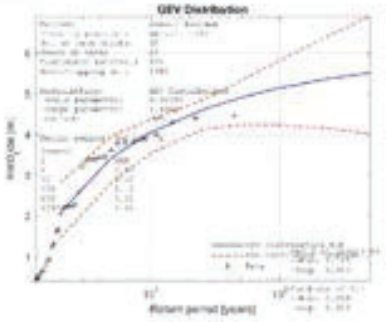


Figure 12-26: GEV fit with PWM method on spectral significant wave height corrected for tide at location 4

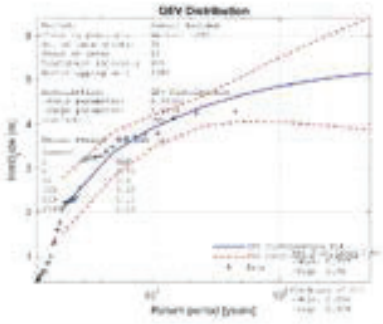


Figure 12-27: GEV fit with PWM method on spectral significant wave height corrected for tide at location 5

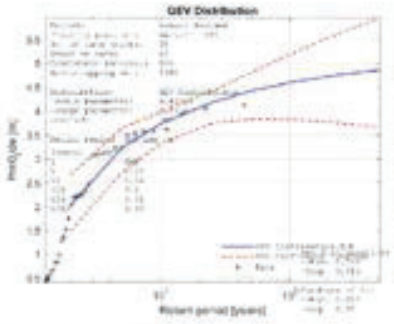


Figure 12-28: GEV fit with PWM method on spectral significant wave height corrected for tide at location 6

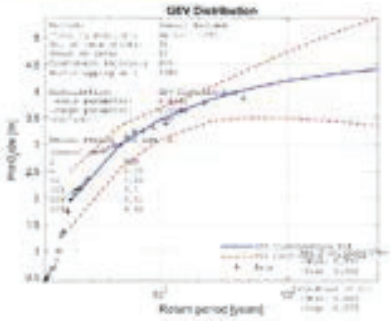


Figure 12-29: GEV fit with PWM method on spectral significant wave height corrected for tide at location 7

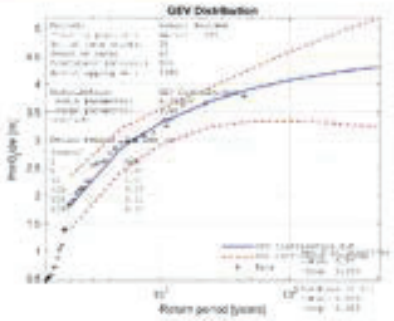


Figure 12-30: GEV fit with PWM method on spectral significant wave height corrected for tide at location 8

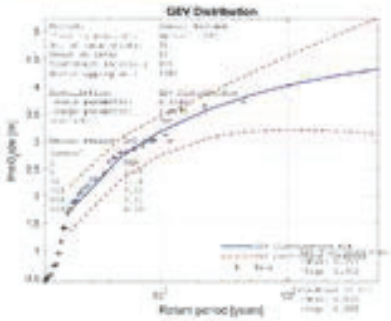


Figure 12-31: GEV fit with PWM method on spectral significant wave height corrected for tide at location 9

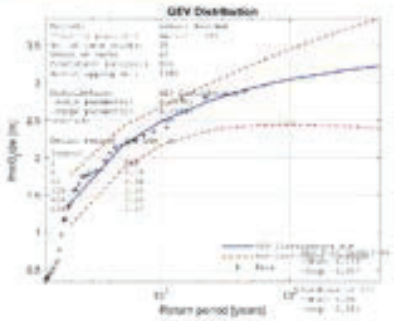


Figure 12-32: GEV fit with PWM method on spectral significant wave height corrected for tide at location 10

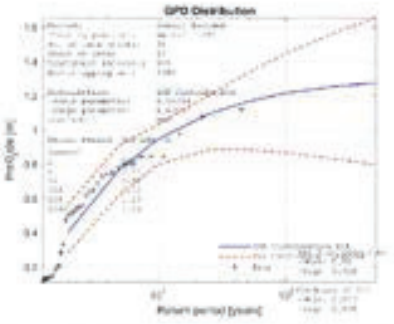


Figure 12-33: GPD fit with MOM method on spectral significant wave height corrected for tide at location 11

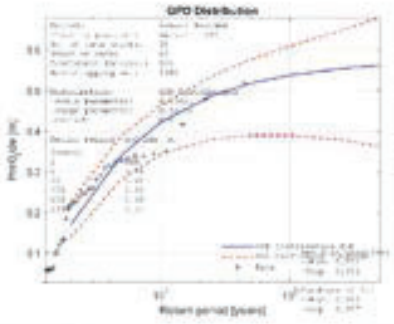


Figure 12-34: GPD fit with MPS method on spectral significant wave height corrected for tide at location 12

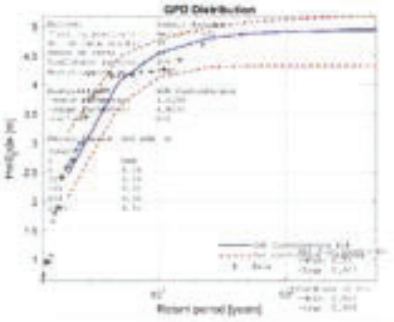


Figure 12-35: GPD fit with MPS method on spectral significant wave height corrected for tide at location 13

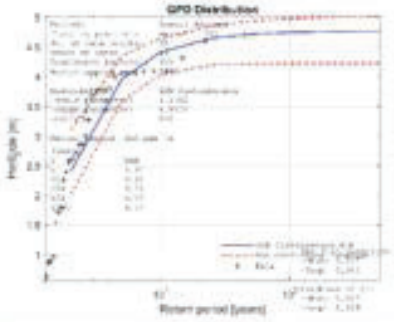


Figure 12-36:GPD fit with MPS method on spectral significant wave height corrected for tide at location 14

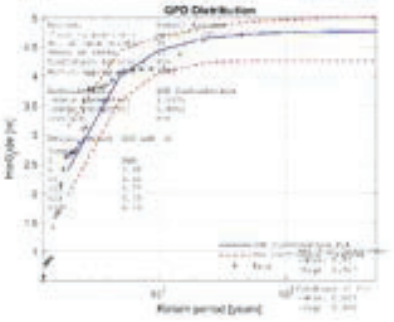


Figure 12-37: GPD fit with MPS method on spectral significant wave height corrected for tide at location 15

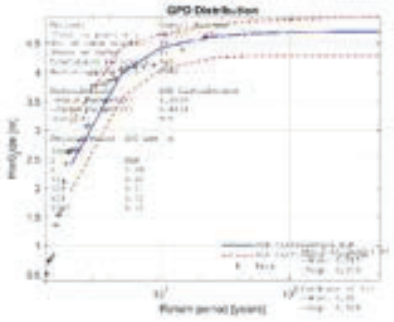


Figure 12-38: GPD fit with MPS method on spectral significant wave height corrected for tide at location 16

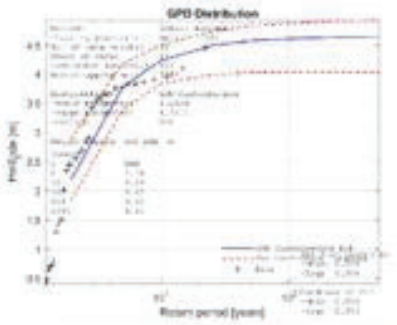


Figure 12-39: GPD fit with MPS method on spectral significant wave height corrected for tide at location 17

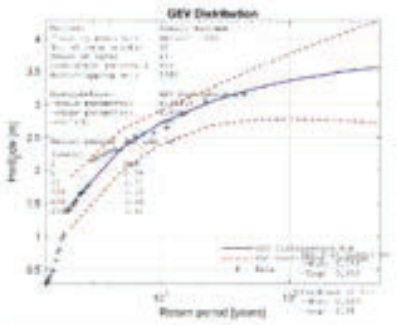


Figure 12-40 GEV fit with PWM method on spectral significant wave height corrected for tide at location 24

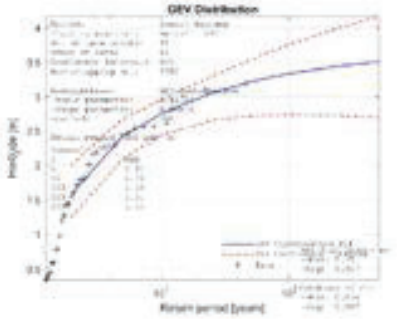


Figure 12-41: GEV fit with PWM method on spectral significant wave height corrected for tide at location 25

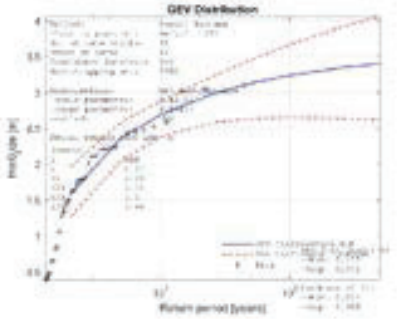


Figure 12-42: GEV fit with PWM method on spectral significant wave height corrected for tide at location 26

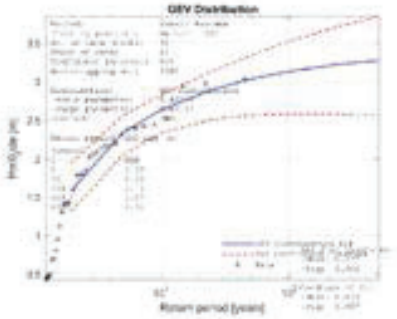


Figure 12-43: GEV fit with PWM method on spectral significant wave height corrected for tide at location 27

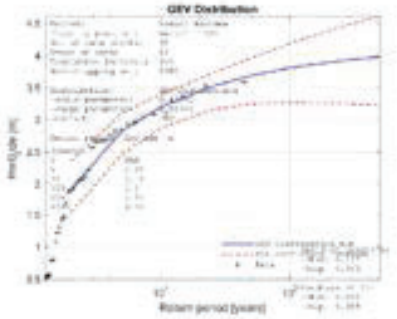


Figure 12-44: GEV fit with PWM method on spectral significant wave height corrected for tide at location 28

Royal HaskoningDHV

Table 12-9: EVA results spectral significant wave height (corrected for tide) [m]

Location	Return period [years]									
	2	5	10	25	50	100	250	500	750	1000
1	2.25	3.40	3.95	4.38	4.61	4.77	4.92	5.01	5.05	5.07
2	2.14	3.37	3.88	4.33	4.56	4.73	4.90	4.99	5.03	5.06
3	2.04	3.25	3.76	4.21	4.44	4.62	4.79	4.88	4.93	4.95
4	2.09	3.45	4.05	4.61	4.91	5.15	5.36	5.52	5.58	5.62
5	2.08	3.35	3.90	4.39	4.65	4.85	5.04	5.15	5.20	5.23
6	2.03	3.23	3.74	4.19	4.42	4.60	4.77	4.86	4.90	4.93
7	1.93	3.02	3.46	3.85	4.05	4.20	4.33	4.41	4.44	4.46
8	1.83	2.87	3.31	3.70	3.91	4.07	4.22	4.31	4.35	4.37
9	1.73	2.73	3.18	3.60	3.83	4.02	4.20	4.31	4.36	4.39
10	1.40	2.16	2.48	2.77	2.93	3.04	3.16	3.22	3.25	3.27
11	0.40	0.77	0.95	1.10	1.17	1.22	1.26	1.28	1.28	1.29
12	0.17	0.34	0.42	0.49	0.52	0.54	0.55	0.56	0.56	0.57
13	2.46	4.06	4.54	4.80	4.88	4.92	4.94	4.94	4.94	4.95
14	2.40	3.97	4.42	4.65	4.72	4.75	4.77	4.77	4.77	4.77
15	2.39	3.98	4.44	4.67	4.74	4.77	4.78	4.79	4.79	4.79
16	2.39	3.99	4.42	4.63	4.68	4.71	4.72	4.72	4.72	4.72
17	2.19	3.76	4.24	4.50	4.58	4.62	4.64	4.65	4.65	4.65
24	1.47	2.34	2.71	3.04	3.22	3.35	3.48	3.56	3.59	3.61
25	1.58	2.41	2.76	3.06	3.22	3.34	3.45	3.51	3.54	3.55
26	1.59	2.37	2.69	2.98	3.13	3.24	3.34	3.40	3.43	3.44
27	1.59	2.33	2.63	2.90	3.03	3.13	3.23	3.27	3.30	3.31
28	1.90	2.82	3.19	3.52	3.68	3.80	3.92	3.98	4.01	4.02

Royal HaskoningDHV

A2.3 Extreme spectral significant wave height results (corrected for tide and SLR)

The fitted extreme value distributions per location are shown in Figure 12-45 to Figure 12-66. The EVA results are shown in Table 12-10.

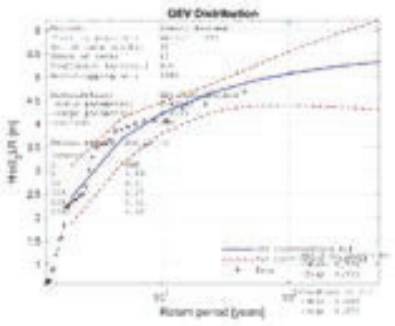


Figure 12-45: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 1

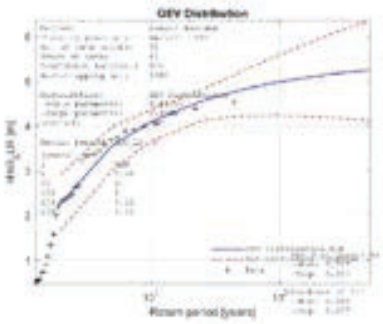


Figure 12-46: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 2

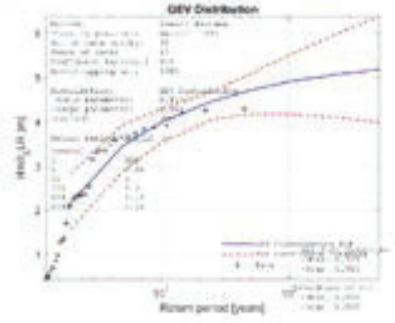


Figure 12-47: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 3

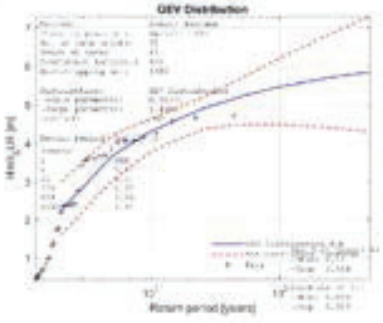


Figure 12-48: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 4

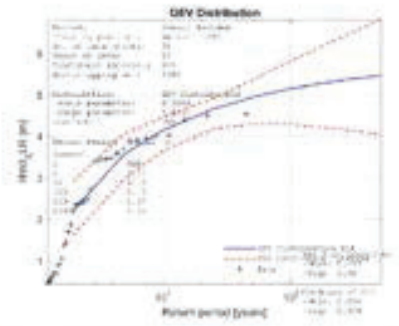


Figure 12-49: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 5

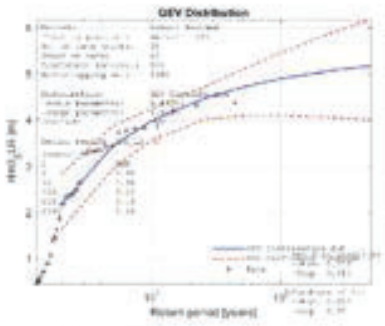


Figure 12-50: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 6

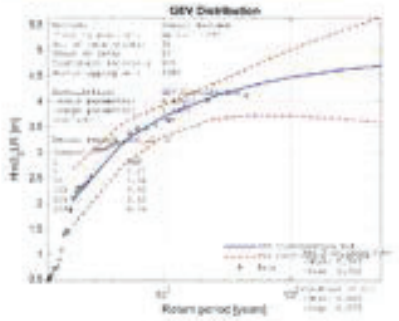


Figure 12-51: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 7

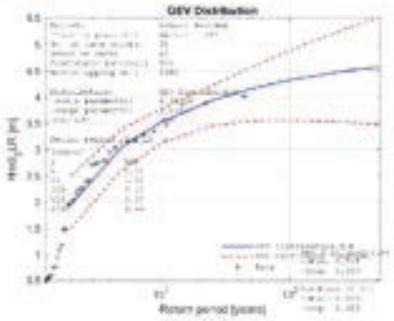


Figure 12-52: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 8

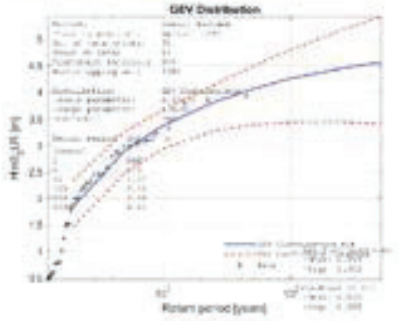


Figure 12-53: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 9

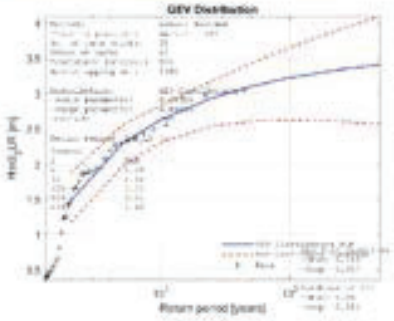


Figure 12-54: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 10

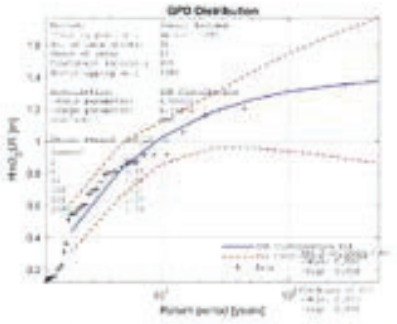


Figure 12-55: GPD fit with MOM method on spectral significant wave height corrected for tide and SLR at location 11

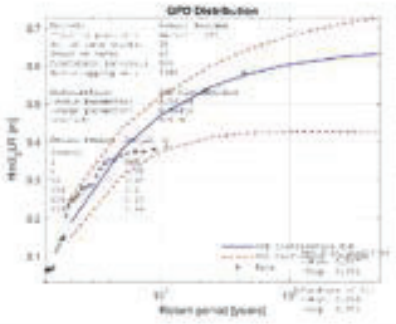


Figure 12-56: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 12

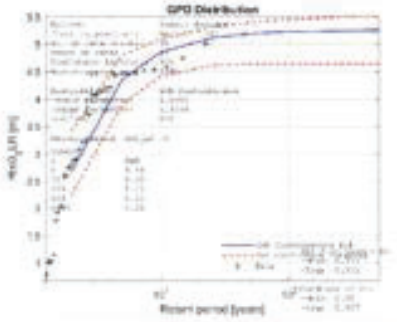


Figure 12-57: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 13

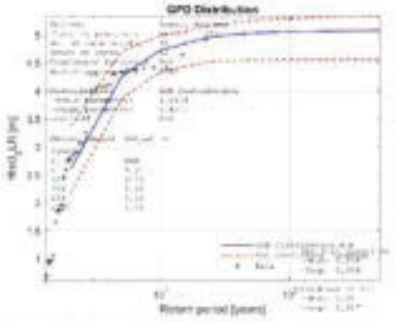


Figure 12-58: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 14

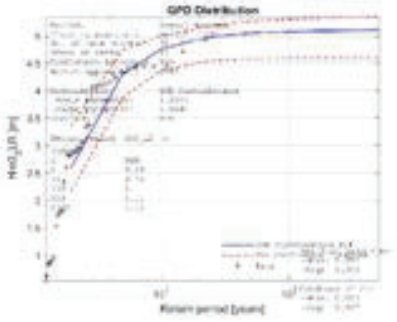


Figure 12-59: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 15

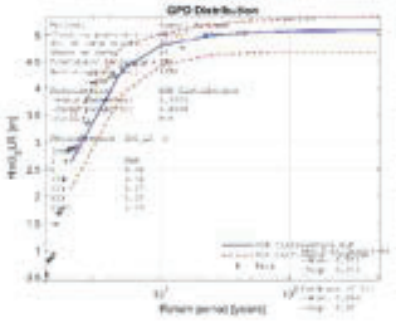


Figure 12-60: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 16

Project related

Royal HaskoningDHV

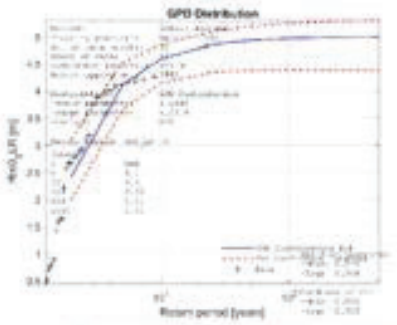


Figure 12-61: GPD fit with MPS method on spectral significant wave height corrected for tide and SLR at location 17

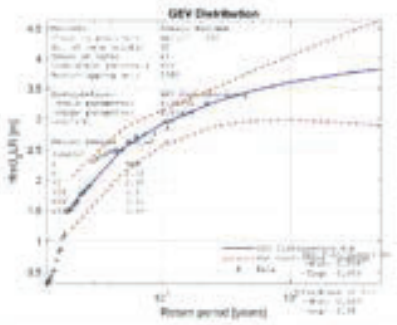


Figure 12-62: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 24

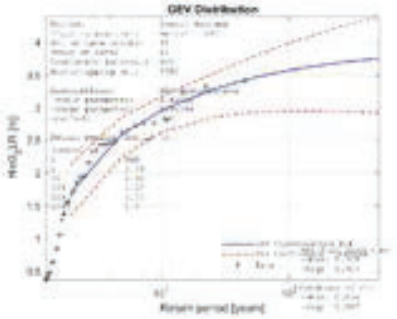


Figure 12-63: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 25

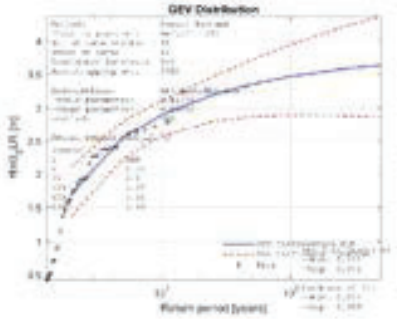


Figure 12-64: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 26

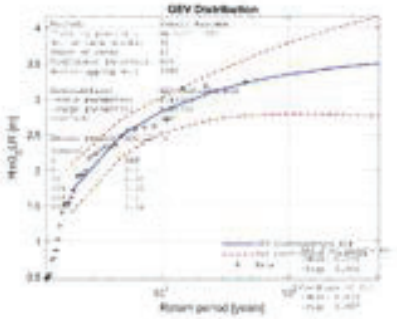


Figure 12-65: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 27

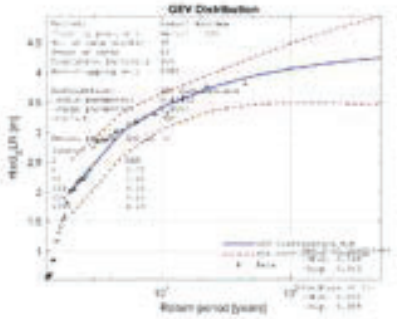


Figure 12-66: GEV fit with PWM method on spectral significant wave height corrected for tide and SLR at location 28

Royal HaskoningDHV

Table 12-10: EVA results spectral significant wave height (corrected for tide and SLR) [m]

Location	Return period [years]									
	2	5	10	25	50	100	250	500	750	1000
1	2.41	3.69	4.21	4.66	4.90	5.07	5.23	5.32	5.36	5.38
2	2.26	3.56	4.10	4.57	4.82	5.00	5.17	5.26	5.31	5.33
3	2.17	3.46	4.00	4.47	4.72	4.91	5.09	5.18	5.23	5.26
4	2.23	3.67	4.31	4.90	5.22	5.47	5.72	5.89	5.93	5.97
5	2.21	3.57	4.15	4.67	4.95	5.15	5.36	5.47	5.52	5.55
6	2.17	3.44	3.98	4.45	4.70	4.89	5.07	5.16	5.21	5.24
7	2.06	3.21	3.68	4.09	4.30	4.46	4.60	4.68	4.72	4.74
8	1.95	3.05	3.52	3.93	4.15	4.32	4.48	4.57	4.61	4.64
9	1.84	2.90	3.37	3.82	4.06	4.26	4.45	4.56	4.61	4.65
10	1.49	2.29	2.64	2.94	3.10	3.23	3.34	3.41	3.44	3.46
11	0.44	0.83	1.02	1.18	1.26	1.31	1.35	1.37	1.38	1.39
12	0.19	0.38	0.47	0.55	0.58	0.60	0.62	0.63	0.64	0.64
13	2.38	2.66	4.36	4.85	5.12	5.20	5.23	5.25	5.25	5.26
14	2.34	2.60	4.27	4.73	4.97	5.04	5.06	5.08	5.08	5.08
15	2.33	2.59	4.29	4.76	5.00	5.07	5.10	5.11	5.11	5.12
16	2.39	2.62	4.34	4.78	4.99	5.05	5.07	5.08	5.08	5.08
17	2.11	2.40	4.10	4.60	4.87	4.95	4.99	5.01	5.01	5.01
24	1.59	2.52	2.92	3.27	3.48	3.60	3.74	3.81	3.85	3.87
25	1.70	2.59	2.96	3.28	3.45	3.57	3.69	3.75	3.78	3.80
26	1.71	2.55	2.90	3.20	3.36	3.47	3.58	3.64	3.67	3.69
27	1.71	2.50	2.82	3.10	3.24	3.35	3.45	3.50	3.52	3.54
28	2.04	3.02	3.42	3.76	3.93	4.06	4.18	4.24	4.27	4.29

Royal HaskoningDHV

A2.4 Extreme current speed results

The fitted extreme value distributions per location are shown in Figure 12-67 to Figure 12-88. The EVA results are shown in Table 12-11.

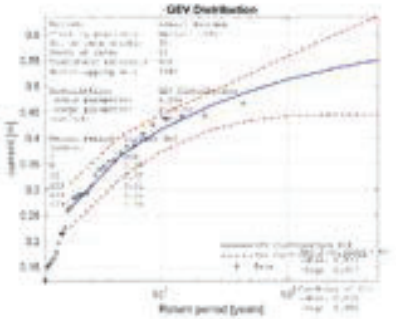


Figure 12-67: GEV fit with PWM method on current speed at location 1

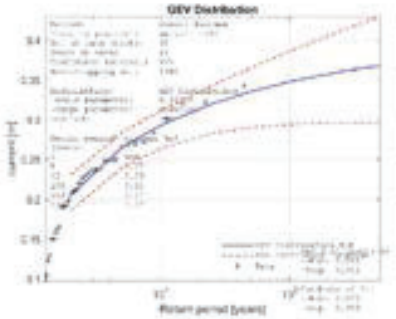


Figure 12-68: GEV fit with PWM method on current speed at location 2

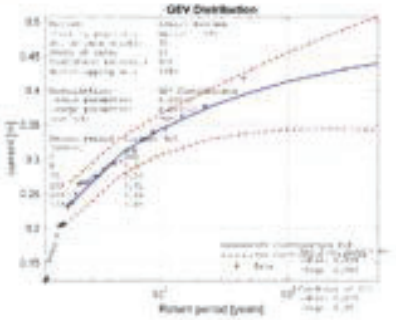


Figure 12-69: GEV fit with PWM method on current speed at location 3

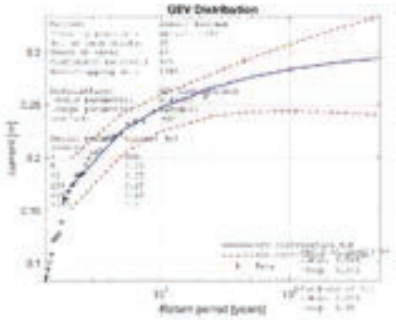


Figure 12-70: GEV fit with PWM method on current speed at location 4

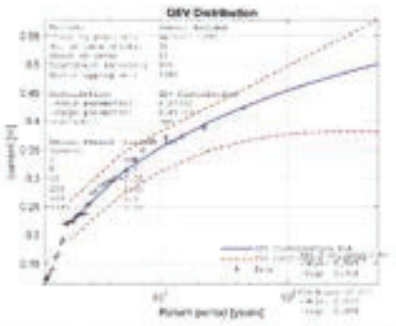


Figure 12-71: GEV fit with PWM method on current speed at location 5

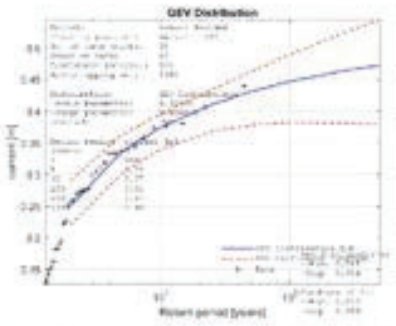


Figure 12-72: GEV fit with PWM method on current speed at location 6

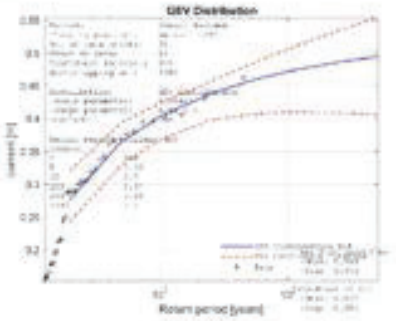


Figure 12-73: GEV fit with PWM method on current speed at location 7

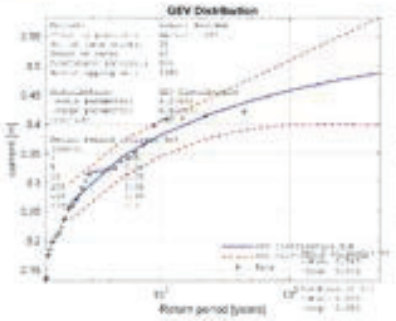


Figure 12-74: GEV fit with PWM method on current speed at location 8

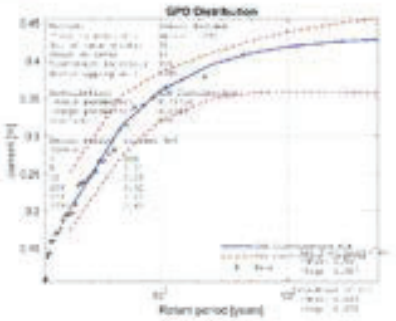


Figure 12-75: GPD fit with MPS method on current speed at location 9

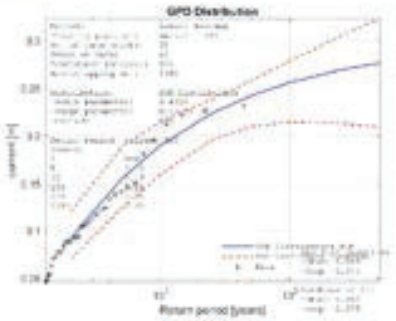


Figure 12-76: GPD fit with MPS method on current speed at location 10

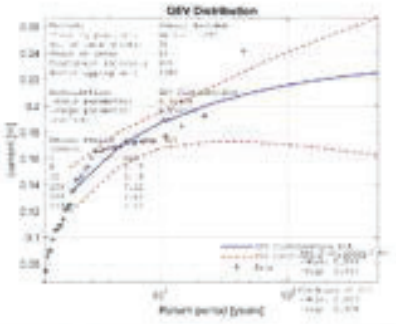


Figure 12-77: GEV fit with PWM method on current speed at location 11

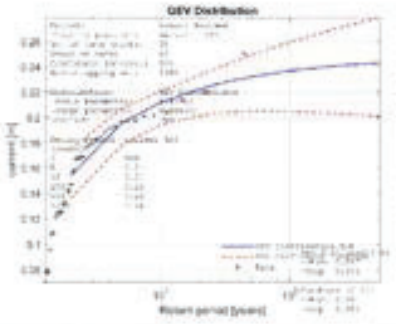


Figure 12-78: GEV fit with PWM method on current speed at location 12

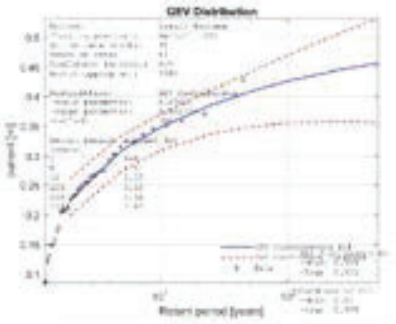


Figure 12-79: GEV fit with PWM method on current speed at location 13

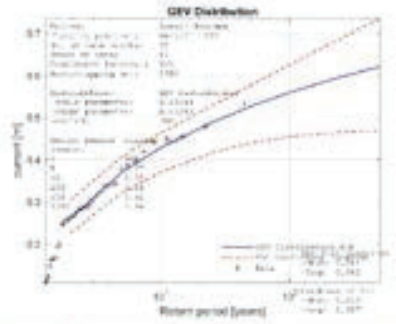


Figure 12-80: GEV fit with PWM method on current speed at location 14

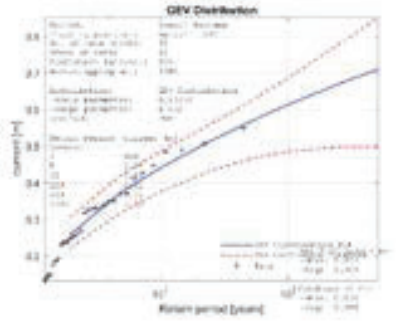


Figure 12-81: GEV fit with PWM method on current speed at location 15

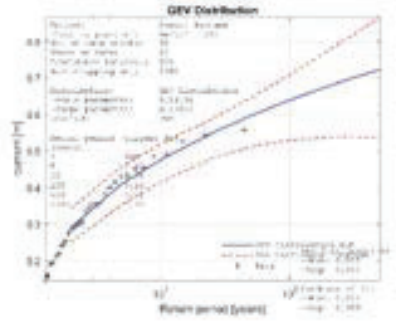


Figure 12-82: GEV fit with PWM method on current speed at location 16

Royal HaskoningDHV

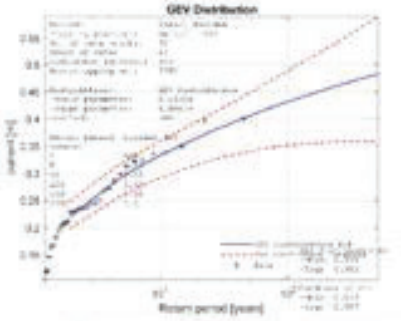


Figure 12-83: GEV fit with PWM method on current speed at location 17

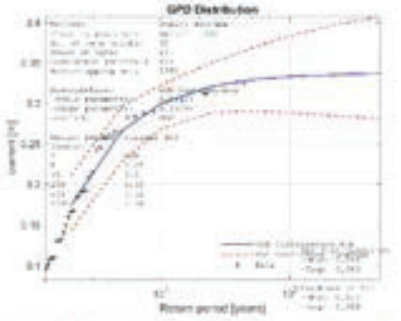


Figure 12-84: GPD fit with MOM method on current speed at location 24

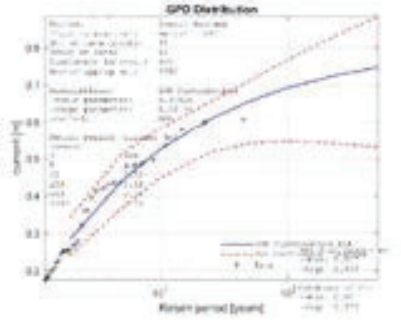


Figure 12-85: GPD fit with MOM method on current speed at location 25

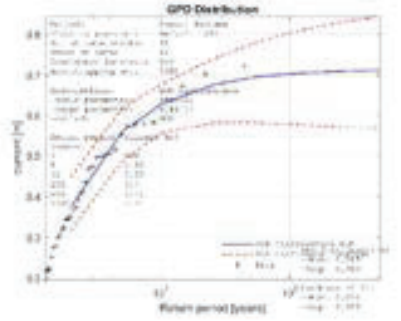


Figure 12-86: GPD fit with MOM method on current speed at location 26

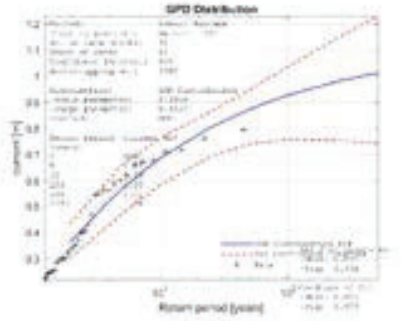


Figure 12-87: GPD fit with MOM method on current speed at location 27

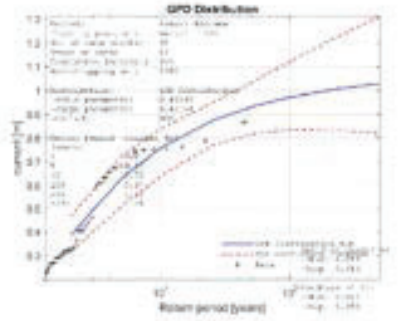


Figure 12-88: GPD fit with MOM method on current speed at location 28

Royal HaskoningDHV

Table 12-11: EVA results current speed [m/s]

Location	Return period [years]									
	2	5	10	25	50	100	250	500	750	1000
1	0.26	0.37	0.42	0.46	0.49	0.51	0.54	0.55	0.56	0.56
2	0.20	0.27	0.29	0.32	0.34	0.35	0.36	0.37	0.37	0.37
3	0.23	0.31	0.34	0.38	0.40	0.41	0.43	0.44	0.44	0.45
4	0.17	0.23	0.25	0.27	0.28	0.28	0.29	0.29	0.30	0.30
5	0.22	0.31	0.35	0.40	0.43	0.45	0.48	0.50	0.51	0.52
6	0.25	0.34	0.37	0.41	0.43	0.45	0.46	0.47	0.48	0.48
7	0.28	0.36	0.40	0.44	0.46	0.47	0.49	0.49	0.50	0.50
8	0.26	0.34	0.38	0.42	0.44	0.46	0.48	0.49	0.49	0.50
9	0.17	0.26	0.31	0.36	0.39	0.41	0.42	0.43	0.43	0.43
10	0.07	0.09	0.16	0.19	0.22	0.24	0.26	0.27	0.28	0.28
11	0.13	0.17	0.19	0.20	0.21	0.22	0.22	0.23	0.23	0.23
12	0.15	0.20	0.21	0.23	0.23	0.24	0.24	0.24	0.24	0.24
13	0.23	0.31	0.35	0.39	0.41	0.43	0.45	0.46	0.46	0.47
14	0.26	0.37	0.43	0.49	0.53	0.56	0.60	0.62	0.63	0.64
15	0.26	0.37	0.44	0.52	0.57	0.61	0.67	0.71	0.73	0.75
16	0.29	0.41	0.48	0.55	0.60	0.64	0.69	0.72	0.74	0.75
17	0.22	0.29	0.33	0.38	0.41	0.43	0.46	0.48	0.49	0.50
24	0.17	0.27	0.30	0.32	0.33	0.33	0.34	0.34	0.34	0.34
25	0.28	0.44	0.53	0.61	0.66	0.69	0.73	0.75	0.76	0.76
26	0.37	0.56	0.63	0.68	0.69	0.70	0.71	0.71	0.71	0.71
27	0.36	0.57	0.69	0.81	0.87	0.93	0.98	1.01	1.03	1.04
28	0.39	0.63	0.76	0.87	0.93	0.97	1.01	1.03	1.04	1.04

APPENDIX K.
FLOOD IMPACT STUDY

Royal HaskoningDHV
Enhancing Society Together

Note / Memo

Haskoning Philippines Inc.
Water & Maritime

To:	SMSCIDC
From:	Michiel Smits, Raman Maharjan, Mariane Pajarillo
Date:	03 May 2024
Copy:	/
Our reference:	SF1013-RHD-L3-XX-ME-X-0003
Classification:	Project related, Final C01
Checked by	Michiel Smits, Trevor Morrish-Hale

Subject: **PRDP and PQRD Hinterland Flood Risk Study**

1 Introduction

This chapter provides an overview of the project background, it gives a detailed site description and summarises the objective of the study and agreed scope of work.

1.1 Project Background

SM Smart City Infrastructure and Development Corporation (SMSCIDC) is currently developing two reclamation areas named as Pasay Reclamation Development Project (PRDP) with a total area of 360 hectares and Parañaque Reclamation Development (PQRD) with a total area of 300 hectares.

SMSCIDC has engaged Haskoning Philippines Inc. (RHDHV) to conduct a study of the two proposed reclamation developments to assess the impact on flood risk to the hinterland due to the construction of the new islands as shown in Figure 1-1.



Figure 1-1. Project location

Royal HaskoningDHV
Enhancing Society Together

1.2 Project Site Description

The projects are located at the administrative boundaries of Pasay and Parañaque City. PRDP Island A+B is located across CCP Complex and Senate of the Philippines Building. PRDP Island C is located across SM Mall of Asia Complex at the Sunset Boulevard. PQRD Island P.A is located across SMDC Festival Grounds while Island PQRD Island P.C is located across Okada Manila.

From Figure 1-2, the initial layout of PRDP, specifically for Island A, was directly connected to the existing land in Pasay City. This is shown with the white dashed lines. This Island A is now proposed to be moved 470m seaward and will be merged with Island B. Island C is approximately 250m away from the existing land. The tentative layout for PQRD as shown in the white shaded area (islands P.A, P.B and P.C), will be constructed approximately 250m away from the existing land, as shown Figure 1-2, the layout is still to be finalised but 250m will likely be the minimum distance.



Figure 1-2: Reclamation layout of PRDP and PQRD

Three channels named as Libertad, Seaside and Redemptorist channels are all draining towards the location of the reclamation areas. There are also several outfalls that are directly discharging to Manila Bay. Lastly, around 2km southeast of PQRD is the Parañaque river mouth. The drainage outfall locations are shown in Figure 1-3.



Figure 1-3 Drainage outfall's locations

1.3 Objective of the Study

The main objective of this study is to perform an initial analysis on the impact of flood risk to the hinterland due to the construction of the new islands through site visits and collecting available secondary data.

In addition to the above objective, the goal of this study is to further define if modelling works on the drainage outfalls are required to further clarify flood risk.

1.4 Scope of Work

The scope of work based on the objectives of the study are listed as follows:

- Kick-off meeting and Site Visit
- Data Collection and Gap Analysis
- Literature Study and plan of approach for further steps

Royal HaskoningDHV

2 Site Visit and Data Collection

This chapter elaborates on the kick-off meeting held, the site visit conducted, and the data collected. For the data collection, for each report or study that was found, the parts relevant to the project were extracted and described in the relevant sub-sections. This information is further used in our assessment done in Section 4.

2.1 Site Visit and Kick-off Meeting

A kick-off meeting was held 11 March 2024 to align the expectations regarding the output of the study which includes related data, planning for the site visits and planning for this stage. The minutes of meeting and presentation slides are presented in SF1013-RHD-L3-XX-MI-X-0001 and added as Appendix A: Kick-off Meeting Minutes of Meeting and Presentation.

RHDHV and SMSCIDC conducted a site visit on 13 March 2024 to the Parañaque River and channels draining to Manila Bay, particularly in the City of Pasay and Parañaque. The general observations and initial assessment of current flooding situation (based on interviews with people on the street) are presented in SF1013-RHD-L3-XX-ME-X-0002 and shown in

Royal HaskoningDHV

Appendix B: Site Visit

2.2 Data collection

The following list of data was collected by RHDHV:

1. Updated PRDP and PQRD layout
2. SM Reclamation Master Development Plan Report
3. Environmental Impact Statement (EIS) for Pasay 360
4. Existing waterways and facilities surrounding the project site.
5. University of the Philippines Nationwide Operational Assessment of Hazards (UP NOAH) 100-year Rain Return Scenario Flood Hazard Maps
6. Mall of Asia (MOA) inland channels survey
7. High tide and sea level data for the Manila Bay (will be taken from our updated Hydrodynamic Modelling Studies, refer to SF1013-RHD-XX-XX-RP-X-0001)

Below list will be collected if drainage modelling is identified as a necessary further study.

1. Updated data of the inland channels survey.
2. Historical extreme rainfall storm events
3. Rainfall Intensity Duration and Frequency (RIDF) data from the nearby meteorological stations
4. Flood discharges, high water level for Paranaque River and major 3 drainage channels at outflows
5. Land-use map of catchments of Paranaque River and drainage channels within the project area

2.2.1 Updated PRDP and PQRD layout

A screen capture in Figure 2-1 from the construction contract drawing with reference to PRDP-RHD-TD-ZZ-ER-0005 Volume IVE Drawings provides the final agreed boundaries for PRDP as confirmed by SMSCIDC during the kick-off meeting. However, for PQRD only the layout as presented in Figure 1-2 is available, which may still change.



Figure 2-1. Final Layout of PRDP

2.2.2 SM Reclamation Master Development Plan Report by AECOM

In January 2016, SM Reclamation Master Development Plan Report (SM Masterplan AECOM, 2016) for the Pasay-Paranaque reclamations was delivered by AECOM. The Master Development Plan for the project involved a range of studies conducted by relevant professionals: economic studies, real estate market assessments, financial feasibility studies, traffic and transportation studies, environmental assessments, land use plans, landscape and urban design concepts, civil infrastructure, and geotechnical assessments of the planned reclamation itself.

In section 4.2.1 of that report, flood management strategies are discussed and the key flood management factors such as storm surge, tsunami, sea level rise, water quality, ecological connectivity, and hinterland flood were identified as shown in Figure 2-2.



Figure 2-2: Key flood management factors (Source: SM Masterplan AECOM, 2016)

Subsequently in Section 4.2.1.2 of this report strategies to mitigate impacts of hinterland flooding are discussed.



Figure 2-3. Floodway Diagram (Source: SM Masterplan AECOM, 2016)

Figure 2-3 shows the current floodway diagram prior to the development of the project site (left), and proposed floodways at the project site to complement existing floodways for flood management purposes (right).

The following information in italic is extracted from that report (slightly modified to align terminology with the rest of the report):

"To ensure that the development will cause no interference to flood flow from inland canals and rivers, a large canal of 200m in width is designed and located in between the existing hinterland and the new islands. This large canal is designed to have a flood capacity that is higher than the combined flood flows of Libertad Channel, Channel 1 (Redemptorist) and Channel 2 (Seaside). Moreover, waterways within the site are designed to provide proper connections between the three existing inland channels and the open sea. There are two main waterways between the islands that are designed such that they can be

considered as extensions of Libertad Channel and Channel 1 (Redemptorist) towards the open sea. These two main waterways are designed to have a larger width than the width of the inland channels to provide higher flood flow capacity.

Scenarios were modelled to examine the impacts of the new islands on hinterland flooding.

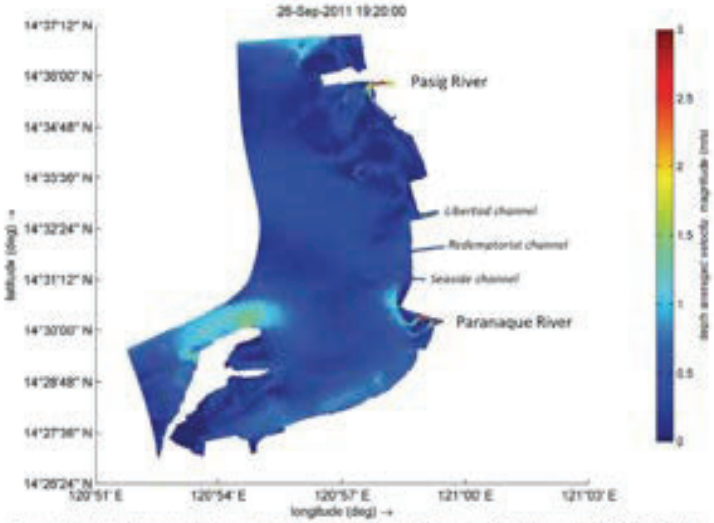


Figure 2-4. Velocity magnitude modelled at pre-development (Source: SM Masterplan AECOM, 2016)

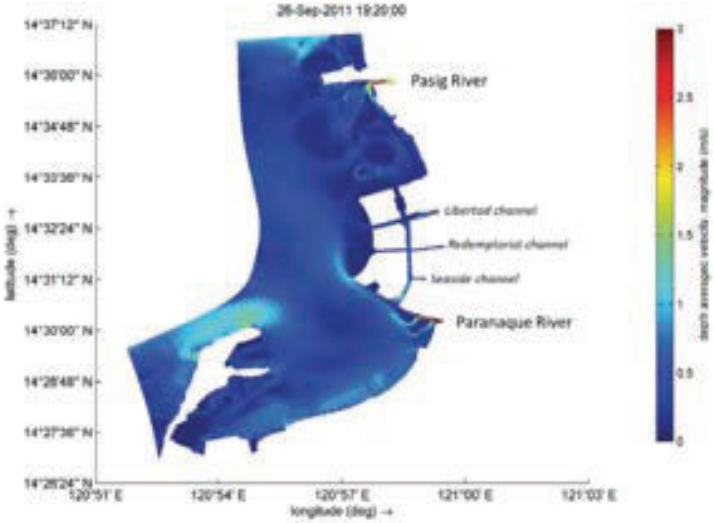


Figure 2-5. Velocity magnitude modelled at post development (Source: SM Masterplan AECOM, 2016)

The modelling results shown in Figure 2-4 and Figure 2-5 show that the designed waterways between the new islands and the 150m-wide large canal between the existing hinterland and the new islands will provide more than enough capacity for the flood flow discharged from Libertad Channel, Channel 1 (Redemptorist) and Channel 2 (Seaside).[1][2]

In the case of the Paranaque River, the proposed project site is located further offshore from the river mouth and not directly blocking its flow. Therefore, the flood flow from Paranaque River will still be able to freely flow out into the open sea in a post-development scenario.

Upon conducting flood modelling, no significant impact on inland floods was projected to be caused by the development."

2.2.3 Environmental Impact Statement (EIS) for Pasay 360

An Environmental Impact Statement was received for the Pasay-Paranaque reclamation development (360 hectares project). In Section II – 2.2 WATER, sub-section 2.2.1.1.1 it describes the "relevance to impact on Flooding". The requirement copied from the EIS is shown in Figure 2-6 below.

The drainage system of the City and immediate vicinities is shown in Figure 2.2.1 from which may gleaned the following:

- Estero Tripa de Gallina located in the City of Pasay adjacent to which is installed a Pumping Station is a major component of the drainage artery. However of the 4.2 hectares surface area of the estero 2.8 (or %) hectares are occupied by informal settlers which significant immobilize the function of the estero.
- West of this Estero is the Maricaban creek, however its original width of 21 meters has been reduced to 10 meters also because of informal settlers.
- Downstream of the Estero is another flood control structure prior to final discharge to Manila Bay which is the Libertad Channel and Pumping Station. On this pumping station are installed pumps.

  These pumps however need major upgrading:

  6 x 7 cu.m./sec and
  2 x 1.5 cu.m./sec

- The Libertad Channel, however, has inherent restrictions (a) Small outlet of the flood waters prior to inlet to the Channel and the (b) restricted openings in the channel at the bridge. These are shown in Plates 2.2.1 and 2.2.2.

Inducement of Flooding

The major aspect of the project is that it is downstream of all of the above drainage systems and does not block, disturb or restrict the upstream storm flows and thus does not constitute to an inducement of flooding.

Figure 2-6: Requirement on hinterland flood risk from EIS (Source: EIS Pasay 360). The Figure 2.2.1 and Plates 2.2.1 and 2.2.2 are provided in Appendix C

The conclusions that were drawn are shown in Figure 2-7 and Figure 2-8.

[1] RHDHV clarification: The AECOM study talks about a 200m wide channel being designed between the new islands and the existing hinterland. Figure 2-3 shows that in fact a 150m wide channel was adopted in the models. Hence AECOM's conclusion that with a 150m wide channel sufficient capacity for flood flow is provided.

[2] RHDHV clarification: Figure 2-4 and Figure 2-5 in fact show depth average velocities. From those figures it can be observed that there is no change in the flow velocities inside the channels between the "no-island" scenario and the scenario with the new islands. This is the basis for AECOM to conclude that the channels have sufficient capacity, hence do not result in a significant impact on inland floods.

Royal HaskoningDHV

Effect of the Project on Stream Flows

The reclamation project does not affect the stream flows of the storm discharges because:

The Libertad Channel which is adjacent the project and which flows directly into the southern boundary of the 300 hectare reclamation is not blocked by the reclaimed land. A drainage area bigger than that of the Channel is available at the mouth of the Libertad Channel with the creation of a 200-meter buffer zone along the southern boundary of the 300-hectare reclamation.

The 60-hectare reclamation is along the boundaries of the Channel and does not block the Channel.

The other drainage channels shown in Figure 2.2.2 are distant from the reclamation area.

The major storm drainage systems in the coast of Manila Bay, i.e. the Pasig River and the Paranaque river are also distant from the project site, shown in Figure 2.2.2.

Figure 2-7. Relevant conclusions from the EIS on impact of the project on hinterland flood risk (Source: EIS Pasay 360). The Figure 2.2.2 is provided in Appendix C.[3]

Historical flooding/drought occurrences

The historical flooding event of significance is that brought about by Typhoon Ondoy. The flow of the storm waters during this event is shown in Figure 2.2.3 indicating therein that the project site is not in the path of the flood waters.



Figure 2-8. Pathway of the Ondoy-induced flood waters. (Source: EIS Pasay 360)[4]

[3] RHDHV additional note: the current planned width of the channel between the new islands and the existing hinterland is even 250m

[4] RHDHV clarification: the red areas in Figure 2-8 show the Pasay reclamation, however at the time the EIS was published, the development was 300 hectares and with a different shape. Also, the Paranaque 300 reclamation is not included. This however does not change the point of the image, which shows the main flow of storm water during typhoon Ondoy, a historical severe event, where the black arrows depict the direction and quantity (the larger the arrow, the larger the flow) of storm water flow. It shows that the main storm water is not discharged through the channels near the new reclamation but flows through Pasig River to the north and through Paranaque River to the south.

Royal HaskoningDHV

2.2.4 Existing Waterways and Facilities

Esteros, Creeks and Rivers

To have a better view on which esteros, creeks and rivers are draining towards each channel, a map showing the network of rivers is summarized below and shown in Figure 2-9.

- Estero de Paco, Estero de Pandacan in Manila and a portion of Estero de Tripa de Gallina in Makati drain towards Libertad Channel.
- Redemptorist and Seaside Channels are only connected to Libertad Channel, no other waterways are connected.
- The other portion of Estero de Tripa de Gallina in Makati, Dilain Creek in Pasay, Maricaban Creek in Taguig and Pasay, Parañaque and Don Galo River in Parañaque and Las Piñas River in Las Piñas, drain towards Parañaque Channel.

Facilities

Sewage Treatment Plants (STPs) and drainage pumping stations within the catchment of these esteros/creeks/rivers are shown in Figure 2-9.

- Sewage Treatment Plant (STP)/ Septage Treatment Plant (STP)/ Water Reclamation Facility (WRF) – these are the facilities being operated and maintained by Maynilad and Manila Water. As observed in this map, there are still areas that are not yet covered or connected to the STPs but are maybe served by Maynilad/Manila Water Desludging Program.
- Drainage Pumping Stations – these are the facilities being operated and maintained by MMDA and DPWH used for the cities flood control.

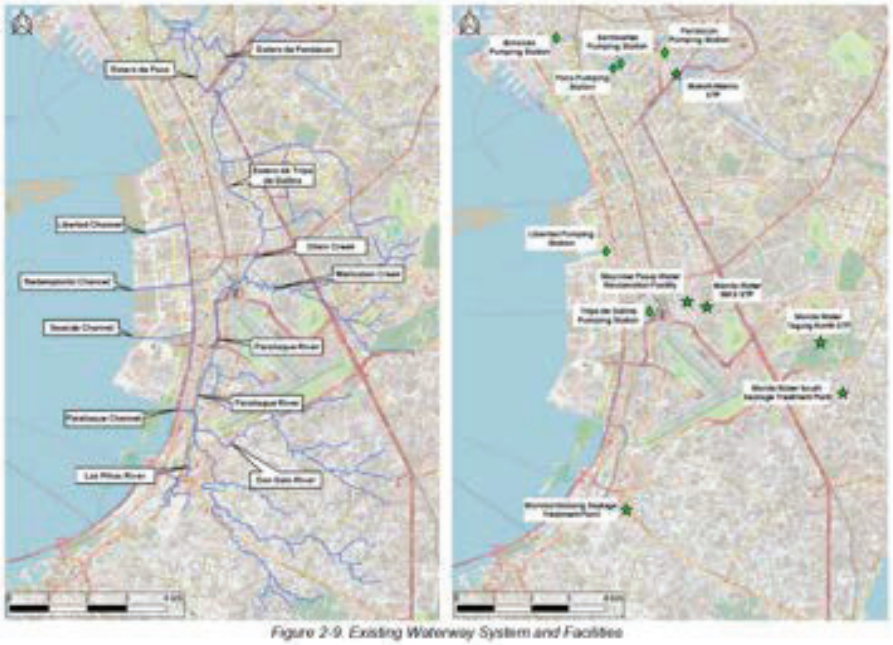


Figure 2-9. Existing Waterway System and Facilities

Royal HaskoningDHV

2.2.5 UP NOAH 100-year Rain Return Scenario Flood Hazard Map

A flood hazard analysis for a 100-year flood as shown in Figure 2-10 was simulated by the UP NOAH using software called Flo-2D GDS Pro in 2022. Flood hazards considered both the height and velocity of the water and calculates the hazard levels based on the danger they pose to people and structures. The flood hazard map was presented as low (below the knee), medium (below the neck) and high (higher than the neck) hazard level.

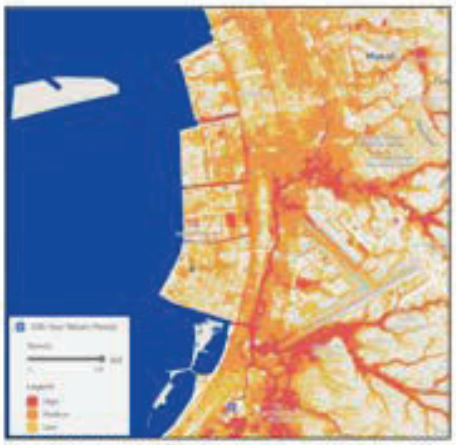


Figure 2-10 UP NOAH 100-yr Return Scenario Flood Hazard Map

2.2.6 MOA inland channels survey

Figure 2-11 shows the MOA inland channel survey cross-sections of the four main channels in the project area. The detailed cross-sections are provided in

Royal HaskoningDHV

Appendix D: Inland Survey Layout and cross-sections. These cross-sections were used in the SM Reclamation Master Development Plan Report. The survey was conducted in 2014 which is now almost 10 years ago. Since the widths of these four inland channels are fixed, no significant changes are expected, however, there might be a possibility that the riverbed has changed somewhat. This can be verified once updated survey data becomes available.

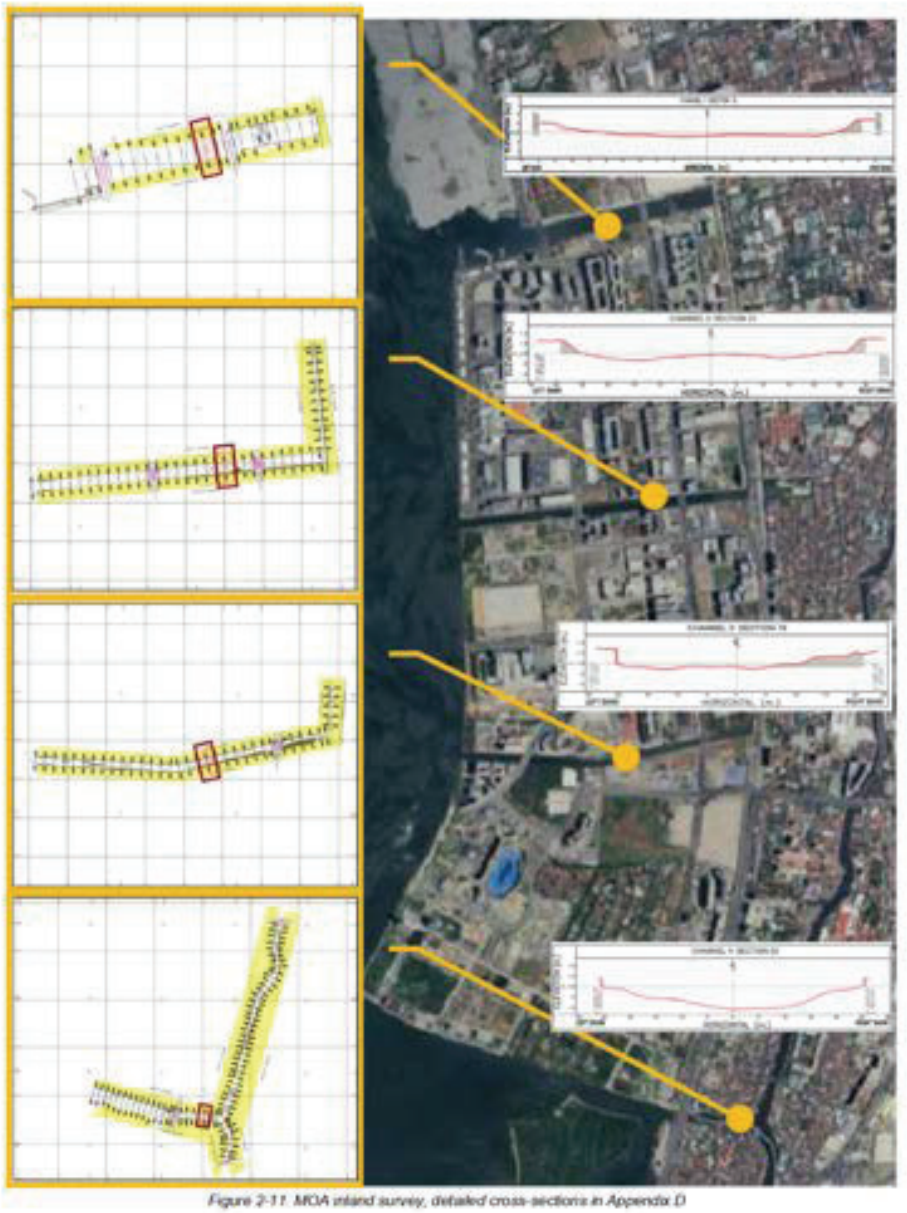


Figure 2-11. MOA inland survey, detailed cross-sections in Appendix D

Royal HaskoningDHV

2.2.7 Updated Hydrodynamic Modelling Studies

RHDHV conducted an update of the Hydrodynamic Modelling Study (typhoon analysis) considering the changed island boundaries. Reference is made to *"SF1013-RHD-XX-XX-RP-X-0001-Hydrodynamic Modelling Studies"*. The main objective of that study is to provide an updated analysis of the hydraulic design conditions along the boundaries of the revised layout. Subsequently, wave penetration modelling was carried out to assess the wave heights in the channels between the islands. The wave penetration into the channels was modelled using the open-source numerical model SWASH (Simulating WAves till SHore). Finally, also a flushing study was conducted, the objective of the flushing study is to provide insight into the flushing time of the water in the channels in between the proposed layout. This flushing time is used as an indication to estimate potential water quality issues due to the construction of the islands.

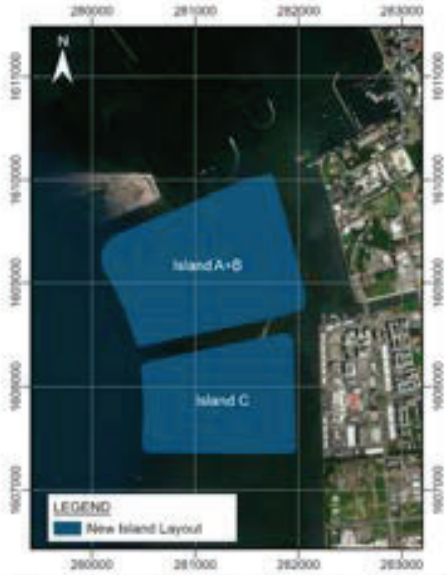


Figure 2-12. Revised layout as adopted for the wave penetration and flushing studies

As can be seen from the SWASH results, the new islands will result in a sheltering effect, protecting the existing mainland from direct wave impact, see Figure 2-13. As a result, the flood risk of the existing land due to overtopping water (from waves) will significantly reduce.

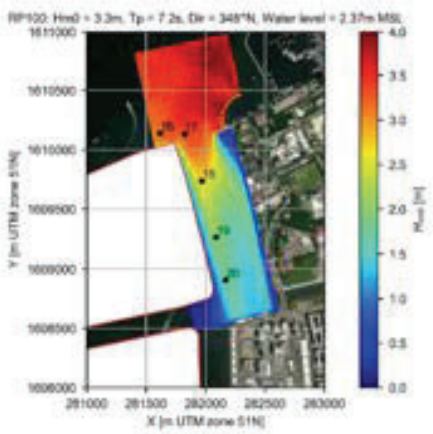


Figure 2-13. Wave penetration for the north-south channel (refer to SF1013-RHD-XX-XX-RP-X-0001)

On the other hand, the results show that there is a slight increase in storm surge (still water level) due to the presence of the new islands. Looking at Figure 2-14 the new islands create a "tunnel" (red dashed lines). When a storm comes in from the north-west, and water levels are pushed up due to the strong storm winds, because of this "tunnel" water levels will be pushed up slightly more compared to a situation without any new islands.

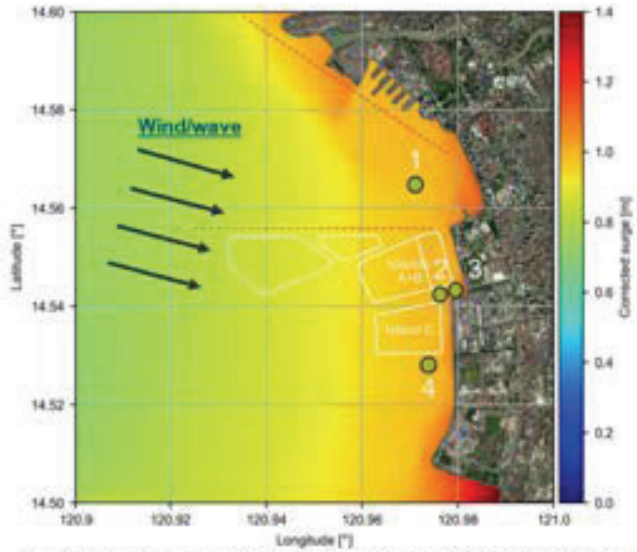


Figure 2-14. Locations for assessment of surge level with islands (Source: RHDHV, 2024)

Royal HaskoningDHV

The increase in surge level is minimal and ranges from 0.01m at point 4 to 0.11m at point 2. It also shows that the surge level increase dampens from point 2 (0.11m) to point 3 (0.05m) i.e. by 0.06m. Relevant surge levels with and without presence of the new islands are shown in Table 2-1.

Table 2-1. Change in surge level (in AMSL) with and without islands

Location Points	Longitude	Latitude	Surge without islands	Surge with islands	Difference
1.	120.9720	14.5650	0.96	1.02	0.06
2.	120.9767	14.5424	0.97	1.08	0.11
3.	120.9795	14.5428	1.05	1.10	0.05
4.	120.9748	14.5288	0.98	0.99	0.01

Royal HaskoningDHV
Enhancing Society Together

3 Gap and Risk Analysis

A qualitative gap and risk analysis was done which contains a list of risks and uncertainties foreseen based on the reviewed data and reports. In addition, we have identified current mitigation for each risk. A summary of gaps and consequences based on risks is presented in Table 3-1.

Table 3-1 List of Gap and Risk

No.	List of data	Gap	Risk	Mitigation / Benefit
	Received and Gathered Data			
1.	Updated PRDP and PQRD layout	Final layout for PQRD	Since the layout for PQRD is yet to be finalized, if the distance between hinterland and islands will be less than 150m then it needs to be rechecked to assess its impact to the existing land.	In the current layout, the distance between islands and mainland is around 250m – 470m for PRDP and 250m for PQRD, which is even more than the minimum 150m, hence reduces the risk.
2.	SM Reclamation Master Development Plan Report	The layout used in the master development plan is not updated for both PRDP and PQRD, a minimum width as recommended in the model is 150m. The actual model used to calculate the minimum width required was not provided.	If the layout for PQRD will be changed, reducing the width between islands, the impact to the existing land will have to be re-assessed.	The current layout is now around 250m – 470m for PRDP and 250m for PQRD. In addition, the tentative layout of PQRD island gives additional space for Seaside Channel to discharge directly to the sea, as the former Island D is split into two creating a channel connecting directly with Seaside Channel.
3.	Existing waterways and facilities	All information is from more than 5 years ago. It is understood that MMDA already upgraded and added pumping stations.	No risk identified	The benefit of more pumping stations further reduces the risk of increased flooding due to the new islands. This can be observed through the existing PS in Libertad and Tripa de Gallina.
4.	UP NOAH 100-year Rain Return Scenario	No gap identified	In case flooding happens, the new islands might be blamed, and people might think the new islands are the cause of the flooding.	The UP NOAH 100-year Rain Return Scenario shows is study shows that there is already occurrence of flooding during 100-year return period storm, even without the presence of the new islands.

Royal HaskoningDHV
Enhancing Society Together

4 Flood Assessment

The sections below provide an overview of possible impacts from the presence of the new islands on hinterland flood risk. A qualitative evaluation for each impact is identified as follows:

- Riverine Flooding
- Sedimentation and Coastal Morphology
- Coastal flooding

4.1 Riverine Flooding

The proposed new islands do not block the outlet of existing channels, they are aligned and widened to enhance the discharge capacity from the hinterland. The islands are offset from the hinterland with a channel varying in width from 250m to 470m. The combined discharge capacity of all these channels is much larger than the capacity of the existing hinterland channels as shown in Figure 4-1.

The SM Reclamation Master Development Plan Report corroborates this, confirming that the proposed islands will not have negative impact on flooding. Furthermore, the Environmental Impact Statement (EIS) Study conducted for Pasay 360, where the proposed island is directly in front of the Libertad channel, concluded that the channels between the islands and the hinterland will prevent impact on upstream flooding.



Figure 4-1. Outflow capacity assessment at the outlet points of existing channels

The new reclamation layout has been designed with careful consideration of potential flooding impacts, and measures have been implemented to mitigate these risks effectively.

Royal HaskoningDHV

By adopting a 250m wide channel between the new islands from both Pasay360 (PRDP) and Paranaque 300 (PQRD) projects and the existing hinterland, a more conservative approach is chosen compared to the minimum required channel width of 150m that resulted from the AECOM masterplan study (refer to Section 2.2.2). On top of that, an additional channel is created directly in front of the Seaside Channel, creating significant additional flow capacity, see Figure 4-2 below.



Figure 4-2: AECOM masterplan islands layout (left) compared to current planned islands layout (right)

Also compared to the Environmental Impact Statement (refer to Section 2.2.3), which concludes a minimum buffer zone of 200m to be required between the new islands and the existing hinterland, the selected islands configuration is a more conservative approach.

Concluding, by offsetting the new islands from the existing hinterland with 250m to 470m there is no direct blockage of any outfalls or channels. Hence, the proposed islands do not block the flow and will not cause locally increased water levels. As discussed in Section 0, from the updated Hydrodynamic Modelling Study, during storm conditions, a small increase in still water levels is observed comparing the situation with and without presence of the new islands. As the impact on water levels is in the order of 0.05m (5cm), and only happens during extreme storm conditions coming from the north-west, the impact on the riverine flooding risk to the existing hinterland is marginal. As the islands also provide shelter against storm waves (refer to Section 4.3 where this is further explained), this raising of still water level is offset against the sheltering effect of the islands which results in a reduced impact from wave overtopping.

Specifically for Libertad Channel, any impact on water levels due to the new islands will not progress upstream of the Libertad Pumping Station, see Figure 4-3. As stated in the EIS study (refer to Section 2.2.3) flooding in the areas is mainly caused by the upstream channels being clogged by solid wastes, which was verified and confirmed by residents during our site visit (refer to Section 2.1).



Figure 4-3. Existing channels, rivers, creeks and pumping stations

4.2 Sedimentation and Coastal Morphology

The existing hinterland channels have a bed level at approximately -2mMSL. The new channels between the new islands are designed with bed levels at -6mMSL or deeper.

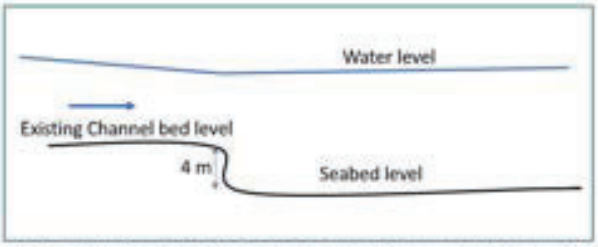


Figure 4-4. New channel seabed levels will be 4m deeper than the current existing channel bed levels

The reclamation and construction of islands might impact on sediment transport and morphological processes at the location. This may result in sediment deposition at the existing and new channels from both the upstream hinterland channels and from coastal processes.

As the new channels are designed, and will be maintained, at a bed level 4m below the existing hinterland channels, it is unlikely that sediment deposition will cause blockage at the outfall points as there is buffer capacity within the new channels for this material.

The sediment deposition in the existing channels and in the new channels should be regularly monitored. Significant accumulation of sediments can be dredged to maintain both the existing and the new channel's discharge capacities after the construction of the islands. If this is done then, from the sedimentation and coastal morphological side, there is no additional flood risk to the existing hinterland due to the proposed new islands.

4.3 Coastal Flooding

In the existing situation without presence of the new islands, during severe storm conditions (typhoon) waves will hit the land in full force. Such waves combined with high water levels (storm surge) result in large quantities off water to overtop the coastal defence resulting in local flooding of the nearshore areas. This phenomenon is shown in Figure 4-5.



Figure 4-5 Wave overtopping on Roxas Boulevard, during typhoon Pedring in 2011

The proposed islands will have a positive impact on the hinterland in terms of protection against these waves. The edges of the proposed islands will consist of revetments with wave walls and are designed to provide protection against normal and typhoon generated waves.

As the proposed islands are to be constructed in front of the hinterland, the new islands will absorb most of the wave impact during storm conditions and will significantly reduce the wave impact (hence overtopping water) on the existing hinterland. This has a positive effect and reduces flood risks in the existing nearshore areas. Refer to Section 0 and Figure 2- where this is shown with a screen shot from the SWASH wave penetration modelling study.

Royal HaskoningDHV

5 Conclusions and Recommendations

5.1 Conclusions

The following main conclusion can be drawn from the assessment:

The presence of the new islands as shown in Figure 1-1 does not impact existing hinterland flood risk.

The following sub-conclusions are relevant:

1. Island A will be moved and connected to Island B, creating a 470m wide channel and avoiding a reclamation directly against the hinterland, removing direct blocking of outfalls.
2. The channels created by the new islands will be wider than the channels initially designed for in both the SM Reclamation Master Development Plan (by AECOM) and as verified in the Environmental Impact Statement.
3. The channels created by the new islands should be monitored and maintained at their designed levels.
4. The nearshore coastal flood risk due to the islands will reduce, as the new islands will provide shelter against storm waves, reducing the amount of overtopping water.
5. A small increase of water levels is observed due to the islands ("tunnelling" effect), which is offset against the reduced impact of overtopping due to storm waves.

5.2 Recommendations

From the literature study and previous modelling studies done, it is concluded that there is no negative impact from the new islands on existing hinterland flood risk. No further modelling studies are considered to be required.

However, if a hydrodynamic modelling assessment is required as part of the Environmental Impact Study (EIS), the following approach is suggested.

Data Collection and Analysis

The available cross-sectional data from MOA inlands channel survey and bathymetry data will be further analysed and validated before using it for setting up a hydrodynamic model. If additional topographical and bathymetry survey is required, this will be identified in the earlier stage of our assessment. As part of the Paranaque design services, we have recommended performing a bathymetric survey of the existing channels up to the pumping stations. If such data is available we can use it in our model.

Hydrological and Hydraulic Modelling

A 1D/2D hydrodynamic model will be applied to confirm the effect of the new islands on hinterland flood risk using 100-year return period rainfall. A simple Rational Method will be used for major drainage channels to estimate the flood runoff using Rainfall Intensity Duration Frequency (RIDF) data. Run-off coefficients will be assumed based on satellite imagery (Google Earth) and agreed with Client prior to running the model. The 24-hour maximum rainfall recorded from the nearest rainfall station with a 100-year return period will be used as input for the model. The effect of the new islands will be analyzed through a simulation for two cases: one without any reclamation islands, and another with the reclamation islands.

Royal HaskoningDHV

Appendix A: Kick-off Meeting Minutes of Meeting and Presentation

Royal HaskoningDHV
Enhancing Society Together

Minutes

Haskoning Philippines Inc.
Water & Maritime

Present:	SMSCIDC (SM): John Chen, Darwin Montemayor, Kevin Khor, Matthew Bauzon, Att. Leah Quiambao, Anabelle V. Tizon Royal HaskoningDHV (RHDHV): Raman Maharjan, Michiel Smits, Mariane Pajarillo, Trevor Morish-Hale
Apologies:	/
From:	Michiel Smits
Date:	11 March 2024
Location:	PHQ south, 7th floor, conference room C
Copy:	Kevin Caluban
Our reference:	SF1013-RHD-L3-XX-MI-X-0001
Classification:	Project related
Enclosures:	Kick-off meeting presentation slides: SF1013-RHD-L3-XX-PP-X-0001

Subject: **Kick-off meeting**

Number	Details	Action
1	**Introduction of project teams** The attendees present during the kick-off meeting will form the team to be involved. Main point of contact will be John Chen.	No action
2	**Project background**	
2.1	The Pasay 360 islands have confirmed boundaries while Paranaque 300 is not yet confirmed. The goal of the literature study is to assess if actual modelling studies are required. For that purpose, the boundaries don't need to be fully confirmed, as long as islands don't move significantly closer to existing land or move exactly in front of channel outflows, potentially blocking those.	No action
2.2	Pasay 360 requires an ECC amendment, for Paranaque 300 a new ECC application is required. The technical scoping meetings with SM and DENR will be held in due course (this or next week). SM to share any (technical) requirements that come out of these meetings with RHDHV.	SM
3	**Project scope and schedule** Discussed and agreed. For the deliverables, SM requested to focus the report on the impact from the Pasay 360 islands and a separate report for the Paranaque 300 islands. For the meantime, it can be 1 report now, however if required it might have to be split in two separate reports.	RHDHV

Number	Details	Action
4	**Data collection**	
4.1	The boundaries for Pasay 360 are confirmed, for Paranaque 300 the boundaries as shown in the kick-off slides will be assumed and used for this study. All parties are aware those boundaries might still change. Implications of such changes will be assessed when they occur.	No action
4.2	The previous flood risk study done for the ECC application for Pasay 360 is of importance. RHDHV has the EIS that was completed in the past for Pasay 360 however not any modelling study done on hinterland flood risk. SM to search for any modelling studies done in the past and provide it to RHDHV.	SM
4.3	All other items listed are not necessarily required for the current assessment. They will be needed in case actual modelling work is deemed required.	No action
4.4	SM: Catchment area, estimated industrial discharge + residential discharge and extreme rainfall event is required to determine maximum discharge capacity. RHDHV: Noted, however this study will not assess actual flood risk, but targets to get an idea on how the islands may influence flood risk on the existing land.	No action
5	**Site Visit**	
5.1	Agreed to have a first Site Visit on Wednesday 12 March. From SM, Darwin will join and maybe John. From RHDHV Mariane, Michiel and possibly Raman will join. RHDHV to share plan (itinerary) for the day (timing, where to go, main goal, etc.).	RHDHV
5.2	Transportation (a van) will be arranged by SM.	SM
6	**Communications**	
6.1	All communications will be directed to John Chen and Michiel Smits, with others in CC. The project email to be included in all communications as well: SF1013@project.rhdhv.com	For info
6.2	Weekly update meetings to be scheduled.	RHDHV
7	**Other matters**	
7.1	Post meeting question (not discussed): The original two islands in the EIS were initially changed to four islands (A, B, C and D). Was the impact of Island D ever assessed in terms of hinterland flood risk?	

Royal HaskoningDHV

Appendix B: Site Visit

Royal HaskoningDHV

Note / Memo

Haskoning Philippines Inc.
Water & Maritime

To:	SMSCIDC
From:	Mariane A. Pajarillo
Date:	20 March 2024
Copy:	/
Our reference:	SF1013-RHD-L3-XX-ME-X-0002
Classification:	Project related
Checked by	Michiel Smits
Subject:	**Site Visit 13 March 2024**

1 Introduction

This memo provides the observations and progress of the site visit to the Parañaque River and channels draining to Manila Bay, particularly in the City of Pasay and Parañaque, Philippines. The site visit was conducted last 13 March 2024. The site visit was joined by the following project team members:

1. Darwin Montemayor - SMSCIDC
2. Michiel Smits - Project Manager RHDHV
3. Mariane Pajarillo – Drainage/Hydraulic Specialist RHDHV

The itinerary of the site visit was shared with SMSCIDC on 12 March 2024 with reference SF1013-RHD-L3-XX-ME-X-0001 and is attached to this Memo for completeness.

2 Site Visit

In total there were 9 sites that we have visited, which were located mostly along the bridges crossing Parañaque River and the three channels within the study area, being Libertad (1), Redemptorist (2) and Seaside (3) channels, see Figure 2-2.



Figure 2-1 Main channels in the study area (1, 2 and 3) and Parañaque River (4)

Royal HaskoningDHV

Figure 2-3 shows all the locations that the team has visited.

1. Redemptorist Channel
2. Seaside Channel
3. Manila Bay view close to Las Piñas–Parañaque Critical Habitat and Ecotourism Area (LPPCHEA)
4. Parañaque River mouth
5. Parañaque River along Niño Bridge
6. Parañaque River along Don Galo Bridge
7. Parañaque River along JP Rizal Road
8. Parañaque River along Tambo Bridge, and
9. Parañaque River along Airport Bridge

During the time of the visit, it was noted that the bridges mentioned above are all located downstream of Tripa de Gallina pumping station (PS). Since the tide is rising, the flow of water in Parañaque River was flowing towards the pumping station and not towards Manila Bay. Tidal tables can be obtained from https://www.tidetime.org/asia/philippines/manila-calendar.htm, snapshot of 13 March 2024 shown in the image below.

March 2024 Manila Tides

Day	High	Low	High	Low	High	Phase	Sunrise	Sunset	Moonrise	Moonset
Wed 13	12:01 AM PST 0.76 m	6:05 AM PST 0.13 m	12:05 PM PST 0.68 m	6:34 PM PST -0.04 m			6:05 AM PST	6:06 PM PST	8:08 AM PST	9:03 PM PST

Figure 2-2: Tidal table during the visit



Royal HaskoningDHV

3 Flooding Situation

Based on our interviews during the site visits, the highest flood occurred was in September 2009 during Typhoon Ondoy and August 2012 during the Habagat (southwest monsoon). While we were also informed that whenever its high tide in Parañaque River and drainage outfalls are clogged, residents also experience flooding of about 0.20m deep or gutter deep. The following are specific flood depths for each location as shown in

Table 3-1 Flood Depths

Flood Depths	Image
Parañaque River water level along Airport Bridge. ➢ Area is located on the upstream side which has a higher elevation than the other sites. ➢ Typhoon Ondoy reached only almost pile cap but was not overtopped. ➢ Residents who have been living in the area for >30 years only encountered the Typhoon Ondoy as the highest water level. However, this level did not flood the area.	
Parañaque River water level along Tambo Bridge. ➢ Typhoon Ondoy reached 1m flood along the service road. However, it did not reached the road level at the Tambo Bridge as it is located 2m higher than the service road. ➢ Another flood occurred during 2012 Habagat (Southwest monsoon). Flood depth is only 0.5m meter from the service road. ➢ Latest flood occurred was last 2022 but only 0.20m deep from the service road.	

Royal HaskoningDHV

Flood Depths	Image
Parañaque River water level along JP Rizal Road. ➢ Resident had been living in for about 10 years, therefore no Typhoon Ondoy flood level. ➢ Highest flood encountered last 2022 with a flood depth of 1m. ➢ Whenever drainage outfall is submerged, flood depth will be around 0.20m or gutter deep.	
Parañaque River along Sto. Niño Road/Bridge ➢ Highest flood encountered during Typhoon Ondoy in 2009 was 1.0m. ➢ While during Habagat in 2012, flood depth was 0.20m. ➢ Latest flood depth was 0.50m in 2023.	

As a general note from the site visit, most of the recent flooding were due to clogged drainage outfalls and since service roads or residential houses has a lower elevation from the national road, most of the national roads were not affected by the flooding. Residential houses especially in Airport Bridge and Don Galo Bridge are relatively located on a higher elevation so no flooding occurred even during Typhoon Ondoy in 2009.

Royal HaskoningDHV

Appendix C: Figures from the EIS – existing drainage channels



Figure 2.2.1 The Drainage System of Pasay and Vicinities

Plate 2.2.1 The two (2) inlets to the Libertad Channel



Plate 2.2.2 Structures at the Libertad Channel Prior to Discharge to Manila Bay

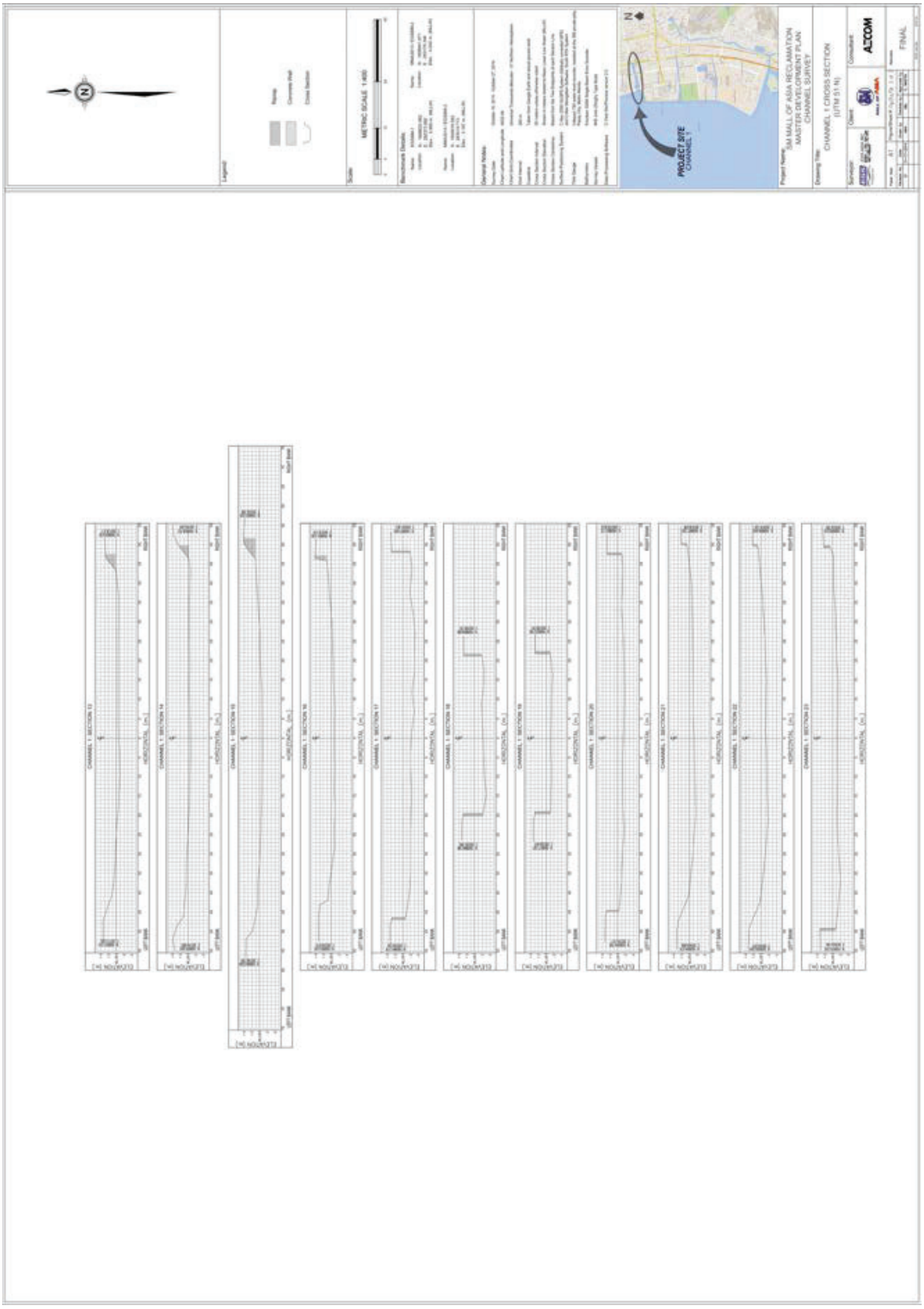




Figure 2.2.2 Map Showing the Distances of the Project Site from Pasig and Paranaque Rivers

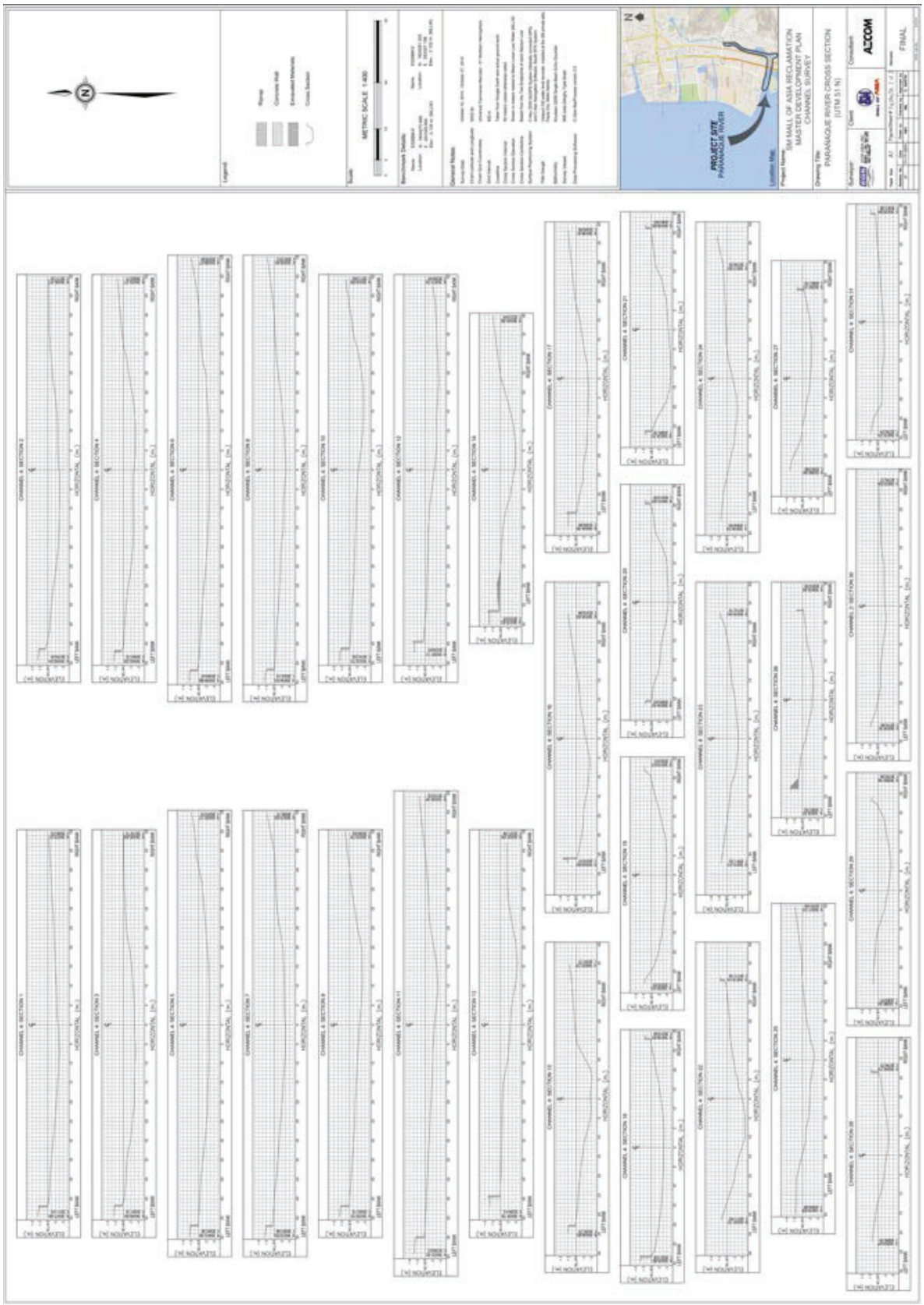
Royal HaskoningDHV

Appendix D: Inland Survey Layout and cross-sections


PROJECT SITE
CHANNEL 1
SM MALL OF ASIA RECLAMATION
MASTER DEVELOPMENT PLAN
CHANNEL SURVEY
CHANNEL 1 CROSS SECTION
(UTM 51 N)
ACCOM
FINAL




PROJECT SITE
CHANNEL 3
SM MALL OF ASIA RECLAMATION
MASTER DEVELOPMENT PLAN
CHANNEL SURVEY
CHANNEL 3 CROSS SECTION
(UTM 51 N)
ACCOM
FINAL


PROJECT SITE
PARANAQUE RIVER
SM MALL OF ASIA RECLAMATION
MASTER DEVELOPMENT PLAN
CHANNEL SURVEY
PARAÑAQUE RIVER CROSS SECTION
(UTM 51 N)
ACCOM
FINAL


PROJECT SITE
PARAÑAQUE RIVER
SM MALL OF ASIA RECLAMATION
MASTER DEVELOPMENT PLAN
CHANNEL SURVEY
PARAÑAQUE RIVER CROSS SECTION
(UTM 51 N)
ACCOM
FINAL

APPENDIX L.
DENR EMB LETTER DATED 21 JUNE 2024 – SUBMISSION OF EPRMP AND PASAY CITY ENDORSEMENT OF RESPONSE TO JV PARTNER FOR THE SUBMISSION OF EPRMP

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

4 July 2024

RECEIVED
JUL 08 2024
By
Time 11:36

DIR. JACQUELINE A. CAANCAN
Director
Environmental Management Bureau
Department of Environment and Natural Resources
DENR Compound, Visayas Avenue
Diliman, Quezon City

Subject: **Endorsement of Response to the Letter of the Department of Environment and Natural Resources ("DENR") dated 21 June 2024**

Dear Dir. Caancan:

We respectfully endorse our Private Joint Venture Partner's letter informing your good office of the efforts being exerted to comply with the directive to submit an updated Environmental Performance Report and Management Plan based on an updated Environmental Management Plan provided in the letter from the Department of Environment and Natural Resources Environmental Management Bureau dated 21 June 2024.

We hope our endorsement and Private Joint Venture Partner's letter are duly acknowledged.

Thank you.

Very truly yours,

IMELDA G. CALIXTO-RUBIANO
City Mayor

Assisted by:

ATTY. SEVERO C. MADRONA, JR.
City Legal Officer

Pasay City Hall Room 203 2nd Floor F.B Harrison Street.
Pasay City, Philippines

SMART CITY INFRASTRUCTURE AND DEVELOPMENT CORPORATION
7/F MOA Square, Seashell Lane cor. Coral Way,
Mall of Asia Complex, Pasay City 1300, Philippines

04 July 2024
SMSCIDC-LRC-24-0084-O

HON. IMELDA CALIXTO-RUBIANO
City Mayor, City of Pasay
Pasay City Hall
F.B. Harrison St., Pasay City

SUBJECT: Response to the Letter of the Department of Environment and Natural Resources ("DENR") dated 21 June 2024

Dear **Mayor Calixto-Rubiano**,

We write in our capacity as Joint Venture Partner of Pasay City for the Pasay 360-Hectare Reclamation Project (the "Project").

In response to the letter from the Department of Environment and Natural Resources Environmental Management Bureau – Central Office ("EMB-CO") dated 21 June 2024 ("Annex A"), we acknowledge the directive of Director Jacqueline A. Caancan to submit an updated Environmental Performance Report and Management Plan ("EPRMP") based on the updated Environmental Management Plan ("EMP") before conducting a meeting with EMB-CO to discuss the ECC amendment for the proposed landform reconfiguration for the Project.

In view thereof, we respectfully inform your office that we are in the process of updating the EPRMP together with our consultant, the University of the Philippines – Planning and Development Research Foundation, Inc. (UP PLANADES) based on our updated EMP attached herewith ("Annex B").

We respectfully request the endorsement of this letter to the EMB-CO to apprise them of our ongoing efforts in relation to their directive.

We look forward to your valuable support. Thank you.

Respectfully yours,

GLENN D. ANG
President

ANNEX A

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

BAGONG PILIPINAS

JUN 2 1 2024

HON. IMELDA CALIXTO - RUBIANO
City Mayor
Lungsod ng Pasay, Kalakhang Maynila
Pasay City Hall Room 203
2nd F.B. Harrison Street, Pasay City

Subject : **REQUEST FOR MEETING ON THE ECC AMENDMENT FOR THE ENHANCED LANDFORM FOR THE 360-HECTARE PASAY RECLAMATION PROJECT**

Dear **Mayor Calixto - Rubiano**:

This refers to your letter dated 08 March 2024 received by this Office on 18 March 2024 requesting a meeting on the ECC amendment for the proposed Land Configuration for the **360-hectare Reclamation Project.**

Please be reminded that per our letter dated 24 January 2024, we required the submission of an updated Environmental Performance Report and Management Plan (EPRMP) based on your updated Environmental Management Plan (EMP) so that the Office can take action on your ECC amendment request.

In this regard, we are reiterating this request and direct for the submission of the EPRMP prior to the conduct of the requested meeting.

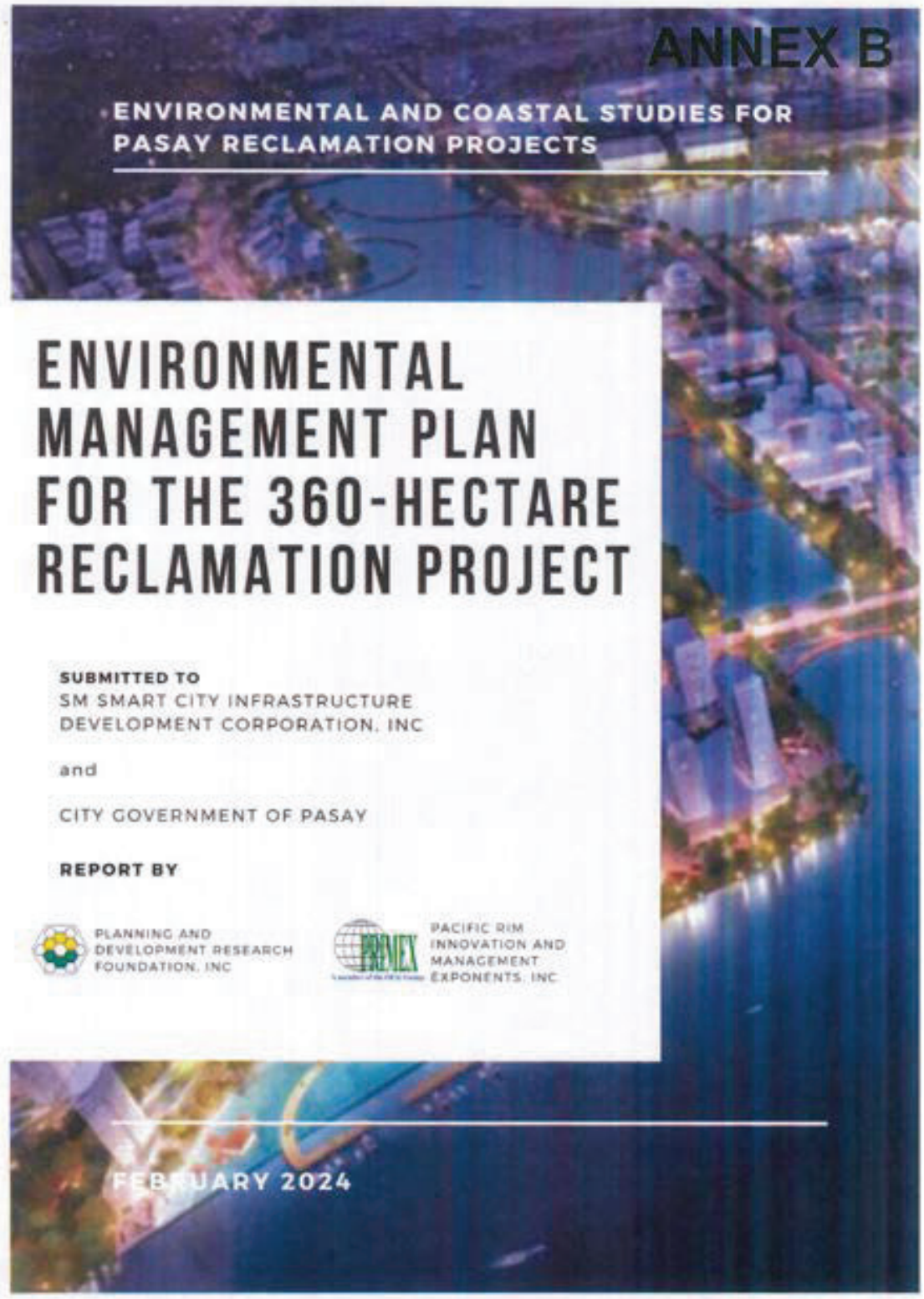
We hope to have clarified our position on the matter.

Very truly yours,

JACQUELINE A. CAANCAN, *CESO III*
Director

IIS No.: CO-2024-009355

DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Telephone No.: (632) 8539-4378
E-mail: recordscoll@emb.gov.ph Website: www.emb.gov.ph


ANNEX B
ENVIRONMENTAL AND COASTAL STUDIES FOR PASAY RECLAMATION PROJECTS
ENVIRONMENTAL MANAGEMENT PLAN FOR THE 360-HECTARE RECLAMATION PROJECT
SUBMITTED TO
SM SMART CITY INFRASTRUCTURE DEVELOPMENT CORPORATION, INC
and
CITY GOVERNMENT OF PASAY
REPORT BY
PLANNING AND DEVELOPMENT RESEARCH FOUNDATION, INC
PACIFIC RIM INNOVATION AND MANAGEMENT EXPONENTS, INC
FEBRUARY 2024

ACRONYMS

APSI/APSE	-	Air Pollution Source Installation / Equipment
BOD	-	Biological Oxygen Demand
CCO	-	Chemical Control Order
CMR	-	Compliance Monitoring Report
DED	-	Detailed Engineering Design
DENR	-	Department of Environment and Natural Resources
DOLE	-	Department of Labor and Employment
ECC	-	Environmental Compliance Certificate
EIS	-	Environmental Impact Statement
EMB	-	Environmental Management Bureau
EMP	-	Environmental Management Plan
EMoP	-	Environmental Monitoring Plan
EQPL	-	Environmental Quality Performance Level
EU	-	Environmental Unit
GES	-	General Effluent Standards
HWGID	-	Hazardous Waste Generator ID
IEC	-	Information, Education and Communication
MARINA	-	Maritime Industry Authority
MARPOL	-	International Convention for the Prevention of Pollution from Ships
MMT	-	Multi-partite Monitoring Team
ODS	-	Ozone-Depleting Substances
OPMS	-	Online Permitting and Monitoring System
OWS	-	Oily Water Separator
PCB	-	Polychlorinated Biphenyls
PCG	-	Philippine Coast Guard
PCL	-	Priority Chemical List
PEISS	-	Philippine Environmental Impact Statement System
PM	-	Project Manager
PPA	-	Philippine Ports Authority
PTO	-	Permit to Operate
SDP	-	Social Development Plan

SM SCIDC	-	SM Smart City Infrastructure and Development Corporation
SMR	-	Self-Monitoring Report
STP	-	Sewage Treatment Plant
TSD	-	Treatment, Storage, and Disposal
TSHD	-	Trailer Suction Hopper Dredger
TSS	-	Total Suspended Solids
WQG	-	Water Quality Guidelines
WSP	-	Waste Service Provider

TABLE OF CONTENTS

ACRONYMS i
TABLE OF CONTENTS iii
LIST OF TABLES iv
1.0 BACKGROUND 1
2.0 OBJECTIVES 2
3.0 MANAGEMENT FRAMEWORK 3
4.0 ENVIRONMENTAL REGULATORY FRAMEWORK 6
5.0 SUMMARY OF POTENTIAL IMPACTS 9
6.0 MITIGATION PLANS 11
7.0 ENVIRONMENTAL MONITORING PROGRAM 22
REFERENCES 34

LIST OF TABLES

Table 3-1. EMP Management Roles and Responsibilities 9
Table 4-1. Relevant Environmental Laws 11
Table 5-1. Summary of Potential Impacts 14
Table 6-1. Summary of Mitigation Measures 16
Table 7-1. Environmental Monitoring Program 27

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

1.0 BACKGROUND

The Department of Environment and Natural Resources (DENR) through the Environmental Management Bureau (EMB) granted the City Government of Pasay (Proponent) an Environmental Compliance Certificate (ECC-CO-1601-0003) for the reclamation and horizontal land development of a 360-hectare property along the coast of Manila Bay, City of Pasay on October 24, 2017. Among the conditions stipulated in the ECC is the submission of an Environmental Management Plan (EMP) 120 days prior to project implementation consistent with the following:

- DENR Manila Bay Coastal Strategy and its Operational Plan;
- Continuing Supreme Court Mandamus on Manila Bay;
- PRA laws and policies;
- PRA Boulevard 2000 Integrated Framework Plan; and
- City of Manila and Pasay related rules and regulations.

2.0 OBJECTIVES

The Environmental Management Plan (EMP) is an important management tool to ensure that adverse environmental impacts are prevented and positive impacts are enhanced throughout all phases of the project. The objective of the EMP is to propose appropriate mitigation measures and recommend mechanisms to monitor and ensure compliance to appropriate environmental regulatory requirements, mitigation measures identified in the Project's Environmental Impact Statement (EIS) and ECC conditionalities. It documents the Proponent's approach to environmental management and will serve as a guidance document to measure and achieve compliance.

3.0 MANAGEMENT FRAMEWORK

The management framework for the implementation of this EMP is summarized in Figure 3-1. There are several parties responsible for the implementation of the EMP. The main responsibility and accountability in the successful implementation of the EMP lies on the Project Proponent, the City of Pasay, as indicated in the ECC of the reclamation project. It will liaise with SM Smart City Infrastructure and Development Corporation (SM SCIDC), its Joint Venture Partner (JVP)/ Project Developer, in the compliance of environmental requirements including the implementation of the ECC conditions, Environmental Monitoring Plan (EMoP) and submission of the Compliance Monitoring Report (CMR) and Self-Monitoring Report (SMR) to the DENR-EMB and related regulatory bodies. SM Smart City through its Environmental Unit is responsible in ensuring the compliance with the ECC conditions and EMoP implementation before, during, and after project completion.

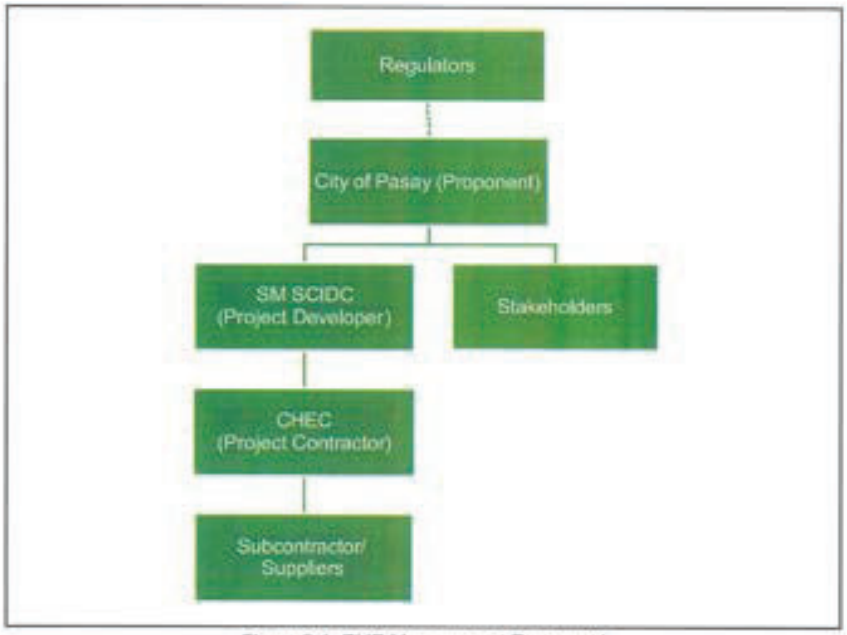


Figure 3-1. EMP Management Framework

Both the Proponent and Project Developer will be responsible for ensuring that all employees, officers, contractors and subcontractors associated with the project are familiar with the EMP, ECC and relevant permits. They should also ensure that requirements of environmental legislation committed to ensuring environmentally sound practices are implemented in all activities.

Specific management responsibilities are summarized in Table 3-1.

Table 3-1. EMP Management Roles and Responsibilities

ROLE	RESPONSIBILITIES
Pasay City Proponent/ Permit Holder/ Project Owner	• Ensure that the Project Developer implements and monitors the EMP, ECC conditions and other environmental regulations and requirements. • Ensure that appropriate and adequate resources are allocated for the effective implementation and maintenance of the EMP. • Ensure that periodic reviews of environmental performance are conducted by the Project Developer. • Ensure that the Project Developer reports to DENR-EMB and other relevant regulators, any major environmental incidents that may have a significant impact on the surrounding environment.
SM SCIDC Project Developer	• Ensure that the Project Consultant implements and monitors the EMP, ECC conditions and other environmental regulations and requirements. • Ensure that all supervisory and management staff involved in the project are aware and understand their responsibilities under this EMP. • Allocate appropriate and adequate resources for the effective implementation and maintenance of the EMP. • Ensure that periodic reviews of environmental performance are conducted by the Project Consultant. • Report any major environmental incidents to DENR-EMB and other relevant regulators, any major environmental incidents that may have a significant impact on the surrounding environment. • Ensure that their employees and contractors receive the relevant environmental instruction in relation to the EMP and understand their obligations and duties. • Provide necessary directives to Project Contractor, directly and indirectly.
Contractor (China Harbour Engineering Construction)	• Responsible for the adequacy, stability and safety of all the Contractor's operations and activities • Submit to the Employer all the necessary approvals, licenses and permits for the commencement of the works • Ensure that all personnel including subcontractors adhere to these requirements. • Ensure that the appropriate requirements are incorporated into the reclamation plans and activities. • Ensure that personnel involved in the project, including subcontractors and visitors, have received necessary environmental training/ induction so that they understand their roles under the EMP.

	• Carry out all work in accordance with the procedures outlined in the EMP. • Make sure adherence to all environmental safeguards and precautions are in place, at a minimum, in accordance with the monitoring requirements outlined in the EMP. • Ensure proper maintenance, inspection and monitoring of equipment • Report all environmental incidents directly to the Project Consultant, in accordance to the severity of the incident. Preliminary reporting to be submitted within 24 hours

4.0 ENVIRONMENTAL REGULATORY FRAMEWORK

The environmental regulations that are applicable to the reclamation project is summarized in Table 4-1. The requirements of these regulations have to be implemented to ensure compliance and to reduce the impact of the projects on the environment.

Table 4-1. Relevant Environmental Laws

ENVIRONMENTAL LAWS	PARTICULARS
PD No. 1586	The Environmental Impact Statement System **Presidential Decree (PD) No. 1586** titled "Establishing an Environmental Impact Statement System, Including Other Environmental Management Related Measures and for Other Purposes."
DAO 2017-15	Guidelines on Public Participation Under the Philippine Environmental Impact Statement (EIS) System
DAO 2003-27	Details the preparation and submission of a Self-Monitoring Report (SMR). Unless otherwise provided, all covered firms shall submit the SMR on a quarterly basis. SMR covering activities in a quarter shall be submitted within 15 calendar days after the end of the said quarter as may be determined by the DENR-EMB regional office concerned.
Law associated with Air Emissions	
RA No. 8749	**Republic Act No. 8749**, otherwise known as the Philippine Clean Air Act, is a comprehensive air quality management policy and program which aims to achieve and maintain healthy air for all Filipinos. It also establishes the standards for ambient air quality and emission standards for point sources. The Act contains provisions on empowering ordinary citizens to address situations involving violators and government officials who neglect the performance of their duties. This law mostly provides a general framework for the new air pollution requirements.
DENR Administrative Orders (DAO) for the implementation of the Law on Air Emissions	
DAO 2000-81	Under this order, a valid Permit to Operate must be obtained from DENR for any source of air pollution continuously emitted out to the environment. Air emission and ambient standards are also listed under this order.
DENR Memorandum Circulars (DMC) on Air Emissions	
DMC 2007-03	Provides the implementing rules and regulations for RA. 8749. Details the policy on compliance and permitting for industrial facilities relating to air quality. The frequencies of emission testing for new or existing sources are also specified in this circular.
DMC 2020-17	Guidelines on the issuance of Permit to Operate (PTO) for air pollution source installation or equipment (APSI/APSE) through the online permitting and monitoring system (OPMS)
Laws associated with control of Hazardous Wastes and Substances	
PD 984	**Presidential Decree (PD) No 984** commonly known as the Pollution Control Law that provides the standards for storage, collection, processing, transport and disposal of solid and hazardous wastes

RA 6969	**Republic Act (RA) No 6969** entitled "An Act to Control Toxic Substances and Hazardous and Nuclear Wastes, Providing Penalties for Violations Thereof, and for Other Purposes." This act regulates, prohibits and restricts the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment. This Act also specifies proper handling of toxic substances which includes pre-manufacture and pre-importation requirements.
RA 9003	**Republic Act (RA) No 9003** entitled "An Act Providing for an Ecological Solid Waste Management Program Creating the Necessary Institutional Mechanism and Incentives, Declaring Certain Acts Prohibited and Providing Penalties, Appropriating Funds Therefore, and for Other Purposes." The Ecological Solid Waste Management Act provides the framework for the handling of solid wastes, standards for the establishment of dumpsites, and guidelines for the segregation and recycling of solid wastes.
DENR Administrative Orders (DAO) for the implementation of the Pollution Control Law	
DAO 2014-02	Revised Guidelines for Pollution Control Officer Accreditation – To effectively enforce RA 9275 by establishing linkages among the (1) Department of Environment and Natural Resources, (2) industrial establishments which are potential and actual sources of pollution and (3) local government agencies, and to carry out the national policy of maintaining a reasonable quality of the environment.
DENR Administrative Orders (DAO) for the implementation of the Law on Hazardous Wastes and Substances	
DAO 2001-34	Provides the implementing rules and regulations for RA 9003
DAO 2004-01	Provides the Chemical Control Order (CCO) for Polychlorinated Biphenyls (PCBs)
DAO 2000-02	Regulates the use and disposal of asbestos
DAO 2019-20	Revised CCO for Mercury and Mercury Compounds
DAO 2013-25	Revised Regulations on the CCO for Ozone-Depleting Substances (ODS)
DAO 2013-22	Revised Procedures and Standards for the Management of Hazardous Wastes (Revising DAO 2004-36)
DAO 2007-23	Implementation of Priority Chemical List (PCL) to regulate the use and importation of selected chemicals such as cadmium acetate
Laws associated with Water Resources	
PD 1067	**Presidential Decree (PD) No 1067** The Water Code of the Philippines, provides the framework relating to the appropriation, control, and conservation of water resources, as well as defines the rights and obligations of water users and water owners. This decree further sets basic laws governing the ownership, utilization, and exploitation of water resources and identifies administrative agencies that will enforce the Code.
RA 9275	**Republic Act (RA) No 9275** Otherwise known as the Clean Water Act of 2004 provides the rules and regulations for the proper implementation of water utilization, protection and conservation to protect water bodies from pollution from land-based sources such as

	industries and commercial establishments, agriculture and community/household activities.
PD 856	The Code of Sanitation of the Philippines provides the need for updating and codifying our scattered Sanitary Laws to ensure that they are in keeping with modern standards of sanitation and provide a handy reference and guide for their enforcement.
DENR Administrative Orders (DAO) for the implementation of the Law on Water Resources	
DAO 2005-10	Provides the implementing rules and regulations for RA 9275. Under this Order, discharging, injecting or allowing seeping into the soil or subsoil any substance in any form that would pollute groundwater is prohibited.
DAO 2016-08	Water Quality Guidelines and General Effluent Standards of 2016
DAO 2021-19	Updated Water Quality Guidelines (WQG) and General Effluent Standards (GES) for Ammonia, Boron, Total Fecal Coliform, Phosphorus and Sulfate.

5.0 SUMMARY OF POTENTIAL IMPACTS

Table 5-1 summarizes the potential environmental issues and impacts during the pre-construction, construction and operation phases, as identified by the Environmental Impact Statement (EIS).

Table 5-1. Summary of Potential Impacts

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT
Pre-construction phase	Survey works	No impact	Not applicable
	Site clearing and artifacts survey • Clearing of site of debris, solid wastes • Implement proper waste management • Reporting of accidental finds (ordnances, artifacts, wrecks) to proper government authorities	Increase in turbidity due to seabed disturbance	Water
		Generation of solid waste	Water and Land
Construction Phase - Raw Land Reclamation	Dredging and filling	Silt dispersal; potential erosion during filling if not contained	Water
		Possible increase in turbidity	Water
		Potential contamination with substances in filling materials	Water
		Solid waste generation	Water and Land
		Changes in seabed properties/ subsurface geology/ bathymetry (Irreversible)	Water
		Disruption in water circulation pattern; Overall impact on whole Manila Bay circulation pattern and dispersion behaviors of existing outfalls and discharges which can lead to sea level rise	Water and Land
		Change in marine water quality	Water
		Oil and grease contamination	Water
		Potential conflict with PPA	People

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT
		Potential accidents and damages to marine ecosystems during transport of dredging vessel	Water
		Aesthetics (Manila Bay sunset)	Land
	Filling of sand keys in the reclamation area (above water level); Construction of containment structure	Water pollution due to increase in turbidity in the bay	Water
		Dust poilution emanating from open areas	Air
		Noise pollution from the operation of heavy equipment	Air
		Generation of domestic wastewater from temporary facilities/ vessels	Water and land
		Generation of solid waste	Water and land
		Generation of hazardous wastes such as used oil, lubricants and paints, batteries, contaminated rags, busted bulbs and lamps	Water and land
Operations Phase	Construction of horizontal development such as roads and utilities	Traffic density increase	Land
		Generation of domestic wastes	Water
		Air pollution from vehicles	Air
		Migration/ in migration	People
		Livelihood and employment	People
		Health	People
Abandonment	Closure and abandonment of facilities utilities and establishments	Loss of employment	People

10

6.0 MITIGATION PLANS

Table 6-1 summarizes the corresponding preventive and mitigating measures that should be implemented by the City of Pasay, SM Smart City and the contractors to prevent adverse impacts to the environment.

Table 6-1. Summary of Mitigation Measures

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
Pre-construction phase	Survey works	No impacts	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
	Site clearing and artifacts survey • Clearing of site of debris, solid wastes • Clearing of the site of possible ordnance(s) remnants from World War II	Increase in turbidity due to seabed disturbance	Water	Use of Turbidity Management Plan (TMP), spreader pontoon, green valve technology, and pelican barge. Regular water quality monitoring.	Project Developer/ Contractor	Part of Project	EIS/ECC Conditions
		Generation of solid waste	Water and Land	Collected solid waste shall be segregated and collected by a 3rd party hauler.			
				When found, artifacts shall be turned over to the responsible regulatory body.			

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
Construction Phase	Dredging and filling	Silt dispersal; Increase in Turbidity	Water	Use of Turbidity Management Plan, floating pipeline, spreader pontoon, green valve technology, and pelican barge. Regular water quality monitoring. Proper maintenance of the vessels to prevent accidental spillages and minimize turbidity increase Monitored/ controlled loading and unloading of fill/dredged materials	Project Developer/ Contractor	Part of contract	EIS/ECC Conditions Project contractors Method Statement and EMP

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
		Potential contamination with substances in filling materials	Water	Provision of appropriate certifications and permits for fill material extraction activities Pre-screening of fill materials thru Toxicity Characteristic Leaching Procedure (TCLP) analysis and technical sand specification.	Project Developer/ Contractor	Part of contract	EIS/ECC Conditions MMT
		Solid waste generation	Water and Land	Proper collection and segregation of solid waste among vessels, lay-down area and other areas within the project by an accredited 3rd party waste service provider	Third Party Waste Service Provider	Part of Project Development Cost	EIS/ECC Conditions
		Change in marine water quality	Water	Implement Turbidity Management Plan (TMP) which includes use of spreader pontoon, green valve technology, and pelican barge.	Project Developer/ Contractor	Part of Project Development Cost	EIS/ECC Conditions MMT

13

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
				Regular water quality monitoring Issuance of stop work order when required, based on onsite monitoring results and actual visibility, in accordance with TMP.			
		Oil and grease contamination	Water	Proper implementation of hazardous waste management plan. Provision of appropriate drip trays. Chemical and fuel tanks/storage areas must be bunded with at least 110% of storage capacity of the largest tank. Maintenance of hazardous waste storage facility. Provision of appropriate spill kits and booms, in case of accidental spillage	Project Developer/ Contractor	Part of contract	EIS/ECC Conditions MMT

14

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
				Practice good maintenance of machineries and equipment to reduce oil losses.			
		Potential conflict with PPA	People	Close coordination with PPA and VTMS Proper implementation of approved Vessel Traffic Management Plan and waterways	Project Developer/ Contractor	Part of Project Develop ment Cost	Phil Coast Guard EIS/ ECC Conditions
		Potential accidents causing damages to marine ecosystems during transport of dredging vessel	Water	Use of sea-worthy vessel approved by MARINA, PCG and appropriate regulatory bodies. Installation of adequate navigational devices including early warning system. Avoid and stop transport during inclement weather. Implementation of Typhoon Response Plan.	Project Developer/ Contractor	Part of Project Develop ment Cost	EIS/ ECC Conditions

15

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
				Compliance with MARINA, PCG and international regulations. Proper training of vessel crew and personnel.			
	Transport of dredged material from the project area to dumping area	Dispersal of reclamation materials resulting in increase in turbidity/ water pollution	Water	Use of Turbidity Management Plan, floating pipeline, spreader pontoon, green valve technology, and pelican barge.	Project Developer/ Contractor	Part of Project Develop ment Cost	EIS/ECC Conditions

16

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
	Filling of sand keys in the reclamation area (above water level); Construction of containment structure	Dust pollution emanating from open areas	Air	Conduct dust suppression activities, e.g. green net installation and water truck sprinkling, when needed Conduct regular Air Quality Monitoring and compare with baseline data.	Project Developer/ Contractor	Part of Project Development Cost	EIS/ECC Conditions
		Noise pollution from the operation of heavy equipment	Air	Conduct noise monitoring during active works. Ensure mufflers are installed in all equipment. Conduct regular preventive maintenance servicing.	Project Developer/ Contractor	Part of Project Development Cost	EIS/ECC Conditions

17

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
		Generation of domestic wastewater from temporary facilities	Water	Provision of portalets in project area, and toilet facilities in every vessel. Regular siphoning by accredited STP facility.	Project Developer/ Contractor	Part of Project Development Cost	EIS/ECC Conditions
		Generation of solid waste	Water and Land	Collection and disposal of solid waste by a DENR accredited 3rd party WSP	Project Developer/ Contractor	Part of Project Development Cost	EIS/ECC Conditions
		Generation of hazardous wastes such as used oil, used batteries, contaminated rags, busted bulbs and lamps	Water and Land	Provision of a Hazardous Waste Storage Area with proper labeling, segregation and storage of wastes. Issuance of Hazardous Waste Generator ID from DENR Collection, transport, treatment, and disposal by a DENR accredited 3rd party WSP	Project Developer/ Contractor	Part of Project Development Cost	EIS/ECC Conditions
		Traffic density increase	Land	Implementation of Traffic Management Plan	Project Developer/ Contractor	To be included in operating	EIS/ECC Conditions

18

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
						cost	
	Use of power generating sets and fossil fuel using equipment	Fossil fuel emissions	Air	Use of diesel fuel (low sulfur fuels) in all gensets. Regular inspection and preventive maintenance servicing of all generators and equipment. Regular Ambient Air Monitoring.			

19

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
Operations Phase (outside the coverage of the project – for reference purpose only)		Generation of domestic wastes	Water	Provision of appropriate toilets/ portalets for onshore active sites Construction and proper operation of sewerage treatment plant	Project Developer/ Contractor	Part of project cost	EIS/ECC Conditions MMT
		Impact on marine and water species	Water	Continued water quality monitoring Recording/reporting of live and dead marine species e.g. birds, fish, mammals	Project Developer/ Contractor	Part of project cost	EIS/ECC Conditions MMT
		Air pollution from vehicles	Air	Traffic management. Use of quality motor fuels. Conduct of yearly vehicle emission testing. Compliance/updated vehicular certificates.	Project Developer/ Contractor	Not applicable	EIS/ECC Conditions. MMT RA 8749
		Migration/ in migration	People	Implement SDMP and IEC.	Project Developer	Part of project cost	EIS/ECC Conditions

20

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

PHASE	ACTIVITIES	POTENTIAL IMPACTS	AFFECTED ENVIRONMENT	OPTIONS FOR PREVENTION/ MITIGATION/ ENHANCEMENT	RESPONSIBLE ENTITY	COST	GUARANTEE/ FINANCIAL ARRANGEMENTS
		Livelihood and employment	People	Preferential hiring of qualified local residents.	Project Developer/ Contractor	Per agreeme nt with affected sectors	Agreements with affected sectors; EIS/ECC Conditions
		Loss of employment	People	Payment of social benefits	Project Developer	Part of project cost	DOLE Rules on Labor Standards
		Disposal of waste including hazardous waste generated during the reclamation activities	Water and Land	Proper management and disposal of waste using DENR accredited 3rd party WSP Air and water sampling and monitoring to ensure that there is no adverse impact to the environment	Project Developer/ Contractor		EIS/ECC Conditions
Abandonment (Plans for rehabilitation, abandonment and decommissioning will be communicated with the DENR/EMB for the latter's requirements and approval)							

21

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

7.0 ENVIRONMENTAL MONITORING PROGRAM

The environmental monitoring program (EMoP) for the reclamation area from the Environmental Impact Statement was updated to reflect the revised water quality standards, the current classification of Manila Bay as SB water and increase in laboratory analysis cost. In addition, location, frequency, number of samples, and/or additional parameters were added to better monitor the effectiveness of the mitigating measures implemented. This is presented in Table 7-1. The EMoP includes the scope of monitoring, environmental media, monitoring parameters, methodology, frequency, location, responsible person, and environmental quality performance level (EQPL) management scheme. Sampling points are shown in Figures 7-1 and 7-2.

Table 7-1. Environmental Monitoring Program

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN: METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME: EQPL RANGE ALERT	ACTION	LIMIT	MANAGEMENT MEASURE ALERT	ACTION	LIMIT
PRE-CONSTRUCTION PHASE													
Based on the actual geo-technical investigation of the seabed in the project site, the area is totally devoid (zero) of corals and the silt and mud was measured at an average depth of 4 meters. It was deemed that no disturbance of corals and marine ecology during the geotechnical survey of the seabed. Deemed not applicable in as much as the pre-construction phase activities were essentially all completed.													
SITE PREPARATION PHASE													
Removal of scraps, debris at sea bed. Recovery of artifacts	Historic Relics	Artifacts	Visual	During entire activity	At specific sites recovery	Project Manager	Follow approved UXO processes Contact relevant authorities for accidental finds						

22

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EGPL MANAGEMENT SCHEME EGPL RANGE ALERT	ACTION	LIMIT	MANAGEMENT MEASURE ALERT	ACTION	LIMIT
CONSTRUCTION PHASE (Dredging, Construction of Containment Walls, Filling Operation, Stabilization)													
Air	Ambient Air Quality	TSP	1-Hour Gas Bubbler Gilmix Saltzman High Volume Sampler / Gravimetric (USEPA method5)	Semi - Annual	Downwind at nearest existing establishments or buildings	Project Manager (PM)	Php 180,000	Of minor significance because of the absence of air pollution generators and because construction activities will be undertaken at sea and not at land. Dust (PM10) monitoring to be conducted on active areas of the project					
		Noise	Meter	Weekly	Same as above	PM	Nil						
Land	Terrestrial	Considered as Nil or not significant. There are no terrestrial (flora) resources.											
	Solid Waste	Most active works will be at sea. All types of waste except (STP products) will be properly segregated and collected by an approved WSP. STP Disposal of all vessels will be properly monitored. Dredged waste materials will be disposed at an identified disposal area (PCG approved permitted) outside Manila Bay Other land-based produced waste shall be collected by an approved WSP.											
Water		TSS	Gravimetric (Direct at 103- 105° C) (USEPA method 3010)	Manual Quarterly	At identified monitoring points (See Fig. 7-2)	Environmental Unit	Php 60,000	>40 mg/L - < 47.5 mg/L	>47.5 mg/L - <50 mg/L	>50 mg/L	Turbidity Management Group (TMG) to manage	Continuous monitoring of TSS Implement TMP	Follow TMP procedure

23

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EGPL MANAGEMENT SCHEME EGPL RANGE ALERT	ACTION	LIMIT	MANAGEMENT MEASURE ALERT	ACTION	LIMIT
			Water Sampling/ Collection for Laboratory Analysis TSS/ Nephelometric Turbidity Unit (NTU) relationship of 1.2 (1 NTU = 2 mg/L)		Mid depth						all turbidity issues including monitoring and corrective action implementation. Inspection of activity causing water quality issues Slowing down of dredging/ filling activity as recommended by TMG		

24

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME EQPL RANGE ALERT	ACTION	LIMIT	MANAGEMENT MEASURE ALERT	ACTION	LIMIT
											Continuous monitoring activity Implementation TMP		
		Oil and Grease	Std Method	Quarterly	At identified monitoring points. (See Fig. 7-2) Mid Depth	Environmental Unit	Php 29,800	>1.8 mg/L >1.9 mg/L	>1.9 mg/L <2 mg/L	>2 mg/L	Environmental Unit (EU) to manage all parameter issues including monitoring and corrective action implementation Inspection of activity causing	Continued water quality monitoring and reporting of exceedance s	Action to be discussed with MMT and stakeholders

25

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME EQPL RANGE ALERT	ACTION	LIMIT	MANAGEMENT MEASURE ALERT	ACTION	LIMIT
			In case of Incident	As needed	3 Depths (Surface, Middle, Bottom)						water quality issues Continued monitoring of activity In case of incident, - Implementation of EERP		
		Heavy Metals					PhP 105,000 for heavy metal analysis (As, Pb, Hg, Cr)						
		Arsenic	SDDC, Spectrophotometric	Quarterly	At identified monitoring points (See Fig. 7-2)	Environmental Unit	Part of heavy metal analysis	>0.006 mg/L <0.009 mg/L	>0.009 mg/L <0.01 mg/L	>0.01 mg/L	Environmental Unit (EU) to manage all parameter	Continued water quality monitoring and reporting of	Action to be discussed with MMT and stakeholders

26

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN: METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EGPL RANGE: ALERT	ACTION	LIMIT	EGPL MANAGEMENT SCHEME: MANAGEMENT MEASURE: ALERT	ACTION	LIMIT
					Mid Depth						ar issues including monitoring and corrective action implementation. Inspection of activity causing water quality issues Continued monitoring of activity	exceedances	
		Chromium	Flame AAS	Quarterly	At identified monitoring points (See Fig. 7-2)	Environmental Unit	Part of heavy metal analysis	>0.03 mg/L = 0.04mg/L	>0.04 mg/L =0.05 mg/L	>0.05 mg/L	Environmental Unit (EU) to manage all	Continued water quality monitoring and reporting	Action to be discussed with MWT and

27

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN: METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EGPL RANGE: ALERT	ACTION	LIMIT	EGPL MANAGEMENT SCHEME: MANAGEMENT MEASURE: ALERT	ACTION	LIMIT
					Mid Depth						parameter issues including monitoring and corrective action implementation. Inspection of activity causing water quality issues Continued monitoring of activity	of exceedances	stakeholders
		Lead	Flame AAS	Quarterly	At identified monitoring points	Environmental Unit	Part of heavy metal analysis	<0.008 mg / L =0.009 mg/L	<0.00 9 mg/L =0.01 mg/L	>0.01 mg/L	Environmental Unit (EU) to manage	Continued water quality monitoring and	Action to be discussed with MWT and

28

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			METHOD	FREQUENCY	LOCATION			EQPL RANGE			MANAGEMENT MEASURE		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
					(See Fig 7-2) Mid Depth						all parameter issues including monitoring and corrective action implementation. Inspection of activity causing water quality issues Continued monitoring of activity	recording of exceedances	stakeholders
		Mercury	Manual Cold Vapor AAS	Quarterly	At identified monitoring points	Environmental Unit	Part of heavy metal analyses	>0.0008 mg/L <0.0009 mg/L	>0.0009 mg/L =	>0.001 mg/L	Environmental Unit (EU) to	Continued water quality monitoring	Action to be discussed with MMT

20

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING & MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
			METHOD	FREQUENCY	LOCATION			EQPL RANGE			MANAGEMENT MEASURE		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
					(See Fig 7-2) Mid Depth				0.001 mg/L		manage all parameter issues including monitoring and corrective action implementation. Inspection of activity causing water quality issues Continued monitoring of activity	and reporting of exceedances	and stakeholders

30

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETERS TO BE MONITORED	SAMPLING & MEASUREMENT PLAN: METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME: EQPL RANGE: ALERT	ACTION	LIMIT	MANAGEMENT MEASURE: ALERT	ACTION	LIMIT
		Marine species	Visual monitoring	During Reclamation works	Near the silt where construction activities, e.g. dredging or filling are conducted	Project Manager	PHP 200,000	10 % increase of recorded dead marine species from average number per year	20 % increase of recorded dead marine species from average number per year	30 % increase of recorded dead marine species from average number per year	EU to convene with project developed for preliminary investigation	Conduct investigation Continued visual monitoring of marine species and reporting	Action to be discussed with MMT and stakeholders
		BOD	Acute Modification - Dilution Technique (USEPA method 3010)	Quarterly	Downstream of specific site of reclamation activities	Project Manager	PHP 7,000	Not considered relevant because domestic wastes are from construction crews only who are based on barges or sea going vessels					
People	Submittal of DOLE/ PRA reportorials	Implementation of safety guidelines	Recording of incidents	Daily	Reclamation construction site	Project Manager	N.A. Part of routine task of Environmental Unit	No injuries or deaths No regulatory framework for quantitative evaluation			Progressive restrictions as imposed by the PCG and other concerned agencies		DOLE/ PRA decision
	Jobs	Employment of locals qualified	Record of contractors	Entire reclamation period	NA	Project Manager	Part of the operation cost	Negative feedback to	Formal complaint by the hired		Propose to investigate	Review the operation protocol	Billing Notice to DOLE

31

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE ACTIVITIES	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETERS TO BE MONITORED	SAMPLING & MEASUREMENT PLAN: METHOD	FREQUENCY	LOCATION	LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME: EQPL RANGE: ALERT	ACTION	LIMIT	MANAGEMENT MEASURE: ALERT	ACTION	LIMIT
								the Proponent	workers			and reconsider the complaint if applicable	

32

ENVIRONMENTAL MANAGEMENT PLAN
Environmental and Coastal Studies for Pasay Reclamation Projects



Figure 7-1. Air & Noise and Water Monitoring Stations

33

REFERENCES

- Environmental Impact Statement (EIS) Report of the Project
- Environmental Compliance Certificate (ECC) issued for the Project
- Operational Plan for the Manila Bay Coastal Strategy (OPMBCS)
- PRA Boulevard 2000 Integrated Framework Plan
- DENR Laws and Regulations applicable for the Project
- Philippine Reclamation Authority (PRA) Laws and Policies
- Supreme Court (SC) Mandamus on Manila Bay (G.R. 171947-48) issued on December 18, 2008
- Pasay City related rules and regulations
- Pertinent documents provided by the proponent for the project such as detailed construction activities and design of the project

APPENDIX M.
PROOF OF SMR AND CMR SUBMISSIONS

M.1. SMR and CMR Submissions
M.2. SMR and CMR Annex Download Link
M.3. Pasay Authorization to the Contractor

APPENDIX M.1

M.1. SMR and CMR Submissions

M.1. SMR and CMR Submissions

CMR SUMMARY OF SUBMISSIONS

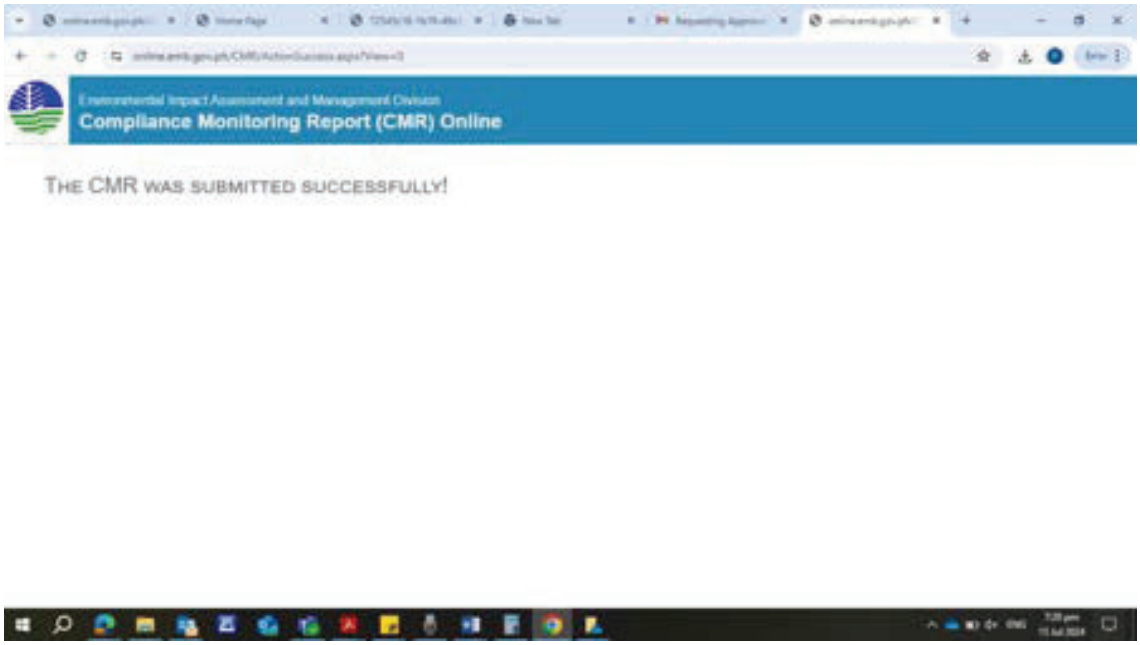
ECC No	Monitoring Period	Submitted By	Date Submitted	Receiving Office	Receiving Account
ECC-CO-1601-0003	1st Semester 2021	Maureen Guillot	Aug 19, 2022	CO	Melrico Nanahara
ECC-CO-1601-0003	2nd Semester 2021	Maureen Guillot	Aug 29, 2022	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2022	Maureen Guillot	Sep 21, 2022	CO	Melrico Nanahara
ECC-CO-1601-0003	2nd Semester 2022	Maureen Guillot	Jan 16, 2023	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2023	Kenzo Poncalan	Jul 13, 2023	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2023	Kenzo Poncalan	Jul 17, 2023	CO	Melrico Nanahara
ECC-CO-1601-0003	2nd Semester 2023	Severo Madrona Jr	Jan 17, 2024	CO	Melrico Nanahara

ECC No	Monitoring Period	Submitted By	Date Submitted	Receiving Office	Receiving Account
ECC-CO-1601-0003	2nd Semester 2021	Maureen Guillot	Aug 29, 2022	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2022	Maureen Guillot	Sep 21, 2022	CO	Melrico Nanahara
ECC-CO-1601-0003	2nd Semester 2022	Maureen Guillot	Jan 16, 2023	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2023	Kenzo Poncalan	Jul 17, 2023	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2023	Kenzo Poncalan	Jul 19, 2023	CO	Melrico Nanahara
ECC-CO-1601-0003	2nd Semester 2023	Severo Madrona Jr	Jan 17, 2024	CO	Melrico Nanahara
ECC-CO-1601-0003	1st Semester 2024	Severo Madrona Jr	Jul 15, 2024	CO	Melrico Nanahara

SMR SUMMARY OF SUBMISSIONS

Reference No.	Facility	Date Created	Date Submitted	Status	Action
44879	CHINA HARBOUR ENGINEERING COMPANY	Jul 1, 2024 5:33 PM	Jul 15, 2024	For Evaluation by EMB	
2413	CHINA HARBOUR ENGINEERING COMPANY	Mar 22, 2024 10:49 AM	Apr 12, 2024	For Evaluation by EMB	
125197	CHINA HARBOUR ENGINEERING COMPANY	Dec 21, 2023 4:19 PM	Jan 12, 2024	For Evaluation by EMB	
35752	CHINA HARBOUR ENGINEERING COMPANY	Sep 19, 2023 4:34 PM	Oct 13, 2023	For Evaluation by EMB	
5006	CHINA HARBOUR ENGINEERING COMPANY	Jun 22, 2023 2:30 PM	Jul 14, 2023	For Evaluation by EMB	
378	CHINA HARBOUR ENGINEERING COMPANY	Mar 15, 2023 10:52 AM	Apr 17, 2023	For Evaluation by EMB	
79128	CHINA HARBOUR ENGINEERING COMPANY	Jan 2, 2023 10:25 AM	Jan 16, 2023	For Evaluation by EMB	
80406	CHINA HARBOUR ENGINEERING COMPANY	Sep 22, 2022 10:44 AM	Dec 4, 2022	For Evaluation by EMB	
56007	CHINA HARBOUR ENGINEERING COMPANY	Jul 18, 2022 1:47 PM	Dec 6, 2022	For Evaluation by EMB	
1126A	CHINA HARBOUR ENGINEERING COMPANY	Apr 14, 2022 2:53 PM	Dec 5, 2022	For Evaluation by EMB	

Reference No.	Facility	Date Created	Date Submitted	Status	Action
19261	CHINA HARBOUR ENGINEERING COMPANY	Apr 14, 2022 1:59 PM	Dec 5, 2022	For Evaluation by EMB	
38441	CHINA HARBOUR ENGINEERING COMPANY	Apr 14, 2022 9:56 AM	Dec 4, 2022	For Evaluation by EMB	
37542A	CHINA HARBOUR ENGINEERING COMPANY	Apr 7, 2022 4:54 PM	Dec 5, 2022	For Evaluation by EMB	


Environmental Impact Assessment and Management Division
Compliance Monitoring Report (CMR) Online
THE CMR WAS SUBMITTED SUCCESSFULLY!

Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 15 July 2024 at 12:57
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 2 Quarter 2024 to our online system on July 1, 2024. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916. This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents. For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR

Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 12 April 2024 at 15:06
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 1 Quarter 2024 to our online system on March 22, 2024. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR

Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 12 January 2024 at 17:48
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 4 Quarter 2023 to our online system on December 21, 2023. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR

Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 13 October 2023 at 14:17
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 3 Quarter 2023 to our online system on September 19, 2023. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR



Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 14 July 2023 at 17:10
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 2 Quarter 2023 to our online system on June 22, 2023. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR



Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 17 April 2023 at 09:38
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 1 Quarter 2023 to our online system on April 17, 2023. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR

Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <iis-notification@emb.gov.ph> 14 January 2023 at 00:45
Reply-To: "iis-notification@emb.gov.ph" <iis-notification@emb.gov.ph>
To: Chec.Environment@gmail.com

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 4 Quarter 2022 to our online system on January 2, 2023. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR

Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <smmotification@emb.gov.ph> 13 October 2022 at 00:08
Reply-To: "smmotification@emb.gov.ph" <smmotification@emb.gov.ph>
To: Chec.Environment@gmail.com
Cc: ncrsupport@emb.gov.ph

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 3 Quarter 2022 to our online system on September 22, 2022. Your transactions has been tagged as For Evaluation with Company Reference ID EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR



Gmail

Chec Environment <chec.environment@gmail.com>

Environmental Management Bureau User Credentials

1 message

SMR Online Services <notification@emb.gov.ph> 20 July 2022 at 14:42
Reply-To: "notification@emb.gov.ph" <notification@emb.gov.ph>
To: Chec.Environment@gmail.com
Cc: ncrsupport@emb.gov.ph

THIS IS AN AUTOMATICALLY GENERATED EMAIL, PLEASE DO NOT REPLY

Managing Head

ATTENTION:
Pollution Control Officer

Dear Sir/Madam:

Good Day!

This is to acknowledge the receipt of your Self-Monitoring Report (SMR) for the 2 Quarter 2022 to our online system on July 18, 2022. Your transactions has been tagged as For Evaluation with company_id EMBNCR-893300-62916.
This shall serve as proof of your submission and may be used for whatever legal purpose this may serve. However, this does preclude this Office and respective Regional Offices to evaluate the completeness of the submitted documents.
For further inquiries, you may contact our Regional Office who has jurisdiction over your project area during office hours from Monday-Friday, 8:00 am – 5:00 pm or you may email them at NCR.

Thank you for submitting your SMR online!

THE SMR ONLINE SUBMISSION TEAM
Environmental Management Bureau, NCR

APPENDIX M.2

SMR and CMR Annex Download Link

M.2. SMR and CMR Annex Download Link

https://drive.google.com/drive/folders/1COB65VbhjuUIKhDDKE2qC0_P6_CJ_l0R

APPENDIX M.2

Coastal Ecosystem Management Plan

Department of Environment and Natural Reources
ENVIRONMENTAL MANAGEMENT BUREAU
EMB Building, DENR Compound, Visayas Ave., Diliman, Quezon City
Tel Nos.: 927-1517/18, 426-4332, 928-1215, 825-5324, 920-2241/43

ACKNOWLEDGEMENT RECEIPT

May 07, 2021

Greetings!

This is to Acknowledge Receipt of your OTHERS with the Subject : **LETTER DATED 04 MAY 2021 COMPLIANCE WITH ECC CONDITIONS/REQUIREMENTS FOR THE 360-HECTARE PASAY RECLAMATION PROJECT.(W/ENCLS) HARD COPY. RING BINDED.**, submitted on May 07, 2021, 1:44pm.

Your transaction has been tagged as IIS No. **CO-2021-017606** with Company ID **EMBNCR-1416000-29500**. For follow-ups, you may provide the given details.

For further inquiries, you may contact our designated EMB Office in your area from Monday to Friday 8:00 a.m. to 5:00 p.m. office hours, or email us at recordsco@emb.gov.ph.

Please be guided accordingly.

Thank you.

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

04 May 2021

ENVIRONMENTAL MANAGEMENT BUREAU
RECORDS SECTION / CENTRAL OFFICE
RECEIVED
MAY 07 2021
By:
Time: 1:45 PM

Engr. William P. Cuñado
Director
Environmental Management Bureau – Central Office
DENR Compound, Visayas Avenue
Quezon City

Subject: **Compliance with ECC Conditions/Requirements For the 360-Hectare Pasay Reclamation Project**

Dear Engineer Cuñado:

We are pleased to submit the following documents as required under the Environmental Compliance Certificate (ECC-CO-1601-0003 dated 24 October 2017) for the 360-Hectare Reclamation Project (Project).

1. Coastal Ecosystem Management Plan/Program;
2. Detailed Social Development Plan (SDP) based on the framework submitted in the Environmental Impact Statement (EIS);
3. Reforestation and Carbon Sink Program; and
4. Environmental Management Plan (EMP) as embodied in the EIS Report and adopted by the dredging contractor on its EMP for the Project.

Further, we would like to inform your office of the following:

1. **Location and source of fill materials.** To date, one of the identified sources of dredge fill materials for the Project is the 5000-hectare PRA borrow area in San Nicholas Shoal (SNS) covered by *Government Seabed Quarry Permit* (GSQP) No. OMROOI-2008-IVA.

2. **Permits/clearances for the extraction of fill materials.** To date, the PRA has yet to issue the guidelines for the extraction of dredge fill materials from the DENR-approved borrow areas of PRA under its *GSQP*. Once PRA approves its guidelines, the City, through its Joint Venture partner, will proceed with the application for extraction and the execution of a Dredgefill Extraction Operations Agreement (DOEA) that will allow the City, through its Private Joint Venture Partner and/or their contractors, to extract and transport fill materials from PRA's approved borrow areas, subject to applicable laws, rules and regulations.

We trust that this compliance will be duly acknowledged.

Thank you.

Very truly yours,

IMELDA CALIXTO-RUBIANO
City Mayor

Pasay City Hall Room 203 2nd Floor F.B Harrison Street.
Pasay City, Philippines

CO-2021-05766

Coastal Ecosystem Management Plan/Program
(Framework)

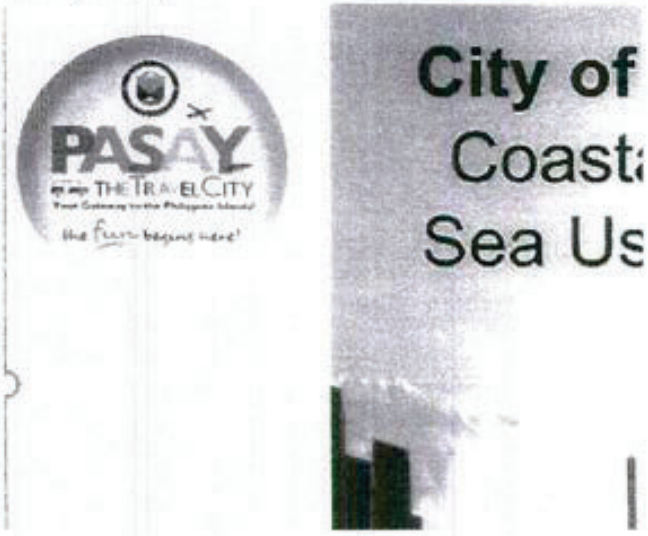
Also referred to as "Coastal Resource and Fisheries Management Plan (CRFMP)"

General Framework of the CEMP: The Coastal Ecosystem Management Plan/Program and Environmental Management Plan (EMP) of the City of Pasay will ensure compliance with --

- (a) Continuing Supreme Court Mandamus on Manila Bay
- (b) DENR Manila Bay Coastal Strategy and its Operational Plan
- (c) PRA laws and policies
- (d) the ordinances and requirements of the City of Pasay, including the requirement that 25% of the revenues derived by Pasay LGU from real property taxes on all properties within the project site shall be devoted to social services, including environmental protection.

Legal Framework of the CEMP: The Coastal and Sea Use Plan ("CSUP")

The Coastal Ecosystem Management Plan/Program and Environmental Management Plan (EMP) of the City of Pasay is already embodied in **The Coastal and Sea Use Plan ("CSUP")** of the City of Pasay, Adopted through City Resolution No. 4935 Series of 2019 (Annex 2)



The Coastal and Sea Use Plan (CSUP) of the City of Pasay contain the following features that also serve as elements of the **CEMP**

> All reclamation works and horizontal development within the designated areas for reclamation shall be consistent with the **Writ of Continuing Mandamus** issued by the Supreme Court for the clean-up of Manila Bay and the Operational Plan for the Manila Coastal Strategy, and environmental laws, rules and regulations,
>
> All reclamation projects shall establish a navigable water channel and appropriate mangroves and/or artificial coral reefs to ensure efficient water circulation and improvement of marine life,

Components of the CSUP that also form part of the CEMP

Area of Coverage. The scope of the CSUP includes the coastal area and municipal waters of the City. The coastal area covers one (1) kilometer from the coastline of the Manila Bay, which are municipal waters, and 200 meters from the coastline inland. The area of the City's municipal waters are defined in City of Pasay Ordinance No. 5768 Series of 2016.

The rates of erosion and sediment flow occur on a continuous basis and vary considerably from day to day along coastal zones. The frequency of sediment flow toward the coastal area is high during rainy season, especially when a storm hits Metro Manila Area. This makes the area highly vulnerable to natural hazards, such as flooding and landslides. An understanding on the water interactions of Manila Bay and the coastal land within the Mall of Asia toward the CCP Complex reclaimed lands is essential in identifying the potential hazards associated within the coastal land and marine zones of the City.

Pasay City: Suitable for Reclamation Projects. The DENR Secretary issued Area Clearances for the Pasay Reclamation Projects declaring the Project areas as suitable for reclamation. The Area Clearances were issued after the DENR also issued the Environmental Clearance Certificates (ECCs) have already been issued for the projects, which ECC impose the responsibility of complying with identified and mitigating measures have been incorporated in the City's Environmental Management Plan (EMP).

No Dislocation of Informal Settlers. There have been concerns raised that these Pasay Reclamation Projects will cause the displacement of informal settlers. However, the Pasay Reclamation Projects will not dislocate or displace even a single informal settler, because the Pasay Reclamation Projects will be built offshore – on an empty expanse of putrid and murky seawater -- across the eastern shores of the existing reclaimed land of the CCP and the MOA Complexes. There are no land or

water-based communities or settlers in the proposed reclamation areas, as confirmed by a technical study conducted by DENR accredited experts. That there are no communities or settlers in the project sites can in fact be verified by any casual observer standing at the eastern edge of the SM MOA Complex and CCP Complex. Thus, in the case of the Pasay Reclamation Projects, any apprehension about displacing human communities in the project sites is simply without any basis.

No Dislocation of Fisherfolks. Equally misplaced are the concerns regarding potential loss of livelihood and fishing activity and damage in the marine ecosystem. A study by DENR accredited experts reveals that no significant population of fish, crustaceans, and marine macroinvertebrates can be found in the project areas of the Pasay reclamation projects. This lack of marine life is due to the absence of coral reefs, seagrass beds, and mangroves that could sustain a marine ecosystem. These facts have resulted to unproductive fishing activity within the project sites. When on-site studies were conducted by the DENR accredited experts for the projects, almost all fishing was being done in areas more than 3 km away from the project sites. With the absence of marine life that can support productive fishing in the project sites, there is no risk of the Pasay Reclamation Projects displacing any fisherfolk in Manila Bay.

Outside any National Park, Watershed Reserve, Wildlife Preserve or Sanctuary. The project sites are not within or near any national park, watershed reserve, wildlife preserve or sanctuary, and thus pose no risk of adverse impact on environmentally critical and protected areas. The project sites are located more than 6 km away from the Las Piñas-Parañaque Critical Habitat and Ecotourism Area (LPPCHEA) and thus, pose no threat to the migratory and important bird species in the LPPCHEA. There are also no significant population of fish found in the proposed reclamation areas, nor are there coral reefs, seagrass beds and mangroves that can support marine life. Equally important, the Pasay Reclamation Projects will be built outside of the zone in Manila Bay declared as a National Historical Landmark. The National Historical Commission of the Philippines (NHCP), through Board Resolution No. 19 (S. 2012) as amended by NHCP Board Resolution No. 1 (S. 2018) declared the Manila Bay waterfront, shoreline and waters from Del Pan Bridge to the CCP as a National Historical Landmark. The Pasay Reclamation Projects will be not be located between the Del Pan Bridge and CCP. These projects will merely continue the eastward development of the existing reclamation projects in Pasay (CCP Complex and SM MOA Complex) and not alter any part of the shoreline of Manila Bay nor any declared inland historical landmark.

On the Manila Bay Sunset. Because of their locations, the Pasay Reclamation Projects will not block the public access for viewing the world-famous sunset of Manila Bay from Roxas Boulevard in Manila. On the contrary, the Pasay Reclamation Projects will provide the public additional and more convenient areas within the reclamation development to view the sunset.

Compliance with the Supreme Court's Continuing Mandamus for the Cleanup of Manila Bay. The City's serious development problems need a holistic strategy to address the issues on acute land scarcity and compliance with the Supreme Court's Writ of Continuing Mandamus for the clean-up of the Manila Bay, and the lack of land for new township and/or commercial business district projects as a major component of its urban renewal program. The City intends to promote inclusive development mindful of the fisherfolk and the implementation of the laws and issuances issued by the Bureau of Fisheries and Aquatic Resources (BFAR). However, it is a matter of record that there is no registered fisherfolk in Pasay City due to the findings that the near-shore municipal waters of the City are almost dead water body. Thus, it is open for other development such as land reclamation projects that will incorporate massive cleaning and rehabilitation activities to regenerate marine life within the water channels separating the islands of these projects.

More specifically, the Pasay Reclamation Projects are compliant with the specific orders in the Supreme Court's Writ of Continuing Mandamus, as shown partially below:

Table 1 Compliances of the Project with the Writ of Mandamus (Partial)

Specific Orders	Agency concerned	Comment on Potential Conflict with Pasay City Reclamation Projects
Direct all Local Government Units (LGUs) in Metro Manila, Rizal, Laguna, Cavite, Bulacan, Pampanga, and Bataan to – a) Inspect all factories, commercial establishments, and private homes along the banks of the major river systems in their respective areas of jurisdiction, such as but not limited to the Pasig-Marikina-San Juan Rivers, the NCR (Parañaque-Zapote, Las Piñas) Rivers, the Navotas-Malabon-Tullahan-Tenejeros Rivers, the Meycauayan-Marilao-Obando (Bulacan) Rivers, the Talisay (Bataan) River, the Imus (Cavite) River, the Laguna De Bay, and other minor rivers and waterways that eventually discharge water into the Manila Bay; and the lands abutting the bay, to determine whether they	Department of Interior and Local Government (DILG)	No conflict. The projects will install liquid waste management system ensuring modern waste retrieval and treatment system. Treatment and disposal of liquid waste at point source will involve collecting liquids of point source origin; directing waste into integrated multiple waste streams facilities or collecting vessels, and application of treatments. Any fluid

have wastewater treatment facilities or hygiene septic tanks as prescribed by existing laws, ordinances, and rules and regulations. b) If none be found, these LGUs shall be ordered to require non-complying establishments and homes to set up said facilities or septic tanks within a reasonable time to prevent industrial wastes, sewage water, and human wastes from flowing into these rivers, waterways, *esteros*, and the Manila Bay under pain of closure or imposition of fines and other sanctions.		effluent to be discharged at sea will be monitored and tested before discharging.
Provide, install, operated, and maintain the necessary adequate waste water treatment facilities in Metro Manila, Rizal, and Cavite where needed at the earliest possible time.	Metropolitan Waterworks and Sewerage System (MWSS)	No conflict. During the operations phase, the potential contribution of the project to marine pollution arising from domestic wastewaters of the various locators will be mitigated using an integrated ecological solid waste processing facility, domestic wastewater treatment and sewage facility.
Provide, install, operate and maintain sewerage sanitation facilities and the efficient and safe collection, treatment, and disposal of sewage in the provinces of Laguna, Cavite, Bulacan, Pampanga, and Bataan where needed at the earliest possible time.	Local Water Utilities Administration (LWUA) *done through the local water district and in coordination with DENR	No conflict. During the operations phase, the potential contribution of the project to marine pollution arising from domestic wastewaters of the various locators will be mitigated using an integrated ecological solid waste processing facility, domestic wastewater

		treatment and sewage facility.
Improve and restore the marine life of the Manila Bay; assist the LGUs in Metro Manila, Rizal, Cavite, Laguna, Bulacan, Pampanga and Bataan in developing, using recognized methods, the fisheries and aquatic resources in the Manila Bay.	Department of Agriculture (DA) through the Bureau of Fisheries and Aquatic Resources (BFAR)	No conflict. The reclamation projects of Pasay will cover only a very small part of the Bay. Marine life can still be restored in the vast sea waters around the reclaimed land. The total reclamation area of 625 hectares (265 hectares of Pasay Harbor Reclamation Project and 360 hectare of the SM project) – is only 0.31% of the total area of Manila Bay (1,994 square kilometers or 199,400 hectares). There are no significant marine life existing within the location of the reclamation projects. The project proponents have commitments for the rehabilitation and maintenance of mangroves and mudflats as part of the OPMBCS recommendations. These will help restoring marine life in the area.

Compliance with the Operational Plan of the DENR Manila Bay Coastal Strategy. The Pasay Reclamation Projects are compliant with the Operational Plan of the DENR Manila Bay Coastal Strategy, as shown in the table below:

Table 2. Compliances to the Operational Plan of the DENR Manila Bay Coastal Strategy

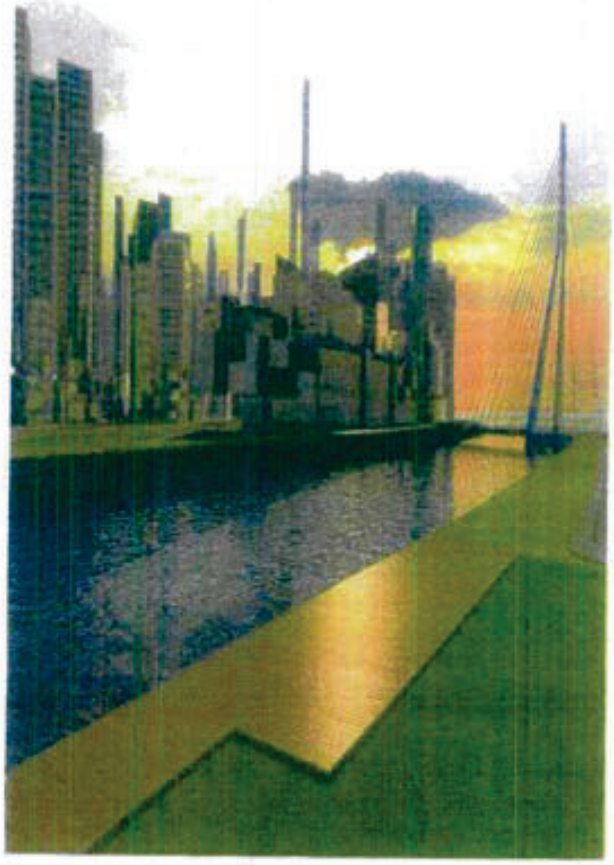
OPMBCS Objectives	Features of the Pasay Reclamation
Promote public-private sector partnerships with LGUs within the Manila Bay region for necessary development and investment programs.	Compliant. Pasay Reclamation Projects are a joint venture between the City Government of Pasay and its private sector partner proponents. These projects will give the City of Pasay billions of revenues being committed for social services, livelihood, & pro-poor programs.
Reduce the illegal settlers, establishments and structures along coast lines.	Compliant. There are no communities or settlers in the proposed reclamation areas in Pasay City. all structures and establishments to be put up in the reclaimed lands shall be compliant with local and international standards. In addition, the City is obliged to devote at least 50 percent of its revenues from reclaimed lands to social services, including resettlement or relocation of informal settlers.
Reduce the discharges of raw sewage, septage, and untreated wastewater.	Compliant. During the operations phase, the potential contribution of the project to marine pollution arising from domestic wastewater of the various locators will be mitigated using an integrated ecological solid waste processing facility, domestic wastewater treatment and sewage facility.
Establish integrated solid waste management programs in all Local Government Units (LGUs).	Compliant. The projects will adhere to the solid waste management program to be implemented by the LGU of Pasay City.

	A rigid solid waste management and retrieval system will also be enforced in all aspects of reclamation activity. There will be no disposal of wastes at sea both from land-based and shipboard sources. The project proponents are required to comply with the Ecological Solid Waste Management Act (RA 9003). Solid Waste from workers of the project will be closely monitored with disposal of these waste to be transported to Pasay City's dumpsite.
Develop and implement a toxic and hazardous waste management system.	Compliant. The reclamation projects will not involve toxic and hazardous wastes.
Stop sea-dumping of sewage, industrial sludge, solid waste, and contaminated dredged materials.	Compliant. The reclamation projects will use technology and best practices to minimize and/or eliminate seepage of sludge and dredge materials outside the reclamation areas. These projects will also comply with rules and regulations on the proper disposal of the dredged materials to government approved sites outside of the Bay.
Set-up sustainable institutional arrangements and management programs in all declared Protected Area (Pas) and Critical Habitats in the Manila Bay Region.	Compliant. The reclamation projects are not located in a protected area or critical habitat.

On the "25% of the revenues derived by Pasay LGU from real property taxes on all properties within the project site shall be devoted to social services, including environmental protection."

This will be undertaken at the appropriate period when the Pasay Reclamation Projects enter the stage of commercial operation.

City of Pasay
Coastal and Sea Use Plan



City Planning and
Development Office

CITY OF PASAY
COASTAL AND SEA USE PLAN
Table of Contents

CHAPTER	NAME	PAGE
I.	**INTRODUCTION**	1
1.1	The City of Pasay: A Fast-Growing Metropolitan Hub	1
1.2	Pasay City's Acute Land Scarcity and Congestion	3
1.3	Sea-ward Development: The Pasay Historical Experience	4
1.4	Building on Past Success of Reclamation	5
1.5	Coastal and Sea Use Plan as Planning Tool	6
1.5.1	Rational of the Coastal and Sea Use Plan	6
1.5.2	Scope of the Plan	6
1.5.3	Objectives	7
1.5.4	Approach and Methodology	7
1.5.5	Classification of Zones	8
II.	**THE PHYSICAL ENVIRONMENT**	9
2.1	Geographic Location	9
2.1.1	Physical Attributes	9
2.1.2	Municipal Waters	9
2.1.3	Underwater Condition	11
2.1.4	City Water Characteristics	11
2.1.5	Geology	12
2.1.5.1	Land Geological Condition	12
2.1.5.2	Underwater Geological Condition	13
2.1.6	Topography, Elevation and Slope	13
2.1.6.1	Active Tidal Flats (Coastal Landscape):	13
2.1.6.2	Former Tidal Flats (Coastal Landscape)	14
2.1.8.	Water Quality	14
2.1.8.1	Pollution in Manila Bay	16
2.1.9	Marine Life and Fishers	17
2.1.10	Regeneration of Biological Resources	17
2.1.11	Geological and other Natural Hazards	17
2.1.12	Solid Waste Management (SWM)	17
2.1.13	Drainage and Floor Control System	18
2.1.14	Disaster Management	19
2.1.15	Other Aspects	19
2.1.16	River and Costal Preservation	19
III.	**SOCIO-ECONOMIC PROFILE**	21
3.1	Economic Sector	21
3.1.1	Labor Force and Employment	22
3.1.2	The Leading Industries of Pasay City	22

3.2	Key Players in the Local Economy	22
3.2.1	The Public Market	23
3.2.2	Tourism Industry Operators	23
3.3	Economic Interdependence	23
3.4	Existing Policies and Institutional Arrangement	23
3.4.1	Public Governance – Organization	23
3.4.2	Coordination with National Agencies	24
3.4.3	Staffing and Personnel	24
3.4.4	Fiscal Management	24
3.5	Key Issues and Concerns	26
3.5.1	Need to Tap Tourism Potential	26
3.5.2	Some Areas in State of "Decay"	26
3.5.3	Limitations on Land Development	26
IV.	**UTILIZATION OF MUNICIPAL WATERS FOR RECLAMATION AND DEVELOPMENT**	27
4.1	Reclamation: An Internationally Proven Solution to Land Scarcity	27
4.2	Pasay City: Suitable for Reclamation Projects	29
4.2.1	No Dislocation of Informal Settlers	29
4.2.2	No Dislocation of Fisherfolks	29
4.2.3	Outside any National Park, Watershed Reserve, Wildlife Preserve or Sanctuary	30
4.2.4	No obstruction of the view of the sunset of Manila Bay	30
4.2.5	No Financial Burden to the Government	31
V.	**COASTAL AND SEA USE ZONES**	**32**
5.1	Pasay Coastal and Sea Use Zones	32
5.2	The Coastal Area	32
5.3	The Municipal Waters	32
5.4	The Four Major Zones	35
5.4.1	Establishing the Build-up Area Zone	36
5.4.2	Approved Reclamation Projects	38
5.4.3	The Solar City Project	42
5.5	Water Tourism Zone	43
5.6	Shipping and Navigation Zone	44
5.7	Other Maritime Zones	45
VI.	**MANAGEMENT OF COASTAL AND BUILD UP ZONES**	**47**
6.1	Compliance with the Writ of Continuing Mandamus and OPMBCS	47
6.1.1	Background on the Writ	47
6.1.2	Reclamation Project Features in Compliance with the Writ and the OPMBCS	48
6.2	Masterplanned Management of Environmental Hazards	55
6.3	Coastal Management	58

6.4	Water Quality and Promotion of Biological Resources	59
6.5	Sustainability	59
6.5.1	Undertakings of Private Sector Partners	60
6.5.2	Commitments of the City	61
6.5.3	Consistency with the Comprehensive Land Use Plan (CLUP)	62
	CONCLUSION	63

List of Figures

FIGURE	NAME	PAGE
I.	**INTRODUCTION**	1
1-1	Manila Bay and Environs	1
1-2	Pasay City's Strategic Location in Metro Manila	2
1-3	Pasay City's land area compared with other Metro Manila Cities.	3
1-4	Images of Urban Congestion in Metro Manila	4
II.	**THE PHYSICAL ENVIRONMENT**	9
2-1	Municipal Water of the City of Pasay	10
2-2	Figure: Manila Yacht Club/Philippine Navy water area	20
III.	**SOCIO-ECONOMIC PROFILE**	21
3-1	Urban Congestion in Metro Manila	21
IV.	**UTILIZATION OF MUNICIPAL WATERS FOR RECLAMATION AND DEVELOPMENT**	27
4-1	The Manzanares River Park	27
4-2	Modern Singapore's Marina Bay area, a major development made possible through land reclamation	28
4-3	The view of the Manila Bay sunset from Roxas Boulevard in relation to the position of the Pasay Reclamation Projects	30
V.	**COASTAL AND SEA USE ZONES**	32
5-1	MOA Consolidated Land Form Plan for Reclamation Projects Of the Cities of Pasay and Manila	34
5-2	Pasay City Spatial Plan	35
5-3	Composite DENR Inspection Team Deliberation Confirming the Absence of Marine Life in the Coastal and Near-Shore Areas of the Municipal Waters of the City	36
5-4	Pasay City CLUP (2016) Proposed Reclamation Sites	37
5-5	SM 360 proposed Road Network and Land Use Plan	40
5-6	Illustrative Sample of Road Networks for 265-hectare Pasay Harbor Reclamation Project	41
5-7	Pasay Harbor Reclamation Project with Proposed Road Network	41
5-8	SM Reclamation Project Illustration of Shore Areas	43
5-9	Google Images of Water Tourism Activities	44
5-10	DENR-EMB Illustration of Reclamation Projects in Manila Bay	45
5-11	Fishing Community in Bacoor Bay	45
VI.	**MANAGEMENT OF COASTAL AND BUILD UP ZONES**	47
6-1	SM by the Bay Clean up Activity	61

List of Tables

FIGURE	NAME	PAGE
II.	**THE PHYSICAL ENVIRONMENT**	9
2-1	Coordinates of the Boundaries of the City of Pasay	10
2-2	Annual Dissolved Oxygen (mg/L) in the Parañaque-Zapote River System, 2000	14
2-3	Annual BOD (mg/L) in the Parañaque-Zapote River System, 2000	15
2-4	Annual Total Suspended Solid Levels in the Parañaque-Zapote River System, 2000	15
2-5	PEMSEA Actual and Estimated Pollution levels in Manila Bay	16
2-6	Existing Solid Waste Disposal Methods	18
III.	**SOCIO-ECONOMIC PROFILE**	21
3-1	Employment Rates in Pasay City, Various Years	22
3-2	Local Government Financial Performance Monitoring System for FY 2015	25
V.	**COASTAL AND SEA USE ZONES**	32
5-1	City of Pasay Municipal Waters Technical Description	33
5-2	Coordinates of the additional 550 hectare Build-up Area Zone	37
5-3	Coordinates of the 360-Hectare SM Reclamation Project based on MOA between Cities of Pasay and Manila	38
5-4	Coordinates of the 265-Hectare Pasay Harbor Reclamation Project Island A based on MOA between Cities of Pasay and Manila	39
5-5	Coordinates of the 265-Hectare Pasay Harbor Reclamation Project Island B based on MOA between Cities of Pasay and Manila	40
5-6	Proposed Land Use Plan for Pasay Harbor Reclamation Project	42
5-7	Coordinates of the Solar City Island A Reclamation Project based on MOA between Cities of Pasay and Manila	42
5-8	Coordinates of the Solar City Island B Reclamation Project based on MOA between Cities of Pasay and Manila	43
VI.	**MANAGEMENT OF COASTAL AND BUILD UP ZONES**	47
6-1	Specific Orders of the Supreme Court and the Comments on its Potential Conflict with Pasay City Reclamation Projects	48
6-2	OPMBCS Objectives and Compliance of the Pasay Reclamation Projects with these Objectives	53
6-3	Mitigating Measures for Geological and other Climate Risks	56

I. INTRODUCTION

1.1. The City of Pasay: A Fast-Growing Metropolitan Hub

The City of Pasay (City) is located in the western coast of Metropolitan Manila (Metro Manila) or the National Capital Region (NCR). The City is strategically located in Metro Manila being bounded in the north by Manila, in the northeast by Makati and the municipality of Taguig, in the south by Parañaque, and in the west by Manila Bay. The City is located, approximately, at latitude 14°32' and longitude 121°00'. When the City was created in 1947, it only had an area of about 14 sq. km.



***Figure 1-1** Manila Bay and Environs*

The City is the country's main air transportation hub. The Ninoy Aquino International Airport (NAIA) alone handled over 45 million passengers in 2018, which number may rise to 65 million by 2022, with the proposed rehabilitation of NAIA.

On top of that, the City is also a leading land transportation hub in Luzon, with 15 bus terminals in the City serving commuters going to various destinations in Metro Manila and nearby provinces. 2 of Metro Manila's major thoroughfares, EDSA and Roxas Boulevard pass through the City. Also, 2 Rail Transit terminals (1 LRT-1 and 1 MRT-3) are located in the City contributing to the human flow in and out of the City.

Due to its strategic location, the City is also a popular destination and has become a thriving center of commerce, business, culture, gaming, education, sports and international events. One of

Pasay City's most popular attractions is the 14th biggest shopping mall in the World (SM Mall of Asia), which attracts a daily average foot traffic of about 200,000 people.



Figure 1-2: Pasay City's Strategic Location in Metro Manila

The City also draws people from all over the country and the world because it is also the site of the mecca of Philippine arts, the Cultural Center of the Philippines (CCP), the country's premiere basketball arenas, the Mall of Asia Arena and the Cuneta Astrodome, the country's leading international event centers, the Philippine International Convention Center (PICC) and the SMX Convention Center, prominent universities and colleges, such as the Arellano University, City University of Pasay, Manila Tytana Colleges, leading casino complex such as Resorts World Manila; and some of the country's premiere hotels, which include Sofitel Philippine Plaza, Marriot, Conrad, Hilton to name a few.

As the Philippine economy surges, Pasay City has also seen the rise of new business offices – for example, the five (5) towers of the E-Com Tower in SM MOA, the buildings at the Double Dragon Meridien Park -- and a growing demand for more. In July 2018, property experts identified the Bay Area, the business hub straddling Pasay City and Parañaque City, as the fastest-growing office district in Metro Manila.

Philippine tourism is also expected to contribute to increased economic activity in Pasay City. Records show that a total of 6,161,503 foreign visitors arrived in the Philippines from January to September 2019, indicating a 14.37% increase from the 5,387,458 arrivals for the same period last year. On the other hand, the accelerating Philippine economy, one of the fastest growing economies in Asia with 6.7% GDP growth in 2018, requires massive infrastructure development to be sustained.

The tourism boom, overall surge of the Philippine economy and the urgent need for greater infrastructure development – all point to the robust demand for residential, commercial and business expansion in the City. The problem is how further developments can be adequately accommodated considering that the City suffers from acute land scarcity and urban congestion.

1.2. Pasay City's Acute Land Scarcity and Congestion

In terms of land area, the City is one of the smallest cities in Metro Manila with a current total land area of only 18.64 sq. km. To make matters worse, more than half of its land area (around 9.5 sq. km) is devoted to the national government's Ninoy Aquino International Airport (NAIA) and Villamor Airbase as seen in Figure 1-3. Pasay City derives no revenue from the use of its land for both these facilities.



Figure 1-3: Pasay City's land area compared with other Metro Manila Cities

The City's population density is 29,815 persons per square kilometer, the third highest in country as of 2015. With the steady rise in economic activities, many of City residents live in cramped communities while numerous public streets and sidewalks have been taken over by crowds of vendors, pedestrians, and parked vehicles. The City can no longer accommodate the increasing demand for residential and recreational spaces, and businesses have no room for expansion. There is a clear and urgent demand for mixed-use sustainable land development in the future to address urban growth. Thus, Pasay City is confronted by an acute land scarcity, worsened

by a rising population, rapidly expanding economy and the need for more infrastructure development.



Figure 1-4: Images of Urban Congestion in Metro Manila

Indeed, Pasay City reflects the global trend of urban congestion, with experts estimating that by mid-century, approximately 70 percent of the world's population will be living in urban centers. Urban congestion is bound to worsen despite the government's effort to distribute the development to the provinces. Thus, for Pasay City, the reclamation of offshore areas within its municipal waters has become a necessity.

1.3. Sea-ward Development: The Pasay Historical Experience

As early as 1960's, the National Government had already planned to reclaim 5,000 hectares of submerged land in Manila Bay. The project came into fruition in 1967 when the Philippine Reclamation Authority (then known as Public Estates Authority) was created to manage the project. Eventually, hundreds of hectares of land had been reclaimed in Pasay City, including the 77-hectare CCP Complex and the land on which the 14th largest mall in the world stands, SM Mall of Asia. As a consequence, the total land area of the City expanded from about 14 sq km in 1947 to over 18 sq km at present.

The reclaimed land on which the CCP Complex and the SM MOA stand serves as concrete and compelling evidence that reclamation projects can be a driver of economic growth and can also be safe, reliable, and sustainable. Through the decades, these reclamation projects have survived battering typhoons and floods—proving the stability, safety and reliability of reclamation. Also, through the decades, no untoward incident related to reclamation construction has disrupted or marred the many important international and national events that have taken place in these reclaimed areas.

Indeed, these reclaimed areas have been the site of visits by international dignitaries, including foreign heads of states—all without incident relating to reclamation.

Many international conferences and conventions have also been held at the PICC. Foreign artists have performed and international athletes have competed in the venues within the SM MOA Complex. All these events were successfully staged without any untoward incident related to reclamation construction—again testifying to the reliability and safety of reclamation projects.

Moreover, these reclamation projects have become thriving business, commercial, residential and recreational centers, substantially boosting the income of the City Government, and allowing it to provide more services to its constituents. In 2015 alone, the City Government of Pasay collected about PhP3.2 billion in real property taxes and business and work permits from the existing Mall of Asia reclamation area. Proceeds from the reclamation project have funded the City Government's school and healthcare facilities and services, medical, burial, educational assistance, financial assistance to barangays and to victims of fire and other calamities, and other social welfare and livelihood programs.

1.4. Building on Past Success of Reclamation

It has been more than 30 years since the Philippine Government has undertaken a major reclamation project. With Pasay City's expanding economy, rising population and the challenges of urban land scarcity and congestion, it is time for the City to build on the success of previous reclamation projects and utilize its off-shore areas for land reclamation.

Thus, the City Government has initiated its own reclamation projects within the City's municipal waters, pursuant to its corporate powers under the Local Government Code. Following the competitive challenge procedure under its 2014 City of Pasay PPP Code (Pasay Ordinance No. 5611, Series of 2014) the City signed two joint venture agreements (JVAs) with private sector proponents for the following land reclamation projects ("Pasay Reclamation Projects") within its municipal waters in Manila Bay, as defined by Pasay Ordinance No. 5768 Series of 2017 ("Ordinance 5768"). These are projects are:

- The 360-Hectare project under a joint venture with SM Prime Holdings Inc. ("Project 360"), approved by the City in 2013; and
- The 265-Hectare Pasay Harbor City Project under a joint venture with the Pasay Harbor City Corporation ("Project 265"), approved by the City in 2017.

The City has opened for development additional expansion areas within its municipal waters when it passed City Resolution No. Ordinance 5768 (covering 600 hectares) and City Ordinance No. 5973 (covering another 550 hectares).

The Pasay Reclamation Projects will be built offshore—across the western shores of the existing reclaimed land of the CCP Complex and Mall of Asia Complex.

Similarly, the Pasay Reclamation Projects are envisioned to become new hubs for business, commerce and tourism in Mega Manila. Facilities to be constructed on the reclaimed land include hotels, integrated tourism complex with waterfront and port facilities, entertainment centers and mixed use commercial and residential complexes.

1.5. Coastal and Sea Use Plan as Planning Tool

The City's serious development problems need a holistic strategy to address the issues on acute land scarcity and compliance with the Supreme Court's Writ of Continuing Mandamus for the clean-up of the Manila Bay, and the lack of land for new township and/or commercial business district projects as a major component of its urban renewal program. The City intends to promote inclusive development mindful of the fisherfolk and the implementation of the laws and issuances issued by the Bureau of Fisheries and Aquatic Resources (BFAR). However, it is a matter of record that there is no registered fisherfolk in Pasay City due to the findings that the near-shore municipal waters of the City are almost dead water body. Thus, it is open for other development such as land reclamation projects that will incorporate massive cleaning and rehabilitation activities to regenerate marine life within the water channels separating the islands of these projects.

1.5.1. Rationale of the Coastal and Sea Use Plan (CSUP):

The rapid urbanization of the City and the existing conditions of its municipal waters necessitate the need to create a CSUP that will identify the best use of the City's municipal waters and determine the proper zoning areas for its compatible use. This is also part of the City's compliance with the Manila Bay Coastal Strategy, the Operational Plan for the Manila Bay Coastal Strategy, and the Supreme Court Mandamus Order.

The CSUP defines the zoning areas of the municipal waters based on its existing conditions, and the proposed developments. These zones will maximize the best use of the coastal and municipal waters while seriously considering the protection of the environment and limit any adverse impacts in the coastal area or municipal water.

Furthermore, the CSUP aims to provide a mechanism for a strategic and integrated plan-based approach for the management of the City's municipal waters to ensure and expedite the resolution of potential conflicting development uses, the cumulative effects of human activities, and protection of the marine habitat. A current concern of the City is determining absorptive capacity as these are both ecologically and biologically sensitive areas.

1.5.2. Scope of the Plan.

The scope of the CSUP includes the coastal area and municipal waters of the City. The coastal area covers one (1) kilometer from the coastline of the Manila Bay, which are municipal

waters, and 200 meters from the coastline inland. The area of the City's municipal waters are defined in City of Pasay Ordinance No. 5768 Series of 2016.

The rates of erosion and sediment flow occur on a continuous basis and vary considerably from day to day along coastal zones. The frequency of sediment flow toward the coastal area is high during rainy season, especially when a storm hits Metro Manila Area. This makes the area highly vulnerable to natural hazards, such as flooding and landslides. An understanding on the water interactions of Manila Bay and the coastal land within the Mall of Asia toward the CCP Complex reclaimed lands is essential in identifying the potential hazards associated within the coastal land and marine zones of the City. Thus, this Coastal and Sea Use Plan is formulated in order to:

- Regulate the development of the City's coastal and municipal waters for a productive, efficient and sustainable development;
- Guide the developers of reclamation projects and the corresponding vertical development; and
- Set parameters for sound engineering and construction practices.

1.5.3. Objectives

- To support informed and integrated decision-making by identifying environmental effects of proposed actions considering alternatives, including the best practicable environmental option and specifying appropriate mitigation measures;
- To contribute to environmentally sustainable development by anticipating and preventing environmental impacts at source, introduce early warning protocols of cumulative effects and global risks;
- To establish safeguards based on principles of sustainable development addressing strategic issues and considerations related to justification of development proposals from the private sector.
- To mainstream environmental objectives incorporating sustainability principles to meet obligations of the City as provided for in the Constitution and the decision of the Supreme Court.
- To ensure sustainability assurance for development proposals and options instituting environmental accountability, and greater transparency and openness in rendering project decision-making.
- To rationalize the development and utilization of the municipal waters into a viable economic growth and development center.

1.5.4. Approach and Methodology:

The information used in this CSUP was gathered from the City's CLUP, zoning ordinances, and various documents of the Philippine Statistics Authority (PSA), BFAR, the Department of Agriculture (DA), National Mapping and Resource Information Authority (NAMRIA), and other government agencies. Information was also gathered from different technical studies conducted

and documented in the Environmental Impact Statement (EIS) Reports of different proposed projects within the City. Development concerns, opinions and inputs from different stakeholders were also studied through the public scoping and consultations made for the CSUP.

All the information gathered for the CSUP were used as basis for the delineation of each zone with the goal of weighing the development potentials of the municipal waters and maximizing the best uses for the greater financial benefits to the City and its constituents.

1.5.5. Classification of Zones.

To properly delineate certain areas of the municipal waters into different economic zones, such as but not limited to the following:

a. Build-Up Area Zone
b. Water Tourism Zone
c. Shipping and Navigation Zone; and
d. Other Maritime Zones

The above zones would eventually transform the economic potentials of the municipal waters into a "Blue Economy". For at the heart of the CSUP is a vast reclamation project which will be developed into townships and commercial districts. In the same vein, the government's land share of 51% will be divided to 30% for roads and open spaces while the remaining 21% will be for commercial and/or institutional uses with the former to be offered to prospective reputable developers for development. In addition, the huge investments for the total development of this Build-Up Area Zone would give rise to massive business opportunities that would bring employment opportunities to the city residents, and generate real property and business taxes to the City coffers.

With the pecuniary benefits that would accrue to the City Government, the City commits 25% of its realized revenues from the various reclamation projects to environmental purposes and cleanup activities of rivers and creeks that currently serve as the waste refuge of those residents living in the river banks. The City would also fund and implement the rehabilitation of its drainage system and water and sanitation program, respectively. To further ensure sustainable development, the respective proponents or owners of the reclaimed commercial lots are mandated to set aside funds for their corporate social responsibility projects, one of which is to possibly raise fish within the man-made water channels using fish cage to produce fish which would showcase that the water quality already improved from a dead body of water to a productive one. Secondly, the cultured fish will be a good attraction among residents and tourists alike and upon reaching the desirable harvest period and is proved to be safe for consumption, the same would be harvested and be distributed free to the urban poor.

II. THE PHYSICAL ENVIRONMENT

2.1. Geographic Location

The City is located, approximately, at latitude 14°32' and longitude 121°00'. Ground elevation ranges from zero (0) on Manila Bay to five (5) meters at the west side of the cities of Mandaluyong and Makati. This morphological unit can be subdivided into sand bar, back marsh including tidal flat, Pasig River delta and reclaimed land. In terms of area, it is the third smallest political subdivision among the cities and municipalities of NCR.

2.1.1. Physical Attributes

In terms of land area, Pasay City is the third smallest political subdivision among the local government units of Metro Manila, with a total area of 1,805.11 hectares. The City proper or Barangays 1 to 201 occupies around 1,399.50 hectares or 77.53 percent of the total area. The Cultural Center of the Philippines (CCP) Complex occupies around 191.95 hectares (10.63%) while its surrounding reclamation area accounts for the remaining 213.66 hectares (11.84 %).

2.1.2. Municipal Waters

Each local government unit lying in the coastal area has its own municipal waters. RA 7160, otherwise known as the Local Government Code of 1991 defines the municipal waters and quote,

> *"(r)Municipal Waters includes not only streams, lakes, and tidal waters within the municipality, not being the subject of private ownership and not comprised within the national parks, public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two lines drawn perpendicularly to the general coastline from points where the boundary lines of the municipality or city touch the sea at low tide and a third line parallel with the general coastline and fifteen (15) kilometers from it. Where two (2) municipalities are so situated on the opposite shores that there is less than fifteen (15) kilometers of marine waters between them, the third line shall be equally distant from opposite shores of the respective municipalities"*

Another source of definition for the municipal waters of the City is based on Section 4 of RA 8550 (The Philippine Fisheries Code of 1998) which provides:

> *"58. Municipal waters - include not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law), public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two (2) lines drawn perpendicular to the general coastline from points*

where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline including offshore islands and fifteen (15) kilometers from such coastline. Where two (2) municipalities are so situated on opposite shores that there is less than thirty (30) kilometers of marine waters between them, the third line shall be equally distant from the opposite shore of the respective municipalities."

Guided by the above provisions of two statues, the City's municipal water boundaries were explicitly declared in the City Ordinance No. 5768 Series of 2016, bearing the following technical description:

Table 2-1: *Coordinates of the Boundaries of the City of Pasay (WGS 84 DATUM)*

Points	Latitude	Longitude
Beginning at 1	14° 31' 47.51"	120° 58' 44.99"
thence 2	14° 31' 54.07"	120° 50' 24.53"
thence 3	14° 33' 24.48"	120° 50' 23.80"
thence 4	14° 33' 19.50"	120° 58' 42.99"

Through this City Ordinance, a 15-kilometer imaginary line was drawn starting from the City's coastline and extending through a straight westerly alignment. This area constitutes the City Government of Pasay's municipal waters with an estimated area of 4,209-hectare of surface water as shown in Figure 2-1.



Figure 2-1*: Municipal Water of the City of Pasay*

Under the existing condition, the municipal waters of the City has an established area for yachts anchorage, and visibly there are commercial vessels anchoring in some parts of the municipal waters too. These maritime activities of commercial vessels have not been regulated by the City due to the absence of a CSUP.

The creation of the CSUP is primarily intended as basis in designating areas for different commercial uses for sustainable development, such as but not limited to laying of artificial coral reefs in the seabed, establishment of a fish sanctuary, designating an area for reclamation projects and support infrastructure and for some related maritime sports activities, among others.

2.1.3. Underwater Condition:

A detailed underwater geotechnical investigation was conducted in 2018 for an offshore project in the near-shore areas of the City municipal waters. The thickness of the tidal sediments ranges from 5 meters to 29 meters. The layer is dominated by dark grey clay. Consistency is very soft to too soft at the top becoming stiff to firm at depth.

Present within the clay are layers of silt and sand. Thickness of the silt layers range from 1 to 1.5 meters to 12 to 14 meters. The silt can either be clayey or sandy dark grey to light brown. Layers at the surface of the sea bed are very soft to soft becoming stiff to very stiff to hard at depth. The sand layer varies in thickness from 2 meters to as much as 9 meters and the sand was described as dark grey to greyish brown, fine to coarse grained, silty or clayey. Consistency varies from very loose at the surface to very dense to dense at depth.

Tuff belonging to the Guadalupe Formation are found below the tidal sediments. The tuff was described to have varying degree of weathering, greyish brown becoming brown with different hues at depth. Consistency range from very dense to very hard requiring the use of coring to recover samples at depth.

The City belongs to the coastal lowlands. It is characterized by a generally flat terrain along the coastal areas in the western portions to a gently sloping topography towards the eastern parts. These coastal lowlands are dissected by drainage systems emptying into the Manila Bay.

2.1.4. City Water Characteristics

Surface Waters: The City is bounded in the west by Manila Bay. It lies within the Manila Bay Watershed area and is traversed by two minor rivers that feed the Parañaque River namely the Estero de Tripa de Gallina and Maricaban Creek. The bay itself has a catchment area of about 17,000 square kilometers and is made up of about eight (8) river basins-- the nearest of which to the City is the Parañaque-Las Piñas river basin. This river basin is subsequently made up of three (3) major rivers, the Parañaque, Las Piñas and Zapote Rivers. These river systems essentially serve about 1,500 hectares of low-lying areas along the Manila Bay and are the principal drainage channels of the area.

Groundwater: The City is situated on a delta which has produced locally-confined aquifers. The groundwater basin contains several connected and interrelated aquifers, composed of tuffaceous sandstone and conglomerates belonging to the Guadalupe Formation. These facets of Guadalupe Formation in the southeastern part of the City have thickness of approximately 1,300

to 1,200 meters. Groundwater utilization, however, has resulted in significant draw-down causing land subsidence and saline water intrusion particularly in the coastal areas.

Recharge to the aquifers comes from rainfall and inflow from the extension of these aquifers. However, these are already over exploited due to uncontrolled pumping and excessive underwater withdrawal, a practice done principally by high-density residential, commercial, and industrial establishments. This situation leads to a partial depletion of the aquifers resulting in the lowering of its water levels and high pumping costs. Almost 2000 wells have been drilled in the aquifers of the Guadalupe Formation for the commercial and residential users. Some of these wells go as deep as 300 meters.

2.1.5. Geology

2.1.5.1. Land Geological Condition

The City consists of two terrain units, an eastern undulating section and a western alluvial portion, which extends into the Manila Bay. The undulating to gently sloping terrain is underlain by a gently dipping sequence of pyroclastic rocks essentially made up of tuffs, tuffaceous sandstones and conglomerates belonging to the Guadalupe formation. This formation is represented by massive to thickly bedded lithic tuff and tuffaceous sandstone.

Based on the Geologic Map of Pasay, the two major geologic formations are:

- Quaternary Alluvial (QA1) which is comprised of detrital deposits mostly silt, sand and gravel; and
- Guadalupe formation (GF) of which the upper member (Diliman Tuff) is thin to medium bedded, fine-grained, vitric tuffs and welded volcanic breccias with subordinate amounts of tuffaceous, fine to medium grained sandstone.

Members of the Pleistocene Guadalupe Formation underlie almost half of the terrain where Pasay lies. These are mainly Alat Conglomerate and Diliman Tuff. Early Pleistocene to late Pleistocene conglomerate, silty mudstone and tuffaceous sandstone comprise the lower member while late Pleistocene well-bedded tuff units make up the upper member. The constituents of the Diliman Tuff were most likely derived from a volcano on the central lobe of Laguna de Bay to the south based on its aerial distribution pattern and lithological similarity with those in the northern vicinity of the central lobe of Laguna de Bay. On the other hand, quaternary alluvial deposits of the Marikina Alluvial plain and Pasig River Delta plain cover western areas of the city. The presence of the marine sediments suggests that the quaternary alluvium was probably deposited after uplift of the Guadalupe formation.

2.1.5.2. Underwater Geological Condition

A detailed underwater geotechnical investigation was conducted in 2018 for an offshore project in the near-shore areas of the City municipal waters. The thickness of the tidal sediments ranges from 5 meters to 29 meters. The layer is dominated by dark grey clay. Consistency is very soft to soft at the top becoming stiff to firm at depth.

Present within the clay are layers of silt and sand. Thickness of the silt layers range from 1 to 1.5 meters to 12 to 14 meters. The silt can either be clayey or sandy dark grey to light brown. Layers at the surface of the sea bed are very soft to soft becoming stiff to very stiff to hard at depth. The sand layer varies in thickness from 2 meters to as much as 9 meters and the sand was described as dark grey to greyish brown, fine to coarse grained, silty or clayey. Consistency varies from very loose at the surface to very dense to dense at depth.

Tuff belonging to the Guadalupe Formation are found below the tidal sediments. The tuff was described to have varying degree of weathering, greyish brown becoming brown with different hues at depth. Consistency range from very dense to very hard requiring the use of coring to recover samples at depth.

2.1.6. Topography, Elevation and Slope

The western part of the City is level to nearly level while its southeastern part is gently sloping to gently undulating. It is characterized by coastal plains along the Manila Bay in the west and sloping areas extending in the south-east direction. Surface elevations range from 2 meters above the mean sea level on the coastal plains and 24 meters on the southeast part of the city.

Land and Associated Soil Characteristics

As per Metro Manila Land Resource Evaluation Project by BSWM, Pasay has the following land and soil characteristics:

2.1.6.1. Active Tidal Flats (Coastal Landscape)

Active tidal flats, with an almost flat relief, have an elevation that ranges from 0 to 1.5 meters, sometimes reaching up to 3 meters above the mean sea level. This land system has very poor drainage characteristics. Waterlogged areas may pose a corrosion problem to underground uncoated steel pipes or structural reinforcement. Poor drainage is also a problem in sewage disposal in areas which are not served by public sewer facilities. It is further characterized by slow permeability, high compressibility, and possible flooding during seasonal high-water table. Soil texture or the different sizes of particles in the soil mass are clay, silty clay, and sandly clay loam. The parent materials of this land classification are tidal mudflats with muck and peat locally, alluvial sediments.

2.1.6.2. Former Tidal Flats (Coastal Landscape)

The former tidal flats consist of areas more inland and slightly higher than the active tidal flats. They occupy the almost flat plains, back swamps and depression of the coastal landscape formed from marine and fluviomarine deposits. Slightly lower than the alluvial plain, its elevation ranges from 2 to 5 meters. It has slow to moderate permeability and a soil texture of clay to silty clay loam. Moreover, it is poorly drained, prone to moderate seasonal flooding, highly compressible, and corrosive to uncoated steel. Its parent materials are alluvial sediments, former tidal mudflats underlain with peaty and mucky materials.

2.1.8. Water Quality

Available data from government agencies such as the DENR-EMB have indicated that the near-shore waters of Manila Bay, together with the major rivers in Metro Manila are considered biologically dead. The water quality in Manila Bay has progressively deteriorated due to domestic, industrial, and agricultural wastes being dumped uncontrollably in the waterways. This present state is likewise being attributed to inadequate drainage facilities and the discharge of untreated domestic and industrial wastewater due to inadequate wastewater collection, treatment, and disposal facilities.

Based on the sampling conducted by the DENR in each month of the year 2000, water quality as per dissolved oxygen, Biological Oxygen Demand (BOD), and the total suspended solid level in various stations of the Parañaque-Zapote River are shown in the following tables. Two stations were located within Pasay City, Tramo and MIA Road.

Table 2-2: *Annual Dissolved Oxygen (mg/L) in the Parañaque-Zapote River System, 2000*

Station	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tramo	Tramo, Pasay City	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MIA Road	MIA Rd, Pasay City	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
La Huerta	Parañaque City	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Parnaque	Parañaque City	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Zapote	Las Piñas City	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Quantec	Parañaque City	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Monthly Ave		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Standard		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 2-3: Annual BOD (mg/L) in the Parañaque-Zapote River System, 2000

Parañaque	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tramo	Tramo, Pasay City	[illegible]												
MIA Road	MIA Rd, Pasay City	[illegible]												
La Huerta	Parañaque City	[illegible]												
Parañaque	Parañaque City	[illegible]												
Zapote	Las Piñas City	[illegible]												
Quirino	Parañaque City	[illegible]												
Monthly Ave.		[illegible]												
Standard mg/L		[illegible]												

Table 2-4: Annual Total Suspended Solid Levels in the Parañaque-Zapote River System, 2000

Parañaque	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tramo	Tramo, Pasay City	[illegible]												
MIA Road	MIA Rd, Pasay City	[illegible]												
La Huerta	Parañaque City	[illegible]												
Parañaque	Parañaque City	[illegible]												
Zapote	Las Piñas City	[illegible]												
Quirino	Parañaque City	[illegible]												
Monthly Ave.		[illegible]												

The sampling results show that dissolved oxygen levels in the two Pasay stations are way below the standards while the BOD concentrations are way above standard. More recent data conducted by Partnership in Environmental Management for the Seas of East Asia (PEMSEA) (2013), an international organization providing solutions for management of the seas, coasts and

oceans in East Asia, shows that the annual pollution that goes to Manila Bay increased as is estimated to continue increasing in the future as shown below:

Table 2-5: PEMSEA Actual and Estimated Pollution levels in Manila Bay

Pollutant	2008A	2015A	2020E
Biochemical Oxygen Demand (BOD)	232,764*	270,182	302,531
Total Nitrogen (N)	79,621	93,738	105,770
Total Phosphorous (P)	17,619	20,580	23,138

*Figures at Metric Ton per Year (MT/year)

2.1.8.1. Pollution in Manila Bay

According to PEMSEA, Manila Bay is facing threats from different factors. This includes over-population, pollution from multiple sources and uncontrolled development—all resulting in the significant degradation of the ecosystems and biodiversity in Manila Bay.

Research shows that pollution in the near-shore areas of Manila Bay comes mostly from land-based human activities which includes the discharge of municipal, industrial and agricultural wastes that are drained into Manila Bay through rivers and waterways. For instance, about 21 percent of the organic pollution load to Manila Bay came from the Pasig River basin, with 70 percent of this load derived from households, making Manila Bay notorious for being the "toilet bowl of Metro Manila." These wastes pushed pollution in certain areas of Manila Bay to over a million times beyond acceptable levels. The DENR's own tests showed that Fecal coliform levels in December 2018 at some areas of the Bay was recorded to be as high as 330 Million Most Probable Number (MPN) while the acceptable Supreme Court mandated Class SB standard should only be at less than 100 MPN.

While heavy concentration of silt has clouded the waters beneath the surface of Manila Bay, domestic garbage, toxic industrial waste, and sediments contaminated by heavy metals and pesticides have accumulated at the bottom. The proponents of the Manila Bay Coastal Strategy have determined that for decades, inadequate solid waste management allowed domestic (including sewage), commercial, and industrial waste to enter the Manila Bay directly or via rivers and drainage systems to contaminate the sediments or pile up on the seabed, thus, transforming the Bay into the "toilet bowl of Metro Manila." Domestic waste accounts for 83 to 90 percent of the pollution sources.

These pollutants have affected the quality and quantity of the community of organisms that live on, in, or near the seabed. Some of the materials emitted by these industrial wastes and sewage wastes contain toxic materials like mercury, cryolite and DDT. The silt in the waters and the solid wastes at the bottom impair the ecosystems, blanket habitats and pose public health risks. Marine creatures and plants bear the brunt of the harmful substances in the dumped materials. The toxic wastes that are dumped into the sea soak in all the seawater oxygen. This leads to a marked

depletion of oxygen available to mammals and other fishes causing them to die in their natural habitat.

2.1.9. Marine Life and Fisherfolk

The poor water quality in the near-shore areas of the municipal waters of the City led to insignificant marine life. Studies conducted in the area have shown that there are no coral reefs within the area and that the absence of viable fisheries resources is an offshoot of largely unproductive conditions and lack of suitable habitats where growth, maturation and reproductive process of marine life can take place. As a result, the City has no registered fisher folks.

2.1.10. Regeneration of Biological Resources

Ultimately, the City through the CSUP hopes to accomplish the gradual revival of the marine life within the municipal waters and that future fishing activities will be reserved for marginalized fishermen, consistent with the existing City Fishery Code and the existing fishery laws and regulations implemented by the BFAR.

2.1.11. Geologic and other Natural Hazards

No traced earthquake fault line traverses the City. However, it is not spared from other related geologic hazards such as tsunamis, ground shaking, and liquefaction.

Tsunamis are giant sea waves generated by under the sea earthquakes and volcanic eruptions. Not all submarine earthquakes, however, can cause the occurrence of tsunamis. Tsunamis can only occur when the earthquake is shallow-seated and strong enough to displace parts of the seabed and disturb the water over it. The coastal area of the City is among the most vulnerable with regard to the threats of tsunamis.

Typhoons and their associated hazards, such as strong winds, storm surges, and floods, are among the most recurrent and damaging calamities our country are prone to. Some twenty (20) typhoons pass the Philippine Area of Responsibility (PAR) every year. These are most frequent during the months of May to December with peak occurrences in the month of November. Of the total 325 typhoons recorded to have crossed the PAR from 1948 to 1978, about twenty (20) passed through Metro Manila. One of these, Typhoon Yoling, was the most severe, registering a maximum wind speed of 200 kph and bringing 24-hour rainfall on the Metropolis. Residential areas, infrastructure, power systems, and other utility installations experienced heavy damages, some of which took months to restore.

2.1.12. Solid Waste Management (SWM)

At present, the City disposes its solid waste in the San Mateo Sanitary Landfill and the Payatas dumpsite. As per a JICA study on Solid Waste Management for Metro Manila involving government agencies such as DECS, DENR and MMDA, Pasay City, along with Taguig, Pateros and the city of Makati, shall be accommodated in the proposed Transfer Station within Fort Bonifacio and then dumped in an inland landfill site to be later specified.

All barangays are covered by solid waste collection, which is handled by the local government and private contractors. Solid wastes are collected daily on main thoroughfares and every other day in the rest of the city. However, the collection systems accommodate urgent requests by residents.

Table 2-6: Existing Solid Waste Disposal Methods

Method	Population Served	Responsible Agency / Units	Equipment/ Facilities	Financing/ Operating Funds	Remarks
1. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3. Conventional Sanitary Landfill	24 Barangays	[illegible]	[illegible]	[illegible]	[illegible]

2.1.13. Drainage and Flood Control System

The Tripa de Gallina and Libertad pumping stations (PS), the Buendia and Libertad Outfalls or Channels are currently servicing the drainage requirement of the City. The Tripa de Gallina PS has a drainage area of over 1,700 hectares. Part of the storm runoff from the Estero de Tripa de Gallina enters the Libertad PS via the Buendia and Libertad Outfalls. The rest are discharged into the Parañaque River. The Estero, however, shows a fluctuation in profile due to the deposit of sediment and garbage, and insufficient improvement of the Buendia Channel. This condition is caused largely by poor sewerage and improper solid waste disposal. A considerable volume of wastes accumulates in the retention pond of the reclamation area. In areas along esteros and creeks occupied by a number of squatter shanties, wastes are directly discharged into the waterway. At present, the local government employs flood control measures such as annual clearing of all

waterways and sedimentation (desilting of riverbeds) accompanied by a proper garbage and waste disposal system.

The adjoining upstream areas of the Libertad Reclamation Area are being drained through the Libertad, Buendia, and EDSA outfalls. Their existing discharge capacities are much smaller than their design capacities due to siltation. Garbage inflow at the inlets of these outfalls aggravates the problem.

2.1.14. Disaster Management

The warning system for both typhoons and floods in Metro Manila are operated by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). It monitors the meteorological and hydrological conditions and issues periodic reports. These reports contain a warning if the conditions entail risks to the population. The warning system for typhoons works separately from the warning system for floods.

2.1.15. Other Aspects

Besides natural factors, other aspects that tend to aggravate flooding problems in Metro Manila include the following:

- Infrastructure development leading to the creation of more impervious areas, resulting to higher peak run-offs that usually cause standing floods;
- Inadequate or non-existent drainage system;
- Improper solid waste disposal that leads to the clogging of drainage systems, further lowering their water retaining capacity;
- Heavy siltation of rivers due to previous floods, indiscriminate dumping of garbage, encroachment of squatters and slum dwellers, and limited maintenance works; and
- Institutional problems and financial constraints which delay implementation of proper flood control system.

Flooding within the City are generally concentrated along Taft Avenue and the areas along the Estero de Tripa de Gallina and Maricaban Creek.

2.1.16. River and Coastal Preservation

The Manila Yacht Club/Philippine Navy water area as shown in Figure 2-2 is the current outflow of the Estero de Maytubig and other minor creeks and storm drains in the City. The following are the river preservation zones of the city:

- Rivers and streams – these critical areas consist of easements of about 3 to 20 meters from both sides throughout the entire length of any river or stream. Areas within this

range are subject to easement of public use in the interest of recreation, fishing, floatage etc.

- Coastal Zone – this includes areas one kilometer from the coastline of the Manila Bay, which is city waters, and 200 meters from the coastline inland.
- Areas of no significance - areas outside the range mentioned above are non-environmentally-critical areas.



Figure 2-2: *Manila Yacht Club/Philippine Navy water area*

III. SOCIO-ECONOMIC PROFILE OF PASAY CITY

After four decades of rapid urbanization in Metropolitan Manila, Pasay City has transformed into an important local corridor between major urban centers, a facilitator of trade among its neighboring LGUs.

The City is home to the nation's busiest air transportation hub, the Ninoy Aquino International Airport, serves as an international gateway not just to Metro Manila but the whole Philippines as. The NAIA airport complex handles 45,982,544 passengers annually. On top of that, Pasay is also a leading land transportation hub, with 15 bus terminals in the city serving commuters going to various destinations in Metro Manila and nearby provinces. In addition, it has 2 Rail Transit terminals (1 LRT-1, and 1 MRT-3) and 2 major thoroughfares (EDSA and Roxas Boulevard) in the City contributing to the human flow in and out of the City.

3.1. Economic Sector

Pasay City's strategic location has brought about benefits in the form of employment and livelihood opportunities, a robust local economy, and a rise in property values. These benefits, however, are not without its attendant urban problems of vehicular traffic congestion, blight, breakdown of services, and an increase of urban poor dependent on the thriving economic activities and government dole-outs.



Figure 3-1: Urban Congestion in Metro Manila

Complementing Pasay City's strategic location is its relatively flat terrain, which has the capacity to absorb a large population and intense commercial enterprises. Another feature that could work to its advantage is its western coastline that could be expanded through reclamation. At present, a large portion of the city is already made up of reclaimed lands where prominent landmarks and national government offices are now establish. 7

As a whole, Pasay City has the foundation that could sustain its economic machinery. It has

highly educated and skilled manpower as well as managers; adequate supply of electricity and water; excellent access provided by light rail transit systems, excellent communication facilities, road networks and airports; and some land for expansion.

3.1.1. Labor Force and Employment

A comparative analysis of data on employment rate shown an increasing trend from 2005 to 2011. Employment increased by six percentage points from 81% in 2005 to 87% in 2008, and two percentage points to 89% in 2011.

Table 3-1: Employment Rates in Pasay City, Various Years

Employment Rate	2005	2008	2011
Employed	87,921	92,344	101,148
Unemployed	21,813	15,541	14,133
Employment Rate	80%	86%	88%
Unemployment Rate	20%	14%	12%

3.1.2. The Leading Industries of Pasay City

Pasay City's rapid urbanization has seen the decline of traditional industries (there are no establishments under the primary sector, that is, those that are into agriculture, fishery and forestry) and their replacement with service-oriented types of livelihood and industries in the form of financial services, medical services, retail and general merchandising, recreation services, public terminals, commercial garages, professional services, personal services, utility services, and light manufacturing.

The number of establishments in Pasay City grew at an average annual growth rate of 4% from 2005 to 2012. The total number of establishments increased from 8,433 in 2005 to 11,644 in 2012. This meant an increase by 3,211 establishments over the eight-year period or an average of 458 new establishments per year.

The secondary sector consists of establishments under the manufacturing sub-sector. There are 361 registered manufacturing firms in the City, which accounts for only 3% of the total number of establishments in 2012.

The tertiary sector is predominant in Pasay City in terms of establishments. Wholesale and retail trade is the biggest sub-sector accounting for 46% of the total establishments. Community, social and personal service such as those catering to food and amusement represent 36%. Finance, insurance, real estate and business services rank third 12%, with the remaining falling under transportation, storage and communication.

3.2. Key Players in the Local Economy

Private investments are the lifeblood of the city's economy. Private investors have voiced

several concerns which have affected their operations such as the lack of parking space and spaces for pedestrians. Another concern is the inefficient solid waste management system that would support business operations. Businesses and legitimate residents of Pasay City area also worried about the increasing number of illegal dwellers taking over many public and private properties, contributing to urban blight in places which could otherwise have been commercially viable. They have also contributed to the rising costs of water and electricity consumption of business enterprises and residents who have been forced to subsidize their consumption from illegal connections.

3.2.1. The Public Market

The public market is an important facilitator of trade and a great provider of employment. Pasay City has two public market operated by the City Government and another owned by a private enterprise. The government public market is a 13,378.47 square meter two-story structure that provides livelihood to some 1,500 stall holders. The market vendors in the Pasay City Public Market are organized and have formed themselves into an association of about 500 member, their capacity to influence market prices cannot be ignored. The privately-owned public market has a floor space of about 500 square meters.

3.2.2. Tourism Industry Operators

Pasay City has a key role in the Philippine tourism industry, as it hosts the Ninoy Aquino International Airport and thus serves as the country's international gateway. It also supports the tourism industry in Metro Manila and the nearby provinces in Southern Luzon as it has 20 hotels that accommodate foreign and local tourists. Likewise, it has hosted many events such as international fairs and conventions, as well as concerts featuring local and foreign talents.

3.3. Economic Interdependence

A great majority of the businesses in the City are devoted to service and retail establishments, with a negligible secondary sector (manufacturing), and virtually no primary sector (agriculture, fishery, forestry). As such, the city relies on economic interdependence with other LGUs. Although there is no hard data on the volume of incoming commodities, it is known that they are sourced from various regions primarily from the Southern Tagalog and Central Luzon Regions.

3.4. Existing Policies and Institutional Arrangements

3.4.1. Public Governance - Organization

The local government bureaucracy of the city of Pasay consists of a core of regular employees and a much greater number of casual employees. All the officers in the departments with line functions are professionals and career employees. The departments are organized in a

substantially two-level structure with authority/responsibility lines emanating from the Office of the Mayor to each and every line department.

3.4.2 Coordination with National Agencies

Of particular concern of the local government is its coordination and relationship with national government agencies and government-owned or controlled corporations with substantial presence and impact on the city. Notable of these are the Civil Aviation Authority of the Philippines (CAAP) with respect to the Domestic and International Airport and the Armed Forces of the Philippines with regard to Villamor Air Base. Other agencies with presence in Pasay are the Department of Public Works and Highways and the Department of Social Welfare and Development.

3.4.3 Staffing and Personnel

Entry into the public service for the regular plantilla positions is through competitive examination in accordance with the Civil Service Commission. Other new entrants into the public service consist of the so-called "casual" employees. Selections of these irregulars are through the discretion of the Local Chief Executive. All the heads of the line departments are experienced and qualified for their positions in accordance with the Local Government Code, provisions of Civil Service Commission and Salary Standardization Law.

3.4.4 Fiscal Management

Based on the latest Local Government Financial Performance Monitoring System published by the Bureau of Local Government Finance (BLGF) covering the 2015 Fiscal Year, the City of Pasay was tagged as having a 'Type 1' Financial Performance Type, having passed thirteen (13) of the twenty (20) indicators set by the BLGF, as follows:

Table 3-2: Local Government Financial Performance Monitoring System for FY 2015

Benchmark Type	Pasay City performance	Benchmark Value	Passed/Failed
TAX REVENUE	[illegible]	[illegible]	Passed
REVENUE GROWTH	[illegible]	[illegible]	PASSED
PER CAPITA LOCALLY SOURCED REVENUE - SGF	[illegible]	[illegible]	PASSED
PER CAPITA GROWTH IN LOCALLY SOURCED REVENUE (LSR)	[illegible]	[illegible]	FAILED
% LOCALLY SOURCED REVENUES TO TOTAL GOVT REVENUE	[illegible]	[illegible]	PASSED
% ANNUAL REAL PROPERTY INCOME TO TOTAL REVENUE	[illegible]	[illegible]	FAILED
RATIO OF TOTAL REVENUE OFFICE OPERATIONS COST (TROOC) TO LOCALLY SOURCED REVENUE (LSR)	[illegible]	[illegible]	PASSED
REAL PROPERTY TAX (RPT) COMPLISHMENT RATE (RPTAR)	[illegible]	[illegible]	FAILED
TOTAL EXPENDITURES PER CAPITA	[illegible]	[illegible]	PASSED
PERSONAL SERVICES EXPENDITURES RATIO (PSER)	[illegible]	[illegible]	PASSED
TOTAL PERSONAL SERVICES EXPENDITURE RATIO (PSLRT)	[illegible]	[illegible]	PASSED
TOTAL DEBT SERVICE EXPENDITURE RATIO (DSER)	[illegible]	[illegible]	PASSED
SOCIAL SERVICES EXPENDITURE RATIO	[illegible]	[illegible]	PASSED
ECONOMIC SERVICES EXPENDITURE RATIO	[illegible]	[illegible]	FAILED
DEBT SERVICE RATIO (DSR)	[illegible]	[illegible]	PASSED
GROSS OPERATING SURPLUS (GOS) TO DEBT SERVICE RATIO (GS)	[illegible]	[illegible]	PASSED
DEBT TO NET ASSET RATIO	[illegible]	[illegible]	FAILED
CAPITAL INVESTMENT EXPENDITURES TO TOTAL REVENUES RATIO (CIETRR)	[illegible]	[illegible]	FAILED
NET OPERATING SURPLUS TO TOTAL LGU REVENUE RATIO (NOSTER)	[illegible]	[illegible]	FAILED
NOBLIGATED CASH BALANCE TO LOCAL LGU EXPENDITURES RATIO	[illegible]	[illegible]	PASSED

Moreover, while Pasay City was in P166 Million deficit in the year 2000, it is no longer the case as of today. In FY 2018, preliminary data published by the Bureau of Local Government Finance has shown that Pasay City now has a surplus of around Php3.66 billion. This is a result of the City earning total tax revenues of Php4.38 billion and total non-tax revenues of Php 428.73 million, and spending around Php3.37 billion for operating expenditures and Php530.02 million in non-operating expenditures.

In FY 2018, Pasay City ranked 6th among all sixteen (16) cities in the National Capital Region in terms of total collections and in terms of net surplus. In terms of expenditure, Pasay City ranked 7th among all cities in NCR in terms of operating expenditures and 11th in terms of non-operating expenditures.

3.5. Key Issues and Concerns

3.5.1. Need to Tap Tourism Potential

Tourism is seen as a growth industry in the Philippines, seeing an increase of 15% in foreign arrivals from January to October 2019 (compared to the same period last year). Pasay City has a lot of tourism potential in terms of cultural and recreational attractions; and historical and cultural heritage areas, not to mention the annual festivals held in the city. While these attractions already invite a lot of tourists, it is imperative that more tourist activities be identified and packaged, both for local and foreign tourists.

3.5.2. Some Areas in State of 'Decay'

Some areas in the city such as Taft Avenue corner Libertad (near the LRT station) are in a state of 'decay'. These areas have very old and dilapidated structures, making the neighborhood an 'eyesore' to the city.

3.5.3. Limitations on Land Development

Available lots in Pasay City are too small to be considered by big developers/investors. The problem is further magnified by the imposition of height restrictions for buildings in certain areas owing to its proximity to the airports Pasay City. This deters some investors from choosing Pasay City, i.e. residential condominiums, in maximizing the returns to the land resources.

IV. UTILIZATION OF MUNICIPAL WATERS FOR RECLAMATION AND DEVELOPMENT

4.1. Reclamation: An Internationally Proven Solution to Land Scarcity

Reclamation is a proven safe, sustainable and environment-friendly solution to the acute demand for more living space for urban development and renewal, as evidenced by numerous reclamation projects worldwide. Indeed, reclamation has received increasing attention as a feasible solution to the problem of land scarcity and the continuing population growth.

Many reclamation projects worldwide were undertaken to address the problem of land scarcity and to promote urban renewal. Some examples:

1. **Manzanares River Project in Madrid, Spain** - The Manzanares River Project, Madrid's main urban-regeneration project, transformed the banks of the capital's river, improved water flow and created more public spaces, including nine new pedestrian walkways over the river. The reclaimed area was planted with 25,000 trees and created 42 km of pedestrian paths and 32 km of cycling tracks, a riverside beach, new children's playgrounds and quiet areas designed to attract elderly visitors.



Figure 4-1: The Manzanares River Park

2. **Singapore**, known for its highest population density, used land reclamation to grow its area by 25%, resulting in the decrease of its population density in 2017. The Marina Bay reclamation projects added significant waterside land adjacent to Singapore's central business district, creating prime real estate that is used for commercial, residential, hotel, and entertainment purposes today.



Figure 4-2: Modern Singapore's Marina Bay area, a major development made possible through land reclamation.

Other countries such as China, Netherlands and South Korea have also undertaken massive reclamation projects covering 1,350,000 ha, 700,000 ha, and 155,000 ha, respectively. The entire Tokyo Bay shoreline (amounting to 24,900 ha) is reclaimed land. These countries have transformed their off-shore areas into new bustling cities, world-class airports and seaports, well-planned urban communities, commercial and industrial centers, tourist destinations and even sites for Olympic events.

Land reclamation projects can withstand the test of time and even last for centuries, as shown by the following examples:

1. **South Boat Quay** – This is Singapore's first land reclamation carried out in 1822. Overtime, it has served its purpose of becoming one of the busiest areas for trade and maritime commerce to its modern role as an area for tourism and aesthetics.
2. **Praya Reclamation Scheme** – Among Hong Kong's first reclamation project completed in 1873, it is now part of the City's bustling metropolis as Des Voeux Road that is located near Hong Kong's City Hall, International Finance Center, and ferry stations.
3. **Odaiba** – An artificial island in Japan built for defensive purposes in 1850s against sea-based attacks. Mostly forgotten in the 20th century, it was revitalized to serve as a place for tourist with shopping malls and convention centers.
4. **Beemster Polder**, a 70 sq. km farmland in the Netherlands was reclaimed in 1612 and is now a declared UNESCO World Heritage Site.

Even more recent ambitious projects worldwide testify to the confidence in the safety, reliability and sustainability of reclamations. Examples include the Kansai International Airport of Japan, Hong Kong International Airport, Singapore Changi Airport, Hamad International Airport of DOHA which serve tens of millions of people.

4.2. Pasay City: Suitable for Reclamation Projects

In its endorsement of the Pasay reclamation projects to the DENR Secretary, the DENR NCR Office declared that the proposed area within the municipal waters of Pasay as suitable for reclamation, noting that it is not covered by existing tenurial contracts or agreements and Environmental Clearance Certificates (ECCs) have already been issued for the projects and significant environmental aspects have been identified and mitigating measures have been incorporated in the City's Environmental Management Plan (EMPs).

4.2.1. No Dislocation of Informal Settlers

There have been concerns raised that these Pasay Reclamation Projects will cause the displacement of informal settlers. However, the fact is the Pasay Reclamation Projects will not dislocate or displace even a single informal settler, because the Pasay Reclamation Projects will be built offshore – on an empty expanse of putrid and murky seawater – across the eastern shores of the existing reclaimed land of the CCP and the MOA Complexes. There are no land or water-based communities or settlers in the proposed reclamation areas, as confirmed by a technical study conducted by DENR accredited experts. That there are no communities or settlers in the project sites can in fact be verified by any casual observer standing at the eastern edge of the SM MOA Complex and CCP Complex. Thus, in the case of the Pasay Reclamation Projects, any apprehension about displacing human communities in the project sites is simply without any basis.

4.2.2. No Dislocation of Fisherfolks

Equally misplaced are the concerns regarding potential loss of livelihood and fishing activity and damage in the marine ecosystem. A study by DENR accredited experts reveals that no significant population of fish, crustaceans, and marine macroinvertebrates can be found in the project areas of the Pasay reclamation projects. This lack of marine life is due to the absence of coral reefs, seagrass beds, and mangroves that could sustain a marine ecosystem. These facts have resulted to unproductive fishing activity within the project sites. When on-site studies were conducted by the DENR accredited experts for the projects, almost all fishing was being done in areas more than 3 km away from the project sites. With the absence of marine life that can support productive fishing in the project sites, there is no risk of the Pasay Reclamation Projects displacing any fisherfolk in Manila Bay.

4.2.3. Outside any National Park, Watershed Reserve, Wildlife Preserve or Sanctuary

The project sites are not within or near any national park, watershed reserve, wildlife preserve or sanctuary, and thus pose no risk of adverse impact on environmentally critical and protected areas. The project sites are located more than 6 km away from the Las Piñas-Parañaque Critical Habitat and Ecotourism Area (LPPCHEA) and thus, pose no threat to the migratory and important bird species in the LPPCHEA. There are also no significant population of fish found in the proposed reclamation areas, nor are there coral reefs, seagrass beds and mangroves that can support marine life.

Equally important, the Pasay Reclamation Projects will be built outside of the zone in Manila Bay declared as a National Historical Landmark. The National Historical Commission of the Philippines (NHCP), through Board Resolution No. 19 (S. 2012) as amended by NHCP Board Resolution No. 1 (S. 2018) declared the Manila Bay waterfront, shoreline and waters from Del Pan Bridge to the CCP as a National Historical Landmark.

The Pasay Reclamation Projects will be not be located between the Del Pan Bridge and CCP. These projects will merely continue the eastward development of the existing reclamation projects in Pasay (CCP Complex and SM MOA Complex) and not alter any part of the shoreline of Manila Bay nor any declared inland historical landmark.

4.2.4. No obstruction of the view of the sunset of Manila Bay

Because of their locations, the Pasay Reclamation Projects will not block the public access for viewing the world-famous sunset of Manila Bay from Roxas Boulevard in Manila. On the contrary, the public will be provided additional and more convenient areas within the reclamation development to view the sunset.

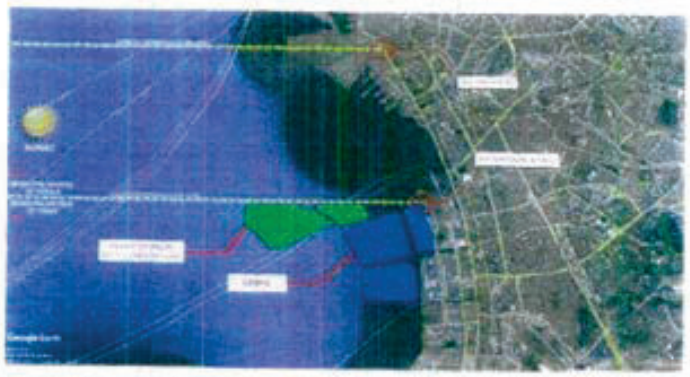


Figure 4-3: *The view of the Manila Bay sunset from Roxas Boulevard in relation to the position of the Pasay Reclamation Projects*

4.2.5. No Financial Burden to the Government

The Pasay City Reclamation Projects will be at zero cost to the government as these will be entirely financed by the private sector proponents under the arrangements with the City Government of Pasay. Furthermore, under the JVAs signed by the City and the private proponents, the latter will provide not only the financing, but also the manpower, facilities, and technology necessary for the reclamation projects to be undertaken.

The LGU of Pasay has full legal authority to undertake the reclamation projects with a private joint venture partner in accordance with existing laws and regulations. The City Government has the power to undertake reclamation projects pursuant to Section 17 of the Local Government Code (LGC). Its authority to enter into joint venture contracts with the private sector is granted by Section 35 in relation to Section 17 and 22 of the LGC. In the pursuit of its proprietary functions, the City may also form joint ventures with the private sector in accordance with its own rules and procedures issued under a proper of ordinance *(DILG Opinion No. 53, S. 2014, 10 September 2014)*. In relation to this, the City of Pasay adopted its own Public Private Partnership (PPP) guidelines through City Ordinance No. 5611 (series of 2014), otherwise known as the 2014 City of Pasay PPP Code.

In accordance with the procedure laid down in the 2014 Pasay PPP Code, unsolicited proposals for the Reclamation Projects were submitted, reviewed at various levels, approved and subjected to public bidding or swiss challenge before being awarded to the private proponents. Furthermore, beyond the agreements with the City Government of Pasay, the projects have already been granted the necessary clearances and permits from different agencies of the government.

V. COASTAL AND SEA USE ZONES

5.1. Pasay Coastal and Sea Use Zones

To come up with a rationalized planning system, this CSUP was conceptualized as planning tool to optimize the use of the City's municipal waters and promote sustainable use of marine resources for all stakeholders. The CSUP is an instrument that can help realize the goals identified in the local development plan of the City within its Coastal Area and municipal waters in conjunction with the City's Comprehensive Land Use Plan (CLUP).

5.2. The Coastal Area

Manila Bay covers 190-kilometer of coastline with a surface area of 199,400 hectares. On the other hand, the City has an estimated 2,800-meter coastline with a surface area of 4,209-hectare starting from the water channel separating Parañaque City to the westernmost point of land in the CCP Complex.

Under the Fisheries Code of 1998 (RA 8550) the Coastal Area of the City is defined as "a band of dry land and adjacent ocean space (water and submerged land) in which terrestrial processes and uses directly affect oceanic processes and uses, and vice versa; its geographic extent may include areas within a landmark limit of one (1) kilometer from the shoreline at high tide to include mangrove swamps, brackish water ponds, nipa swamps, estuarine rivers, sandy beaches and other areas within a seaward limit of 200 meters isobath to include coral reefs, algal flats, seagrass beds and other soft-bottom areas." The existing coastal area of the City may be altered due to various reclamation projects of the City.

5.3. The Municipal Waters

Section 131 (r) of the Local Government Code (RA 7160) defines municipal waters as follows:

> *"(r)Municipal Waters includes not only streams, lakes, and tidal waters within the municipality, not being the subject of private ownership and not comprised within the national parks, public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two lines drawn perpendicularly to the general coastline from points where the boundary lines of the municipality or city touch the sea at low tide and a third line parallel with the general coastline and fifteen (15) kilometers from it. Where two (2) municipalities are so situated on the opposite shores that there is less than fifteen (15) kilometers of marine waters between them, the third line shall be equally distant from opposite shores of the respective municipalities"*

Section 58 of the Fisheries Code (RA 8550) defines municipal waters as follows:

> *"58. Municipal waters - includes not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law), public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two (2) lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline including offshore islands and fifteen (15) kilometers from such coastline. Where two (2) municipalities are so situated on opposite shores that there is less than thirty (30) kilometers of marine waters between them, the third line shall be equally distant from the opposite shore of the respective municipalities."*

In a letter dated November 11, 2016 addressed to National Mapping and Resource Information Authority (NAMRIA), the Honorable Mayor Antonio G. Calixto requested NAMRIA for assistance to plot and determine the technical description of the municipal waters of the City of Pasay based on RA 7160 and RA 8550. In response, NAMRIA replied through a letter dated December 9, 2016 which provided for a table survey map and technical descriptions of the municipal waters of the City. Based on these laws and the letter of NAMRIA, the City demarcated its municipal waters through City Ordinance No. 5768 Series of 2016 which has the following technical description:

Table 5-1: *City of Pasay Municipal Waters Technical Description*

Coordinates of the Boundaries of the City of Pasay (WGS 84 DATUM)		
POINTS	**LATITUDE**	**LONGITUDE**
Beginning at 1	14° 31' 47.51"	120° 58' 44.99"
thence 2	14° 31' 54.07"	120° 50' 24.53"
thence 3	14° 33' 24.48"	120° 50' 23.80"
thence 4	14° 33' 19.50"	120° 58' 42.99"

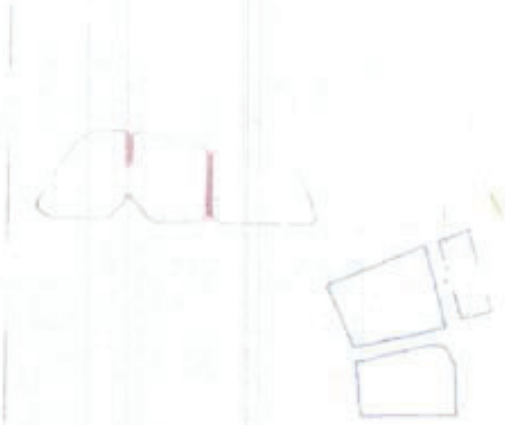
Through this City Ordinance, a 15-kilometer imaginary line was drawn starting from the City's coastline and extending through a straight westerly alignment. This area comprises the municipal waters of the City with an area covering an estimated 4,209-hectare of surface water.

In a letter dated August 28, 2018 issued to PRA and copy furnished the Mayors of Manila and Pasay, NAMRIA clarified its previous plotting under NAMRIA-MW-MMA-001, this time showing an expanded municipal waters through a new terminal point. To quote:

> *"This pertains to the municipal water boundaries of the cities of Manila and Pasay as plotted under NAMRIA-MW-MMA-001.*
>
> *As a result of further document analysis of Presidential Decree No. 774 dated 22 August 1975 and the Transfer of Certificates of Title Nos. 75676 and 75681*

covering the parcels of land of the Cultural Center of the Philippines, we have revised the Municipal Waters Map.

Subsequently, on October 18, 2018, the Cities of Pasay and Manila, entered into a Memorandum of Agreement (MOA) to harmonize the implementation of reclamation projects in the municipal waters of the two cities. Both LGUs, along with their respective joint venture private sector partners, have agreed to respect and comply with the revised plan with geographic coordinates in the consolidated landform plan which also shows the alignment of Manila Solar City Reclamation Project as falling within the municipal waters of Pasay thereby affirming the demarcation of the Pasay municipal waters as set forth in the City Ordinance No 5768.



Annex A: Consolidated Land Form Plan

Figure 5-1: *MOA Consolidated Land Form Plan for Reclamation Projects Of the Cities of Pasay and Manila*

5.4. The Four Major Zones

By delineating the zones, this CSUP provides efficient mechanisms for allocating the City's coastal and municipal waters for appropriate usage based on the suitability of environmental, social and economic conditions, and compatibility to sustainable development objectives and principles, policies and legal requirements.

This zoning presents a framework for resolving multiple-use conflicts, gearing towards best use of the City's coastal area and municipal waters. The zones also provide for a regulatory framework for permitting and prohibiting human activities in accordance with designated use.

For Pasay City, its municipal waters are classified into four major zones:

1. Build-up Area Zone;
2. Water Tourism Zone;
3. Shipping and Navigation Zone; and
4. Other Maritime Use Zone

The four major zones are reflected in the following Spatial Plan.

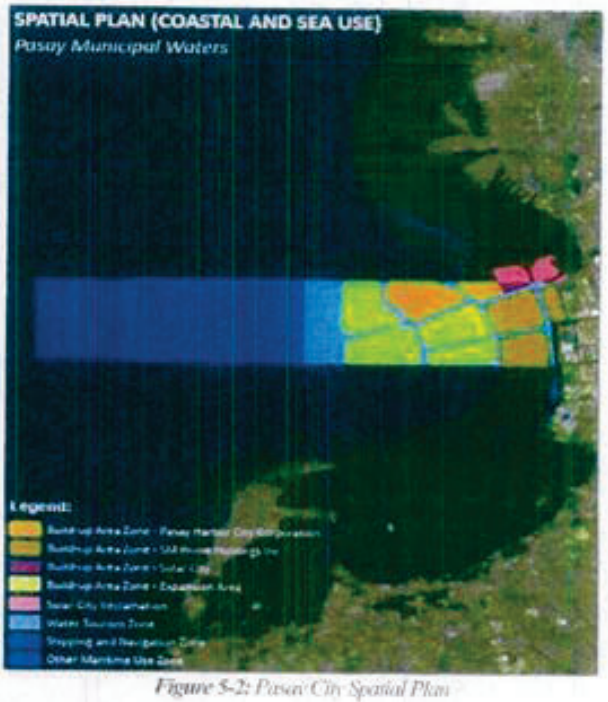


Figure 5-2: Pasay City Spatial Plan

5.4.1 Establishing the Build-up Area Zone

PEMSEA (2003) defines coastal use planning as a "process of comprehensively studying resources, economic activities and societal needs, including problems and opportunities in specific coastal planning areas, or Coastal Areas, and proposing actions for their future development." The City studied its coastal water resources, economic activities, societal needs and problems and opportunities.

In the case of the City, its strategy to establish Build-up Area Zone is a result of maritime research which showed that the coastal and near-shore areas are totally devoid of any living sea grass and corals, and mangrove plants as validated by the composite DENR inspection held last 23 October 2018.



***Figure 5-3**: Composite DENR Inspection Team Deliberation Confirming the Absence of Marine Life in the Coastal and Near-Shore Areas of the Municipal Waters of the City*

As part of the established EIS process, the City also conducted several public consultations which concluded that the best use of its coastal and near shore municipal waters would be for reclamation projects to resolve the problem of land scarcity and maximize economic opportunities. Citing the facts based on studies, consultations, and City records, it shows that:

- The near-shore municipal waters of the City are not suitable for fishing;
- There exist a high level of pollution and accumulated waste within the near-shore municipal waters of the City;
- There is insignificant marine life within the Build-up Area Zone and there are no corals, mangroves, seagrass or other marine habitats in the said zone;
- There are no coastal communities within the City's coastline; and
- There are no records or application of fishers or fisher's organization in the City.

As a result, the coastal and near-shore areas are reserved to be harnessed as Build-up Area Zone for land reclamation as reflected in the Pasay City CLUP.

In 2016, the City Council declared in its Ordinance 5768 that an area equivalent to 600 hectares of the municipal waters of Pasay is open for reclamation. This is in addition to the area covered by pending applications for reclamation with the Philippine Reclamation Authority (PRA). These areas are shown in Figure 5-4.



Figure 5-4: Pasay City CLUP (2016) Proposed Reclamation Sites

This Build-up Area Zone for Proposed Reclamation Projects has been expanded by the City through Ordinance 5973 Series of 2018. An additional area of five hundred fifty (550) hectares has been established as open for reclamation which is particularly described as follows:

Table 5-2: Coordinates of the additional 550 hectare Build-up Area Zone

Corner	Longitude	Latitude
01	120°55'9.16"E	14°33'18.80"N
02	120°55'50.20"E	14°33'18.83"N
03	120°55'50.50"E	14°32'52.75"N
04	120°56'8.04"E	14°32'40.82"N
05	120°56'14.71"E	14°32'33.20"N
06	120°56'20.27"E	14°32'25.69"N
07	120°56'23.04"E	14°32'14.79"N
08	120°56'25.25"E	14°32'5.17"N
09	120°56'26.91"E	14°31'56.09"N
10	120°56'27.50"E	14°31'42.66"N
11	120°55'8.50"E	14°31'42.98"N

5.4.2. Approved Reclamation Projects

The PRA has issued Notice to Proceed (NTP) for the 360-Hectare Reclamation Project in partnership with SM Prime Holdings Inc. and the 265-hectare Pasay Harbor Reclamation Project in partnership with Pasay Harbor City Corporation. Different Government agencies have also issued their respective Letters of No Objection and other clearances for these projects such as the DPWH, BFAR, PCG, DICT, DOE, DOT, NAMRIA, Philippine Navy, PPA, DOH, Regional Development Council, DENR and EMB. These projects are located within the municipal waters of the City under the following coordinates:

Table 5-3: Coordinates of the 360-Hectare SM Reclamation Project based on MOA between Cities of Pasay and Manila

No.	NORTHING	EASTING
SM Project Island A		
SM 5	14°33'22"N	120°58'41"E
SM 6	14°33'16"N	120°58'26"E
SM 7	14°32'37"N	120°58'38"E
SM 8	14°32'41"N	120°58'53"E
SM Project Island B		
SM 1	14°33'14"N	120°58'19"E
SM 2	14°32'53"N	120°57'31"E
SM 3	14°32'22"N	120°57'45"E
SM 4	14°32'33"N	120°58'30"E
SM Project Island C		
SM 9	14°32'15"N	120°57'46"E
SM 10	14°31'48"N	120°57'49"E
SM 11	14°31'49"N	120°58'36"E
SM 12	14°32'15"N	120°58'35"E
SM 13	14°32'23"N	120°58'30"E
SM 14	14°32'24"N	120°58'23"E

Table 5-4: Coordinates of the 265-Hectare Pasay Harbor Reclamation Project Island A based on MOA between Cities of Pasay and Manila

No.	NORTHING	EASTING
Harbor City Project Island A		
HCA 1	14°33'15.08"N	120°55'57"E
HCA 2	14°33'16.42"N	120°55'57.36"E
HCA 3	14°33'17.68"N	120°55'58.44"E
HCA 4	14°33'18.58"N	120°55'59.52"E
HCA 5	14°33'19.26"N	120°56'0.6"E
HCA 6	14°33'19.5"N	120°56'2.04"E
HCA 7	14°33'20.2"N	120°56'39.48"E
HCA 8	14°33'19.94"N	120°56'41.28"E
HCA 9	14°33'18.65"N	120°56'45.96"E
HCA 10	14°33'16.67"N	120°56'51"E
HCA 11	14°33'14.26"N	120°56'56.76"E
HCA 12	14°33'11.41"N	120°57'2.16"E
HCA 13	14°33'9.36"N	120°57'5.76"E
HCA 14	14°33'5.87"N	120°57'10.8"E
HCA 15	14°33'3.85"N	120°57'12.96"E
HCA 16	14°33'3.02"N	120°57'13.68"E
HCA 17	14°33'0.32"N	120°57'13.68"E
HCA 18	14°32'59.57"N	120°57'13.32"E
HCA 19	14°32'58.67"N	120°57'11.88"E
HCA 20	14°32'36.02"N	120°56'26.52"E
HCA 21	14°32'35.88"N	120°56'24.72"E
HCA 22	14°32'35.84"N	120°56'22.56"E
HCA 23	14°32'36.42"N	120°56'21.48"E
HCA 24	14°32'37.54"N	120°56'20.26"E
HCA 25	14°32'39.73"N	120°56'18.24"E
HCA 26	14°32'43.62"N	120°56'15"E
HCA 27	14°32'47.26"N	120°56'11.04"E
HCA 28	14°32'50.32"N	120°56'7.44"E
HCA 29	14°32'52.69"N	120°56'4.2"E
HCA 30	14°32'55"N	120°56'0.6"E
HCA 31	14°32'56.26"N	120°55'58.8"E
HCA 32	14°32'57.44"N	120°55'57.72"E
HCA 33	14°32'58.81"N	120°55'57.36"E
HCA 34	14°32'59.78"N	120°55'57"E

Table 5-5: Coordinates of the 265-Hectare Pasay Harbor Reclamation Project Island B based on MOA between Cities of Pasay and Manila

No.	NORTHING	EASTING
	Harbor City Project Island A	
HCB1	14°33'19.33"N	120°57'46.61"E
HCB2	14°33'8.49"N	120°57'54.18"E
HCB3	14°32'59.60"N	120°57'29.09"E
HCB4	14°33'0.42"N	120°57'27.11"E
HCB5	14°33'1.19"N	120°57'25.53"E
HCB6	14°33'15.53"N	120°57'5.07"E
HCB7	14°33'17.87"N	120°57'4.90"E
HCB8	14°33'19.31"N	120°57'6.19"E

For proper mobility and use of the reclamation areas, the City shall properly regulate, coordinate, and supervise the road networks and land use plan of the projects. The 360-hectare reclamation project has the following proposed road networks and land use plan:



Figure 5-5: SM 360 proposed Road Network and Land Use Plan

The 265-hectare reclamation project on the other land has the following road networks and land use plan:

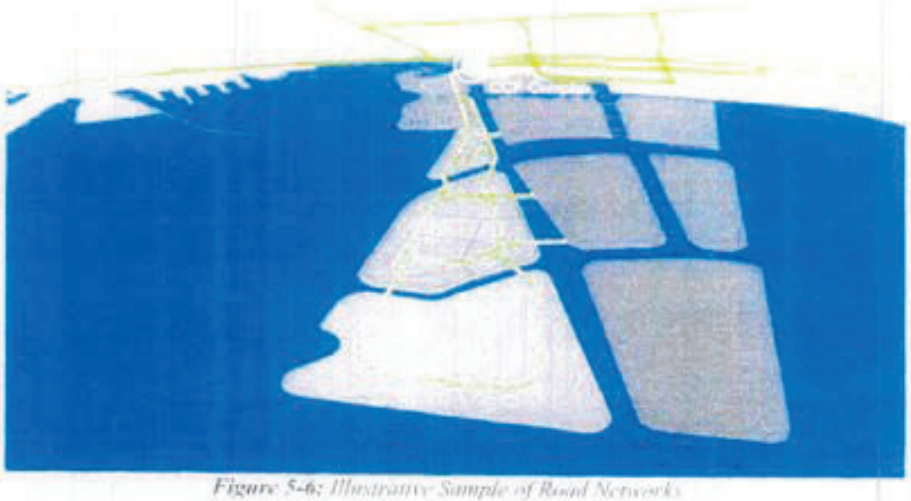


Figure 5-6: Illustrative Sample of Road Networks for 265-hectare Pasay Harbor Reclamation Project

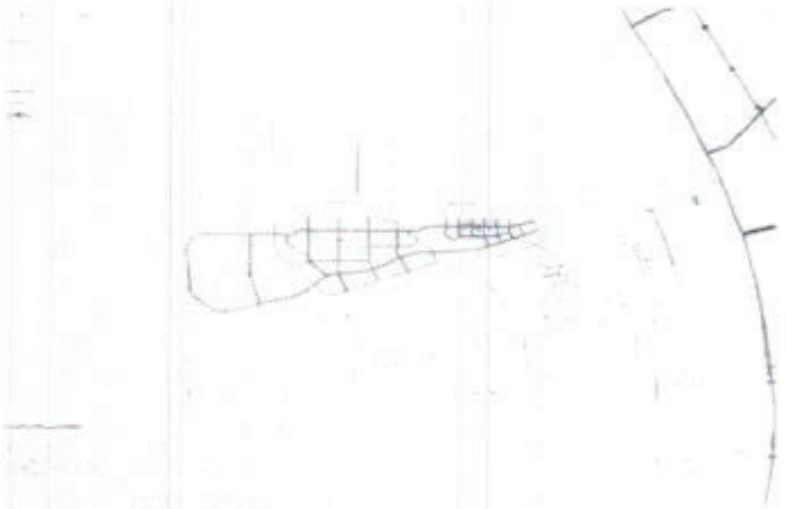


Figure 5-7: Pasay Harbor Reclamation Project with Proposed Road Networks

Table 5-6: Proposed Land Use Plan for Pasay Harbor Reclamation Project

Proposed land use for the 70% Developable Land	265-hectare Pasay Harbor Reclamation Project
Mixed Use Office Commercial	42%
Mixed Use Residential	37%
Mixed Use Resort Hotel	11%
Retail/F&B	6%
Mixed Use Institutional	4%
Total	**100%**

5.4.3. The Solar City Project

In the Memorandum of Agreement between the Cities of Manila and Pasay, it was agreed that a portion of the Solar City Reclamation Project is within the municipal waters of Pasay. As such, both cities have decided that with respect to the Solar City Reclamation Project, the City shall have a corresponding share in the reclaimed land that is within its jurisdiction, provided that such share shall be devoted to public roads, public parks and open spaces consistent with the Land Allocation Plan. This reclamation project has the following coordinates within the municipal waters of the Cities of Manila and Pasay:

Table 5-7: Coordinates of the Solar City Island A Reclamation Project based on MOA between Cities of Pasay and Manila

No.	NORTHING	EASTING
Solar City Island A		
A 1	14°33'21.55''N	120°58'26.31"E
A 2	14°33'27.11''N	120°58'41.15"E
A 3	14°33'22.24''N	120°58'43.16"E
A 4	14°33'29.34''N	120°58'56.25"E
A 5	14°33'40.22''N	120°58'49.83"E
A 6	14°33'40.23''N	120°58'19.56"E
A 7	14°33'39.24''N	120°58'18.70"E
A 8	14°33'37.75''N	120°58'18.43"E
A 9	14°33'22.64''N	120°58'24.36"E
A 10	14°33'21.73''N	120°58'25.13"E

Table 5-8: Coordinates of the Solar City Island B Reclamation Project based on MOA between Cities of Pasay and Manila

No.	NORTHING	EASTING
	Solar City Island B	
B1	14°33'8.49"N	120°57'51.18"E
B2	14°33'1.58"N	120°58'13.98"E
B3	14°33'20.25"N	120°58'15.42"E
B4	14°33'23.37"N	120°58'15.14"E
B5	14°33'37.22"N	120°58'0.47"E
B6	14°33'39.12"N	120°58'0.76"E
B7	14°33'40.06"N	120°58'0.46"E
B8	14°33'43.86"N	120°57'51.11"E
B9	14°33'42.23"N	120°57'29.22"E
B10	14°33'39.97"N	120°57'28.55"E
B11	14°33'09.42"N	120°57'27.99"E
B12	14°33'09.32"N	120°57'16.11"E

5.5. Water Tourism Zone

Complementing the Build-up Area Zone would be the Water Tourism Zone. This zone shall be within the various water channels that separate the islands of the reclamation projects located within the municipal waters of the City.



Figure 5-8: SM Reclamation Project Illustration of Shore Areas

The City is currently considered the country's gateway to the world because of the main international and domestic airport (NAIA) erected within its territory. It also hosts major bus

terminals and land transportation hubs. As such, the City is known as the Travel City. It also has a vibrant entertainment and tourism hub, the nation's cultural complex, and one of the world's largest shopping malls.

Tourism gives water resources great potential as it combines protection of water and respectful use for these attractive locations. This water tourism zone will complement the existing facilities within the City with the vision of harmonizing both urban and nature. Introduction of mangroves, artificial coral reefs and other environmental features shall be included in this zone to mix urban development, tourism and nature. The City's role as transportation hub within Metro Manila will be maximized as tourist will have easy access to a well-developed and master-planned tourism area where water tourism activities can be experienced along the channels of the reclamation sites and the Manila Bay Sunset can be viewed in the coastal areas and water channels that are accessible to the public.

Various water tourism activities can be done through the development of the channels and shorelines of the reclamation islands. Such activities may include, but are not limited to sailing, jet ski, leisure fishing, kayaking and others.



Figure 5-9: *Google Images of Water Tourism Activities*

5.6. Shipping and Navigation Zone

The City's municipal waters are currently being used by sea vessels as part of the sea route accessing the Manila North Harbor and Manila South Harbor. As such, the City recognizes that

portions of its municipal waters shall be dedicated to the safe passage and navigation of these sea vessels. This zone shall be the designated beyond the Build-up Area Zone. It shall cover an area with a safe distance from the other zones identified by the City and shall be consistent with the DENR-EMB approved design of the proposed reclamation projects in Manila Bay as shown in Figure 5-10 where the DENR-EMB identified a safe passage way for sea vessels going to Manila South Harbor in between the New Manila and Horizon Manila Reclamation Projects.

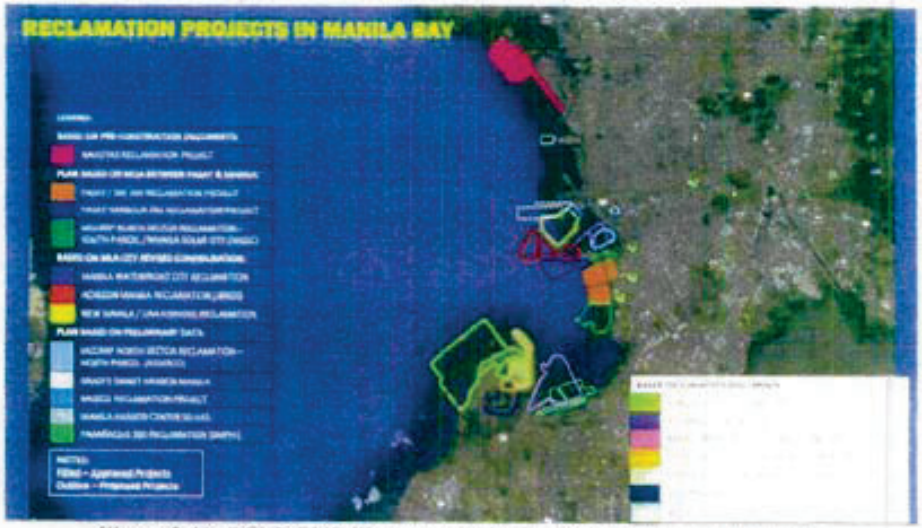


Figure 5-10: DENR-EMB Illustration of Reclamation Projects in Manila Bay

5.7. Other Maritime Zones

Municipal records show that there are no fisherfolk or fishing communities in the City. Studies have indicated that the fishermen are coming from the adjacent province of Cavite, particularly in the cities of Bacoor and Cavite City.



Figure 5-11: Fishing Community in Bacoor Bay

The presence of stationary fishing gears was observed in the outer fringes of the City's municipal waters based on the ocular inspection through different EIS Reports. These fishing gears called "Sapra" or lift nets are lighted at night and lifted every three (3) to four (4) hours for the capture of mostly tilapias, ponyfishes, anchovies, and sardines. The nearest reported fish pens are inside Bacoor Bay and the boundary of Parañaque which are 4-kilometers away from the southern limit of the municipal waters.

According to the regular maritime and Coastal Areas classification as established by the BFAR, the following general zoning classifications can still be designated at the outer fringes of the municipal waters of the City:

- Mari-cultural Zone
- Coral Reef Zone
- Industrial Zone
- Traditional Fishing Zone
- Sanctuary Zone
- Aquaculture Zone

However, these traditional marine and fishery related uses cannot be applied to the near coastal municipal waters of the City since the water quality of the bay near the coastal areas of the City is currently not safe for fishing, mari-culture and other aquaculture activities. There are no coral reefs or significant marine life in this area as well. Accordingly, the other maritime zones, if applicable and found safe, healthy and sustainable can only be established beyond the Build-up Area Zone and the Shipping and Navigation Zone.

VI. MANAGEMENT OF COASTAL AND BUILD-UP ZONE

6.1. Compliance with the Writ of Continuing Mandamus and the Operational Plan for the Manila Bay Coastal Strategy (OPMBCS)

6.1.1. Background of the Writ

On 29 January 1999, a group calling itself the Concerned Residents of Manila Bay filed a complaint (Civil Case No. 1851-99) before the Regional Trial Court (RTC) of Imus, Cavite for the cleanup, rehabilitation, and protection of the Manila Bay. Named as defendants were several government agencies, namely, defendant government agencies (DENR, MMDA, DOH, DepEd, DPWH, DA, DBM, PCG, PNP, DILG, LWUA, PPA). The complaint alleged that the water quality of the Manila Bay had fallen way below the allowable standards set by law, specifically Presidential Decree No. (PD) 1152 or the Philippine Environment Code. This environmental aberration, the complaint stated, stemmed from:

> *x x x [The] reckless, wholesale, accumulated and ongoing acts of omission or commission [of the defendants] resulting in the clear and present danger to public health and in the depletion and contamination of the marine life of Manila Bay, [for which reason] ALL defendants must be held jointly and or solidarily liable and be collectively ordered to clean up Manila Bay and to restore its water quality to class B waters fit for swimming, skin-diving, and other forms of contact recreation.*

The complainants alleged that the continued neglect of the defendant government agencies in abating the pollution of the Manila Bay violated several environmental laws and regulations. They prayed that the defendants be ordered to clean the Manila Bay and submit to the RTC a concerted concrete plan of action for the purpose. On 13 September 2002, finding merit in the complaint, the RTC ordered the government agencies to clean up and rehabilitate Manila Bay.

On appeal, the Court of Appeals sustained the RTC. Ultimately, the case reached the Supreme Court which, in the landmark case entitled *Metropolitan Manila Development Authority v. Concerned Residents of Manila Bay, G.R. Nos. 171947-48, December 18, 2008* (hereinafter, "Mandamus Case"), issued the Writ of Continuing Mandamus to clean up, rehabilitate and preserve Manila Bay.

The dispositive portion of the Supreme Court's Decision reads:

> *"WHEREFORE, judgment is hereby rendered ordering the abovenamed defendant-government agencies to clean up, rehabilitate, and preserve Manila Bay, and **restore and maintain its waters to SB level** (Class B sea waters per Water Classification Tables under DENR Administrative Order No. 34 [1990]) to make them fit for swimming, skin-diving, and other forms of contact recreation."*

6.1.2. Reclamation Project Features in Compliance with the Writ and the OPMBCS

The Supreme Court issued specific orders in the Writ to the concerned government agencies to clean up Manila Bay. The approved reclamation projects of the City are compliant with these specific orders of the Supreme Court as shown in the table below:

Table 6-1: Specific Orders of the Supreme Court and the Comments on its Potential Conflict with Pasay City Reclamation Projects

Specific Orders	Agency Concerned	Comment on Potential Conflict with Pasay City Reclamation Projects
Fully implement the ***Operational Plan for the Manila Bay Coastal Strategy*** for the rehabilitation, restoration, and conservation of the Manila Bay at the earliest possible time.	Department of Environment and Natural Resources (DENR)	No conflict. The ***Operational Plan for the Manila Bay Coastal Strategy*** will be incorporated in the plans for the Pasay Reclamation Projects.
Direct all Local Government Units (LGUs) in Metro Manila, Rizal, Laguna, Cavite, Bulacan, Pampanga, and Bataan to -- a) Inspect all factories, commercial establishments, and private homes along the banks of the major river systems in their respective areas of jurisdiction, such as but not limited to the Pasig-Marikina-San Juan Rivers, the NCR (Parañaque-Zapote, Las Piñas) Rivers, the Navotas-Malabon-Tullahan-Tenejeros Rivers, the Meycauayan-Marilao-Obando (Bulacan) Rivers, the Talisay (Bataan) River, the Imus (Cavite) River, the Laguna De Bay, and other minor rivers and waterways that eventually discharge water into the Manila Bay; and the lands abutting the bay, to determine whether they have wastewater treatment facilities or hygienic septic tanks as prescribed by existing laws, ordinances, and rules and regulations. b) If none be found, these LGUs shall be ordered to require non-complying	Department of Interior and Local Government (DILG)	No conflict. The projects will install liquid waste management system ensuring modern waste retrieval and treatment system. Treatment and disposal of liquid waste at point source will involve collecting liquids of point source origin; directing waste into integrated multiple waste streams facilities or collecting vessels, and application of treatments. Any fluid effluent to be discharged at sea will be monitored and tested before discharging

Specific Orders	Agency Concerned	Comment on Potential Conflict with Pasay City Reclamation Projects
establishments and homes to set up said facilities or septic tanks within a reasonable time to prevent industrial wastes, sewage water, and human wastes from flowing into these rivers, waterways, esteros, and the Manila Bay under pain of closure or imposition of fines and other sanctions.		
Provide, install, operate, and maintain the necessary adequate waste water treatment facilities in Metro Manila, Rizal, and Cavite where needed at the earliest possible time.	Metropolitan Waterworks and Sewerage System (MWSS)	No conflict. During the operations phase, the potential contribution of the project to marine pollution arising from domestic wastewaters of the various locators will be mitigated using an integrated ecological solid waste processing facility, domestic wastewater treatment and sewage facility.
Provide, install, operate, and maintain sewerage and sanitation facilities and the efficient and safe collection, treatment, and disposal of sewage in the provinces of Laguna, Cavite, Bulacan, Pampanga, and Bataan where needed at the earliest possible time.	Local Water Utilities Administration (LWUA) *done through the local water districts and in coordination with the DENR	No conflict. During the operations phase, the potential contribution of the project to marine pollution arising from domestic wastewaters of the various locators will be mitigated using an integrated ecological solid waste processing facility, domestic wastewater treatment and sewage facility.
Improve and restore the marine life of the Manila Bay; assist the LGUs in Metro Manila, Rizal, Cavite, Laguna, Bulacan, Pampanga, and Bataan in developing, using recognized methods, the fisheries and aquatic resources in the Manila Bay.	Department of Agriculture (DA) through the Bureau of Fisheries and Aquatic	No conflict. The reclamation projects of Pasay will cover only a very small part of the Bay. Marine life can still be restored in the

Specific Orders	Agency Concerned	Comment on Potential Conflict with Pasay City Reclamation Projects
	Resources (BFAR)	vast sea waters around the reclaimed land. The total reclamation area of 625 hectares (265 hectares of Pasay Harbor Reclamation Project and 360 hectare of the SM project) – is only 0.31% of the total area of Manila Bay (1,994 square kilometers or 199,400 hectares). There is no significant marine life existing within the location of the reclamation projects. The project proponents have commitments for the rehabilitation and maintenance of mangroves and mudflats as part of the OPMBCS recommendations. These will help in restoring marine life in the area.
Apprehend violators of PD 979, RA 8550, and other existing laws and regulations designed to prevent marine pollution in the Manila Bay.	The Philippine Coast Guard (PCG), and the Philippine National Police (PNP) Maritime Group	No conflict. The projects will be compliant through a multi-party monitoring system with government agencies
Immediately adopt such measures to prevent the discharge and dumping of solid and liquid wastes and other ship-generated wastes into the Manila Bay waters from vessels docked at ports and apprehend the violators.	Philippine Ports Authority (PPA)	No conflict. The process of reclamation will not generate wastewater as domestic effluents on vessels will be collected on board and discharged offshore

Specific Orders	Agency Concerned	Comment on Potential Conflict with Pasay City Reclamation Projects
		through an accredited wastewater treatment facility.
a) Dismantle and remove all structures, constructions, and other encroachments established or built in violation of RA 7279, and other applicable laws along the Pasig-Marikina-San Juan Rivers, the NCR (Parañaque-Zapote, Las Piñas) Rivers, the Navotas-Malabon-Tullahan-Tenejeros Rivers, and connecting waterways and esteros in Metro Manila. b) Establish, operate, and maintain a sanitary landfill, as prescribed by RA 9003, within a period of one (1) year from finality of this Decision. c) Cause the apprehension and filing of the appropriate criminal cases against violators of the respective penal provisions of RA 9003, Sec. 27 of RA 9275 (the Clean Water Act), and other existing laws on pollution.	The Metropolitan Manila Development Authority (MMDA) in coordination with the Department of Public Works and Highways (DPWH), DILG, affected LGUs, PNP Maritime Group, Housing and Urban Development Coordinating Council (HUDCC), and other agencies	No conflict. The projects will not have any effect on illegal structures and is far from rivers and waterway The private sector partners of the City have already committed to support the Manila Bay Rehabilitation by participating in the Adopt a River/Estero Program of the DENR.
Remove and demolish all structures, constructions, and other encroachments built in breach of RA 7279 and other applicable laws along the Meycauayan-Marilao-Obando (Bulacan) Rivers, the Talisay (Batangas) River, the Imus (Cavite) River, the Laguna De Bay, and other rivers, connecting waterways, and *esteros* that discharge wastewater into the Manila Bay.	DPWH	No conflict. The projects will not have any effect on illegal structures and is far from rivers and waterway
Determine if all licensed septic and sludge companies have the proper facilities for the treatment and disposal of fecal sludge and sewage coming from septic tanks; give the companies, if found to be non-complying, a reasonable time within which to set up the	Department of Health (DOH)	No conflict. The Reclamation Projects shall adhere to proper sanitation and waste water treatment requirements.

Specific Orders	Agency Concerned	Comment on Potential Conflict with Pasay City Reclamation Projects
necessary facilities under pain of cancellation of its environmental sanitation clearance.		
Integrate lessons on pollution prevention, waste management, environmental protection, and like subjects in the school curricula of all levels to inculcate in the minds and hearts of students, and through them, their parents and friends, the importance of their duty toward achieving and maintaining a balanced and healthful ecosystem in the Manila Bay and the entire Philippine archipelago.	Department of Education (DepEd)	No conflict. The Projects' ECCs require effective and continuing Information, Education and Communication (IEC) Program to inform and educate all stakeholders on the project's mitigating measures embodied in its EIS and the conditions stipulated in the ECC
Consider incorporating an adequate budget in the General Appropriations Act of 2010 and succeeding years to cover the expenses relating to the cleanup, restoration, and preservation of the water quality of the Manila Bay.	Department of Budget and Management (DBM)	No conflict. In addition, the City of Pasay intends to use at least 25% of income to environmental projects, including the cleanup of Manila Bay. The Reclamation Projects will also have no cost to the government as agreed in the Joint Venture Agreement of Pasay City and its private partner proponents
Submit to the Court a quarterly progressive report of the activities undertaken in accordance with this Decision.	The heads of MMDA, DENR, DepEd, DOH, DA, DPWH, DBM, PCG, PNP Maritime Group, DILG, and also of MWSS, LWUA, and PPA.	No conflict. The projects will be compliant through a multi-party monitoring system with government agencies

The Supreme Court also ordered the concerned government agencies to implement the OPMBCS, with which the approved reclamation projects are compliant, as discussed in the table below:

Table 6-2: OPMBCS Objectives and Compliance of the Pasay Reclamation Projects with these Objectives

2005 OPMBCS	
ISSUE: Partnership and Governance	
OPMBCS Objectives	**Features of the Pasay Reclamation**
Promote public-private sector partnerships with LGUs within the Manila Bay region for necessary development and investment programs.	Compliant Pasay Reclamation Projects are a joint venture between the City Government of Pasay and its private sector partner proponents. These projects will give the City of Pasay billions of revenues with at least 50% of these additional revenues being committed for social services, livelihood, & pro-poor programs
Reduce the illegal settlers, establishments and structures along coast lines.	Compliant There are no communities or settlers in the proposed reclamation areas in Pasay City. All structures and establishments to be put up in the reclaimed lands shall be compliant with local and international standards. In addition, the City is obliged to devote at least 50 percent of its revenues from reclaimed lands to social services, including resettlement or relocation of informal settlers.
Reduce the discharges of raw sewage, septage, and untreated wastewater.	Compliant During the operations phase, the potential contribution of the project to marine pollution arising from domestic wastewaters of the various locators will be mitigated using an integrated ecological solid waste processing facility, domestic wastewater treatment and sewage facility.
Establish integrated solid waste management programs in all Local Government Units (LGUs).	Compliant The projects will adhere to the solid waste management program to be implemented by the LGU of Pasay City. A rigid solid waste management and retrieval system will also be enforced in all aspects of reclamation activity.

2005 OPMBCS	
ISSUE: Partnership and Governance	
OPMBCS Objectives	**Features of the Pasay Reclamation**
	There will be no disposal of wastes at sea both from land-based and shipboard sources. The project proponents are required to comply with the Ecological Solid Waste Management Act (RA 9003). Solid Waste from workers of the project will be closely monitored with disposal of these waste to be transported to Pasay City's dumpsite.
Develop and implement a toxic and hazardous waste management system.	Compliant The reclamation projects will not involve toxic and hazardous wastes.
Stop sea-dumping of sewage, industrial sludge, solid waste, and contaminated dredged materials.	Compliant The reclamation projects will use technology and best practices to minimize and/or eliminate seepage of sludge and dredge materials outside the reclamation areas. These projects will also comply with rules and regulations on the proper disposal of the dredged materials to government approved sites outside of the Bay.
Set-up sustainable institutional arrangements and management programs in all declared Protected Areas (PAs) and Critical Habitats in the Manila Bay Region.	Compliant The reclamation projects are not located in a protected area or critical habitat.
Implement a no net loss policy for existing mangroves, mudflats, shorelines, beaches and sandy shores.	Compliant The reclamation projects are not located within the shallow coastal waters, mangrove areas nor mudflats. In addition, the Pasay City Government intends to have an ordinance mandating to use 25 percent of the of income to be generated from land reclamation projects for environmental purposes, including the cleanup of Manila Bay.

2005 OPMBCS	
ISSUE: Overexploitation of Resources and Degradation of Habitats and Historical, Cultural, Religious, Archeological, and Unique Geological Sites	
OPMBCS Objectives	**Features of the Pasay Reclamation**
Increase the forest cover in the entire Manila Bay watershed area.	Compliant The reclamation projects are not located in a watershed area. Nevertheless, the Reclamation Projects will provide space for mini-forests in the reclaimed land.
Implement a restoration and maintenance program for important cultural, historical, religious and architectural landmarks, archeological, and unique geological sites within the Manila Bay Region.	Compliant The reclamation project will not affect the status of Manila Bay as a historical site nor will it lead to the destruction of Manila Bay. A joint survey with the NHCP or other concerned government agency of the project sites to recover and/or preserve any important cultural, historical or archeological objects can be done.
Increase the productivity of fishery resources within the Manila Bay Region to attain maximum sustainable yield.	Compliant Currently, the location of the reclamation project shows minimal to nil fishing activities. However, the project EIS recommendation that mangroves should be considered to address concerns on storm surges, has the benefit of supporting marine life after reclamation activities are done.
Increase coverage of water supply distribution in areas with unsustainable groundwater extraction to protect aquifers from contamination and salt-water intrusion.	Compliant The location of the reclamation project will not affect aquifers.

6.2. Masterplanned Management of Environmental Hazards

In line with global best practices, the City's approved reclamation projects will entail expert masterplanning and engineering that will create safe and reliable environments designed to withstand natural and man-made hazards.

As part of the approval process, the City's reclamation projects underwent a rigorous ECC review by the DENR, wherein the impact of threats such as land subsidence, liquefaction, soil erosion, earthquakes, flooding, and typhoons were studied. In fact, all hazards and potential adverse effects of reclamation projects were assessed in

the EIS, and the corresponding preventive mechanisms and mitigating measures were identified therein as well. These geological hazards, natural risks, and mitigation measures are summarized below:

Table 6-3: Mitigating Measures for Geological and other Climate Risks

How Reclamation's Risks will be Mitigated and Properly Managed	
Risks	**Mitigation and Safe Management**
Ground-shaking The Philippine Earthquake Model of DOST-PHILVOLCS 2017 shows high risk of ground shaking due to earthquakes.	• Adopt a conservative approach in the structural and foundation design of the structures • Ensure that the foundation design of the structure conforms to the recommendations of the geotechnical and foundation engineer of the project and will take into consideration the potential for ground shaking and liquefaction • Ensure that the building contractor implements the design specification guided by the National Building Code • Use of seismic dampers to the project's multistory structures to absorb seismic waves.
Liquefaction The liquefiable materials exist in project site. Reclamation fill materials are liquefiable.	• Additional drilling works with depth extending into the Guadalupe Tuff layer • Removal of liquefiable/ compressible soil layer prior to reclamation • Providing support to critical and/or strategic structure
Soft sediments Current soft sediments found at the sea bed on site can be subjected to compression/settlement once load is applied	• Use of industry accepted test (e.g., for compression and liquefaction potential) and procedures prior to and after application of remediation measure • Consider lateral pressure and resistance against buckling during earthquake in the design of coastal protection structures
Loose sediments The loose sediments with relatively shallow ground water table may not be able to stand without any slope support for a period of time The safety must be ensured during the foundation excavation	• The use of appropriate excavation support structure. The design of the earth retaining structure should take into account lateral earth pressure, surcharge loads and dynamic thrust in the occurrence of earthquake • The excavation should be designed and supervised by a competent person
Seismic waves The site is within the zone where seismic waves due to earthquake can	• The use of mass dampers may be adopted • Multi-Frequency Quieting Building System (MFQBS) can also be used to increase the shielded range of forcing frequencies for the building

How Reclamation's Risks will be Mitigated and Properly Managed	
Risks	**Mitigation and Safe Management**
make a building sway depending on the frequency and direction of ground motion, and the height and construction of the building	
Faults Fault rupture and creep commonly occur on pre-existing fault lines	• No active fault is known to exist in the vicinity of the project site (PHIVOLCS)
Flooding Portions of the reclamation areas may be flooded due to surface runoff induced by the intense rainfall and run-up of waves impacting the seawall during storms. The flood may have been initiated by a combination of reason such as: a) Partially blocked drainage lines b) Inadequate drainage systems c) Backflow of seawater	• The impact of flooding cannot be avoided but can be reduced by raising the elevation of the main structures above the highest anticipated flood level in the area. This will also help raise the discharge elevation of drainage rom the project site towards Manila Bay. The raised elevation will also negate the possibility of backflow of seawater from Manila Bay when storm waves coincide with High tide • Factor in the effect of sea level rise and intense rainfall due to climate change in the drainage design
Storm surges Manila Bay experienced 7 storm surges between 1909 and 1972. Storm Surge occurrence may increase due to intensification and frequency of typhoons due to climate change.	Anticipate and incorporate the anticipated height of sea level in the reclamation plan/design. Consider the occurrence of highest tide level and storm wave height as the sea level rises in the reclamation design • Consider the introduction of mangroves as part of coastal defense strategy.
Tsunami A tsunami might occur within Manila Bay	• Design of the structures of the project can take into consideration not only the high waves brought by the storm surge (relatively more frequent) but also the possibility of occurrence of tsunami

6.3. Coastal Management

The City's current shoreline, measuring approximately three (3) kilometers along Manila Bay, is reclaimed land on which iconic structures such as the Cultural Center of the Philippines and the SM Mall of Asia stand.

Having been reclaimed, the shoreline was deliberately engineered to serve as protection against erosion and natural threats from the Bay, such as flooding caused by storm surges. Such protection was realized by way of containment walls (also called seawalls) which rise several meters above the mean lower low water level (MLLW) and are buttressed by sturdy boulders or armor rocks.

The City's proposed reclamation project in partnership with SM Prime Holdings, Inc., for instance, has the following major design features:

A. Dredging and reclamation of land with an area of no less than 360 hectares composed of 3 islands;
B. Finished platform with a uniform elevation of +4.0 meters above MLLW;
C. Containment wall to be constructed around the entire reclaimed area consisting of a combination of rock mound and concrete deflector wall rising 1.5 meters above the platform level;
D. Fast-tracked consolidation and compilation of thirty percent (30%) of the total reclaimed area with an approximate area of 1,080,000 square meters allocated for roads, drainage, and utility distribution lines through surcharging and installation of wick drains;
E. Horizontal site development works covering the entire reclamation area, consisting of the construction of major road networks, road markings, traffic signaling systems at major intersections, traffic signage, sidewalks, street lighting, underground ducts/conduit for utilities (i.e. telephone and power lines), water reticulation system with water distribution, storm water and wastewater collection systems, and landscaping of areas designed as open parks and public spaces; and
F. Allocation and provision of an average of a 200-meter wide channel along the entire length of the reclaimed area to separate the project area from the existing shoreline for the unimpeded flow of run-off surface water to existing tributaries from the built-up areas and draining into Manila Bay.

The City has substantially similar design features in its proposed project with Pasay Harbor City Corporation, which will involve the reclamation of an area of 265 hectares composed of 2 islands. The City will require the same features from Manila Goldcoast Development Corporation, with respect to such portions of its Manila Bay reclamation project which fall within the City's municipal waters.

6.4. Water Quality and Promotion of Biological Resources

This CSUP takes into consideration the biological status of the City's municipal waters, which presently has no watershed reserves, wildlife preserves, sanctuaries, or other environmentally-critical areas. Neither is there any significant population of fish in the near-shore areas, nor are there coral reefs, seagrass beds, mudflats, or mangroves that can support marine life, which is the result of severe water pollution and unbridled urban development.

In this regard, the City's planned reclamation projects will put into place new shorelines and eco-friendly water channels (featuring the latest technological advances) designed to regenerate marine life and prevent the build-up of coliform through the introduction of mangroves, artificial corals, and fish restocking programs.

The City will also continue cooperating with all concerned government agencies in fulfilling the Supreme Court's directive for the restoration and maintenance of Manila Bay's waters to Class SB. Class SB's beneficial uses are as follows:

A. Recreational Water Class 1: areas regularly used by the public for bathing, swimming, skin diving, etc.; and
B. Fishery Water Class 3: spawning areas for Chanos chanos or "Bangus" and similar species.

While the ultimate goal of the City is to achieve Class SB rating with fish restocking and spawning grounds in the mangrove areas, commercial fishing will not be permitted. Consistent with the City's development plans for the area, the unreclaimed portions of its municipal waters will be best allocated with navigational routes and/or shipping operations.

6.5. Sustainability

Studies have shown that a heavy concentration of silt has clouded the waters beneath the surface of Manila Bay, as domestic garbage, toxic industrial waste, and sediments contaminated by heavy metals and pesticides have accumulated at the bottom. The proponents of the Manila Bay Coastal Strategy have determined that for decades, inadequate solid waste management across Metro Manila has allowed domestic (including sewage), commercial, and industrial waste to enter the Bay directly or via river and drainage systems to contaminate the sediments or pile up on the seabed, thus, transforming the Bay into the "toilet bowl of Metro Manila." Domestic waste accounts for 83 to 90 percent of the pollution sources.

These pollutants have affected the quality and quantity of the community of organisms that live on, in, or near the seabed. Some of the materials emitted by these industrial wastes and sewage wastes contain toxic materials like mercury, cryolite, and DDT. The silt in the waters and the solid wastes at the bottom impair the ecosystems, blanket habitats and pose public health risks. Marine creatures and plants bear the brunt of the harmful substances in the dumped materials.

To remove the thousands, if not millions, of tons of toxic waste and silt in Manila Bay will require massive dredging, as the DPWH's initial operations in the clean-up of Manila Bay have already shown. Dredging is the removal of sediments and debris from the bottom of lakes, rivers, harbors, and other bodies of water. It is a necessary routine in waterways around the world because sedimentation—the natural process of sand and silt washing downstream—gradually fills channels and harbors.

Dredging is also performed to reduce the exposure of fish, wildlife, and people to contaminants and to prevent the spread of contaminants to other areas of the water body. This environmental dredging is often necessary because sediments in and around cities and industrial areas are frequently contaminated with a variety of pollutants. These pollutants are introduced to waterways from point sources such as sewer overflows, municipal and industrial discharges, and spills; or may be introduced from nonpoint sources such as surface runoff.

In this regard, the City has plans to remove these waste materials found in its near-shore municipal waters through complementary reclamation projects that entail the massive removal of accumulated wastes from the bottom of Manila Bay and their disposal at a government-approved site outside the bay zone. Indeed, these projects will dredge out thousands if not millions of metric tons of wastes from the seabed, and improve its overall water quality and marine life, at zero financial cost to the government. In this way, these projects will hasten the Manila Bay cleanup.

According to the DENR approved EIS reports of reclamation projects of the City, reclamation starts with the removal of deposited silt, garbage, and scraps from the sea bed. Dredging and desilting will take out layers of stored up mud and pollutants, including household wastes like sludge and plastics, industrial wastes, heavy metals and non-biodegradable substances. The elimination of these pollutants on such a massive scale will immediately improve the overall water quality of Manila Bay. Dredging will reduce the exposure of fish, wildlife, and people in Manila Bay to contaminants, and prevent the spread of contaminants to other areas of the bay. Overall, these projects will translate to a net positive impact to existing water quality and the environment.

6.5.1. Undertakings of Private Sector Partners

The City's private sector partners have already undertaken to support the on-going Manila Bay Rehabilitation of the government. SM Prime Holdings, Inc. has executed a Memorandum of Understanding with the DEN R for the "Adopt a River/Estero" Program.



Figure 6-1: SM for the Bay Clean-up Activity

Under this program, SM Prime Holdings, Inc. will support the clean-up of Estero de Tripa de Gallina and the Parañaque River by:

A. Improving water quality suitable for the agreed water standards set;
B. Cleaning up of solid wastes and floating debris;
C. Pursuing physical improvements and other measures, consistent with the efforts for a sustainable and continuous rehabilitation, to improve water flow, including but not limited to measures such as greening, and establishment of linear parks;
D. Decongesting the adopted sites of garbage through immediate surface clean-up and engineering solutions such as installation of trash traps, and other similar measures;
E. Assisting the City Governments in the community mobilization activities of the DENR, for all the local government units traversing the Waterways, to foster harmonious relations with, and solicit community participation, cooperation and support for the Program; and
F. Ensuring the provision of support needed to the identified areas and components of the program including IEC materials.

Pasay Harbor City Corporation has expressed that it will likewise support the Manila Bay clean-up efforts in partnership with the City.

6.5.2 Commitments of the City

The City has committed, along with its private sector partners Pasay Harbor City Corporation and SM Prime Holdings, Inc., to undertake dredging and desilting operations in the offshore areas of SM Mall of Asia and the Cultural Center of the Philippines Complex in support of the DENR Manila Bay Clean-up and Rehabilitation Program. These dredging and desilting operations seek to remove tons of domestic, commercial and industrial waste materials that have accumulated at the bottom of the Bay.

The City will also devote 25% of public revenues generated from the reclamation projects to continuing Manila Bay clean-up efforts and other environmental protection projects. Such environmental protection projects include the proper disposal and treatment of wastes coming from land-based sources and activities.

6.5.3 Consistency with the Comprehensive Land Use Plan

The City's approved reclamation projects will have the benefit of being masterplanned in consonance with the City's CLUP and prevailing principles of sustainable development, thus avoiding urban planning mistakes of the past. The City's coastal and sea assets will be developed in accordance with the following guidelines:

A. To ensure compliance with environmental laws, rules, and regulations, all reclamation works and horizontal development within the designated areas for reclamation shall be consistent with the Writ of Continuing Mandamus issued by the Supreme Court for the clean-up of Manila Bay and the OPMBCS;

B. To ensure efficient water circulation and improvement of marine life, all reclamation projects shall establish a navigable water channel with appropriate mangroves and/or artificial coral reefs;

C. To ensure mobility and accessibility to and from the reclamation projects within the City, the horizontal reclamation development shall be required to comply with the following design and construction guidelines:

   i. All offshore or island development shall be interconnected to each other with a minimum of two (2) bridges with four (4) lanes each;
   ii. Total road and open spaces should not be less than thirty percent (30%) of the gross reclaimed land; and
   iii. Interconnecting main arterial roads shall be established within the island reclamations of at least six (6) lanes wide, which shall be connected to the main access roads to the existing reclamation areas (EDSA Extension and Jose W. Diokno Boulevard in the CCP Complex).

D. To avoid degradation of water quality and marine life, all reclamation projects shall have proper drainage, sewerage, and wastewater treatment facilities per island.

The projects will also adopt an eco-friendly design by incorporating elements such as mini-forests and mangroves, as well as environmentally-crucial assets such as state-of-the-art waste treatment facilities.

CONCLUSION

The City is adopting this CSUP in order to establish a strategic framework for the development of its coastal and sea assets by promoting the best economic use available. As part of a broader socioeconomic program, this CSUP is consistent with and partly dependent on the City's CLUP.

The CSUP is designed to rationalize the City's growth and will promote sustainable masterplanning in its continuing urban development, for the benefit of its constituents. In brief, it delineates four (4) zones within the City's municipal waters, namely: (1) the Build-Up Area Zone; (2) the Water Tourism Zone; (3) the Shipping and Navigation Zone; and (4) other Maritime Zones.

To ensure the sustainable development of these zones, the CSUP is consistent with the Manila Bay Coastal Strategy, as well as the OPMBCS, and compliant with the Supreme Court's Writ of Continuing Mandamus. It also involves a masterplanned management of environmental hazards and coastal management policies, strategies for the improvement of water quality and promotion of biological resources, and commitments and undertakings on the part of both the City as well as its private sector partners in the approved reclamation projects in line with the government's drive to clean up Manila Bay.

Ultimately, this CSUP will be a pivotal tool in the City's continued socioeconomic growth and development, consistent with environmental, eco-friendly, and sustainability principles.

ENVIRONMENTAL MANAGEMENT BUREAU

ACKNOWLEDGEMENT RECEIPT

September 09, 2020

Greetings!

This is to Acknowledge Receipt of your COMMUNICATION with the subject : LETTER DTD 01 SEPTEMBER 2020 RE: THE SOCIAL DEVELOPMENT PROGRAM/IEE (SDP) FOR THE PASAY 360 HECTARE RECLAMATION PROJECT, CITY PASAY, submitted on September 08, 2020, 1:22pm.

Your transaction has been tagged as RS No. CO-2020-09-25735 with Complaint ID EMB-08-R-2009162620-256179. For follow-ups, you may provide the given details.

For further inquiries, you may contact our designated EMB Office in your area from Monday to Friday, 8:00 a.m. to 5:00 p.m. office hours, or email us at recordsunit@emb.gov.ph.

Please be guided accordingly.

Thank you.

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

3 September 2020

Engineer William P. Cunado
Director
Environmental Management Bureau – Central Office
DENR Compound, Visayas Avenue
Quezon City

Subject: **The Social Development Programme (SDP) for the Pasay 360 Hectare Reclamation Project**

Dear **Engineer Cunado**

We are pleased to submit herewith the updated and continuing Social Development Programme (SDP) for the above captioned Reclamation Project granted under **ECC No. ECC – CO-1601-0003**.

We trust that this submission merits your favorable consideration.

For purposes of communications, we have authorized Technotrix Integrated Services Corp. represented by Dr. Ragacho G. Alabastro and Ms. Hazel A. Victoriano to make additional submittals of documents and liaise with your office on this matter.

Thank you.

Very truly yours,

IMELDA CALIXTO-RUBIANO
City Mayor

The Pasay City 360-Hectare Reclamation Project
ECC –CO-1601-0003

ECC Compliances – Social Development Programme (SDP)
29 August 2020

The more detailed and updated Social Development Programme (SDP) is hereunder discussed.

Framework

1.0 The guidelines under Annex 2-18 of the Revised Procedural Manual (RPM) for DAO 2003-30 as originally reflected in the EIS Report are observed.

2.0 The Comprehensive Land Use Plan (CLUP) of the City provides vital inputs to the SDP which are thus integrated in this SDP.

3.0 The major results of the "Public Participation" activities such as the IEC Program, the Public Scoping and the Public Hearing are reflected.

4.0 The SDP is a continuing process commencing from the Pre-Construction through the completion of the Construction Phases. The Construction Phase is defined as the activities through the completion of the horizontal developments, i.e. the "Operations Phase" is distinct and separate.

5.0 In consideration that there are other reclamation projects under the same Proponent, i.e. the City Government of Pasay a holistic SDP shall be evolved.

Table 1 is the summary table of the general SDP based on the format of the Revised Procedural Manual.
Table 2 shows more specific programs.

Table 1 Summary Matrix of the Social Development Programme (SDP)

CONCERN	Community Member / Beneficiary	Government Agency/ Non-government Agency and Services	PROPONENT	Indicative Timeline	Source of fund
HEALTH					
1. Medical missions and emergency relief programs	• Barangay Chairman • Barangay Kagawad for Health • Barangay Health Workers (BHWs) • Residents of Brgy 76 Zone 10	Local Government Unit (LGU) • Pasay City Health Office • Barangay Health Unit	City Health Office (CHO)/ Community Relations Officer (CRO)	-Operation	Private Partner LGU Funds e.g. IRA
2. Medical assistance	• Barangay Chairman • Barangay Kagawad for Health • Barangay Health Workers (BHWs) • Residents of Brgy 76 Zone 10	Local Government Unit (LGU) • Pasay City Health Office • Barangay Health Unit	CHO / CRO	-Operation	Private Partner LGU Funds e.g. IRA
3. Healthcare facilities and services	• Barangay Chairman • Barangay Kagawad for Health • Barangay Health Workers (BHWs) • Residents of Brgy 76 Zone 10	Local Government Unit (LGU) • Pasay City Health Office • Barangay Health Unit	CHO / CRO	-Construction -Operation	Private Partner LGU Funds e.g. IRA
HOUSING / URBAN SETTLEMENT					
4. Financial assistance to barangays and to victims of fire and other calamities	• Barangay Chairman • Residents of Brgy 76 Zone 10) • Social Welfare Office	• Social Welfare Office • Barangay 76 Zone 10	Social Welfare Office	-Construction	Private Partner LGU Funds e.g. IRA
5. Balik-probinsya program	• Barangay Chairman • Residents of Brgy 76 Zone 10 • Social Welfare Office	• CPDC • City Engineering • Barangay	CDPO	Operations Phase	Private Partner LGU Funds e.g. IRA
EDUCATION					
6. School facilities and services	• Barangay Kagawad for Education • Teacher and/or Principal	• DepEd • Barangay	Council member for Education / CRO	Pre-construction -Construction -Operation	Private Partner LGU Funds e.g. IRA
7. Educational assistance	• Barangay Kagawad for Education • PTA • Qualified Students of Brgy 76 Zone 10	• Dep Ed • Barangay	Council member for education / CRO	-Pre-construction -Construction -Operation	Private Partner LGU Funds e.g. IRA
EMPLOYMENT AND LIVELIHOOD					
8. Social pension and senior citizen's welfare	• Qualified Students of Brgy 76 Zone 10	• City LGU • CSWD • Barangay	City of Pasay	Pre-Construction Construction Operation	Private Partner LGU Funds e.g. IRA

CONCERN	Community Member / Beneficiary	Government Agency/ Non-government Agency and Services	PROPONENT	Indicative Timeline	Source of fund
9 Cash gifts and financial and emergency relief assistance	• Qualified Students of Brgy 76 Zone 10	• City LGU • CSWD	City of Pasay	Pre-Construction Construction Operation	Private Partner LGU Funds e.g. IRA
10 Livelihood programs	• Qualified Students of Brgy 76 Zone 10	• CPDO • City LGU • Barangays • TESDA	City of Pasay	Pre-Construction Construction Operation	Private Partner LGU Funds e.g. IRA
SPIRITUAL					
11 Assistance to the Church	• Representative from different religious groups	• Parish Priest • Religious Sector	CROs	Pre-Construction Construction Operation	Private Partner LGU funds e.g. IRA

Table 2. Programs and Project That Benefits Pasayeños

A. Programs and Projects That Benefits Pasayeños Who are 0 to 2 Years Old	
Programs Projects	**Relevance / Responsiveness to Community Needs**
MATERNAL NEWBORN AND CHILD HEALTH Training of Barangay Nutrition Scholars (BNS) on Infant and Young Child Feeding (Pagsasanay ng Gumagabay sa Tamang Pagpapasuso) **Communication for Behavioral Impact** – Breast feeding TSEK! - It is a DOH campaign on executive breastfeeding implemented in the City. This activity aims to establish and sustain a supportive environmental for mothers to exclusively breastfeed their babies for at least six months. **Training on Community Health Team (CHT)** – This is conducted to enhance the knowledge and skills of the identified CHT members in effectively and efficiently performing the functions as transformers of health needs as first links of family to health service delivery and referrals, and as facilitators in enrolling and availing Phil health benefit packages of families especially the poor.	The City targets a "zero" mortality rate among children The programs aim to respond to inadequate safe motherhood services. It includes provision of equipment and drugs, training and supervision, IEC, etc.
NUTRITION EDUCATION **Cooking Demonstrations / Livelihood Seminars** among mothers with underweight and severely underweight preschool children. **Promotion of Nutritional Guidelines for Filipinos** through community assemblies and dialogues. **Infant and Young Child Feeding Counselling** among pregnant women and lactating mothers. **Conduct of Pabasa sa Nutrisyon** (Nutrition Education classes among Mothers)	These programs aim to: 1) improve nutritional status of children by transforming locally available products into low cost nutrient-dense food, 2) improve household income by training mothers for alternative income-generating activities, and 3) increase and strengthen women's participation in general health and nutritional status improvement
LIGTAS TIGDAS AND PASAY INTEGRATED MANAGEMENT OF CHILD IMMUNIZATION This initiative is a measles-rubella supplemental immunization intended for children 9 to 95 months. This includes monitoring and registration of birth and completion of immunization series for the prevention of TB, pertussis, neonatal tetanus, measles, poliomyelitis, hepatitis B, etc.	The city targets a "zero" mortality rate among children The programs aim to respond to inadequate safe motherhood services. Those include provision of equipment and drugs, training and supervision, IEC, etc.

Programs and Project That Benefits Pasayeños

B. Programs and Projects That Benefits Pasayeños Who are 3 to 5 Years Old	
Programs Projects	**Relevance / Responsiveness to Community Needs**
EARLY CHILDHOOD EDUCATION	This ensures that all children aged four and five years old are enrolled in any pre-school class and provided with free tuition and materials.

B. Programs and Projects That Benefits Pasayenos Who are 3 to 5 Years Old	
Programs Projects	Relevance / Responsiveness to Community Needs
	Given that Kindergarten for five years old children in elementary schools is now mandatory, the City believes in intensifying Early Childhood Education which will help children succeed in Kindergarten

Programs and Project That Benefits Pasayeños

C. Programs and Projects That Benefits Pasayeños Who are 6 to 17 Years Old	
Programs Projects	Relevance / Responsiveness to Community Needs
E-LEARNING PROGRAM	A City-based initiative of Pasay that gives impetus on information technology and enhancement of the skills in the prescribed curriculum for public academic institutions.
REMEDIAL READING PROGRAM	This program is implemented in all elementary schools in Pasay which caters to and purports to improve the reading competencies of 1,450 learners in all grade levels who are diagnosed as non/slow readers
PARA SA'YO BATANG PASAY	This is an initiative of the Pasay City Health Office to guide the youth and prevent teenage pregnancies. Part of the program is the establishment of Counselling Centers for youth. Fertility Awareness and Protected Sex lectures are also given to public elementary and high schools in Malibay.
LITERACY FOR DIFFERENTLY-ABLED PERSONS	The City recognizes the role and contribution of persons with disability in our society. In doing so, the City support special schools (Pasay SPED Center, School for the Blind, School for the Deaf) in providing programs and activities designed to meet full potential of PWDs with the end goal of maximizing their capacity to contribute to nation building.
FINANCIAL ASSISTANCE PROGRAM FOR SECONDARY STUDENTS, ALS AND SPED LEARNERS	The City targets a 100% attendance for students in the secondary level, ALS and SPED programs. This initiative aims to increase participation rate and completion rate in the secondary level.
EDUCATIONAL ASSISTANCE FOR STREET CHILDREN AND CHILD LABORERS	The objective of the program is to bring street children back to the schools. Educational Assistance in the form of cash and supplies that are provided to the children are also the target of ALS/Livelihood activities.
PROGRAM FOR CHILDREN IN CONFLICT WITH LAW	This program provides basic business management skills, skills development and capital assistance for CICL and Pasay City Youth Home.
PASAY HOPES	The programs implements behaviour intervention that seeks to change the knowledge, skills and attitude of adolescents to directly address the prevention of increasing HIV prevalence and apply structural interventions. This also addresses broader societal issues that serve as either risk or protective factors of reproductive health towards decreasing vulnerability to the risk behaviours.
TRAVEL CITY SCHOLARS (for students in private school)	The project aims to support parents who are striving hard to send their children to private schools. Php 4,000 is granted to qualified high school and college students currently enrolled in private schools.
PAMANTASAN NG LUNGSOD NG PASAY	This is the City's response to the national challenge of increasing number of students who enter tertiary level.

Programs and Project That Benefits Pasayenos

D. Programs and Projects That Benefits Pasayenos Who are 18 Years Old and Above	
Programs Projects	Relevance / Responsiveness to Community Needs
PASAY CITY BAYANIHAN BANKING PROGRAM	This is the City's pooled savings/micro finance/cooperative development program for the urban poor, depressed barangays, woman and their families. Its mission is to establish a uniform and compatible savings-based financial intermediation system among the urban poor in the economic and social development of their community.
PASAY CITY PUBLIC EMPLOYMENT SERVICES	The Pasay City Public Employment Services Office (PESO) has been conducting livelihood trainings and seminars, and life skills trainings which include world class animation training.
PEACE AND ORDDER AND ANTI-DRUG ABUSE PROGRAM	The program response for the realization of the City's target of a lesser or zero crime in all of its 201 barangays.
LIAISON SERVICES FOR SENIOR CITIZENS	This involves some livelihood, special education and trainings. This program assists them to sustain their productivity in order to help their families and communities.
LIBRENG SECURITY GUARD TRAINING, PATI LISENSYA SAGOT NA DIN!	This program is the City's response to the security needs of public schools, hospitals and offices. Over 4,000 guards have been hired by various companies.
SPORTS CLINIC	This project helps the schools produce winner-athletes in all sport competitions/athletic meets.

APPENDIX M.2

DRAFT FINAL STRATEGIC IEC PLAN FOR PASAY RECLAMATION PROJECTS



ENVIRONMENTAL and COASTAL STUDIES for PASAY RECLAMATION PROJECTS

DRAFT FINAL STRATEGIC IEC PLAN FOR PASAY RECLAMATION PROJECTS

August 2022













REVISION HISTORY

Revision No.	Date	Comments	Authorization		
			Originated by	Checked by	Approved by
1		Drafting of Report	Maricel Badilla/ Lourdes Caballero	Len Garces	Maricel Badilla
2	17 Mar 2022	Formatting	Karen Claire Eda	Paolo Gutierrez	Lourdes Caballero
3	18 Mar 2022	Final review and editing	Paolo Gutierrez	Maricel Badilla	Lourdes Caballero
4	21 Mar 2022	Formatting	Paolo Gutierrez	Lourdes Caballero	Len Garces
5	07 Jun 2022	Revision	Maricel Badilla	Lourdes Caballero	Maricel Badilla
6	10 Jun 2022	Finalization and Formatting	Karen Claire Eda	Lourdes Caballero	Len Garces
7	28 Jul 2022	Revision	Maricel Badilla	Karen Claire Eda	Lourdes Caballero
8	10 Aug 2022	Revision	Maricel Badilla	Lourdes Caballero	Lourdes Caballero
9	12 Aug 2022	Finalization and Formatting	Karen Claire Eda	Karen Claire Eda	Lourdes Caballero

CONDUCT OF ENVIRONMENTAL AND COASTAL STUDIES FOR THE PASAY RECLAMATION PROJECTS

DRAFT FINAL STRATEGIC IEC PLAN

August 2022

TABLE OF CONTENTS

List of Tables ii
List of Figures ii
List of Abbreviations iii

I. INTRODUCTION 1

A. Background of the Plan 1
B. Proponent 1
C. Join Venture Partners 1
D. Importance of an IEC Plan 1

II. KEY GOAL 2

III. OBJECTIVES 2

IV. METHODOLOGY 2

V. TARGET AUDIENCE 3

VI. KEY ISSUES, MESSAGES, AND PROJECT BENEFITS 5

VII. INTEGRATED COMMUNICATION PLAN 35

A. Communication Principles 35
B. Communication Strategy 35
C. IEC Plan, Timeline, and Cost 37

VIII. PROPOSED ORGANIZATIONAL STRUCTURE OF COMMUNICATION TEAM 39

IX. MONITORING AND EVALUATION 40

X. THE WAY FORWARD – RECOMMENDATIONS 41

References 42

LIST OF TABLES

Number	Title	Page
1	Audience of the Information, Education, and Communication Plan	4
2	Description of Potential Benefits/Features and Key Messages	7
3	Description of Issues and Key Messages	24
4	Phasing of the Communication Strategy	37
5	Summary of the IEC Strategy	38
6	Monitoring and Evaluation Matrix by Phase	40

LIST OF FIGURES

Number	Title	Page
1	Catchphrase for the IEC Campaig	5
2	Sample of Creative Rendition	37
3	Template of Social Media Posts	37
4	Proposed Organizational Structure	39

LIST OF ABBREVIATIONS

CCP	Cultural Center of the Philippines
CJVA	Contractual Joint Venture Agreement
COVID-19	Coronavirus Disease 2019
DENR	Department of Environment and Natural Resources
ECC	Environmental Compliance Certificate
EIS	Environmental Impact Statement
EMB	Environmental Management Bureau
EPC	Engineering, Procurement, and Construction
FGD	focus group discussions
HLURB	Housing and Land Use Regulatory Board
IEC	information, education, and communication
LGU	local government unit
LLPCHEA	Las Piñas-Parañaque Critical Habitat and Ecotourism Area
LONO	Letters of No Objection
LPPWP	Las Piñas-Parañaque Wetland Park
MOA	Mall of Asia
NCCA	National Commission for the Culture and the Arts
NFRDI	National Fisheries Research and Development Institute
NGO	non-government organization
NHCP	National Historical Commission of the Philippines
OPMBCS	Operational Plan for the Manila Bay Coastal Strategy
PHCC	Pasay Harbor City Corporation
PPP	Public-Private Partnership
SC	Supreme Court
SM SCIDC	SM Smart City Infrastructure Development Corporation

I. INTRODUCTION

A. Background of the Plan

1. The strategic information, education, and communication (IEC) plan is one of the deliverables of the PLANADES and PRIMEX consulting team for the Environmental and Coastal Studies for Pasay Reclamation Projects. The IEC plan and the other additional studies aim to guide the proponent, the Pasay City Local Government Unit (LGU), with SM City Infrastructure Development Corporation (SM SCIDC) and the Pasay Harbor City Corporation (PHCC) as their joint venture partners, in complying with the conditions set forth in the Environmental Compliance Certificate (ECC) for the Pasay 360 and Pasay 265 reclamation projects. All outputs also aim to contribute to the realization of the first eco-city towards the grand vision of Pasay City LGU.

2. The development and conduct of an effective IEC plan are vital due to the perceived and predicted adverse impacts of the reclamation projects to community health and environment welfare on Pasay City waters. With the Supreme Court Mandamus, citizens are now more aware of the importance of Manila Bay as a natural resource and the role of the state and private entities to clean up, rehabilitate, and preserve it. Given the heightened social and environmental consciousness and the legal mandate, the proponents need to work closely to prepare an IEC plan that will educate and galvanize stakeholder support.

B. Proponent

3. The Pasay City local government unit is the main proponent for this coastal development pursuant to its vision of becoming the first eco-city in the Philippines. The project is envisioned to create positive benefits for the City. As premier coastal development projects, these will create more opportunities for development and progress beneficial for all stakeholders.

C. Join Venture Partners

Pasay City–SM 360 Hectares (SM-360)

4. SM SCIDC is a wholly owned subsidiary of SM Prime Holdings Inc., one of the largest integrated property developers in Asia. A responsible developer, growth catalyst, and socially responsible servant to the ever-changing needs and aspirations of the Filipino communities, SM Prime serves so every member can live a fun-filled, secure, and sustainably-inspired quality of life. It remains committed to being the most environmentally-conscious and sustainable developer in the country.

Pasay City–Pasay Harbor City 265 Hectares (PHC-265)

5. PHCC, a subsidiary of Ulticon Builders Inc., is one of the LGU's private joint venture partners. PHCC submitted an unsolicited proposal to develop a portion of Manila Bay within Pasay City's municipal waters. In undertaking the project, PHCC aims to transform into reality Pasay City's vision of a sustainable, eco-friendly, and world-class metropolis that will help promote the quality of life of its people.

D. Importance of an IEC Plan

6. A communication plan is a tool used by organizations to come up with a well-thought-out strategy to communicate the benefits of the Coastal Ecosystem Management Project. An IEC plan (also referred to as a communication campaign) helps outline the goals, target audience, key messages, tactical action plans, and timetable of the organization. An IEC plan can be well-coordinated using a framework that everyone in the organization buys into.

II. KEY GOAL

7. The terms of reference of the IEC component seeks to undertake an effective and continuing IEC plan to inform and educate all stakeholders, especially local residents, employees of commercial and government establishments within the site and vicinity, on the project's mitigating measures embodied in its Environmental Impact Statement (EIS) and the conditions stipulated in the Certificate. Overall, the project seeks to be aligned to Pasay City's grand vision, generate support for the project and overcome objections with the project by highlighting its benefits.

III. OBJECTIVES

8. The IEC plan has three objectives, namely:

i. To identify the perceived issues and challenges of various stakeholders of the Pasay City coastal development project;

ii. To propose a communication strategy to ensure that information about the project is disseminated clearly to all stakeholders to generate public support; and

iii. To provide key messaging on the project's benefits and advantages along with recommendations on issues and challenges to increase the likelihood of the project's acceptance by key stakeholders.

9. The IEC Plan is intended to guide the proponent and its joint venture partners. It is an evolving document that needs to be periodically reviewed so that it can be modified to meet emerging issues during implementation.

IV. METHODOLOGY

10. The study team underwent the different steps in the preparation of the IEC Plan as follows:

i. **Situation analysis.** The team analyzed the current level of awareness about the mitigating measures of the EIS for the Pasay City Harbor Center Reclamation Project. Secondary data analysis from reports, clippings, and other written documents from the proponents were used. Consultations and key informant interviews were conducted to ensure the completeness of information gathered from the Pasay City LGU, SM SCIDC, PHCC and other secondary data. Thematic analysis was utilized to develop major categories on the issues presented. Prioritization on the degree of importance and significance of each major issue was conducted to ensure that information dissemination will be relevant to its target audience.

ii. **Review of project objectives.** A review of objectives of the project was conducted to determine alignment with current situation and status of information dissemination. The objectives were elucidated and summarized based on the existing materials received from the proponents.

iii. **Identification of goals and objectives of the plan.** The main objective of the plan and specific goals were identified and mentioned in the previous section. These objectives were used to align to the key messages and tactical action plans.

iv. **Audience analysis.** The audience segments for the IEC plan were identified and its characteristics were considered in the crafting of the key messages (see Table

1). This helped match the key messages and media channels that are being recommended for use for specific audiences within this plan.

v. **Development of key messages.** Broad messaging campaign concepts were determined based on results of the previous steps conducted (see Table 2 and 3). An Internet search on data on reclamation projects was also conducted as inputs in the development of key messages.

vi. **Development of a tactical action plan.** A tactical action plan detailed how the key messages will be communicated, to whom and by what media channels. Table 5 summarizes said action plan.

vii. **Preparation of proposed timetable, and tasking based on tactical action plans.** A one-year timeline was prepared outlining the tactical action plans to be implemented with specific persons/agencies in charge and resources needed.

viii. **Planning for the monitoring and evaluation**. Measures of success (Key Performance Indicators/Key Result Areas) were developed in the last section of the report to ensure that there is a concrete way to monitor plan implementation.

11. Two research methods were used in developing the plan. Consultations and discussions were graciously set up by the proponents to provide the study team key information needed to develop the plan. This was conducted at various stages of the plan preparation. Secondary data analysis was meticulously conducted to ensure that all major issues are identified (news clippings, blogs/vlogs, internet sources, government reports and plans). These, in turn, were validated with the point persons of Pasay City LGU, Libra Law, SM SCIDC, and PHCC.

V. TARGET AUDIENCE

12. For maximum effect, the IEC plan targets specific audiences for specific issues (refer to Table 1 and Table 5). This way, the issues are targeted directly to the affected audience. These stakeholders need to learn and understand the mitigating measures of the reclamation projects. They are decision-makers whose support and commitment are critical to the success of the IEC plan. Hence, the proponents should determine their level of knowledge, interest, and any potential biases regarding the key messages.

13. The secondary audience are groups of people who can be tapped to help activate, educate, or influence the primary audience. **Table 1** presents the primary audience and their description. The stakeholders identified here are not exhaustive. The list may grow as the IEC plan is implemented and modified to respond to the projects' emerging needs and challenges. It is important to add hard-to-reach audiences and marginalized groups and reach out to them using their preferred channels.

Table 1: Audience of the Information, Education, and Communication Plan

Audience	Description
Primary	
1. Local residents	Constituents living in the 201 barangays of Pasay City, including: • Barangay officials • Homeowners and renters • Informal settlers • Vulnerable groups especially: ○ Youth and children (children in need for special protection, children in conflict with the law, youth in need of special protection, out of school youth) ○ Women in especially difficult circumstances ○ Persons with disabilities ○ Senior citizens ○ Families affected by disaster/calamities (fire and typhoon/floods)
2. Employees	• Staff personnel and executives of the Pasay City LGU • Employees of commercial and government establishments within the vicinity • Cooperatives in Pasay City that help members access livelihood opportunities
3. Business owners and investors	• Influential organizations in the city's political and economic sustainability such as the Chinese Chamber of Commerce and the Pasay City Chamber of Commerce • Owners of micro, small, and medium enterprises in Pasay City • Entrepreneurs
4. Special interest groups	• Fisherfolk and informal settlers in the area who may be displaced by the projects • Political personalities against reclamation • Environmentalists
Secondary	
1. Civil society organizations	• Pangingisda Natin Gawing Tama (PANAGAT) Network
2. National Government Agencies, Senate,Congress	• Department of Environment and Natural Resources (DENR) • Department of Agriculture-Bureau of Fisheries and Aquatic Resources • Philippine Coast Guard • Philippine Reclamation Authority • Senate Committee on Environment, Natural Resources and Climate Change • House Committee on Ecology
3. Media	• Opinion makers, social media influencers • Journalists covering the business, environment, tourism beat • Media outlets
4. Residents of nearby areas outside Pasay City	• Residents in other coastal cities/areas who might have a negative perception of the coastal development project due to concerns such as potential flooding in their area

VI. KEY ISSUES, MESSAGES, AND PROJECT BENEFITS

14. Pasay City has one of the smallest land areas among the Metro Manila LGUs. Through the coastal development projects proposed by the LGU, SM SCIDC, and PHCC, it has the potential to expand its land area through reclamation activities. The projects aim to create artificial islands on the portion of Manila Bay within the municipal waters of Pasay City which will be connected to the mainland via bridges. The residents, business owners, and other stakeholders stand to experience economic and social gains while ensuring that the environment is protected. With the proposed development, the benefits will translate into the creation of a smart, sustainable, and disaster-resilient city.

15. This coastal development project aligns with the UN Sustainable City Program with its development considerations include the safeguarding of the natural resources and achieving economic, physical and social progress while eliminating environmental risks. The availability of green spaces, blue features, waste segregation practices, and renewable energy can improve the quality of life of Pasayeños.

16. It is one of the banner projects of the Pasay City government toward the achievement of the Pasay Eco City Grand Vision of being self-sufficient and sustainable. It seeks to enhance the well-being of its citizenry through an integrated urban planning and management. The project is touted to help Pasay City become a sustainable eco-city by 2026 and beyond.

17. The proposed catchphrase to describe the benefits of the project can be summed up with “PASAYasenso” (Figure 1). It encapsulates the purpose of the project in terms of bringing progress to all stakeholders of Pasay City. The coastal development project seeks to provide benefits to its primary and secondary stakeholders by improving their overall quality of life.

Figure 1. Catchphrase for the IEC Campaign



18. Some of the benefits of the project include the following:

i. Development Strategy
   1. Smart City Development of Pasay City
   2. Reclamation as a Coastal Development Strategy

ii. World Class Urban Master Plan
   1. Improved relationship between people and buildings to serve the needs of Pasayeños
   2. Creation of more green urban areas
   3. Working with nature to promote the city’s sustainability
   4. Reusing existing space for a greener and more pleasant urban environment
   5. Strengthening proper waste management
   6. Promotion of healthier and more sustainable lifestyles

7. Protection of the beauty of Pasay's neighborhoods and development of picturesque vistas
8. Better water resource management
9. Promotion of green and circular economy
10. Reduction of air pollution
11. Reduced noise to improve comfort and well-being
12. Promotion of nature-based solutions for managing disaster risk

iii. Economic
1. Employment and livelihood opportunities
2. Availability of marine aquaculture and ecotourism in the area
3. Use of private capital to fully finance the project
4. Public revenues to be generated
5. Distribution of reclaimed lands

iv. Improved Quality of Life
1. Provision of infrastructure for social services and education
2. Implementation of a Social Development Plan
3. Availability of safe and affordable housing
4. Access to clean air
5. Access to open spaces

v. Mobility
1. Improved mobility and local community
2. Availability of emission free public transport system

vi. Environment
1. Enables mangrove planting in the coastal development site
2. Promotes planting of significant mangrove species
3. Mangrove offsite planting
4. Induces regular ocean clean-up
5. Seaweed culture to improve water quality
6. Provision of green spaces and mini forest for increased vegetation
7. Improve waste segregation and solid waste management
8. Encourages use of renewable energy
9. Induces regular ocean clean up
10. Restoration of the ecological value of Manila Bay

19. The detailed benefits are discussed in **Table 2**.

Table 2: Description of Potential Benefits/Features and Key Messages

Area	Potential Benefits/Features	Key Messages
Development Strategy		
1. Smart City Development	PHCC 265 and SM 360 coastal development projects will contribute to Pasay City's Grand Eco Vision of being a globally competitive Smart City.	The projects are geared towards mixed use real estate development with residential, commercial, and business addresses with park frontage, waterfront views, and the iconic Manila Bay sunset. • Well-planned access and mobility will allow people to travel on foot, cycle, car, rail, and public transport and avail of all basic needs within 15 minutes. • Smart infrastructure will also be available using fiber optic networks and 5G ready. • Green spaces with parks, mangroves, and pedestrian-only corridors will be provided. This development project well prepares Pasay City for the next hundred years.
2. Reclamation as a coastal development strategy	This coastal development strategy has been successfully used as an effective solution to create new urban spaces in countries/cities with limited areas of usable, natural land such as Hong Kong, Singapore, and Spain. Pasay City's adoption of this strategy is a justifiable move given its lack of land. Second, the performance of similar coastal development projects have shown that it is a viable urban development solution. Third, the multiple benefits of reclamation in the area have been identified by research teams mobilized by Pasay LGU and its joint venture partners.	1. These projects will provide for the emerging needs of Pasayeños and the vision of the LGU for a global, smart, and sustainable eco city. Pasay City needs more space to serve the basic social and human needs of its growing population for shelter, employment, and access to opportunities. It will usher improved quality of life for Pasayeños and help address the problem of urban congestion and decay. 2. This project will help stimulate Pasay City's economic growth. Pasay City is one of the smallest cities in Metro Manila with barely 18.64 sq. km. of land with 9.5 sq. km. It is occupied by the airport complex, Villamor Airbase, and the Civil

Area	Potential Benefits/Features	Key Messages
		Aviation Authority of the Philippines. With its small land space, Pasay City is confronted with acute land scarcity and congestion. Due to its very limited land area and high urban density, large-scale inland development in Pasay City is not feasible. This coastal development strategy is a solution that will respond to the city's need for more land for commercial and industrial use. 3. It will enable Pasay City to harness the potentials of its territorial waters for coastal development at no financial cost to the government. For example, built-in sewage treatment plants can be set up in contrast to inland development in areas where there are no sewage treatment plants. 4. This coastal development strategy has planned the space after carefully considering the massing of the whole development and the influx of the residents, tourist, and employed coming in and out of the area. 5. This coastal development strategy has been used worldwide for centuries. In fact, there are numerous sites that are on reclaimed land in advanced economies. For instance: • Singapore's size has grown by almost a quarter from 224 to 277 square miles through reclamation. • Further, 6% of Hong Kong's total land area is reclaimed. It accommodates 27% of the city's population and almost 70% of its commercial activities. • A new development project off the east coast of Lantau intends to create 1,700 hectares of land to house an estimated 1.1 million people.

Area	Potential Benefits/Features	Key Messages
World-class Urban Masterplan Development		
1. Improved relationship between people and buildings to serve the needs of Pasayeños	Planning and development approaches will be human-centered and designed towards quality neighborhoods with easy access to housing, shopping, and public spaces.	1. In doing these projects, Pasay City aims to use planning and development approaches based on the principles of human-scaled design. This means walkable blocks and streets, housing and shopping in proximity, and accessible public spaces. 2. The projects are also designed to be a 15-minute neighborhood. This is all about developing a walkable district – thus placemaking and public space are essential to such an approach.
2. Creation of more green urban areas	The projects' urban landscape will highlight green urban spaces. These will provide benefits to human communities, plants, and animals.	1. Pasay City is aware of the importance of green urban spaces. With this project, the LGU aims to provide its residents with numerous benefits from increased public health outcomes to enhanced flood resiliency. 2. The LGU also aims to make green urban spaces become habitat corridors for plant and animal species. The benefits from these spaces have commonly been associated to human communities in cities but not to the plants and animals that live in the same place. Thus, green urban spaces can also be viewed as a shared space with a variety of plants and animals and thus help in environmental conservation efforts.The projects will include specific calculations for the space required by important plant and animal species that share the same watershed.
3. Working with nature to promote the city's sustainability	Natural design principles will be adopted to ensure that the development footprint will not exceed the area's carrying capacity.	An important aspect of working with nature is making sure that the development footprint does not exceed the capacity nature provides. Building with nature and working with nature means never exceeding the carrying capacity of the development area. • Pasay City will seriously consider basic carrying capacity principles when designing the urban form and built

Area	Potential Benefits/Features	Key Messages
		environment in reclaimed areas. The LGU will also consider the projects' impact on the surrounding natural environment.
4. Reusing existing space for a greener and more pleasant urban environment	Green spaces will surround the coastal development to enhance livability and manage impacts of urbanization and population growth.	It is imperative to ensure that the benefits of public green open space are felt in development. Hence more nature is important. • Publicly accessible, open, and green space provides a wide array of social, health, economic, and environmental benefits to individuals and to the community. It is an essential ingredient for enhancing the livability of an area and improving the quality of life of its residents. Easy access to well designed and diverse open spaces will help manage the negative impacts of rapid and massive urbanization and population growth and enhance the benefits that open space provides. • Hard and soft infrastructure will be in place from both the developers and the local government. • Land developments will incorporate sufficient green spaces to provide not only recreational green spaces but also improve the overall environmental quality and integrity of the reclamation areas. These green spaces serve as additional carbon sink areas that will also contribute to the improvement of the air and overall aesthetic qualities of the reclaimed islands.
5. Strengthening proper waste management	Projects will adopt the strategy of circular economy for waste management in compliance with the Ecological Solid Waste Management Act.	1. A circular economy can be adopted as a strategy for waste management where waste is seen as a manageable resource to deliver economic, environmental, and social benefits. 2. The project will comply with all implementing rules and regulations of the Ecological Solid Waste Management Act of 2000 or Republic Act 9003 that provides for the systematic, comprehensive, and ecological waste management program for the protection of public health and the environment.

Area	Potential Benefits/Features	Key Messages
		The projects will consider including all discarded household or commercial waste, non-hazardous institutional and industrial waste, street sweepings, construction debris, agriculture waste, and other non-hazardous or non-toxic solid waste.
6. Promotion of healthier and more sustainable lifestyles	Residents can live, work, and play through the adoption of active designs which will incorporate physical activity and healthy eating will significantly improve their health and well-being.	Pasay City recognizes that the projects have an essential role in addressing the rapidly growing epidemic of lifestyle illnesses and related chronic diseases, especially considering mounting scientific evidence showing the impact of environmental design on physical activity and healthy eating. By adopting active design in the building of new city districts, city planners and developers in Pasay City can help significantly improve the health and well-being of the population. Incorporating healthy activity into the daily lives of those living in Pasay City should be a central goal of any sustainable lifestyle initiative for developments in the projects. Creating an urban landscape which supports healthy diets and active daily lifestyles by providing spaces where people can live actively, work actively, and play actively is essential to this sustainable lifestyle. Creating healthier buildings, streets, and urban spaces means environmental design that encourages stair climbing, walking, bicycling, transit use, active recreation, and healthy eating.
7. Protection of the beauty of Pasay's neighborhoods and development of picturesque vistas	Picturesque viewsheds and vistas will be created and protected through a planned development in the built environment.	Creating and protecting picturesque viewsheds and vistas is fundamental in strengthening the overall character of the coastal developments in Pasay City. Protecting scenic vistas and viewsheds from the effects of haphazard development allows older communities to preserve their unique charm, newer communities to develop their own distinctive character, build civic pride, and attract growth. View corridors are typically planned openings in the built environment that allow views of scenic vistas and viewsheds.

Area	Potential Benefits/Features	Key Messages
		Some regulatory measure to control vistas and viewsheds in urban areas include implementing zoning and land use ordinances for view protection, including those for the identification and protection of historical districts, establishing design guidelines and design review that limit the impact of development on scenic vistas and viewsheds in the City, and enacting strict billboard controls.
8. Better water resource management	Long-term sustainability on the way water is managed will be designed to include flood and water pollution management.	The management of water in the areas and areas adjacent to these in Pasay City will be designed to include both water flood and water pollution management. For long-term sustainability, development in the reclaimed areas will transform the way water is managed.The projects will also address urban and wastewater service delivery in a sustainable and economically efficient manner.
9. Promotion of green and circular economy	The projects will work towards decarbonization and product life cycle management.	The City will observe district level product life cycle management. Decarbonization towards the green economy means serious investments into a low-carbon economy that considers the lifecycle of products, materials, and the built environment. Putting a cap on carbon emissions is a least-cost way to achieve the necessary transformation to a low carbon pollution economy.
10. Reduction of air pollution	Air quality offset projects will be undertaken to ensure a reduction of air pollution.	To address the possible effects of increased major sources of air pollution, strategies such as air quality offsets to deter negative impacts on air quality of the project. Air quality offset projects may include electricity subsidies to replace emission related energy sources (such as for hybrid and electric vehicles), tree planting and maintenance, and improved waste collection services. This will ensure that the ambient levels of air pollutants in the proposed reclaimed developments at Pasay City are reduced by attentive management of major sources of pollutants including motor vehicles.
11. Reduced noise to	Current technological advancements on managing noise will	Activities will consider requirements not only for the comfort of

Area	Potential Benefits/Features	Key Messages
improve comfort and well-being	be used.	residences but also to the disturbance to fauna and avifauna on-site. The project will ensure the use of current technologies to keep unwanted sound away from residential and commercial office units.
12. Promotion of nature-based solutions for managing disaster risk	Nature-based solutions (NbS) that will address conditions of vulnerability to disaster risks will be employed to manage such risks.	Conditions of vulnerability are traditionally addressed by hard infrastructure based on engineering. However, nature provides resilient ways to address conditions of vulnerability that also provides a host of co-benefits. Solutions that address conditions of vulnerability to disaster risk through the natural environment are called nature-based solutions. NBS such as enhanced green spaces and habitat rehabilitation can complement conventional hard infrastructure to manage disaster risk and have proven to be highly effective and beneficial to communities. Pasay City strives to have well-managed ecosystems such as wetlands, mangrove forests, and coastal habitats that can act as natural infrastructure to reduce physical exposure of urban assets to hazards and with co-benefits increasing socioeconomic resilience of people and communities by sustaining local livelihoods (i.e., fishing and tourism).
Economic		
1. Job creation	i. Development of livelihood center ii. Commercial and office spaces iii. Manpower training program iv. Credit program	An abundance of employment opportunities exists in Pasay City. Under the pillar of economic dynamism with 10 sub-indicators, Pasay City ranked first in the 2021 Cities and Municipalities Competitive Index. In Barangay 76 alone, there are about 3,279 establishments, which is about 41% of all establishments in Pasay City. The coastal development project will further open employment and livelihood opportunities. A livelihood center will be developed to serve as a venue for various employment and livelihood

Area	Potential Benefits/Features	Key Messages
		training. It will also be an incubation hub for start-up microenterprises that will be developed. With hundreds of thousands of jobs to be created, capacity building programs will be conducted to capacitate locals to prepare them for the jobs available. A credit program may be developed by the LGU and interested NGOs to ensure that funding sources for possible livelihood activities will be available to interested parties.
2. Availability of marine aquaculture and ecotourism activities in the area	**Proposed livelihood opportunities** i. Cage culture of milkfish and some high-value marine fishes • Income generation; • Food provision; • Larval source for the neighboring waters if fishes are cultured until reproductive age; • Increased biodiversity ii. Restocking of mangrove crab *Scylla spp*. in the mangrove area • Increased biodiversity in the mangrove areas and neighboring tidal flats; • Establishment of new crab population; income generation; • Food provision iii. Establishing oyster reefs in the subtidal area – • Improved water quality; • Habitat provision to other fishes and invertebrates; • Food provision; • Increased biodiversity; • Shoreline stabilization; • Coastal protection iv. Culture of abalone, if water quality improves –	The proposed coastal development may provide livelihood opportunities that can provide additional income, food, improved coastal biodiversity through cage culture of high-value marine fishes, restocking of mangrove crab species, establishing oyster reefs and possible culture of abalone. Further, popular tourism activities can be developed in some marine designated areas (e.g., bird watching, catch and release fishing, fish feeding in aquaculture cages, sightseeing, small dinghy sailing, and sea kayaking/canoeing).

Area	Potential Benefits/Features	Key Messages
	• Income generation; • Food provision; • Larval source for the neighboring waters if abalone are cultured until reproductive age; • Establishment of new abalone population in areas suitable for the settlement of larvae transported by currents and tides; • Increased biodiversity	
3. Use of private capital to fully finance the project	The projects will be fully financed by the City's private joint venture partners and no Government funds will be used for reclamation projects.	The coastal development project will be at zero cost to Pasay City. Pasay City has entered into a CJVA with private sector proponents/joint venture partners who will fully finance and undertake the coastal development project towards Pasay's Eco City Grand Vision. The CJVA is in accordance with the Local Government Code and Pasay City's own PPP Code[1]. The government does not need to appropriate public funds or borrow capital to implement the Projects.
4. Use of public revenues to be generated	A projected revenue of billions worth of public funds from fees and taxes to be generated by the National and Local Government will be used for public purposes.	• Reclamation fees have already been paid by proponents on coastal development/reclamation fees. After the construction of the projects and once the projects are developed as new environment-friendly residential and commercial centers, thousands more new jobs and business opportunities will be created and the City will earn additional revenues in terms of property and business taxes. • The National Government will derive additional income taxes from the new businesses to be established and new employment opportunities to be generated and more. The revenues that the City and National Government will receive can then be devoted to improve and expand social services. • Pasay City has committed to devote at least 50% of local public revenues from the reclaimed area for social services,

[1] Pasay Ordinance No. 5611, Series of 2014

Area	Potential Benefits/Features	Key Messages
		livelihood, and pro-poor programs such as school and healthcare facilities and services; medical, burial, educational assistance; financial assistance to barangays and to victims of fire and other calamities; Balik-Probinsiya Program; social pension and senior citizens' welfare; cash gifts and financial and emergency relief assistance; Medical missions and emergency relief programs; livelihood programs and so on. • Pasay City has also declared that at least 25% of such income will be devoted to environmental projects, including the cleanup of Manila Bay. Further, new schools, hospitals, youth centers, and the like will be built on the site.
5. Distribution of reclaimed lands	51% of reclaimed lands will be allocated to the Government	• 51% of high-value land will be given to the government at no cost while only 49% of the land stays with the private proponents. • 30% of the government share will be for roads and open spaces under the Republic of the Philippines. • 21% is net saleable area (NSA) shared by PRA and Pasay City at a 60%-40% sharing. • In other words, PRA gets 12.6%, Pasay City gets 8.4% and the National Government gets 30% of the projects at zero cost to the government.
Improved Quality of Life		
1. Provision of infrastructure for social services and education	i. Development of specialized hospital ii. New city hall iii. Senior/youth and sports center iv. Expansion of Pamantasan ng Lungsod ng Pasay v. Science, Technology, Engineering, and Mathematic (STEM) Learning Innovation Center	Pasay City's population is growing and demands for social services are rising. In 25 years or by 2050, it is projected that Pasay City would have grown by 28% more. This will translate to an additional 175,054 individuals who will need social services such as education, health, housing, and employment. It is essential that social services, and the facilities used for delivering those services (i.e., social infrastructure) keep pace with Pasay's growth. These programs and projects will foster the

Area	Potential Benefits/Features	Key Messages
		development of public spaces. They will also help ensure inclusive community engagement by making public facilities and buildings accessible.
2. Implementation of a social development plan	Various projects focused on health, education, employment and livelihood, social welfare i. Smart city compliant Infrastructure will utilize real-time updates on air quality to improve livability of the reclaimed development ii. A focus on urban greenery and a natural environment contributes to cleaning the air and improving air quality iii. Increasing comfort and wellbeing of urban dwellers by investing in landscaping and making space for canopies from large trees creating tree-lined corridors and streets with trees	The social development plan aims to strengthen social infrastructure. This includes the establishment of a specialized hospital in the coastal development area that will be devoted primarily for the treatment of chronic or long-term illness, injury, or infirmity. The social development plan will also establish the development and enhancement of the e-learning system and a STEM learning innovation center. This will further enhance the competitiveness of students and their proficiency in math and science.
3. Availability of safe and affordable housing	i. In-city medium rise housing program ii. Socialized housing program iii. Balik-probinsya program	Housing is a fundamental human need. Ideally, all residents should be able to secure accommodation that meets their basic needs. Specifically, housing should be within the financial means of households and contain sufficient space and features for various household needs. Affordable and accessible housing can help ensure that current and future residents can live, work, play, and thrive in Pasay City.
4. Access to clean air	i. Smart city compliant infrastructure will use real-time updates on air quality to improve livability of the reclaimed development ii. A focus on urban greenery and a natural environment contributes to cleaning the air and improving air quality. iii. Increasing comfort and wellbeing of urban dwellers by investing in landscaping and making space for canopies	Smart cities can leverage technology-based solutions to meet the demands of residents by providing them more efficient services thereby limiting mobility of individuals, maintaining air quality and more efficient use of energy among others. Urban planting has given rise to more plants that clean the air.

Area	Potential Benefits/Features	Key Messages
	from large trees creating tree-lined corridors and streets with trees.	
5. Access to open spaces	i. Availability of open spaces for parks, easements, right of way and utilities. Additional 9 kms of waterfront will be made available.	The development provides excellent views from whatever vantage point. There is park view, ocean view, city view, and sunset views available.The parks function as pedestrian corridors and will provide people green spaces to rest and linger. The waterfront is a 10-minute walk from the city center. Such open spaces allow place-making and cultural identity. It also enables resilience and mental health.
Mobility		
1. Improved mobility of local community	i. 15-minute City	The design and development principles of a 15-minute neighborhood can be applied to all scales of development including main streets, urban neighborhoods, and dense city centers. Such mobility allows comfortable living, working, creating, and playing space without the stress of long hours in traffic.
	ii. No-car zones (walking zone)	The 15-minute neighborhood is all about a walkable district thus placemaking and public space are essential to such an approach. The aim is to reduce many short trips using cars and promote walking, cycling, or public transport. The coastal development project will incorporate a 15-minute walk shed which is approximately a 2-kilometer radius from the defined center. This project in Pasay City shall create walkable districts that focus design on the holistic function of communities based on their needs.
	iii. Biking provisions on existing infrastructure	The 15-minute city spatial strategy will include the provision of the bike lanes and bike parking facilities. Bike lanes serve as independent mobility systems since bike lanes can form their own routes as bikes do not necessarily follow the same paths

Area	Potential Benefits/Features	Key Messages
		and patterns of larger vehicles. They can form their own paths flanked with green open space and cut through city blocks without the need for roads to be adjacent – in fac,t they can integrate into pedestrian only access zones which in turn can increase active design.
	iv. Small vessel navigation channels	Small vessels may be allowed to navigate the water channels in-between islands to ferry passengers, i.e., water taxis. This is to decongest the traffic in the inter-island streets system.
	v. Variety of options for travel	Travel options include walking, biking, car, commute (three mass transit stations), water ferry
	vi. Co-locate residential areas and schools/workplaces to encourage an active and healthy lifestyle.	Residents are encouraged to walk to their destinations instead of bringing cars to encourage exercise and minimize carbon emissions.
2. Availability of emission-free public transport system	i. improved air quality ii. new forms of transport	The design of the urban environment around arterials and even major roads is vital as the master plan designs suggest that most people will live, work, and gather near many of these roads. Almost the entire coastal development project will have residential and commercial land use activities within a few hundred meters of a major and arterial road. Thus, the urban environmental guidelines for the developments within the reclaimed lands will focus on the control of exhaust and non-exhaust emissions from road vehicles. The introduction and use of public electric vehicles will be promoted with the reclaimed islands of Pasay City.
Environmental		
1. Mangrove planting in the coastal development site	i. Provide protection against storm surges and strong wave action especially during typhoons ii. Improve water quality due to filtering properties of	Pasay City aims to build a mangrove park by planting suitable mangrove species in the channels between islands. Once established, this will have a positive impact to residents since there are no existing mangroves in Pasay City.

Area	Potential Benefits/Features	Key Messages
	mangrove roots iii. Provide a habitat for bird species and mangrove associated wildlife that will improve biodiversity iv. Serve as a venue for education and public awareness on the importance of coastal habitats v. Serve as a potential ecotourism site e.g., mangrove tours, mangrove park vi. Contribute to carbon sequestration since mangroves are very efficient carbon sinks	A mangrove community will provide diverse benefits to the city. • It will protect the shorelines and communities from strong waves and storm surges. It will improve water quality and provide a rich habitat for diverse fauna such as birds, monkeys, reptiles, and many species of fish and crustaceans. • The planned mangrove parks can also serve as a potential ecotourism site and a rich educational resource for students and visitors. • Mangroves also offer vital ecosystem services by stabilizing shorelines, sequestering carbon, and trapping sediments and pollutants from upland areas which will improve the water quality of coastal waters. They also export nutrients to coral reefs and seagrass beds. Pasay City LGU and its joint venture partners are motivated to pursue mangrove planting. There is a possibility that mangroves can be established over time in the project site if a suitable area is identified. Biological and engineering studies are ongoing to check the water quality. Species for test planting, including the iconic nilad (*Scyphiphora hydrophyllacea*) and kulasi (*Lumnitzera racemose)*, have also been identified. These preparatory steps will enable the LGU to find the best area that can support the sustainability of the mangrove park.
2. Mangrove offsite planting	i. Improve mangrove cover in coastal areas in Manila Bay that will lead to improved biodiversity and fisheries productivity ii. Provide a source of livelihood to communities that will be involved in the management of mangrove rehabilitation sites iii. Promote awareness about the need for mangrove conservation among coastal communities and	• The Pasay City LGU and its partners are exploring offsite mangrove planting locations in nearby provinces. As of July 2022, three areas namely Kawit and Noveleta in Cavite and Sasmuan, Pampanga have been identified as potential sites. Offsite planting is a good option should mangrove planting along the channels' perimeters show poor survival due to unsuitable soil type/substrate, weather conditions, and presence of pests, etc. • Offsite mangrove planting has multiple benefits. Aside from

Area	Potential Benefits/Features	Key Messages
	encourage community participation for project sustainability iv. Contribute to carbon sequestration	improving biodiversity and fisheries productivity, it can also be a source of livelihood and encourage community participation. Furthermore, there are other degraded mangrove forests in Manila Bay that will benefit from rehabilitation through offsite planting under the Pasay City coastal development project.
3. Planting of nilad (*Scyphiphora hydrophyllacea*) in Pasay City	i. Help improve water quality along waterways leading to Manila Bay ii. Promote public awareness about the value of coastal resources and the need for their protection	The iconic nilad (*Scyphiphora hydrophyllacea*) shrubs will be test planted in the banks of the Diokno Bridge channel. This action will help restore this culturally significant mangrove species that has disappeared from Manila Bay. Experimental planting may also be done in other sites such as the mouth of other Pasay City riverways. Planting the nilad will help improve water quality and promote awareness of the importance of coastal protection.
4. Seaweed culture (*separate from the integrated multi-trophic aquaculture)* to improve water quality	Improve water quality	Seaweed culture and raft/longline culture of shellfish will improve water quality in the project site. This will seed the area over time and increase productivity. Both livelihood initiatives will be part of the allowable activities in designated areas of the marine waters.
5. Provisions of green spaces and mini forest for increased vegetation	Increase terrestrial vegetation cover to reduce habitat fragmentation and functional green spaces	• The coastal development within the project site will provide around 33 hectares of additional vegetation cover. It can serve as habitats for a range of species, reduce habitat fragmentation, and enhance the biodiversity values of Manila Bay. • These green spaces also can serve as parks and functional open spaces that can accommodate recreational and human health benefits.
6. Improve waste segregation and solid waste	With the availability of Material Recovery Facilities in the project, waste segregation and solid waste management in Manila Bay will be addressed.	The development will improve waste management in the area and prevent the disposal of solid waste into Manila Bay. Solid waste generated will be segregated at the source and recycled in

Area	Potential Benefits/Features	Key Messages
management		designated Material Recovery Facilities (MRFs). Residual waste will be disposed of in sanitary landfills. Hazardous waste generated will be transported and treated by DENR accredited hazardous waste transporter and treater.
7. Encourage use of renewable energy	i. Encourage tenants to adopt green architecture principles including the adoption of rooftop solar photovoltaic (PV) technology as a renewable energy source ii. Development of solar-powered public spaces by using solar panels for street lighting	The adoption of green architecture design principles will encourage energy efficiency and cut energy consumption by maximizing natural sources of light and energy.
8. Induces regular ocean clean-up	i. Keeps wastes and toxic chemicals away from the water ii. Makes seafoods safer to eat iii. Provides a cleaner and better environment for marine organisms	• The project identifies 25% of public revenues generated from the development will go to environmental projects that may include a regular clean-up of Manila Bay and other similar activities. This will help manage the trash that gets into Manila Bay from nearby residential areas. • Cleaning coastal waters and Pasay City shorelines, if undertaken on a more regular basis and in partnership with different sectors will not only improve the aesthetic value of Manila Bay, improve its water quality but also showcase how collective community action can result in significant gains. • Cleaning of plastic debris will protect birds, turtles, and marine mammals who mistake these for food.
9. Restoration of the ecological value of Manila Bay	i. Create oyster reefs that will serve as a natural filtration system – improved water quality; habitat provision to other fishes and invertebrates; food provision; increased biodiversity; shoreline stabilization; coastal protection ii. Grow seaweeds *Kappaphycus* sp., *Eucheuma* sp., and *Gracilariopsis* spp. to help improve water quality and	The project's proposed activities such as seaweed growing, mussel culture, restocking of endangered giant clams and commercially important species of mollusks like the Manila clam and blood clams, and the creation of oyster reefs can help restore the lost ecological value of Manila Bay. The subtidal habitats may be developed and used to contribute towards the restoration of Manila Bay's ecological value.

Area	Potential Benefits/Features	Key Messages
	later to serve as feed for abalone (in the case of *Gracilariopsis*) – improved water quality; food provision; income generation iii. Restock other commercially important species of mollusks, e.g., Manila clam (*Ruditapes philippinarum*) and blood clams (*Anadara granosa*) to eventually become a source of seedstocks in other parts of the Bay – income generation; food provision; larval source for the neighboring waters if these clams survive to reproductive age and start reproducing; establishment of new clam species population in areas suitable for the settlement of larvae transported by currents and tides; increased biodiversity iv. Restock the endangered giant clams (e.g., *Tridacna gigas, T. squamosa*) – increased biodiversity; promotion of ecotourism and education v. Culture of mussels to improve water quality and as a source of seedstocks in surrounding waters – improved water quality; food provision; income generation	

20. Based on the data gathering and prioritization meeting with the proponents, the most critical issue that the reclamation projects should address are the environmental impacts and safety concerns related to climate and geologic risks. These are followed by issues related to the project approval process and potential legal challenges and lastly, displacement, and social issues. Table 3 describes the major concerns and the proposed key messaging approaches this IEC plan will take in discussing the key areas of concern. The messages for each segment of the audience should be concise, striking, action-oriented, and attractive to the intended audience. More details on each concern can be found in the Resource Book on the Pasay Reclamation Projects.

Table 3: Description of Issues and Key Messages

Area	Issue/Concern	Key Messages
Environmental		
1. Water quality	Water quality will degrade due to the projects.	• There will be nil or minimal possible adverse impact on water quality and marine life in the coastal development project sites and nearby areas based on the ECCs, including its supporting technical studies. • The projects are designed to help improve the overall water quality in Manila Bay. During the first phase, it will remove massive amounts of accumulated waste. This major clean-up of 625 ha in Manila Bay will be at no cost to the Pasay City LGU, saving taxpayers' money. In addition, the projects will play a key role in the long-term rehabilitation of Manila Bay through the following: - Built-in sewage treatment plants will ensure that wastewater flowing out of the reclaimed areas are clean and will not pollute the surrounding areas. - Pasay City LGU has committed to devote 25% of revenues from real property tax collections within the reclaimed islands to environmental projects, including the cleanup of Manila Bay, improvement of water quality, and environment protection. - Pasay City LGU's joint venture partners are also committed to abide by government regulations and proper zoning and development. • Finally, the Pasay City LGU is prepared to carry out effective mitigation measures. These will prevent or minimize any temporary deterioration of the water quality during construction.
2. Marine biodiversity and fishery resources	The Projects will threaten the existence and/or lead to the loss of important local species and habitats.	**The coastal development projects will nurture coastal and marine fauna. It will not threaten local species or habitats.** Portions of the reclamation area will be dedicated to mangrove planting and resource

Area	Issue/Concern	Key Messages
		enhancement interventions. These will serve as shelters, breeding, feeding, and nursery grounds for important marine species and will improve the area's marine biodiversity over the long term. As of now, there are limited fish, crustaceans, and marine macroinvertebrates in the project site because there are no habitats for them to thrive. For the proposed SM 360 project: • The Environmental Impact Assessment (EIA) Report that Technotrix Integrated Services Corp. (TISC) prepared for SM Prime Holdings Inc. and submitted to the Environmental Management Bureau (EMB)-DENR showed that "spot dives and sub-surface snorkeling surveys yielded no encounters with sizable fish communities except for a few sightings of tilapia and small glassfish." Key informants claim that they catch an average of 3 kg to 5 kg of tilapia in fishing grounds about 1-km from the seawalls. Tilapia has apparently acclimatized to the saline waters of the Bay but the tilapia that somehow move closer to the shores in the study site of the EIA are relatively few. For the proposed PHCC 265 project: • EIA studies prepared by TISC for SM Prime Holdings Inc. also showed that the nearshore waters of Manila Bay are no longer frequented as fishing grounds due to extremely low catch rates. The PLANADES and PRIMEX team confirmed the presence of tilapia in Manila Bay during the field visit in Las Piñas-Parañaque Wetland Park (LPPWP) and Pasay reclamation sites on 4 December 2021. Based on the key informants (i.e., Parañaque fishers), tilapia are caught using gillnets averaging about 5 kg within a two-hour fishing operation. • Green mussel (*Perna viridis*) populations occurred only in the rocky revetments of the south breakwater outside of the reclamation area boundary. • Gleaners were also encountered in the breakwaters harvesting at least four species of edible bivalves and gastropods that include species of ark shell, various species of the zigzag venus Manila clam or *halaan (Venerupis philippinarum*), pitar venus, rasp tellin, and isolated occurrence of Frilled dogwinkle (*Nucella lamellosa*). Coral reefs, seagrasses, and mangroves do not grow in the portion of the Bay belonging to Pasay City. These ecosystems are only found in a few areas in Manila Bay due to the poor water quality. However, as part of the Coastal and Sea Use Plan

Area	Issue/Concern	Key Messages
		updating, an aqua-tourism zone is proposed to be established for the conduct of research and pilot demonstration of potential climate-resilient and sustainable aquaculture technologies (e.g., seaweeds and mussel/shellfish culture using line methods) as alternative source of fish production, water quality improvement, and for carbon sequestration.
3. Las Piñas - Parañaque Critical Habitat and Ecotourism Area (LPPCHEA)	The projects will have a potential adverse impact on marine fauna.	**The Projects pose no threat to the migratory and important bird species as well as marine life since the sites are more than 6 km away.** The ECC's mitigation and prevention measures imposed under the ECCs and continuous monitoring, will also protect the Las Piñas-Parañaque Critical Habitat and Ecotourism Area (LLPCHEA) during project implementation.
Safety		
A. Climate risks		**Pasay City is aware of the potential climate change impacts of the Project and the related safety concerns.** To address these risks, the City has prepared a comprehensive Coastal and Sea Use Plan that presents the appropriate mitigation measures. The Projects will also entail expert master planning and engineering to create a safe environment that will withstand natural and man-made hazards.
1. Flooding	The projects will worsen flooding in Metro Manila.	**The projects will not have any effect on the existing drainage system.** The current flooding in Metro Manila is caused by clogged drainage systems and heavily silted rivers and waterways. Although Pasay City cannot totally avoid flooding, the City can reduce flooding through the following: a. **Raising the elevation of the main structures above the highest anticipated flood level in the area.** In this case, the reclaimed island will have a platform elevation of 4 m and length of 2,498 m at the side facing the middle of the Bay. This may provide a sheltering effect that could then minimize floods in the coastal areas. b. **Rehabilitating rivers and waterways.** The City and its partners have entered into a memorandum of agreement with DENR to adopt and rehabilitate rivers. One of the focus areas will be Estero de Tripa de Gallina, one of Manila Bay's tributaries and a major waterway. This would prevent rising waters that can lead to flooding in

Area	Issue/Concern	Key Messages
		surrounding areas.
2. Sea level rise	The projects will displace sea water and raise sea levels, further worsening the effects to residents.	**By itself, the projects are safe, and they are not anticipated to contribute to increased sea level rise.** The affected part/total reclamation area of 625 hectares is only 1/3 of 1 percent (0.31%) of the total area of Manila Bay, which covers 199,400 hectares. Thus, the projects will not lead to any significant increase in water level in Manila Bay.
3. Storm surges	The projects will increase the severity of climate change impacts, such storm surges.	**Storm surges could happen with or without the reclamation projects.** In this case, the reclaimed island may even provide a sheltering effect, which could minimize floods in the coastal areas. The reclamation platforms will serve as barriers against storm surges that would otherwise hit the inland cities of Metro Manila.
4. Tsunami	The projects will make the coastal areas in Manila Bay more vulnerable to damage to property and loss of lives due to tsunami.	**The elevated reclamation platforms based on innovative engineering designs can protect coastal settlements against tsunami and storm surges.** Mangrove corridors will also be planted as part of the city's coastal defense strategy. It will also protect the shoreline by reducing the tsunami strength.
B. Geologic risks 1. Liquefaction	It is claimed that reclaimed land is prone to liquefaction. This can lead to tilting or collapse of structures; sand boils; movement of subsoil, and deep cracks to the ground. Liquefiable materials exist in the project site. Reclamation fill materials are also liquefiable. Reclaimed soil is more prone to liquefaction because it is weak, compressible, and not as stable as hard bedrock on land.	**The Pasay Reclamation Projects will be safe from the threat of liquefaction.** The ECC/EIA process established that the Projects are safe and reliable based on the technical studies that were conducted. The DENR and the Environmental Management Bureau have reviewed the results from these studies. The Pasay City Coastal and Sea Use Plan have also identified the appropriate mitigating measures against the threat of liquefaction. These include the following: • Additional drilling works with depth extending into the Guadalupe Tuff layer; • Removal of liquefiable/compressible soil layer prior to reclamation; • Providing support to critical and/or strategic structure; • Use of industry-accepted tests (e.g., for compression and liquefaction potential) and procedures prior to and after application of remediation measure); and • Consideration of lateral pressure and resistance against buckling during earthquakes in the design of coastal protection structures.

Area	Issue/Concern	Key Messages
2. Subsidence	The reclamation may contribute to the subsidence of the coastal land bordering the Manila Bay.	**There is no evidence that reclamation in Manila Bay will speed up the sinking of the land in Metro Manila.** • There is also no record of land subsidence in the existing reclaimed area in Pasay. There appears to be no studies that directly correlate land subsidence in Metro Manila with the reclamation projects in Manila Bay. Neither is there any record of land subsidence in the Cultural Center of the Philippines (CCP) area and the Mall of Asia (MOA) area. • Land subsidence is caused by over extraction of ground water. In this case, the projects will not extract groundwater in the reclaimed land or in the process of reclaiming land. • The projects' engineering designs have addressed the risk of subsidence by providing enough channels, drainages, and runoff discharges to the open sea as well as non-blockage of river outfalls and other flood paths.
C. Health COVID-19	Construction activities that may worsen the spread of COVID-19.	The City and its joint venture partners will observe and follow all laws, rules, regulations and standards for COVID-19 safety, security, and health.
Project Approval Process		
	The Project Approval Process is a major issue that needs to be addressed to ensure that there is transparency, stakeholder participation and no irregularities occurred during the process. Stating the reputation and accomplishments of the private proponents also justifies their selection.	**Transparency and stakeholder participation** Consultation and stakeholder participation of various sectors were conducted at various stages of the approval process. Public hearings and plenary discussions were conducted prior to the release of resolutions from the City Council. **Compliance with government approval process** The private joint venture partners have complied with all the necessary requirements and processes as required by Pasay City following the prescribed procedure under the 2008 National Economic Development Authority Joint Venture guidelines and Pasay Public-Private Partnership (PPP) code which involve that transparency, competition, accountability, and public interest prevail. There were no shortcuts made in the approval process. The Pasay City Council authorized the acceptance of unsolicited proposals for the projects, approved the selection of private sector proponents and authorized the execution of the Contractual Joint Venture Agreement (CJVA). The Philippine Reclamation Authority under the Office of the President granted the Notices to

Area	Issue/Concern	Key Messages
		Proceed, Notices to Mobilize and Notices to Commence Actual Reclamation Work while the Environment Management Bureau issued the Environment Compliance Certificates and the Department for Environment and Natural Resources issued the Area Clearances. All relevant government agencies were notified of the project and letters of no objection (LONO) were received. **Reputation of PHCC and SM SCIDC** The private proponents for the coastal development projects (SM SCIDC for the 360-hectare reclamation and Pasay Harbor City Corporation for the 265-hectare reclamation) were awarded the contracts for the Projects as joint venture partners, after establishing their financial, technical, and legal eligibility or qualifications to undertake the projects and after their unsolicited proposals for the projects underwent a competitive and transparent selection process (which is a form of public bidding) pursuant to the City's PPP Code (for the 265-hectare reclamation) and the 2008 NEDA Joint Venture Guidelines (for the 360-hectare reclamation). **Presentation of timeline** The detailed timeline for the approval of both PHC265 and SM360 from the period of submission of unsolicited proposals to the ratification of the Joint venture agreement by the City Council are available upon request.
Legal		
	Some legal issues have been raised concerning the project such as the involvement of foreign companies in the projects, writ of continuing mandamus, a possible filing of a *Writ of Kalikasan* and the disposition of reclaimed land.	**Involvement of foreign companies in the projects** Royal Boskalis Westminster NV. Boskalis has been hired by PHCC265 and China Harbour Engineering Corporation (CHEC) has been hired for SM360 coastal development projects since no local company has the technical expertise to accomplish the task. Royal Boskalis has a solid track record, having built islands in Bahrain, Indonesia, the Netherlands, Panama, Singapore, and South Korea and is best suited for the project. CHEC's diverse infrastructure portfolio includes marine engineering, dredging and reclamation, road and bridge, railway, airport, and equipment assembly. **Writ of continuing Mandamus** The Supreme Court's decision does not contain an outright ban on reclamation projects in the Bay, in fact the reclamation project will hasten the clean-up and rehabilitation of Manila Bay. Further, the projects cannot be covered by a moratorium in reclamation as

Area	Issue/Concern	Key Messages
		the sites are not located in any mangrove, marine habitat, or fish sanctuary. The project is compliant with the desired output of the Operational Plan for the Manila Bay Coastal Strategy (OPMBCS) in that it will incorporate mangrove corridors to regenerate marine life around the reclaimed islands. **Writ of Kalikasan** Proponents are wary that a Writ of Kalikasan may be filed once the project commences. To date, there are none filed. If ever one is filed, there is no substantial evidence that the project does not pose a large-scale ecological threat. The Project is consistent with the SC order for the Bureau of Fisheries and Aquatic Resources to improve and restore marine life in the Bay. **Disposition of reclaimed land** Reclaimed land cannot be disposed of without a prior presidential proclamation that the reclaimed land is alienable and disposable and no longer needed for public use or purpose. In the absence of any actual threat or imminent danger, remedies are available in administrative agencies to properly address and resolve concerns involving protection of ecological rights.
Displacement		
1. Displacement of fisherfolk	The proposed area does not have registered fisherfolk and substantial fishing area and lack of marine life in the project site. Being done in the water, reclamation projects are prone to affect fisher folks within the area. Displacement is an impact of any development. Some sectors have been vocal about the fact that fisherfolks will be affected by the proposed project.	**Absence of substantial fishing area in the project site** A study by DENR accredited experts reveals that no significant population of fish, crustaceans, and marine macroinvertebrates can be found in the project areas. This lack of marine life is due to the absence of coral reefs, seagrass beds, and mangroves that could sustain a marine ecosystem. These facts have resulted in unproductive fishing activity within the project sites. When on-site studies were conducted by the EIS consultants for the projects, almost all fishing was being done in areas more than 3 kilometers away from the project sites. On the contrary, the Projects are projected to create hundreds of thousands of new job and business opportunities within Pasay and adjoining cities. **No registered fisherfolks** However, for the purposes of the SM360 and PHCC265 projects, there are no

Area	Issue/Concern	Key Messages
		registered fisherfolks[2] that will be affected by the project. Upon further examination, the locations of the reclamation projects show minimal to nil fishing activities. Studies have shown that some fisherfolks are present in the area but there is no substantial fishing in the area because of low fish productivity compared to other fishing grounds in Manila Bay. Their activities can be channeled to more productive areas, thus, the project poses no risk of the Pasay Reclamation Projects substantially economically displacing any fisherfolk in Manila Bay. Equally misplaced are the concerns regarding potential loss of livelihood and fishing activity.
2. Displacement of informal settlers in the project sites	Some sectors elucidated those informal settlers will be affected and displaced by the Projects.	The projects will not result in the displacement or resettlement of informal settlers. There are no informal settlements or communities in the project sites, which are offshore areas (in front of SM MOA and CCP Complex) devoid of any human habitation at the moment. This can be confirmed by an ocular inspection of the Project sites at any time.
3. Availability of socialized housing	The Balanced Housing Development Program[3] of the Housing and Land Use Regulatory Board (HLURB) provides that condominium developers are required to develop socialized housing equivalent to at least 5% of the project cost for subdivision or condominium projects, at the option of the developer.	This is not a subdivision or condominium project; hence such provision does not apply to reclamation projects. However, it may apply to developers that will invest in the reclamation projects, after the land has been reclaimed.
Social		
1. Influx of Chinese/foreign workers	The projects will take jobs away from Filipino workers in favor of Chinese/foreign workers.	To meet the highly technical requirements of the projects, Pasay City LGU's joint venture partners engaged two foreign Engineering, Procurement, and Construction (EPC) contractors, namely Royal Boskalis Westminster N.V. for Pasay 265 and China Harbour Engineering Corporation for Pasay 360. But during construction, the projects

[2] Based on the results of the Fisheries Compliance Audit (FishCA) conducted by the DILG

[3] HLURB Memorandum Circular No. 9, Series of 2018

Area	Issue/Concern	Key Messages
		will prioritize the hiring of qualified Pasay City residents to fill up the manpower requirements.
2. Increased congestion and traffic	Metro Manila's vehicular traffic will worsen due to the projects.	**The construction will focus on submerged areas in the open sea so it will not contribute to congestion.** Upon completion, 30% of the reclaimed islands will comprise new roads, bridges, parks, and open spaces. Thus, the Projects will not impede traffic flow within the reclaimed islands and surrounding areas in Metro Manila. Furthermore, the internal and access roads and bridges in the reclaimed islands will be integrated with the existing access roads and national highways with a proposed monorail going into the coastal development area. This will promote efficient traffic control and management.
3. Manila Bay as a National Historical Landmark	Manila Bay is a National Historical Landmark; thus, any coastal development in Manila Bay needs the approval of the National Historical Commission of the Philippines (NHCP) or the National Commission for Culture and the Arts (NCCA).	The NHCP has already expressed no objection to the implementation of the projects since it regulates only coastal development within the City of Manila, and not those within the municipal waters of Pasay.
	The coastal development projects will obstruct the view of the Manila Bay sunset.	**The new Manila Bay waterfront is envisioned to be a central place where people can sit down and enjoy the sunset.** It will be actively designed as a destination site that the public can experience for free.
4. Promotion of equitable and inclusive community	The coastal development projects will not have enough public facilities (schools, social welfare centers, health centers, etc.) that will benefit Pasay City's vulnerable groups, namely: • Youth and children (children in need for special protection, Children in conflict with the law, youth in need of special protection) • Women in especially difficult	**The schools, hospitals, open areas, and other facilities (e.g., bike paths, walkable areas) in the coastal development sites will be designed to support the needs of Pasay City's aging population, families, women, and youth.** A specialized hospital and youth/senior activity centers are being proposed in the area. These will contribute to the long-term development of vulnerable groups and support the building of an equitable and inclusive community.

Area	Issue/Concern	Key Messages
	circumstances • Persons with disabilities • Senior citizens • Families affected by disaster/calamities (fire and typhoon/floods)	

21. The LGU has proposed several messages based on Pasay's Grand Eco-City grand vision. These highlight the key benefits of the coastal development projects. The communication strategy will amplify these using the preferred channels of the primary audience. These messages include the following:

i. **Overall:** The coastal development projects will transform the site to an eco-city aligned with Pasay City's grand vision.

ii. **Economic**: The coastal development will improve the quality of life for Pasay city constituents and provide jobs, jobs, jobs.

The proposed project envisions that employment opportunities, safe and affordable housing, healthy and affordable food, and other basic needs such as clean air and water will be available. The area will be well-planned and is expected to increase mobility of residents and ease of travel from work to home and vice versa, thus improving overall well-being.

iii. **Environmental**: The projects will result in a net-positive environmental impact.

With significant land for both coastal development projects allocated for environmental protection, it assures the community that safe green and blue spaces are available. Further, solid waste segregation and management, water and waste recycling, sewerage treatment and opportunities for renewable energy will be prioritized. Ocean clean-up and mangrove regeneration and habitat rehabilitation activities will also be undertaken as well as research on potential climate-resilient aquaculture technologies (e.g., seaweeds and mussel culture using line methods) as alternative source of fish production and for carbon sequestration.

iv. **Project approval process:** The coastal development projects went through a meticulous approval process.

The Project Approval Process undertaken ensures that there is transparency, stakeholder participation, and no irregularities occurred during the process. The reputation and accomplishments of the private proponents also justifies their selection.

v. **Legal:** Pasay City LGU together with its private partner proponents continues to address issues about the coastal development projects.

Some legal issues raised concerning the coastal development projects, such as the involvement of foreign companies, Supreme Court Mandamus, a possible filing of a Writ of Kalikasan, and the disposition of reclaimed land will be appropriately addressed.

vi. **Social:** The coastal development projects will increase public facilities for the community that will provide benefits for the local community.

22. Provision for the use of land to be shared to the Pasay City LGU for public services such as a new city hall, hospital, schools, senior and youth center, as well as a sports center.

VII. INTEGRATED COMMUNICATION PLAN

A. Communication Principles

23. We need to employ communication strategies in stakeholder consultation and engagement through three steps:

i. **Notification.** The public has the right to know about your project, to ask questions and even to oppose it. But they need to be supplied with the right information to form such an opinion. In the absence of an official communication from the proponents, the public will form an opinion based on what people say, subjected to misconceptions and fake news. The image of the proponents should also be built up especially during the initiation phase of the project to build trust among the stakeholders.

ii. **Consultation.** To achieve meaningful communication, this should involve an ongoing two-way communication to increase understanding and clarify preferences, values, and objections.

iii. **Participation.** The value of the information and how it is presented is important during the entire process. A sincere and detailed consultation with the public will help ensure that trust is developed and that solutions are co-created with your stakeholders.

24. Communication should be:

i. Transparent – honest, factual, and easy to comprehend;

ii. Consistent – decide to use communication channels that are accessible to them, and

iii. Recorded – all meetings, letters, emails, etc. should be recorded and easily accessible.

B. Communication Strategy

25. This IEC plan considers the coastal development projects as high-risk due to three main reasons. First, this type of coastal development is a highly controversial topic and there is a high possibility that it will be under scrutiny by the media or political parties. Second, It is a complex undertaking that involves many sectors or many components. Third, it is likely to attract a negative response from opinion makers who are strongly against this type of coastal development projects. Communication will be integral in educating the stakeholders in an effective manner and in mitigating the risks associated with the projects.

26. There has been minimal information released to the public through different media channels such as news reports and social media posts. Response, both negative and positive, towards the project has also been minimal. It is anticipated, however, that issues may arise when the development becomes visible to the mainland. This communication strategy responds to the major issues that the public may raise about the coastal development project. With the messages directed towards progress, development and potential benefits in pursuit of the vision of Pasay's Eco-City grand vision, the potential opposition to the project may be neutralized.

1. Phase One

27. During phase one, the strategy is to engage the primary audience through focused small group activities. At this stage, the goal is to educate them by introducing the project and clearly explaining how it contributes to the achievement of the city's long-term vision for

improved quality of life for the stakeholders. It is important to discuss the key benefits and focus on those that are highly relevant to each group of stakeholders. This is also an opportunity to identify the risks and present the mitigation measures to allay fears or doubts.

28. The second goal for phase one is to listen and respond to questions and concerns about the project. This is the time to correct misconceptions and hearsay about the project and to introduce contact persons who can serve as reliable sources of information. The meetings should be documented so that recurring themes and answers to similar questions can serve as inputs for future IEC materials (e.g., frequently asked questions) and outreach activities in phase two and three.

29. The third goal is to build rapport with the audience and identify potential supporters. The first meeting with each stakeholder group is crucial to set the tone and open communication lines. At the end of each session, the proponents should be able to identify the communication needs of each group in relation to the project and plan how to meet those needs. This is also the chance to identify potential champions who will promote the project. As such, it would be better to avoid high-profile events and buying of media space/time during phase one and focus on smaller activities.

30. These orientation sessions or briefings can be followed up or supplemented with information and awareness materials that can be sent by email through a mailing list, print materials, or social media updates. For employees of the local government, there can also be monthly updates discussed during regular department meetings or bulletins released on a bi-monthly or quarterly basis depending on the needs.

2. Phase Two

31. Phase two will include media outreach to journalists or opinion makers who are involved in environmental, business, tourism beats, etc. Small group sessions for updates on the project will be conducted via "kapihan (coffee) sessions" or similar activities. Depending on the comfort level of the participants, this can be a face-to-face event or structured as an online press conference or media briefing.

32. To provide periodic updates on the coastal development projects, it is suggested that a new page in the Pasay City LGU website be created and regularly updated to provide basic project information, contact persons for media inquiries, answers to frequently asked questions, and downloadable IEC materials such as the project primer or brochure. This page can be enhanced with other types of content such as short videos introducing the project, links to media coverage, and other relevant project documents or reports that show that the project is being transparent.

33. Further, a mailing list of email addresses can be made available to add to the list from Phase 1. Updates can be sent on a monthly or quarterly basis. The distribution of IEC materials both physically and electronically is also suggested.

3. Phase Three

34. Phase three will focus on communicating with the secondary audience. This can be done through mass communication channels such as digital media, social media, and traditional media (TV, radio, and print). The channels that will be chosen would be media outlets or platforms that stakeholders trust because of their high credibility. They must also be accessible and highly preferred by the audience. The use of these tools should be carefully thought out and used only when necessary. Otherwise, caution should be exercised in the dissemination of information. Depending on prevailing health regulations, limited face-to-face events can also be organized to reach out to potential allies and to strengthen rapport with existing supporters.

35. **Table 4** summarizes the phases of the communication strategy and the suggested activities for each one. This is not an exhaustive list and additional activities can be added depending on the need. The phases may overlap from each other based on the duration of the project.

Table 4: Phasing of the Communication Strategy

PHASE 1	PHASE 2	PHASE 3
Goal: Engage primary stakeholders through: • Small group orientation sessions (e.g., meetings, briefing, etc.) • Electronic newsletters sent to a mailing list (may be monthly updates, quarterly bulletins, etc.) • Viber group updates • Distribution of IEC materials (primer, brochures, etc.)	**Goal**: Engage key opinion leaders and influencers through: • Kapihan sessions, Ulat sa Barangay • Website • Newsletters sent to a mailing list • Distribution of IEC materials (primer, brochures, etc.)	**Goal**: Engage secondary audience and general public through: • Digital and social media • Traditional media (TV, radio, print) • Face-to-face events, subject to health regulations

Note: We need the adjusted project duration for us to be able to recommend the period of months per phase.

36. The communication messages will be expressed using a corporate yet futuristic creative rendition using the pink color palette sporadically.

Figure 2: Sample of Creative Rendition

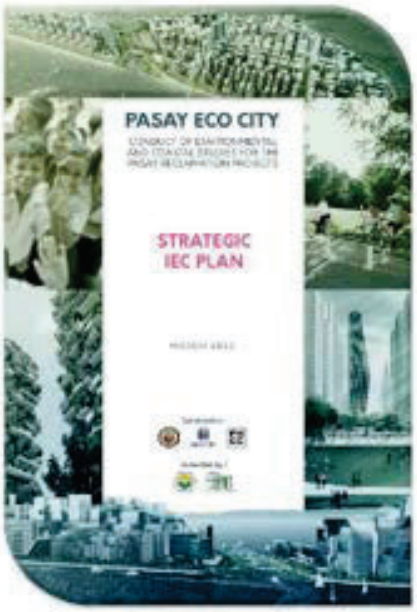
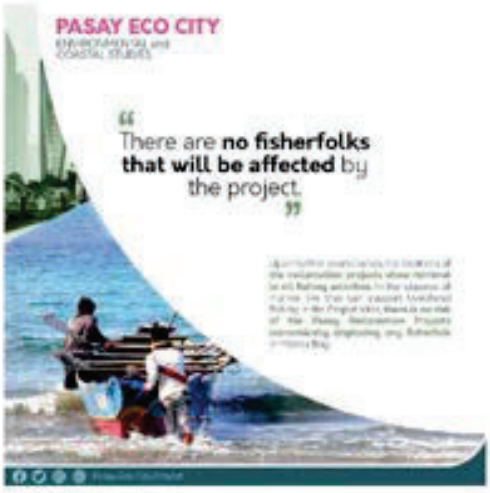


Figure 3: Template of Social Media Posts



C. IEC Plan, Timeline, and Cost

37. **Table 5** below shows the summary of the IEC strategy categorized per target audience with its corresponding communication goal, information channels, and timeline. The IEC plan shall be implemented in phases based on the need to activate the information channels at appropriate times.

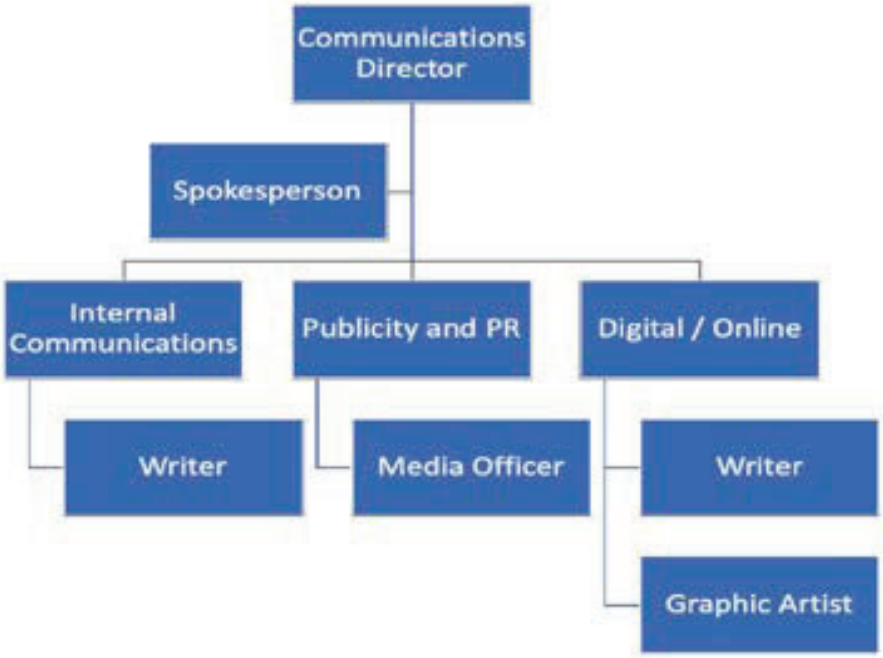
Table 5: Summary of the IEC Strategy

Audience	Desired Behavior / Communication Goal	IEC Strategy/ Messaging	Information Channels	Time line
Primary Local residents Employees Business owners and investors Entrepreneurs	**Knowledge:** 1. Stakeholders are highly aware and can list the key benefits that the coastal development projects will bring to their sector and to their community. 2. Stakeholders have a clearer understanding of the potential risks, how it might affect them, and what the LGU's mitigation measures are. **Attitude:** Stakeholders have a more favorable view of the coastal development projects.	Education	• Small group orientation sessions • Electronic newsletters sent to a mailing list • Viber group updates • Distribution of IEC materials to community leaders	Phase 1
Special interest groups: Fisherfolk	Stakeholders will not oppose the project. Instead, they will commit to working with the LGU in finding mutually acceptable options to the identified issues.	Information	Small group meetings	Phase 1
Secondary Political personalities against coastal development Media and opinion makers Environment advocates / groups Civil society organizations	**Practice:** Stakeholders will: 1. Write and share accurate facts about the project; 2. Promote healthy discussions that will help increase positive perception or public support for the project.	Information	• Kapihan sessions or similar activities • Website updates • Newsletters sent to a mailing list • Distribution of IEC materials (primer, brochures, etc.)	Phase 2
General public	**Attitude:** Stakeholders have a more favorable view of the coastal development projects.		• Digital and social media • Traditional media (TV, radio, print) • Face-to-face events, subject to health regulations	Phase 3

VIII. PROPOSED ORGANIZATIONAL STRUCTURE OF COMMUNICATION TEAM

38. Currently, the Communication Team is loosely organized with representatives from the LGU, SM, PHCC, and Libra Law. The consultants recommend that a team be assigned for this project with specific roles and responsibilities.

Figure 4: Proposed Organizational Structure



Duties and Responsibilities of the Communication Team

39. ***Communications Director.*** The Communications Director for the project shall lead the overall direction and implementation of the communication plan, its strategies, timeline and costs. As such, the Director shall ensure that a monitoring system is set in place and that a positive image of the coastal development project is in place. He/she shall also ensure that the issues arising from the public and media are addressed in a timely manner.

40. **Spokesperson.** The spokesperson should be well-informed and knowledgeable of the different aspects and developments of the plan at any time. He/she shall portray a positive persona that reflects the nature of the project. The spokesperson is expected to speak on behalf of the proponent and joint venture partners on any and all issues presented to them.

41. **Internal Communications Writer.** Internal communications team shall handle all communications directed to employees of Pasay City LGU, SM Prime, and PHCC as well as its venture partners, residents, and business owners within Pasay City. He/she will handle the production and distribution of materials addressed to internal stakeholders.

42. **Publicity and PR Media Officer.** The media officer shall handle building relationships with external stakeholders and media. He/she lobbies with government officials and agencies, media outlets, and other external stakeholders.

43. **Digital Writer.** A digital writer shall handle all pertinent communication initiative for the project's website and social media channels. Aside from creating the media messages, he/she shall also handle the dissemination and engagements online.

44. **Graphic Artist.** In partnership with the writer, the graphic artist renders the communicative messages in creative format. He/she also ensures that the designs conform with the branding kit (type of fonts, color palette, and design guidelines).

IX. MONITORING AND EVALUATION

45. Monitoring and evaluation of the IEC is an important tool to assess the progress of the plan. Since the project is done in phases, the period and metrics have also been defined by phase. (**Table 6**)

Table 6: Monitoring and Evaluation Matrix by Phase

PHASE 1	Period	Metrics
Goal: Engage primary stakeholders through: • Small group orientation sessions (e.g., meetings, briefing, etc.) • Electronic newsletters sent to a mailing list (may be monthly updates, quarterly bulletins, etc.) • Viber group updates • Distribution of IEC materials (primer, brochures, etc.)	To be determined following activation of the information channel	• Number of orientation sessions conducted and number of attendees • Number of newsletters created, distributed and to whom • Number of primers / brochures / fliers • Number of members in the Viber groups

PHASE 2	Period	Metrics
Goal: Engage key opinion leaders and influencers through: • Kapihan sessions, Ulat sa Barangay • Website • Newsletters sent to a mailing list • Distribution of IEC materials (primer, brochures etc.	To be determined following activation of the information channel	• Number of kapihan sessions conducted and number of attendees • Number of unique visitors to the website and minutes they stayed • Number of newsletters distributed and to whom • Number of primers / brochures / fliers distributed.

PHASE 3	Period	Metrics
Goal: Engage secondary audience and general public through: • Digital and social media • Traditional media (TV, radio, print) • Face-to-face events, subject to health regulations	To be determined following activation of the information channel	• Number of posts and engagements in social media • Number and length of exposure of tv, radio and print appearances • Number of attendees to face to face events

X. THE WAY FORWARD – RECOMMENDATIONS

46. Coastal development projects, by nature, are controversial especially since there are numerous coastal development projects in the Manila Bay. Implementation of these projects when mishandled can create negative public sentiment. A responsive yet cautious communication strategy can help shape and manage public opinion.

47. **Monitoring of public sentiment.** A team should be assigned to monitor traditional and digital media for articles and posts on the projects and its level of engagement. A daily report should be submitted to the decision makers on how to manage the media releases. Negative messages should be anticipated and a positive response should be made to address the matter. Mass media thrives on sensationalism; however, digital media affords engagement and interaction. Hence, being able to respond to media messages is imperative.

48. **Proactive and preemptive measures should be taken by the communication team.** The communication team should be able to make a proactive and preemptive response to issues that may be raised even before they are raised to soften its impact. The issues itemized in Table 3 are deemed as probable "hot" issues that opposing sectors may raise.

REFERENCES

BusinessWorld (2019). *Pasay-SM Prime Manila Bay reclamation project set to proceed.* https://www.bworldonline.com/editors-picks/2019/12/06/268172/pasay-sm-prime-manila-bay-reclamation-project-set-to-proceed/

Olano, C.V. (2020). *Doubts on fate of reclamation projects weigh down SM Prime Holdings.* Business World. https://www.bworldonline.com/doubts-on-fate-of-reclamation-projects-weigh-down-sm-prime-holdings/

Pasay City Local Government Unit (2021). Resource Book on the Pasay Reclamation Projects (Working Draft).

Pasay City Local Government Unit (n.d). Pasay City Eco City Grand Vision. (Presentation Material).

Philippines News Agency (2019). SM Prime gets notice to proceed for Pasay reclamation project. https://www.pna.gov.ph/articles/1088144

PLANADES and PRIMEX (2022). *Coastal Habitats and Fisheries Interim Report*. Conduct of Environmental and Coastal Studies for the Pasay Reclamation Projects

PLANADES and PRIMEX (2022). *Development Guidelines for the Sustainable Environmental Design for the Reclamation Areas*. Conduct of Environmental and Coastal Studies for the Pasay Reclamation Projects

PLANADES and PRIMEX (2022). *Environmental Management Plan*. Conduct of Environmental and Coastal Studies for the Pasay Reclamation Projects

PLANADES and PRIMEX (2022). *Pasay City Operational Plan for Manila Bay*. Conduct of Environmental and Coastal Studies for the Pasay Reclamation Projects

PLANADES and PRIMEX (2022). *Pasay City Sustainable Coastal Environment Management Plan: Conceptual Development and Coastal- Sea Use Plan Framework*. Conduct of Environmental and Coastal Studies for the Pasay Reclamation Projects

PLANADES and PRIMEX (2022). *Social Development Plan*. Conduct of Environmental and Coastal Studies for the Pasay Reclamation Projects

Rosales, E.F (2019). *Pasay City reclamation project gets PCC's nod*. Business Mirror. https://businessmirror.com.ph/2019/10/01/pasay-city-reclamation-project-gets-pccs-nod/

Rousseau, D.M., S.B. Sitkin, R.S. Burt and C. Camerer (1998). Not so different after all: A cross-discipline view of trust. Academy of Management Review, 23:393-404.

APPENDIX M.2

SDP PLAN

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

01 June 2023

ENVIRONMENTAL MANAGEMENT BUREAU
RECORDS SECTION / CENTRAL OFFICE
RECEIVED
JUN 02 2023
By: JAMES
Time: 3:05

ENGR. GILBERT C. GONZALES
Director, Environmental Management Bureau (EMB)
Department of Environment and Natural Resources (DENR)
DENR Compound, Visayas Avenue
Diliman, Quezon City

Subject: **Submission of Updated Social Development Plan and Information, Education, and Communication Plan for the Pasay Reclamation Projects ("Projects")**

Dear Dir. Gonzales,

In response to the EMB's letter dated 7 November 2022, we are pleased to submit the updated Social Development Plans (**Annex "A"**) and Information, Education, and Communication Plans (**Annex "B"**) for the Pasay 360-hectare[1] and 265-hectare[2] Pasay Reclamation Projects ("Projects") as part of our continuing compliance with the conditions set forth in the Environmental Compliance Certificates for the Projects.

With regard to the Environmental Management Plans for the Projects, we will submit these as soon as our consultants have completed incorporating EMB's observations.

Thank you.

Very truly yours,

IMELDA CALIXTO-RUBIANO
City Mayor

[1] ECC-CO-1601-0003 issued 24 October 2017
[2] ECC-CO-1807-0015 issued 03 December 2018

ENVIRONMENTAL AND COASTAL STUDIES FOR PASAY RECLAMATION PROJECTS

SOCIAL DEVELOPMENT PLAN

SUBMITTED TO
SM SMART CITY INFRASTRUCTURE DEVELOPMENT CORPORATION, INC

PASAY HARBOR CITY CORPORATION
and

CITY GOVERNMENT OF PASAY

REPORT BY

PLANNING AND DEVELOPMENT RESEARCH FOUNDATION, INC

PACIFIC RIM INNOVATION AND MANAGEMENT EXPONENTS, INC.



AUGUST 2022

ACRONYMS

ABM	Accountancy, Business and Management
ALS	Alternative Learning System
APD	Areas for Priority Development
BFAR	Bureau of Fisheries and Aquatic Resources
BGY	Barangay
CAAP	Civil Aviation Authority of the Philippines
CAB	Civil Aeronautics Board
CBMS	Community-based Monitoring System
CCDO	City Cooperative Development Office
CCP	Cultural Center of the Philippines
CDP	Comprehensive Development Plan
CEO	Chief Executive Office
CHED	Commission on Higher Education
CHO	City Health Office
CITEM	Center for International Trade Expositions and Missions
CMCI	Cities and Municipalities Competitive Index
CMP	Community Mortgage Program
COVID-19	Coronavirus Disease 2019
CPDO	City Planning and Development Office
CSR	Corporate Social Responsibility
CSWD	City Social Welfare and Development
DepEd	Department of Education
DFA	Department of Foreign Affairs
DOH	Department of Health
DOLE	Department of Labor and Employment
DPSIR	Driver, Pressure, State, Impact, and Response Model of Intervention
DTI	Department of Trade and Industry
ECC	Environmental Compliance Certificate
EIS	Environmental Impact Study
EMB	Environmental Management Bureau
EMI	Ease of Making Investment
FGD	Focus Group Discussion
GAA	General Appropriations Act
HS	Highschool
HUMSS	Humanities and Social Sciences
IEC	Information, Education, Communication
ISF	Informal Settler Families
LGU	Local Government Unit
MDG	Millennium Development Goals
MOA	Mall of Asia
MPS	Mean Percentage Score
NAT	National Achievement Test
NCR	National Capital Region

NGO	Non-government Organization
NHA	National Housing Authority
NSO	National Statistics Office
OTS	Office for Transportation Security
PCCI	Philippine Chamber of Commerce and Industry
PCG	Philippine Coast Guard
PEISS	Philippine EIS System
PESO	Public Employment Services Office
PHILEXPORT	Philippine Exporters Confederation, Inc.
PLAA	Pasay-Libertad Anglers Association
POPCEN	Census of Population
PPP	Public Private Partnership
PRA	Philippine Reclamation Authority
PSA	Philippine Statistics Authority
PTTC	Philippine Trade Training Center
PWD	Persons with Disability
RCC	Regional Competitiveness Committee
RPM	Revised Procedural Manual
RT-PCR	Reverse Transcription–Polymerase Chain Reaction
SDG	Sustainable Development Goal
SDP	Social Development Plan
SEF	Special Education Fund
SPED	Special Education
STEM	Science, Technology, Engineering and Mathematics
TBD	To be discussed
TVL	Technical, Vocational, Livelihood
UDHO	Urban Development and Housing Office
UPE	Universal Primary Education
WHO	World Health Organization

Contents

ACRONYMS 1
LIST OF FIGURES 4
LIST OF TABLES 5
1.0 INTRODUCTION 6
1.1 Background 6
1.2 Project Description 6
2.0 OBJECTIVES and SCOPE 8
3.0 PASAY CITY'S SOCIAL SECTOR PROFILE 9
3.1 Population and Demography 9
3.2 Employment and Local Economy 16
3.3 Education 22
3.4 Health 26
3.5 Housing and Urban Settlements 30
4.0 SUMMARY OF KEY ISSUES AND CONCERNS 36
5.0 DEVELOPMENT FRAMEWORK AND STRATEGIES 37
5.1 Key Principles and Assumptions 37
5.2 Social Development Framework 38
5.3 Goals and Strategies 38
6.0 PROPOSED PROGRAMS AND PROJECTS 40
6.1 Goal 1: Strategy 1: Enhancing Housing Choices (G1S1) 40
6.2 Goal 1: Strategy 2: Enhance Community Accessibility (G1S2) 40
6.3 Goal 1: Strategy 3: Address the Needs of Vulnerable People (G1S3) 41
6.4 Goal 1: Strategy 4: Help Children, Youth and Families Thrive (G1S4) 42
6.5 Goal 2: Strategy 1: Strengthen Social Infrastructure 43
6.6 Goal 2: Strategy 2: Provide High Quality Recreation, Arts, Cultural and Wellness Opportunities (G2S2) 44
6.7 Goal 2: Strategy 3: Facilitate Strong and Safe Neighborhoods 45
REFERENCES 49

LIST OF FIGURES

Figure 1. Proposed Pasay City Reclamation Projects 6
Figure 2. Project Primary Impact Area and Secondary Impact Zones .... **Error! Bookmark not defined.**
Figure 3. Pasay City's Economic Dynamism Ranking 17
Figure 4. SDP Framework 38

LIST OF TABLES

Table 1. Total Population and Growth Rate of Pasay City, 2000 to 2020 4
Table 2. Projected Population of Pasay City 2025-2050 5
Table 3. Population and Demographic Indicators, 2020, Pasay City 5
Table 4 Total Population of Barangays, Growth Rate and Population Density, Pasay City, 2000 to 2020 6
Table 5 Historical CMCI Scores of Pasay City 11
Table 6 2020 Total Employment 12
Table 7. Unemployment and Income 13
Table 8 Pasay City's Poverty Incidence 14
Table 9 Pasay City's Number of Establishment per type 14
Table 10. 2020 Number of Establishments 15
Table 11.. Magnitude of Children of School-going Age not attending School, 2020, Pasay City 17
Table 12. Basic Education Sector Information, 2020, Pasay City 18
Table 13. Basic Information on Specialized Schools 19
Table 14. 2018 National Achievement Test (NAT) Results for Pasay City 19
Table 15. List of Public High Schools in Pasay, 2016 20
Table 16. List of Universities and Colleges in Pasay City 21
Table 17. Vital Health Indicators, 2020, Pasay City 21
Table 18. Top Ten Leading Causes of Morbidity, 2010-2012, Pasay City 22
Table 19. Top Ten Leading Causes of Mortality 22
Table 20. Health Personnel, 2012, Pasay City 23
Table 21. Health Facilities, 2012, Pasay City 24
Table 22. List of Hospitals, 2013, Pasay City 24
Table 23. Households without access to safe water and sanitary toilet facility, 2020, Pasay City 24
Table 24. Housing Situation, 1990-2015 25
Table 25. Occupied Housing Units, Households, Household Population by Type of Building, 1990-2015 25
Table 26. Magnitude of Households who are Informal settlers and Living in Makeshift Housing.,2020 26
Table 27. Magnitude of Informal Settlers in Pasay and South Sector, as of April 11, 2000 26
Table 28. Percentage of Occupied Housing Units by Construction Materials of the Outer Walls and Roof, 2015 27
Table 29. Households by Type of Building and Tenure Status of the Housing Unit/Lot,2015 27
Table 30. Number of Households by Kind of Fuel for Lighting, 2015, Pasay City 28
Table 31. Number of Households by Main Source of Water Supply for Drinking 29
Table 32 Issues and Concerns per Sub-Sector 30
Table 33 Social Development Program, Projects and Activities 39
Table 34 Indicative Cost and Proposed Period of Implementation of Proposed Programs and Projects 41

1.0 INTRODUCTION

1.1 Background

This Social Development Plan (SDP) for Pasay City is part of the overall outputs under the **Environmental and Coastal Studies for the Pasay Reclamation Projects**, in compliance to the Environmental Compliance Certificate (ECC) requirements issued by the DENR Environmental Management Bureau (EMB) for both the SMPH Proposed 360 Hectares Reclamation Project and Pasay City Harbor Center Reclamation Project (PHCC), to wit:

> *"Provide a detailed Social Development Program based on the framework submitted in the Environmental Impact Study (EIS")*

1.2 Project Description

The Pasay City LGU has entered into agreement with the above mentioned proponents to develop two reclamation areas: These are:

a) SMPH 360 Hectares Reclamation Project – Composed of 2 islands: (a) Island 1 is 300 hectares fronting the Mall of Asia Complex, the Cultural Center of the Philippines (CCP) and Financial Center Asia (FCA); and (b) Island 2 covers 60 hectares beginning from the northern bank of Libertad Channel and up towards north over a span of about 1,290 meter, terminating at the offshore vicinity of the Coconut Palace; and,
b) Pasay City Harbor Center Reclamation Project- covers 265 hectares involving two (2) islands with areas of 210 hectares and 55 hectares, respectively.

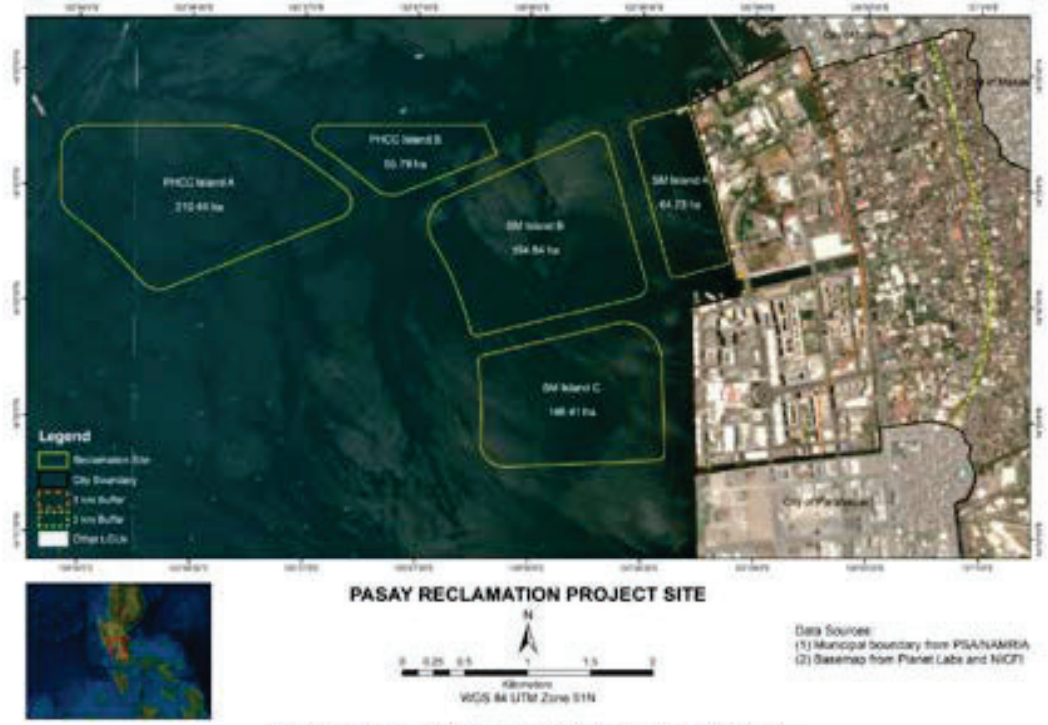


Figure 1. Proposed Pasay City Reclamation Projects

Both reclamation projects, SMPH 360 and PHCC 265 were already respectively issued an ECC. The two projects have almost the same ECC conditions. Consistent with the Revised Procedural Manual (RPM) protocol, the Environmental Compliance Certificate (ECC) covers only the horizontal development phase. The operations phase will be subject to the Philippine EIS System (PEISS).

Both projects are designed as “smart city – new town development” fully master-planned community that will only accommodate Office-Residential-Commercial in high density (FAR 12) mixed-use development concept. A couple of areas were designated as institutional (hospital, civic center, university and city hall) but definitely, there will be no industrial activity within the reclaimed area. Both projects will devote 5% of the total reclaimed area per island into green (urban forest) zones as mandated by the Philippine Reclamation Authority (PRA).

2.0 OBJECTIVES and SCOPE

This SDP aims to enhance and provide detail to the programs and projects identified in the SDP that was submitted as part of the EIS for the two reclamation projects. It will also identify additional programs, projects and activities (PPAs) that will further enhance the quality of life of the affected communities and help provide direction for future decisions in key social sub-sectors such as population and demography, education, health, income, employment and livelihood; and housing and urban settlements.

Specifically, this SDP aims to:

a) Identify issues and concerns affecting the social conditions of the affected communities through an updated socio-economic profile of the communities;
b) Formulate strategies and identify programs and projects that will address issues and gaps in the social development sectors of i) education, health, housing and employment and livelihood; and

c) Establish indicative timeline and budget for identified PPAs.

The scope and coverage of the projects identified here includes the Primary Impact Barangay and the Secondary Impact Zones.

The primary project impact area is Barangay 76 which covers the Cultural Center of the Philippines (CCP) Complex, the MOA area and the one lot deep area of the northeast portion of Roxas Boulevard. The secondary impact zones are the barangays that are within the 1-km radius from the project area (see Figure 2).

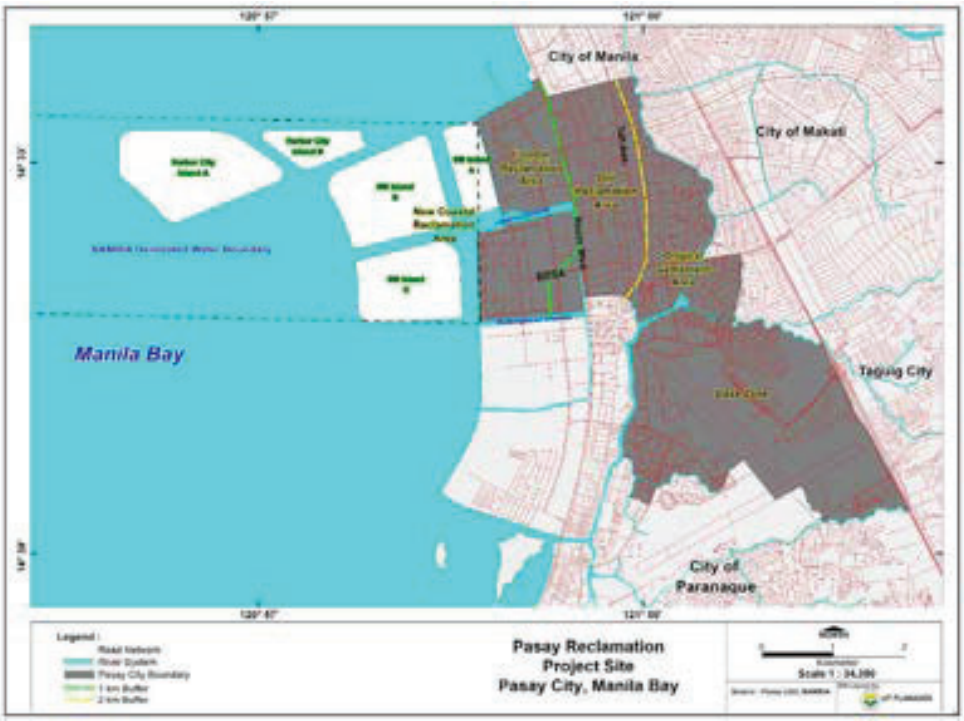


Figure 2. Project Primary Impact Area and Secondary Impact Zones

3.0 PASAY CITY'S SOCIAL SECTOR PROFILE

The city of Pasay ("City") is located in the western coast of Metropolitan Manila (Metro Manila) or the National Capital Region (NCR). It is bounded in the north by Manila's city, in the northeast by the city of Makati and the municipality of Taguig, in the south by Parañaque City, and in the west by the Manila Bay. The City is located approximately, at latitude 14°32' and longitude 121°00'. It is the third smallest political subdivision among the cities and municipalities of NCR in terms of area.

The City has a total area of 1,805.11 hectares. The City proper or Barangays 1 to 201 occupies around 1,399.50 hectares or 77.53 percent the total area. The Cultural Center Complex is a reclamation area which occupies around 191.95 hectares (10.63%) while the rest of the reclamation areas including MOA covers an area of 213.66 hectares (11.84 %).

Pasay City is strategically located in a relatively flat terrain that has the capacity to accommodate large population and a number of commercial enterprises. It is also adjacent to the highly urbanized cities of Manila, Makati, Taguig, and Paranaque that have equally vibrant economies. With the Ninoy Aquino International Airport within its jurisdiction, Pasay City is considered as gateway to Metro Manila and the whole of the Philippines. It is also home to recreational and cultural destinations, and event places that attract visitors and investors.

3.1 Population and Demography

Population Size and Growth Rate

Based on the latest Census of Population (2020), Pasay City has a total population of 440,656 which is about 3.26% of the National Capital Region's (NCR) population of 13,484,462. Pasay City has been growing at an average growth rate of 1.12% for the last 20 years from the 2000 to 2020. (Table 1).

Table 1. Total Population and Growth Rate of Pasay City, 2000 to 2020

Region/City	TOTAL POPULATION				AVERAGE GROWTH RATE (in percent)			
	01-May-00	01-May-10	01-Aug-15	01-May-20	2000-2010	2010-2015	2015-202	2010-2020
NCR	9,932,560	11,855,975	12,877,253	13,484,462	1.78	1.58	0.97	1.29
Pasay City	354,908	392,869	416,522	440,656	1.02	1.12	1.19	1.15

Source: PSA, 2020 Census

Table 2 presents the projected total population in Pasay City from 2025 to 2050 using the average growth rate of 1.12% per year. It is projected that in 25 years or by 2050, Pasay City will have grown by 28% more or an additional 175,054 individuals that will need social services such as education, health, housing and employment.

Table 2. Projected Population of Pasay City 2025-2050

CITY	PROJECTED POPULATION					
	2025	2030	2035	2040	2045	2050
PASAY CITY	465,921	492,635	520,880	550,745	582,322	615,710

Source: PSA, 2020 Census

According to Pasay City's CBMS data of 2018, there are over 83,000 households with an average of only 3 persons per household. Pasay City has a robust population where a large number of population are young and productive. The population of school going age comprise about 19.3% of the total population, while the number of population that are already members of the labor force is equivalent to about 46% of the total population.

Table 3. Population and Demographic Indicators, 2020, Pasay City

Indicator	Household		Population		
	Total	Proportion	Total	Male	Female
Population	83,260		245,237	122,310	122,927
Average HH size	3				
Children under 1 year old	3,943	4.7	3,980	2,021	1,959
Children under 5 years old	16,494	19.8	19,837	10,139	9,698
Children 0-5 years old	18,976	22.8	23,931	12,225	11,706
Children 5 years old	4,053	4.9	40,94	2,086	2,008
Children 6-11 years old	18,644	22.4	24,565	12,824	11,741
Children 6-12 years old	20,555	24.7	28,316	14,774	13,542
Members 12-15 years old	12,503	15	15,151	7,764	7,387
Members 13-16 years old	12,482	15	15,132	7,697	7,435
Members 16-17 years old	7,202	8.7	7,706	3,855	3,851
Members 6-15 years old	25,560	30,7	39,716	20,588	19,128
Members 6-16 years old	27,147	32,6	43,448	22,471	20,977
Members 6-17 years old	28,863	34,7	47,422	24,443	22,979
Members 10 years old & above	83,251	100	204,598	101,349	103,249
Members of the labor force	77,810	93.5	113,171	68,738	44,433

Source: CBMS 2018

Growth of Barangay Population

Pasay City has 201 barangays with an average size of about 0.089 square kilometer or about 8.9 hectares. The smallest barangay is Barangay 154 with an area of only about 0.50 hectare. It has a population of 743 as of 2020 Census and growing at a positive rate of 0.02 percent. The largest barangay in terms of size is Barangay 76 with an area of about 4.262 km^2 or about 426 hectares. Most This covers the reclamation area from the CCP Complex to the MOA Complex and a lot deep from the other side of Roxas Boulevard. Barangay 76 has a total population of 19,604 in 2020, a 400% leap from only 4,902 population five years earlier or in

2015 Census. This could be attributed to high occupancy of residential condominiums built in the same period in the area.

The second largest barangay in terms of size is Barangay 183, with an area of about 3.884 km^2 or about 388 hectares. Barangay 183 which consist the international airport has the biggest population in Pasay City with about 37,372 in 2020. The population there grew at a steady average of 0.022% in the last 20 years.

The other two barangays with bigger areas are Barangays 191 and 197 with 1.826 km^2 and 1.412 km^2 areas, respectively. Both barangays have an average population only of over 3,000 persons with population density of only 1.86 for Barangay 191 and 2.73 for Barangay 197.

More than half or 105 out of 201 barangays have negative growth rates from 2015 -2020. There are 12 barangays, however with double digit growth rates, with Barangay 5 having the highest growth rate at 420% from only 1,035 in 2015 to 6,081 in 2020. It has the highest population density of 420 per km^2. Another area that has a high growth rate is Barangay 7 with 304% growth rate, from 709 in 2015 to 2,676 in 2020.

Table 4 Total Population of Barangays, Growth Rate and Population Density, Pasay City, 2000 to 2020

NAME	AREA IN KM2	POPULATION				AVERAGE GROWTH RATE	2020 POP. DENSITY/ KM2
		01-MAY-00	01-MAY-10	01-AUG-15	01-MAY-20		
Barangay 1	0.025	759	1,035	1,233	2,275	0.066	89,885
Barangay 2	0.028	1,459	1,230	1,562	1,327	-0.002%	47,906
Barangay 3	0.020	1,207	964	906	824	(0.018)	40,812
Barangay 4	0.031	2,147	1,930	1,888	2,086	0.002	67,661
Barangay 5	0.014	1,604	1,016	1,035	6,081	0.128	430,057
Barangay 6	0.016	365	532	605	463	0.004	29,453
Barangay 7	0.027	931	550	709	2,676	0.102	99,925
Barangay 8	0.022	1,641	922	1,028	1,160	(0.003)	53,089
Barangay 9	0.018	351	249	281	257	(0.009)	14,686
Barangay 10	0.029	1,198	1,176	1,501	1,405	0.012	49,023
Barangay 11	0.020	1,784	391	471	408	(0.044)	19,932
Barangay 12	0.020	2,409	627	1,192	540	(0.045)	26,588
Barangay 13	0.151	1,247	2,627	2,405	2,646	0.026	17,559
Barangay 14	0.027	4,250	6,419	7,219	4,769	(0.005)	179,623
Barangay 15	0.024	891	867	2,718	2,328	0.075	97,569
Barangay 16	0.015	284	962	1,035	424	(0.006)	27,658
Barangay 17	0.012	271	668	1,013	985	0.059	81,811
Barangay 18	0.035	1,287	832	896	1,019	(0.001)	29,273
Barangay 19	0.011	493	535	968	812	0.033	75,959
Barangay 20	0.033	405	1,015	1,048	623	0.001	19,069
Barangay 21	0.018	609	978	1,265	790	0.004	45,014
Barangay 22	0.011	599	684	801	714	0.008	64,615
Barangay 23	0.046	1,627	1,438	1,806	1,419	(0.004)	30,602
Barangay 24	0.021	664	875	1,229	704	(0.002)	33,444
Barangay 25	0.027	375	603	864	595	0.017	21,747
Barangay 26	0.020	665	697	659	932	0.022	47,527
Barangay 27	0.019	387	321	416	273	(0.015)	14,050
Barangay 28	0.031	959	898	926	1,237	0.020	40,149
Barangay 29	0.025	1,710	1,757	2,031	1,429	(0.012)	57,972
Barangay 30	0.013	862	1,184	773	964	(0.001)	75,078

NAME	AREA IN KM2	POPULATION				AVERAGE GROWTH RATE	2020 POP. DENSITY/ KM2
		01-MAY-00	01-MAY-10	01-AUG-15	01-MAY-20		
Barangay 31	0.03	1,089	1,537	1,495	3,544	0.073	117,819
Barangay 32	0.031	1,324	2,578	2,044	1,906	0.003	61,883
Barangay 33	0.069	711	759	855	983	0.020	14,300
Barangay 34	0.030	1,033	2,232	2,090	939	(0.027)	31,196
Barangay 35	0.035	236	550	741	600	0.036	17,118
Barangay 36	0.034	235	331	1,162	3,799	0.196	110,020
Barangay 37	0.050	671	996	1,457	1,529	0.043	30,660
Barangay 38	0.083	1,479	2,002	2,800	1,967	0.011	23,579
Barangay 39	0.060	1,411	1,024	1,287	1,290	0.005	21,340
Barangay 40	0.055	1,809	1,716	2,147	2,311	0.018	41,662
Barangay 41	0.038	863	1,245	1,706	1,591	0.029	41,791
Barangay 42	0.028	1,326	1,423	1,752	1,826	0.019	65,495
Barangay 43	0.017	2,029	2,581	2,871	2,620	0.009	157,169
Barangay 44	0.057	1,262	1,218	1,235	1,417	0.009	25,044
Barangay 45	0.031	1,148	943	1,262	1,672	0.033	54,694
Barangay 46	0.038	4,509	5,748	6,038	5,783	0.009	151,745
Barangay 47	0.053	984	906	1,005	1,207	0.017	22,641
Barangay 48	0.019	525	600	531	509	(0.006)	26,373
Barangay 49	0.036	318	422	451	290	(0.014)	8,013
Barangay 50	0.006	560	432	468	478	(0.002)	75,276
Barangay 51	0.024	1,953	2,246	2,078	2,159	0.002	89,771
Barangay 52	0.028	1,758	1,886	2,074	2,392	0.018	83,695
Barangay 53	0.013	689	461	794	788	0.025	60,061
Barangay 54	0.009	1,437	1,553	1,560	1,479	(0.001)	158,351
Barangay 55	0.021	664	667	761	832	0.015	40,135
Barangay 56	0.011	602	630	891	855	0.023	76,750
Barangay 57	0.021	1,788	1,493	1,209	1,361	(0.012)	64,168
Barangay 58	0.038	1,829	1,452	1,723	1,382	(0.010)	36,532
Barangay 59	0.044	913	968	1,641	1,657	0.040	37,353
Barangay 60	0.036	1,393	1,342	1,516	1,425	0.003	39,463
Barangay 61	0.021	2,157	2,541	2,962	2,503	0.005	119,475
Barangay 62	0.011	1,054	1,300	1,294	1,228	0.003	112,661
Barangay 63	0.009	510	646	702	679	0.011	78,770
Barangay 64	0.012	1,643	1,255	1,603	1,582	0.007	130,528
Barangay 65	0.030	2,888	2,736	2,883	2,932	0.003	98,854
Barangay 66	0.027	2,488	2,513	2,472	2,797	0.008	101,709
Barangay 67	0.026	1,404	979	1,127	1,104	(0.004)	43,192
Barangay 68	0.015	616	630	1,007	852	0.023	55,146
Barangay 69	0.013	1,146	916	1,012	1,153	0.008	89,938
Barangay 70	0.066	1,000	1,153	1,588	2,199	0.049	33,465
Barangay 71	0.013	619	620	659	685	0.007	53,599
Barangay 72	0.019	1,221	917	1,383	1,423	0.021	73,237
Barangay 73	0.065	1,006	985	1,143	699	(0.022)	10,770
Barangay 74	0.034	499	563	589	460	(0.009)	13,699
Barangay 75	0.096	795	1,174	1,128	1,326	0.022	13,815
Barangay 76	4.262	1,823	5,975	4,902	19,604	0.016	4,599
Barangay 77	0.044	1,667	1,604	1,238	1,107	(0.025)	25,332
Barangay 78	0.047	230	345	100	494	0.066	10,565
Barangay 79	0.043	553	726	622	677	0.005	15,592
Barangay 80	0.024	756	1,017	713	1,208	0.024	50,544
Barangay 81	0.017	486	3,034	2,162	2,129	0.044	122,709

NAME	AREA IN KM2	POPULATION				AVERAGE GROWTH RATE	2020 POP. DENSITY/ KM2
		01-MAY-00	01-MAY-10	01-AUG-15	01-MAY-20		
Barangay 82	0.008	358	461	707	554	0.022	72,042
Barangay 83	0.027	608	843	956	794	0.007	28,957
Barangay 84	0.013	535	603	783	719	0.016	54,264
Barangay 85	0.034	1,208	936	1,223	1,285	0.013	37,442
Barangay 86	0.023	702	1,153	1,097	1,389	0.030	60,868
Barangay 87	0.014	515	455	681	633	0.019	44,989
Barangay 88	0.034	911	1,147	1,356	958	(0.003)	28,343
Barangay 89	0.011	465	644	1,041	1,003	0.042	88,604
Barangay 90	0.022	969	1,707	1,856	1,615	0.016	74,219
Barangay 91	0.019	1,040	1,285	1,738	1,881	0.033	101,183
Barangay 92	0.025	319	537	562	469	0.009	18,957
Barangay 93	0.037	453	314	279	382	0.002	10,247
Barangay 94	0.029	1,685	1,758	1,801	2,375	0.022	83,158
Barangay 95	0.022	1,484	1,034	1,147	1,132	(0.006)	50,513
Barangay 96	0.021	825	871	1,121	826	(0.001)	39,128
Barangay 97	0.073	1,230	967	1,123	1,361	0.015	18,626
Barangay 98	0.046	847	1,042	1,199	1,487	0.031	32,117
Barangay 99	0.020	986	1,242	1,334	1,111	0.001	55,495
Barangay 100	0.035	835	1,327	1,360	1,223	0.010	34,470
Barangay 101	0.014	350	330	409	550	0.033	38,952
Barangay 102	0.010	566	737	845	826	0.017	84,631
Barangay 103	0.021	666	956	1,024	949	0.012	44,160
Barangay 104	0.020	954	1,224	1,718	1,127	0.005	56,890
Barangay 105	0.009	468	592	620	567	0.005	59,810
Barangay 106	0.012	1,167	1,122	1,131	1,158	0.001	97,804
Barangay 107	0.026	1,789	1,534	1,840	1,561	(0.004)	60,953
Barangay 108	0.030	1,893	1,841	2,134	2,070	0.007	68,025
Barangay 109	0.010	1,002	1,028	1,094	1,122	0.007	117,610
Barangay 110	0.019	1,853	2,199	1,973	1,827	(0.006)	97,129
Barangay 111	0.016	1,067	1,156	1,237	1,279	0.009	78,756
Barangay 112	0.014	581	437	382	640	0.018	44,077
Barangay 113	0.030	1,860	1,742	1,926	1,800	0.000	60,831
Barangay 114	0.024	712	885	932	1,050	0.019	43,623
Barangay 115	0.041	1,248	1,149	1,072	1,240	0.003	30,214
Barangay 116	0.012	1,063	1,260	1,320	1,205	0.003	103,611
Barangay 117	0.008	954	1,048	1,021	935	(0.004)	115,432
Barangay 118	0.026	1,814	1,056	1,963	1,634	0.014	62,726
Barangay 119	0.026	1,202	1,351	1,398	1,622	0.016	61,814
Barangay 120	0.031	418	531	330	332	(0.022)	10,583
Barangay 121	0.020	1,112	892	847	1,007	0.001	49,218
Barangay 122	0.013	1,229	1,171	1,176	1,184	(0.001)	89,629
Barangay 123	0.015	1,277	1,258	1,295	1,284	0.001	84,363
Barangay 124	0.019	1,423	1,481	1,473	1,666	0.009	85,965
Barangay 125	0.024	1,432	1,327	1,591	1,508	0.006	62,186
Barangay 126	0.013	693	1,456	1,168	725	(0.019)	56,596
Barangay 127	0.026	1,823	2,021	1,977	1,799	(0.004)	68,118
Barangay 128	0.020	1,144	906	1,133	1,634	0.033	80,255
Barangay 129	0.013	997	925	1,076	1,209	0.016	93,000
Barangay 130	0.0293	3,040	3,410	3,537	4,042	0.015	137,905
Barangay 131	0.031	1,145	1,000	1,555	1,427	0.021	46,528
Barangay 132	0.027	2,620	4,107	3,501	5,088	0.031	185,579

NAME	AREA IN KM2	POPULATION				AVERAGE GROWTH RATE	2020 POP. DENSITY/ KM2
		01-MAY-00	01-MAY-10	01-AUG-15	01-MAY-20		
Barangay 133	0.022	2,097	1,406	1,805	2,221	0.018	100,407
Barangay 134	0.012	1,776	1,972	1,747	1,686	(0.007)	136,962
Barangay 135	0.041	2,516	3,371	2,239	2,768	(0.002)	68,093
Barangay 136	0.031	1,626	1,285	1,550	2,167	0.028	69,123
Barangay 137	0.026	2,296	2,455	4,174	2,994	0.018	115,822
Barangay 138	0.015	1,519	1,025	1,520	1,031	(0.010)	70,327
Barangay 139	0.012	749	850	848	1,065	0.020	87,944
Barangay 140	0.012	613	658	816	590	(0.004)	51,038
Barangay 141	0.017	692	585	711	465	(0.019)	27,844
Barangay 142	0.011	652	356	495	318	(0.025)	27,919
Barangay 143	0.061	3,807	3,361	1,402	1,390	(0.058)	22, 594
Barangay 144	0.055	3,200	3,000	1,714	2,212	(0.020)	40,291
Barangay 145	0.069	7,104	7,808	7,428	8,758	0.011	127,001
Barangay 146	0.045	619	334	533	1,036	0.060	23,110
Barangay 147	0.035	1,824	1,587	1,580	1,459	(0.010)	41,841
Barangay 148	0.093	3,158	3,638	3,888	3,164	(0.004)	34,014
Barangay 149	0.012	374	328	460	768	0.055	64,268
Barangay 150	0.019	605	614	622	662	0.006	34,569
Barangay 151	0.016	784	678	864	1,175	0.033	73,300
Barangay 152	0.041	1,147	1,632	1,386	1,219	(0.007)	29,530
Barangay 153	0.024	1,376	1,310	1,382	1,367	0.001	56,255
Barangay 154	0.005	871	385	682	743	0.020	141,794
Barangay 155	0.028	1,090	768	814	916	0.000	32,528
Barangay 156	0.026	3,142	3,627	3,299	3,540	0.003	133,333
Barangay 157	0.014	2,010	2,419	2,425	2,242	0.001	157,887
Barangay 158	0.019	517	771	798	961	0.029	51,199
Barangay 159	0.031	1,290	1,338	1,543	1,301	(0.000)	42,447
Barangay 160	0.019	937	1,028	1,174	1,245	0.016	66,864
Barangay 161	0.058	2,083	2,574	2,700	2,834	0.014	49,159
Barangay 162	0.032	1,278	1,802	1,429	1,898	0.016	58,580
Barangay 163	0.016	897	1,064	1,203	1,467	0.028	91,288
Barangay 164	0.014	1,525	1,503	1,735	1,749	0.010	121,374
Barangay 165	0.074	3,646	4,863	5,330	5,472	0.018	74,197
Barangay 166	0.021	1,023	1,649	1,023	1,190	(0.004)	56,026
Barangay 167	0.012	668	719	805	755	0.006	62,038
Barangay 168	0.026	496	411	421	521	0.010	19,848
Barangay 169	0.037	2,714	2,328	3,111	2,825	0.008	76,413
Barangay 170	0.015	1,869	1,901	1,939	1,571	(0.012)	104,664
Barangay 171	0.032	2,969	3,004	3,202	3,390	0.008	105,542
Barangay 172	0.041	4,719	5,064	5,442	4,919	0.001	120,623
Barangay 173	0.028	1,411	1,903	2,020	1,814	0.007	64,739
Barangay 174	0.020	1,299	1,524	1,731	1,826	0.018	92,083
Barangay 175	0.026	1,686	1,954	2,064	1,952	0.005	74,305
Barangay 176	0.014	1,532	1,643	1,833	1,617	0.001	116,164
Barangay 177	0.053	4,956	5,665	5,074	6,235	0.011	117,864
Barangay 178	0.038	5,649	5,827	5,620	3,889	(0.025)	103,321
Barangay 179	0.049	5,072	5,483	5,058	6,692	0.016	138,637
Barangay 180	0.010	1,887	2,984	2,074	2,059	(0.008)	212,049
Barangay 181	0.013	2,474	2,876	2,453	1,883	(0.023)	140,522
Barangay 182	0.014	2,001	3,014	2,725	2,906	0.012	212,117
Barangay 183	3.884	29,450	25,040	32,146	37,372	0.022	9,621

NAME	AREA IN KM2	POPULATION				AVERAGE GROWTH RATE	2020 POP. DENSITY/ KM2
		01-MAY-00	01-MAY-10	01-AUG-15	01-MAY-20		
Barangay 184	0.176	9,454	12,434	15,059	14,209	0.018	80,609
Barangay 185	0.050	4,630	4,967	5,179	4,639	(0.002)	92,374
Barangay 186	0.032	4,645	5,786	5,093	3,450	(0.026)	109,005
Barangay 187	0.023	3,971	4,185	4,077	4,629	0.009	194,496
Barangay 188	0.031	1,461	1,460	1,857	2,094	0.025	68,164
Barangay 189	0.018	1,108	1,359	1,238	2,431	0.049	133,866
Barangay 190	0.231	4,631	5,368	3,553	4,336	(0.008)	18,800
Barangay 191	1.83	3,378	4,133	3,086	3,406	(0.005)	1,865
Barangay 192	0.045	4,153	4,232	4,364	4,217	0.000	93,732
Barangay 193	0.094	7,121	7,956	8,067	7,430	(0.001)	79,313
Barangay 194	0.061	5,858	5,291	5,779	4,523	(0.013)	74,637
Barangay 195	0.105	1,876	2,161	2,246	2,449	0.013	23,268
Barangay 196	0.016	1,653	1,379	1,506	1,499	(0.000)	95,356
Barangay 197	1.412	3,310	3,671	4,139	3,854	0.007	2,730
Barangay 198	0.038	1,362	1,489	1,846	1,904	0.020	49,635
Barangay 199	0.032	1,769	2,034	2,195	2,044	0.005	63,795
Barangay 200	0.033	538	585	558	594	0.004	18,055
Barangay 201	0.410	14,209	22,985	22,165	19,788	0.007	48,221
TOTAL	**17.886**	**354,908**	**392,869**	**416,522**	**440,656**	0.011	-

Population Density

The City has a total land area of 1,831.977 hectares (has.). The three largest barangays which account for 62.42% of the total land area are Barangays 76 (417.50 has.), 183 (391.639 has.), and 192 (334.301 has.). Based on 2020 population, the average population density of the City was estimated at 227 persons per hectare (ha.). The three (3) most densely populated barangays were Barangays 5 (4,300 persons/ ha.), 180 (2,120 persons/ ha.) and 182 (2,121 persons/ ha.) while the least densely populated barangays were Barangays 191 (18 persons/ ha.), 197 (27 persons/ ha), and 76 (46 persons/ ha.).

Household Distribution

From 2000-2007, household population increased by 13.75% and from 2007-2010 decreased by 2.51%. The number of households also presented the same trend with an increase of 25.70% from 2000-2007 and a decrease of 0.31% from 2007-2010. The number of households grew at a faster rate than the household population which resulted to a decreasing average household size from 4.5 to 4.0 from 2000-2010.

Age-Sex Distribution

There is a generally even distribution of male and female in the population, although slightly skewed to the female population at 100 females for every 99 males. Males, however, were higher in number in younger age sets while the women population increases over the years. Possibly indicating longer life expectancy of females as compared to males.

Dependency Ratio

In 2020, young dependents (0-14 years old) constituted 27.5% of the total population. The working-age population (15-64 years old) constituted the remaining 46%. The over-all dependency ratio was 47.74%. This indicated that for every 100 working-age population, there were about 47 dependents.

3.2 Employment and Local Economy

Competitiveness Index Ranking

The Cities and Municipalities Competitive Index (CMCI)[1] is an annual ranking of Philippine cities and municipalities developed by the National Competitiveness Council through the Regional Competitiveness Committees (RCCs) with the assistance of the United States Agency for International Development. Four convergent pillars guided by existing competitiveness indicator systems were developed:

- Economic Dynamism (25%) – associated with activities that create stable expansion of business and industries and higher employment;
- Government Efficiency (25%) – the quality and reliability of government services and government support for effective and sustainable productive expansion;
- Infrastructure (25%) – the physical building blocks that connect, expand, and sustain a locality and its surrounding to enable the provision of goods and services; and,
- Resiliency (25%) – the capacity of a locality to facilitate businesses and industries to create jobs, raise productivity, and increase the incomes of citizens over time despite the shocks and stresses it encounters.

Local government units (LGUs) are ranked on their competitiveness based on an overall competitiveness score or the sum of scores on three main pillars: economic dynamism, government efficiency, and infrastructure. The higher the score of an LGU, the more competitive it is. Of the 33 highly urbanized cities, Pasay City ranked 3rd in 2021 CMCI with overall score of 52.80 (13.6291 for Economic Dynamism, 14.1990 for Government Efficiency, 10.0948 for Infrastructure, and 14.8777 for Resiliency). The following table displays the scores of Pasay City from 2014 to 2021:

Table 5 Historical CMCI Scores of Pasay City

Pillar/ Indicator	2014	2015	2016	2017	2018	2019	2020	2021
Overall Score	42.6736	42.0647	36.9073	58.0956	58.4219	52.9623	58.6473	52.8006
Economic Dynamism	11.3198	10.7350	8.1323	13.1139	11.4023	13.3434	16.2490	13.6291
Government Efficiency	18.8794	21.1329	15.8643	13.9015	16.4756	11.5258	13.3476	14.1990
Infrastructure	12.4744	10.1968	12.9107	12.1064	10.8621	10.5289	10.9004	10.0948
Resiliency	-	-	-	18.9737	19.6818	17.5642	18.1505	14.8777

Under the pillar of Economic Dynamism with ten (10) sub-indicators, Pasay City ranked 1st in 2021 CMCI with scores shown in the following figure:

[1]2021 CMCI Rankings retrieved on 11 March 2022, from: https://cmci.dti.gov.ph/

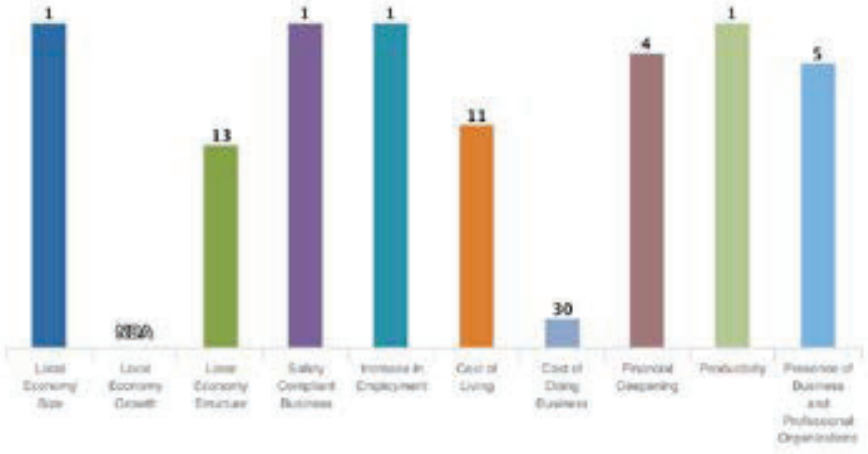


Figure 3. Pasay City's Economic Dynamism Ranking

Employment and Unemployment Rate

For 2020, there are 139,942 employed individuals from Pasay City. This translates to 31.76% of the total population of Pasay City in 2020 at 440,656.

Large number of its population is working in the sectors of Transportation and Storage with 22.57% or 31,585 individuals, Administrative and Support Service Activities with 20.16% or 28,213 individuals, and Wholesale and Retail Trade with 16.90% or 23,651 individuals. The table displays the disaggregated data on Pasay's total employment in 2020:

Table 6 2020 Total Employment

SECTORS	TOTAL	MICRO (1-9 employees)	SMALL (10-99 employees)	MEDIUM (100-199 employees)	LARGE (200 & over employees)
Agriculture, Forestry, and Fishing	4	4	-	-	-
Mining and Quarrying	35	1	34	-	-
Manufacturing	7,058	1,301	1,312	573	3,872
Construction	2,211	41	385	285	1,500
Wholesale and Retail Trade including Repair of Motor Vehicles and Motorcycles	23,651	11,083	6,704	1,416	4,448
Transportation and Storage	31,585	389	2,008	1,675	27,513
Accommodation and Food Service Activities	18,624	3,736	10,414	1,336	3,138
Information and Communication	2,823	296	217	143	2,167
Financial and Insurance Activities	6,676	1,084	1,070	300	4,222
Real Estate Activities	5,209	532	1,193	334	3,150

SECTORS	TOTAL	MICRO (1-9 employees)	SMALL (10-99 employees)	MEDIUM (100-199 employees)	LARGE (200 & over employees)
Professional, Scientific, and Technical Activities	1,407	230	205	182	790
Administrative and Support Service Activities	28,213	563	1,603	618	25,429
Education	2,701	214	1,028	471	988
Human Health and Social Work Activities	2,252	581	487	-	1,184
Arts, Entertainment, and Recreation	4,295	157	275	-	3,863
Other Service Activities*	3,198	1,674	1,075	449	-

Source: 2020 PSA Number of Total Employment of Establishments

**Including Personal Services for Wellness, except Spas, Repair of Personal and Household Goods, Funeral and Related Activities, Repair of Computers and Communications Equipment, Laundry Activities, and Other Personal Service Activities.*

Despite the presence of numerous enterprises, Pasay recorded 7.1% or 5,918 in households with income below poverty threshold and 5.6% or 4,360 in the number of households that have unemployed members of the labor force:

Table 7. Unemployment and Income

Indicator	Households		Population					
	Magnitude	Proportion	Magnitude			Proportion		
			Total	Male	Female	Total	Male	Female
Households with income below	2,904	3.5	11,755	5,781	5,974	4.8	4.7	4.9
Households who experienced food shortage	75	0.1	284	140	144	0.1	0.1	0.1
Unemployed member of the labor force	4,360	5.6	4,762	2,855	1,907	4.2	4.2	4.3

Source: CBMS Census 2017-2019

Poverty Incidence

Considering the per capita poverty threshold for the National Capital Region at PhP14,102 in 2018 and PhP16,625 in 2021, Pasay City has recorded 6.0% of households with income below poverty threshold and 6.8% households with income below food threshold. These translate to the magnitude of poor families in the city estimated at 6,700 in 2018 and 8,000 in 2021.

Table 8 Pasay City's Poverty Incidence

Indicator	No. of HH	Population		
		Total	Male	Female
Households with income below poverty threshold	5918	25,669	12,669	13,004
Households with income below food threshold	2904	11,755	5,781	5,974
Households who experienced food shortage	75	284	140	144
Unemployed members of the labor force		4,762	2,855	1,907

Economic Sectors of Activity

In terms of the number of establishments, there are 8,012 registered businesses in Pasay City. Most of these are micro enterprises at about 82.75% or 6,630, followed by small enterprises at 15.30% or 1,226, medium enterprises at 0.67% or 54, and large enterprises at 1.27% or 102. Majority of the establishments are under the sectors of Wholesale and Retail Trade (3,815), Accommodation and Food Services Activities (1,409), Other Service Activities (649) Manufacturing (466), and Financial and Insurance Activities (349).

In Barangay 76 there are about 3,279 establishments, which is about 41% of all establishments in Pasay City.

Table 9 Pasay City's Number of Establishment per type

Type of Establishment	Number
Banking and other financial institutions	173
Boarding House	5
Business exempt from business tax (e.g. publishing, technology mgt., etc)	65
Cold storage and refrigeration cases	5
Commercial lessor and sub-lessor or real properties	99
Common Carrier	8
Dancing schools/driving schools	5
Dealers in tobacco	5
Dealers of fermented liquors	6
Financing Company	3
Hotels	19
Insurance Company	5
Manufacturers, assemblers, importers, repackers, processors	66
Non-stock, non-profit	37
Nursery, vocational and other schools	3
Owners or operators or amusement/vending devices	3
Owners or operators of cafes, cafeteria, refreshment parlors, restaurants	705
Owners or operators of amusement places	21
Owners of businesses rendering or offering services (e.g. World Trade Center, PICC)	923

Type of Establishment	Number
Private Universities and Colleges	9
Private warehouse or bodegas	5
Residential Lessors or sub-lessor	24
Retailers	775
Theater or Cinema house	13
Wholesalers, distributors, dealers	324

The table displays the disaggregated data on the number of establishments in 2020:

Table 10. 2020 Number of Establishments

SECTORS	TOTAL	MICRO (1-9 employees)	SMALL (10-99 employees)	MEDIUM (100-199 employees)	LARGE (200 & over employees)
Agriculture, Forestry, and Fishing	1	1	-	-	-
Mining and Quarrying	3	1	2	-	-
Manufacturing	466	403	56	4	3
Construction	29	9	14	2	4
Wholesale and Retail Trade including Repair of Motor Vehicles and Motorcycles	3,815	3,483	312	10	10
Transportation and Storage	201	99	61	11	30
Accommodation and Food Service Activities	1,409	943	449	10	7
Information and Communication	165	153	8	1	3
Financial and Insurance Activities	349	282	62	2	3
Real Estate Activities	194	141	45	3	5
Professional, Scientific, and Technical Activities	72	61	7	1	3
Administrative and Support Service Activities	231	143	58	4	26
Education	101	53	41	3	4
Human Health and Social Work Activities	239	211	26	-	2
Arts, Entertainment, and Recreation	88	70	16	-	2
Other Service Activities*	649	577	69	3	-

Source: 2020 PSA Number of Total Employment of Establishments

**Including Personal Services for Wellness, except Spas, Repair of Personal and Household Goods, Funeral and Related Activities, Repair of Computers and Communications Equipment, Laundry Activities, and Other Personal Service Activities.*

Pasay's economy is primarily composed of secondary and tertiary economic sectors. It doesn't have an agriculture and fishery sector, although there is a small number of fishers that reside in the City belonging to the Pasay-Libertad Anglers Association (PLAA).

PLAA is an non-government organization (NGO) accredited by the Sangguniang Panlusod of Pasay City with at least 90 members; 50 of which have boats but only 30 are motorized. According to some of the officers interviewed during the FGD conducted on 05 March 2020, many of the members are fishing for livelihood but some are only for recreational.

They fish around Manila Bay waters including Pasay City, Las Piñas, Parañaque and even as far as Sangley Point in Cavite depending on the season and the abundance of fish. According to the Study's Marine Component Team, fishers claim that when water salinity is low e.g., during the rainy season and northeast monsoon, the fish move farther away. Conversely, during the southwest monsoon (habagat), the fish move closer to shore or remain in their fishing ground.

The most common types of gear used by these fishers are gillnet, hook and line, multiple hook and line, and speargun. PLAA members claim that they can catch crabs (*alimasag*), cavallas (*talakitok*), bakoko (*sweetlips*), threadfin bream (*bisugo*), ten pounder (*bidbid*), therapon (*bagaong*), and mojarra (*malakapas*). Cavallas are caught by hook and line and multiple hook and line while sweetlips and therapon are caught by gill net and and hook and line. They report occasionally catching grouper (*lapu-lapu*) using speargun or gillnet near the rocky shorelines of Pasay City. They describe the cavallas they catch as being, on the average, just "4-fingers" in depth and which they sell for ₱250-₱350/pile (tumpok) depending on the size. Fish catch is erratic with fishers reporting getting only a kilo or less of small-sized cavallas per fishing trip. They can get more fish using gill net up to 10 kg but this is the exception rather than the norm[2].

These fishers claim to face many concerns including the decreasing catch due to pollution and the development in the area, marine litter/ debris including water lilies from Pasig River, and limited fishing access to nearby developed areas; unsustainable fishing practices such as dynamite fishing and overfishing of trawls; access to capital and capacity building initiatives of the government; and, access to health care facilities and services.

Pasay City has a public market operated by the city government and another owned by a private enterprise. The government public market is a 13,378.47 square meter two-story structure while the privately-owned public market has a floor space of about 500 square meters. However, fishers claim they only sell their catch along the sidewalk near Diokno Bridge.

Doing Business in Pasay City

The private sector is considered as the lifeblood of Pasay City's local economy. Major companies included in the 2018 Top 100 Corporation in the Philippines[3] helping in keeping the vibrant economy of the city include the Philippine Airlines, Inc., SM Prime Holdings, Inc., Supervalue, Inc., Sanford Marketing Corporation, Philippine National Bank, and SM Development Corporation. Other notable companies with headquarters in Pasay are Philippine Airlines, Spirit of Manila Airlines, Cebu Pacific, Air Juan, Interisland Airlines, LBC Express, and Oishi or Liwayway Marketing Corporation.

[2] page 45 Revised Interim Report: Coastal Habitats and Fisheries, PRIMEX, 2022
[3] Retrieved on 14 March 2022, through: https://www.makati.gov.ph/cms/business/top-100-corporations/2261

The city also houses popular attractions and event places that are crowd-drawers such as the Cultural Center of the Philippines, the Philippine International Convention Center, Tanghalang Francisco Balagtas, Manila Film Center, Coconut Palace, World Trade Center, Cuneta Astrodome, Aliw Theater, and Star City.

On the part of the government, national offices of Senate of the Philippines, Department of Foreign Affairs, Civil Aviation Authority of the Philippines, Civil Aeronautics Board, Manila International Airport Authority, the Department of Trade and Industry's (DTI) Philippine Trade Training Center (PTTC), Center for International Trade Expositions and Missions, Government Service Insurance System (GSIS) and the Office for Transportation Security are located in the city.

The presence of non-profit private organizations to support businesses in Pasay is also strong. It has two chambers of commerce and industry. The Philippine Chamber of Commerce and Industry (PCCI), a non-government association of private businesses, has its chapter in Pasay. Generally, PCCI works to influence government actions on issues such as agriculture, information technology, human resources, and tourism. PCCI Pasay City serves as an anchor for thoughtful, manageable, and more rationalized interaction with the local government. The Filipino Chamber of Commerce of Pasay City, Inc., on the other hand brings together Filipino-Chinese entrepreneurs and trade associations.

The Philippine Exporters Confederation, Inc. (PHILEXPORT) mandated to strengthen the country's export industry through its export promotion and development programs is also situated in the city. Lastly, the DTI-PTTC supports the business sector through training, skills building, systems enhancements, and technology adaptation to become productive, competitive, resilient, and sustainable.

In 2019, Pasay formulated its policy on Ease of Making Investment (EMI) modeled after Republic Act No. 11032 or Ease of Doing Business and Efficient Government Service Delivery Act of 2018. Through EMI, Pasay intends to make the city more business-friendly to attract more investors, increase existing business players' investments, and enhance job generation for the residents.

3.3 Education

Pasay City's Literacy Rate is at 99.90 per cent (based on PSA 2015 Census of Population). This means that nine (9) out of ten (10) Pasayeños with age ten and above are able to read and write with comprehension.

The Millennium Development Goals (MDGs), the predecessor of the SDGs, targeted to attain universal primary education (UPE). Thus, it is important to improve participation in primary education. Data from Pasay City CBMS in 2018 indicate there are still a lot of children in school-going age that are not attending school. Table 11 below shows there are at least 4,817 children ages 6-12 not attending elementary. About 3,600 of children ages 13-15 years old are not attending Junior High School and about 3,263 children ages 16-17 years old are not attending Senior High School.

Table 11.. Magnitude of Children of School-going Age not attending School, 2020, Pasay City

Indicator	Total	Male	Female
Children 5 years old not attending kindergarten	801	428	373
Children 6-11 years old not attending elementary	2079	1151	928
Children 6-12 years old not attending Elementary	4817	2521	2296
Children 12-15 years old not attending Junior HS	2506	1396	1110
Children 13-15 years old not attending Junior HS	3600	1850	1750
Children 16-17 years old not attending Senior high school	3263	1803	1460
Children 6-15 years old not attending school	651	397	254
Children 6-16 years old not attending school	903	555	248
Children 6-17 years old not attending school	1428	835	593

Source: Pasay City CBMS, 2020

The Department of Education (DepEd) has been implementing the *Balik-Aral* program to encourage those who have dropped out to enroll and complete basic education. In addition, support programs, such as the *Pantawid Pamilyang Pilipino* Program (4Ps), have incentivized the poor to send their children to school. These programs, coupled with improved budgets was designed to reduce the out-of-school children and increased the size of the school system. As a result, by 2019, Pasay City reduced dropouts, and increased completion both in primary and secondary education. Those who are in school are able to continue with a retention rate of 97% and 98% for elementary and Junior High School, respectively.

In 2022, Pasay City was awarded as the Most Outstanding Local Government Unit in highly urbanized areas during the Regional Literacy Search organized by the DepEd National Capital Region, making their official entry into the National Literacy Awards. The Award recognizes exemplary literacy practices of various LGUs and Non-government Organizations (NGOs).

Pasay City has about 19 Public Elementary Schools and 8 Public Junior High Schools that can accommodate children not currently enrolled. There are adequate classroom with an average of 1 classroom for every 40 students. There are more private elementary and Junior High Schools in Pasay City that can accommodate additional students.

Table 12. Basic Education Sector Information, 2020, Pasay City

	Kindergarten	Elementary	Junior High
Number of Schools			
Public		19	8
Private[4]		39	30
Enrollment	4500	29,681	19,278
Classroom to Pupil Ratio	1:25	1:40	1:40
Retention Rate		97.39%	98,25%

[4] 2016 data

Completion Rate		88.24%	94.68%

Source: DepED, 2020

Pasay City also has two (2) Public Special Education (SPED) Schools and Community Learning Institutions offering Alternative Learning System or ALS for both elementary and secondary schools. Enrollment in ALS reached 274 in Elementary and 1,755 in Junior High School in 2020. During the same period, the City constructed about 110 new classrooms funded from the Special Education Fund (SEF) – further increasing the City's capacity to accommodate increasing number of students.

Table 13. Basic Information on Specialized Schools

No. of SPED Schools	2
Number of new classrooms constructed	110
Number of Community Learners offering ALS:	8
Elementary School	2
Secondary School	
ALS Enrollment:	
Elementary	274
Junior High School	1,755
Basic Literature	61

The goals and targets on education under the SDGs have leveled up from bringing all kids to primary school to ensuring the quality of everyone's learning. Changes in the socioeconomic landscape have also necessitated a focus on SDG 4 (quality learning)—an education system's success lies in its ability to equip its learners with the skills and competencies needed to navigate a world filled with volatility, uncertainty, complexity, and ambiguity.

The Philippines conducts annual National Achievement Test (NAT) which measures proficiency of students in 5 basic subjects. The NAT has no passing grade or scores. It uses the Mean Percentage Score (MPS) to indicate the percentage of correctly answered items in a test.

The overall MPS for Grade 6 NAT is 49.05 and 44.53 for Grade 10. Both are considered low proficiency. The students test lowest in Science and Math as seen in Table below.

Table 14. 2018 National Achievement Test (NAT) Results for Pasay City

Subject	2018 NAT Results	
	Philippines	Pasay City
Grade 6 NAT		
Filipino	54.5	54.48
Mathematics	35.2	53.92
English	41.0	48.82
Science	27.2	37.83
Araling Panlipunan	39.2	50.24
OVERALL MPS	39.4	49.05

Subject	2018 NAT Results	
	Philippines	Pasay City
Grade 10 NAT		
Filipino	57.2	58.56
Mathematics	38.6	32.70
English	50.6	44.00
Science	39.2	35.88
Araling Panlipunan	51.7	51.52
OVERALL MPS	47.5	44.53

Note: Criteria of proficiency levels: Highly proficient (90-100), proficient (75-89), nearly proficient (50-74), low proficient (25-49), not proficient (0-24)

Pasay City has about ten (10) public secondary schools that have Senior High School and offers different categories of specialization such as (1) Science, Technology, Engineering and Mathematics (STEM), (2) Accountancy, Business and Management (ABM), (3) Humanities and Social Sciences (HUMSS), and (4) Technical, Vocational, Livelihood (TVL).

There are also specialized secondary schools for the blind and deaf – the Philippine National School for the Blind and the Philippine School for the Deaf located in Pasay City.

Table 15. List of Public High Schools in Pasay, 2016[5]

#	School	School ID	Categories
1	Kalayaan NHS	319601	STEM, ABM, HUMSS, TVL
2	Pasay City East HS	305367	ABM, HUMSS, TL
3	Pasay City North High School – Main	305363	ABM, HUMSS, TVL
4	Pasay City North HS	305365	
5	Pasay City North HS – Mactan Air Base Annex	305366	
6	Pasay City North HS – Tramo Campus	305364	STEM, ABM, HUMSS, TVL
7	Pasay City Science High School	305369	STEM, ABM, HUMSS, TVL
8	Pasay City West HS	305370	STEM, ABM, TVL
9	Pasay City South HS	3-5368	STEM, ABM, HUMSS
10	President Corazon C. Aquino HS	319604	
11	Philippine National School for the Blind	500328	TVL
12	Philippine School for the Deaf	500329	TVL

ABM – Accountancy, Business, and Management
HUMSS – Humanities and Social Sciences
STEM, Science, Technology, Engineering and Mathematics
TVL – Technical, Vocational, Livelihoodß
Source: DepEd Pasay City Facebook Page.

In the 2020 Accomplishment Report of Pasay City DepEd, the following activities were reported:

a. Several training and capacitating of teachers, particularly for coping with online classes

5

b. Provision of Hygiene Kits to all learners with assistance from the Pasay City Local Government Unit (even before the pandemic);
c. Construction of addition classrooms from Special Education Fund (SEF);
d. Provision of honorarium from Special Education Fund (SEF) for teachers of organized extension classes in Open High School Program, Madrasah/ALIVE, Alternative Learning System and Remedial Reading;
e. Production and validation of books and modules for student learners;
f. Construction of additional "Aral-Pinoy" Laboratories; and,
g. Construction of additional laboratories for Senior High School.

There are also several higher education facilities in Pasay City offering tertiary education, mostly private, except for the Pamantasan ng Lungsod ng Pasay which is funded by the City.

Table 16. List of Universities and Colleges in Pasay City

Arellano University	Private
Pamantasan ng Lungsod ng Pasay	Public
Airlink International Aviation College	Private
Asian Institute of Maritime Studies	Private
San Juan de Dios Educational Foundatioin	Private
Manila Adventist College	Private
Southeastern College	Private
Wesleyan College of Manila	Private
STI Pasay	Private
Lacson College	Private
Datamex Institute of Computer Technology	Private
Holy MDNJ's International School and College	Private

3.4 Health

Vital Health Indicators

Table 17 presents vital health indicators collected by Pasay City from 2017-2019 under CBMS. The data involves indicators of children under 5 years old who died, women who died due to pregnancy related causes and malnourished children 0-5 years old. These indicators aid in formulating appropriate policies and programs. Pasay City has a low percentage on all three indicators ranging from 0.1 to 1.1 percent. This implies that these maybe addressed in the short term if targeted groups receive proper intervention.

Table 17. Vital Health Indicators, 2020, Pasay City

Indicator	Household		Population	
	Magnitude	Proportion	Magnitude	Proportion
Children under 5 years old who died	20	0.1	20	0.1

Women who died due to pregnancy related causes	2	0.1	2	0.1
Malnourished children 0-5 years old	203	1,1	215	0.9

Source: Pasay City CBMS 2017-2019 Survey

Disease Trends

a) Ten Leading Causes of Morbidity

Table 18 presents the top ten (10) leading causes of morbidity in the City from 2010-2012. In Pasay City, eight out of the ten leading causes of morbidity or illness can be attributed to infectious disease. The list remained the same during the 3-year period. Cough and Colds was the consistently top leading cause while Upper Respiratory Tract Infection and Urinary Tract Infection were the second and third leading causes from 2011-2012. Both increased by 20% and 8%, respectively. Pneumonia and Bronchitis, which were the second and third leading causes in 2010, ranked fourth and fifth in 2011 and 2012.

There are no recent data available, particularly from 2020 at the start of the COVID 19 pandemic. However, it could be surmised that morbidity would remain the same respiratory related diseases.

Table 18. Top Ten Leading Causes of Morbidity, 2010-2012, Pasay City

Rank	2010 Cause	Number	2011 Cause	Number	2012 Cause	Number
1	Cough and Colds (No Pneumonia)	4,537	Cough and Colds (No Pneumonia)	7,374	Cough and Colds (No Pneumonia)	7,574
2	Pneumonia	3,647	Upper Respiratory Tract Infection	4,232	Upper Respiratory Tract Infection	5,090
3	Bronchitis	2,775	Urinary Tract Infection	3,997	Urinary Tract Infection	4,318
4	Upper Respiratory Tract Infection	2,768	Pneumonia	3,975	Bronchitis	2,164
5	Urinary Tract Infection	2,638	Bronchitis	2,590	Pneumonia	1,539
6	Acute Upper Respiratory Infection	1,724	Acute Upper Respiratory Infection	2,054	Dengue Fever	1,534
7	Diarrhea	1,283	Diarrhea	1,969	Pulmonary TB	1,108
8	Systemic Viral Infection	979	Acute Tonsillopharyngitis	677	Acute Tonsillopharyngitis	1,099
9	Conjunctivitis	766	Hypertension	1,141	Hypertension	947
10	Tonsillopharyngitis	677	Pulmonary Tuberculosis	975	Diarrhea	883

Source, CDP-City Health Office

b) Ten Leading Causes of Mortality

Diseases of the heart consistently topped the ten leading causes of mortality from 2010 to 2012, followed by Influenza and pneumonia and malignant neoplasms. All leading

causes have increased in magnitude during the 3-year period except for Diabetes which lowered from 113 to 93 incidents from 2011 to 2012.

Table 19. Top Ten Leading Causes of Mortality

Rank	2010 Cause	2011 Cause	2011 Number	2012 Cause	2012 Number
1	Diseases of heart	Diseases of heart	728	Diseases of heart	806
2	Influenza and pneumonia	Influenza and pneumonia	247	Influenza and pneumonia	302
3	Malignant neoplasms	Malignant neoplasms	214	Malignant neoplasms	240
4	Diabetes mellitus	Accidents	128	Accidents	124
5	Septicemia	Septicemia	128	Septicemia	101
6	Cerebrovascular diseases	Diabetes mellitus	113	Diabetes mellitus	93
7	Tuberculosis	Cerebrovascular diseases	85	Cerebrovascular diseases	93
8	Chronic lower respiratory diseases	Tuberculosis	81	Tuberculosis	90
9	Accidents (unintentional injuries)	Chronic lower respiratory diseases	79	Chronic lower respiratory diseases	86
10	Nephritis, nephritic syndrome and nephrosis	Nephritis, nephritic syndrome and nephrosis	58	Nephritis, nephritic syndrome and nephrosis	83

Source: CDP, City Health Office

Health Personnel

The health human resources are the main drivers of the health care system and are essential for the efficient management and operation of the public health system. Table 20 presents the list of Pasay City's health manpower. Based on the standard health personnel to population ratio, the City has enough doctor to population ratio but is deficient in nurses, midwives, sanitary inspectors and dentists.

Table 20. Health Personnel, 2012, Pasay City

Personnel	Number	Actual Ratio*	Standard Ratio
Doctor	33	1:11,905	1:20,000
Nurse	24	1:16,370	1:15,000
Midwife	55	1:7,143	1:5,000
Sanitary Inspector	10	1:39,287	1:20,000
Dentist	19	1:20,677	1:20,000

**Based on NSO 2010 population of 392,869*
Source: CDP 2017-2019, City Health Office

Health Facilities

Health facilities in Pasay City include government and private hospitals, and primary and tertiary health care facilities such as clinics and specialty care units. In Pasay City, the private sector comprises 50% of the City's health system. There are four (4) hospitals and fourteen (14) health centers in the City (Refer to Tables 21 and 22).Two (2) of the hospitals are government-owned with a combined bed capacity of 300 and two (2) are privately-owned with a combined bed capacity of 350. Per WHO recommendation, there should be 20 hospital beds per 10,000 population. Given the 2020 population of 440,000 Pasay City would need to add additional 230 beds in order to have adequate population to bed ratio. This gap became more important during the COVID 19 pandemic when most hospitals had reached maximum capacity and had to turn away patients for lack of hospital beds and personnel.

Table 21. Health Facilities, 2012, Pasay City

Facilities	Public	Private
Hospitals	2	2
Health Centers	14	-
Lying-in	1	9

Source: CDP 2017-2019, City Health Office

Table 22. List of Hospitals, 2013, Pasay City

Hospital	Location	Bed Capacity	Type of Ownership
Manila Adventist Medical Center	Donada St.	150	Private
Pasay General Hospital	P. Burgos	150	Public
San Juan de Dios Hospital	Roxas Blvd.	200	Private
Philippines Airforce General Hospital	Villamor Airbase	150	Public

Source: CDP 2017-2019, City Health Office

Water and Sanitation

Despite the availability of water supply from Maynilad, there are still about 2.4% households without access to safe water. This is equivalent to 1,971 households and 6,446 individuals. There are also households still without access to sanitary toilet facility with a magnitude of about 1,432 households or 4,268 individuals. These are probably households that belong to informal settlers.

Table 23. Households without access to safe water and sanitary toilet facility, 2020, Pasay City

Indicator	Household		Population	
	Magnitude	Proportion	Magnitude	Proportion
Households without access to safe water	1,971	2.4	6,447	2.6
Households without access to sanitary toilet facility	1,432	1.7	4,268	1.7

Source: CBMS, Pasay City 2020

COVID-19 Response

Like the rest of the Philippines and the world in general, Pasay City was gravely affected by COVID 19 infections. According to the DOH COVID-19 Tracker website, Pasay City has a total of 52,573 cases as of April 16, 2022. This is about 21.6% of total population. About 51,760 recovered and 390 died. Pasay City government provided medicines, food and cash during the pandemic to alleviate the plight of its people. Some of the activities undertaken included:

- Creation of a COVID 19 Task Force;
- Aggressive implementation of the Prevent-Detect-Isolate-Treat-Reintegrate Program;
- Preparation and Distribution of Information, Education, Communication (IEC) materials on COVID 19 to different barangays;
- Strict implementation of health protocols like wearing of masks, social distancing, washing of hands;
- Provision of logistical support and relief assistance to COVID-19 confirmed patients and families;
- Establishment of COVID 19 Tracing Command Center;
- Provision of Free RT-PCR and Antigen Tests;
- Free vaccination against COVID 19;
- Free quarantine facility accommodation;
- Regular disinfection of public places;
- Implementation of localized lockdowns; and,
- Provision of Accommodation for health care workers.

3.5 Housing and Urban Settlements

Available data from the years 2000 to 2015 shows an increasing number of housing units in Pasay City. However, the ratio of households to occupied housing units remain close to 1:1, which means that the housing sector is able to keep up with the demands for housing in the City.

Table 24. Housing Situation, 1990-2015

	1990	2000	2007	2010	2015
Households		78,180	98,274		107,619
Household Population		354,019	402,436		412,497
Occupied Housing Units	60,087	72,066	91,237	90,583	101,557
Ratio (HH to Occupied Housing Units)		1.08	1.08		1.06
Ratio (HH Population to Occupied Housing Unit)		4.91	4.41		4.06

Source: NSO

According to the latest Census of Housing in 2015, Pasay City has 101,557 occupied housing units. This has increased by almost 41% from 1990. (See Table 25) More than half of households live in multi-unit residential buildings like condominiums and apartments. This was a great shift from living in single houses from 15 years ago. Households living in Duplex houses also increased by almost three times in the last 15 years. This trend is similar to what is happening to the rest of Metro Manila to accommodate the increase in the number of families. There are also more rented living spaces in the City because some workers working in the City choose to rent a space there to avoid traffic and high cost of transportation. Institutional living quarters also increased from 11 to 17 in the same period.

The ratio of households to occupied housing unit is close to 1:1. However, there are more individuals living in one housing unit than the average family size in the City. This could be due to doubled up housing or share-renters.

Table 25. Occupied Housing Units, Households, Household Population by Type of Building, 1990-2015

Type of Bldg. Area of Classification	Occupied Housing Units		No. of HHs	HH to Occupied Housing Units		HH Population	HH Population to Occupied Housing Units	
	1990	2015	2015	1990	2015	2015	1990	2015
NCR								
Total	1,435,365	2,968,651	3,095,484	1.094	1.04	12,786,611	5.509	4.31
Single House	878,416	1,333,067	1,396,332	1.084	1.05	6,378,542	5.607	4.78
Duplex	127,042	410,775	427,606	1.093	1.04	1,733,813	5.369	4.22
Multi-Unit Residential	411,531	1,207,374	1,252,815	1.114	1.04	4,608,041	5.363	3.82
Commercial/Industrial/Agricultural	10,382	10,369	11,388	1.102	1.10	37,889	5.187	3.65
Institutional Living Quarters	452	458	483	1.104	1.05	1,794	4.527	3.92
Other Housing Units	5,326	2,606	2,646	1.094	1.02	9,960	5.002	3.82
Not Reported	2,216	4,002	4,214	1.000	1.05	16,572	4.708	4.14
Pasay City								
Total	60,087	101,557	107,619	1.229	1.06	412,497	6.103	4.06
Single House	37,015	27,795	29,623	1.234	1.07	136,354	6.266	4.91
Duplex	5,265	13,174	14,071	1.242	1.07	54,018	6.020	4.10
Multi-Unit Residential	16,924	59,850	63,122	1.222	1.05	219,314	5.831	3.66
Commercial/Industrial/Agricultural	481	441	500	1.094	1.13	1,661	5.106	3.77
Institutional Living Quarters	11	17	17	1.636	1.00	69	6.091	4.06
Other Housing Units	276	194	195	1.072	1.01	750	4.826	3.87
Not Reported	115	91	91	1.000	1.06	331	4.617	3.85

Source: NSO, 2015

There is still a considerable number of households living in makeshift housing (0.7%) and households who are considered informal settlers – 3,102 families or 3.7% of all households. (Table 26) This translates to about 4,966 individuals or about 4.1% of population.

Table 26. Magnitude of Households who are Informal settlers and Living in Makeshift Housing.,2020

Indicator	Household		Population	
	Magnitude	Proportion	Magnitude	Proportion
Households living in makeshift housing	597	0.7	967	0.8
Households who are informal settlers	3,102	3.7	4,966	4.1

This information is significantly lower than the April 2000 report of the City which records about
33,433 informal settler families (Table 27). More than half are in Areas for Priority Development or APD while a large percentage is squatting on private lands and tourism areas. For lack of reference report, it is assumed that the families living in APDs have already been relocated or given compensation or housing within the City.

Table 27. Magnitude of Informal Settlers in Pasay and South Sector, as of April 11, 2000

Location	South	%Share to Total	Pasay City	%Share to South Total
DANGER AREA				

Location	South	%Share to Total	Pasay City	%Share to South Total
Waterways	16,527	11%	3,804	
Railroad Tracks	4,854	3%	-	
Pasig River	22,885	2%	-	
Sub-total	23,666	16%	3,804	3%
GOVERNMENT INFRASTRUCTURE				
ROW (Right of Way)	975	1%	120	0%
Public Utilities	1,412	1%	-	
Sub-total	2,387	2%	120	0%
GOVERNMENT OWNED LANDS	36,670	24%	-	
PRIVATE LANDS	60,804	42%	8,683	6%
TOURISM AREAS	5,650	4%	5,650	4%
DESIGNATED HOUSING SITES	142	0%	-	
Areas for Priority Development (APDs)	17,480	12%	15,176	10%
	144,799	100%	33,433	23%

Note: South includes Paranaque, Muntinlupa, Lass Pinas, Makati, Taguig, Pateros
Source: LGU as of April 2000

Based on 2015 PSA data on housing, more households (53%) have concrete houses, about 40% have half concrete and half wood and only 14% have solid outer wall materials. Most of the occupied housing units' roofs (82%) were made of galvanized iron/aluminum.

Table 28. Percentage of Occupied Housing Units by Construction Materials of the Outer Walls and Roof, 2015

Construction Materials of the Outer Walls	Construction Materials of the Roof								
	Total Occupied Housing Units	Galvanized Iron/ Aluminum	Tile/ Concrete / Clay Tile	Half Galvanized Iron and Half Concrete	Bamboo/ Cogon/ Nipa / Anahaw	Makeshift/ Salvaged/ Improvised	Trapal	Others	Not Reported
PASAY	101,557	83,086	6,153	11,949	-	95	240	34	
Concrete/Brick/ Stone	54,146	47,787	4,644	1,712	-	-	3	-	
Wood	14,093	11,579	696	1,793	-	8	17	-	
Half Concrete/Brick/ Stone and half wood25	32,635	23,409	800	8,419	-	7	-	-	
Galvanized Iron/ Aluminum	197	159	13	25	-	-	-	-	
Bamboo/Sawali/ Cogon/Nipa	-	-	-	-	-	-	-	-	

Construction Materials of the Outer Walls	Construction Materials of the Roof: Total Occupied Housing Units	Galvanized Iron/ Aluminum	Tile/ Concrete / Clay Tile	Half Galvanized Iron and Half Concrete	Bamboo/ Cogon/ Nipa / Anahaw	Makeshift/ Salvaged/ Improvised	Trapal	Others	Not Reported
Asbestos	-	-	-	-	-	-	-	-	
Glass	-	-	-	-	-	-	-	-	
Makeshift/ Salvaged/ Improvised	186	98	-	-	-	77	11	-	
Trapal	201	11	-	-	-	3	187	-	
Others/Not Reported	7	-	-	-	-	-	7	-	
No Walls	47	-	-	-	-	-	15	32	
Not reported	45	43	-		-	-	-	2	

Source: PSA 2015

Majority of the households living in Pasay City are renters (52%). Only about 36% are reportedly house and lot owners. The rest either own the house and renting the land or living on rent free house and lot.

Those who own their house and lot are living either on single detached houses (40%) or multi-residential quarters (45%). On the other hand, about 71% of renters are living in multi-unit residential buildings and only about 19% are living on single detached or duplex residential structures.

Table 29. Households by Type of Building and Tenure Status of the Housing Unit/Lot,2015

Tenure Status	# of Households	% of Share	Single House	Duplex	Multi-unit Residential	Commercial /Industrial/ Agricultural	Institutional living quarter	Others	Not reported
Owned or Owner like possession of house and lot	39,088	36.0 %	15198	6251	17519	87	2	7	24
Rent house/room including lot	56,084	52.0 %	10581	5994	39272	219	7	1	10
Own house rent lot	1,393	1.0%	442	309	637	-	2	1	2
Own house rent free lot	4,599	4.0%	1618	617	2334	10	2	1	17

Tenure Status	# of Households	% of Share	Single House	Duplex	Multi-unit Residential	Commercial /Industrial/ Agricultural	Institutional living quarter	Others	Not reported
with consent of owner									
Own house rent free lot without consent of owner	603	0.6%	266	110	185	2	-	29	11
Rent free house and lot with consent of owner	5,363	1.0%	1379	714	3063	182	4	6	15
Rent free house and lot without consent of owner	459	0.4%	135	73	101	-	-	138	12
Not reported	12	0.01%	-	-	-	-	-	12	-
Not applicable	18	0.02%	4	3	11	-	-	-	-

Source: PSA, 2015 POPCEN

Almost all households in Pasay City are using electricity for lighting their houses. However, there are still a few who use kerosene (*gaas*) (0.2%) and LPG (0.03%). There are about less than 0.01% of the houses already using solar panel and solar lamps. Considering the costs of these installations, it is presumed the households belong to high income residences.

Table 30. Number of Households by Kind of Fuel for Lighting, 2015, Pasay City

	Number of HH by Kind of Fuel for Lighting	Percentage of Total HH
Total	107619	
Electricity	107240	99.65%
Kerosene (Gaas)	210	0.2%
Liquefied Petroleum Gas (LPG	32	0.03%
Oil (vegetable, animal and others)	-	-
Solar panel	4	0.003%
Solar lamp	3	0.003%
Others	41	0.038%
None	71	0.066%
Not reported	18	0.012%

About 40% of households are using water from community water system for drinking, but a greater majority uses bottled water for drinking. This could be attributed to lack of confidence on the quality of water from piped systems. However, almost all households use water from community water system for cooking, both from households with own/direct connection and shared faucets.

Table 31. Number of Households by Main Source of Water Supply for Drinking

	No. of HH by main source of water supply for drinking	No. of HH by main source of water supply for cooking
Total	107,619	107,619
Own use faucet community water system	42,903	87,737
Shared faucet community water system	13,983	19,367
Own use tubed/piped deep well	-	1
Shared tubed/piped deep well	-	-
Tubed/piped shallow well	-	-
Dug well	-	-
Protected spring	-	-
Unprotected spring	-	-
Lake, river, rain and others	-	-
Peddler	-	-
Bottled water	50,698	513
Others	35	1
Not reported	-	-

4.0 SUMMARY OF KEY ISSUES AND CONCERNS

The volume, scope, and complexity of social issues in Pasay City are expected to increase in the future alongside increased growth and development. Factors contributing to this trend include population growth, poverty, escalating real estate values, growing income gaps, low proficiency of students and many more. The summary of key issues per sub-sector are outlined below.

Table 32 Issues and Concerns per Sub-Sector

Sub-Sector	Key Issues and Concerns
Local Economy	About 7.1% or 5,918 households have income below poverty threshold 6.8% households have income below food threshold. Magnitude of poor families in the city estimated at 8,000 in 2021. 5.6% or 4,360 households have unemployed members of the labor force A number of people suffer from food shortage A number of people are unemployed Lack of support for fisherfolks
Education	Number of primary school-going age children are not attending school Number of junior and senior aged children are not attending school Low proficiency of students
Health and Environment	Insufficient number of service providers Insufficient bed to population ratio. Need additional 230 beds in order to have adequate population to bed ratio Limited public tertiary or specialty hospitals
Housing and Urban Settlements	There are 3,102 informal settler families that are living in makeshift housing affecting about 4,966 individuals Building of illegal settlement structures 2.4% households without access to safe water. This is equivalent to 1,971 households 52% households living in Pasay City are renters 58% are using bottled water for drinking Inefficiencies in collection, transportation, treatment, recycling and disposal systems that affect wastewater and drainage systems leading to marine litter and plastic pollution Direct disposal of waste (domestic, industrial, construction) in waterways leading to Manila Bay Over 13,000 commercial establishments with possibly over 90% without water treatment facility with over 2,300 are located in Bgy 76 or within the vicinity of the reclamation project

5.0 DEVELOPMENT FRAMEWORK AND STRATEGIES

The Development Framework for this Plan will be guided by the SDP Framework used in the prepared EIS for the projects in compliance with the conditionality under ECC-CO-1807-0015. The Framework contains identified projects that were the result of consultations done during the EIS preparation. Each project specified project beneficiaries, partner institutions, timeframe of implementation as well as source and amount allotted per activity/component reportedly derived from consultations done during the EIS preparation (See Annex 1).

The projects identified in the EIS prepared will be detailed and incorporated and additional projects will be identified to harmonize LGU plans and programs for the impact area, including those related in response to the pandemic.

5.1 Key Principles and Assumptions

The preparation of social development programs and plans for Pasay City will be guided by the following key principles and assumptions:

Key Principles

a) Consistency with Pasay City's overall Vision. The social development projects will be consistent with existing vision and plans of Pasay City and Barangay 76 Zone 10 as the primary impact Zone. The new grand vision is to make Pasay City a sustainable eco City.

b) Social Sustainability. The programs and projects will reflect sustainability principles, and address current social needs while also being financially viable and environmental friendly. The Plan will also clarify and detail the existing SDP in the EIS.

c) Engaging Community. The programs and projects will be responsive to expressed needs of the communities covered and reflect activities that engage the participation of communities.

d) Complementarity to current programs and policies. Proposed programs and projects will complement interests, policies, programs, services and funding priorities that may have already been planned by Pasay City and its Barangay 76 Zone 10 as well as other plans of other government agencies.

Key Assumptions

a) Building on existing SDP framework and forging new priorities. The SDP will detail the existing social development policies, strategies, and initiatives, but will also identify new priority initiatives that are not currently being pursued responsive to the identified key issues and concerns. Per request of the City Planning Development Office, the SDP will address not only the primary impact zone of Barangay 76 but the rest of the barangays in the City to also benefit from social development projects of the

reclamation projects. Hence, projects that have over-reaching benefits to all barangays in the City will be identified.

b) Identifying project requirements. The SDP will identify possible funding requirements and their sources in consultation with the LGU as well as possible implementing mechanisms with broad roles and responsibilities.

5.2 Social Development Framework

The overall social development framework will be anchored on the new grand vision of *Pasay City of a sustainable eco city.*



Figure 4. SDP Framework

5.3 Goals and Strategies

Goal 1: Enhance Social Equity and Inclusion

a) Strategy 1: Expand Housing Choices. Housing is a fundamental human need. Ideally, all residents should be able to secure accommodation that meets their basic needs. Specifically, housing should be within the financial means of households and contain sufficient space and features for various household needs. Affordable and accessible housing can help ensure that current and future residents can live, work, play and thrive in Pasay City.

b) Strategy 2: Enhance Community Accessibility. Reducing barriers and enhancing accessibility are essential for creating an inclusive society. The removal of barriers for people to participate in community life by developing age and ability friendly neighborhoods is crucial to enhancing livability.

c) Strategy 3: Address the Needs of Vulnerable Population. The vulnerable population include the poor, elderly, youth and differently-abled, have more specific, specialized needs and increasing expectations. When addressed, their

conditions will improve and still able to contribute meaningfully to their communities.

d) Strategy 4: Help Children, Youth and Families Thrive. A positive start to life and a nurturing environment are critical factors for the health and wellbeing of younger population from early childhood to youth.

Goal 2: Building Social Assets and Community Capacities

a) Strategy 1: Strengthen Social Infrastructure. Pasay City's population is growing and demands for social services are rising. It is essential that social services, and the facilities used for delivering those services (i.e. social infrastructure) keep pace with Pasay's growth. This will also be attained by involving various government and non-government organizations with capability to partner with Pasay LGU in developing and providing these services.

b) Strategy 2: Provide High Quality Recreation, Arts, Cultural and Wellness Opportunities. Through recreation and sports, people enjoy themselves, become physically active and engage in life experience learning. Arts and cultural opportunities give people a sense of identity, shared pride and a way to communicate. A breadth of opportunities may also offset other social costs (e.g. health and community services) resulting in a more dynamic and sustainable quality of life.

c) Strategy 3: Facilitate Strong and Safe Neighborhoods. Strong and safe communities promote social inclusion, encourage active living and contribute to economic viability. When people feel safe in their communities, they venture outside of their homes, use parks and public spaces, and experience a more enriched community life. The sense of security is important for enhancing livability and ensuring residents have a good quality of life.

6.0 PROPOSED PROGRAMS AND PROJECTS

Table 30 provides a list of proposed programs and projects that will implement the strategies and achieve the goals set above. The matrix used in the EIS Submission is retained as directed in the ECC Conditionalities.

6.1 Goal 1: Strategy 1: Enhancing Housing Choices (G1S1)

The City government will develop socialized housing for low income families. More effort should be made to offer incentives to encourage developers to build affordable units and to identify suitable sites for affordable housing developments in City. Measures to reduce the prevalence of informal settlements should also be looked into.

In-City Medium-Rise Socialized Housing Program

This will be developed for the resettlement of informal settler families living in danger zones and priority areas for development as well as other disadvantaged groups. This will promote efficient commuting patterns, productive activity and jobs are retained and supported. Designed to minimize negative financial, social, economic and environmental impacts to families that will be relocated. Currently, two proposed areas are identified in barangays Cuenca and Leveriza. A potential area for development has already been identified and a preliminary study has already been prepared.

Site development and construction of disaster resistant housing for low income groups' projected future need. This can also make use of the 15% of developable area requirement or its equivalent cost under RA 10884 or Balanced Housing Development Program - to be donated and consolidated by the LGU.

Balik Probinsiya Program

This is a national program geared towards addressing Metro Manila's congested urban areas by encouraging people, especially informal settlers to return to their home provinces and assist them in this transition with support and incentives on transportation, family, livelihood, housing, subsistence and education, among others.

6.2 Goal 1: Strategy 2: Enhance Community Accessibility (G1S2)

These programs and projects will foster the development of public spaces and ensuring inclusive community engagement, making place and facilities, particularly public facilities and buildings are accessible.

Upgrading of City/ Public Facilities to Increase Accessibility

Develop a comprehensive plan with associated budget requirements, for undertaking necessary upgrades to further increase accessibility of existing City facilities. *Long Term (7–10 years)*

Support for Community-Based Initiatives

During the pandemic, the community pantry concept has received widespread acceptance and proved to be very helpful, particularly to low-income families, most especially to those who lost their jobs or sources of income. The City will support initiatives that will reduce the cost of living for low-income households and encourage community engagement (e.g. community gardens, community kitchens, social enterprises, and community-based life skills workshops).

6.3 Goal 1: Strategy 3: Address the Needs of Vulnerable People (G1S3)

Medical/Dental Missions and Emergency Relief

This program aims to meet the health needs of the vulnerable sector of communities who have very little capacity to pay for medical or dental services. Among the services included will be :

1. Free medical checkup and consultation
2. Dispensing of medicines
3. Dental Services
4. Giving of free reading eyeglasses
5. Minor Surgery and “Operation Tuli”

Medical Assistance

This program aims to provide financial assistance for hospitalization of critically ill members of vulnerable population. This can also include referral to other hospitals not within the City, if services or specialization for the diseases or illness are not available.

Liaison Services for Senior Citizens

This program provides assistance to senior citizens living on their own and have no relatives to care for them. Assistance will be given for livelihood to sustain them and assistance in buying medicines or transport for going for check-ups or groceries.

Educational Assistance

This program aims to provide assistance and continuing education for children and youth including ALS. It will also provide educational assistance to street children and child laborer for basic training on business management and skills development and capital for CICL and Pasay Youth Home.

Sports and Activity Center for Youth and the Elderly

Pasay City plans to develop a Sports and Activity Center where the youth, elderly and differently-abled persons, particularly those in low income families are given access to facilities that will give a rounded lifestyle of sports, fitness and other recreational and educational

activities. The elderly can still contribute productively if given purpose and appropriate facilities and tools.

"Diskwento" Caravan

During the pandemic, the Pasay City Government, through its Cooperative Development Office (PCCDO) and the Department of Trade and Industry, deployed "Diskwento Caravan" to communities to bring basic commodities, at discounted prices, closer to residents. It aims to lessen the movement of individuals in going to the market or malls, and at the same time, help the local economy recover from adverse effects of the pandemic. The caravan also helps upland and lowland farmers in selling their vegetables. The caravan is brought to strategic areas in the city to help barangay cooperatives and farmers sell their goods. This project will continue to forge the direct selling linkage affording Pasay residents for discounted prices of vegetables and fruits.

Alternative Livelihood Program for Differently abled Persons

Alternative livelihood programs with training and financial assistance will be made available to vulnerable groups including poor households, differently-abled persons, solo parents and senior citizens who are still active to engage in livelihood or employment. There are very few employment opportunities for senior citizens and differently-abled persons. The City will develop a program that will provide livelihood opportunities through training and capital provision, as well as endorsement to employment opportunities to various establishments within the City to intentionally hire persons in vulnerable situations in their staff. This may need memorandum or cooperation agreement provided with incentives for establishments that will participate.

Center for Children in Conflict with Law

As part of a Comprehensive Program for Street Children, the development of a Center will help not only provide a safe place for the children in conflict with law, but provide a place for education, learning profitable skills and instill discipline.

Center for Trafficked Persons

Pasay being a highly urbanized City, and an international gateway, with water access and in close proximity to the seaports in Manila has seen a rise in the cases of human trafficking. TAs part of re-entry program and to prepare a place for taking care of these people while being processed for eventual return to their families, Pasay City will develop a Center for Trafficked persons equipped with psycho-social counselling and primary health care facilities to properly take care of these individuals.

6.4 Goal 1: Strategy 4: Help Children, Youth and Families Thrive (G1S4)

Establishment of High Quality, Safe Child Care Services

With increasing prices and cost of living in the City, it has become imperative for both parent to be working to make ends meet. However, it is sometimes difficult for mothers to leave their small children because there are no safe child care services where they can leave their child while they are working. Pasay City will strive to development and establish high quality, safe

child care services with trained workers, equipment and supplies. The City can work with private sector in financing this project.

6.5 Goal 2: Strategy 1: Strengthen Social Infrastructure

Health

a. HealthCare Facilities and Services. The Pasay City LGU is planning for the development of a Specialized Hospital that will be devoted primarily to the specialized care and treatment of persons with chronic or long-tern illness, injury or infirmity. A feasibility study can be developed for review and appropriate funding for development may be explored with national government and/or private investors.

b. Masterplan for Sustainable Use of COVID Isolation Facilities. Pasay City established several isolation facilities that can be re-tooled or planned for multi-purpose use like evacuation centers and the like.

Education

c. Scholarship Program for High School and College Students. This will be made available to deserving students of poor families to help them with tuition fees, student allowance and books and even clothing allowance. This also include PhP 4,000 assistance to high school students studying in private schools and cannot be accommodated in public schools also dubbed as Travel City Scholars.

E-Learning Systems. The pandemic has taught us the more than ever, digital and electronic platforms are essential in all aspects of modern life, including education. Pasay City is planning to provide support for the development of E-Learning Systems that will prepare students studying within the City to become more competitive in the market place.

e.. Expansion of Pamantasan ng Lungsod ng Pasay. Pasay City plans to expand the PLP to accommodate increasing number of students and increase its ability to provide more facilities for education.

f. STEM Learning Innovation Center. Pasay City aims to develop this facility to further enhance competitiveness of students and increase their proficiency, particularly in Math and Science where the students have very low proficiency.

Employment and Livelihood

g. Livelihood Center. This is part of the overall 5-year vision for a sustainable eco Pasay City. The Livelihood Center will provide a venue for training, and may also serve as an incubation hub for start-up microenterprises.

h. Alternative Livelihood Support Programs. This will provide training, credit and market assistance to poor families as alternative livelihood or source of income for their families. This will include free availment of food kart or seed capital for distributorship of frozen foods.

i. Manpower Training Program. This aims to provide and update skills of workers living in Pasay City to be more competitive workforce. This will be implemented in coordination and collaboration with the private sector. As part of this program, the "Libreng Security Guard Training at Bayad sa Lisensiya" will be continued and the training and technical assistance to Pasay City Fisherfolks will be developed. This is an identified need of members of PLAA for training on alternative livelihood skills and vocational training. This also involves assistance to registration to BFAR and other appropriate government institutions for recognition and protection of fisherfolks and ensure their continued access to fishing grounds within Manila Bay.

j. Credit Program for Pasay Fisherfolks. This is an identified need of members of PLAA to help them with funds for acquisition of boats, boat engines and other tools and supplies used for fishing, including working capital for ice and gasoline.

6.6 Goal 2: Strategy 2: Provide High Quality Recreation, Arts, Cultural and Wellness Opportunities (G2S2)

An abundance of opportunities is available in Pasay, examples include arenas, the Cultural Centre of the Philippines Complex, MOA Complex, Specialty Museums (Upside Down Museum, Myth of the Human Body, Manila Trickeye Museum, The Dessert Museum, Public Libraries, heritage facilities and professional theatre, also found within the CCP complex.

Although these facilities are present in Pasay, not all residents are able to enjoy because of sometimes very expensive and unaffordable rates, particularly for low income families. Pasay City will try to endeavor to make these amenities affordable for the enjoyment of Pasay City residents by partnering with these facilities and establishments to provide discounts, in exchange for the lost open spaces in the City.

Discounted Rates for Recreation and Wellness Facilities for Pasay City Residents

A Program or Ordinance may be developed in cooperation with the recreational facilities to grant discounts for the residents of Pasay City, not only for senior citizens but for all residents. An important component of this is a memorandum of agreement with the administration and management of these facilities; a Pasay City Resident ID or QR code that will establish the residency of the holder in Pasay City. In exchange, Pasay City LGU may provide incentives to the facilities in terms of tax, awards and recognition.

Arts and Cultural Festivals

To cultivate the development of arts and creativity and promote Filipino culture, the City can support and fund festivals and workshops that will invite all sectors and ages in the City to participate to foster pride and unity of people in neighborhoods.

Urban Gardens, Farmers Market and Fish Market

Even though there is no land for agriculture in Pasay, the City can advocate and support urban gardening making use of rooftops and other available spaces in the community. A Farmers' Market may also be established during weekends at designated places that will offer farmers' produce straight from the farms. An alliance or cooperation with farmers' cooperatives in neighboring provinces may be formed to develop this scheme. This will offer lower priced commodities because it did not pass through middlemen or traders.

A Mini Fresh-Catch Fishers' Market may also be developed along Diokno Boulevard, particularly in the area where the fisher folks belonging to Pasay-Libertad Angler's Association are anchored. This will provide a more permanent and cleaner space to sell their fish catch, and pin the place as a destination for local fresh fish catch.

6.7 Goal 2: Strategy 3: Facilitate Strong and Safe Neighborhoods

Urban Re-Development Program

This will consist of:

a) Completing a network of safe bike routes and walkways linking neighborhood hubs and gathering places to one another and city amenities
b) Development of vibrant streetscapes with a diverse range of uses and amenities in appropriate neighborhood locations throughout the city.

Community and Coastal Clean Up Programs

Establish a program of rotating barangay involvement in community and coastal clean-up to foster care for the environment and allow avenue for neighborhood interactions. At present, according to PLAA - Anglers' Association – they are the only ones involved by the Coast Guard in the regular coastal clean-up activities for Manila Bay.

This should also involve IEC campaigns in neighborhoods for proper solid waste and waste water disposal.

Table 33 Social Development Program, Projects and Activities

PROGRAM/PROJECTS	GOAL/ STRATEGY ADDRESSED	BENEFICIARY	LOCATION	CONCERNED GOVERNMENT AGENCY/NGO	LEAD AGENCY	INDICATIVE TIMELINE[6]	SOURCE OF FUND[7]
HEALTH							
1. Medical Missions and Emergency Relief Programs	G1S3	Vulnerable Persons and Groups	Citywide	CHO	CHO	M	City of Pasay[9]
2. Medical Assistance	G1S3	Vulnerable persons	Citywide	CHO	Office of the Mayor/CHO	M	City of Pasay
3. Feeding Program for Malnourished Children	G1S1	Qualified Children 0-5 years old	Citywide	CHO	CHO	S	City of Pasay
4. Masterplan for Sustainable Use of COVID Isolation Facilities	G2S1	CHO	Bgy 76	CHO/DOH	CHO	S	City of Pasay
HOUSING & URBAN SETTLEMENTS							
5. In-City Socialized Housing Program (Medium-rise Building)	G1S1	ISF within the City	Cuenca Libertad	UDHO, NHA	UDHO	M	City of Pasay, NHA
6. Upgrading of City/Public Facilities to Increase Accessibility	G1S2	All residents	Citywide	CEO	UDHO	M	City of Pasay
7. Support for Community-Based Initiatives (Urban Gardening)	G1S2	All residents	Citywide	UDHO, CEO	UDHO	M	City of Pasay
EDUCATION							
8. Educational Assistance	G1S3	Qualified elementary & HS students	Citywide	OCM/DepEd	DepEd	M	City of Pasay

[6] S – Short-term (<1 year); M- Medium-term (1 - <3 years); L-Long-term (≥3 years)
[7] All Projects are initially identified to have GAA funding of the City of Pasay but can also be in partnership with other institutions
[9] Funds included in the budget under Government Appropriations Act (GAA)

PROGRAM/PROJECTS	GOAL/ STRATEGY ADDRESSED	BENEFICIARY	LOCATION	CONCERNED GOVERNMENT AGENCY/NGO	LEAD AGENCY	INDICATIVE TIMELINE[6]	SOURCE OF FUND[7]
9. Scholarship Program for High School & College Students	G2S1	Qualified High School & College Students	Citywide	Office of the Mayor/DepEd/ CHED	Office of the Mayor	M	City of Pasay
10. E-Learning Systems for Public Schools	G1S3	Selected Public Schools	Citywide	Office of the Mayor/DepEd	DepEd	M	City of Pasay
11. F.S for STEM Innovation Learning Center	G2S1	High School students		DepEd	DepEd	M	City of Pasay
EMPLOYMENT AND LIVELIHOOD							
12. Alternative Livelihood Program	G2S1	PWD	Citywide	PESO/DSWD	PESO	S	City of Pasay
13. Credit Program for Pasay City Fisherfolks	G2S1	PLAA	Bgy 76	TBD	TBD	S	City of Pasay
14. Training and Technical Assistance Program for Pasay Fisherfolks	G2S1	PLAA	Bgy 76	BFAR, PCG	TBD	S	City of Pasay, BFAR, PCG
15. Diskwento Caravan	G2S1	Vulnerable families	Citywide	PCCDO/DTI	PCCDO	S	City of Pasay
SOCIAL WELFARE							
16. Liaison Services for Senior Citizens and PWDs	G1S3	Senior Citizens	Citywide	CSWD			
17. Establishment of high quality, safe child care services	G1S4	Low income families	Bgy 76 & Select Barangays	CSWD, NGO	CSWD	M	City of Pasay
18. F.S. for Sports and Activity Center for Youth and the Elderly	G1S3	All residents		CPDO, CEO,	Office of the Mayor	L	City of Pasay
19. Discounted Rates for Recreational and Wellness Facilities for Pasay City Residents		All residents	Citywide	Sangguniang Panlunsod, Office of the Mayor	Sanggunian g Panlunsod	S	City of Pasay

REFERENCES

City of Pasay. (2014). City of Pasay Comprehensive Development Plan 2014-2019.

City of Pasay. (2019). Community-based Monitoring System Census 2017-2019.

City of Pasay (2022), Annual Investment Plan 2022

Crosskey, J. (2021). How Much Does it Cost to Build a Sports Complex? The Sports Facilities Companies. https://sportsfacilities.com/how-much-does-it-cost-to-build-a-sports-complex/

Department of Agriculture. (2021). Bidding Documents: Construction of Tagum City Modern Fish Market (Design & Build). https://pfda.gov.ph/images/Invitation_to_Bid/Bid_Doc___Const_of_Tagum_City_Modern_ Fish_Market_Design__Build.pdf

Department of Trade and Industry. (2021). 2021 Cities and Municipalities Competitiveness Index Rankings. https://cmci.dti.gov.ph/

Philippine Statistics Authority. (2020). 2020 Census of Population and Housing. https://psa.gov.ph/content/2020-census-population-and-housing-2020-cph-population- counts-declared-official-president

Philippine Statistics Authority. (2020). 2020 PSA Number of Total Employment of Establishments. https://psa.gov.ph/content/total-establishment-employment-1

Rebosa, M. (2021). Construction Cost in the Philippines-Updated. GR Design Studio. https://grdesignstudio.com/index.php/2021/04/10/construction-cost-in-the-philippines/

Securities and Exchange Commission. (2018). 2018 Top 100 Corporation in the Philippines. https://www.makati.gov.ph/cms/business/top-100-corporations/2261.

Tsilaajav, T. (2009). Costing study for selected hospitals in the Philippines. Department of Health. https://doh.gov.ph/sites/default/files/publications/CostingStudySelectedHospitals Philippines.pdf

Wayne State University. (2017). FY 2019: Capital Outlay Project Request STEM Innovation Learning Center. https://facilities.wayne.edu/pdf/fy19_attachment_b_project_request.pdf

https://pia.gov.ph/news/2022/06/28/pasay-takes-first-place-in-2022-ncr-literary-search



APPENDIX M.3

Pasay Authorization to the Contractor

M.3. Pasay Authorization to the Contractor

Republika ng Pilipinas
Pamahalaang Lungsod ng Pasay
Tanggapan ng Pinunong Pambatas ng Lungsod
(Office of the City Legal Officer)

17 August 2023

Atty. Michael Drake P. Matias
Director, Environmental Management Bureau – National Capital Region ("EMB-NCR")
Department of Environment and Natural Resources ("DENR")
EMB-NCR Bldg. National Ecology Center Compound,
East Ave., Diliman, Quezon City

Attn: **Engr. Wilma R. Uyaco**
Chief, Clearance and Permitting Division

Re: **China Harbor Engineering Company Ltd. ("CHEC"), Project Contractor for the 360-Hectare Pasay Reclamation Project**

Dear Sir:

We respectfully endorse the attached clarification of our private joint venture partner, Smart City Infrastructure and Development Corporation ("**SM SCIDC**"), on the authority of **China Harbor Engineering Company Ltd. ("CHEC"),** Project Contractor for the 360-Hectare Pasay Reclamation Project.

We trust that this endorsement will be duly acknowledged.

Thank you.

Respectfully yours,

Atty. Severo C. Madrona, Jr.
City Legal Officer

2nd Floor, Room 205, Pasay City Hall, F.B. Harrison Street, Pasay City, 1300 M.M. Phil.
Tel. Nos. 8824-3948 / Email: pasaylegal@gmail.com
www.pasay.gov.ph

SMART CITY

SMART CITY INFRASTRUCTURE AND DEVELOPMENT CORPORATION
10/F Mall of Asia Arena Annex Building,
Coral Way cor. J.W. Diokno Boulevard,
Mall of Asia Complex, Pasay City 1300, Philippines

SMSCIDC-LRC-23-0105-O
14 August 2023

Honorable Imelda G. Calixto-Rubiano
City Mayor
City Government of Pasay
Pasay City Hall
F.B. Harrison Street, Pasay City

Subject: **Authority of China Harbor Engineering Company Ltd. ("CHEC") to Apply for Permit to Operate in relation to the 360-Hectare Pasay Reclamation Project**

Dear Mayor Calixto-Rubiano:

We write in our capacity as the joint venture partner of the City of Pasay for the 360-Hectare Pasay Reclamation Project (the **"Project"**). This refers to the applications for Permit to Operate (**"PTO"**) for the diesel engine generator sets filed by our third party Project contractor, China Harbor Engineering Company Ltd. (**"CHEC"**) with the Environmental Management Bureau – National Capital Region (**"EMB-NCR"**) in connection with the implementation of the Project. We have been informed that these applications remain pending or were denied due to questions on the personality of CHEC as contractor for the Project.

In view of this, we are constrained to make the following clarification.

Based on record, the SM-Smart City Infrastructure and Development Corporation (**"SM-SCIDC"**) is the private joint venture partner of the City Government of Pasay (**"Pasay LGU"**) in undertaking the 360-Hectare Pasay Reclamation Project pursuant to its Contractual Joint Venture Agreements (**"CJVAs"**).[1] As Private Joint Venture Partner, SM-SCIDC is authorized to engage the services of private contractors to undertake the implementation of the Project.[2]

Pursuant to its authority under the CJVAs, SM-SCIDC has engaged the services of CHEC as project contractor to undertake the rawland reclamation of the Project.[3] The Environmental Compliance Certificate[4] for the Project requires all contractors and subcontractors for the Project to comply with the conditions of the ECC including regulations covering the entire activities. Thus, in the implementation of the Project, CHEC applied for the PTOs for its diesel engine generator sets with the EMB-NCR.

---

[1] The CJVA for 60-hectares was executed on 23 October 2012, while the CJVA was executed on 15 November 2012.
[2] Section 4.2.c. of the CJVA dated 23 October 2012 and Section 4.2.d. of the CJVA dated 15 November 2013 provide: that the Project Developer shall "provide the manpower, equipment, machinery, technology, management and all other support facilities for the full implementation of the Project;"
[3] Relevant portions of the Contract Agreement between SM-SCIDC and CHEC are attached herein as **Annex "A"**
[4] The EMB issued ECC-CO-1601 for the 360-Hectare Pasay Reclamation Project on 24 October 2017.

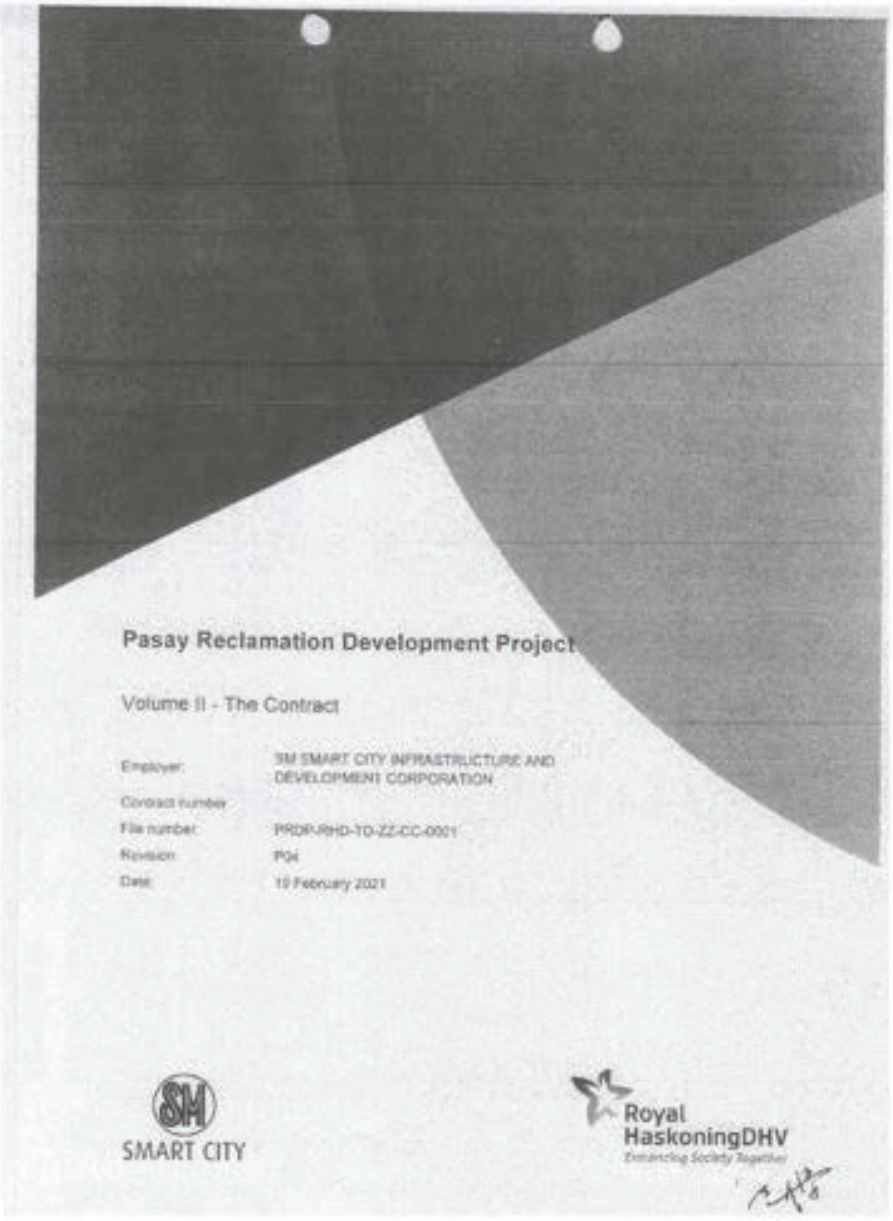
We respectfully request that this clarification be endorsed to the EMB-NCR as part of the compliance of CHEC in its applications for PTO.

Respectfully yours,

Glenn D. Ang
President

Copy furnished:

Atty. Michael Drake P. Matias
Director, Environmental Management Bureau – National Capital Region ("EMB-NCR")
Department of Environment and Natural Resources ("DENR")
EMB-NCR Bldg. National Ecology Center Compound,
East Ave., Diliman, Quezon City


Pasay Reclamation Development Project
Volume II - The Contract
Employer:
SM SMART CITY INFRASTRUCTURE AND DEVELOPMENT CORPORATION
Contract number:
File number:
PRDP-RHD-TD-ZZ-CC-0001
Revision:
P04
Date:
10 February 2021
SMART CITY
Royal HaskoningDHV
Enhancing Society Together

Contract Agreement

This Contract Agreement for the Pasay Reclamation Development Project ("Contract Agreement") is made and entered into on this by and among:

SM SMART CITY INFRASTRUCTURE AND DEVELOPMENT CORPORATION, a corporation duly authorized and existing under Philippine laws, with office address at the 10th/F Mall of Asia Annex Building, Coral Way corner J.W. Diokno Boulevard, Mall of Asia Complex, 1300, Pasay City, Philippines, represented herein by its Attorney-in-Fact **ATTY. SIEGFRED RAMON B. MISON** (hereinafter called the "**Employer**"), and

CHINA HARBOUR ENGINEERING COMPANY, a branch office of China Harbour Engineering Company Ltd. and duly licensed to do business in the Philippines, with office address at the 5th Floor Ramon Magsaysay Center, Roxas Boulevard, Malate, Manila 1004, Philippines, represented herein by its Attorney-in-Fact **MR. CHU XIAORUN** (hereinafter called the "**Contractor**").

Whereas the Employer desires that the Works should be executed by the Contractor, and has accepted a Tender by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Contract Agreement, unless the context provides otherwise, words and expressions shall have the same meanings as are respectively assigned to them in The Particular Conditions Part A – Contract Data, The Particular Conditions Part B – Special Provisions and General Conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Contract Agreement:

   a) The Contract Agreement
   b) Letter withdrawing acceptance of Boskalis International B.V. and Boskalis Philippines, Inc.'s portion of the Tender
   c) The Letter of Acceptance dated April 16, 2020 (as may be amended)
   d) The Particular Conditions Part A – Contract Data (Volume II)
   e) The Particular Conditions Part B – Special Provisions (Volume II)
   f) General Conditions of Contract
   g) The Employer's Requirements Volumes IVA to IVF
   h) Site Data (Volume V)
   i) The Schedules (Volume III)
   j) The Letter of Tender dated 10 January 2020 (as may be amended upon mutual agreement of the Parties)
   k) The Proposal that was included in the Letter of Tender dated 10 January 2020

   The foregoing documents are to be interpreted harmoniously and taken as mutually explanatory of one another. If there is any conflict, ambiguity or discrepancy, the priority of documents shall be in accordance with the foregoing sequence with a document higher on the list prevailing over a document lower on the list.

3. The Employer has appointed China Harbour Engineering Company as the Contractor. For the avoidance of doubt, the Contractor undertakes to perform and be responsible for the Works and all the obligations, works, and activities specified in the Contract.

(iv) **Counterparts.** This Contract Agreement may be signed in various counterparts. If a signatory of a Party signed this Contract Agreement outside the Philippines, this Contract Agreement must be acknowledged before, or authenticated by, the appropriate Philippine consul having jurisdiction over the place where this Contract Agreement was signed.

(v) **Expenses.** Each Party shall bear its respective legal, accounting, and other expenses incurred in connection with the negotiation and preparation of the Contract.

(vi) **Binding Effect.** The Contract shall be binding upon the Parties and their successors and permitted assigns. The declaration of nullity of any particular provision of the Contract will not affect the validity of the entire Contract.

IN WITNESS WHEREOF the Parties hereto have caused this Contract Agreement to be executed the day and year written above.

Signed by:

SIEGFRED RAMON E. MISON
For and on behalf of the Employer

Signed by:

CHU XIAORUN
For and on behalf of the Contractor

SIGNED IN THE PRESENCE OF:

(Name and Signature of Witness)

(Name and Signature of Witness)

(Name and Signature of Witness)

[Acknowledgment Page Follows]

APPENDIX N. PROOF OF PUBLIC PARTICIPATION

Summary of SPRMP Stakeholder Activities

Table 1 shows the summary of Stakeholder Activities conducted for the EPRMP while Figure 1 and Figure 2 shows the photo documentation.

Table 1 Summary of EPRMP Stakeholder Activities

Date and Venue	Activity	Participants
18 May 2024	FGD	Pasay Libertad Anglers Association (PLAA) – Fisherfolk Group
06 May 2024 Barangay Hall	KII	Barangay Chair Rosemarie San Miguel
06 May 2024 Barangay Hall	FGD	Barangay 76 Councilors
29 April 2024 The Henry Hotel Manila	FGD	Pasay City LGU City Planning and Development Office City Environment and Natural Resources Office City Health Office Office of the Mayor SM Smart City
3 and 5 September 2024	Perception Survey	Barangay 76: 100 residents and 30 fisherfolks





Barangay 76 Chairperson and Councilors (6 May 2024)



Pasay City LGU Representative Group (29 April 2024)





Pasay Libertad Anglers Association (PLAA) – Fisherfolk Group (18 May 2024)

Figure 1 Photo Documentation of IEC Activities



Figure 2 Photo Documentation of Household Survey (3 and 5 September 2024)

ATTENDANCE SHEETS

360 HECTARES RECLAMATION PROJECT
LOCAL GOVERNMENT OF PASAY
FOCUS GROUP DISCUSSION
APRIL 29, 2024

NAME	OFFICE	POSITION	CONTACT NUMBER AND EMAIL ADDRESS	SIGNATURE
1. MICHELLE YU	PLANADES	PROJ. COORDINATOR		
2. [illegible]	[illegible]	[illegible]		
3. [illegible]	[illegible]	Compliance manager		
4. Engr Richard Biason	Planades	EIA Team Leader		
5. Aileen Siason	Planades	EIA Socio Consultant		
6. Achillac L. Robiso	CPDO - Pasay	PO III		
7. [illegible]	[illegible]	[illegible]		
8 Juan Jose Chua	MAYOR'S OFFICE	[illegible]		
9. Engr Mark Jan	CHO	CHO II		
10. ENP. MARIA ODELIA Z. PEREZ, CESE	CPDO	CPDC		
11. NICOLE FIKINGAS, CHEI ENP	CPDO	PDN		

360 HECTARES RECLAMATION PROJECT

A Project of Pasay City Government
Activity: Focus Group Discussion
Participants: Fisherfolk Group
Date: 18 May 2024

No.	Name	Gender (M/F)	Office/Organization	Position/Title	Contact Number	Signature
1	JESUS OLIVEROS	M	PLAA			
2	Julito ORELLANO	M	PLAA			
3	Wilmar Macayayong	M	PLAA			
4	ANTONIO CABUNOC	M	PLAA			
5	Michael Abejon	M	PLAA			
6	EUSTO A. ORTILLANA JR	M	PLAA			
7	JOHN JOHN	M	PLAA			
8	Jaime Antonio Gatpo	M	PLAA			
9	Jason Luterio	M	Plaa			
10	Mark John Quidoc	M	PLAA			
11	Kenny Berenacy	M	Plaa			
12	Jerice C. Luterio	M	PLAA			
13	JEY C. MINA	M	P.L.A.A			
14	DANILO SABORNIDO	M	PLAA			
15	Henderson C Sotallo	M	PLAA			

360 HECTARES RECLAMATION PROJECT

A Project of Pasay City Government
Activity: Focus Group Discussion
Participants: Fisherfolk Group
Date: 18 May 2024

No.	Name	Gender (M/F)	Office/Organization	Position/Title	Contact Number	Signature
1	Dominador C MARADE	M	PLAA			
2	SEVERO B. MARASIGAN	M	PLAA			
3	[illegible]	M	PLAA			
4	ACERN MAGDALENO	M	PLAA			
5	REGTO GOBRES	M	PLAA			
6	VIPAL O. LUCAS III	M	PLAA			
7	CHRISTOPHER IAN L. MAGTOTO	M	PLAA			
8	JOSELITO DELMONTE	M	PLAA			
9	EDMUNDO ATIENZA	M	PLAA			
10	Rene-Ortillado	M	PLAA			
11	ALVINGN E. SOLIS	M	P.L.A.A			
12	JOSE A MIRA	M	PLAA			
13	HERIBERTO LABARDA	FCM	PLAA			
14	CRISANTO MENDOZA	M	PLAA			
15	[illegible]	FCM	PLAA			

360 HECTARES RECLAMATION PROJECT

A Project of Pasay City Government
Activity: Focus Group Discussion
Participants: Fisherfolk Group
Date: 18 May 2024

No.	Name	Gender (M/F)	Office/Organization	Position/Title	Contact Number	Signature
1	[illegible] WILLIE	M	P.L.A.A			
2	ELIGIO A. ORTILLADO.	M.				
3	JAIME SEMBRANO	M.				
4	Agustines Canino	M.	P.L.A.A	Member		
5	[illegible] DIMAPILIS	M	PCAA	MEMBER		
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Perception Survey Form

SF No.

PERCEPTION SURVEY
Pangalan ng Proyekto: 360-hectare Reclamation Project
Lokasyon: Barangay 76, Pasay City
Proponent/Owner: Pasay City Government

Ang Perception Survey na ito ay para sa proyektong nabanggit sa itaas. Ito ay isinasagawa alinsunod sa kautusan ng Department of Environment and Natural Resources (DENR) upang malaman ang kalagayan ng komunidad kung saan isasagawa ang proyekto. Ito rin ay isang pamamaraan upang magkaroon ng programang makakatulong sa komunidad at sa kalikasan. Ang iyong identity o pagkakakilanlan ay hindi namin ilalahad kaninuman ng wala ang inyong pahintulot. Maraming salamat po.

Petsa/Araw:	Barangay:
Pangalan ng Ini-interview	Pangalan ng Nag-i-interview:

I. IMPORMASYON TUNGKOL SA SUMASAGOT AT SA PAMILYA

Edad ng sumasagot	18-25 ☐	26-35 ☐	36-45 ☐	46-55 ☐	56-65 ☐	66-75 ☐	76-above ☐
Biyolohikal na Kasarian	Lalaki ☐ Babae ☐	**Civil Status:**	Single ☐	May asawa ☐	Widowed/Balo ☐	Hiwalay ☐	Common-law/Hindi kasal ☐
Sino ang Head of the Household (namumuno)	Tatay ☐ Nanay ☐	Anak na Lalaki ☐	Anak na Babae ☐	Iba pa: _____			
Sino ang pangunahing nagtatrabaho sa pamilya o breadwinner (malaking kontribusyon)?	Tatay ☐ Nanay ☐ Anak na lalaki ☐ Anak na babae ☐ Kamag-anak ☐	**Uri ng Trabaho o Pinagkakakitaan ng Breadwinner**	Empleyado sa gobyerno ☐ Empleyado sa pribado ☐ Laborer/Contract Job (karpintero, mekaniko, pintor, nangangalakal, driver, manikurista, atbp.) ☐ May sariling negosyo ☐ Wala sa nabanggit, paki-sulat: _____				
Lugar ng pinagta-trabahuhan ng breadwinner?	Sariling barangay (Brgy. 76) ☐ Sa ibang barangay sa Pasay ☐ Sa ibang lugar sa Metro Manila ☐ Sa ibang bansa/OFW ☐	**Buwanang kita/income ng BUONG pamilya**	Less than 10,000 ☐ 10,001 to 20,000 ☐ 20,001 to 30,000 ☐ 30,001 to 40,000 ☐ 40,001 to 50,000 ☐ 50,001 above ☐				
Natapos na edukasyon ng HEAD of the Household	Di tapos ng Elementary ☐	Elementary Graduate ☐	Di tapos ng Highschool ☐	Highschool Graduate ☐	Di tapos ng Kolehiyo ☐	College Graduate ☐	May Master's/PhD ☐
Relihiyon ng HEAD of the Household	Roman Catholic ☐	Protestant ☐	Iglesia ni Cristo ☐	Aglipay ☐	Born Again ☐	Islam ☐	Iba pa: _____
Lugar ng Kapanganakan ng HEAD of the Household	_____	**Ethnic Origin ng HEAD of the Household: (Tagalog, Cebuano, Ilocano, Bicolano, Kapampangan, atbp.)**	_____	**Tenurial Status of Residence** (Katayuan ng tinitirhan)	May-ari ng lupa at may titulo ☐ Nangungupahan ☐ Nakitira sa lupa ng walang pahintulot ☐ Nakikitira lamang (may pahintulot) ☐		
Ilang taon na nakatira sa lugar ngayon	Less than 1 year ☐	1-5 years ☐	6-10 years ☐	11-15 years ☐	16-20 years ☐	21-25 years ☐	Over 26 years ☐

Bilang ng tao na nakatira sa bahay	1-3 tao ☐	4-6 tao ☐	7-9 tao ☐	10 above ☐	**Lighting system o Uri ng pang-ilaw sa bahay**	Electricity ☐ Lamparang de Gaas ☐ Kandila ☐ Solar light ☐ Iba pa na wala sa nabanggit: _____	
Uri ng bahay	Single house o walang katabi ☐			Duplex o 2 bahay na magkadikit ☐		Multi-unit residential hal. Condominium ☐	
Gawa saan ang bahay	All concrete o semento ☐			Mixed concrete and wood (lumber, plywood, etc.) ☐		Indigenous materials (nipa,bamboo, cogon, rattan, atbp) ☐	Salvage materials (gulong, tarpaulin, scraps, tela, atbp) ☐
Gamit sa pagluto	Gasul ☐		Kuryente ☐		Gaas ☐	Uling ☐	Iba pa: _____

II. PANG-KALUSUGAN AT PANG-KALINISAN (HEALTH AND SANITATION)

1. Ano ang nakikita ninyo problemang pang-kalusugan sa inyong barangay? *(ex. walang doctor, walang ambulansya, walang gamot at iba pa)*	a. _____	b. _____	c. _____	d. _____	e. _____
2. Nakaranas ba ang inyong pamilya ng pagkalat ng sakit sa nakalipas na 5 taon?	Measles/Tigdas ☐	Chickenpox/Bulutong ☐	Dengue ☐	COVID-19 ☐	Iba pa na hindi nabanggit: _____
3. Ano-anong mga sakit ang naranasan ng pamilya sa nakalipas na 5 taon?	a. _____	b. _____	c. _____	d. _____	e. _____
4. Saan po kayo nagpapagamot/nagpapatingin kapag may karamdaman?	Bahay/ self-medication ☐	Herbalist ☐	Community Health Center ☐	Private Hospital ☐	Public Hospital ☐
	Private Clinic ☐	Faith Healer/Albularyo/Hilot ☐			
5. May namatay po ba sa pamilya sa nakaraang limang (5) taon?	Oo ☐ Wala ☐	**5.1 Kung OO, ano po ang sanhi ng pagkamatay?**	a. _____	b. _____	c. _____
6. Saan po kayo kumukuha ng tubig inumin?	Local water district ☐ (sariling gripo)	Manual poso/deep well ☐	Electric poso/deep well ☐	Mineral water station ☐	Iba pa: _____
7. Saan kayo kumukuha ng tubig pangluto, panligo, panlinis, atbp?	Local water district ☐ (sariling gripo)	Manual poso/deep well ☐	Electric poso/deep well ☐	ilog ☐	Iba pa: _____
8. Anong klase ang inyong CR?	Pampubliko ☐ (may toilet bowl)	Pampubliko ☐ (hole/butas lang)	Sariling CR ☐ (may toilet bowl)	Sariling CR ☐ (hole/butas lang)	Iba pa: _____
9. May sarili ba kayong septic tank o poso negro? *(daluyan ng dumi/tubig galing sa CR)*	Oo ☐ Wala ☐	**10. May regular na koleksyon ng basura sa inyong barangay?**	Oo ☐ Wala ☐		
11. Kung walang regular na koleksyon, paano itinatapon ang inyong basura?	Inaantay pa din ang koleksyon ☐ Sinusunog ☐ Iba pa: _____		Itinatambak sa ibang lugar ☐	Tinatapon sa ilog/dagat ☐	

☐

III. EDUCATION PROFILE

12. Mayroon ba sa pamilya ang nakapag-aral o nag-aaral sa public school?	Oo ☐ Wala ☐	13. Mayroon ba sa pamilya ang nakapag-aral o nag-aaral sa private school?	Oo ☐ Wala ☐
14. Mayroon bang nakapagtapos ng high school sa inyong pamilya?	Oo ☐ Wala	15. Mayroon bang nakapagtapos ng kolehiyo sa inyong pamilya?	Oo ☐ Wala ☐

IV. PAGTINGIN SA KALAGAYAN NG KOMUNIDAD

ASPETO	Ikaw ba ay nasisiyahan? Lagyan ng check (√) kung OO o HINDI		ASPETO	Ikaw ba ay nasisiyahan? Lagyan ng check (√) kung OO o HINDI	
	OO	HINDI		OO	HINDI
16. May available na trabaho o pagkakakitaan (livelihood) – may sapat na trabaho na makikita sa inyong barangay			**22. Utilities** – may sapat na supply ng tubig, may supply ng kuryente, may communication signal sa barangay para sa cellphone at internet		
17. Buhay at kalusugan - may available na doctor/brgy health workers; may sarili or malapit na hospital, may libreng bakuna laban sa sakit, pangangalaga sa mga buntis at baby, family planning, pangangalaga sa senior citizen, atbp.			**23. Community facilities and amenities** – may sports facilities tulad ng basketball court, auditorium, gymnasium at park		
18. Kapayapaan at kaayusan (peace and order) – naaayos ng barangay at kapulisan ang krimen at problema sa barangay; payapa ang lugar; walang nag-aaway na magkakapitbahay			**24. Commercial Services** – may available na tindahan, bangko, restaurant, hardware, repair shop, palengke, atbp.		
19. Kalinisan (Cleanliness/Sanitation) – may koleksyon ng basura, may tamang palikuran/CR ang lahat ng bahay, walang nakakalat na basura at dumi ng hayop			**25. Barangay Services** – sapat na serbisyo para sa mga tao sa kalusugan, resolusyon ng problema at nakakapag issue ng clearance, cedula, certificate, atbp.		
20. Edukasyon – may paaralan sa sariling barangay o malapit sa barangay, may sapat na mga guro, maayos na nakakapag-aral ang mga bata			**26. Transportation** – maayos na napapatupad ang batas trapiko, maayos ang daloy ng mga sasakyan, may available na pampublikong sasakyan.		
21. Imprastraktura – may maayos na daan, may tulay para makatawid ang mga tao at mga sasakyan, maayos na school building, may barangay building, poste ng ilaw			**27. Pagtugon sa Sakuna (disaster mitigation, preparedness and response)** – may sapat na kakayahan ang barangay para sa agarang pagtugon sa sakuna tulad ng evacuation center, rescue boats, pagkain, gamot, atbp. Naghahanda ang brgy bago pa man mangyari ang sakuna.		

V. PROJECT AWARENESS AND CONCERNS

28. May alam ba kayo o sinumang miyembro ng pamilya tungkol sa proposed 360-reclamation project ng Pasay City LGU? (ito po ay pagkakaroon ng expansion or mas malawak na reclamation na sakop ng Brgy. 76?)	Oo ☐ Wala ☐	**29. Kung OO ang sagot, gaano mo o ninyo naiintindihan ang proyektong gagawin?**	Hindi naiintindihan ang proyekto ☐	May kaunting Kaalaman sa proyekto ☐	Kabisado ang proyekto ☐

30. Kung OO ang sinagot sa No. 28, saan nanggaling ang kaalaman mo o ninyo tungkol sa proyekto?	Barangay official/employee ☐ Kaibigan/kapitbahay/kamag-anak ☐ Sa internet ☐ Sa empleyado ng Pasay City ☐ Iba pa na hindi nabanggit: _____	**31. Sa inyong palagay, ano-ano ang maidudulot ng proyekto sa inyong barangay?**	Positibo: (1) _____ (2) _____ (3) _____ (4) _____ Negatibo: (1) _____ (2) _____ (3) _____ (4) _____
32. Kayo ba ay sumasang-ayon or hindi sumasangayon sa pagkakaroon ng reclamation project sa inyong barangay?	Sumasang-ayon ☐ Hindi sumasang-ayon ☐ Dahilan ng pagsang-ayon o hindi pagsang-ayon: _____ _____ _____ _____	**33. Kung sakaling matuloy ang proyektong 360-reclamation, paano ninyo gustong makatulong ito sa inyong pamilya?** *(hal. magbigay ng trabaho, tulong sa barangay health center, scholarship sa pag-aaral, atbp.)*	

MARAMING SALAMAT PO SA INYONG ORAS UPANG SAGUTAN ANG SURVEY NA ITO.

APPENDIX O.
PERMITS AND CLEARANCES

O.1. Hazardous Waste Generator's Certificate
O.2. LLDA Clearance
O.3. PCG Approved Oil Spill Contingency Plan
O.4. Permit to Operate of Generator Sets
O.5. Special Waste Permit to Dump/ Discharge Waste and/or Other Matter

APPENDIX O.1

Hazardous Waste Generator's Certificate

O.1. Hazardous Waste Generator's Certificate

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
National Capital Region
National Ecology Center, East Avenue, Diliman Quezon City
Telephone Nos: 931-23-97, 931-29-54, 931-18-34
Website: http://ncr.emb.gov.ph

HAZARDOUS WASTE GENERATOR REGISTRATION CERTIFICATE

Pursuant to Chapter 3 of DENR Administrative Order (DAO) No. 2013-22, the Implementing Rules and Regulations of Republic Act (RA) 6969, this Certificate is issued to:

Name of Establishment : **CHINA HARBOUR ENGINEERING COMPANY**

Facility Address : WITHIN THE COASTAL WATERS OF MANILA BAY IN THE TERRITORIAL JURISDICTION OF THE CITY OF PASAY, BARANGAY 76, PASAY CITY, NCR, FOURTH DISTRICT

You are hereby assigned with the new *on-line registration no*

OL-GR-NCR-76-043595

This certifies that the above-named Hazardous Wastes Generator generates the following types of wastes:

Waste Class	Waste Number
Used industrial oil including sludge	I101
Vegetable oil including sludge	I102
Oil-contaminated Materials	I104
Wastes with specific non-halogenated toxic organic chemicals	L402
Pathological or infectious wastes	M501
Pharmaceuticals and drugs	M503
Oxidizing agents	E501
Waste electrical and electronic equipment (WEEE)	M506
Containers previously containing toxic chemical substances	J201
Solvent based	F601
Lead compounds	D406
Non-halogenated organic solvents	G704

1. The above-named HW Generator shall comply with all the requirements of R.A 6969 and its Implementing Rules and Regulations particularly DAO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes (Revising DAO 2004-36).
2. Submission of the online Self Monitoring Report (SMR) shall be made within fifteen (15) days after the end of every reporting period.
3. Please refer to this assigned registration number for every transaction related to the online Hazardous Waste Management System.
4. Non-compliance to the above stipulations shall be subjected to the penalty provisions as provided under Section 41 of DAO 1992-29 and Chapter 11 of DAO 2013-22.

ATTY. MICHAEL DRAKE P. MATIAS
Regional Director
February 15, 2023

This is a computer generated certificate.
To verify the authenticity of this file, kindly scan the generated QR Code using your QR Code scanner / reader or visit the HWMS website for details.

APPENDIX O.2

LLDA Clearance

O.2. LLDA Clearance



Republic of the Philippines
LAGUNA LAKE DEVELOPMENT AUTHORITY
National Ecology Center, East Avenue, Diliman, Quezon City

Permit No. PC-25c-2022-01608 Date Issued:

LLDA CLEARANCE

FOR DEVELOPMENT PLAN/PROJECT/PROGRAM WITHIN THE LAGUNA DE BAY REGION

Pursuant to Section 4 (d) of Republic Act 4850, as amended by Presidential Decree No. 813 and further clarified by Executive Order No. 927, LLDA Board Resolution Nos. 224 (Series of 2004) and No. 408 (Series of 2011), clearance to implement development plan/program/project within the Laguna de Bay Region is hereby granted to:

CITY GOVERNMENT OF PASAY
(PASAY CITY RECLAMATION PROJECT)
Name of Firm, Individual Owner, Plant, etc.

Along the coast of Manila Bay, Pasay City
Address

SPECIFICALLY:
To proceed with the 360 hectares rawland reclamation project, composed of Islands 1 and 2 with a total land area of Three Hundred (300) hectares and Sixty (60) hectares respectively, located off the coast of Manila Bay.

Implementation requirements and other conditions set forth in this Clearance are as follows:

a. This Clearance may not be assigned or transferred to a new Owner without the prior written consent of LLDA;
b. Any subsequent additions, alterations or changes to the originally approved plan, project or program subject of this Clearance shall be made only upon written consent of the LLDA and shall be covered by a separate or amended LLDA Clearance as per LLDA Board Resolution No. 408, Series of 2011;
c. A copy of Zoning Permit or Locational Clearance from the LGU concerned shall be submitted to this Office within ninety (90) days upon receipt of this Clearance;
d. All conditions stipulated in the submitted Zoning Permit and Environmental Compliance Certificate (ECC) must be faithfully complied with and in case of revocation of Zoning Permit or ECC, this Clearance shall be considered null and void;
e. Pursuant to the Philippine Clean Water Act of 2004 (RA 9275), a Wastewater **Discharge Permit** shall be secured from this Office within thirty (30) days upon receipt of this Clearance if the project is already operational, or within thirty (30) days before its target date of operation, whichever is applicable;
f. Any processes, fuel-burning equipment, tools and installations emitting air pollutants shall be covered by the necessary clearance or permit from DENR - EMB Regional Office, pursuant to the Philippine Clean Air Act of 1999 (RA 8749);
g. The operation must comply with Ecological Solid Waste Management Act of 2000 (RA 9003), Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (RA 6969), and other national regulations and local ordinances on the proper disposal of solid wastes, hazardous and/or special wastes;
h. In general, the implementation of such plan, program or project shall not cause significant negative environmental impact and shall ensure that critical environmental concerns are addressed to the full satisfaction of the LLDA;
i. Should verified complaints arise against this project, the operation shall be suspended until corrective measures are implemented and the complaints are resolved to the full satisfaction of the LLDA; and
j. This Clearance or a copy hereof should be posted in a conspicuous place within the premises clearly visible to the public for verification and guidance and shall be adequately framed or otherwise protected against damage.

Non-compliance with any of these conditions constitutes a violation of RA 4850, as amended, and shall be subject to appropriate fines and penalties and may result in an enforcement action, clearance revocation and/or denial of a clearance renewal application.

Recommended by:

ENGR. EMITERIO C. HERNANDEZ, EnP
Department Manager III, Environmental Regulations Dept.

APPROVED BY:

JAIME C. MEDINA
General Manager

This LLDA Clearance is valid for the duration of the Project, unless sooner suspended or revoked in writing by this Office.

Processing Fee	O.R. No.:	0033881	Amount :	PHP	1,600.00	Date :	01 December 2022
Regulatory Fee	O.R. No.:	0033881	Amount :	PHP	19,404,000.00	Date :	01 December 2022

This Permit is not valid without the LLDA Official Seal. Establishment ID No. **PSY30482**

LLDA Nº 00056

APPENDIX O.3

PCG Approved Oil Spill Contingency Plan

O.3. PCG Approved Oil Spill Contingency Plan

5TH FLOOR, TOWER B, TWO E-COM CENTER, BAYSHORE AVE. ST., MALL OF ASIA (MOA) COMPLEX, BARANGAY 076, DISTRICT 1, PASAY CITY, METRO MANILA

CHINA HARBOUR ENGINEERING COMPANY

OIL SPILL CONTINGENCY PLAN (OSCP)

PHILIPPINE COAST GUARD
MARINE ENVIRONMENTAL PROTECTION COMMAND
MEP ACCREDITATION AND CERTIFICATION SERVICES

ROBERT N PATRIMONIO
CG VADM
Commander, MEPCOM

DOC: PCG-2023-OSCP-030
OR NO: A 05498058
DATE APPROVED: 19 October 2023
VALID UNTIL: 19 October 2026

Note: Renewal of this plan must be at least three (3) months prior before expiry date to avoid unnecessary delay and penalties. This plan will need to be available for inspection at any time.

China Harbour Engineering Company
Pasay Reclamation Development Project (PRDP)
SMART CITY

Date: 14-September-2023 **By Hand / Email**
Our Ref.: CHEC-PRDP-EXT-223

To : **LTJG GERALD CORDERO**
MEPGRU-Commander
MEPFORCENCR-CL
Farola Compound, Binondo
Manila 1006

Subject: Request for Approval of Oil Spill Contingency Plan (OSCP)

Dear **LTJG CORDERO,**

I hope this letter finds you well.

I am writing to formally request the approval of the Oil Spill Contingency Plan (OSCP) officially submitted to MEPFORCENCR-CL last August 21, 2023. Our team diligently prepared the plan in accordance with the necessary guidelines and regulations to ensure an effective and efficient response in case of any unforeseen oil spill incidents. The OSCP includes corresponding required documents outlined in the regulatory guidelines including but not limited to the following: detailed information about our response strategies, emergency contacts, equipment readiness, and coordination with relevant authorities.

We kindly request your prompt approval of the submitted Oil Spill Contingency Plan. Our aim is to maintain a proactive stance in minimizing the potential impacts of oil spills and to contribute to the overall protection of our environment. Your approval of the oil spill contingency plan will significantly contribute to our collective efforts to safeguard our surroundings.

If you require any further information or clarifications regarding the submitted plan, please do not hesitate to contact our Environmental Manager Ms. Mercy Faburada at (+63) 999 716 6893 or Mercyfaburada@dredging-chec.com.

Thank you for your time and consideration. We look forward to your positive response.

Best Regards,

LIU ZHI
Contractor's Representative
China Harbour Engineering Company

Deputy P.M – WG / QAQC-NE / Tech. Adv-MK / Contracts-SH / Construction-LW / Design - AZ
Cc: D.C – GO
Encl:

China Harbour Engineering Company
Pasay Reclamation Development Project (PRDP)

SMART CITY

TRANSMITTAL FORM

TO: MEPFORCENCR-CL
Mueller dela Industria
Fausta Compound, Binondo
Manila

Attention Of: LTJG GERALD D CORDERO
MEPORU-Commander
MEPFORCENCR CL

From: CHINA HARBOUR ENGINEERING COMPANY

Please find the attached items detail below

Item No.	Title	Description	Unit	Qty
1	Oil Spill Contingency Plan	Submitting herewith 2 documents in compliance with the PCG requirement for PRDP or Pasay 360 1 Environmental Emergency Response Plan (EERP) Submitted and approved on October 22, 2021 2 Oil Spill Contingency Plan (OSCP) for your review and approval.	1 1	

Signature of Originator:
Mercy O. Paburada
Environmental Manager
CHINA HARBOUR ENGINEERING COMPANY

Date Prepared and Signed:
16 August 2023

Concurred:
Felix Liu
Constructors Representative
CHINA HARBOUR ENGINEERING COMPANY

Remarks:

For Recipient's Use Only

Name: Signature: Date Received:

MEPFORCENCR

CG 302 Received
17 1908 Aug 2023

China Harbour Engineering Company
Pasay Reclamation Development Project (PRDP)

SMART CITY

TRANSMITTAL FORM

TO: **MEPFORCENCR-CL**
Muelle dela Industria
Farola Compound, Binondo
Manila

Attention Of: **LTJG GERALD D. CORDERO**
MEPGRU-Commander
MEPFORCENCR-CL

From: **CHINA HARBOUR ENGINEERING COMPANY**

Please find the attached items detail below

Item No.	Title	Description	Unit	Qty
1	Oil Spill Contingency Plan	Submitting herewith the revised Oil Spill Contingency Plan (OSCP) in compliance with the PCG requirement for Pasay 360 Project: 1. Oil Spill Contingency Plan (OSCP) For your review and approval.	1	

Signature of Originator:

Mercy D. Faburada
Environmental Manager
CHINA HARBOUR ENGINEERING COMPANY

Date signed and submitted:
21-August-2023

Concurred:

Felix Liu
Constructors Representative
CHINA HARBOUR ENGINEERING COMPANY

Remarks:

For Recipient's Use Only

Name:	Signature:	Date Received:
CG SN2 Fetalvero		21 Aug 2023

MEPFORCENCR
CG SN2 Fetalvero
21 (0911) Aug 2023

5th Floor, Tower B, Two E-Com Center, Bayshore Avenue, Mall of Asia Complex (MOA), Pasay City, Philippines
E-Mail: [redacted] Tel Number: +632-8992153

China Harbour Engineering Company
Pasay Reclamation Development Project (PRDP)

SMART CITY

TRANSMITTAL FORM

TO: **MEPFORCENCR-CL**
Muelle dela Industria
Farola Compound, Binondo
Manila

Attention Of: LTJG GERALD D. CORDERO
MEPGRU-Commander
MEPFORCENCR-CL

From: CHINA HARBOUR ENGINEERING COMPANY

Please find the attached items detail below

Item No.	Title	Description	Unit	Qty
1	OSCP attachments #3 and #4	Submitting herewith the OSCP attachments #3 and #4. For your review and approval.	1	1

Signature of Originator: **Mercy D. Faburada** Environmental Manager CHINA HARBOUR ENGINEERING COMPANY	Date signed and submitted: 22-September-2023
Remarks:	

For Recipient's Use Only

Name:	Signature:	Date Received:
cc SM2 Taboya		22 BOSH Lopez

5th Floor, Tower B, Two E-Com Center, Bayshore Avenue, Mall of Asia Complex (MOA), Pasay City, Philippines
E-Mail: [illegible] Tel Number: +632-8392153

PASAY RECLAMATION DEVELOPMENT PROJECT
Oil Spill Contingency Plan (OSCP)



Deliverable Information	
Employer doc. no.	PRDP-CON-EN-XX-XX-RP-09
Contractor doc. no.	CHEC-PRDP-HSE-073

Contractor	Name / position	Date	Signature
Approved	Felix Liu Contractor's Representative	16-Aug-23	
Checked	Robert Davies HSE Director	16-Aug-23	
Originated	Mercy Faburada Environmental Manager	16-Aug-23	

Revision Change Log		
Revision	Date	Change
P01	16-Aug-23	First draft ready for Engineer review

Employer Information	
Company	SM Smart City Infrastructure and Development Corporation
Project name	Pasay Reclamation Development Project
Contract no.	PRDP-SMP-SMRT/02

Engineer Information	
Company	Mace TPM
Address	Unit 0806 The One Executive Building, 5 West Ave, Nayong Kaunlaran, Quezon City
Other details	Tenman Project Management, Inc

Contractor Information	
Contractor setup	China Harbour Engineering Company (CHEC)
CHEC Project no.	CHEC/PH/2019/001

TABLE OF CONTENTS

1 Introduction 5
1.1 Description of the project 5
1.2 Authorities and Regulations 6
1.3 Legislation, Standards and other documents 7
2 Purpose and Scope 7
2.1 Purpose of Oil Spill Contingency Plan 7
2.2 Scope of Oil Spill Contingency Plan 8
2.3 Global framework 8
2.4 Project Specific Spill Management 9
2.5 Link with Emergency Response Plan 10
2.6 Emergency Response Organizational Chart 11
2.6.1 **Roles and Responsibilities** 13
2.6.1.1 **Project Key Positions and Responsibilities** 13
2.7 Notifications and Contacts 15
3 OIL SPILL AND TIER CLASSIFICATION 16
3.1 Source of Oil Spill 16
3.1.1 **MATERIAL PROPERTIES** 16
A. Diesel Fuel 16
B. Hydraulic Oil 16
C. Lube Oil 17
D. Waste Oil 18
3.1.2 **Spill Volume** 18
3.1.3 Spill Coverage 19
3.2 OIL SPILL TIERED RESPONSE FRAMEWORK 21
3.2.1 Principles of Tiered Preparedness and Response 21
3.2.2 Tier Levels and Classification 22
3.2.3 Oil Spill incident Characteristics per Tier 23
4 Oil Spill Risk Assessment 25
4.1 Likelihood 25
4.2 Consequence 25
4.3 Risk Response and Risk Treatment Strategies 26
4.4 Risk Assessment Procedure 27
4.5 Training 56
4.6 Management of hazardous substances 50
4.7 Preventive maintenance 50
4.8 Bunkering 51
4.8.1 **Bunkering Operation Procedure:** 51
4.9 Onshore refueling 54
4.10 Addressing oil spills 45

Flowchart 1 shows the Envi. Emergency Procedures during Oil Spill in working at sea. 46
Graph 2. 46
Flowchart 2. shows the Envi. Emergency Procedures during Leakage. 47
Graph 2. 47
5 ASSESSMENT OF NATURAL CONDITIONS AND SENSITIVE AREAS 44
5.1 Identification of sensitive areas 44
6 OIL SPILL RESPONSE 45
6.1 Absorbents, dispersants 48
7 REPORTING 57
7.1 Abbreviations and Definitions 58
8 ATTACHMENT 59
Attachment A Environmental Incident Report Form 60
Attachment B Oil Spill Report form 62
Attachment C Review Log 63
Attachment D EERP Evaluation and review log 64
Attachment E Spill Kit Review Log (TBD) 65
Attachment F Drill Example – Fuel Spill 66

1 Introduction

Oil Spill Contingency Plan (OSCP) describes the PRDP's spill emergency response which will be implemented throughout the project site. The document is a requirement of Philippine Coast Guard in conjunction with the EERP and with the EMP, PWMP, ERP and HSE Manual.

Oil Spill Contingency Plan forms part of the Environmental Preparedness and Response scheme, a component of the Environmental Management System, which is developed to be consistent with the ISO 14001 Environmental Management System Standard, the EMP, the ECC, the EIS and the Employers Requirement. Emergency response plans are also legally required the Philippine Government and an effective tool in protecting personnel, property and the environment as a whole. OSCP is used in response to the uncontrolled, unplanned or accidental release of oil causing negative impact to the environment. Examples include overfilling of fuel tanks, fuel knocked off, leaking engines and containers, spill from collision and among others.

When an oil spill occurs, there is no time to decide who is in charge, what alternatives will best control a situation, who has training to help, and how to use the communication equipment to obtain help. An Oil Spill Contingency Plan addresses these issues and provides information and direction for addressing the situation as quickly as possible. In critical situations the first hour during an emergency (the golden hour) is often the most important, and the outcomes for the people involved and the company will be more successful when a company has an OSCP prepared in advance, with dedicated response procedures in place and appropriately trained staff and contractors.

Contractor will exercise due diligence to prevent, contain, and respond to spills of mainly petroleum products and other oil substances related to construction works. Oil Spill clean-up equipment and materials will be maintained at the work site. In the event of an oil spill, Contractor will take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. This plan is to address any leaks or spills of all types of Oils, fuels and lubricants.

1.1 Description of the project

The Pasay Reclamation Development Project in Manila Bay, the Philippines, is a new and modern commercial and residential property development of SM Smart City Infrastructure and Development Corporation (Employer). It is based on sustainable design principles and designed to international standards to ensure a safe living environment. The Project is being developed by the Employer in close cooperation with the Philippine Reclamation Authority (PRA) and the municipality of Pasay.

The location and an overall plan view of the project is shown in Figure 1. The works include the following main activities:

1. Design, engineering and preparation of the Project
2. Dredging
3. Supply and placement of sand fill
4. Soil improvement of the natural present soil:
    a. Sand key along the reclamation boundaries
    b. Prefabricated Vertical Drains (PVD) for acceleration of settlements
    c. Application of (temporary) surcharge to comply with residual settlement criteria
5. Soil improvement of the sand fill to prevent liquefaction of the fill under seismic loading conditions

6. Supply of material and installation of reclamation edge structures
7. Construction and installation of a concrete wave wall against overtopping of waves during design wave conditions
8. Demolition of existing Paseo de Palisoc Groyne & revetment

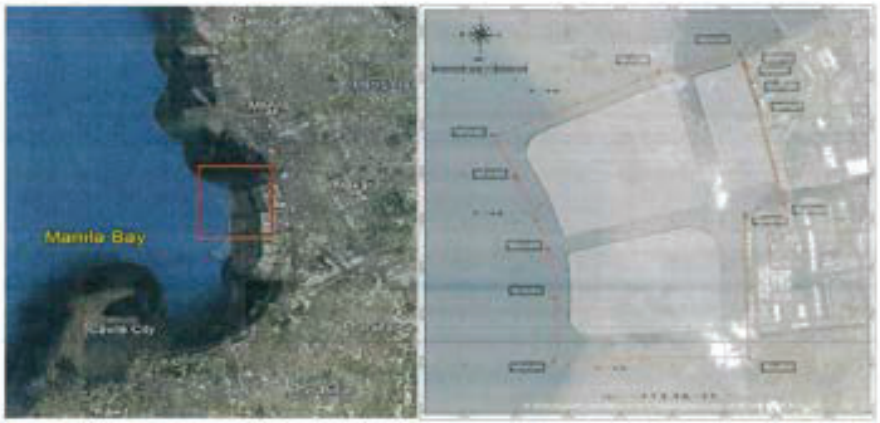


Figure 1: Location and plan view of the project (Note: This site plan is to be updated upon release of the approved Site Plan.

1.2 Authorities and Regulations

The OSCP provides PRDPs personnel with the communication and operational protocol to adhere to during a Spill emergency. The protocols comply with applicable International, National, Provincial and City/Municipal legislation including but not limited to:

- Republic Act 9993: The Philippine Coast Guard Law of 2009 and its Implementing Rules and Regulations: RULES AND REGULATIONS ON THE PREVENTION OF POLLUTION FROM OFFSHORE PETROLEUM EXPLORATION, DEVELOPMENT AND PRODUCTION OPERATIONS
- MC 19-14: Shipboard Oil Pollution Emergency Plan for Philippine Registered Vessels
- MC 08-14: Rules and Regulations for tank Cleaning and the Collection and Disposal of Diluted Oil and other Substances
- MC 04-05: Accreditation of Oil Water Separators, Oil Containment, Recovery and Dispersal Equipment and Chemical Dispersant
- MC 06-05: Issuance of International Oil Pollution Prevention Certificate to Philippine Registered Vessels
- MC 11:14- Procedures for the Dumping of Wastes and other Harmful matter within the Philippine Maritime Jurisdiction
- MC 02-06: Marine Pollution Inspection/Apprehension Report
- Environment (Protection) Act, 1986 (No. 29 of 19: 86): An Act to provide for the protection and improvement of environment and for matters connected therewith.
- Republic Act 10121: Philippine Disaster Risk Reduction and Management Act of 2010;
- Republic Act 110391: An Act Institutionalizing the Electric Cooperative Emergency and resiliency Fund and Appropriating funds thereof;
- Republic Act 6969, otherwise known as "Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990

- DENR Administrative Order No. 29 Series 1992: Implementing Rules and Regulations of Republic Act 6969
- Republic Act No. 10654: An Act to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing, Amending Republic Act. 8550, Otherwise Known as "The Philippine Fisheries Code of 1998," and for Other Purposes.
- Republic Act No. 9514: Fire Code of the Philippines of 2008
- Department of Health
- Department of Transportation and Communication: Transportation of dangerous goods
- Environmental Protection Act (EPA);
- ISO 14001 Environmental Management System Standard
- DENR- DAO 2016-08 WQG and GES
- DENR-DAO 2021-19 Updated WQG and GES

1.3 Legislation, Standards and other documents

No.	Legislation
C1	Presidential Decree 1586 Philippine Environmental Impact Statement System
C2	Republic Act 6969 Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990
C3	Republic Act 8749 Philippine Clean Air Act
C4	Republic Act 9003 Ecological Solid Waste Management Act
C5	Republic Act 9275 Philippine Clean Water Act
C6	Administrative Order No. 16, s. 2019 Expediting the Rehabilitation and restoration of the coastal and marine ecosystem of Manila Bay and creating the Manila Bay Task Force.
C7	DEPARTMENT ORDER NO. 198, SERIES OF 2018 (Implementing Rule and Regulations of RA #11058)
C8	DEPARTMENT ORDER NO. 13, SERIES OF 1998 (Guidelines Governing Occupational Safety and Health in the Construction Industry)
C9	OCCUPATIONAL SAFETY AND HEALTH STANDARDS 2020 Edition (Department of Labor and Employment)
C10	LABOR CODE OF THE PHILLIPPINES 2017

International, National Standards, Guidelines and Codes of Practice

BS 6349-5:2016 [Maritime structures - Part 5: Code of practice for dredging and land reclamation];
PIANC Report No.100:2009 [Dredging Management Practices for the Environment].

2 Purpose and Scope

2.1 Purpose of Oil Spill Contingency Plan

The purpose of the Oil Spill Contingency Plan is to eliminate, reduce and/or mitigate the environmental impact of an uncontrolled, unplanned, or accidental release of oil into the environment, as a means of meeting regulatory requirements.

This Oil Spill Contingency Plan addresses requirements for prevention, preparedness, response, recovery and reporting for spills and releases of petroleum products and/or oil wastes.

The Plan provides measures covering the following areas of an environmental emergency:

1. **Prevention** – actions taken to reduce or eliminate the probability of an emergency occurring.

2. **Preparedness** – measures taken prior to an emergency to ensure an effective response.
3. **Response** – actions taken to respond to an actual emergency. These actions are aimed at providing a controlled, effective and timely response.
4. **Recovery** – actions taken to recover from an emergency that could be short-term or long-term activities. The aim is to return all systems to normal operations.
5. **Reporting** – provides protocol for notifying the appropriate agencies.

Potential impacts of not planning and preparing for Spill Emergencies are threats to the health and safety of workers and the public, air contamination, soil/silt, surface water or groundwater contamination, destruction of wildlife habitat, damage to property, equipment and resources and result in legal infractions and penalties.

2.2 Scope of Oil Spill Contingency Plan

Protocols related to the prevention, preparedness and response of oil and other petroleum products from equipment controlled and/or managed by the Contractor is included in this OSCP, as applicable. The transportation of dangerous goods outside of the site's property boundaries are managed in accordance with the DOTc and the DENR, including reporting and response to environmental emergencies. All personnel transporting dangerous goods outside the boundaries of the facility by water shall follow Philippine Coastguard mandate and regulations.

Where spillage emergency results in the evacuation of personnel, refer to the Project's HSE Manual and Emergency Response Plan, located at the strategic places of the vessels, offices/ accommodation) that may deal with other situations such as fire, gas leaks, bomb threats, earthquakes, or others.

2.3 Global framework

The Oil Spill Contingency plan (OSCP) provides a general response framework (e.g., contain, clean-up, report) and a number of guidelines in combination with specific prevention and response strategies in order to ensure appropriate, yet flexible, approach to spill management.

The basic principle in planning the spill prevention and response measures has three components:

- Awareness and spill prevention
- Minimization of the volume of hazardous liquid that could potentially spill
- Contingency planning in the event of a spill.

The OSCP discusses both marine and land spill contingency planning and elaborates on the following subjects (including but not limited to):

- Priorities for protection
- The impacted environment and associated sensitivities and risks
- Responsibilities of Project personnel regarding oil spill prevention and response
- Statutory and regulatory requirements as imposed by international (e.g., vessel flag state) and local authorities
- Oil spill response actions and available equipment
- Good work practices (e.g., hazardous goods management and storage) and personnel training
- Specific requirements regarding the use of dispersants, and
- Post-spill actions, including reporting requirements and waste handling.

In addition to the general project OSCP, all dredging and reclamation vessels in the CHEC fleet more than 400 gross tonnage (GT) have a Shipboard Oil Pollution Emergency Plan (SOPEP),

complying with regulation 26 of Annex I of MARPOL 73/78 and This plan provides vessel specific guidance for the Master and Officers on board with respect to procedures and techniques to follow when an unexpected spill event occurs.

Smaller Project vessels, such as survey vessels, barges, and pontoons, may not require a SOPEP as specified under MARPOL 73/78, but will have an appropriate spill response material on board to deal with smaller spills because of their own activity, as well as to assist in response to spills caused by other vessels.

Sufficient and appropriate equipment, materials and resources will be available to:

- Prevent spills to marine and land environment from working machinery (e.g., drip trays, Spill kits or other spill prevention features),
- Respond to spills to marine environment (e.g., absorbing materials, oil spill booms, absorbents, dispersant), and
- Respond to spills on hard surface (e.g., absorbing materials, dispersant, absorbents).

All Project personnel will be trained in general spill response and reporting, key personnel such as vessel crews and site supervisors will (have) receive(d) more in-depth training.

2.4 Project Specific Spill Management

The variation that exists within the receiving environment in terms of sensitive areas, weather conditions etc. rules out the possibility of one single approach to spill response. The response to a spill event must be determined once it has effectively occurred and a thorough understanding of priorities for protection is more valuable than an inflexible response plan. Consequently, a dedicated project specific Oil Spill Contingency Plan is set up. This OSCP describes how CHEC will manage oil spill prevention and response during the Works.

The purpose of this OSCP is to:

- Identify the receiving natural environment and associated sensitivities; indeed, it is important to fully understand not only prevailing hydrodynamic regime or meteorological characteristics, but also ecological sensitivities and priorities for protection of the receiving ecosystem,
- Provide a management framework and several guidelines to ensure an appropriate and flexible approach to any spill event,
- Describe organization, communication, response equipment and actions to be taken in the event of an oil spill, clearly identifying specific responsibilities of key personnel,
- Provide dedicated risk assessment and prevention and mitigation actions for the most relevant activities ("having the potential to result in large scale oil spills") within the scope of work (e.g., bunkering, vessel collision and grounding, sludge and bilge disposal, hydraulic hoses bursts and leak)
- Demonstrate compliance with all relevant legal and statutory requirements, policies and procedures related to spill contingency planning, and
- Discuss safe work practices and procedures.

All offshore works shall be performed in accordance with the rules and requirements of the International Regulations for Preventing Collisions at Sea (IRPCS-72) as well as the Project/ Vessel Traffic Management Plan. Oil Spill management is in full accordance with the requirements of Chapter 5 of Appendix I (as revised) to the International Convention for the Prevention of Pollution from Ships (1973), amended by the Protocol of 1978 to this Convention (MARPOL 73/78).

Philippine Coast Guard is responsible for monitoring and responding to oil spills and receives reports of oil spillages and coordinates oil spill response activities throughout the Philippines. In

the event of a spill, PCG will call all concerned parties for assistance and heads the spill management and cleanup.
In accordance with global international standards, the Oil Spill Response management system shall be organized following basic requirements:

- Promptness-stability-steadiness.
- Closest possible proximity of OSR management headquarters.
- Advanced communications and warning means.
- Integration of all communications and warning systems.
- Intensive cooperation between all competent bodies.
- (Management) efficiency.
- promptness and feasibility of decisions made regarding prevention and management of oil spills.
- sufficient and timely provision of forces and sources engaged for OSR purposes.
- Reliability of communicated information.
-

The following, general spill management components are considered in this plan:

- Good work practices.
- Tiered response framework.
- Assessment of natural conditions.
- Material properties.
- Operational response equipment.
- Oil spill response actions
- Post-spill management.
- Project location.

2.5 Link with Emergency Response Plan

This OSCP is linked with the EERP and ERP produced by CHEC for this project. The following are:
1. PRDP-CON-EN-XX-XX-PL-0006 (Environmental Emergency Response Plan)
2. PRDP-CON-HY-XX-XX-PL-0003 (Emergency Response Plan)

2.5 Emergency Response Organizational Chart

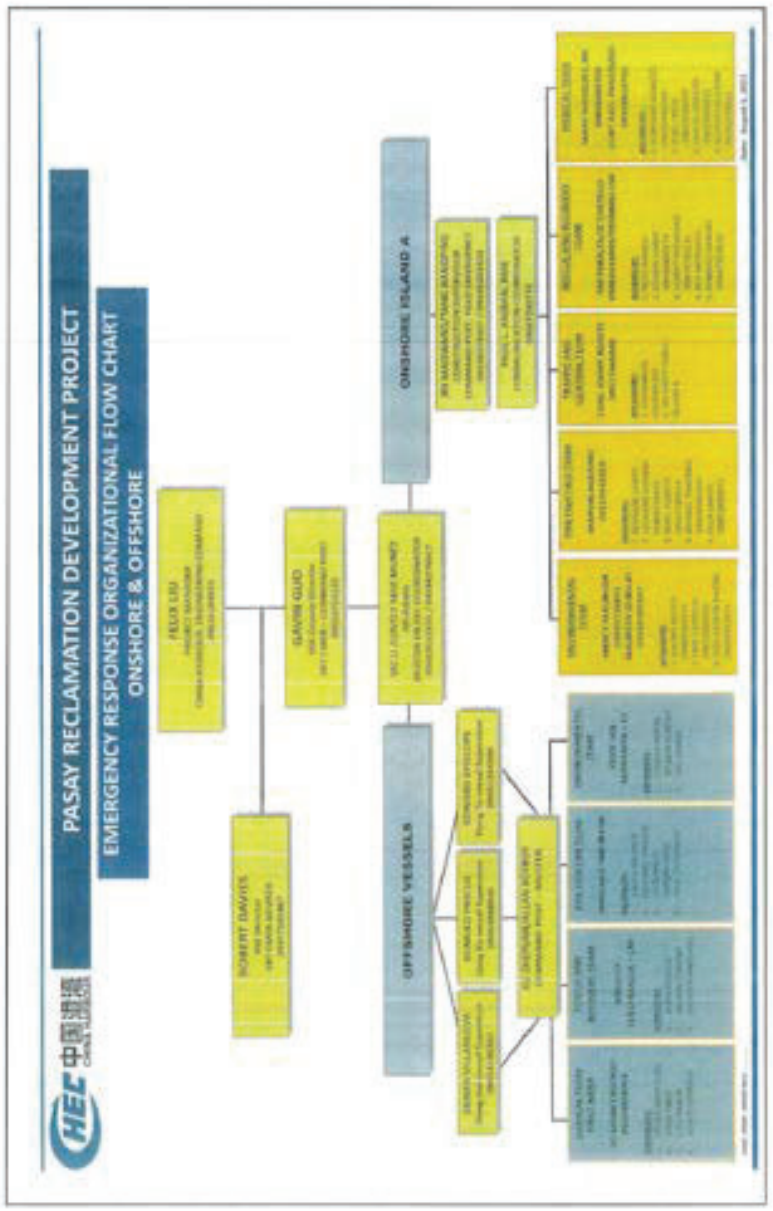


Figure 2: CHEC ERT Flowchart in response of any emergency such as Oil Spill.



China Harbour Engineering Company
Pasay Reclamation Development Project (PRDP)

SMART CITY

Date:	02 August 2023
From:	China Harbour Engineering Company
To:	SM SMART CITY
Subject:	APPOINTMENT OF EMERGENCY RESPONSE TEAM (ONSHORE & OFFSHORE)

EMERGENCY RESPONSE TEAM APPOINTMENT

This is to formally appoint and extend our peincere appreciation to the following individuals who have been selected to serve as crucial members of our **Emergency Response Team (ERT)** both for Onshore and Offshore operations. Our commitment to ensure safety and well-being of our personnel and assets during critical situations is highly commendable, and we are confident that our expertise will significantly contribute to the success of our emergency response efforts.

As members of the Emergency Response Team, our responsibilities will include swift and effective action during emergencies, assuring the safety of all personnel, coordinating emergency response efforts, and implementing necessary safety protocols. Our dedication to maintain a high level of preparedness will be critical in mitigating risks and protecting both human life and company assets.

This appointment with the Emergency Response Team will be effective from 01 August 2023, and we kindly request your usual and never-ending support.

Thank you.

Robert Davies

CHEC - HSE Director

Figure 3: Appointment Memo for all ERT.

2.6.1 **Roles and Responsibilities**

2.6.1.1 **Project Key Positions and Responsibilities**

Within the boundaries of legislation, senior management of Contractor has delegated certain responsibilities and associated authorities regarding Oil Spill emergencies. key positions involved in OSCP are as follows:

A. Project Director/Manager

- Project Director/ Manager (PD/PM) has the overall responsibility to implement the OSCP throughout the Project duration;
- May act as the ERT head upon being notified of an emergency or incident on a vessel or construction site causing spill issues;
- Shall evaluate the emergency/incident and will decide on escalating the response to the ERT;
- Ensure all action items from OSCP reports are taken and implemented as per recommended;
- Authorising appropriate and adequate financial resources, materials and services to overcome the emergency;
- Keeping Employer informed of the emergency and developments; and
- Ensuring that the times and nature of all critical events occurring during the emergency are recorded in the emergency record logbook.

B. Master – Offshore Superintendent

- During an offshore oil spill emergency the involved Master acts as offshore ERT;
- Has the overall responsibility and will coordinate all activities and logistics;
- Shall identify and prepare the emergency messages and notifications to be dispatched; and
- Determine the need for outside assistance.

C. HSE Director

PRDP CHEC HSE Director is responsible for ensuring that provisions are in place for an emergency response. In the event of an emergency the HSE Director shall take the following actions:

- Support the Project Director for the coordination of the oil spill emergency;
- Advice the Project Director if escalation may be required and the following mobilization of the Emergency Response Team
- Contact other Emergency resources if required and needed and not done before;
- Supervise the area with other emergency resources and identify all emergency scenarios to which personnel, environment and facilities are exposed;
- Cooperate with Engineer and Owner for updating the oil spill emergency incident reporting.
- Coordinates the available resources for oil spill emergency response;
- Set an Emergency Drills Program for Oil Spill;
- Raise awareness among workers on the implementation of this OSCP, through periodic drills, training and information.
- Establish a suitable alternative location and easy access, where to focus the information necessary to control the emergency, (if you do not have electricity services, computers) Hard copy of the OSCP, First Aid, etc

D. HSE Deputy Director

- Act as advisor on the OSCP and to the ERT;
- Develops, reviews and updates the OSCP both for the offshore as well as the construction site, as and when required (i.e. as per recommendation by audit, drill report, local regulations etc.);

- Determines resources to ensure proper implementation of the ERT;
- Advises site team in any medical related emergency;
- Liaises with all assistance in case of oil spill emergencies; and
- Ensures all safety support equipment are available in operational worksites (onshore & offshore).

E. Construction Manager

- Act as the ERT for onshore construction oil spill and site emergencies;
- Ensure the implementation of the site specific OSCP (including drills, training etc.);
- Ensure all Site Emergency Response Team (SERT) members are trained and understand the OSCP;
- Ensure that the emergency duties of any injured or unavailable personnel have been delegated;
- Notify the Project Management Team;
- Evaluate the emergency situation and make a decision on whether to contact outside supporting agency (i.e. PCG, Police, Fire Department, Hospital Services, etc.);
- Ensure that any casualties are treated by First Aiders and prepare for medical evacuation (MEDEVAC) if appropriate;
- Undertake a head count and, if required, coordinate search for any missing personnel;
- Coordinate the logistics during the Emergency; and
- Notify all persons and units who have been previously informed of the emergency, once the emergency is over.

F. Construction Site-Fire Fighting Team

- Fights small fire with the firefighting equipment available;
- Assists the Fire Brigade on putting out uncontrolled fire at worksite during emergency, especially during oil spillage and related emergencies;
- Inspects and maintain the firefighting equipment; and
- Waits for further instructions from ERT.

G. Emergency Response Coordinator

The appointed ERT shall be made known to all construction site personnel and people on board the vessel prior to commencement of work. The ERT and his deputy shall have full knowledge of this and any site-specific ERP, especially the OSCP. The ERT responsibilities are:

- Ensuring that emergency alarm is sounded;
- Ensuring that activities have been shut down to a safe condition (e.g. all sources of stored energy are isolated);
- Assessing the situation;
- Ensuring that the security will be considered (e.g. contact Ship Security Officer / Site Security Officer);
- Ensuring that the emergency duties of any injured or unavailable personnel have been delegated;
- Verifying status of personnel onboard (POB) and / or on construction site;
- If necessary, coordinating a search for any missing personnel;
- Ensuring that any casualties are treated by First Aiders and prepare for MEDEVAC if needed;
- If necessary, initiating the evacuation of non-essential personnel; and
- If necessary, initiating the total evacuation of the vessel/construction work site.

H. Subcontractor Manager

- Has the responsibility to ensure that all his personnel implement this procedure;
- Shall ensure that all his personnel participate to the emergency drills organized at Site;

- Shall cooperate with CHEC, providing the needed support and resources, for theorganization of Emergency response.
- Shall assure that all his workers receive adequate information and training about emergency response for oil spillage and other related emergencies.

2.7 Notifications and Contacts

For all Environmental Emergencies, the following contacts would be notified:

Table 1: Internal Responsible Personnel Contact List

Title	Name	Contact Number
Contractor (CHEC)		
HSE Director	Robert Davies	+63949 3970715
Environmental Manager	Marcy Faburada	+63999 9716893
Environmental Engineer/PCO	Maureen P. Quidlat	+63977 3596881
HSE Manager	Gavin Guo	+63905 5715133
Site/Construction Manager	Michael Kay	+63917 1039149

If the environmental emergency causes an immediate threat to the health and safety of personnel or the public, or presents a risk of fire, **DIAL 911** for assistance.

After the initial threat has been addressed, a list of individuals responsible for the OSCP at the site will be notified, along with the MOE Spills Action Centre:

Site manager would ensure that all personnel who are listed in the Contacts are informed and made aware of their responsibility in case of an oil spillage issues. This can be checked as part of the annual review.

Table 2: External Contact List

Name	Who Would Contact	When to Call	Contact Number
Bureau of Fire Protection-Pasay City			
• Central Fire Station	Duty Officer	Emergency Assistance only	+632844-2120 +632843-6523
• Pasay Volunteer Fire Brigade	Duty Officer	Emergency Assistance only	+632-8831-3801
• Malibay Fire Sub-Station	Duty Officer	Emergency Assistance only	+632 851-0869
• Villamor Airbase Fire-Substation	Duty Officer	Emergency Assistance only	+632853-5031 +632 854-6722
• Senate Fire Sub-Station	Duty Officer	Emergency Assistance only	+632552-6601 local 1999
DENR-EMB (NCR)	Duty Officer	When spill occurs/or discovered	+63289206214
Manila Bay Coast Guard	Site Head/OIC	Reporting of spills in watercourses; clean-up assistance	+632527-8482 to 89 / +632527-3880 to 85
Manila Bay Maritime Office-Main	Manager/OIC	Reporting of spills on sealine area; clean-up assistance	+63916 315 4812
Barangay 78, Pasay City	Brgy Captain/OIC	Public alert and notification of Environmental emergency	+6328340812

Alternatively, spills should be notified to the nearest port authority.

3 OIL SPILL AND TIER CLASSIFICATION

3.1 Source of Oil Spill

3.1.1 MATERIAL PROPERTIES

All oil-based products are heavier than air and will flow, either as a liquid or gas, to low points downhill and away from the initial spill source. The priority must always be for the protection and preservation of life. One of the main considerations to keep in mind when assessing a spill is the type of material that has been spilled.

This section contains information on the physical properties of specific petroleum products that are commonly used in construction works and which may be the spilled substance to combat. This information is provided for general guidance only and the responders must at any times refer to MSDS of the leaked material for full accuracy. This information will help to deal effectively with a spill of any of these in construction activity.

A. Diesel Fuel

Typical Physical and Chemical Properties:

- Appearance Clear, yellow, or red
- Flashpoint 40°C (minimum)
- Odour Petroleum
- Pour point -50°C to -6°C
- Solubility Insoluble
- Viscosity Not viscous
- Vapour Will sink to ground levels
- Specific gravity Floats on water (0.8 to 0.9)
-

Safety Measures/Warnings:

- Vapours are heavier than air and form easily at high temperatures
- Empty containers can contain explosive vapours
- Toxic gases form upon combustion
- Eye contact causes irritation
- Material can accumulate static charges
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting, and unconsciousness

Personal Protection:

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles
- Nitrile, PVC, and Viton are suitable materials
- Do not use natural rubber or Neoprene
- Wear a full-face organic vapour cartridge respirator where oxygen is adequate; otherwise wear a positive-pressure SCBA

Precautions:

- Monitor for explosive atmosphere
- Avoid contact with strong oxidizers (e.g., nitric acid, sulphuric acid, chlorine, ozone, peroxides)
- Eliminate ignition sources
- Restrict access and work upwind of spill

(Note: refer to MSDS for specific material in question)

B. Hydraulic Oil

Typical Physical and Chemical Properties:

- Appearance Straw-yellow liquid

- Flashpoint 215°C
- Odour Petroleum
- Pour point -25°C
- Solubility Generally insoluble
- Viscosity Medium (265 cSt, 15°C)
- Vapour Few vapours emitted
- Specific gravity Floats on water (0.9)

Safety Measures/Warnings:

- Vapours are heavier than air but are unlikely to form
- Toxic gas can form in fire and at high temperatures
- CO, CO2 and dense smoke are produced upon combustion
- Oil mist or vapour from hot oil can cause irritation of the eyes, nose, throat, and lungs

Personal Protection:

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles
- Nitrile, PVC, and Viton are suitable materials
- Do not use natural rubber or Neoprene

Precautions:

- Avoid excessive heat, which can cause formation of vapours
- Avoid contact with strong oxidizers (e.g., nitric acid, sulphuric acid, chlorine, ozone, peroxides)
- Eliminate ignition sources
- Restrict access and work upwind of spill

(Note: Please refer to the MSDS for the specific material in question.)

C. Lube Oil

Typical Physical and Chemical Properties:

- Appearance Amber liquid
- Flashpoint 190°C to 220°C
- Odour Petroleum
- Pour point -35°C to -40°C
- Solubility Generally insoluble
- Viscosity Medium (255 cSt, 15°C)
- Vapour Few vapours emitted
- Specific gravity Floats on water (0.9)

Safety Measures/Warnings:

- Vapours are heavier than air but are unlikely to form
- Toxic gas can form in fire and at high temperatures
- CO, CO2 and dense smoke are produced upon combustion
- Oil mist or vapour from hot oil can cause irritation of the eyes, nose, throat, and lungs

Personal Protection:

- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles
- Nitrile, PVC, and Viton are suitable materials
- Do not use natural rubber or Neoprene

Precautions:

- Avoid excessive heat, which can cause formation of vapours
- Avoid contact with strong oxidizers (e.g., nitric acid, sulphuric acid, chlorine, ozone, peroxides)

- Eliminate ignition sources
- Restrict access and work upwind of spill

(Note: Please refer to the MSDS for the specific material in question.)

D. Waste Oil

Typical Physical and Chemical Properties:

- Appearance Black to brown liquid
- Flashpoint 100°C to 200°C
- Odour Petroleum
- Pour point -30°C to 40°C
- Solubility Generally insoluble
- Viscosity Medium (200 to 300 cSt)
- Vapour Few vapours emitted
- Specific gravity Floats on water (0.9)

Safety Measures/Warnings:

- Vapours are heavier than air but are unlikely to form
- Toxic gas can form in fire and at high temperatures
- CO, CO2 and dense smoke are produced upon combustion

Personal Protection:

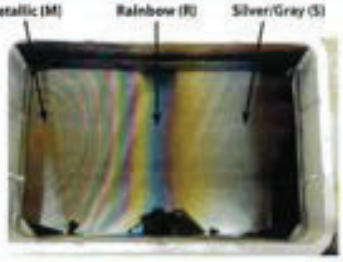
- Always wear impervious, chemical-resistant clothing, gloves, footwear, and goggles
- Nitrile, P

3.1.2 Spill Volume

When the amount of oil spilled into the sea is unknown, it becomes more difficult to assess the extent of the spill. This spill amount however is necessary to determine the level of response. In such a case, the following rule of thumb can be used to estimate the spill amount.

First qualify the oil thickness, using the following guide:

Table 3. The Bonn Agreement oil appearance code

Code	*Description/ Appearance*	*Typical Appearance*	*Layer Thickness Interval ($\mu m/m^3/km^{-2}$)*	*Litres per km^2*
1	Silver sheen (grey/silver)		0.04 – 0.30	40 – 300
2	Rainbow sheen		0.30 – 5.0	300 – 5000
3	Metallic sheen		5.0 – 50	5000 – 50000
4	Discontinuous true/dark colour slick		50 – 200	50000 – 200000

5	Continuous true/dark colour slick		200 – >200	> 200000

Through the usage of the oily appearances, an approximate quantity can be determined according to the formula below:

$$\frac{\text{L (meters)} \times \text{W (meters)} \times \text{Thickness (mm)}}{1000} = \text{Cubic Meters}$$

3.1.3 Spill Coverage

It is also important to estimate percentage cover where oils have dispersed, this can be done with help of the charts below:

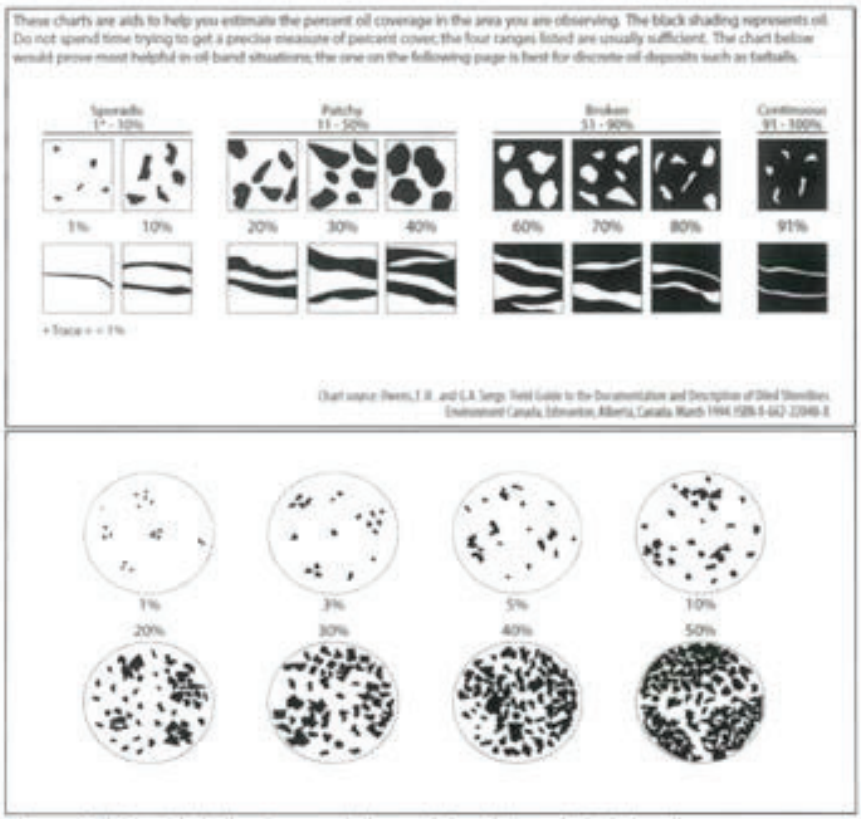


Figure 4. Field guide to the documentation and description of oiled shorelines.
Source. Environment Canada. 1994

Lastly, to estimate in which direction and how fast the oil slick will move, following information can be useful:

An oil slick will move at approximately 3% of the wind speed and 100% current speed. By using the following formula, an estimation regarding the movement can be made.

Movement = (wind speed * 0.03) + current



Figure 5. Oil spill movement prediction

a. Spill kits

The combatting the oil pollution is performed with specialized equipment.
All vessels should have the necessary equipment on board to be able to:

- prevent oil leaking overboard
- combat oil spills on board
- assist other vessels in case of an oil spill
- effectively communicate onboard and with other vessels/authorities.

Note: CHEC adheres to the governmental regulations requirement of Spill Kits, depending on the GT of each vessel. Onshore, designated spill kits are places in strategic areas of the project.

Oil spill combatting readiness is the subject of regular drills by the crew. SOPEP equipment is also a subject of inspections by Project supervisory personnel and management.

For land-based spills, the scale of the hazardous materials flow and operations in close vicinity to the waterways will be considered when decided on the content and the amount of spill response equipment. At a minimum, spill kits will be available for use at any construction operation in which fuels or other potentially hazardous materials are being used. Besides, special attention will be given to the hydraulic equipment under pressure used for reclamation works which will be additionally supplied with spill kits.

- VC, and Viton are suitable materials
- Do not use natural rubber or neoprene
- Use of organic vapour cartridge respirator is highly unlikely

Precautions: Avoid excessive heat, which can cause formation of vapours

- Avoid contact with strong oxidizers (e.g., nitric acid, sulphuric acid, chlorine, ozone, peroxides)
- Eliminate ignition sources
- Restrict access and work upwind of spill

3.2 OIL SPILL TIERED RESPONSE FRAMEWORK

3.2.1 Principles of Tiered Preparedness and Response

The principle of Tiered Preparedness and Response is an internationally recognized system employed for categorizing and structuring levels of oil spill preparedness and response, whereby appropriate resources can be mobilized rapidly and escalated to provide a most effective response to any oil spill. A tiered Preparedness and Response allows potential oil spill incidents to be categorized in terms of their potential severity and the capabilities that need to be in place to respond.

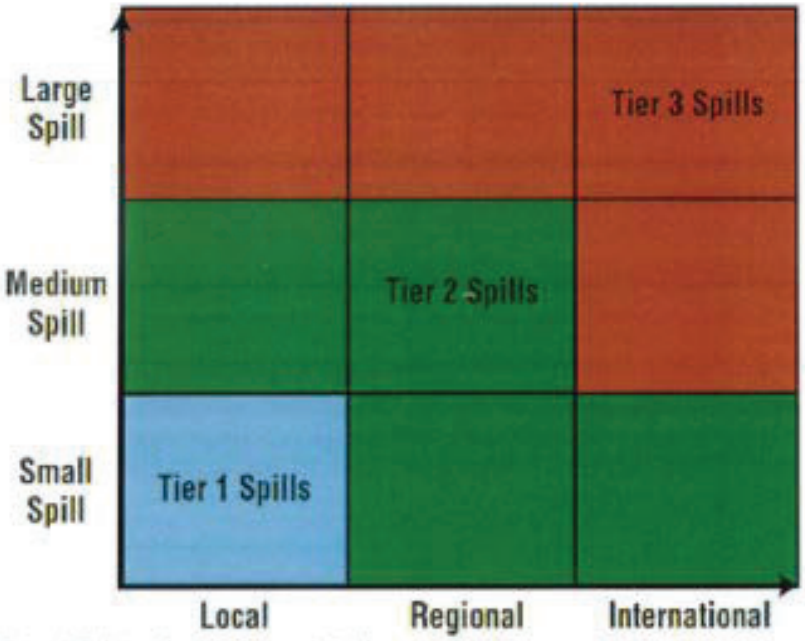


Figure 6. Relation of spill size to proximity of response resources

The Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC, 1990) - as developed and applied by IMO - encourages individual states or regions to develop and maintain a response system and to facilitate international cooperation and mutual assistance for major pollution incidents. Tiered preparedness and Response are fully consistent with the OPRC Convention.

For response planning, marine spill incidents are typically divided into 3 categories based on the severity of the risk associated with the spill and the availability of operations response resources. This allows for appropriate identification of the required response strategy and equipment.

For offshore equipment, Vessel Master is the primary person in charge of assessing the spill and assigning the appropriate Tier level.

3.2.2 Tier Levels and Classification

The Figure below provides an illustrative example overview of the tier levels and a classification framework - attributing the following spill characteristics to tiered local, regional, or federal response actions:



Tier 1

Tier 1 capabilities describe the operator's locally held resources used to mitigate spills that are typically operational in nature occurring on or near an operator's own facility. The resources also provide an initial response to spills that may potentially escalate beyond the scope of Tier 1 initial actions and capabilities.



Tier 2

Tier 2 capabilities refer to additional, often shared, national or regional resources necessary to supplement a Tier 1 response or support an escalating response. Tier 2 capability includes a wider selection of equipment and expertise suited to a range of strategic response options.



Tier 3

Tier 3 capabilities are globally available resources that further supplement Tiers 1 and 2. They comprise the international resources necessary for spills that require a substantial external response due to incident scale, complexity and/or impact potential.

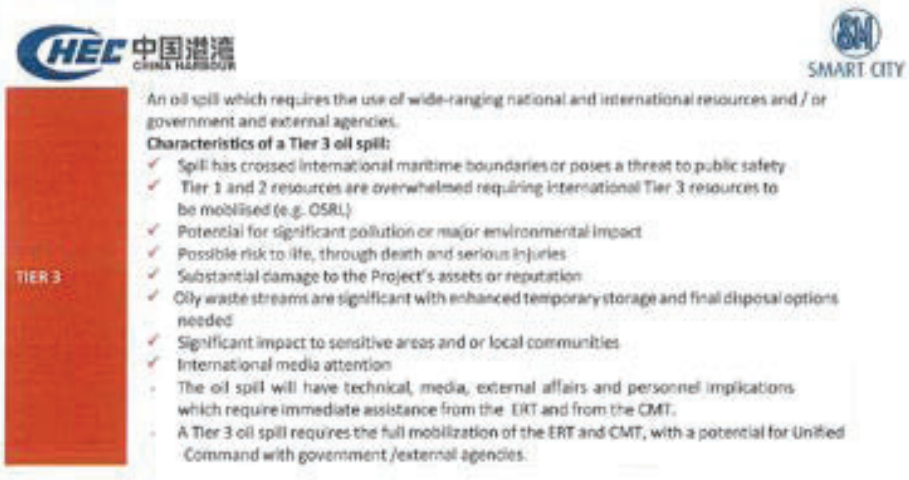
Figure 7. Tiered preparedness and response system
Source: IPIECA, Contingency planning for oil spills on water, 2015

3.2.3 Oil Spill incident Characteristics per Tier

Specifically, Table 4 below characterizes each tiers of oil spill incidents.

Table 4. Oil spill incident characteristics

Level / Tier	Incident
MINOR	**Managed By: CHEC and Subcon Response Team and Equipment** Minor oil spills are very small and affect a very localised area. The spill can be managed by the immediate facility / location personnel and spill kit, as per the owner facility / location Site Specific Response Plans. **Characteristics of a Minor oil spill are:** ✓ Spills are effectively contained within the immediate site ✓ Insignificant environmental impact ✓ There is no risk to life, CHEC or the Project's assets or reputation ✓ Spill can be easily managed using the owner facility response resources available on site with no external involvement ✓ Oily waste streams are negligible and disposed of easily ✓ The spill source is eliminated ✓ No media interest
TIER 1	**Managed By: CHEC and Subcon Response Team and Equipment** Tier 1 oil spills are likely to be small and affect a localised area. The spill can be managed by the ERT and the Tier 1 oil spill contractor. **Characteristics of a Tier 1 oil spill are:** ✓ Spill occurs within immediate site proximity ✓ Potential for minor environmental impact ✓ Minimal risk to life, CHEC and the Project's assets or reputation ✓ Spill can be easily managed using the response resources available in the Initial Spill Response Trailers and oil spill store ✓ The spill does not have any effect outside the facility / location with limited external involvement ✓ Oily waste streams require temporary storage before final disposal ✓ The spill source has been secured ✓ Little media interest
TIER 2	**Managed by: Emergency Response Team (ERT)** An oil spill which may be dealt with locally but requires support from the Engineer and Employer. PCG and other External national and regional resources and agencies may be required to control the spill. **Characteristics of a Tier 2 oil spill are:** ✓ Spill may be on-site, have some effect outside the site or be off-site ✓ Tier 1 resources are overwhelmed, additional regional resources are required ✓ Potential for medium environmental impact ✓ There is possible risk to life, CHEC and the Project assets or reputation ✓ Oily waste steams are substantial with enhanced temporary storage before final disposal needed ✓ Potential impact to sensitive areas and / or local communities ✓ Spill source cannot be immediately secured ✓ Local / national media attention - A Tier 2 oil spill requires mobilisation of the ERT to a level appropriate to the scale of the incident (at a minimum the core ERT staff will attend) and its potential to escalate - The oil spill should be managed as described in the OSCP - A Tier 2 oil spill may require only notification or minimal input from the Crisis Management Team (CMT), composed of all Project Heads and implementors
	Managed by: Crisis Management Team/Emergency Response Team



Consequently, The Contractor will have adequate resources available to manage Tier 1 events efficiently and appropriately.

A Tier 2 event will require external assistance of local forces and/or authorities equipped to deal with spill events. The Contractor will seek to arrange assistance of response forces from PCG, PNP and other governmental authorities. Such will be discussed prior to the start of works.

Tier 3 events are serious pollution events posing a substantial risk to both the environment and human safety and require national or even international assistance. Events of this scale rarely occur during dredging works as the amount of fuel and oil carried by a dredging vessel is too small to cause Tier 3 event. Tier 3 spills are generally aimed at vessels carrying hydrocarbon or chemical products in bulk.

The hired Bunkering fuel supplier will have their own Oil spill emergency response plans and necessary forces that will be deployed in case of an emergency. As required by law each company dealing with oil operations and activities must possess a contingency plan for the prevention, control and removal of spilled oil from its own facilities.

The fulfilment of tasks for oil spill response in this project is entrusted to CHEC, our third-party waste service provider and managed by PCG. PCG maintains the rescue coordination centre, the national contact point for spill response throughout the affected areas of the project and in the entire country.

4 Oil Spill Risk Assessment

This risk assessment is a fundamental element of the contingency planning process used to design and build a tiered response capability. Potential oil spill scenarios are identified and the resultant risk estimated. The tiered response capability is then outlined commensurate to the risk identified. This information culminates in the Risk Register and Risk Assessment Matrix (RAM).

CHEC Risk Assessment follows a prescribed common standard across the company. The risk assessment structure and procedure are intended for the assessment of all types of risks Health Safety and Environment (HSE), Operational, Quality and Audit (risk-based audit) areas.

The CHEC risk categories are Four major groupings of different types of risks:
1. Strategic Risks: Risks pertaining to Company's Objectives and Strategic Initiatives
2. Operational Risks: Risks related to company operations, in four areas; health and safety of the workforce and the public (OHSAS 18001), environment, assets and public image (as part of EMS ISO 14001)
3. Compliance Risks: Risks due to non-compliance with governance and best practices and regulatory and legal obligations.
4. Financial Risks

The CHEC Risk assessment defines risk as 'the possibility that an event will occur and adversely affect the achievement of objectives such as environmental protection. Risk is calculated as the likelihood of an event x consequence of the event. Internal policies, procedures, practices, standards, and actions (or lack of them) may be considered as risks.

4.1 Likelihood

Likelihood is a probability or chance that a risk event will occur considering the effectiveness of controls in place. Generally, the likelihood is the potential 'frequency' of an event happening and is categorised as the following:

Table 5. Likelihood of Oil spill incident

Frequent	Multiple occurrences have happened frequently in the industry or probability of occurrence >80%
Likely	Occurs more than once or twice per year, is continuous or certain to occur or probability of occurrence 50% to 80%
Occasional	Likely to occur once every two ears or more or probability of occurrence 10% to 50%
Possible	Likely to occur once or more in life of facility/organization; probability 1%-10%
Remote	Unlikely to occur but known in industry; probability .1%-1%

4.2 Consequence

Consequences are considered a financial or non-financial impact related to a risk event and are categorised as the following:

Table 6. Consequence of Oil spill incident

Incidental	No or unnoticeable consequences
Minor	Noticeable but of very little impact
Moderate	Some impact but not major
Serious	Significant and serious impact
Catastrophic	Huge and disastrous impact on business

4.3 Risk Response and Risk Treatment Strategies

The risk response is the type of actions that would be required to mitigate the risk in light of the assessment of consequences, controls and likelihood of a risk event. The risk matrix (see Table below) determines the severity of the risk events through the ranking of the consequence and likelihood ratings.

Table 7. Risk Matrix



The recommended risk responses are several risk treatment strategies that can be adapted to the nature and scope of the incident as required. Risk treatment is a set of agreed actions reflecting the severity and the scope of risk response. A risk event being assessed in the risk matrix could be treated in the short term by preventing the risk materialising and in the long term, to transfer the risk (such as taking insurance for example). The Project's risk assessment identifies the following potential risk treatment strategies:

Terminate	Identifying actions to eliminate the risk such as withdrawing from the activity. Implemented when a risk goes beyond the risk threshold
Transfer	Transferring the risk to a third party, e.g. insurance
Prevent	Identifying measures to prevent a risk having an impact on the company
Reduce	Taking action to reduce either the probability of the risk escalating further, or its impact. The responses to be implemented must bring the risks below the projected residual risk thresholds
Provide Contingency	Having a plan of action to be implemented when a risk crystallizes further and goes beyond the risk threshold
Accept	When the probability and impact are low, or when it would be too expensive to mitigate a risk, no further action will be required

4.4 Risk Assessment Procedure

The PRDP's risk assessment steps are illustrated in the below Figure. This process has been followed throughout the assessment of CHEC's operations.

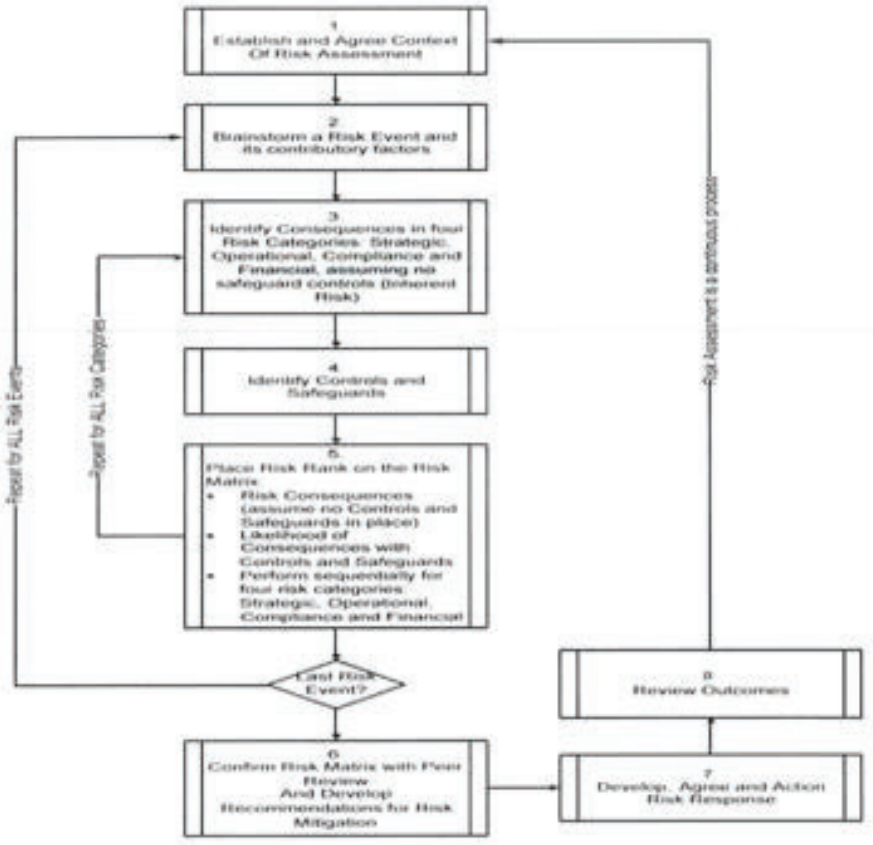
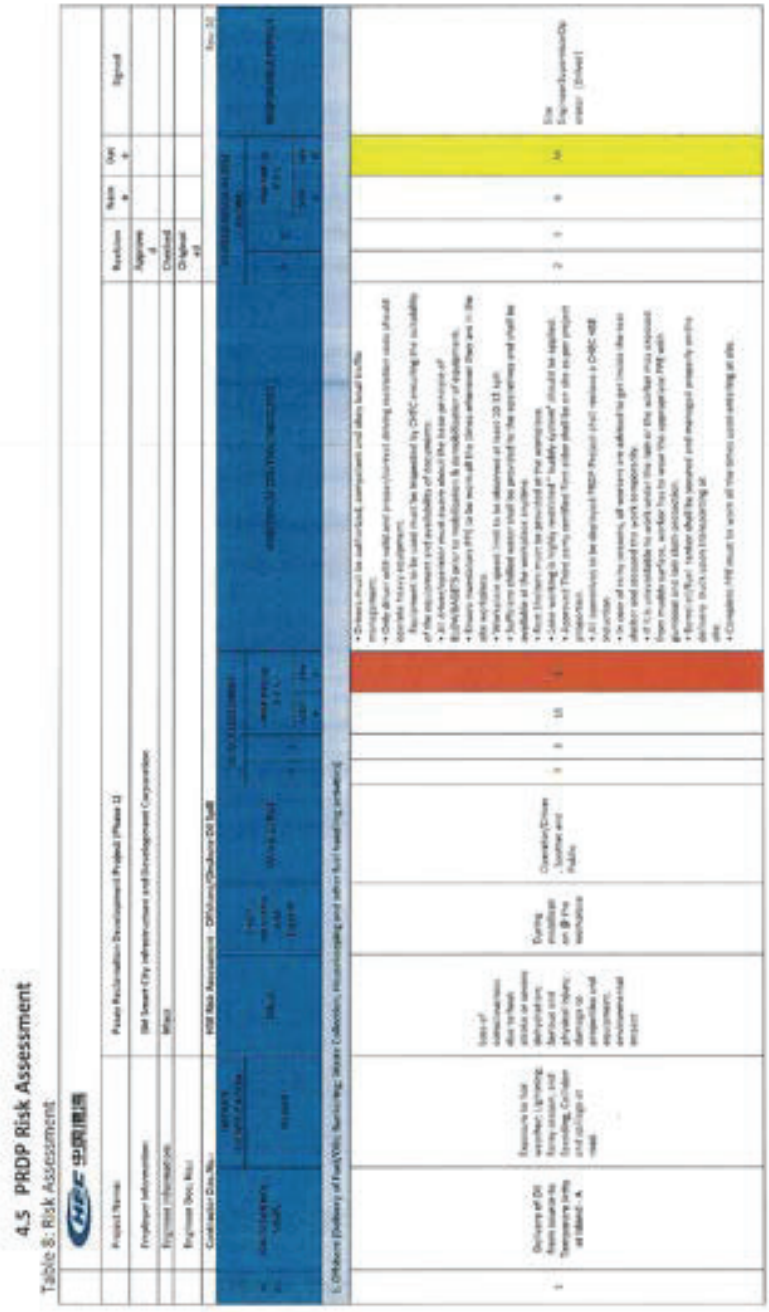
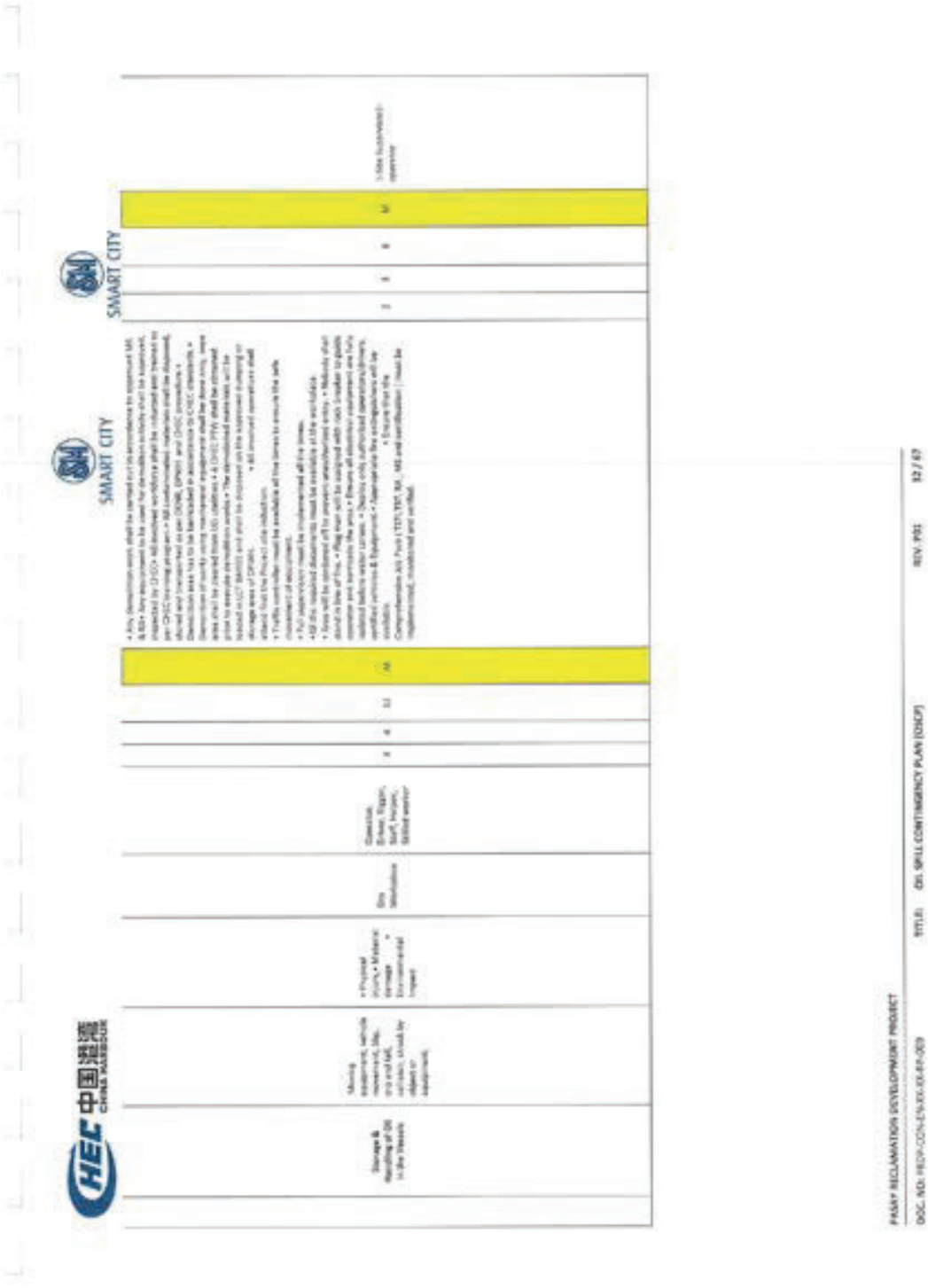


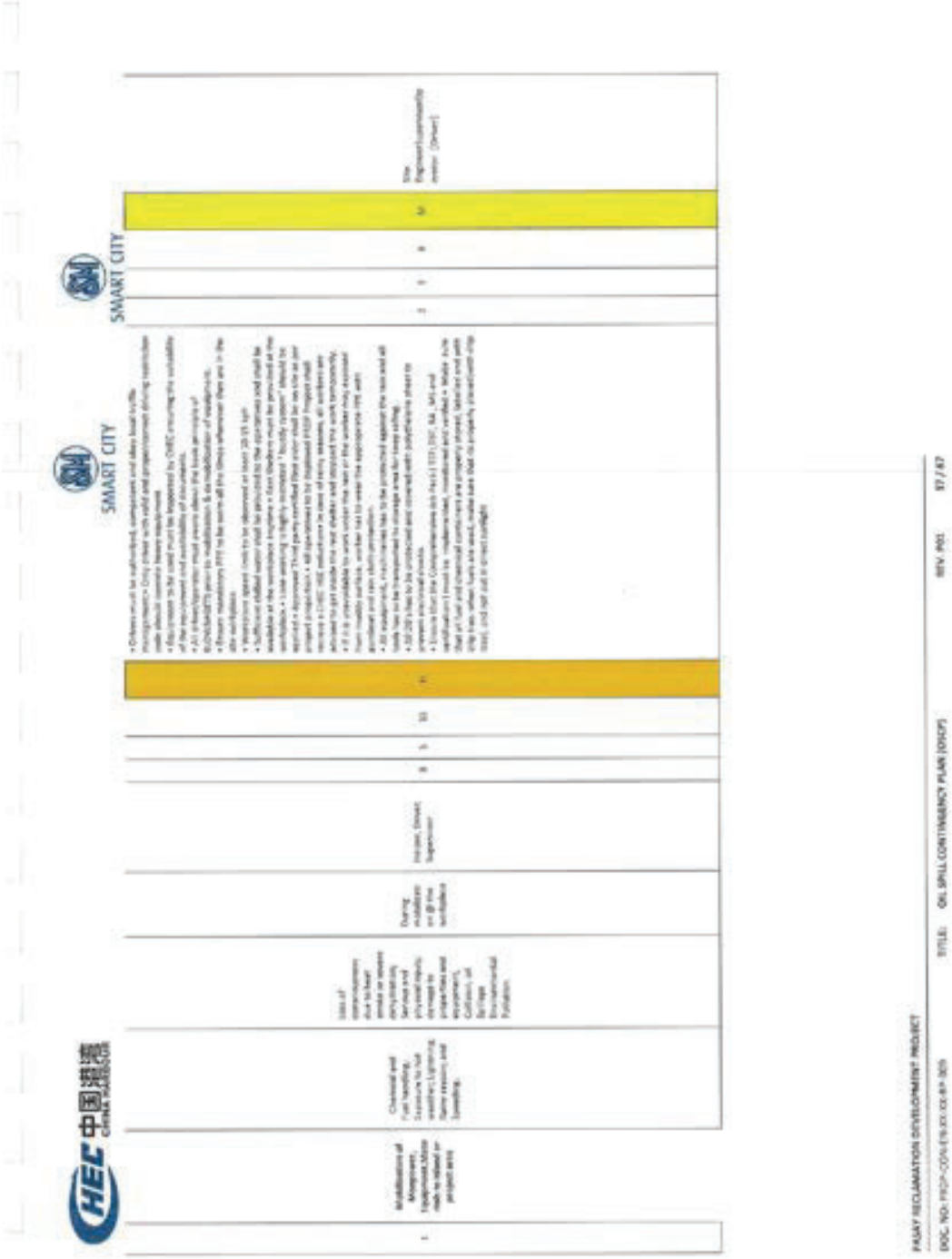
Figure 8. Risk Assessment Procedure

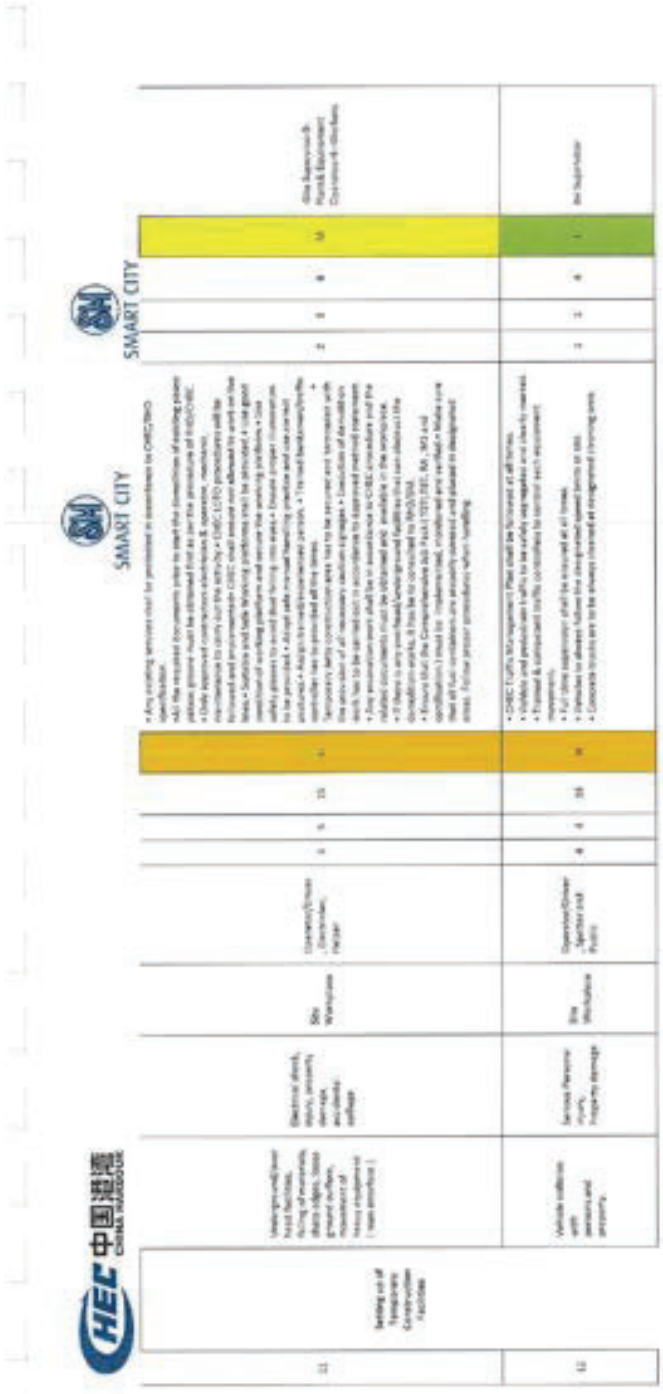


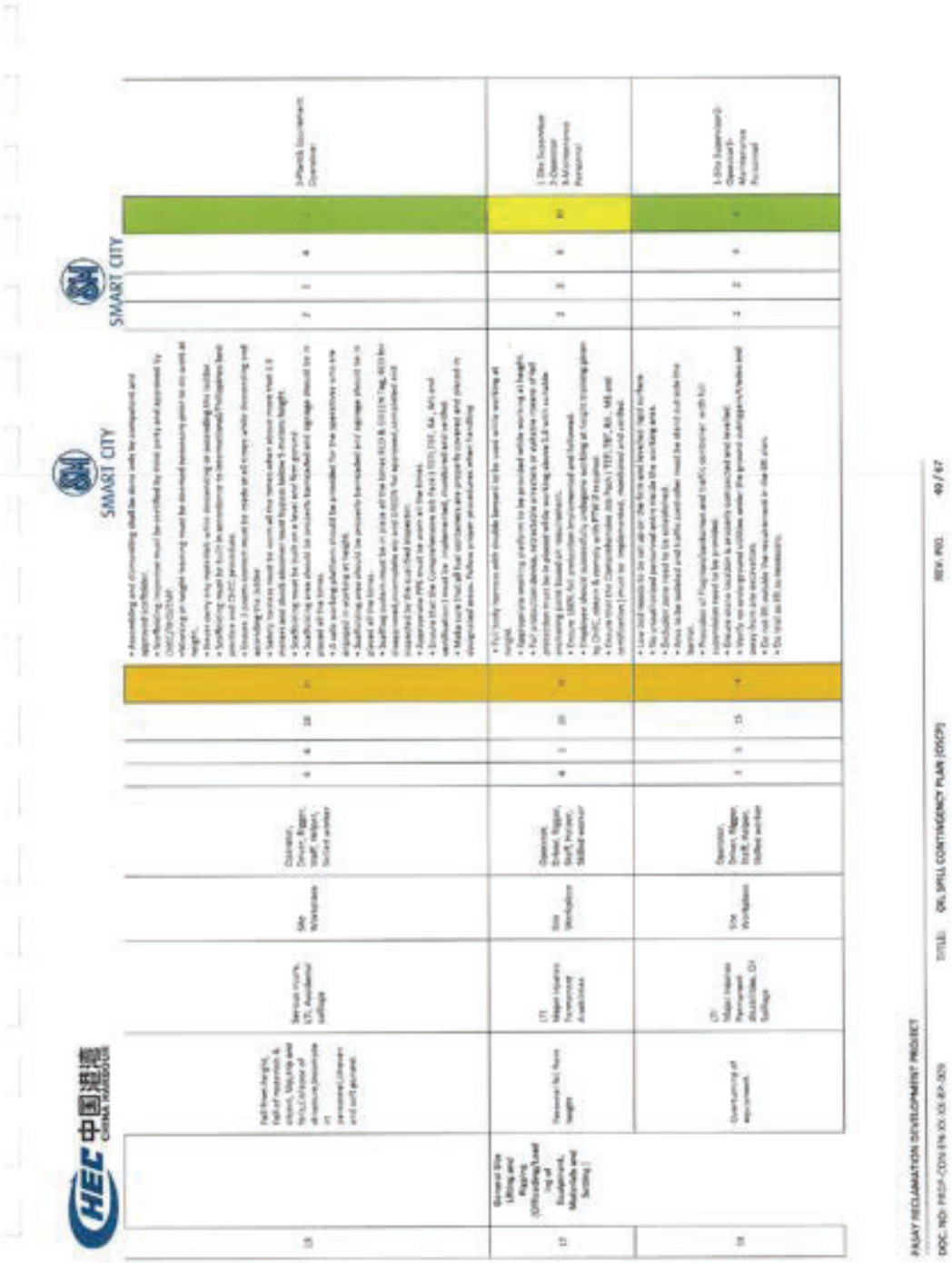
4.5 PRDP Risk Assessment

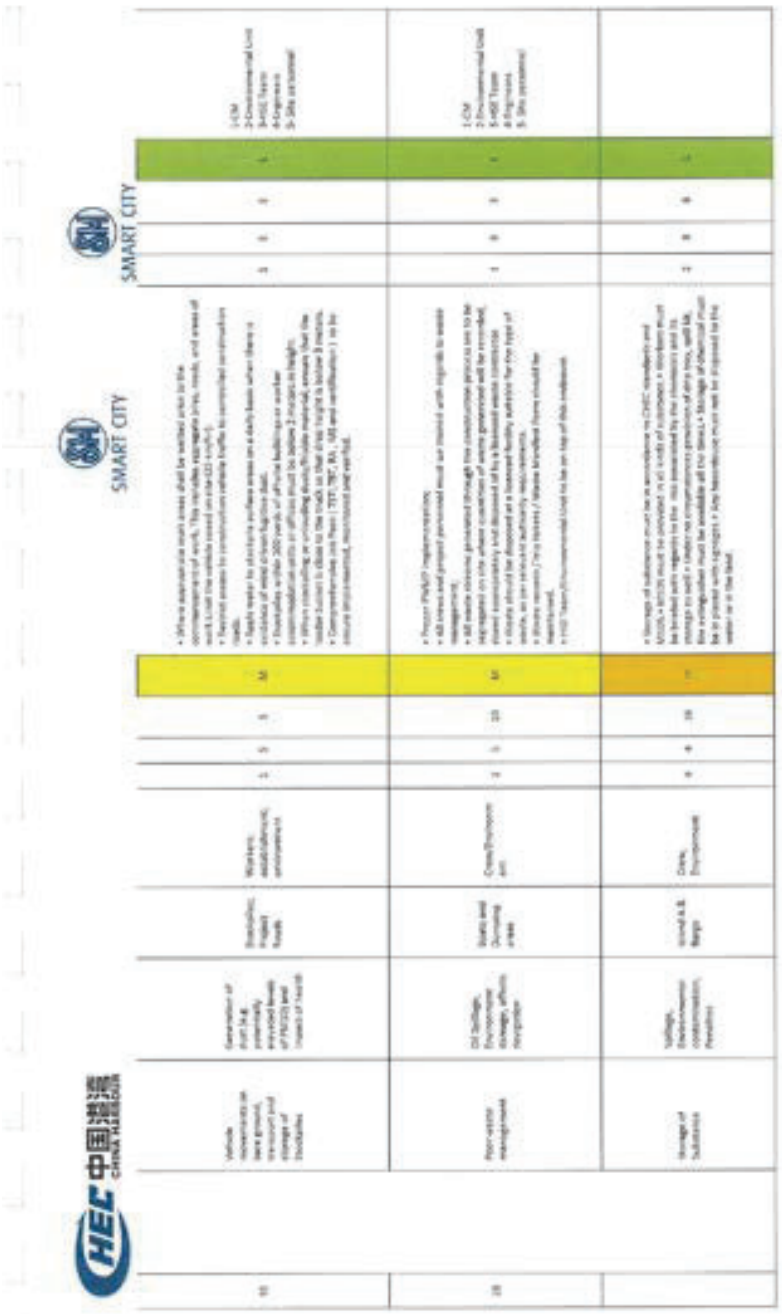
Table 8: Risk Assessment


SMART CITY
SMART CITY
SMART CITY
PASAY RECLAMATION DEVELOPMENT PROJECT
DOC. NO.: REDP-CON-ENVI-XX-XX-XX-XXX
TITLE: OIL SPILL CONTINGENCY PLAN (OSCP)
REV. NO.: R01
PAGE: 12 / 67









5 ASSESSMENT OF NATURAL CONDITIONS AND SENSITIVE AREAS

5.1 Identification of sensitive areas

The immediate identification of environmental (e.g., natural protected areas, nesting grounds, breeding sites) and socio-economic (e.g., recreational areas, tourist attractions, fish farms) sensitivities potentially at risk from an oil spill, together with any pre-designed protection tactics, is vital in ensuring the most appropriate allocation of equipment and personnel. Oil spill responders need clear procedures and tools for the immediate identification of potentially threatened sensitivities, as well as the protection priorities and tactical measures developed and agreed during planning.

6 OIL SPILL RESPONSE

Regardless the nature of the emergency spill, the first response measures shall be aimed at the leakage stop at the source and localization of the spots to avoid the further contamination spread to new areas and reducing the area of contamination.

The First Person On-Scene should take the following steps:

1. Assess the initial severity of the spill and safety and environmental concerns
2. Identify the source of the spill
3. Determine the size of the spill and stop or contain it, if possible
4. Notify the vessel / site responsible
5. Immediately stop work, transfer or fuelling operations, control all sources of ignition
6. If possible and safe to do so, put out any fire and stop any leak that may be present
7. If possible, prevent access of spilled material to water.

There are specific steps to take when dealing with a spill of petroleum products, and they are dependent upon the environment in which the spill occurs [1].

On Land:

- Do not flush into ditches or drainage systems
- Block entry into waterways and contain with absorbing booms or other barrier(s)
- Remove small spills with absorbent pads
- Where possible, recover spills through manual or mechanical means, including shovels, heavy equipment, and pumps

Quick containment of oil on land is necessary to ensure that spilled oil does not spread over a large surface area, thus increasing the potential for greater surface coverage and subsurface contamination. This is particularly so when spills occur in loosely packed materials (e.g., sand, soil).

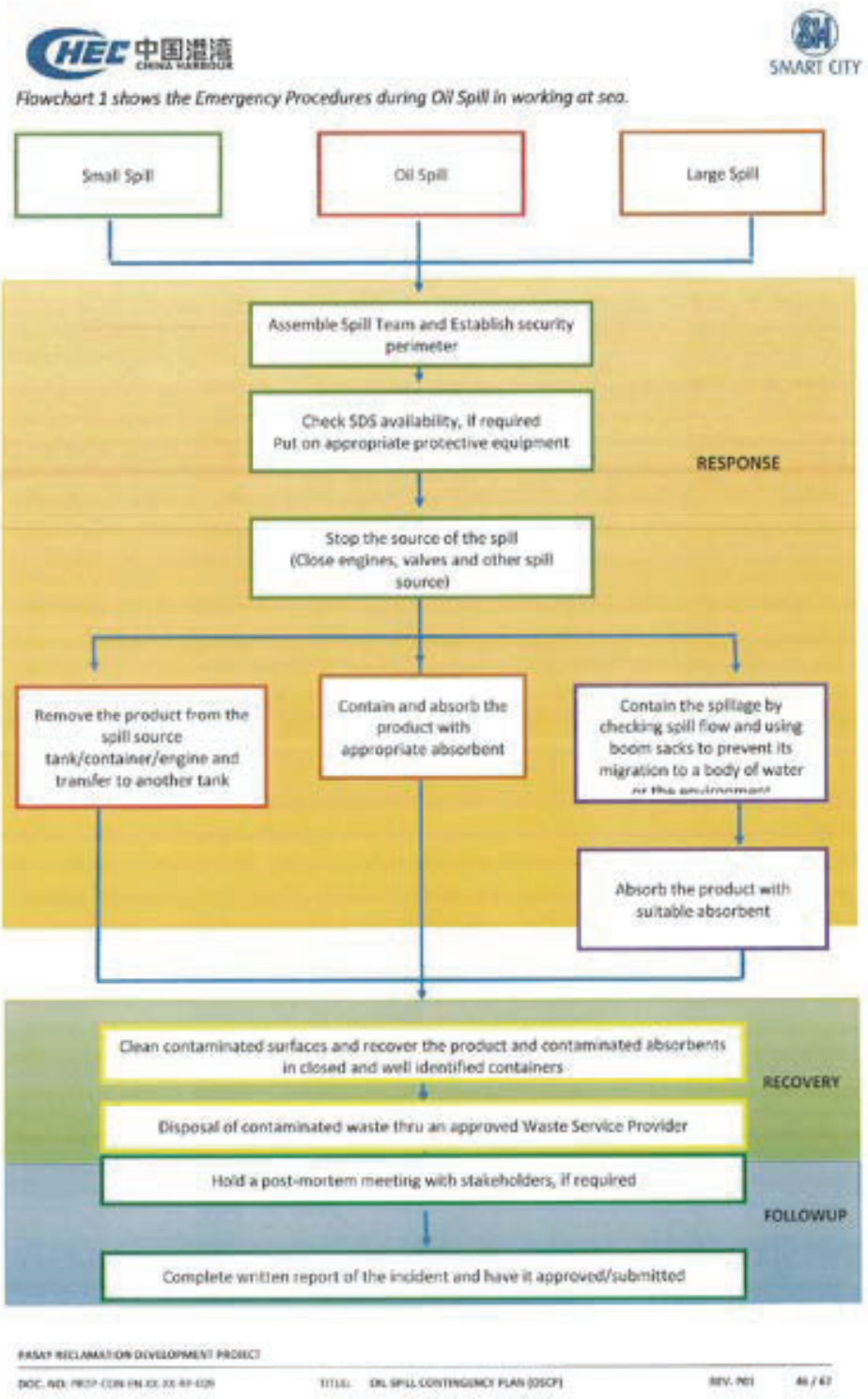
On Water:

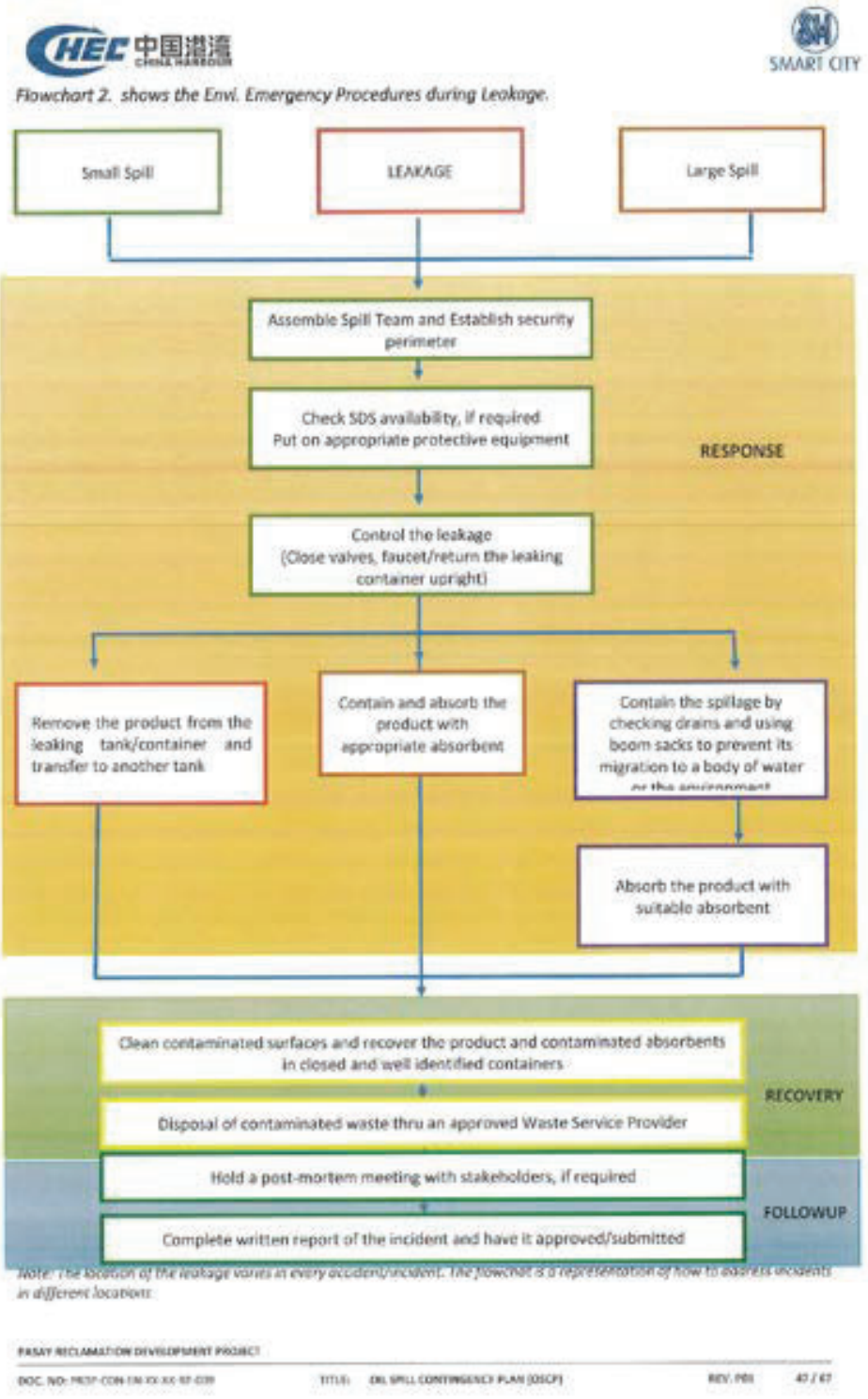
- Contain spill as close to release point as possible
- Use spill containment boom to concentrate slicks for recovery
- On small spills, use absorbent pads to pick up contained oil
- On larger spills, obtain and use skimmer on contained slicks

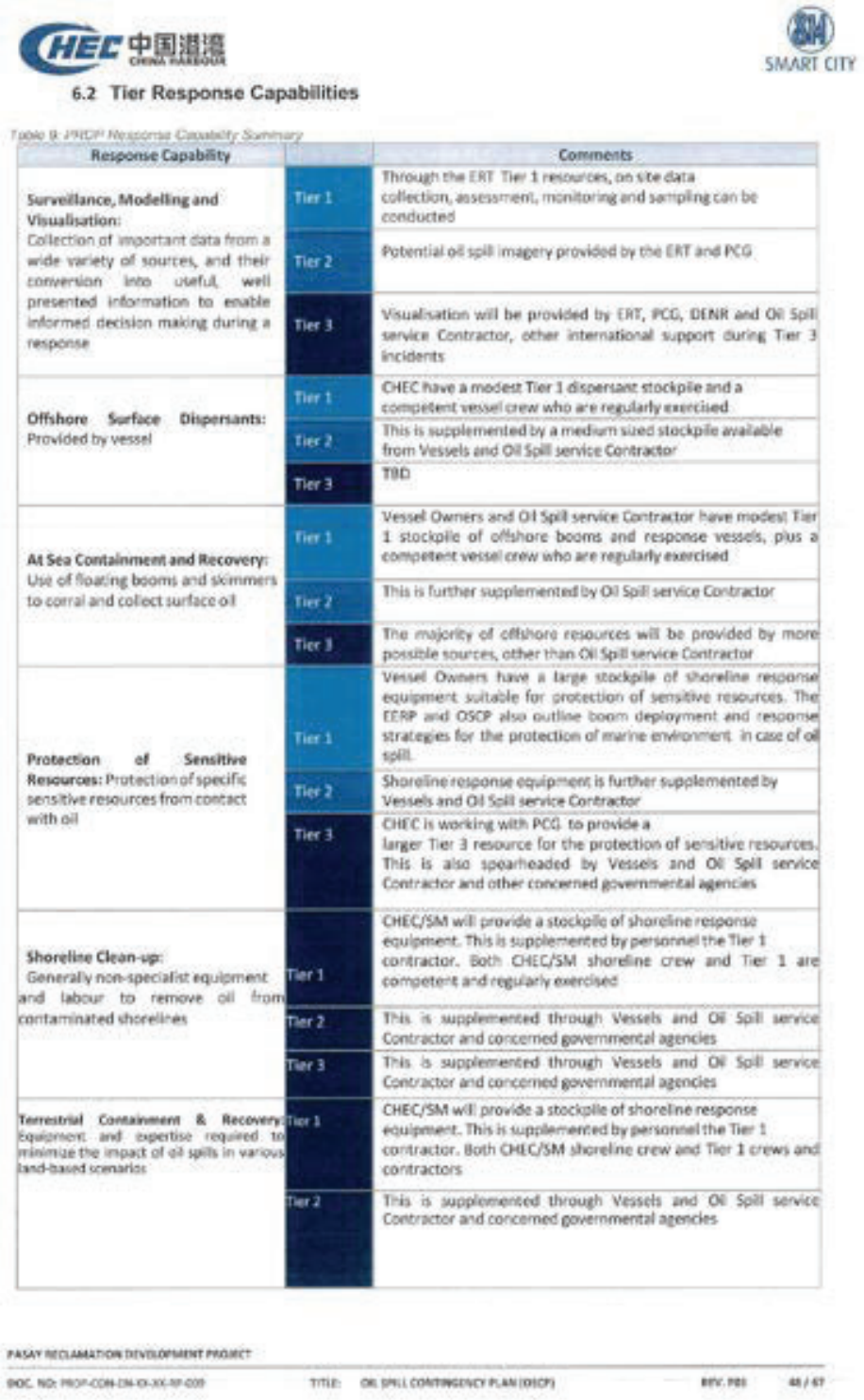
A marine oil spill could occur at any point along a fuel transfer system between vessel-to-vessel and / or onshore bunkering facility to vessel. The general strategy for near-shore marine spill responses is to limit the spread of oil on water, through downwind or down-current booming and collection at an accessible shoreline location. Oil stranded on a beach can be manually removed or re-floated at high water. Use absorbent pads to collect oil in shallow pools and fresh oil stranded on beaches. Absorbents and oil mixed with sand must be collected and bagged for disposal.

6.1 Addressing oil spills:

The below flowcharts show the procedures in addressing oil spill in both offshore and onshore.


HEC 中国港湾
CHINA HARBOUR
SMART CITY
Flowchart 1 shows the Emergency Procedures during Oil Spill in working at sea.
Small Spill
Oil Spill
Large Spill
Assemble Spill Team and Establish security perimeter
Check SDS availability, if required
Put on appropriate protective equipment
RESPONSE
Stop the source of the spill
(Close engines, valves and other spill source)
Remove the product from the spill source tank/container/engine and transfer to another tank
Contain and absorb the product with appropriate absorbent
Contain the spillage by checking spill flow and using boom sacks to prevent its migration to a body of water
Absorb the product with suitable absorbent
Clean contaminated surfaces and recover the product and contaminated absorbents in closed and well identified containers
RECOVERY
Disposal of contaminated waste thru an approved Waste Service Provider
Hold a post-mortem meeting with stakeholders, if required
FOLLOWUP
Complete written report of the incident and have it approved/submitted
PASAY RECLAMATION DEVELOPMENT PROJECT
DOC. NO.: PRDP-CON-EN-XX-XX-XX-029
TITLE: OIL SPILL CONTINGENCY PLAN (OSCP)
REV. NO.
46 / 47


SMART CITY
Flowchart 2. shows the Envi. Emergency Procedures during Leakage.
Small Spill
LEAKAGE
Large Spill
Assemble Spill Team and Establish security perimeter
Check SDS availability, if required
Put on appropriate protective equipment
RESPONSE
Control the leakage
(Close valves, faucet/return the leaking container upright)
Remove the product from the leaking tank/container and transfer to another tank
Contain and absorb the product with appropriate absorbent
Contain the spillage by checking drains and using boom sacks to prevent its migration to a body of water
Absorb the product with suitable absorbent
Clean contaminated surfaces and recover the product and contaminated absorbents in closed and well identified containers
RECOVERY
Disposal of contaminated waste thru an approved Waste Service Provider
Hold a post-mortem meeting with stakeholders, if required
FOLLOWUP
Complete written report of the incident and have it approved/submitted
Note: The location of the leakage varies in every accident/incident. The flowchart is a representation of how to address incidents in different locations
PASAY RECLAMATION DEVELOPMENT PROJECT
DOC. NO: PRDP-CON-EM-XX-XX-XX-039
TITLE: OIL SPILL CONTINGENCY PLAN (OSCP)
REV. P01
47 / 47



CHEC 中国港湾 CHINA HARBOUR

SMART CITY

6.2 Tier Response Capabilities

Table 9: PNDP Response Capability Summary

Response Capability		Comments
Surveillance, Modelling and Visualisation: Collection of important data from a wide variety of sources, and their conversion into useful, well presented information to enable informed decision making during a response	Tier 1	Through the ERT Tier 1 resources, on site data collection, assessment, monitoring and sampling can be conducted
	Tier 2	Potential oil spill imagery provided by the ERT and PCG
	Tier 3	Visualisation will be provided by ERT, PCG, DENR and Oil Spill service Contractor, other international support during Tier 3 incidents
Offshore Surface Dispersants: Provided by vessel	Tier 1	CHEC have a modest Tier 1 dispersant stockpile and a competent vessel crew who are regularly exercised
	Tier 2	This is supplemented by a medium sized stockpile available from Vessels and Oil Spill service Contractor
	Tier 3	TBD
At Sea Containment and Recovery: Use of floating booms and skimmers to corral and collect surface oil	Tier 1	Vessel Owners and Oil Spill service Contractor have modest Tier 1 stockpile of offshore booms and response vessels, plus a competent vessel crew who are regularly exercised
	Tier 2	This is further supplemented by Oil Spill service Contractor
	Tier 3	The majority of offshore resources will be provided by more possible sources, other than Oil Spill service Contractor
Protection of Sensitive Resources: Protection of specific sensitive resources from contact with oil	Tier 1	Vessel Owners have a large stockpile of shoreline response equipment suitable for protection of sensitive resources. The EERP and OSCP also outline boom deployment and response strategies for the protection of marine environment in case of oil spill.
	Tier 2	Shoreline response equipment is further supplemented by Vessels and Oil Spill service Contractor
	Tier 3	CHEC is working with PCG to provide a larger Tier 3 resource for the protection of sensitive resources. This is also spearheaded by Vessels and Oil Spill service Contractor and other concerned governmental agencies
Shoreline Clean-up: Generally non-specialist equipment and labour to remove oil from contaminated shorelines	Tier 1	CHEC/SM will provide a stockpile of shoreline response equipment. This is supplemented by personnel the Tier 1 contractor. Both CHEC/SM shoreline crew and Tier 1 are competent and regularly exercised
	Tier 2	This is supplemented through Vessels and Oil Spill service Contractor and concerned governmental agencies
	Tier 3	This is supplemented through Vessels and Oil Spill service Contractor and concerned governmental agencies
Terrestrial Containment & Recovery: Equipment and expertise required to minimize the impact of oil spills in various land-based scenarios	Tier 1	CHEC/SM will provide a stockpile of shoreline response equipment. This is supplemented by personnel the Tier 1 contractor. Both CHEC/SM shoreline crew and Tier 1 crews and contractors
	Tier 2	This is supplemented through Vessels and Oil Spill service Contractor and concerned governmental agencies

PASAY RECLAMATION DEVELOPMENT PROJECT

DOC. NO: PROP-CON-EN-EI-XX-RP-020 TITLE: OIL SPILL CONTINGENCY PLAN (OSCP) REV. P01 48 / 67

	Tier 3	In the event of a Tier 2 or 3 incident (tanker roll-over) the PCG, PNP and other concerned agencies will be involved and will lead in the response.
Waste Management: Facilities and expertise to manage the large volumes of waste generated during oil spill response	Tier 1	CHEC/SM will provide stockpile of Tier 1 temporary waste storage resources, personnel through the Tier 1 contractor and oiled waste disposal through their contractors (for all Tier incidents)
	Tier 2	A small stockpile of additional temporary waste storage is made available through the approved waste service provider
	Tier 3	Vessel owners/RMS or other waste service provider can provide Tier 3 temporary waste storage
Stakeholder Engagement and Communications: Outreach and communication with a wide range of stakeholders including local communities, responders, agencies and authorities and other interested and involved parties at local, national and international levels	Tier 1	Stakeholder engagement and communication is not likely for Tier 1 incidents
	Tier 2	Employer will liaise with the local community, government agencies as required for all Tier 2 and 3 incidents as necessary
	Tier 3	

6.3 Spill equipment and materials

It is understood that containment and recovery are the first response options. We are authorized to use sorbents and dispersants in accordance with the national regulations and, as such, the usage of sorbents and dispersants is not prohibited. Dispersants use, however, requires prior assessment with consultation with PCG. Mechanical methods can be applied without any prior approval.

Therefore, CHECs preferred methods for removing oil pollution in marine waters will be the mechanical collection and the use of sorbents. If the above methods are found ineffective or inapplicable or if the disadvantages of using chemical dispersants are outweight by its benefits, then it can be applied.

7 Other Practices

7.1 Management of hazardous substances

As the prevention of spills into the marine and land environment altogether is the ultimate goal, a number of general management actions in regards of storage and handling of hydrocarbons (and hazardous goods in general) are taken:

- Hydrocarbons and hazardous goods stored on deck or land will be secondarily contained, with the secondary containment having sufficient capacity (at least 110 % of the volume of the largest container, or 25 % of the cumulative volume of containers stored thereon, whichever is greatest)
- Maintenance of hydrocarbon (e.g., hydraulic) containing equipment will be done in controlled conditions and, where possible, below deck or inside a bunded area to avoid spillage into the sea or soil
- Spill response equipment is stored in easily accessible and clearly marked locations
- All personnel will be aware of the risks associated with the handling of hazardous goods and be trained in basic spill response (as a minimum).

CHEC has committed itself to efficient use of oils and lubricants on any equipment that has potential contact with water environment, e.g., hydraulic hoses on drag-heads of TSHD. In case a spill has occurred, the impact from using oils will not be as adverse on the environment and its ecosystem elements as by using conventional oils and lubricants.

A dedicated material safety data sheet (MSDS) must be delivered alongside with supply of all type of chemicals and other dangerous goods (if any) on site and on the operational vessels. This documentation will be accessible anytime in a dedicated storage room.

The MSDS should contain the following information:

- Identification of the substance or mixture and of the supplier
- Hazards identification
- Composition information of the ingredients
- First-aid measures
- Fire-fighting measures
- Accidental release measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information
- Ecological information
- Disposal considerations
- Transport information
- Other information including information on preparation and revision of the MSDS.

For the fuel bunkering MSDS should be delivered by the bunker barge prior to the start of the operation. The bunker delivery note does not replace the MSDS. The MSDS is an additional document containing safety information for the type of bunkers.

7.2 Preventive maintenance

Vessels have a maintenance schedule in place, which covers spill prevention equipment and containment/response equipment. Regular maintenance of equipment is also an essential

aspect of minimizing vessel's downtime as a result of equipment failure. All Project vessels are scheduled to undergo a full check-up and maintenance prior to mobilization to the Project to ensure they are in the best possible technical condition.

Specific attention is paid to hydraulic hoses located on the deck, as a burst in any of those lines has the possibility to create a spill to the surrounding water. Hydraulic hoses and associated couplings, fittings, valves, etc. are replaced timely and in accordance with manufacturer's specifications to help prevent hose failure due to excessive wear and tear. A dedicated hydraulic hose management plan is in place.

Results of overall maintenance activities are recorded and submitted in logbooks and will be part of the monthly/quarterly reporting.

Land-based equipment such as excavators, wheel loaders, bulldozers, dump tracks etc. will be sourced externally and on condition to be fully checked-up and serviced prior to mobilization on site. Special attention will be given to hydraulic equipment such as hoses, couplings and fittings etc. which will be replaced with brand new ones if necessary. Hydraulic oils and lubricants will be regularly exchanged upon reaching limiting engine hours to avoid engine overloading and breakdowns.

Any oil exchange, machinery repair and service of land-based equipment will take place in a designated workshop with spill prevention measures in place.

7.3 Bunkering

The bunkering of fuel and oil products to vessels is a critical operation in terms of spill management. To manage the inherent risks involved with this procedure, CHEC set up a Bunkering Procedure which is implemented in the project. Special attention is given to the obliged implementation of this instruction towards third party vessels to assure a fully controlled management of oil spill risks during bunkering.

7.3.1 Bunkering Operation Procedure:

The bunkering procedure on a ship can be divided into three important stages:

1. Preparation – Preparing for the bunkering operation which will involve the readiness of bunkering equipment, storage tanks and bunkering safety
2. Perform – Performing the bunkering operation in real time as per the pre-decided procedure and receiving the marine fuel according to the bunker plan
3. Wrap-up – Wrapping up the bunkering operation with utmost safety and ensuring the correct amount and quality of bunker fuel has been received onboard from the bunkering facilities (bunker ship or shore truck etc.)

A. Before Bunkering Operation

1. The chief engineer/representative should calculate and check which bunker oil tanks are to be filled after he/she receives confirmation from the shore office about the amount of fuel to be accepted.
2. It might be required to empty some tanks and transfer the oil from one tank to other. This is required to prevent the mixing of two oils and prevent incompatibility between the previous oil and the new oil.
3. The sounding of other fuel storage tank (not be used in bunkering operation) should also be taken to keep a record of fuel already present onboard. This will help the ship's officer in case any valve is leaking, and the bunker oil is being transferred to the unwanted tank.
4. Sounding is taken before bunkering and record is made
5. A checklist is to be filled so that nothing is missed

6. All deck scuppers and save all trays are plugged
7. Adequate lighting at the bunker and sounding position are to be provided
8. No smoking notice should be positioned near the bunkering station
9. Onboard communication, signs, and signals to stop the operation between the people involved in bunkering are to be understood by all the crew involved in the operation.
10. Red flag/light is presented on the masthead
11. Opposite side bunker manifold valves are closed and appropriately blanked
12. Vessel draught and trim is recorded before bunkering
13. All equipment in SOPEP (shipboard oil pollution emergency plan) locker are checked and kept near the bunkering station
14. When bunker ship or barge is secured to the ship side, the person in charge on the barge is also explained about the bunker plan
15. Bunker supplier's paperwork is checked for the oil's grade and the density if they are as per the specification
16. The pumping rate of the bunker fuel is agreed with the bunker barge/ bunker truck
17. The hose is then connected to the manifold. The condition of the hose must be checked properly by the ship staff and if it is not satisfactory, same to be notified to the chief engineer
18. Most of the bunker supplier send their crew to connect the bunker oil pipeline coming from bunker ship/ barge. The ship staff must recheck the flange connection to eliminate the doubt of any leakage
19. Once the connection is made, the chief engineer will ensure all the line valves which will lead the bunker fuel to the selected bunker tanks are open, keeping the main manifold valve shut
20. Proper communication between the barge and the ship is to be established
21. Sign and signals are to be followed as discussed in case of communication during an emergency
22. Most bunkering facilities (ship/ barge/ terminal/ truck etc.) provide an emergency stop switch which controls the bunkering supply pump. Ensure to check its working before commencing the operation
23. Once all the checks are done, the manifold valve is open for bunkering

B. During Bunkering Procedure

1. During the start of the bunker, the pumping rate is kept low; this is done to check that the oil is coming to the tank to which the valve is opened
2. The ship staff must track the sounding of selected bunkering tank and other tanks which are not involved in the operation to ensure oil is only going to the selected tank
3. After confirming the oil is coming to the proper tank, the pumping rate is increased as agreed before
4. Generally, only one tank filling is preferred because gauging of more than one tank at a time increases the chances of overflow
5. The max allowable to which tank is filled is 95 %, and when the tank level reaches about to maximum level, the barge is told to pump at low pumping rate to top up the tank, and then the valve of another tank is opened
6. During bunkering, sounding is taken regularly and the frequency of sounding is more when the tank is near to full. Many vessels have tank gauges which show tank level in the control room, but this is only to be relied upon if the system is working correctly.
7. The temperature of the bunker oil is also to be checked; generally, the barge or supplier will provide the bunker temperature. Temperature is a critical parameter, especially for bunker fuel such as heavy fuel oil, and any deviation in the provided temperature value may lead to a shortfall in bunker supply
8. A continuous sample is taken during bunkering with the help of sampling cock at the manifold
9. The crew needs to switch (open and close the valves) the internal storage tanks to accommodate the quantity of the bunker oil being supplied. Utmost precaution needs to be

taken when opening the other storage tank valve and closing the valve of the tank which is reaching the maximum fill limit.

C. After Bunkering Procedure: Wrap-up

1. Once the bunker is finished, it is a general practice to air blow the bunkering supply line for discharging all the oil trapped in the pipelines. At this stage, ensure all sounding pipe caps are closed and keep a watch on those storage tank vents which are at its maximum limit.
2. Draught and trim of the ship is checked
3. Take sounding of all the tanks bunkered
4. The volume bunkered should be corrected for trim, heel and temperature correction
5. Four samples are taken during bunkering. Two are kept onboard, Two for the bunker ship or barge
6. The chief engineer will sign the bunker receipt (BDN) and the amount of bunker received
7. If there is any shortfall of bunker received the chief engineer can issue a note of protest against the barge/supplier (in case the deficit is not agreed by the bunker supplier)
8. After everything is settled, the hose connection is removed
9. The chief engineer will make the entry of the operation in oil record book along with received BDN.



Figure 9. Bunkering Activity

The checklist provides a framework for controlling known, inherent risks associated with bunkering activities and is aimed at spill prevention. In case of an unanticipated event, the integrated and mandatory checks contribute to the minimization of any adverse effects.



Figure 10: Sample Bunkering Checklist

Bunkering operations are subject to regular inspections by Project supervisory personnel and management.

In the event of any spillage (e.g., any leakage, escape, spillage or overflow of marine fuels) causing or likely to cause pollution occurring at any stage of the bunkering operation, both the bunker barge and bunkered vessel shall jointly, and regardless as to whether the bunker barge or bunkered vessel are responsible, immediately take such actions as are reasonably necessary to execute clean up and which shall always be conducted in accordance with such local laws and regulations which may compulsorily apply.

7.4 Onshore refueling

Refueling and lubricating of land-based equipment and motor vehicles will be conducted in a manner that protects against spills and evaporation. Spill kit will be provided on site and staff will be rained how to use the spill kit. In accordance with the international good practice, all temporary fuel oil or petroleum storage tank must be surrounded with a temporary berm or containment of sufficient size and strength to contain the contents of the tank, plus 10 percent freeboard for precipitation (110 % secondary containment). The containment must be constructed in a way so that any discharge will not permeate, drain, infiltrate, or otherwise escape before clean-up occurs.

For this project, the above ground temporary fuel storage tank and mobile refueler is still in planning stage. Refueling is done on certified main fuel suppliers for construction machinery and equipment.

To prevent overflow during refueling the fuel nozzle is installed on the end of fuel hose. Refueling must be avoided in close distance to waterway or drainage system. Spill response equipment will be always at command during refueling along with personnel trained in the proper use of such equipment. Persons are designated for emergency response coordination on a 24/7 basis.

8 Training

As an explicit part of the Environmental Management approach, CHEC accepts that pollution incidents have the potential to severely affect the environment. Therefore - as reflected in our HSE and Environmental Policy – CHEC's goal is to have zero incidents, including environment and minimized pollution within the workplace.

All crew on board the vessels have received basic emergency response training, including internal spill response training, as a statutory prerequisite to be allowed to work on board.

All onshore workers will also be required to undergo spill drill and basic emergency response training.
Additionally, all CHEC offshore and onshore personnel will receive oil spill response training as part of their HSE training from the Philippine Coast guard (PCG). This will involve both theoretical and practical courses to instill a high degree of environmental awareness, as well as to encourage environmentally sound work practices.

Following oil spill possible related topics will be included as part of the training:

- Environmental aspects and impacts arising from oil spills.
- Oil spill prevention and response
- Communication flow chart
- PPE requirements when handling oil spills
- Spills to land (or deck) and water
- Spill containment (booming) techniques
- Post-spill actions (including waste management and reporting) procedures.

The methods of delivering training may vary, but generally involve Project specific induction(s), toolbox meetings, drills, notices posted on message boards, etc.

9 REPORTING

An incident report must be prepared within 24 hours of the spill detection.

As a minimum, pertinent information on the spill occurrence must be included in the report as follows:

- Name and contact details of reporter
- Time of spill or leak
- Time of detection of spill or leak
- Type of product spilled or leaked
- Amount of product spilled or leaked
- Location of spill or leak
- Source of spill or leak
- Type of accident - rupture, collision, overflow, other.

Besides, following information should be included in the report:

- The product passport, safety data sheet
- Whether the spill or leak is still occurring
- Whether the spill or leaked product is contained and, if not, where it is flowing.

Report should also identify the local climatic and other factors such as:

- Wind velocity and direction
- Temperature
- Proximity to water bodies, water intakes and facilities
- Tidal action (if applicable)
- terrain and soil conditions.

Subsequent to the spill occurrence and clean-up the follow-up actions will be prepared on the spill event, clean-up and environmental impacts to ensure that post-spill reports are completed and take action, as necessary, to prevent a reoccurrence.

10 Abbreviations and Definitions

Abbreviation	Definition
Employer	SM Smart City
Engineer	MACE
Contractor	China Harbour Engineering Company (CHEC)
Project	Philippine Reclamation Development Project (PRDP)
Approved Subcontractor	A Subcontractor appointed by the Contractor and approved by the Employer to undertake elements of the Works
Subcontractor / Supplier	Any person named in the Contract as a subcontractor or supplier, or any person appointed as a subcontractor or supplier, in each case of any tier, for a part of the Works; and the legal successors in title to each of these persons
HSE	Health, Safety, Environment
ERC	Emergency Response Center
MARPOL 73/78	International Convention for the prevention of Pollution from Ships
OPRC Convention	International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990
PCG	Philippine Coast Guard
SOPEP	Shipboard Oil Pollution Emergency Plan
IMO	International Maritime Organisation
VTMS	Vessel Traffic Management System
PPE	Personal Protective Equipment
TSHD	Trailing Suction Hopper Dredger
Pelican barge	Extract sands and unload it to PRDP
MSDS	Material Safety Data Sheet

11 ATTACHMENT

ATTACHMENT A	ENVIRONMENTAL INCIDENT REPORT FORM
ATTACHMENT B	OIL SPILL REPORT FORM
ATTACHMENT C	REVIEW LOG
ATTACHMENT D	SPILL KIT REVIEW LOG
ATTACHMENT E	TEST DRILLS

HEC 中国港湾 CHINA HARBOUR

SMART CITY

ATTACHMENT A ENVIRONMENTAL INCIDENT REPORT FORM

ENVIRONMENTAL INCIDENT REPORT FORM			
GENERAL INFORMATION:			
Department:			
Contact:			
Facility/Vessel/Vehicle Name: Address:			
File No. (If applicable)			
Date/Time of Release			
Date/Time of Detected:			
Date/Time Response Commenced:			
DESCRIPTION OF THE INCIDENT AND CAUSE OF RELEASE (If Known)			
SOURCES AND QUANTITES			
Type of substance(s) spilled:			
Where was the substance spilled?			
Affected environment (Tick all that applies)	Water ☐ Land ☐ Air ☐ Indoor ☐ Outdoor ☐ Drain ☐ Oil-Water Separator ☐ Other ☐		
Capacity of the Equipment/Container:			
Estimated Quantity (L or Kg) spilled:	Estimated Quantity (L or Kg) recovered:		
Means of Containment:			
Is this spill from a fuel storage tank? YES ☐ NO ☐			
If yes, does this tank have checked with bund? YES ☐ NO ☐			
If Facility/Vessel/Vehicle has the following information: Name of Owner: Name of Operator: Other Info:			
Reporting Criteria:			
Release Location:	Quantity Spilled	Reporting Process	
Stays inside the secondary containment (e.g., does not reach the environment	Any quantity spilled	☐ Contact your supervisor/manager External reporting is not required	

ENVIRONMENTAL INCIDENT REPORT FORM		
Contain from a container **(NON-TANK)** outside the secondary containment)	Any quantity into water (Aquatic receiving environmental): *External reporting* Less than 100L (26 Gal) unto the land (terrestrial receiving environment)- *Internal Reporting*	☐ Contact your Supervisor/HSE-M ☐ Contact the Engineer ☐ Contact the authorities/concerned Agencies, if required ☐ Send report to Engineer
From a **FUEL STORAGE TANK** outside the secondary containment	Any quantity into water (Aquatic receiving environmental): External reporting Less than 100L (26 Gal) unto the land (terrestrial receiving environment) - *Internal Reporting*	☐ Contact your Supervisor/HSE-M ☐ Contact the Engineer ☐ Contact the concerned Authorieties/Agencies ☐ Send report to Engineer ☐ Send report to concerned authorities, if required
Outside the secondary containment (e.g release into the surrounding soil/water)	Any quantity into water (Aquatic receiving environmental): External reporting Greater than than 100L (26 Gal) unto the land (terrestrial receiving environment) – *External Reporting*	☐ Contact your Supervisor/HSE-M ☐ Contact the Engineer ☐ Contact the concerned Authorities/Agencies ☐ Send report to Engineer ☐ Send report to concerned Authorities/agencies (e.g DENR, PCG)
TYPE OF ACCIDENT AND RECOVERY		
Root Cause of the Accident:		
Description of the Response Activities Taken:		
Measures Taken to Prevent Subsequent Occurrence:		

ATTACHMENT B OIL SPILL REPORT FORM

	Pasay Reclamation Development Project (PRDP) Manila Bay, Philippines	Ref. No. Rev. No. Date Page:

Oil Spill Reporting Form

Item	Description	Remarks
1	Name (Reporter)	
2	Contact numbers	
3	Company	
4	Place of Accident: Location / position	
5	Name or ID Vessel / Boat / unit	
6	Quantity	
7	Type of Spilled Oil	
8	Type of spill	
9	Dimensions of oil spill	
10	Depth of accident area	
11	Depth of accident area	
12	Probable cause of Spill	
13	Contained	
14	Arrangements taken for treatment of spill	
15	Quantity and type of used dispersants	
16	Actions taken	
Other information:		
17	Conditions of the sea: waves /swell	
18	Current	
19	Wind speed	
20	Wind Direction	
21	Temperature	
22	Authorities informed	
23	Third parties informed	
24	Report taken by	
25	Time	

ATTACHMENT C REVIEW LOG

EERP SPILL RESPONSE PLAN REVIEW	
___ Annual review of your EERP	
___ De-brief and review of plan after an environment incident	
___ Test drill evaluation	
___ Spill Kit Inspection	
Site:	Date:
Attendees:	
Incident Identification Number (if applicable):	
Description of Test Drill or Environment Incident (if applicable)	



ATTACHMENT D EERP EVALUATION AND REVIEW LOG

EVALUATION AND REVIEW LOG	
Topic for Review	Comments and Recommendations
Is your EERP located in close proximity to your fuel tanks/areas with hazardous materials?	
Are the Emergency Contacts still valid?	
Does the site map show the correct locations of the spill kits?	
Adequacy of spill kits and response equipment (e.g., Oil- only spill pads available for fuel storage tank)	
Have your fuel tanks changed? Are there new areas of hazardous materials onsite?	
Lesson learned/Program gaps	

Note: A copy of this form will be kept onsite.

ATTACHMENT E **SPILL KIT REVIEW LOG (TBD)**

List of Spill Kits	Location	Replenishment Required?	Date Completed
General Type Spill Kit			
Chemical Spill Kit			
Oil Spill Kit			

Inspection Completed by: _____
(Name and Signature)

Date: _____

ATTACHMENT F DRILL EXAMPLE – FUEL SPILL

Spill Response Scenario: Diesel or Hydraulic Fuel Spill

Note: The time spent on Step 1 and Step 2 would be proportional to the quantity spilled and the risk associated with the spill.

EXAMPLE OF SPILL RESPONSE DRILL SCENARIO

No.	Suggested Steps	Detailed Drill Response
1	Recognize the problem & evaluate the surrounding hazards	• Identify type of product spilled &approximate volume. • Approach the site carefully, downwind or with the wind at your back. • Look at the label and placard • ID where the spill came from (i.e., drum, storage tank, pail, vehicle, equipment.) to estimate quantity spilled. • Contact the supervisor or site manager • Without risk, carefully locate the source of the release. – ID how the spill occurred (e.g., fitting on dispensing hose failed, dispensing hose left unattended, perforation on the drum) • Identify & evaluate potential problems that may be encountered during the spill response. – Example: Spill close to storm drain, close to the stream close to an ignition source. • If the spill has reached a sewer drain or watercourse, it can no longer be contained. • External parties will have to be immediately notified. • Have fire extinguishers available if there is a risk of fire. • Refer to the product's SDS for the safe handling procedure.
2	Determine response level	• Determine the level of response required to respond to the spill. • Level 1 Respond – Personnel trained and able to handle spill • Level 2 Respond – On-site Spill Response Team • Level 3 Respond – Spill cannot be contained and outside assistance is required (i.e., Fire Department)
3	Stop the release	• Stop operations related to the release & shut off equipment. • Without risk, remove any sources of spark or flame. • Ensure the appropriate personal protective equipment (PPE) is worn. • Safely stop the release. – Close taps and valves – Block flow with sorbent pads, bucket, spill kit container. – Make temporary repairs to the container and temporarily seal all cracks. – Reposition the drum so that the perforation causing the leak is at the top – Define a safety perimeter.
4	Contain the spill	• Contain spill in a small space close to the source. • If spill is migrating to water: • Construct retaining dikes and install plywood sheets along entrance of any culver

		• Use floating barriers made of sorbents, booms, plywood. • If spill is on land: • Dig pits, soil trenches, retaining dikes • Block the migration of the spill using sorbents • Isolate all water sources from the spill using sorbent pads, drain covers and plywood sheets • Avoid directing the product toward drains, access shafts, manholes, ditches or sewer system. • Ensure catch basin has the capability to contain the spill, if not, block and cover the catch basin
5	Commence recovery of the spilled product	• Consider elements that may affect sill migration: • Product properties (refer to SDS) • Weather conditions (i.e., wind, rain, snow, sun) • Remove product spilled from ground and water • It is preferred to pump a spilled substance directly into the temporary hazardous waste drum • Soak up all free product with available materials • Mix stained soil with loose absorbents. • Contain spill from the outer edge and work inwards. • Temporarily store the spilled substance and used sorbents. • The waste bags are to be properly labelled prior to filling. • Waste labels would include the following: – Name of the lead responder – The product spilled, i.e., "Diesel Fuel" – The date – The contact number • Wastes are to be stored in a safe location designed for storage of hazardous waste. Ensure all waste is stored in such a manner as to reduce the potential for further spillage. • Sorbents used to recover hazardous material are considered hazardous waste.
6	Dispose of contaminated materials and waste	• Contact the certified hazardous waste disposal contractor. – Coordinated through the site manager or superintendent – Contact information stored in the EERP (Spill Response) Binder.
7	Call and report the spill	• For the purpose of the exercise, review who would be contacted (e.g., Engineer Representative, etc.
8	Complete an incident Report	• For the purpose of the exercise, only review the incident reporting form. Pay particular attention to the Type of Accident and Recovery section, for lessons learned.
9	Replenish the spill kit	• For the purpose of the exercise, discuss what will need to be replaced in the spill kit.

APPENDIX O.4

Permit to Operate of Generator Sets

O.4. Permit to Operate of Generator Sets

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
National Capital Region (NCR)
National Ecology Center, East Avenue, Diliman Quezon City
Tel No: 931-23-97, 931-29-54, 931-18-34

Permit No: PTO-OL-NCR-2023-01783
Application Type: New

Date Issued: 22 Feb 2023
Date Expiration: 22 Feb 2028

PERMIT TO OPERATE
Air Pollution Source and Control Installations

Pursuant to Part IV, Rule XIX of the Rules and Regulations of R.A. 8749, authority is hereby granted to:

CHINA HARBOUR ENGINEERING COMPANY (CHINA HARBOUR ENGINEERING COMPANY)

5f Two E-Com Center, Ocean Drive, Mall Of Asia Complex (Moa), Barangay 76, Pasay City, Ncr, Fourth District

subject to the following terms and conditions:

TERMS AND CONDITIONS

1. Submit Self-Monitoring Report (SMR) based on the following schedule:

Quarter	Coverage	Submission	Quarter	Coverage	Submission
First	Jan. to Mar.	1-15 Apr.	Third	Jul. to Sep.	1-15 Oct.
Second	Apr. to Jun.	1-15 Jul.	Fourth	Oct. to Dec.	1-15 Jan.

2. The establishment and its Pollution Control Officer shall strictly comply with all the above stipulations and shall be responsible for ensuring that any emission of air pollutants, from abnormal or unexpected events, do not cause air pollution in the surrounding air environment or have adverse effects on the persons in that environment.

3. Allow the entry of our duly authorized representative(s) to conduct inspection within your premises.

4. This permit, together with the corresponding Official Receipts of Payment, shall be adequately framed & posted in a conspicuous place at the establishment.

5. The permit shall be renewed thirty (30) days prior to its expiration.

Nature of Business: Reclamation Project

Recommended by:

ENGR. WILMA B. UYACO
Chief, Clearance and Permitting Division

Approved by:

ATTY. MICHAEL DRAKE P. MATIAS
Regional Director

Filing Fee	: Php 600.00	O.R. No. : 6773047	Date : Jan. 10, 2023
Permit Fee	: Php 5000.00	O.R. No. : 6773047	Date : Jan. 10, 2023
PD1856	: Php 10.00	O.R. No. : 6773047	Date : Jan. 10, 2023
Documentary Stamp Tax	: Php 30.00	O.R. No. : 6773047	Date : Jan. 10, 2023

This is a computer generated certificate. To verify the authenticity of this file, kindly scan the generated QR Code using your QR Code scanner/reader or visit the OPMS website for details.

Protect the environment ... Protect life...

Annex

Fuel Burning					
ID	**APSI**	**Capacity**	**Brand name**	**Type of Fuel**	**APCD**
275765	Generator Set 1	115.0 KW	WEICHAI	Diesel	---
302384	Generator Set 2	58.0 KW	WEICHAI	Diesel	---

Filing Fee	: Php 600.00	O.R. No. : 6773047	Date : Jan. 10, 2023
Permit Fee	: Php 5000.00	O.R. No. : 6773047	Date : Jan. 10, 2023
PD1856	: Php 10.00	O.R. No. : 6773047	Date : Jan. 10, 2023
Documentary Stamp Tax	: Php 30.00	O.R. No. : 6773047	Date : Jan. 10, 2023

This is a computer generated certificate. To verify the authenticity of this file, kindly scan the generated QR Code using your QR Code scanner/reader or visit the OPMS website for details.

Protect the environment ... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
NATIONAL CAPITAL REGION
EMB-NCR Bldg. National Ecology Center Compound, East Ave., Diliman, Quezon City
Email address: [redacted] / Website: [redacted]
Phone : 6931-1331 local CPD: 1115-1113 | EMED: 1116-1124 | FAD: 1102 - 1107 | ORD 1114 - 1117

Permit No: PTO-OL-NCR-2023-09576
Application Type: Amendment

Date Issued: 30 Jun 2024
Date Expiration: 30 Oct 2028

PERMIT TO OPERATE
Air Pollution Source and Control Installations

Pursuant to Part IV, Rule XIX of the Rules and Regulations of R.A. 8749, authority is hereby granted to:

PASAY CITY GOVERNMENT (PASAY RECLAMATION PROJECT)

ALONG THE COAST OF MANILA BAY NEAR CCP AND DPWH D.W. DIOKNO, BARANGAY 76, PASAY CITY, NCR, FOURTH DISTRICT

subject to the following terms and conditions:

TERMS AND CONDITIONS

1. Submit Self-Monitoring Report (SMR) based on the following schedule:

Quarter	Coverage	Submission	Quarter	Coverage	Submission
First	Jan. to Mar.	1-15 Apr.	Third	Jul. to Sep.	1-15 Oct.
Second	Apr. to Jun.	1-15 Jul.	Fourth	Oct. to Dec.	1-15 Jan.

2. Submit a valid Certificate of Pollution Control Officer (PCO) Accreditation within thirty (30) calendar days from the issuance of this permit. Make sure that the managing head had already attended the required eight (8) hours of training on environmental management covering the basic environmental laws, rules & regulations, and the duties & responsibilities of the PCO.

3. The establishment and its Pollution Control Officer shall strictly comply with all the above stipulations and shall be responsible for ensuring that any emission of air pollutants, from abnormal or unexpected events, do not cause air pollution in the surrounding air environment or have adverse effects on the persons in that environment.

4. This supersedes Permit to Operate No. PTO-OL-NCR-2023-09576 issued on October 9, 2023.

5. Allow the entry of our duly authorized representative(s) to conduct an inspection within your premises.

6. This permit, together with the corresponding Official Receipts of Payment, shall be adequately framed & posted in a conspicuous place at the establishment.

Nature of Business: Reclamation Project

This permit shall be renewed thirty (30) days prior to its expiration.

Recommended by:

ENGR. DIVINA C. CAMAJAO
OIC, Clearance and Permitting Division

Approved by:

ATTY. MICHAEL DRAKE P. MATIAS
Regional Director

Filing Fee	: Php 600.00	O.R. No. : 6561002	Date : June 21, 2024
Permit Fee	: Php 8000.00	O.R. No. : 6561002	Date : June 21, 2024
PD1856	: Php 10.00	O.R. No. : 6561002	Date : June 21, 2024
Documentary Stamp Tax	: Php 30.00	O.R. No. : 6561002	Date : June 21, 2024

This is a computer generated certificate. To verify the authenticity of this file, kindly scan the generated QR Code using your QR Code scanner/reader or visit the OPMS website for details.

Protect the environment ... Protect life...

Annex

Fuel Burning					
ID	**APSI**	**Capacity**	**Brand name**	**Type of Fuel**	**APCD**
461075	Generator Set	240.0 KW	CUMMINS	Diesel	---
461076	Generator Set	58.5 KW	Shanghai	Diesel	---
461077	Generator Set	33.0 KW	Yuchai	Diesel	---
461078	Generator Set 1	20.0 KW	China Yangdong	Diesel	---
461079	Generator Set 2	20.0 KW	China Yangdong	Diesel	---
461080	Generator Set	30.0 KW	WEICHAI	Diesel	---
461084	Generator Set	240.0 KW	Altman Power	Diesel	---
461085	Generator Set	40.0 KW	Altman Power	Diesel	---
465632	Generator Set	75.0 KW	Xin Rong Sheng	Diesel	---
465634	Generator Set	32.0 KW	DUNAMIS	Diesel	---

Filing Fee	: Php 600.00	O.R. No. : 6561002	Date : June 21, 2024
Permit Fee	: Php 8000.00	O.R. No. : 6561002	Date : June 21, 2024
PD1856	: Php 10.00	O.R. No. : 6561002	Date : June 21, 2024
Documentary Stamp Tax	: Php 30.00	O.R. No. : 6561002	Date : June 21, 2024

This is a computer generated certificate. To verify the authenticity of this file, kindly scan the generated QR Code using your QR Code scanner/reader or visit the OPMS website for details.

Protect the environment ... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
NATIONAL CAPITAL REGION
EMB-NCR Bldg. National Ecology Center Compound, East Ave., Diliman, Quezon City
Email address: [redacted] / Website: [redacted]
Phone : 6931-1331 local CPD: 1115-1113 | EMED: 1116-1124 | FAD: 1102 - 1107 | ORD 1114 - 1117

Permit No: PTO-OL-NCR-2024-05926
Application Type: New

Date Issued: 30 Jun 2024
Date Expiration: 30 Jun 2029

PERMIT TO OPERATE

Air Pollution Source and Control Installations

Pursuant to Part IV, Rule XIX of the Rules and Regulations of R.A. 8749, authority is hereby granted to:

PASAY CITY GOVERNMENT (PASAY RECLAMATION DEVELOPMENT PROJECT - CHINA HARBOUR ENGINEERING COMPANY)

ALONG THE COAST OF MANILA BAY NEAR CCP AND DPWH D.W. DIOKNO, BARANGAY 76, PASAY CITY, NCR, FOURTH DI, BARANGAY 76, PASAY CITY, NCR, FOURTH DISTRICT

subject to the following terms and conditions:

TERMS AND CONDITIONS

1. Submit Self-Monitoring Report (SMR) based on the following schedule:

Quarter	Coverage	Submission	Quarter	Coverage	Submission
First	Jan. to Mar.	1-15 Apr.	Third	Jul. to Sep.	1-15 Oct.
Second	Apr. to Jun.	1-15 Jul.	Fourth	Oct. to Dec.	1-15 Jan.

2. Submit a valid Certificate of Pollution Control Officer (PCO) Accreditation within thirty (30) calendar days from the issuance of this permit. Make sure that the managing head had already attended the required eight (8) hours of training on environmental management covering the basic environmental laws, rules & regulations, and the duties & responsibilities of the PCO.

3. The establishment and its Pollution Control Officer shall strictly comply with all the above stipulations and shall be responsible for ensuring that any emission of air pollutants, from abnormal or unexpected events, do not cause air pollution in the surrounding air environment or have adverse effects on the persons in that environment.

4. Allow the entry of our duly authorized representative(s) to conduct an inspection within your premises.

5. This permit, together with the corresponding Official Receipts of Payment, shall be adequately framed & posted in a conspicuous place at the establishment.

Nature of Business: Reclamation Development Project

This permit shall be renewed thirty (30) days prior to its expiration.

Recommended by:

ENGR. DIVINA C. CAMAJAO
OIC, Clearance and Permitting Division

Approved by:

ATTY. MICHAEL DRAKE P. MATIAS
Regional Director

Filing Fee	: Php 600.00	O.R. No. : 6561001	Date : June 21, 2024
Permit Fee	: Php 2500.00	O.R. No. : 6561001	Date : June 21, 2024
PD1856	: Php 10.00	O.R. No. : 6561001	Date : June 21, 2024
Documentary Stamp Tax	: Php 30.00	O.R. No. : 6561001	Date : June 21, 2024

This is a computer generated certificate. To verify the authenticity of this file, kindly scan the generated QR Code using your QR Code scanner/reader or visit the OPMS website for details.

Protect the environment ... Protect life...

APPENDIX O.5

Special Waste Permit to Dump/ Discharge Waste and/or Other Matter

O.5. Special Waste Permit to Dump/ Discharge Waste and/or Other Matter

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 6555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **31 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO:	Issued On:	Expires on:
CGSM-MEPGru- 0124-R-026	**31 January 2024**	**01 February 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **30 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-025**	Issued On: **30 January 2024**	Expires on: **31 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 068,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **29 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-024**	Issued On: **29 January 2024**	Expires on: **30 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **28 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-023**	Issued On: **28 January 2024**	Expires on: **29 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **27 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-022**	Issued On: **27 January 2024**	Expires on: **28 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No:	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **26 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-021**	Issued On: **26 January 2024**	Expires on: **27 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **26 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-020**	Issued On: **25 January 2024**	Expires on: **26 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG-CDR VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **24 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistance of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-19**	Issued On: **24 January 2024**	Expires on: **25 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonifacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **23 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistance of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-18**	Issued On: **23 January 2024**	Expires on: **24 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 06B, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG COL VINCENT S LACA** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **22 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-017**	Issued On: **22 January 2024**	Expires on: **23 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAP Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 068,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186638**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **21 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-016**	Issued On: **21 January 2024**	Expires on: **22 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAO** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 068,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **20 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO:	Issued On:	Expires on:
CGSM-MEPGru- 0124-R-015	**20 January 2024**	**21 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAO** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **20 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-014**	Issued On: **20 January 2024**	Expires on: **21 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAO** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 068,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**	Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**

Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:

Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**	Address: **362 BINJIING ZHONG ROAD, GUANGZHOU, CHINA**

Terms and Conditions

Date and Time of Dumping: **18 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-013**	Issued On: **18 January 2024**	Expires on: **19 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAP** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **17 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-012**	Issued On: **17 January 2024**	Expires on: **16 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAO** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **16 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-011**	Issued On: **16 January 2024**	Expires on: **17 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAO** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113188838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **15 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-010**	Issued On: **15 January 2024**	Expires on: **16 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG COR VINCENT S LACAO** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**	Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**

Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:

Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**	Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**

Terms and Conditions

Date and Time of Dumping: **14 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (In metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-09**	Issued On: **14 January 2024**	Expires on: **15 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative: **CG CDR VINCENT S LACAP** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **13 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-08**	Issued On: **13 January 2024**	Expires on: **14 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAO** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **07 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-07**	Issued On: **07 January 2024**	Expires on: **08 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG COR VINCENT S LACAP** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B, Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels:	Address & Tel No.
M/V "HANG BO 3001"	**CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**

Kind of License Number:	Issuing Authority:	Issued On: / Expires On:
Certificate of Vessel Nationality CN2011386838	**GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**
CSFL/SCSFL	Issued On:	Expires On:
Cert of Inspection/Special Permit No.	Issued at:	Issued On: / Expires on:

Owner/Operator/Representative:	Address:
CCCC GUANGZHOU DREDGING CO., LTD.	**362 BINJIANG ZHONG ROAD, GUANGZHOU, CHINA**

Terms and Conditions

Date and Time of Dumping:	Requested Dumping Site:
06 January 2024	**Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO:	Issued On:	Expires on:
CGSM-MEPGru- 0124-R-06	**06 January 2024**	**07 January 2024**

Issued At:	Name and Signature of Area Commander/ Authorized Representative
Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.	**CG CDR VINCENT S LACAO Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **05 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-05**	Issued On: **05 January 2024**	Expires on: **06 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG COL VINCENT S LACAO** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonofacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**	Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**

Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:

Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**	Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**

Terms and Conditions

Date and Time of Dumping: **04 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid *( ) Liquid* ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological Materials* ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical *( ) Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-04**	Issued On: **04 January 2024**	Expires on: **05 January 2024**

Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG COR VINCENT S LACAP** **Station Commander, CGS Manila**

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonifacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJIING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **03 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: (/) **Solid** ( ) Semi-Liquid ( ) *Liquid* ( ) Gaseous
Properties of Waste/Matter: (/) **Physical** ( ) Chemical ( ) *Biological Materials* ( ) Sediments	Persistence of Waste/Matter: (/) **Physical** ( ) Chemical ( ) *Biological*
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-03**	Issued On: **03 January 2024**	Expires on: **04 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 068, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAP** **Station Commander, CGS Manila**	

Department of Transportation
National Headquarters Philippine Coast Guard
Coast Guard District National Capital Region-Central Luzon
HEADQUARTERS COAST GUARD STATION MANILA
4th Floor,Gwapotel,Bonifacio Drive, Brgy 653, Zone 06B,
Port Area Manila

SPECIAL PERMIT TO DUMP/DISCHARGE WASTE & / OR OTHER MATTER
(Vessels)

Name of Vessels: **M/V "HANG BO 3001"**		Address & Tel No. **CHINA HARBOUR ENGINEERING COMPANY C/O Ben Line Agencies Philippines, Inc. Unit 701-A, 7th Floor, Tower A, Two E-Com Center Bldg., Palm Coast Ave., Mall of Asia Complex, Pasay City 1300 Tel: +632 756 5555**	
Kind of License Number: **Certificate of Vessel Nationality CN20113186838**	Issuing Authority: **GUANG DONG**	Issued On: **21 January 2019** Expires On: **20 January 2024**	
CSFL/SCSFL	Issued On:	Expires On:	
Cert of Inspection/Special Permit No.	Issued at:	Issued On.	Expires on:
Owner/Operator/Representative: **CCCC GUANGZHOU DREDGING CO., LTD.**		Address: **362 BINJING ZHONG ROAD, GUANGZHOU, CHINA**	

Terms and Conditions

Date and Time of Dumping: **03 January 2024**	Requested Dumping Site: **Lat 14 degs 11 mins 891 sec North** **Long 120 degs 19 mins 776 sec East**
Type of Waste/Matter: **Dredge Materials/Excavation Soil**	Form of Waste/Matter: **(/) Solid** ( ) Semi-Liquid ( ) Liquid ( ) Gaseous
Properties of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological Materials ( ) Sediments	Persistence of Waste/Matter: **(/) Physical** ( ) Chemical ( ) Biological
Total Quantity of Waste/Matter (in metric tons): **1,000 metric tons**	Method of Packaging: **Vessel Split Type/Barge transfer with Clam Shell**

Method of Release/Discharge **Through underwater dumping**

IMPORTANT: *This Special Permit is non-transferable and subject to Grantee's compliance with HPCG Memorandum Circular Nr. 11-2014 dtd 19 December 2014 and existing regulations. Any violation of the terms and conditions set forth above shall constitute sufficient ground for the automatic revocation of the privilege to dump/discharge waste and/or other matter, without prejudice to the imposition of appropriate sanctions.*

SPECIAL PERMIT NO: **CGSM-MEPGru- 0124-R-02**	Issued On: **03 January 2024**	Expires on: **04 January 2024**
Issued At: **Coast Guard Station Manila, 4th Floor, Gwapotel, Bonifacio Drive, Brgy 653, Zone 06B, Port Area, Manila.**	Name and Signature of Area Commander/ Authorized Representative **CG CDR VINCENT S LACAP** **Station Commander, CGS Manila**	

APPENDIX P.
SEDIMENT PLUME MODELING

Note / Memo

Haskoning Philippines Inc.
Water & Maritime

To:	SM Smart City Infrastructure and Development Corporation (SMSCIDC)
From:	Andaru Katri Lasrindy
Date:	18 September 2024
Copy:	/
Our reference:	SF1013-RHD-L8-XX-TN-X-0001-P07
Classification:	Project related
Checked by	Michiel Smits, Trevor Morrish-Hale

Subject: **Sediment Plume Modelling**

---

1 Introduction

The construction of PRDP (Pasay 360 hectares) islands will cause a temporary increase in suspended sediment in the environment during construction, due to the wash out of fine sediment during the reclamation process. The increase in suspended sediment here is referred to as sediment plume. Those plumes are transported with the flow and by wind effects across the adjacent area within Manila Bay. An increased suspended sediment concentration during construction can lead to environmental effects for sensitive receivers, such as ports, beaches, and mangrove areas.

1.1 Objective

Previously a methodology using large Trailing Suction Hopper Dredgers (TSHDs) in combination with spray pontoons was proposed for the project. The actual methodology being adopted now is the use of Pelican Barges (PBs) which have a reduced production, however more PBs are being deployed. Another relevant difference is the sand source, where the current sand source contains much less fines compared to the initially anticipated sand source. Finally, in the current methodology bunds are in place along large part of the island boundaries.

The aim of this study is to analyse the effects of the reclamation works on the suspended sediment concentration (SSC) in Manila Bay, and to show the differences between the two approaches in terms of sediment plume.

1.2 Starting points

To compare the sediment plumes for both reclamation methods, the following starting points were used:

- Scenario 1: Initial reclamation methodology
  - Use of TSHD with hopper capacity of 16,500 m³
  - Discharge through spray pontoon
  - Fines content 15%, sailing distance approximately 25 km from project site

- Scenario 2: Current reclamation methodology
  - Pelican Barges with hopper capacity of 15,000 m³
  - Direct placement by Pelican Barges with lower production capacity
  - Fines content 5%, sailing distance approximately 180 km from project site

2 Analysis of the reclamation process

During the dredging and reclamation processes, fines (defined as sediment with a grain size diameter, D < 63 µm) may be spilled and come into suspension. Only fines are light enough to remain in suspension for a longer time and over long distances. Coarser material will settle in close vicinity of where they are spilled. In this section, the source terms for dredging-induced turbidity will be derived.

2.1 Dredging equipment

An impression of a TSHD and a Pelican Barge are given in the figure below. For the plume modelling TSHD's with a hopper capacity of 16,500 m³ are assumed whilst for the Pelican Barge 15,000 m³ is assumed. These values are in line with common sized vessels on the actual project. As the sailing distances in each scenario are different (due to the different borrow areas), the total production is kept approximately the same by assuming six Pelican Barges and 1 TSHD. The resulting number of loads discharged at the project site per week is thereby kept the same.



Figure 2-1: Impression of Trailing Suction Hopper Dredgers (left) [1] and Pelican Barge (right) [2]

2.2 Source terms

The estimated cycles and source term from both vessels are estimated as per the description in Table 2-1 below.

Table 2-1: Estimated cycle of Pelican Barge and TSHD

Item	Unit	Scenario 1: TSHD	Scenario 2: PBs
Hopper size	m³	16,500	15,000
Sailing empty	hours	0.8	12.0
Loading	hours	2.7	8.0
Sailing full	hours	0.9	14.0
Connect pipeline	hours	0.3	0.0
Discharge	hours	2.0	6.0
Disconnect pipe	hours	0.1	0.0
Total cycle	hours	6.8	40.0
Weekly operational time	hr/wk	145	140
Dredging cycles per week	cycle	21.5	3.5

Vessel unit	unit	1.0	6.0
Total dredging cycles per week	cycle	21	21
Fine sediment	%	15%	5%
Reclamation fill rate - fines only	kg/s	400	50

3 Sediment Plume Modelling Approach

3.1 MIKE21 Model and Settings

Following RHDHV 2017 study [3], the Hydrodynamic and Mud Transport Modules of a MIKE21 Flexible Mesh (FM) model was used for this sediment plume assessment. The hydrodynamic model has been calibrated against water level and current speed survey data that was collected during ADCP survey in October and November 2014 [3]. The settings of the calibrated model that were applied to the hydrodynamics of the sediment plume assessment, are presented in Table 3-1.

Table 3-1: Final model parameters

Model parameter		Parameter setting
Equation		Shallow Water Equations
Solution Technique	Time Integration	Low Order, Fast algorithm
	Space Discretization	Low Order, Fast algorithm
	Minimum Time step	0.01s
	Maximum time	300
	Critical CFL Number	0.8
Depth Correction type		No depth correction
Flood and Dry	Drying Depth	0.005m
	Flooding Depth	0.05m
	Wetting Depth	0.10m
Density type		Function of salinity
Eddy Viscosity		Smagorinsky formulation, constant 0.28
Bed Resistance		Manning number, constant 32 m^(1/3)/s
Coriolis Forcing		Varying in domain
Wind Forcing		Varying in time and domain (2D wind fields)
Friction	Friction Type	Varying with wind speed
	Linear variation	For speed: 7m/s, Friction: 0.001255
		For speed: 25m/s, Friction: 0.002425
Wave Radiation		None
Boundary conditions		TPXO62
Settling velocity		0m/s
Sediment type		Cohesive
Critical bed shear stress for sedimentation		No sedimentation: 0.00001N/m² With sedimentation: 0.1N/m²
Critical bed shear stress for erosion		0.1N/m²

The coarse material from the reclamation process is assumed to completely settle at the reclamation location and is therefore not considered for the dispersal of the sediment plume. Sedimentation and erosion parameters are set to a level that sedimentation or erosion of fines does not occur. Therefore, all fine sediment from the reclamation process is kept in suspension.

3.2 Meteorological conditions

The meteorological conditions which were modelled are summarised in Table 3-2. During the Habagat monsoon (wet season), dominant winds are coming from the southwest. During the Amihan monsoon (dry season) dominant winds are coming from the northeast.

The channels in or adjacent to the project site are expected to discharge into Manila Bay. As the model is only considering the operational conditions, the following 1-year Return Period of discharges are selected:

- Pasig River 275 m^3/s,
- Libertad channel 49 m^3/s,
- Redemptorist Outfall 24 m^3/s,
- Seaside Outfall 23 m^3/s, and
- Parañaque River 103 m^3/s.

These annual discharges were extrapolated from several return periods that were stated in the river management report for San Juan River by Woodfields Consultant, Inc. [4].

Table 3-2: Scenarios for sediment plume assessment

Layout	Meteorological Condition	TSHD's Source Term for Island Reclamation	PB's Source Term for Island Reclamation*
No Islands	Southwest (SW) monsoon (Habagat)	400 kg/s	50 kg/s
No Islands	Northeast (NE) monsoon (Amihan)	400 kg/s	50 kg/s
No Islands	Inter-monsoon (assumed no wind)	400 kg/s	50 kg/s

**) included sand bunds with 300-400m wide openings*

The source of fines is added as a single inflow point shown in Figure 2-1 and in variation following the estimated cycles in Table 2-1. A continuous cycle was assumed for Scenario 2 as six Pelican Barges will be used for island construction. Simulations are carried out for 28 days, covering neap and spring tide condition for all meteorological conditions.

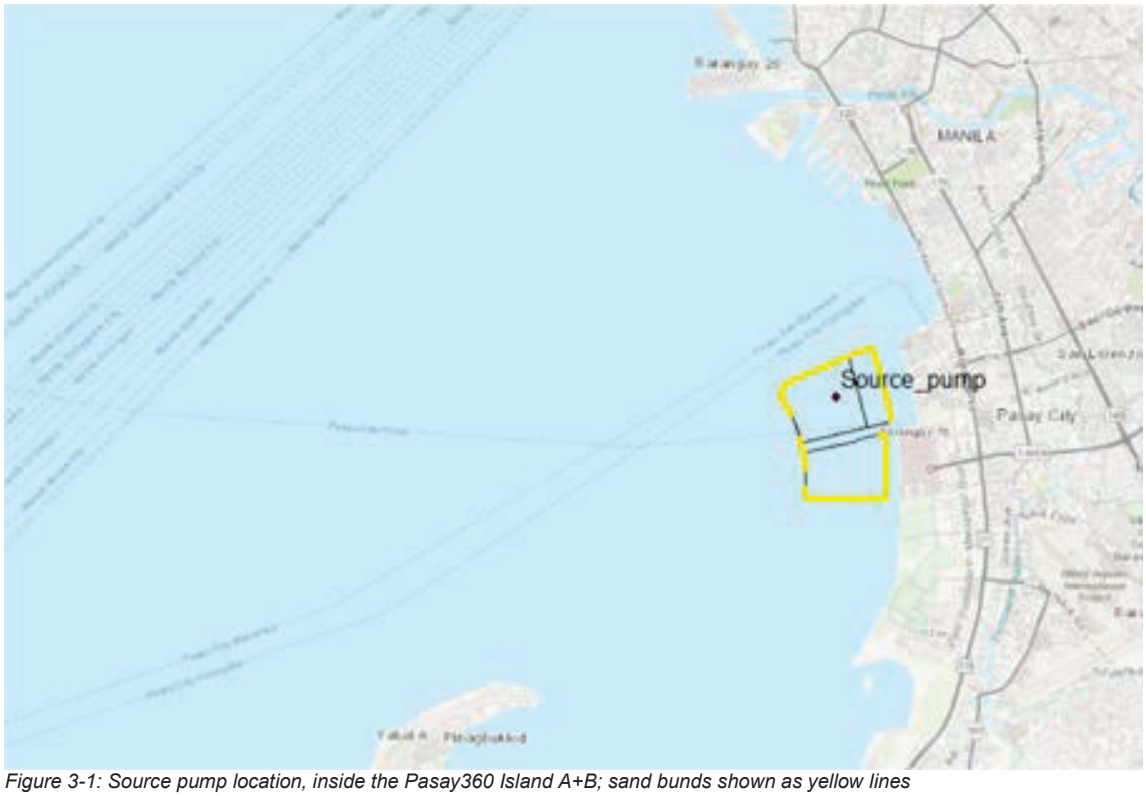


Figure 3-1: Source pump location, inside the Pasay360 Island A+B; sand bunds shown as yellow lines

4 Sediment Plume Modelling Results

The comparison of maximum SSC (suspended sediment concentration) from 1-month simulation between the two scenarios are shown in Figure 4-1 (in kg/m³) for all meteorological conditions.

From the figures it is visible that the dispersion area of the sediment plume is significantly larger and higher with the TSHD method compared to the Pelican Barge method. Although the Pelican Barges will cause a more continuous influx of suspended sediments (due to the longer discharge time). The sediment plume is mainly reduced due to the coarser sand (less fines), which are sourced by the Pelican Barges.

In can also be observed that wind influences the sediment plume development, as the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the port area, whilst in the NE monsoon the main direction of the plume is towards the south.

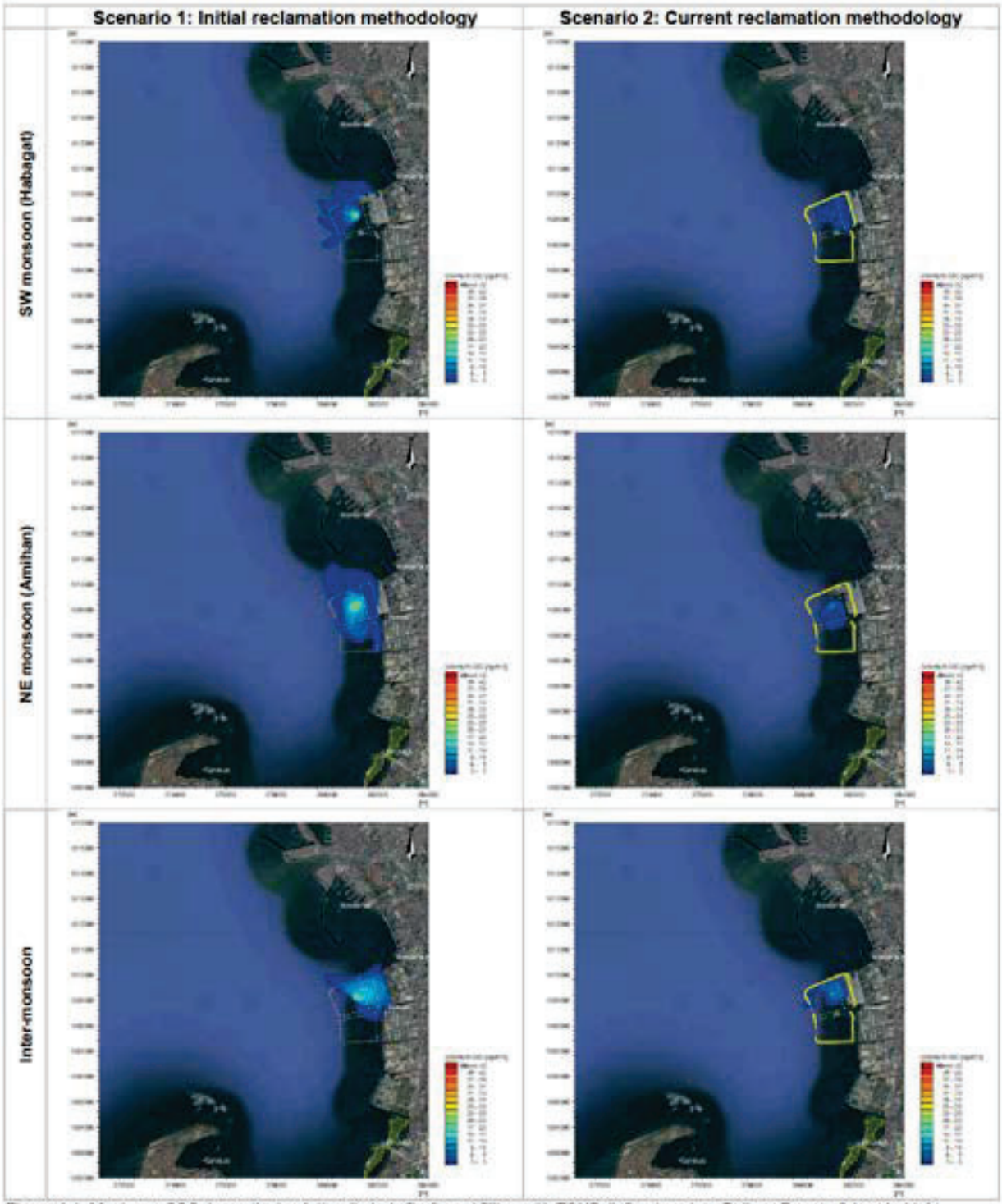


Figure 4-1: Maximum SSC 1-month simulation (in kg/m³) of sand filling with TSHD (left column) vs Pelican Barges & bunds (right column)

This wind effect becomes better visible when changing the scale of the images to mg/l, as shown in Figure 4-2. In this Figure 4-2, 50 mg/l is selected as the maximum limit value. This is to represent the maximum suspended sediment concentration in the Class SB water body, based on the Water Quality Guidelines and General Effluent Standard of 2016 issued by Department of Environment and Natural Resources (DENR). Both scenarios show that >50 mg/l of sediment plume can spread widely along the coastline.

Presenting the results using a mg/l scale has some disadvantages in our specific case:

1. Inside Manila Bay suspended sediment concentrations are in the range of 30-50 mg/l already (along the nearshore areas around MOA). In the rainy season such values can become 100 mg/l or more when heavy rains cause significant river outflow containing high levels of suspended sediments.

2. The main goal of the sediment plume assessment is to visualize the difference between the two methods suggested and sand sources used. The sediment plume model relies upon selected input and calculates based on certain settlement velocities what the sediment plume may be. The smallest particles (less than 4 µm) have a settlement velocity set in the model of 0.0 m/s which means they are assumed to always remain in suspension. This is a conservative approach, for two reasons:
    a. Actual settlement velocity of such particles will be slightly more than 0.0 m/s, so they will settle over time;
    b. The finest particles (less than 30 µm) are flushed out first during the dredging process. Generally leaving 5% fines, however ranging in size between say 20 – 63 µm. This distinction is not made in the sediment plume modelling, which assumes the 5% fines ranges in particle size between 0 and 63 µm.

3. More assumptions are made for this sediment plume model, which are justified by the defined goal of the sediment plume modelling. And as we are interested in the biggest impact from the reclamation works, meaning the highest concentrations produced, which are in the order of 10 – 30 kg/m³, the results are best shown to the kg/m³ scale.

In summary, for the goal of this assessment the best approach is to show sediment plumes with a scale using kg/m³. Using mg/l will result in a too conservative and detailed plume which does not reflect reality.

For completeness the results with the mg/l scale are shown in Figure 4-2 below.

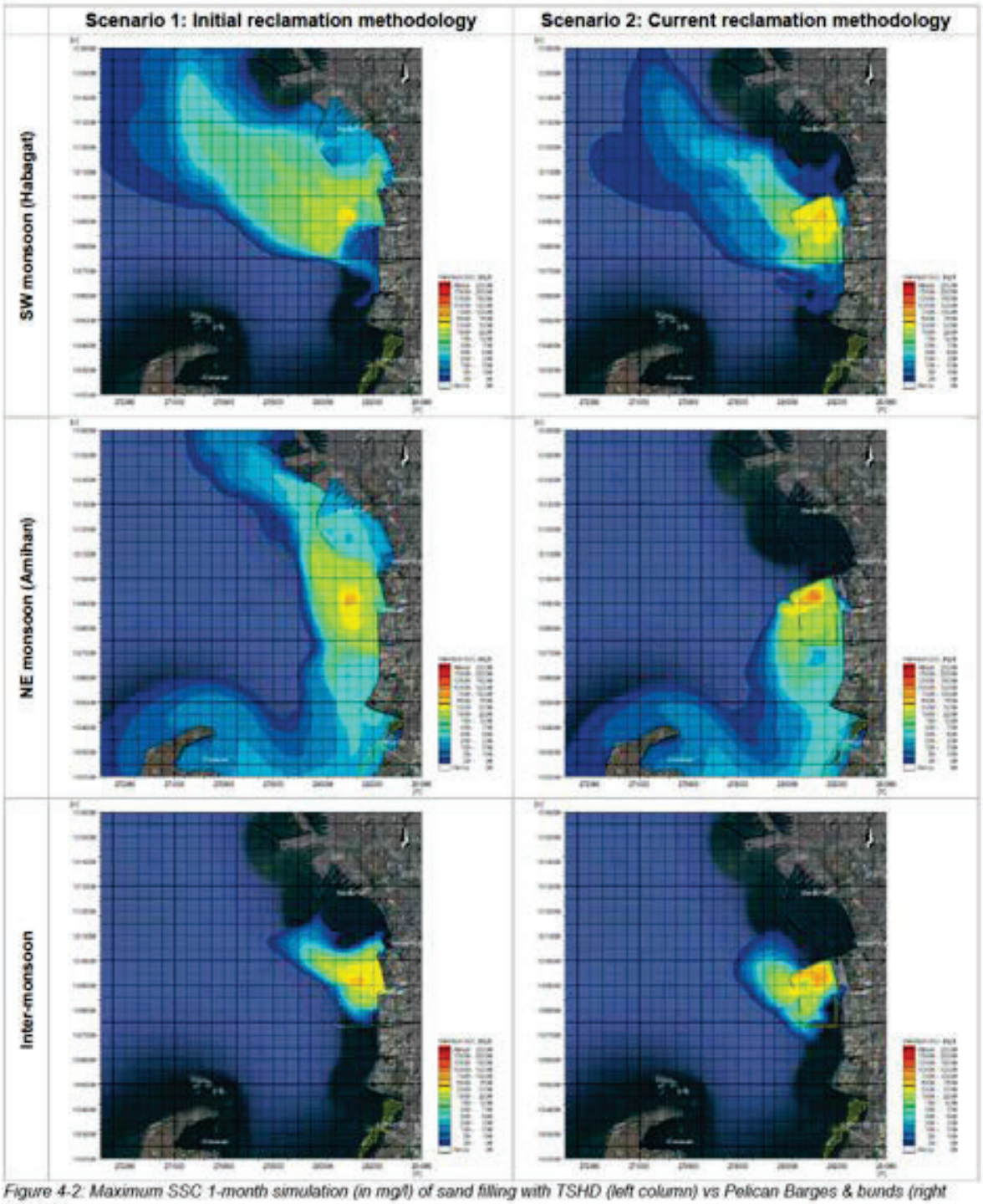


Figure 4-2: Maximum SSC 1-month simulation (in mg/l) of sand filling with TSHD (left column) vs Pelican Barges & bunds (right column)

5 Conclusions

The sediment plume assessment results lead to the following general conclusions:

Primary conclusions

- The purpose if this assessment is to show the difference in sediment plume between the two identified construction methods (Scenario 1 and Scenario 2). Due to limitation on accuracy of input and model computations, the sediment plume images using a kg/m³ scale are more reliable for showing the expected extent of the sediment plume.
- Scenario 2 of sand filling with 6 Pelican Barges and a sand source with 5% fines content, will result in a reduced dispersion area if compared to Scenario 1 with 1 TSHD and 15% fines content.
- The suspended solids concentrations induced in Scenario 2 are approximately 50% of the suspended solids concentrations induced in Scenario 1.
- In the current situation (Scenario 2) bunds are already in place around large part of the outer contours of the islands. As most of the sand placement is done within those bunds, the higher concentrations of the sediment plume are well contained.

Secondary conclusions

- When considering very low suspended solids concentrations, such as those stipulated in the Water Quality Guidelines and General Effluent Standard of 2016, the plume can be seen to spread over larger areas; however, the plume will mainly attach to the shore.
- Wind has an effect, mainly on the smallest suspended sediments. As low concentrations of suspended solids remain in suspension for a long period of time and the tidal flow is weak. During the SW monsoon, an increase of SSC is generated towards the west, whilst in the NE monsoon the main direction of the plume is towards the south.

6 References

[1] QPS, “QPS Maritime Software Solution,” April 2018. [Online]. Available: https://confluence.qps.nl/.

[2] Alphatech , “Alphatech Group of Companies,” 10 September 2024. [Online]. Available: https://alphatech1.com.sg/project/pelican-barge-adi-3/.

[3] Royal HaskoningDHV, “Pasay and Parañaque Reclamation Development - Hydraulic and Morphological Study,” BE8289-R0009-WdH_Phil, 2017.

[4] Woodfields Consultant, Inc., “Review and Detailed Engineering Designs of Comprehensive River Management for San Juan River,” 2015.

APPENDIX Q. HOUSEHOLD PERCEPTION SURVEY REPORT







CITY GOVERNMENT OF PASAY

Household Perception Survey Report of Barangay 76, Pasay City: 360-hectare Reclamation Project (Pasay 360 Project)

Conducted and prepared by Planning and Development Research Foundation, Inc.

2024

TABLE OF CONTENTS

LIST OF TABLES I

LIST OF FIGURES II

1. INTRODUCTION 1

1.1. METHODOLOGY 3
1.1.1. PERCEPTION SURVEY OF 100 RESIDENTS FROM BARANGAY 76 3
1.1.2. PERCEPTION SURVEY OF 30 MEMBERS OF THE FISHERFOLK GROUP IN BARANGAY 76 3
1.2. RESULTS OF PERCEPTION SURVEY 5
1.2.1. RESULTS OF PERCEPTION SURVEY OF 100 RESIDENTS FROM BARANGAY 76 5
1.2.2. RESULTS OF PERCEPTION SURVEY OF 30 MEMBERS OF THE FISHERFOLK GROUP IN BARANGAY 76 29

2. CONCLUSION AND RECOMMENDATIONS 52

LIST OF TABLES

Table 1.1 *Profile of the Household Breadwinners* 7
Table 1.2 Profile of the Household Heads 9
Table 1.3 Prevalent Barangay Health Problems 18
Table 1.4 Household Illness Outbreaks in the last Five (5) years 19
Table 1.5 Household Experienced Illnesses in the last Five (5) years 19
Table 1.6 Preferred Medical Setting 20
Table 1.7 Household Members Mortality 21
Table 1.8 Household and Community Sanitation 22
Table 1.9 Household Education Profile in terms of Educational Setting and Educational Attainment 23
Table 1.10 Respondents' Satisfaction in Community Services and Welfare 24
Table 1.11 Respondents' Awareness of the 360-hectare Reclamation Project 25
Table 1.12 Respondents' Acceptance or Resistance of the 360-hectare Reclamation Project 26
Table 1.13 Respondents' Perceived Benefits and Risks of the Project to Barangay 27
Table 1.14 Respondents' Perceived Benefits of the Project to their Families 28
Table 1.15 Profile of the Household Breadwinners 31
Table 1.16 Profile of the Household Heads 33
Table 1.17 Prevalent Barangay Health Problems 41
Table 1.18 Household Illness Outbreaks in the last Five (5) years 42
Table 1.19 Household Experienced Illnesses in the last Five (5) years 42
Table 1.20 Preferred Medical Setting 43

Table 1.21 Household Members Mortality 43
Table 1.22 Household and Community Sanitation 44
Table 1.23 Household Education Profile 46
Table 1.24 Respondents' Satisfaction in Community Services and Welfare 47
Table 1.25 Respondents' Awareness of the 360-hectare Reclamation Project 48
Table 1.26 Respondents' Acceptance or Resistance of the 360-hectare Reclamation Project 49
Table 1.27 Respondents' Perceived Benefits and Risks of the Project to Barangay 50
Table 1.28 Respondents' Perceived Benefits of the Project to their Families 50

LIST OF FIGURES

Figure 1.1 Photo Documentation of Household Survey (3 and 5 September 2024) 4
Figure 1.2 Age Distribution of the Respondents 5
Figure 1.3 Biological Sex Distribution of the Respondents 6
Figure 1.4 Civil Status Distribution of the Respondents 7
Figure 1.5 Monthly Household Income Distribution 9
Figure 1.6 Tenurial Status of Residence Distribution 12
Figure 1.7 Duration of Residency Distribution 13
Figure 1.8 Number of Household Members Distribution 14
Figure 1.9 Housing Type Distribution 15
Figure 1.10 Housing Materials Distribution 16
Figure 1.11 Cooking Equipment Distribution 17
Figure 1.12 Housing Lighting System Distribution 18
Figure 1.13 Reported Causes of Mortality 21
Figure 1.14 Age Distribution of the Respondents 29
Figure 1.15 Biological Sex Distribution of the Respondents 30
Figure 1.16 Civil Status Distribution of the Respondents 30
Figure 1.17 Monthly Household Income Distribution 32
Figure 1.18 Tenurial Status of Residence Distribution 35
Figure 1.19 Duration of Residency Distribution 36
Figure 1.20 Number of Household Members Distribution 37
Figure 1.21 Housing Type Distribution 38
Figure 1.22 Housing Materials Distribution 39
Figure 1.23 Cooking Equipment Distribution 40
Figure 1.24 Household Lighting System Distribution 41
Figure 1.25 Reported Causes of Mortality 44

1. INTRODUCTION

The Pasay City Government or the "City" through its Joint Venture (JV) partner, the SM Smart City Infrastructure and Development Corporation (SM SCIDC), intends to reconfigure the physical layout of its Project referred to as "reclamation and horizontal land development of three hundred sixty (360) hectares" or the "360-hectare Reclamation Project" (the "Pasay 360" Project) under the original ECC (ECC-CO-1601-0003). The Project is described in the ECC as follows:

> *"The project shall cover the reclamation and horizontal land development of three hundred sixty (360) hectares along the Coast of Manila Bay, City of Pasay. The project is bounded by the coordinates as listed in its Environmental Impact Statement (EIS).*
>
> *The proposed project will include construction of major/primary internal access roads and bridges, and support facilities such as drainage systems, electricity, water supply and pollution abatement facilities involving wastewater treatment systems."*

The reconfiguration of Pasay 360 aims to enhance water circulation and mitigate potential flooding. This Environmental Performance Report and Management Plan (EPRMP) provides the summary of the Project's implementation of its environmental management measures, and the updates on the potential impacts and management plan based on the planned reconfiguration. In compliance with the EPRMP Checklist and as agreed during the EIARC Review Committee Meeting held on 30 August 2024 the EPRMP shall include a Household Perception Survey to establish a baseline data of Barangay 76 and the fisherfolk group – PLAA, a perception survey was conducted on September 2 and 3, 2024. Barangay 76 was represented by 100 randomly selected residents and PLAA was purposively sampled by 30 respondents

Summary of Perception Survey Result of Barangay 76

Most of the 100 respondents who answered the belonged to the adult population of 26-65 years old (91% individuals). They were also represented by 50% male and 47% female, while 3% did not disclose their sex.

In terms of income, the result shows that majority of the household's family monthly income is below the latest poverty threshold of at least PhP13,873 (43% households), 39% are earning between PhP10,001 to PhP20,000.

Among the 100 respondents, 54% are renting a house/room and have been living in Barangay 76 for more than 26 years (27% respondents). Each household is mostly composed of 4-6 members (44%) and is living in a duplex/attached houses (78%).

More than half of the households (53%) did not experience any illness outbreaks in the last five (5) years, while those who experienced it, stated experiencing COVID-19 (21%) and Measles (11%). Their household illnesses in the last five (5) years are due to respiratory problem (43%). Those household members who get sick preferred accessing their community health centers (51%) and public hospital (37%). As regards the mortality, 28% household

members experienced death in the last five (5) years. Known cause reported was due to cardiac arrest (17.9%), COVID-19 (10.7%) and diabetes (10.7%).

In the matter of satisfaction with community services - employment opportunities, health services, peace and order, cleanliness and sanitation, education, infrastructure, utilities, community facilities and amenities, commercial services, barangay services, transportation and disaster management, more than 90% are satisfied.

On project awareness and acceptance, 66% are aware of the 360-hectares reclamation project. Those who are aware have slight understanding of the project (54%). Others have full understanding (5%) and 7% of the respondents do not understand the project at all. Their source of information is mostly the barangay official/employee (32%). Although not all of the respondents know about the project, 95% agreed to having the reclamation project at their barangay for the reasons of perceived opportunities for employment, land expansion, financial and educational assistance, livelihood assistance, reliable infrastructure, support to vulnerable sectors, economic growth, and healthcare assistance. Other respondents mentioned of risks like decrease in fishing area, environmental destruction, flooding, traffic congestion, and overcrowding.

Perception Survey Result of Fisherfolk Group (Pasay Libertad Anglers Association (PLAA) stationed in Barangay 76, Pasay City.

All 30 respondents from PLAA are male. The adult population of 18-65 years old in PLAA represented the group with 24 respondents and are mostly married (60%). Twenty-five (83.3%) respondents said that they are the breadwinner in the family and are earning below the poverty threshold of PhP13,873. Majority of these respondents (96.7% or 29 individuals) are relying on fishing as its main source of income.

In terms of health, the respondents shared that COVID-19 (23.3%) was experienced by their family, followed by chickenpox (13.3%) in the last five (5) years. Common illnesses reported were respiratory problems (80.0%). Those who fell ill preferred to go to community health centers (46.7%) or the public hospital (36.7%). There were also death in the family of 14 respondents due to hypertension (21.4%) and cardiac arrest (14.3%).

On project awareness and acceptance, 73.7% are aware of the 360-hectares reclamation project. Those who are aware have slight understanding of the project (81.8%). Others have full understanding (81.8%) and 13.6% of the respondents do not understand the project at all. Their source of information is mostly their friends/co-members (36.4%). Although not all of the respondents know about the project, 80% or 24 respondents agreed to having the reclamation project for the reasons of perceived opportunities for employment, land expansion, financial and educational assistance, livelihood assistance, healthcare assistance, and continuance of fishing activities.

1.1. METHODOLOGY

1.1.1. PERCEPTION SURVEY OF 100 RESIDENTS FROM BARANGAY 76

The survey team conducted a household perception survey of randomly selected adult residents of Barangay 76, Pasay City on 05 September 2024 (Figure 1.1). The primary goal of the survey was to understand the current situation of the community through its representative population, and gather their issues and concerns related to the 360-hectare Reclamation Project. The information collected during the survey will enable the proponent to create plans, programs and activities in the SDP and IEC that will help enrich the lives of the community as the Reclamation Project progresses.

The respondents were selected randomly and were gathered in a venue for a face-to-face survey. They were provided with a survey questionnaire using self-administered structured questions. The questionnaire contains dichotomous questions, multiple choice and open-ended questions. The questionnaire has four (4) main parts: 1) respondent and household characteristics, 2) health and sanitation, 3) household profile, 4) satisfaction of the respondents to the current state of the community, and 5) project awareness and concerns. Participants were also personally informed regarding the non-disclosure of their identity without proper consent.

The margin of sampling error used was ± 10.0 percent at a 90 percent confidence level. Using the Slovin's Formula for 6,404 households, we have:

$$n = \frac{N}{1 + N\,e^2} \qquad \text{(Equation 1)}$$

where N = population size, n = sample size, and e = margin of error

$$n = \frac{6404}{1 + 6404\,(0.10)^2} = \frac{6404}{1 + 6404\,(0.10)^2} = \frac{6404}{65.04} \approx 100$$

Therefore, given the calculations above, the survey team gathered 100 residents residing in Barangay 76, Pasay City as its respondents.

1.1.2. PERCEPTION SURVEY OF 30 MEMBERS OF THE FISHERFOLK GROUP IN BARANGAY 76

The survey team has conducted a household perception survey of fisherfolk group named Pasay Libertad Anglers Association (PLAA) stationed in Barangay 76, Pasay City on 03 September 2024 (Figure 1.1). The primary goal of the survey was to understand the current status of this fisherfolk group, and their issues and concerns related to the 360-hectare Reclamation Project. The information collected during the survey will enable the proponent to create plans, programs and activities in the SDP that will help improve the lives of the PLAA members and to mitigate the risks to their livelihood as the Reclamation Project progresses.

The selection of respondents was done by using a purposive sampling method as they are directly affected by the ongoing construction activities for the Reclamation Project. The

respondents were gathered at their wharf for a face-to-face self-administered survey. All 60 members were invited to participate in the survey through their president, 30 members responded. The respondents were provided with a survey questionnaire using structured questions. The questionnaire contains dichotomous questions, multiple choice and open-ended questions. The questionnaire has four (4) main parts: 1) respondent and household characteristics, 2) health and sanitation, 3) household profile, 4) satisfaction of the respondents to the current state of the community, and 5) project awareness and concerns. Participants were also personally informed regarding the non-disclosure of their identity without proper consent.



Figure 1.1 Photo Documentation of Household Survey (3 and 5 September 2024)

1.2. RESULTS OF PERCEPTION SURVEY

1.2.1. RESULTS OF PERCEPTION SURVEY OF 100 RESIDENTS FROM BARANGAY 76

Respondent and Household Characteristics

A. Profile of the Respondents

Figure 1.2 shows the respondents' age distribution, the one answering the survey form, or a representative of the selected 100 households.

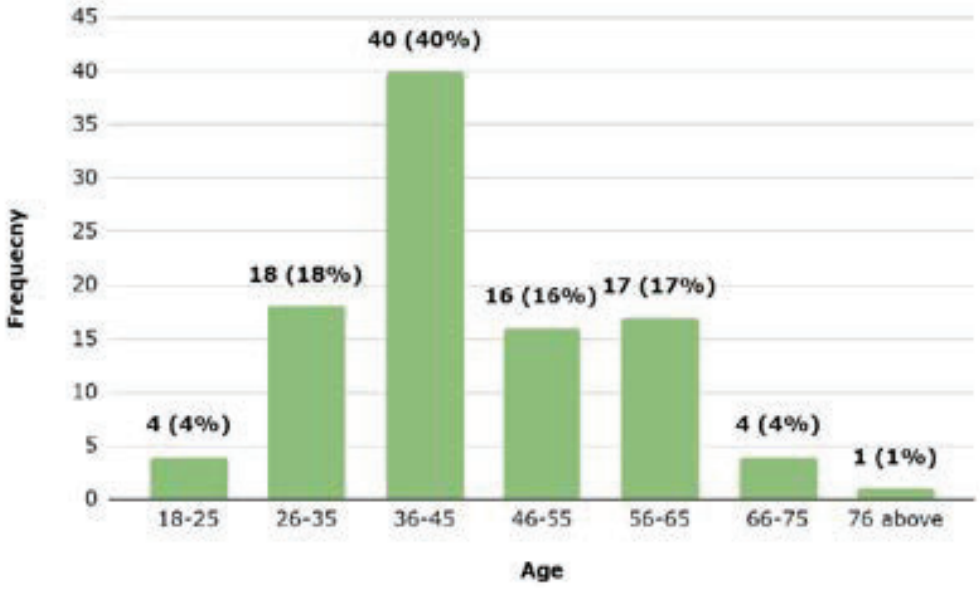


Figure 1.2 Age Distribution of the Respondents

The majority of the respondents belong to the adult population with ages 26-65, accounting to 91% of the respondents. Four respondents belong to the youth aged 18-25. Also, those who are aged 76 years and above are underrepresented as well (n = 1, 1%).

The survey also asked the biological sex of the respondents as part of the profiling. Results revealed that there is an almost equal representation between the biological sexes. Half of the respondents were Male (50%), while there is a slight decrease of women's percentage (47%). Three respondents failed to provide their biological sexes.

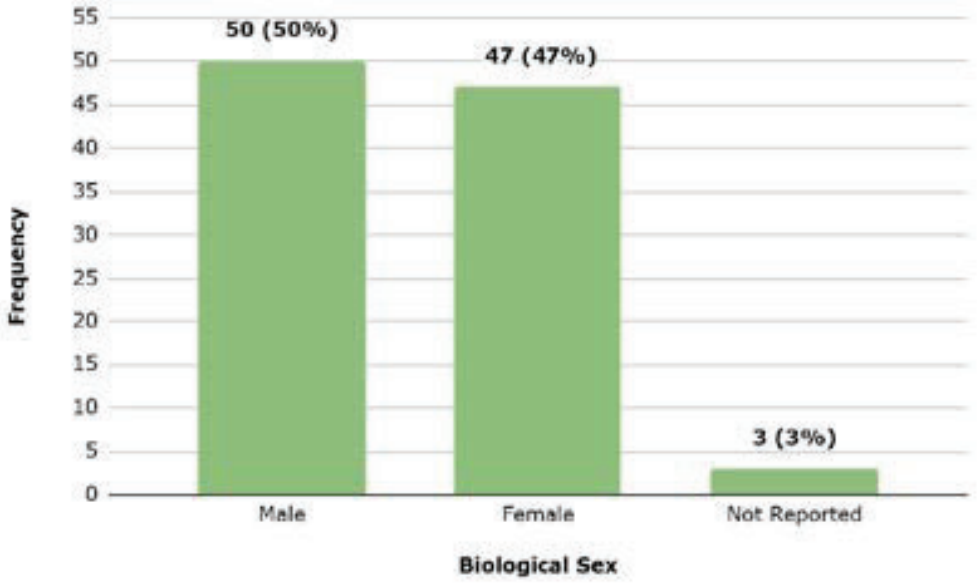


Figure 1.3 Biological Sex Distribution of the Respondents

Meanwhile, **Figure 1.4** depicts the respondents' civil status distribution, revealing that the majority are single (*n* = 38, 38%), followed closely by those who declared they belong to the married population (*n* = 36, 36%). Respondents who are separated have the lowest contribution, with three recorded observations. Five respondents did not disclose their respective civil statuses.

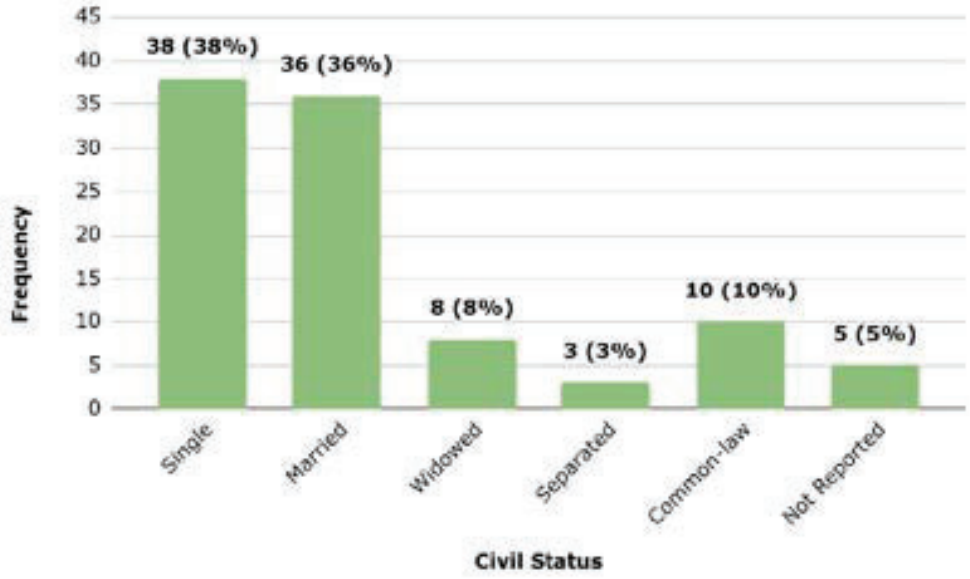


Figure 1.4 Civil Status Distribution of the Respondents

B. Profile of the Household Breadwinners

Among the one hundred (100) respondents, majority of breadwinners were fathers, accounting for 55%, followed by mothers with 22% share, then by sons at 11%. Also, there are respondents who reported living alone (2%).

Table 1.1 *Profile of the Household Breadwinners*

Characteristics	Frequency (*n*)	Percentage (%)
Household Breadwinner		
Father	55	55.0
Mother	22	22.0
Daughter	8	8.0
Son	11	11.0
Relative	2	2..0
Living Alone	2	2.0
Occupation Type		
Government Employee	52	52.0
Private Employee	20	20.0

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Characteristics	Frequency (*n*)	Percentage (%)
Laborer/Contractual Job	21	21.0
Business Owner	3	3.0
Unemployed	1	1.0
Not Reported	3	3.0
Occupation Location		
Within Barangay 76	68	68.0
Other Barangay in Pasay City	15	15.0
Other Location in Metro Manila	16	16.0
Not Reported	1	1.0

N = 100.

In addition, the majority were employed in government (52%), followed by laborers/contractual jobs (21%), then closely by those who are working in the private sector with 20% share. Only one (1) respondent was unemployed during the survey, while three (3) did not report the household breadwinner's occupation. Most breadwinners were also relatively near in their respective occupations, working within Barangay 76 (68%). All others are working in other barangay in Pasay or other cities within Metro Manila. One respondent did not report their occupation location.

C. Income Profile

Figure 1.5 depicts the respondents' monthly household income distribution. Findings reveal that most of the respondents and their households are earning way below the latest poverty threshold of at least PHP 13,873 to meet their minimum basic food per month for a family of five (5).

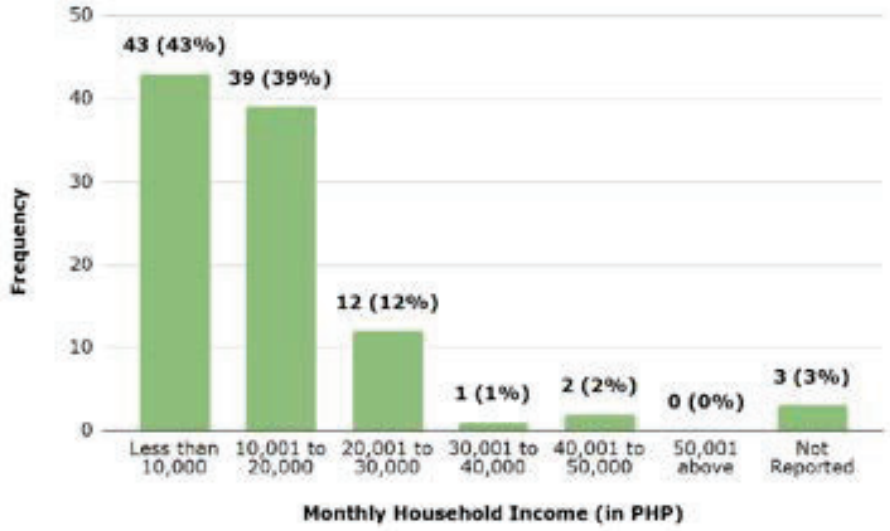


Figure 1.5 Monthly Household Income Distribution

Forty-three (43) households were earning less than PHP 10,000 monthly, followed by those who earn within 10,001 to 20,000 (*n* = 39, 39%). Only three households earn PHP 30,001 to PHP 50,000, with none of them belonging to higher income brackets. Meanwhile, three of the respondents did not state their income classifications.

D. Profile of the Household Heads

The majority of the household heads were fathers (*n* = 56, 56%), followed by respondents reporting that the mothers were the head of the family (*n* = 29, 29%). Also, there are two respondents who are living alone, while four failed to provide an answer. In terms of the highest educational attainment of the household heads, the majority are at least started (*n* = 17, 17%) or high school graduates (*n* = 34, 34%). This result is followed by those who stated that they accomplished (*n* = 13, 13%), or at least started college (*n* = 23, 23%).

Table 1.2 Profile of the Household Heads

Characteristics	Frequency (*n*)	Percentage (%)
Household Head		
Father	56	56.0
Mother	29	29.0

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Characteristics	Frequency (*n*)	Percentage (%)
Daughter	5	5.0
Son	4	4.0
Living Alone	2	2.0
Not Reported	4	4.0
Educational Attainment		
Elementary Undergraduate	7	7.0
Elementary Graduate	4	4.0
High School Undergraduate	17	17.0
High School Graduate	34	34.0
College Undergraduate	13	13.0
College Graduate	23	23.0
Post Graduate	1	1.0
Not Reported	1	1.0
Religion		
Roman Catholic	93	93.0
Iglesia ni Cristo	1	1.0
Born Again	2	2.0
Islam	1	1.0
Church of Latter-Day Saints	1	1.0
Not Reported	2	2.0
Place of Birth		
Luzon[a]	79	79.0
Visayas[b]	15	15.0
Mindanao[c]	5	5.0
Not Reported	1	1.0
Ethnic Origin		
Tagalog	56	56.0
Ilocano	7	7.0
Kapampangan	4	4.0

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Characteristics	Frequency (*n*)	Percentage (%)
Bicolano	8	8.0
Bisaya	9	9.0
Waray	7	7.0
Cebuano	6	6.0
Muslim	1	1.0
Maranao	1	1.0
Not Reported	1	1.0

N = 100.
[4]Some parts of Metro Manila, Bicol, Aurora, Bataan, Cagayan Valley, Cavite, Isabela, La Union, Laguna, Masbate, Pampanga, Tarlac, Zambales
[5]Iloilo, Leyte, Bohol, Cebu, Samar, Negros Island
[6]Lanao Del Norte, Davao, Unspecified (*nl* = 1).

Moreover, the participants are mostly affiliated with the Roman Catholic Church (*n* = 93, 93%), residing in Luzon (*n* = 79, 79%), including some cities of Metro Manila and some portion of Regions 1 and 2, most of Central and Southern Luzon, followed by those who have Visayan descent (*n* = 15, 15%%). Mindanao has five representatives originally coming from Lanao Del Norte and Davao (*n* = 5, 5%) with one unspecified location. Since the majority has origins in Central and Southern Luzon, more than half (56%) has Tagalog descent, followed by Bisaya with 9% share, then by Bicolanos (8%).

E. Housing Characteristics

1. Tenurial Status of Residence

Of the respondents, 98 individuals have declared their tenure housing status. Majority of respondents resided in a rented house or room (54%), followed by those who own their house and lot (26%), then by those in rent-free housing with the owner's consent (16%). Meanwhile, two respondents did not answer this question.

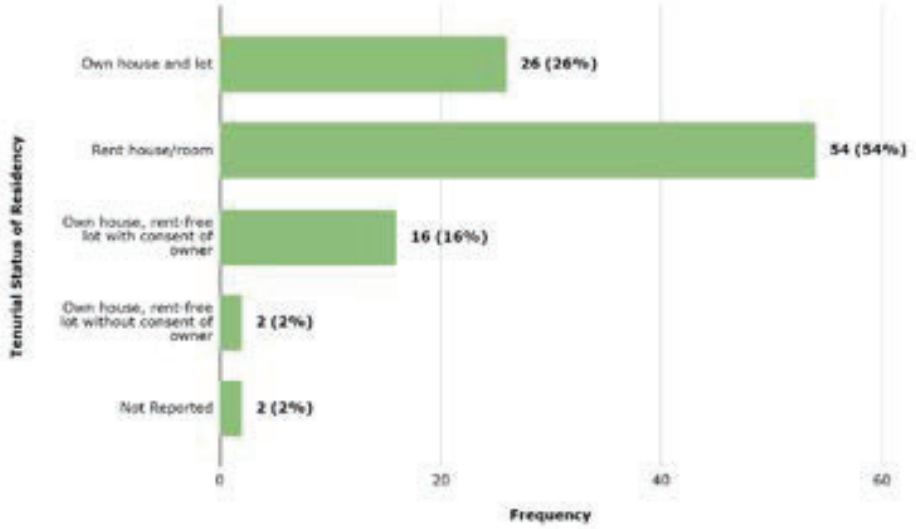


Figure 1.6 Tenurial Status of Residence Distribution

These findings, however, do not corroborate with the latest census by the Philippine Statistics Authority (PSA), as most of the occupied housing units in the country were owned, both house and lot, by the majority of households. This finding suggests that of the respondents from Barangay 76, most still do not possess land titles or have ownership of permanent housing.

2. Duration of Residency

Figure 1.7 shows the respondents' duration of residency frequency distribution. Most are relatively old residents of their barangay, with 26 years and above duration (27%). This result is followed by those living in their residence for 11-15 years (20%), then by a tie between 1-5 and 16-20 years length of residence, both accounting for 15% share.

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

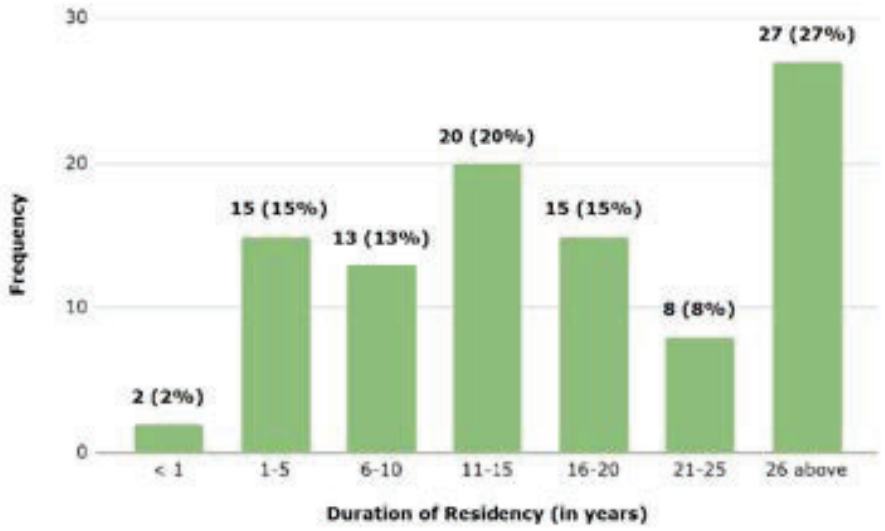


Figure 1.7 Duration of Residency Distribution

3. Number of Household Members

To further determine and observe the housing characteristics of the household respondents, the survey asked the respondents, the number of individuals belonging to the household.

Most households had 4-6 members (n = 44, 44%), followed by those who had 1-3 household members (n = 30, 30%). Only 8 (8%) households have more than ten (10) household members. Interestingly, these results follow the 2020 Census of Population and Housing (CPH) of PSA, where they found an average of 4.3 household members in the occupied housing units, a minimal decline from 4.5 members in 2015 POPCEN data.

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

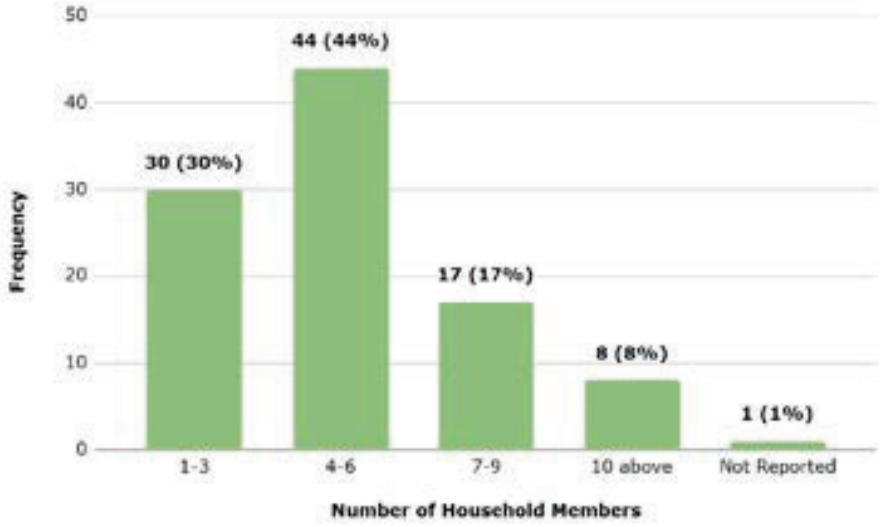


Figure 1.8 Number of Household Members Distribution

4. Housing Type

Figure 1.9 depicts the housing type distribution among the household respondents. In this survey context, the current PSA definition of single houses and multi-unit residential, among others was used as basis (refer to 2020 Census of Population and Housing Technical Notes). However, for duplexes, we will extend its current definition to cater to those dwelling with attached houses or housing units with other units adjacent to their walls.

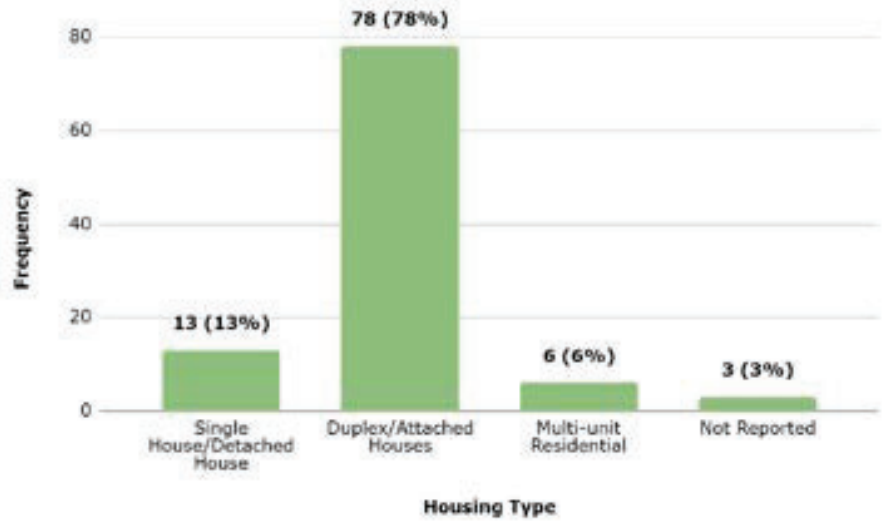


Figure 1.9 Housing Type Distribution

Results revealed that the majority of the respondents are currently dwelling in duplex or attached houses (*magkakadikit na mga bahay*) (*n* = 78, 78%), followed by single house or detached houses inhabitants (*n* = 13, 13%). Only six respondents reported living in a multi-unit residential (i.e., condominium). Three respondents did not report their housing type.

5. Housing Materials

Figure 1.10 presents the housing materials, or the most present material in each housing unit distribution. Findings show that most houses were made of a combination of concrete and wood (i.e., lumber, plywood, etc.) (*n* = 58, 58%), followed by all concrete housing units (*n* = 36, 36%). Only one household still preserves the usage of indigenous materials, such as nipa, bamboo, rattan, cogon, and others. Five respondents did not state their housing materials/composition, while other categories have zero responses.

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

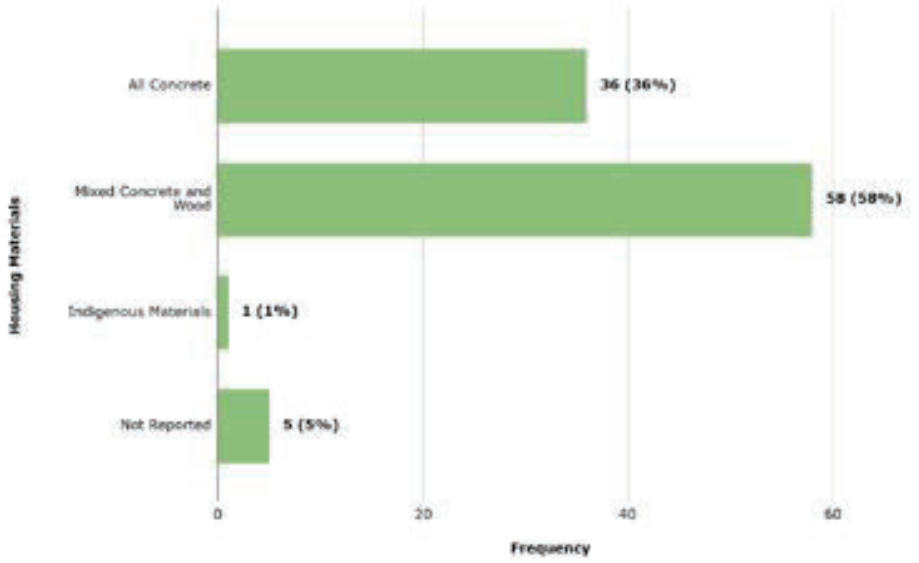


Figure 1.10 Housing Materials Distribution

6. Cooking Equipment

The majority of households also utilize gas stoves as their primary means of cooking their food (n = 90, 87.4%). Following this result are those using gasoline (n = 7, 6.8%), then those using electric stoves/cookers (n = 3, 2.9%). Note that the percentages do not add up to exactly 100% since some respondents had two or more answers. Interestingly, the 2020 Census supports this result, with LPG (liquified petroleum gas) still popularly used for cooking in the country (N = 12.6 Million, 47.9%).

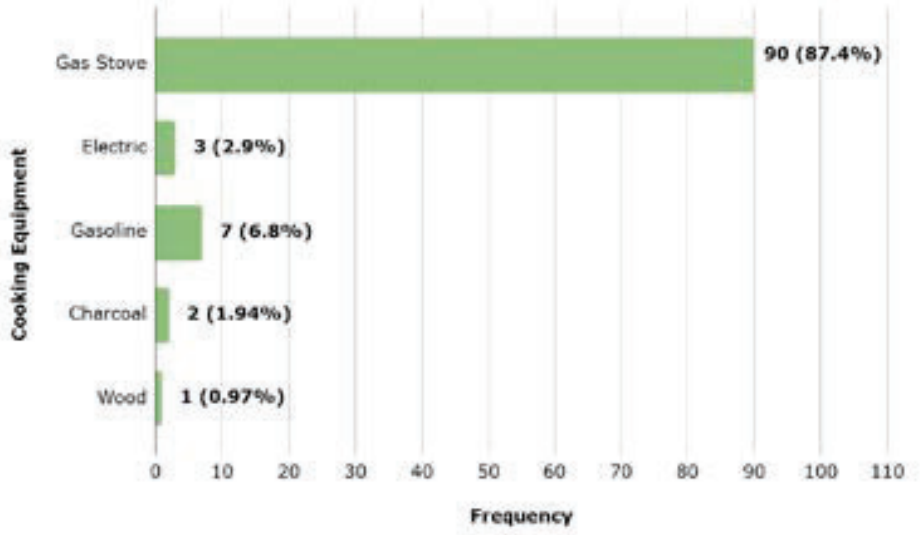


Figure 1.11 Cooking Equipment Distribution

7. Household Lighting System

As the last part of determining the housing and household characteristics, the survey acquired data regarding the household lighting system. Results showed that the great majority of households are heavily reliant on electricity to light their houses (n = 92, 92%). Other categories such as gas lamps, candlelight, and solar light have no responses. Also, there are eight (8) respondents that did not answer this question.

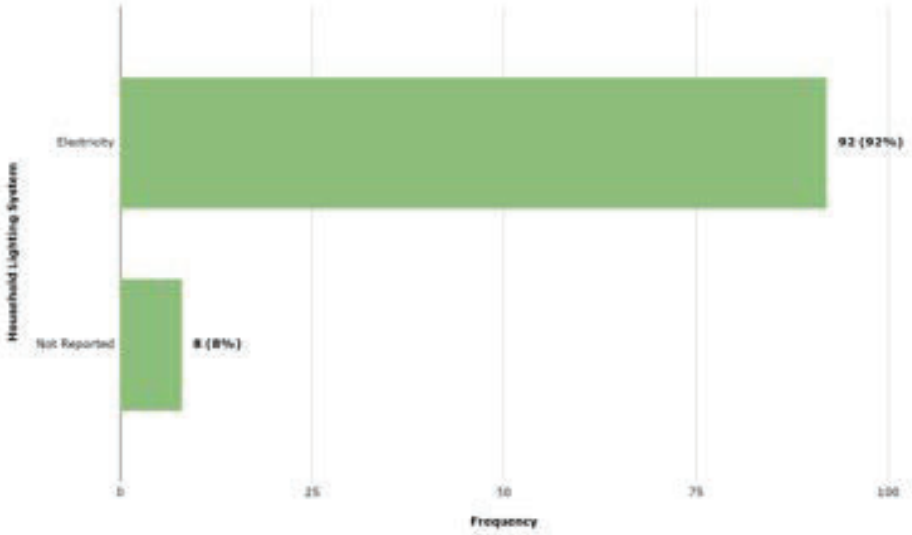


Figure 1.12 Housing Lighting System Distribution

This result corroborates with the 2020 PSA CPH report for fuel for lighting in the country, where they recorded that about 24.3 Million (92.2%) households have access to electricity as their primary source of a lighting system.

II. Household Health and Sanitation

A. Health

1. Barangay Health Problems

Almost half of the respondents stated that there were no health problems or issues at all in their barangay (48%), with 30% did not report any problems. Meanwhile, a significant portion (22%) stated the shortage of healthcare practitioners, medicine supplies, and ambulances. Moreover, some 4% raised issues on lack of reliable facilities and limited access to health and urban centers.

Table 1.3 Prevalent Barangay Health Problems

Health Problems	Frequency (*n*)	Percentage (%)
Shortage of Physicians	6	6.0
Shortage of Medicine	13	13.0
Shortage of Ambulances	3	3.0

Lack of Facilities	2	2.0
Limited Access to Health and Town/Urban Centers	2	2.0
None	48	48.0
Not Reported	30	30.0

Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

2. Household Illness Outbreaks and Other Health Concerns

Fifty- three (53%) respondents stated that they did not experience any outbreaks in their household for the last five years. Many respondents were impacted by the recent COVID-19 pandemic (21%). Other outbreaks, including chickenpox, measles, and dengue, were also declared, amounting to 9 responses. Refer to **Table 1.4** for the tabulation of results.

Table 1.4 Household Illness Outbreaks in the last Five (5) years

Illness Outbreaks (last 5 years)	Frequency (*n*)	Percentage (%)
Chickenpox (*Bulutong*)	2	2.0
Dengue	3	3.0
COVID-19	21	21.0
Measles *(Tigdas)*	11	11.0
Others*	6	6.0
None	53	53.0
Not Reported	7	7.0

Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.
*Cough (*n* = 1), Fever (*n* = 1), Cold (*n* = 1), Flu (*n* = 1), High Blood Pressure (*n* = 1), Kidney Disease (*n* = 1)

Table 1.5 Household Experienced Illnesses in the last Five (5) years

Illnesses/Other Health Concerns (last 5 years)	Frequency (*n*)	Percentage (%)
Respiratory Issues	43	43.0
Infectious Diseases	5	5.0
Chronic Health Conditions	6	6.0

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Illnesses/Other Health Concerns (last 5 years)	Frequency (*n*)	Percentage (%)
General Symptoms	32	32.0
None	32	32.0
Not Reported	22	32.0

Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

In addition to **Table 1.5** results, the respondents experienced health concerns, including respiratory issues (i.e., cough, cold, and flu) (43%), infectious diseases (i.e.,chickenpox, COVID-19) (5%), chronic health conditions (i.e., diabetes, heart problems, high blood pressure, and kidney disease) (6%), and general symptoms (i.e., fever, allergies. Body ache, LBM) (32%). Among the respondents, thirty-two (32%) reported that they did not experience any health concerns within the last five years, while twenty-two (22%) did not respond to this question.

3. Preferred Medical Setting / Healthcare Provider

Table 1.6 Preferred Medical Setting

Medical Setting	Frequency (*n*)	Percentage (%)
Self-medication/Own House	12	12.0
Community Health Centers	51	51.0
Public Hospital	37	37.0
Private Hospital	8	8.0
Private Clinic	2	2.0
Mobile Clinic	1	1.0
Herbalist	2	2.0
Faith Healer	1	1.0
Not Reported	1	1.0

Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

Furthermore, the respondents' reliance on free, public, and easily accessible healthcare facilities, including community health centers (51%) and public hospitals (37%), is noticeable. Some still prefer to medicate themselves in the comfort of their homes (12%), with two prefer using herbal medications. In addition, some prefer to consult in private hospitals (8%) and

private clinics (2%). These results further highlight the need of the people, especially marginalized sectors, for reliable, efficient, and free access to healthcare.

4. Mortality

Table 1.7 Household Members Mortality

Household Member/s Mortality (last 5 years)	Frequency (*n*)	Percentage (%)
Yes	28	28.0
No/None	72	72.0

When asked if any household members died in the last five years, the majority responded No/None (72%), while twenty-eight answered Yes (28%). Of those who experienced household member death, most (21.4%) did not disclose the reasons or cause of that mortality, with one (3.6%) unknown. Meanwhile, the recorded causes of death primarily include cardiac arrest (17.9%), cancer (7.1%), and vehicular accidents (7.1%).

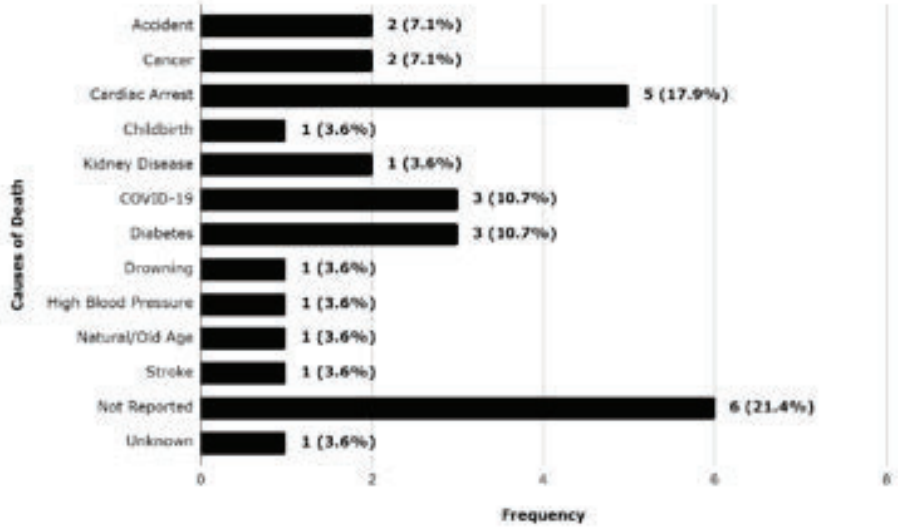


Figure 1.13 Reported Causes of Mortality

B. Sanitation

In the context of household and community sanitation and other necessary utilities, the respondents were asked about their water sources, ownership and access to bath facilities and sewage systems, and waste management.

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Table 1.8 Household and Community Sanitation

Aspects	Frequency (*n*)	Percentage (%)
Sources of Drinking Water		
Local Water District	33	33.0
Mineral Water Station	62	62.0
Fetching from other location	2	2.0
Deep well *(Electric)*	3	3.0
Sources of Water for Household Use		
Local Water District	88	88.0
Fetching from other location	2	2.0
Deep well *(Electric)*	5	5.0
Deep well *(Manual)*	5	5.0
Type of Bathroom Facility		
Communal (with toilet bowl)	10	10.0
Communal (with hole only)	3	3.0
Owned (with toilet bowl)	84	84.0
Owned (with hole only)	2	2.0
Not Reported	1	1.0
Owned Septic Tank/Poso Negro		
Yes	88	88.0
No/None	12	12.0
Existing Regular Waste Collection		
Yes	91	91.0
No/None	9	9.0
Alternative Waste Disposal		

Waiting for Scheduled Collection	95	95.0
Burning	3	3.0
Waste disposal to other location	1	1.0
Not Reported	1	1.0

Note. Categories with zero values are excluded in the presentation.

The respondents' sources of drinking water are primarily from mineral water stations (62%), followed by those who are acquiring from the local water district or their own faucet (33%). In addition, other household uses of water, such as cooking and bathing, were from the local water district (88%). These results follow the PSA CPH 2020 data, as these sources are widely used in households in the country.

Among the respondents, eighty-four (84%) have ownership and access to improved bathroom facilities, followed by those who are using improved communal or public bathroom facilities

With regard to waste management, most respondents stated that there is regular waste collection in their barangay (91%), while nine stating the opposite (9%). Almost all of them have no alternative (95%), but to wait for the scheduled disposal or collection. Others are burning their waste (3%).

III. Household Education Profile

Table 1.9 Household Education Profile in terms of Educational Setting and Educational Attainment

Aspects	Frequency (*n*)	Percentage (%)
Household Member/s studied/studying in a public school		
Yes None Not Reported	84 12 4	84.0 12.0 4.0
Household Member/s studied/studying in a private school		
Yes None Not Reported	26 62 12	26.0 62.0 12.0
Household Member/s who completed High School		
Yes	89	89.0

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
None Not Reported	6 5	6.0 5.0
Household Member/s who completed College		
Yes None Not Reported	50 42 8	50.0 42.0 8.0

The respondents were also asked about the household member's access to educational institutions and their respective educational attainment. The majority of household members studied or are studying in public schools (84%), while some portion were in private schools (26%). Some may have access to both. Moreover, the great majority accomplished high school (89%), while half of the sample (50%) finished their bachelor's degree programs. **Table 1.9** shows the comprehensive tabulation of the results.

IV. Satisfaction on Community Services and Welfare

Table 1.10 below summarizes the respondents' satisfaction rating on different aspects concerning community services and welfare. All of the aspects or dimensions of community welfare were rated highly, garnering satisfaction rating within the range of 90-98%. Infrastructure is the highest (98%), followed by peace and order (97%), then by a tie between transportation and utilities (96%), while employment got the lowest rating, but still at 90%. These results suggest that the current state of community welfare is impressive but still needs some improvement, especially in providing sufficient job opportunities for the constituents.

Table 1.10 Respondents' Satisfaction in Community Services and Welfare

Aspects	Rating		
	Satisfied n (%)	Dissatisfied n (%)	Not Reported n (%)
Employment Opportunities	90 (90.0)	9 (9.0)	1 (1.0)
Health and Well-being	95 (95.0)	4 (4.0)	1 (1.0)
Peace and Order	97 (97.0)	2 (2.0)	1 (1.0)
Cleanliness and Sanitation	93 (93.0)	6 (6.0)	1 (1.0)
Education	92 (92.0)	7 (7.0)	1 (1.0)

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Aspects	Rating		
	Satisfied n (%)	Dissatisfied n (%)	Not Reported n (%)
Infrastructure	98 (98.0)	1 (1.0)	1 (1.0)
Utilities	96 (96.0)	1 (1.0)	3 (3.0)
Community Facilities and Amenities	92 (92.0)	5 (5.0)	3 (3.0)
Commercial Services	93 (93.0)	4 (4.0)	3 (3.0)
Barangay Services	94 (94.0)	3 (3.0)	3 (3.0)
Transportation	96 (96.0)	1 (1.0)	3 (3.0)
Disaster Management	92 (92.0)	5 (5.0)	3 (3.0)

Legend: *n* = frequency, % = corresponding percentage

V. Project Awareness and Concerns

A. Project Awareness and Acceptance

The respondents' awareness of the reclamation project was determined using dichotomous options (Yes and No/None). Results revealed that most respondents, or any household members, are aware of the project (*n* = 66, 66%), while the rest are not.

Table 1.11 Respondents' Awareness of the 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
Respondent, or Household Members, is/are aware about the project		
Yes	66	66.0
No/None	34	34.0
Extent of Awareness and Knowledge of the Respondent (if aware)		
No Awareness/Understanding	7	7.0
Slightly Aware/Basic Understanding	54	54.0
Fully Aware/Full Understanding	5	5.0
Source/s of information (if aware)		
Barangay Official/Employee	32	32.0
Friends/Neighbors/Relatives	16	16.0
Pasay City LGU Employee	18	18.0

Aspects	Frequency (*n*)	Percentage (%)
Internet	10	10.0

Note. For the second aspect/question, the number of observations is 66 since this is the number of respondents who have awareness of the project. For the third aspect/question, frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

Among those who answered Yes, the majority had a basic understanding and awareness of the project (54%). This awareness is disseminated by barangay officials and employees. Refer to **Table 1.12** for a comprehensive tabulation of results. These results reveal the need to enhance information and education campaign to increase the level of awareness of the community.

Table 1.12 Respondents' Acceptance or Resistance of the 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
Respondents' Acceptance of the Project		
Agree	95	95.0
Disagree	5	5.0
Reason of Acceptance		
Employment	11	11.0
Reliable Infrastructure	2	2.0
Land Expansion	1	1.0
Cleanliness and Order	3	3.0
Economic Growth	2	2.0
Beneficial to Community Welfare	10	10.0
Tourism/Aesthetics	4	4.0
Reason for Resistance		
Disorder, Environmental Destruction	2	2.0
Did not state any reason	48	48.0

N = 100. Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

The respondent's acceptance or project's approval was determined using binary options (Agree and Disagree). Results revealed a consensus of the respondents, backing the reclamation project. The majority agreed (95%) with the project's existence in their barangay, while only five respondents disagreed (5%).

Moreover, the participants were also allowed to provide reasons for their agreement or disagreement. Almost half of them agreed but did not state any reasons (48%). Among the respondents who provided reasons, the most common answer is that they perceived this

project as highly beneficial to overall community welfare and as an avenue to create livelihood programs and employment. Some of them were also concerned about the impact of such a project on the environment and order in the community.

B. Respondents' Perceived Benefits and Risks of the Project to Barangay and Families

More specifically, the perceived benefits and risks of the project to Barangay 76, the following tables (**Table 1.13** and **Table 1.14**) summarize the responses. Findings revealed that employment opportunities are the most common response (75%). In light of this result, other relevant aspects, including economic growth (8%) and creating livelihood programs (10%), were also mentioned.

Table 1.13 Respondents' Perceived Benefits and Risks of the Project to Barangay

Aspects	Frequency (*n*)	Percentage (%)
Benefits		
Employment Opportunities	75	75.0
Economic Growth	8	8.0
Financial Assistance	2	2.0
Creation of Livelihood	10	10.0
Land Expansion	2	2.0
Business Expansion	3	3.0
Provision of Facilities	1	1.0
Tourism/Aesthetics	5	5.0
Cleanliness	6	6.0
Peace and Order	4	4.0
Effective Barangay/Government Services	5	5.0
Additional Source of Barangay Income	3	3.0
Provision of Housing	1	1.0
Reliable Project	2	2.0
Risks		
Decrease in Fishing Area, Production	1	1.0
Flooding	11	11.0
Traffic Congestion	4	4.0

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
Security Concerns	1	1.0
Littering	1	1.0
Earthquake	1	1.0
Overcrowding	1	1.0
Environmental Destruction	1	1.0
Others		
Not response	7	7.0

Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

On the other hand, risks, such as flooding (11%) and traffic congestion (4%) are the primary issues raised by the respondents. Only one of the respondents identified the risk of, the decrease in fishing areas. Seven did not report any benefits and risks (7%). Issues concerning security, overcrowding, waste mismanagement, and environmental destruction were also stated by the respondents.

Table 1.14 Respondents' Perceived Benefits of the Project to their Families

Benefits	Frequency (*n*)	Percentage (%)
Support to Vulnerable and Marginalized Sectors	38	38.0
Peace and Order	6	6.0
Inclusive Economic Growth	72	72.0
Institutional Support	16	16.0
Healthcare	34	34.0
Not Reported	1	1.0

Note. The frequencies and percentages do not add up exactly to 100 (100%) due to multiple answers per item.

Furthermore, **Table 1.14** provides the perceived benefits of the project to their families, including the inclusive economic growth (i.e., long-term employment, livelihood programs, and business expansion) (72%), assistance to several marginalized or vulnerable sectors (elderly, youth/students, women, and PWDs) through scholarships and social services provision (38%). Healthcare (34%) is the third most popular answer among the respondents. They believe that this project might help in building reliable healthcare facilities and aid in medical services.

1.2.2. RESULTS OF PERCEPTION SURVEY OF 30 MEMBERS OF THE FISHERFOLK GROUP IN BARANGAY 76

Respondent and Household Characteristics

A. Profile of the Respondents

Figure 1.14 shows the respondents' age distribution, the one answering the survey form, or a representative of the selected fisherfolk group. A total of 30 respondents were purposely selected based on the main inclusion criteria, their area of occupation as fisherfolks to determine their perception of the 360-hectare reclamation project.

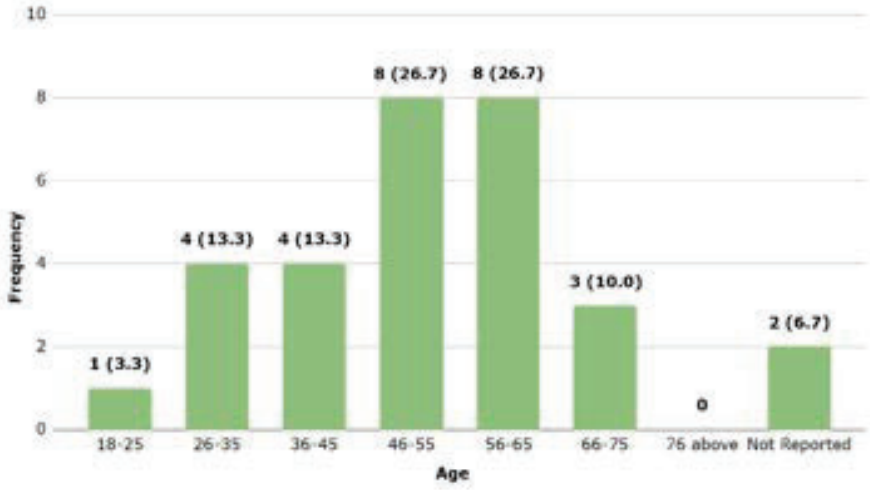


Figure 1.14 Age Distribution of the Respondents

The majority of the respondents belong to the adult population with ages 26 and above, including senior citizens. Only one respondent belongs to the youth aged 18-25. Also, those who are aged 76 years and above are underrepresented as well. Meanwhile, two (2) respondents failed to provide their respective ages.

The survey also asked the biological sex of the respondents as part of the profiling. All of the respondents were men (N = 30). This result suggests and supports the overwhelming participation of men in the fisheries sector, even in a smaller sample. Ferrer et al. (2017) confirmed the domination of men in mariculture in all phases of its operations, as they were perceived to take a job in that industry. Also, men have more access to higher-valued marine organisms (Torell et al., 2020). For visualization purposes, **Figure 1.15** shows the distribution of biological sexes.

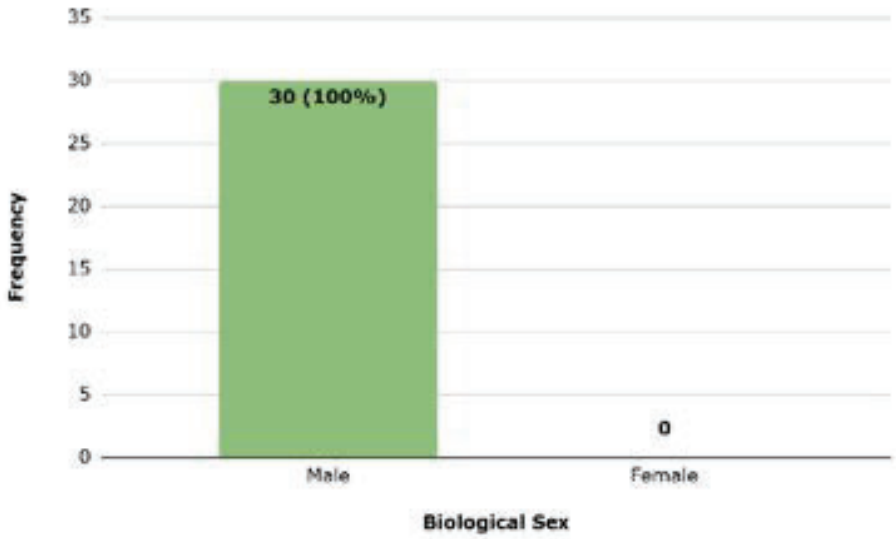


Figure 1.15 Biological Sex Distribution of the Respondents

Meanwhile, **Figure 1.16** depicts the respondents' civil status distribution, revealing that the majority are married (n = 18, 60%), followed by those who declared they belong to the single population (n = 5, 16.7%). Respondents who are either widowed or separated have the lowest contribution, with one (1) participant each.

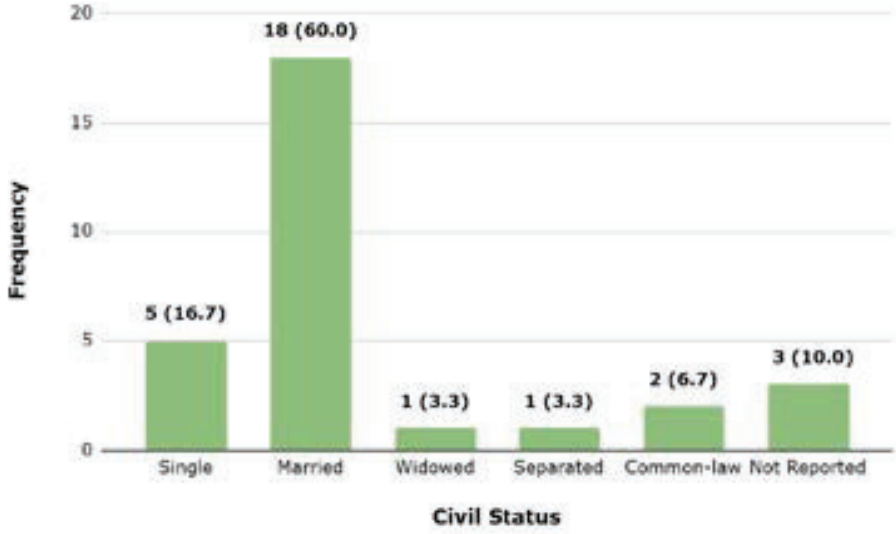


Figure 1.16 Civil Status Distribution of the Respondents

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

B. Profile of the Household Breadwinners

Among the thirty (30) fisherfolk respondents, the majority were also breadwinners, accounting for 83.3%. Following this are daughters at 6.7%, then by the three-way tie between mother, son, and relative with 3.3% share each.

Table 1.15 Profile of the Household Breadwinners

Characteristics	Frequency (*n*)	Percentage (%)
Household Breadwinner		
Father	25	83.3
Mother	1	3.3
Daughter	2	6.7
Son	1	3.3
Relative	1	3.3
Occupation Type		
Fishing	29	96.7
Government Employee[a]	1	3.3
Occupation Location		
Within Barangay 76	14	46.7
Other Barangay in Pasay City	11	36.7
Other Location in Metro Manila	5	16.7

N = 30.
[a]Public School Teacher
*Categories with zero values are excluded in the presentation.

The rest of the household members shared a minute portion of the distribution. In addition, their occupation is also homogenous due to the sampling technique, where almost all are fisherfolks. Only one respondent deviates, a breadwinner daughter working in the government as a public-school teacher. Most breadwinners were also relatively near in their respective occupations, working within Barangay 76 (*n* = 14, 46.7%) or another barangay in the same city, Pasay (*n* = 11, 36.7%). All others are working in other cities but still within Metro Manila.

C. Income Profile

According to a preliminary poverty assessment conducted by the Philippine Statistics Authority in 2021, the fisherfolk, with farmers, children, and residents in rural areas, remained one of the poorest sectors in the country. This situation remains the same as the 2015 and 2018 poverty statistics report indicated. This statistic is also consistent with the results of this survey.

The majority of the respondents and their households are earning way below the latest poverty threshold of at least PHP 13,873 to meet their minimum basic food per month for a family of five (5) (*n* = 17, 56.7%). This result is followed by those whose monthly household incomes are within the 10,001 to 20,000 income bracket.

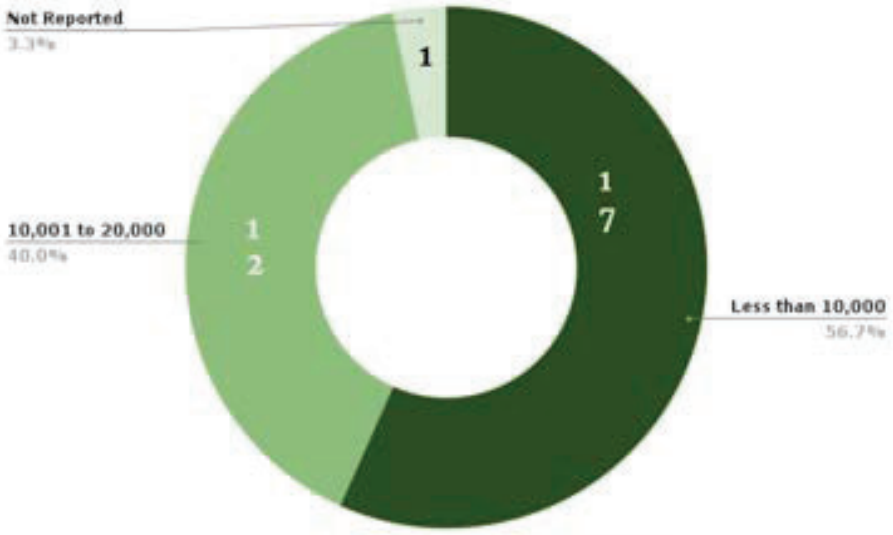


Figure 1.17 Monthly Household Income Distribution

One respondent did not declare their income. Other categories with zero values were omitted from the presentation of the result to emphasize the relevant and significant results. **Figure 1.17** shows the number and percent share of respondents according to their income classifications.

D. Profile of the Household Heads

The majority of the household heads were also fathers (*n* = 27, 90%), with only three respondents reporting that the mothers were the head of the family. In terms of the highest educational attainment of the household heads, the majority are at least started (*n* = 5, 16.7%) or high school graduates (*n* = 11, 36.7%). Only one participant each, meanwhile, stated that they accomplished (*n* = 1, 3.3%), or at least started college (*n* = 1, 3.3%).

Table 1.16 Profile of the Household Heads

Characteristics	Frequency (*n*)	Percentage (%)
Household Head		
Father	27	90.0
Mother	3	10.0
Educational Attainment		
Elementary Undergraduate	6	20.0
Elementary Graduate	6	20.0
High School Undergraduate	5	16.7
High School Graduate	11	36.7
College Undergraduate	1	3.3
College Graduate	1	3.3
Religion		
Roman Catholic	28	93.3
Not Reported	1	3.3
Others[a]	1	3.3
Place of Birth		
Luzon[b]	18	60.0
Visayas[c]	10	33.3
Mindanao[d]	2	6.7
Ethnic Origin		
Tagalog	16	53.3
Bicolano	3	1o.0
Bisaya	2	6.7

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Characteristics	Frequency (*n*)	Percentage (%)
Waray	5	16.7
Ilonggo	1	3.3
Cebuano	2	6.7
Boholano	1	3.3

N = 30.
[a]Members Church of God International
[b]Manila City, Pasay City, Marikina City, Batangas, and Sorsogon
[c]Negros Occidental, Biliran, Bohol, Cebu, Eastern Samar, Northern Samar, and Samar
[d]Zamboanga Del Norte, General Santos
*Categories with zero values are excluded in the presentation.

Moreover, the participants are mostly affiliated with the Roman Catholic Church (*n* = 28, 93.3%), residing in Luzon (*n* = 18, 60%), including Manila City, Pasay City, Marikina City, Batangas, and Sorsogon, followed by those who have Visayan descent (*n* = 10, 33.3%). Mindanao has only two representatives originally coming from Zamboanga Del Norte and General Santos (*n* = 2, 6.7%). As expected, their ethnic origin is Tagalog, accounting for 53.3% percent share, followed by Warays (*n* = 5, 16.7%). Also, Ilonggos and Boholanos each have one representative.

E. Housing Characteristics

1. Tenurial Status of Residence

Of the respondents, 28 individuals have declared their tenure housing status. Most respondents resided in rent-free housing with the owner's consent (*n* = 12, 40%), followed closely by those paying rent for a house or room (*n* = 11, 36.7%). One respondent was rent-free without the owner's consent (informal settler family).

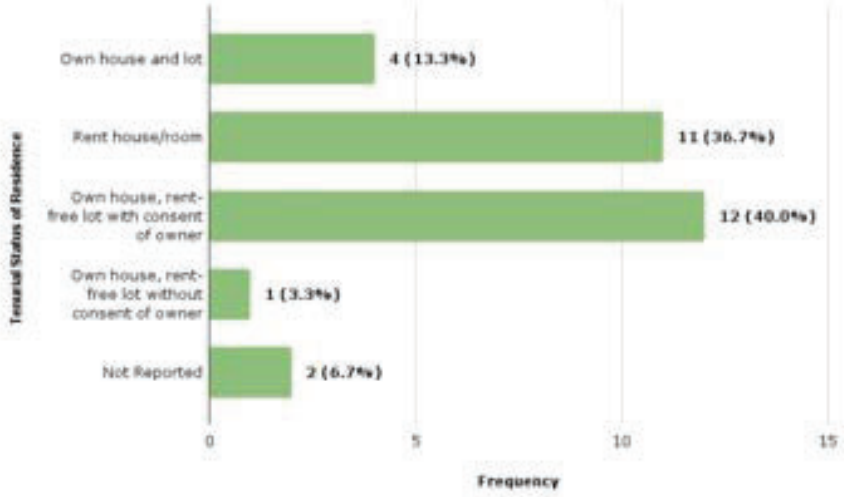


Figure 1.18 Tenurial Status of Residence Distribution

These findings, however, do not corroborate with the latest census by the Philippine Statistics Authority (PSA), as most of the occupied housing units in the country were owned, both house and lot, by the majority of households. This finding suggests that of the respondents from Barangay 76, most still do not possess land titles.

2. Duration of Residency

The battle to own their land and permanent housing is observable in the respondents' duration of residency. Even though most respondents are relatively old residents in their town, with more than or at least 26 years living in their current residence, only four (4) or 13.3% have permanent housing (Refer to **Figure 1.18** above).

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

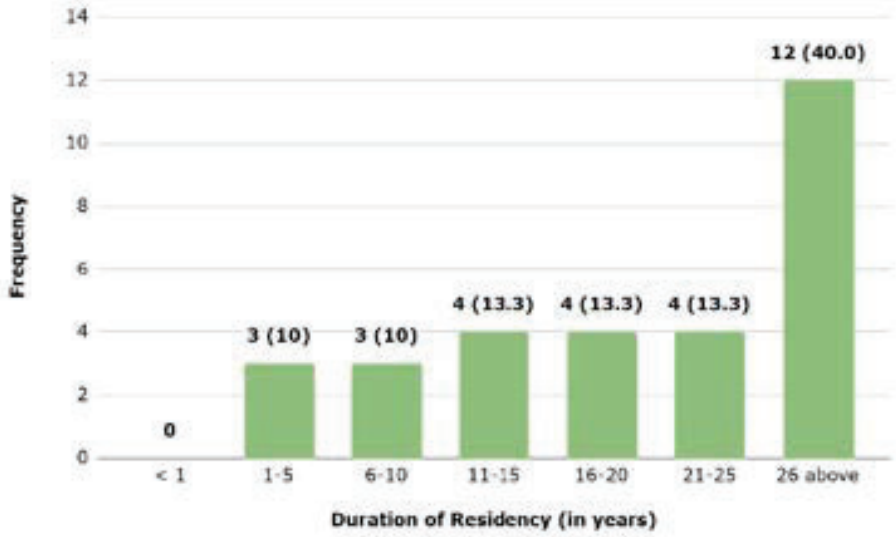


Figure 1.19 Duration of Residency Distribution

Those living in their residence for 11-15, 16-20, and 21-25 years accounted for a percent share of 40.0%. Six respondents had a duration of residency of 1-5 and 6-10 years. None of the participants were newly settled (less than one year of residency) in their current residence.

3. Number of Household Members

To further determine and observe the housing characteristics of the household respondents, the survey asked the household population, which means the number of individuals who belong to the household, "the usual place of residence, where a person usually resides, or where they usually sleep" (Check the 2020 Census of Population and Housing Technical Notes).

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

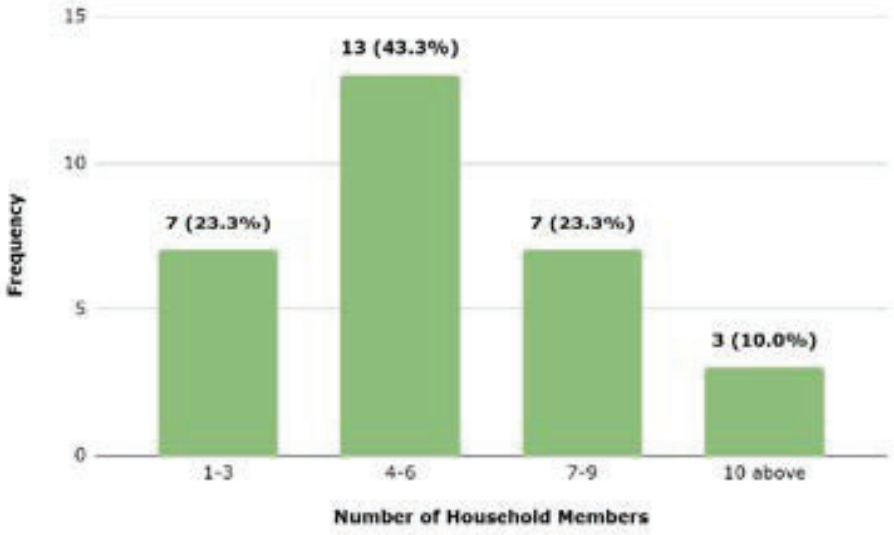


Figure 1.20 Number of Household Members Distribution

Most households had 4-6 members (n = 13, 43.3%), followed by a tie between those who had 1-3 and 7-9 household members (n = 7, 23.3%). Only 3 (10%) households have more than ten (10) household members. Interestingly, these results follow the 2020 Census of Population and Housing (CPH) of PSA, where they found an average of 4.3 household members in the occupied housing units, a minimal decline from 4.5 members in 2015 POPCEN data.

4. Housing Type

Figure 1.21 depicts the housing type distribution among the household respondents. In this survey context, we will follow the current PSA definition of single houses and multi-unit residential, among others (refer to 2020 Census of Population and Housing Technical Notes). However, for duplexes, we will extend its current definition to cater to those dwelling with attached houses or housing units with other units adjacent to their walls.

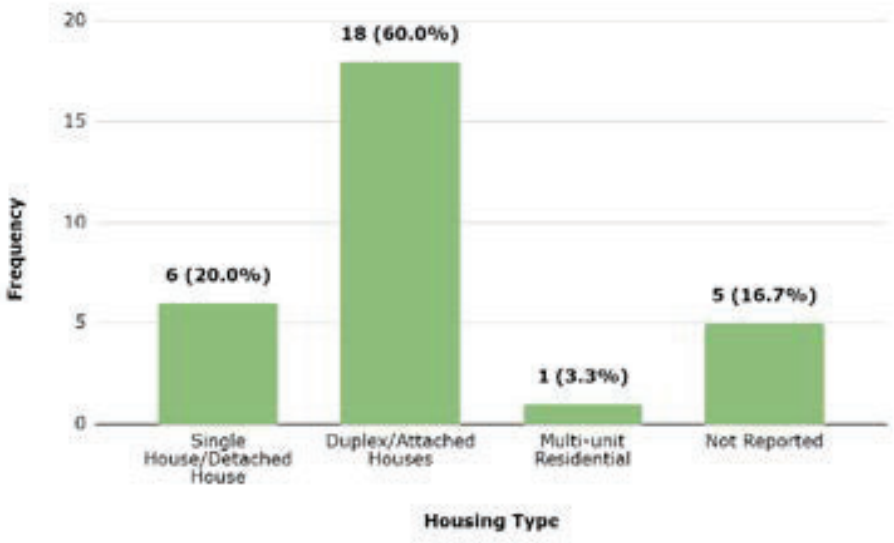


Figure 1.21 Housing Type Distribution

Results revealed that the majority of the respondents are currently dwelling in duplex or attached houses (*magkakadikit na mga bahay*) (*n* = 18, 60%), followed by single house or detached houses inhabitants (*n* = 6, 20%). Only one respondent reported living in a multi-unit residential (i.e., apartment). Five respondents did not report their housing type.

5. Housing Materials

Figure 1.22 presents the housing materials, or the most present material in each housing unit distribution. Findings show that most houses were made of a combination of concrete and wood (i.e., lumber, plywood, etc.) (*n* = 22, 73.3%), followed by all concrete housing units (*n* = 4, 13.3%). Two households still preserve the usage of indigenous materials, such as nipa, bamboo, rattan, cogon, and others. One household used salvage materials, while one did not state their housing materials/composition.

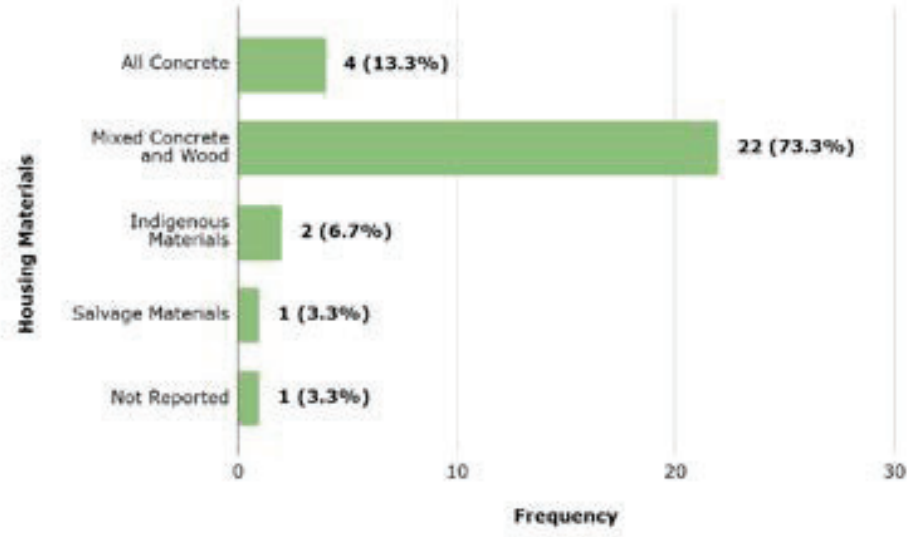


Figure 1.22 Housing Materials Distribution

6. Cooking Equipment

The majority of households also utilize gas stoves as their primary means of cooking their food (*n* = 24, 80%). Following this result are those using gasoline and charcoal (*n* = 2, 6.7%), then those using wood (*n* = 1, 3.3%). No one uses electric stoves. One respondent did not state their primary cooking equipment. The 2020 Census supports this result, with LPG (liquified petroleum gas) still popularly used for cooking in the country (*N* = 12.6 Million, 47.9%).

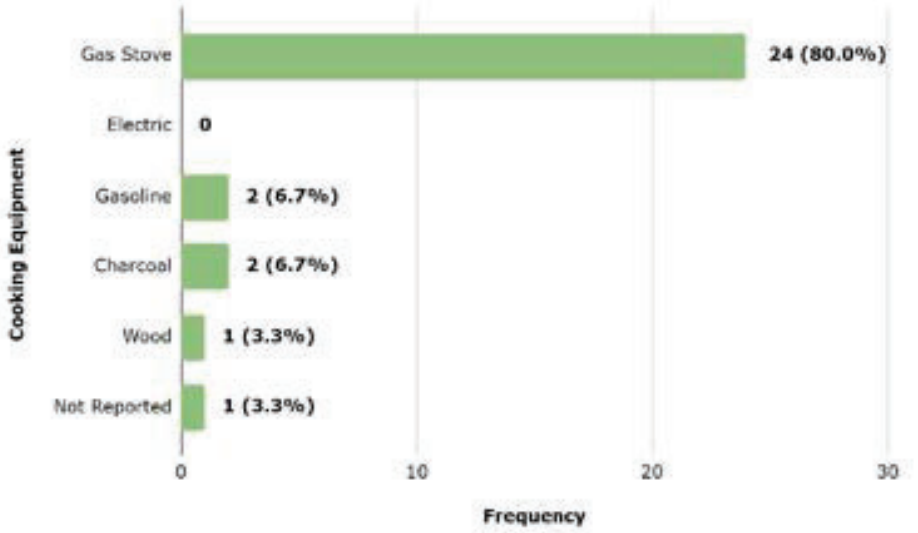


Figure 1.23 Cooking Equipment Distribution

7. Household Lighting System

As the last part of determining the housing and household characteristics, the survey acquired data regarding the household lighting system. Results showed that the majority of the households are heavily reliant on electricity to light their houses (n = 26, 86.7%), while some still use gas lamps (n = 2, 6.7%) and batteries (generators). None of the respondents uses candlelight and solar light. Also, one of the participants did not declare their lighting system.

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

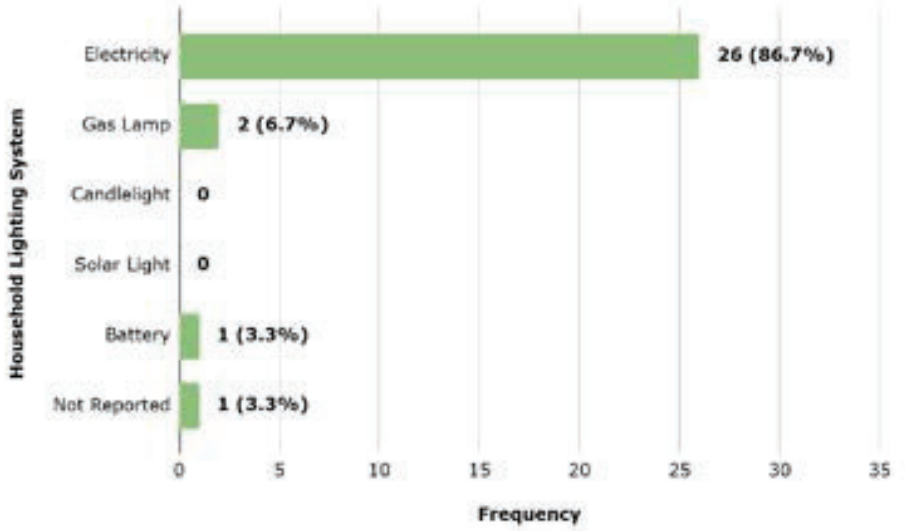


Figure 1.24 Household Lighting System Distribution

This result corroborates with the 2020 PSA CPH report for fuel for lighting in the country, where they recorded that about 24.3 Million (92.2%) households have access to electricity as their primary source of a lighting system.

II. Household Health and Sanitation

A. Health

1. Barangay Health Problems

The majority of the respondents did not report any problems in terms of healthcare in their Barangay (*n* = 20, 66.7%). Also, three of them stated that there were no problems or issues at all (10.0%). Meanwhile, a significant portion (26.6%) stated the shortage of healthcare practitioners, medicine supplies, and ambulances.

Table 1.17 Prevalent Barangay Health Problems

Health Problems	Frequency (*n*)	Percentage (%)
Shortage of Physicians	6	20.0
Shortage of Medicine	1	3.3

Shortage of Ambulances	1	3.3
None	3	10.0
Not Reported	20	66.7

Note. The frequencies and percentages do not add up exactly to 30 (100%) due to multiple answers per item.

2. Household Illness Outbreaks and Other Health Concerns

Thirteen (or 43.3%) respondents did not report any outbreaks in their household for the last five years. Also, seven were impacted by the recent COVID-19 pandemic. Other outbreaks, including chickenpox, flu, and dengue, were also declared, amounting to 9 responses. Refer to **Table 1.18** for the tabulation of results.

Table 1.18 Household Illness Outbreaks in the last Five (5) years

Illness Outbreaks (last 5 years)	Frequency (*n*)	Percentage (%)
Chickenpox (*Bulutong*)	4	13.3
Dengue	3	10.0
COVID-19	7	23.3
Others*	4	13.3
Not Reported	13	43.3

Note. The frequencies and percentages do not add up exactly to 30 (100%) due to multiple answers per item.
*Diabetes (*n* = 1), Kidney Failure (*n* = 1), Flu (*n* = 2)

Table 1.19 Household Experienced Illnesses in the last Five (5) years

Illnesses/Other Health Concerns (last 5 years)	Frequency (*n*)	Percentage (%)
Respiratory Issues	24	80.0
Infectious Diseases	4	13.3
Chronic Health Conditions	3	10.0
General Symptoms	10	33.3
None	12	40.0
Not Reported	2	6.7

Note. The frequencies and percentages do not add up exactly to 30 (100%) due to multiple answers per item.

In addition to **Table 1.18** results, the respondents experienced health concerns, including respiratory issues (i.e., asthma, cough, cold, flu) (80%), infectious diseases (i.e., dengue, hepatitis B) (13.3%), chronic health conditions (i.e., arthritis, hypertension, back pain, and kidney disease) (10%), and general symptoms (i.e., fever, headache) (33.3%). Among the respondents, twelve reported that they did not experience any health concerns within the last five years, while two (6.7%) did not respond to this question.

3. Preferred Medical Setting / Healthcare Provider

Table 1.20 Preferred Medical Setting

Medical Setting	Frequency (*n*)	Percentage (%)
Self-medication/Own House	9	30.0
Herbalist	1	3.3
Community Health Centers	14	46.7
Public Hospital	11	36.7

Note. The frequencies and percentages do not add up exactly to 30 (100%) due to multiple answers per item.

Furthermore, the respondents' reliance on free, public, and easily accessible healthcare facilities, including community health centers (46.7%) and public hospitals (36.7%), is noticeable. Some still prefer to medicate themselves in the comfort of their homes (30%), while one prefers traditional, herbal medications. These results further highlight the need of the people, especially marginalized sectors, for reliable, efficient, and free access to healthcare.

4. Mortality

Table 1.21 Household Members Mortality

Household Member/s Mortality (last 5 years)	Frequency (*n*)	Percentage (%)
Yes	14	46.7
No/None	16	53.3

When asked if any household members died in the last five years, the majority responded No/None (53.3%), while fourteen answered Yes (46.7%). Of those who experienced household member death, most (28.6%) did not disclose the reasons or cause of that mortality, with two (6.7%) unknown. Meanwhile, the recorded causes of death primarily include high blood pressure (21.4%) and cardiac arrest (14.3%).

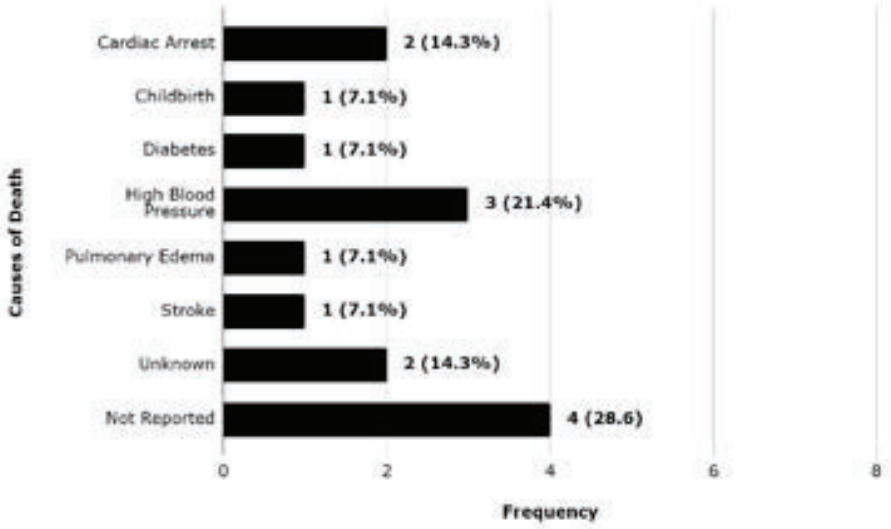


Figure 1.25 Reported Causes of Mortality

B. Sanitation

In the context of household and community sanitation and other necessary utilities, the respondents were asked about their water sources, ownership and access to bath facilities and sewage systems, and waste management.

Table 1.22 Household and Community Sanitation

Aspects	Frequency (*n*)	Percentage (%)
Sources of Drinking Water		
Local Water District	17	56.7
Mineral Water Station	13	43.3
Sources of Water for Household Use		
Local Water District	28	93.3
Other Water Delivery Services	2	6.7
Type of Bathroom Facility		
Communal (with toilet bowl)	2	6.7

Household Perception Survey Report of Barangay 76, Pasay City : 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
Owned (with toilet bowl)	25	83.3
Owned (with hole only)	1	3.3
Informal, Anywhere	1	3.3
None	1	3.3
Owned Septic Tank/Poso Negro		
Yes	28	93.3
No/None	2	6.7
Existing Regular Waste Collection		
Yes	26	86.7
No/None	4	13.3
Alternative Waste Disposal		
Waiting for Scheduled Collection	29	96.7
Not Reported	1	3.3

Note. Categories with zero values are excluded in the presentation.

The respondents' sources of drinking water (56.7%) and other household uses (93.3%), such as cooking and bathing, were the local water district or their own faucet. Others were availing of water refilling stations (43.3%) and other water delivery services (6.7%). These results follow the PSA CPH 2020 data, as these sources are widely used in households in the country.

Among the respondents, twenty-five (83.3%) have ownership and access to improved bathroom facilities, while others own unimproved sanitary facilities. Two respondents (6.7%) reported that they do not have access to such facilities. Almost all of the respondents either own or have access to septic tanks (93.3%).

With regard to waste management, most respondents stated that there is regular waste collection in their barangay (86.7%), while four stated the opposite (13.3%). Almost all of them have no alternative (96.7), but to wait for the scheduled disposal or collection.

III. Household Education Profile

Table 1.23 Household Education Profile

Aspects	Frequency (n)	Percentage (%)
Household Member/s studied/studying in a public school		
Yes	28	93.3
None	2	6.7
Household Member/s studied/studying in a private school		
Yes	3	10.0
None	24	80.0
Not Reported	3	10.0
Household Member/s who completed High School		
Yes	24	80.0
None	6	20.0
Household Member/s who completed College		
Yes	7	23.3
None	21	70.0
Not Reported	2	6.7

The respondents were also asked about the household member's access to educational institutions and their respective educational attainment. The majority studied or are still studying in public schools (93.3%), while a small portion were in private schools (10%). Some may have access to both. Moreover, the majority accomplished high school (80%), while only seven (23.3%) finished their bachelor's degree programs. **Table 1.23** shows the comprehensive tabulation of the results.

IV. Satisfaction on Community Services and Welfare

Table 1.24 Respondents' Satisfaction in Community Services and Welfare

Aspects	Rating	
	Satisfied n (%)	Dissatisfied n (%)
Employment Opportunities	9 (30.0)	21 (70.0)
Health and Well-being	28 (93.3)	2 (6.7)
Peace and Order	28 (93.3)	2 (6.7)
Cleanliness and Sanitation	29 (96.7)	1 (3.3)
Education	28 (93.3)	2 (6.7)
Infrastructure	29 (96.7)	1 (3.3)
Utilities	27 (90.0)	3 (10.0)
Community Facilities and Amenities	24 (80.0)	6 (20.0)
Commercial Services	27 (90.0)	3 (10.0)
Barangay Services	26 (86.7)	4 (13.3)
Transportation	25 (83.3)	5 (16.7)
Disaster Management	26 (86.7)	4 (13.3)

Legend: *n* = frequency, % = corresponding percentage

Table 1.24 summarizes the respondents' satisfaction/dissatisfaction rating on different aspects concerning community services and welfare. Among all aspects or dimensions, employment opportunities are poor, garnering a 70% dissatisfaction rating and highlighting the need for inclusive opportunities for community members. They were satisfied with every other aspect or dimension of the provided services, such as infrastructure (96.7%), cleanliness and sanitation (96.7%), peace and order (93.3%), health and well-being (93.3%), and education (93.3%). These results suggest that the current state of community welfare is impressive but still needs improvement, especially in providing sufficient job opportunities for the fisherfolks.

V. Project Awareness and Concerns

A. Project Awareness and Approval

The respondents' awareness of the reclamation project was determined using dichotomous options (Yes and No/None). Results revealed that most respondents are aware of the project (*n* = 22, 73.7%).

Table 1.25 Respondents' Awareness of the 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
Respondent, or Household Members, is/are aware about the project		
Yes	22	73.7
No/None	8	26.7
Extent of Awareness and Knowledge of the Respondent (if aware)		
No Awareness/Understanding	3	13.6
Slightly Aware/Basic Understanding	18	81.8
Fully Aware/Full Understanding	3	13.6
Source/s of information (if aware)		
Barangay Official/Employee	1	4.5
Friends/Neighbors/Relatives	8	36.4
Pasay City LGU Employee	1	4.5
Internet	12	54.5

Note. For the second and third aspects/questions, the number of observations is 22 since this is the number of respondents who have awareness of the project.

Among those who answered Yes, the majority had a basic understanding and awareness of the project (81.8%). This awareness is disseminated via the Internet (54.5%). Refer to **Table 1.25** for a comprehensive tabulation of results. These results suggest that the primary source of information among the respondents was online. Thus, maximizing such sources is beneficial in the dissemination of relevant information.

Table 1.26 Respondents' Acceptance or Resistance of the 360-hectare Reclamation Project

Aspects	Frequency (*n*)	Percentage (%)
Respondents' Acceptance of the Project		
Agree	24	80.0
Disagree	6	20.0
Reason of Agreement (Disagreement)		
Support in creation of livelihood programs	9	30.0
Highly beneficial to Barangay	2	6.7
Reason for Resistance		
Negative impact to livelihood (Fishing)	4	13.3
Not Reported	15	50.0

N = 30.

The respondent's agreement or project's approval was also determined using binary options (Agree and Disagree). Results revealed a consensus of the respondents, backing the reclamation project. The majority agreed (80%) with the project's existence in their barangay, while only six respondents disagreed (20%).

Moreover, the participants were also allowed to provide reasons for their agreement or disagreement. Half of them did not state any reasons (50%). The most common answer is that they perceived this project as an avenue to create livelihood programs and employment. Some of them were also concerned about the impact of such a project on fishing activities.

B. Respondents' Perceived Benefits and Risks of the Project to Barangay and Families

More specifically, the perceived benefits and risks of the project to Barangay 76, the following tables (**Table 1.27** and **Table 1.28**) summarize the responses. Findings revealed that employment opportunities are the most common response (70%). In light of this result, other relevant aspects, including economic growth and creating livelihood programs (6.7%), were also mentioned.

Table 1.27 Respondents' Perceived Benefits and Risks of the Project to Barangay

Aspects	Frequency (n)	Percentage (%)
Benefits		
Employment Opportunities	21	70.0
Economic Growth	1	3.3
Financial Assistance	2	6.7
Creation of Livelihood	2	6.7
Land Expansion	1	3.3
Risks		
Decrease in Fishing Area, Production	6	20.0
Flooding	1	3.3
Traffic Congestion	1	3.3
Others		
Unknown	3	10.0
Not response	4	13.3

Note. The frequencies and percentages do not add up exactly to 30 (100%) due to multiple answers per item.

On the other hand, risks, such as a decrease in fishing areas; hence, lesser fish production, were also a concern among the fisherfolk respondents (20%). Two respondents cited other issues, including flooding and traffic congestion. Lastly, some respondents do not know the project's potential impact, while four (13.3%) chose to skip this portion.

Table 1.28 Respondents' Perceived Benefits of the Project to their Families

Benefits	Frequency (n)	Percentage (%)
Employment Opportunities	23	76.7
Creation of Livelihood	7	23.3
Continuation of fishing	4	13.3
Healthcare Assistance	4	13.3
Financial Assistance	3	10.0
Academic Scholarships	4	13.3
Not Reported	4	13.3

Note. The frequencies and percentages do not add up exactly to 30 (100%) due to multiple answers per item.

Lastly, in addition to the results of **Table 1.27**, the respondents also cited that this project would be beneficial to their household through the creation of jobs (76.7%) and livelihood programs (23.3%). They also wish that their current livelihood (fishing activities) will be preserved even with the continuation of the project. Other perceived benefits include healthcare (13.3%), financial assistance (10%), and aid in academic endeavors (13.3%), especially for the vulnerable and marginalized sectors (i.e., youth, women, senior citizens, and PWDs).

2. CONCLUSION AND RECOMMENDATIONS

Generally, the respondents agreed that having the reclamation project has its advantages. Although there were few risks mentioned, majority of the respondents perceived that the land expansion project may bring certain benefits like opening of employment and livelihood opportunities for their community, additional income for the LGU, and improved social services. While other studies suggest environmental degradation, change of landscape, increased disaster risk on reclamation projects, respondents are acknowledging also the social and economic impacts of the project to their community and the fisherfolk group.

Reclamation project is one way of decongesting the growing population of Pasay City. The government of Pasay sees the development as an opportunity to boost their economy by creating real estate opportunities, attracting tourism, employment opportunities, commercial/business development and improved infrastructure and services. It is imperative that Pasay City government to create measures to minimize the impacts of natural and man-made hazards and commit to provide long-term benefits to the affected community. Collaborative effort must be made with Barangay 76 and surrounding communities, professional/business group, and government and non-government stakeholders to create shared benefits and harmonious relationship towards sustainable development.

References

1. Torell, E., Castro, J., Lazarte, A., & Bilecki, D. (2020). Analysis of Gender Roles in Philippine Fishing Communities. *Journal of International Development*, 33(1). 10.1002/jid.3520.

2. Ferrer, A. J., Francisco, H., Carmelita, B., Hopanda, J., & Predo, C. (2017). Gender Differences in Participation, Roles, and Attitude towards Mariculture Operation: A Case Study in the Philippines. *Asian Fisheries Science*. 30S. 83-102. 10.33997/j.afs.2017.30.S1.004.

3. *Youth*. (2024). *UNESCO*. https://www.unesco.org/en/youth

4. Fisherfolks and farmers remain to have the highest poverty incidences among the basic sectors in 2021. (2023). *Philippine Statistics Authority*. https://www.psa.gov.ph/content/fisherfolks-and-farmers-remain-have-highest-poverty-incidences-among-basic-sectors-2021

5. Household Characteristics (2020 Census of Population and Housing). (2023). *Philippine Statistics Authority*. https://psa.gov.ph/content/household-characteristics-2020-census-population-and-housing

APPENDIX R.
EPRMP CHECKLIST

AUG 16 2024

Hon. Imelda Calixto-Rubiano
City Mayor
CITY GOVERNMENT OF PASAY
Pasay City Hall, F.B. Harrison St.
Pasay City, Metro Manila

SUBJECT : EIARC MEETING FOR THE LAND RECONFIGURATION OF THE 360-HECTARE PASAY RECLAMATION PROJECT

Dear Mayor Calixto-Rubiano:

This has reference to your application for an amendment of the Environmental Compliance Certificate (ECC) for the Landform Reconfiguration of the 360-Hectare Pasay Reclamation Project along the coast of Manila Bay, City of Pasay.

Please be informed that the Environmental Impact Assessment Review Committee (EIARC) meeting for the above project is scheduled on **30 August 2024 (Friday)** at **08:30 AM** in the **EIA Conference Room** of this Office. The meeting aims to substantively review the Environmental Performance Report and Management Plan (EPRMP) submitted by your Office for the proposed project modification. The approval of the ECC amendment will be based on the adequacy of the report and the appropriateness of the environmental management and monitoring plan commitments presented in the EPRMP.

In view of the foregoing, we would like to invite you or your designated representative to attend the upcoming review meeting. Attached are our initial comments on the submitted EPRMP for the project. The substantive review of the EPRMP will be thoroughly discussed during the meeting.

For further information, you may contact **Engr. Carlo Vic Arida, EnP** or **Engr. Christine Solo** of the Environmental Impact Assessment and Management Division of this Office through telephone number (02) 8539-4378 local 116/166 or email us at eia@emb.gov.ph

Thank you.

Very truly yours,

JACQUELINE A. CAANCAN, *CESO III*
Director

Copy furnished:

Atty. Severo Cañete Madroña, Jr.
City Governmetn of Pasay Legal Officer
scmadrona@gmail.com

Mr. Glen D. Ang
SM Smart City Infrastructure and Development Corporation
glenn.ang@smartcity.com

CO-2024-028357

NOTICE OF MEETING

TO : THE EIA REVIEW COMMITTEE

1. Engr. Jose Reynato Morente – Air/Water Quality and ERA
2. Dr. Maria Lourdes Moreno – Freshwater & Marine Ecology
3. Dr. Natalia Soledad Dalisay - Social Impact Assessment
4. Mr. Edmund Vargas – Geology/Hydrogeology

RESOURCE PERSON

1. DENR National Capital Region
2. EMB National Capital Region
3. Forest Management Bureau
4. Biodiversity Management Bureau

FROM : THE DIRECTOR

SUBJECT : **EIA REVIEW MEETING FOR THE PROPOSED LAND RECONFIGURATION OF THE 360 HECTARE RECLAMATION PROJECT OF THE CITY GOVERNMENT OF PASAY**

DATE : AUG 16 2024

This is in reference to the application of the City Government of Pasay for the amendment of its Environmental Compliance Certificate (ECC) for the proposed Land Reconfiguration of the 360-hectare Reclamation Project within its jurisdiction in Manila Bay. An Environmental Performance Report and Management Plan (EPRMP) was required for this ECC amendment.

As part of the ECC amendment application process, we would like to invite you to attend the project's Environmental Impact Assessment Review Committee meeting scheduled on **30 August 2024 (Friday)** at **08:30 AM** in the **EIA Conference Room** of this Office. The meeting aims to substantively review the submitted EPRMP of the project. The approval of the ECC amendment will be based on the adequacy of the report and the appropriateness of the environmental management and monitoring plan committed by the proponent.

For your reference, the project's EPRMP and the EIA Screening Form are downloadable at the following link:

https://embco-my.sharepoint.com/:f:/g/personal/carlo_arida_emb_gov_ph/EkOsD3jFxldLqL2IuvVz3P8BoghJ5mTC_r9Oa9InDraQCw?e=nDs7Xa

Kindly use the EIA screening form for your comments and recommendations and submit the accomplished form on or before 28 August 2024.

For further information, please contact **Engr. Carlo Vic Arida, EnP** and **Engr. Christine Solo** of the Environmental Impact Assessment and Management Division of this Office through telephone number (02) 8539-4378 local 116/166 or email us at eia@emb.gov.ph.

JACQUELINE A. CAANCAN, *CESO III*

Copy furnished:

DENR Undersecretary for Special Concerns and Legal Affairs

IIS No. CO-2024-026758

Comments on the EPRMP of the proposed Landform Reconfiguration of the 360 ha Pasay Reclamation Project

Table 1. Checklist of Documentary Requirements

Documents	Comments
Environmental Performance Report and Management Plan (EPRMP)	-See attached Table 2 to 4 for comments -Attach as Annex a copy of the JV Agreement between Pasay and SM
Proof of Authority over the Project Site	Attach as Annex the PRA Governing Board Resolution approving the recent changes in the land configuration, i.e. 476 m distance from mainland Pasay. What was attached was attached is the 300 m distance from mainland of Pasay
Accountability Statements of Preparers & Proponent (see Annexes 2-21 & 2-22 of Revised Procedural Manual for DAO 2003-30)	The sworn accountabilities for proponent and preparer should be signed and notarized
Duly Accomplished Project Environmental Monitoring & Audit Prioritization Scheme (PEMAPS) Questionnaire (see Annex 2-7d of Revised Procedural Manual for DAO 2003-30)	Attach copy of the Sworn Accountability of the Proponent for PEMAPS
For EPRMP, Copy of previous ECC	Acceptable
For EPRMP, Proof of compliance in the submission of monitoring reports	Attach as Annex copies of the EM-received copies of submitted CMRs and SMRs

Table 2. EIS/EPRMP Annotated Outline

Sections / Subsections	Required Content	REMARKS
Executive Summary (maximum of 10 pages)		
Project Fact Sheet	Summary of Project Description *(For EPRMP, Include comparative matrix of the existing project components vis-à-vis the proposed changes)*	The Project Fact sheet should provide the existing project vis-a-vis the proposed amendment
Process Documentation	Documentation of the process undertaken in the conduct of EIA *(EIA Team, EIA Study Schedule & Area, description of key EIA Methodologies including sampling and measurement plan, Scoping and Public Participation)*	-Under ES. 2.4, provide a summary matrix of the issues raised and how it was addressed in the EPRMP -Attach as Annex the full documentation of the conducted public participation.
EIA Summary	• Summary of alternatives considered in terms of siting, technology selection/operation processes and design	Provide the required information. Remove ES 3.2, 3.3 and 3.4 in the Executive Summary

Sections / Subsections	Required Content	REMARKS
	• Concise integrated summary of the main impacts and residual effects after applying mitigation • Risks and uncertainties relating to the findings and implications for decision making	
1. Project Description		
1.1 Project Location and Area *For EPRMP, discussions should be in the context of the proposed modification/changes*	a) Map showing sitio, barangay, municipality, province, region boundaries, vicinity, proposed buffers surrounding the area and Primary & secondary impact areas	For the project background: -Include in the project background the discussion on the previous request for ECC amendment, i.e. 390 has reclamation area **-Note: The EMB letter dated 24 January 2024 only allows Pasay to proceed with its project implementation that is within its current ECC coverage not with the proposed land reconfiguration.** -Provide map showing proximity to nearest protected area and Ramsar site
	b) Geographic coordinates (shape file data) of project area (use WGS 84 datum - GPS setting)	Acceptable
	c. Describe the vicinity and the accessibility of the project site/area	Provide discussion
1.2 Project Rationale *For EPRMP, discussions should be in the context of the proposed modification/changes*	• Cite and focus on the need for the project based on national and regional/local economic development in terms of contribution to sustainable development agenda or current development thrusts. • Describe the justification for the Project with particular reference made to the economic and social benefits, including employment and associate economic development, which the project may provide. The status of the project should be discussed in a regional and national context.	The Rationale should include justification on the proposed project modification, i.e. land reconfiguration
1.3. Project Alternatives *For EPRMP, discussions should be in the context of the proposed modification/ changes*	a) Cite criteria used in determining options for facility siting, development design, process/technology selection, resource utilization and discuss how the decisions on the preferred options were made. Siting: Alternative project locations including factors significant to the selection such as severity of impacts, perception of affected communities with regards to project, ancestral domain issues, land classification, etc. Discuss other options on the siting of major components of the project within the project area. Technology Selection/Operation Processes and design Selection for storage: Alternative	Provide discussion on the following: -Options/alternative considered in determining the final land configuration of the project; and -Options considered in the selection of the dredging and reclamation methodology that will be used for the project. The selection of the preferred option for siting, technology selection and resources should be based on environmental criteria.

Page 2 of 23

Sections / Subsections	Required Content	REMARKS
	technologies, operation processes, and measures to minimize wastes, prevent adverse impacts such as air and water pollution, groundwater and land contamination, and for the prevention/control of emergency events (eg. fire, explosion, leaks, spills) including factors significant to the selection. Resources: Alternative sources of power, water, raw materials and other resources needed including factors significant to the selection such as supply sustainability and climate change projections *Likewise contextualize the determination of preliminary options in terms of project site factors significant to the selection such as supply sustainability and susceptibility to:* • *Liquefaction, Ground Shaking, Ground Rupture, Earthquake induced Landslides Volcanic eruptions, tsunami (PHIVOLCS)* • *Rain-induced landslide and flooding (MGB)* • *Storm surge, and flooding as well as extreme climatologic conditions (PAGASA)*	
	b) Summarize and discuss comparison of environmental impacts of each alternative for facility siting, development design, process/technology selection, resource utilization	Revise discussion based on above comments.
	c) Discuss the consequences of not proceeding with the project or no project option	Revise discussion based on above comments
1.4 Project Components *For EPRMP, discussions should be in the context of the proposed modification/changes; boundaries of current project area should be delineated from the proposed expansion area, if any*	a) General layout of facilities;	Provide general layout of the overall project components/facilities including temporary facilities.
	b) Maps showing in particular, the location and boundaries of project area, location and footprint of main facilities, storage and support facilities, and proposed buffers.	Provide technical specifications.
	c) Identification and general description of major components such as materials, capacity, number, safety features , etc.	Provide technical specifications.
	d) Identification and description of support facilities and infrastructure requirements such as energy/power generating facility (if any) or energy source, water supply/storage, storm water drainage, sewerage, telecommunications, safety devices/emergency facilities, accommodation and similar facilities	Provide technical specifications.
	e)Identification and description of pollution control devices and waste management system for the waste materials: wastewater, air emissions, domestic wastes, toxic and	Provide technical specifications.

Sections / Subsections	Required Content	REMARKS
	hazardous wastes, non toxic and non hazardous wastes, etc.	
I.5. Process/ Technology *For EPRMP, include discussion/comparison of existing and proposed modifications or expansion*	a) Description of the Processing/Manufacturing technology o process flow sheet showing material, and water (and energy, if applicable) balance including inputs and similar data on products, recycling and waste streams o materials/product handling and transport including storage protocols	The discussion should be based on PRA-approved Dredging and Reclamation Methodology for the project.
	b) Description of the pollution control devices and waste management system	-Provide a detailed discussion for silt management from dredging and reclamation activities to soil stabilization of the reclaimed land -Provide discussion on waste management and disposal on marine vessels and on-shore facilities
	c) Description of the operations and maintenance of facility	Provide discussion
I.6. Project Size *For EPRMP, include discussion/comparison of existing and proposed modifications or expansion*	a) Total capacity / stock population/dimension (whichever is applicable based on screening parameter in the Guidelines for Coverage Screening per MC 2014-005)	Acceptable
	b)Total Project Area in sq.m. or hectares	Acceptable
I.7. Development Plan, Description of Project Phases and Corresponding Timeframes For EPRMP, *discussions should be in the context of the proposed modification/changes*	Phases to be described in terms identifying specific activities (w/ special attention on those with significant environmental impacts as well as climate change adaptation options relevant to the project and project activities) and corresponding projected implementation timeframes: • ***Pre-construction*** (e.g. planning, acquisition of rights to use land, etc.) • ***Construction*** (e.g. land/site clearing, temporary housing, transport of materials, health and other services for the workforce, discussion of temporary facilities including the progress of works/milestones and the number workers required per milestones) • ***Operation*** (projected period of start-up/commissioning/full operation of various project components) include discussion on the	-For the pre-construction activities, identify all the list of permits and clearances that were already secured and needed to be secured from Government Agencies. Attach as Annex copies of the permits and clearances that were already secured. -For construction phase, the specific activities in sequence should be provided and discussed in detail. -For decommissioning phase, provide a detailed decommissioning plan

Sections / Subsections	Required Content	REMARKS
	operation of various components (as identified above) in terms of raw materials, fuel requirements, waste management and infrastructure requirements • ***Decommissioning/Abandonment/Rehabilitation*** - projected life of the project and alternatives for the future use of the project area which should be consistent with long term zoning and land use development plan of the municipality; - Abandonment Plan (general) to include management plan for the projected cumulative/long term project impacts such as remediation of contaminated soil and water resources, land restoration, proper dismantling/abandonment of facilities/ equipment and other necessary activities	
1.8 Manpower	Tabulate the following per project phase (pre-construction, construction, operation and maintenance): • manpower requirements; • expertise/skills needed; • nature & estimated number of jobs available for men, women, and indigenous peoples (if in IP ancestral land); • scheme for sourcing locally from host and neighboring LGUs	Acceptable
1.9 Project Cost	Indicative Project Investment Cost (Philippine Peso)	Acceptable
2. Assessment of Environmental Impacts See Table 3 for the list of key environmental impacts which shall be subjected to assessment. The assessment shall done using the prescribed approach/method and in relation to the corresponding baseline characterization in the primary and secondary impact areas (*as determined using the Guidelines in Annex 2-2 of the Revised Procedural Manual (RPM) for DAO 2003-30 or succeeding issuances*). The sampling and measurement plan used shall be discussed. Likewise, the assessment should be done for the various phases of development (i.e. pre-construction, construction and operation) and should consider climate change projections and disaster risks based on existing natural hazard information. For all maps, include overlays of project area footprint, show sensitive/critical receptors and sampling points for baseline data (indicate geographical coordinates). In conclusion, the residual and cumulative impacts shall be assessed. For EPRMP, the result of the proponent's monitoring shall be used as baseline. The assessment of environmental impacts of proposed modification shall be discussed in relation to the actual impacts of existing project operations which shall be presented from a summary of the results of compliance monitoring (in matrix and graphical form) as described in 6.1.		-See comments on Table 3 -Provide the subsections of Land, Water, Air and People the Impact Analysis, Environmental Management and Monitoring Plans -A discussion on the baseline results on EIS vis-a-vis EPRMP should be provided for Land, Water, Air and People.

Sections / Subsections	Required Content	REMARKS
3. Environmental Management Plan Appropriate mitigation/management measures should be specified for each of the identified key impacts (Table 3). Appropriate climate change adaptation and disaster risk reduction measures/options shall likewise be thoroughly discussed. The impact management plan should be summarized using at the minimum, the format in Annex 2-17 of RPM for DAO 2003-30 For EPRMP, the proposed impact management plan to be discussed shall consider review of performance of existing project based on the Environmental Quality Performance Levels (EQPLs) set. Also include change in adaptation measures / options and remediation of contaminated soil and water resources, land restoration proper dismantling, if any.		-Table 3.2 should be based on the specific project activities that will be identified in Section 1.7 of this screening form. -Table 3.2 shall include excavation activities of the 476 m-channel -Table 3.2, under "Cost" column, provide cost for the implementation of proposed mitigating measures -The mitigating measures should be specificically determined for every identified environmental impacts per project activity. -Monitoring activities shall not be considered as mitigating measures.
4. Environmental Risk Assessment (ERA) & Emergency Response Policy and Guidelines The level of coverage and type of document required shall first be determined based on Annex 2-7e of RPM for DAO 2003-30. For EPRMP, discuss status of implementation of the safety policies/guidelines and any proposed changes. Include last three (3) years of safety statistics. Also include incidence such as spills, near spills and similar incidents such as accidents and emergency. Discuss actions taken. See Table 4 for details		For further evaluation of EIA Review Committee
5. Social Development Plan/Framework (SDP) and IEC Framework For EPRMP, discussion should focus on the status of implementation of SDP and IEC commitments. Discuss adjustments that should be undertaken.		
5.1 Social Development Program (SDP)	Community development or livelihood programs/activities, projected beneficiaries, partner institutions, timeframe of implementation as well as source and amount allotted per activity/component (See Annex 2-18 of RPM for DAO 2003-30)	Provide discussion on the current SDP implementation
5.2 Information and Education Campaign (IEC)	Target sector, key messages, scheme/strategy/methods, Information medium, timelines and frequency, cost (See Annex 2-19 of RPM for DAO 2003-30)	-The IEC should also include status of the proponent's compliance with the issued ECC. -Provide discussion on the current IEC implementation
6. Environmental Compliance Monitoring		
6.1 Environmental Performance (for EPRMP only)	• Results of compliance monitoring in matrix and graphical form showing and explaining the trend in environmental conditions	For further evaluation of EIA Review Committee

Sections / Subsections	Required Content	REMARKS
	• Analyze performance based on the Environmental Quality Performance Levels (EQPLs) set • Discuss compliance to ECC conditions and performance against the originally approved Environmental Management and Monitoring Plan, MMT requirements/commitments, third party audits (if any) • Discuss implementation of appropriate and effective environmental impact remedial actions in case of exceedances • Discuss operationalization of complaints management system	
6.2.Self-Monitoring Plan	The monitoring plan shall be summarized using Annex 2-20 of RPM for DAO 2003-30 or succeeding issuances as template. For EPRMP, the original and proposed additional/changes in sampling sites/stations shall be discussed and shown in map/s. Proposed reduction in or additional parameters especially for air and water shall likewise be identified. The proposed changes in parameters and/or sampling stations which shall be based on the results of the impact assessment reported in Chapter 2 shall be discussed in this section.	This should be updated based on the revision of the IMP
6.3.Multi-Sectoral Monitoring Framework	Discussion on the necessity of creating a Multi-Partite Monitoring Team (MMT). If deemed necessary, describe the proposed scope of MMT responsibilities and activities and tabulate the list of proposed stakeholder-members of the MMT, basis of selection and proposed role. (See Annex 3-4 of the RPM for DAO 2003-30).	Acceptable
6.4 Environmental Guarantee and Monitoring Fund Commitments	•Discussion on the necessity of putting up an EGF. If deemed necessary, present a proposed amount of EGF indicating the basis for the estimate (per guidelines in annex 3-6 of RPM for DAO 2003-30) •If MMT is deemed necessary, present a proposed amount of EMF (based on a draft AWFP in following the format in Annex 3-4 and consistent with guidelines in Annex 3-5 of RPM for DAO 2003-30);	For further evaluation of EIA Review Committee
7.Decommissioning / Abandonment /Rehabilitation Policy Statement on Proponent's policies to implement the abandonment plan described in Item 1.7 and to formulate and submit procedures for Rehabilitation/ Decommissioning/Abandonment within a timeframe specified in the ECC. For EPRMP, present approved plan/program, if any, and proposed changes.		For further evaluation of EIA Review Committee

Sections / Subsections	Required Content	REMARKS
8. Institutional Plan for EMP Implementation Present the organizational scheme of the proponent including line of command and reporting procedures as well as manpower complement and relationships with other operating departments. For EPRMP, discuss status of implementation and any proposed changes in the plan to cover modification/expansion if any.		Provide a detailed organizational structure of EU. The City Government of Pasay, as the proponent of the ECC, should have its own Managing Head and PCO. Moreover, the City Government of Pasay should be responsible for securing EMB-permits under its name and submission of required compliance reportorial reports to EMB.

Table 3. Key Environmental Impacts to be included in the Assessment and Formulation of Management and Monitoring Plan to be reflected in the EPRMP

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
1. Land			
1.1. Land Use and Classification			-Provide Impact Analysis, Environmental Management and Monitoring Plans
1.1.1 Impact in terms of compatibility with existing land use	Description & Map showing the project area in relation to existing land use.	Assessment of the compatibility of the proposed project vis-a-vis actual land use and the approved comprehensive land use plan/zoning classification, ECA Classification and/or the coastal resource management plan of the LGU if any.	-Figure 2.3 should be updated to proposed land reconfiguration
1.1.2 Impact on compatibility with classification as an Environmentally Critical Area (ECA)	Identify ECA where the project is located or near the project area. Identify areas vulnerable/susceptible to natural hazards where the project is located or near the project area (include map/s).		-LLPCHEA is now named as Las Piñas-Parañaque Wetland Park (LPPWP) -In Figure 2.6, show the proximity of the project to LPPWP
1.1.3 Impact in existing land tenure issue/s	Determine if the project area is under CARP or with CADC / CADT / CALC/ CALT, with IFMA/CBFMA, within COC, within MPSA or other tenurial instruments and identify corresponding existing tenure issues including presence of informal settlers.	Identify and assess impact in terms of land tenure issues in relation to project implementation	-Provide map showing the project area with respect to adjacent reclamation projects with issued ECC.
1.1.4 Impairment of visual aesthetics	Visually significant landforms/ landscape/structures	Identify and assess impact of the project on these visually significant landforms/landscape/structures	-Provide discussion
1.1.5 Devaluation of land value as a result of improper solid waste	Existing solid waste management and related land management scheme in the area	Identify and assess impacts of the estimated generation of solid wastes in terms of:	-Provide discussion

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
management and other related impacts		- amount and - characteristics (hazardous or domestic) and other related issues on the existing management scheme	
1.2 Geology/Geomorphology			-Provide Impact Analysis, Environmental Management and Monitoring Plans
1.2.1 Change in surface landform/geomorphology/ topography/ terrain/slope	Slope and Elevation/Topographic Map;	Identify and assess project impact in terms of the changes in surface landform/topography/terrain/slope including existing hazard as maybe aggravated by climate change as projected by PAGASA	For further evaluation of EIA Review Committee
1.2.2 Change in sub-surface geology/underground conditions	Regional/General Geological Map Natural Hazard Map (sub surface)	Identify and assess project impact in terms of the changes in sub-surface geology and inducement of subsidence, liquefaction, landslides, mud/debris flow to the environment including the possibility of aggravating existing natural hazards Discuss and assess the impacts of geologic hazards and planned earthworks on the project facilities (e.g., landslides, mudflows, subsidence, ground shaking from earthquake, liquefaction, flooding, etc.). Note in the discussion how climate change	For further evaluation of EIA Review Committee
1.2.3 Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	Geological Map as needed.; hazard maps (NAMRIA, NDRRMC, MGB, PHIVOLCS, PAGASA)		For further evaluation of EIA Review Committee

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
		can aggravate the hazards and impacts. The geologic hazards map must consider the hazards/exposure/vulnerability / risk maps of Section 1.1.2.	
1.3 Pedology			-Provide Impact Analysis, Environmental Management and Monitoring Plans
1.3.1 Soil erosion / Loss of topsoil/overburden	• Summary of Soil Investigation Report on soil type and quality • Soil map showing soil types, sampling stations, topography, streams, built-up areas, and planned project features • Water and wind erodibility potential • Sediment sources, and • Riverbank stability	Describe capability of the land to accommodate the proposed development with minimal or without soil erosion/loss of topsoil/overburden Describe the physical properties and erodibility potential of the soil, ongoing erosion processes and assess the erosional impacts of the project. The Universal Soil Loss Equation (USLE) and its variants may be used in the modeling.	-Attach as Annex a copy of the Geotechnical Investigation/Study Reports for reference
1.3.2 Change in soil quality/fertility	Laboratory results on soil sample analysis for N, P, K, pH, organic matter, micronutrients and trace metals e. g. Pb, Hg, As, Cd, Cr hexavalent, etc.	Assess the impact of the project activities including the possibility of spills on soil quality and fertility	For further evaluation of EIA Review Committee
1.4 Terrestrial Ecology			-Provide Impact Analysis, Environmental Management and Monitoring Plans
1.4.1 Vegetation removal and loss of habitat	• Map showing land cover; sampling sites; location of observed important, endangered, and keystone species; ecologically sensitive	To establish baseline, - Use quadrat sampling for flora to cover all land cover types	For further evaluation of EIA Review Committee

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
	sites; planned land development works • Flora and fauna species inventory or survey report to cover species listing, abundance, richness, dominance, diversity, evenness, ecological status, and uses; • Historical occurrences of pest infestation, forest/grass fire and/or similar incidences	- Use transect walk – mist nets, traps, for fauna - show survey locations in a map Identify and assess specific impacts of the project activities guided by the following: 1. Habitat loss or degradation – Land clearing, river damming, etc. will result in the loss of habitat. Some activities may lead to the alteration of habitat composition, structure or function. Some habitats, e.g., wetlands, are critical to ecological processes or endangered species. 2. Habitat fragmentation – This is the break-up of the natural landscape into small patches isolated from one another. It affects the number of species present, movement of species, and transfer of materials among habitats. 3. Loss of species – Of special interest are the keystone, endangered, and endemic species. 4. Pollution effects on species – The stressors include dust, noise,chemical/ petrochemical spills, eroded sediment, increased temperature, etc.	
1.4.2 Threat to existence and/or loss of important local species	Summary of endemicity / conservation status		For further evaluation of EIA Review Committee
1.4.3Threat to abundance, frequency and distribution of important species	• Summary of abundance, frequency and distribution • Economic importance and uses of significant flora and fauna		For further evaluation of EIA Review Committee
1.4.4 Hindrance to wildlife access	Survey map in relation to the project site		For further evaluation of EIA Review Committee

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
		Relate discussions to estimated GHG emissions and possible carbon sequestration program/s	
2.WATER			
2.1 Hydrology/Hydrogeology			-Provide Impact Analysis, Environmental Management and Monitoring Plans
2.1.1 Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	Drainage map (also showing local drainage system/infrastructures); Historical flooding/drought occurrences, stream flow measurements/estimates; Delineation of watershed /sub-watersheds/ floodplain; and identification of aquifers if any	Identify and assess project impact on the change in drainage morphology/local drainage system and resulting effects of flooding pattern in the project area and surrounding. Include climate projections effects on flooding. Relate discussions to item 3.1.1	For further evaluation of EIA Review Committee
2.1.2 Change in stream, lake water depth	Regional hydrogeological map	Identify and assess project impact in terms of change in stream, lake water depth	For further evaluation of EIA Review Committee
2.1.3 Depletion of water resources / competition in water use	Current / projected water use (groundwater/surface water) in the area and adjacent areas Inventory of water supply source including springs and wells(indicate depth of water table) and show location in a map of appropriate scale	Identify and assess project impact on the existing water resources and the resulting competition in the water use using analysis/estimation of water availability. Include discussions taking into consideration the PAGASA medium to long term projections	For further evaluation of EIA Review Committee
2.2 Oceanography			-Provide Impact Analysis, Environmental Management and Monitoring Plans

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
2.2.1 Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition	• Bathymetric survey and map • Measurement of water currents • Analysis of available proximate tides data • Hydrodynamic modeling • Particle dispersion modeling and map • Storm surge hazard, exposure, vulnerability, risk maps	Identify and assess project impact on the degree of change/disruption of circulation pattern and the potential for coastal erosion Build a hydrodynamic model based on the measured bathymetry and currents and tidal analysis and then validate the model. A public domain software like the United States Environmental Protection Agency Environmental Fluid Dynamics Code (EFDC) may be used. Through the validated hydrodynamic model, assess the impacts of the project on water circulation, littoral current, and coastal erosion and deposition. Use the modeling results of Sec. 1.3.1 and 2.1.1. Discuss how the impacts may be affected by climate change especially sea level rise.	For further evaluation of EIA Review Committee
2.2.2 Change in bathymetry	Bathymetric map;	USLE / similar modeling when applicable Use the hydrodynamic model to assess the impacts of the bathymetric changes. Discuss how the impacts may be affected by climate change. Compare projected new bathymetry as a result of the project with the existing	- Provide the required information and discussion

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
2.3 Water Quality			-Provide Impact Analysis, Environmental Management and Monitoring Plans
2.3.1 degradation of groundwater quality	Physico-Chemical characterization of water: ☐ pH ☐ BOD5 ☐ COD ☐ DO ☐ Oil and grease ☐ TSS ☐ Heavy Metals : _____ ☐ fecal / total coliform ☐ others: _____ ☑ sampling site map	Identify and assess project impact in terms of degradation of groundwater, coastal surface water and coastal/marine water quality. Use DENR standard methods and procedures for sampling and analysis. Assess impact on siltation of surface and coastal/marine waters. Circulation / plume modeling for regular discharges, leaks/spills, worst case scenario of failure of WTF and other emergency/ accident scenarios for facilities with structures in water bodies Link discussion of spills with Section 1.3 especially if spills affect soil and groundwater. Aquifer (Groundwater) vulnerability Assessment (i.e. discussions on groundwater contamination due to project operation). Show in a map, sampling sites for monitoring purposes based on the above assessment.	
2.3.2 degradation of surface water quality			-Provide a discussion on the updates on the water quality, i.e. Water quality results in the EIS vis-a-vis water quality results in the EPMRP
2.3.3 degradation of coastal/marine water quality			-Provide a discussion on the updates on the water quality, i.e. Water quality results in the EIS vis-a-vis water quality results in the EPMRP
2.4 Freshwater Ecology			

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
2.4.1 Threat to existence and/or loss species of important local and habitat	• Summary of endemicity / conservation status • Abundance of ecologically and economically important species (fishes, benthos, planktons); • Presence of pollution indicator species; • sampling site map	Identify and assess project impact in terms of threats to existence/and or loss of species, abundance frequency and distribution species and include discussions on overall impact to freshwater ecology. Relate discussions to air and water Show in a map, sampling sites for monitoring purposes based on the most significant threats identified.	- Provide the required information and discussion
2.4.2 Threat to abundance, frequency and distribution of species			- Provide the required information and discussion
2.5 Marine Ecology			-Provide Impact Analysis, Environmental Management and Monitoring Plans
2.5.1 Threat to existence and/or loss of important local species and habitat	•Abundance/densities/distribution of ecologically and economically important species (mangroves, fishes, benthos, planktons, coral reefs, algae, seaweeds, sea grasses); •Presence of pollution indicator species; •Historical occurrences of red-tide, fish kill or any related event •marine resource map •sampling site map	Quadrat, transect, line intercept, spot dive, manta tow, marine resource characterization (e.g. municipal and commercial fisheries data) for baseline gathering. Identify and assess project impact in terms of threats to existence, loss of important local species, threat to abundance, frequency and distribution and include discussions on overall impact to marine ecology. Relate discussions to air, water and oceanography	-Provide a discussion on the updates on marine ecology, i.e. results in the EIS vis-a-vis results in the EPMRP
2.5.2 Threat to abundance, frequency and distribution			-Provide a discussion on the updates on marine ecology, i.e. results in the EIS vis-a-vis results in the EPMRP

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
		Show in a map, sampling sites for monitoring purposes based on the most significant threats identified.	
3.0 THE AIR			-Provide Impact Analysis, Environmental Management and Monitoring Plans
3.1 Meteorology/Climatology			
3.1.1 Change in the local micro-climate e.g. local temperature	Monthly average rainfall and temperature of the area; Climatological normals/extremes; Wind rose diagrams; Frequency of Tropical cyclones	Identify and assess project impact in terms of change in the local micro- climate change. Also discuss effects of climate change using PAGASA medium to long term projections	- Provide the required information and discussion
3.1.2 Contribution in terms of greenhouse gas emissions (or GHG mitigation potential) Note: applicable only for projects with significant GHG emissions	Data on Greenhouse gasses (i.e. carbon dioxide, nitrous oxide);	Estimate projected greenhouse gases (GHG) (i.e. carbon dioxide, nitrous oxide) using IPCC guidelines; include mitigation and/or sequestration for both construction and operation phases.	- Provide the required information and discussion
3.2 Air Quality (& Noise)			-Provide Impact Analysis, Environmental Management and Monitoring Plans
3.2.1 Degradation of air quality	Characterization of ambient air quality: ☐ TSP ☐ PM10 ☐ SOx ☐ NOx ☐ Trace Metals :_____	Use DENR standard methods and procedures for sampling and analysis. Relate selection of sampling locations using data collected in 3.1.1 Identification and assessment of impact of the project to the identified parameters including VOCs and odor through air	-Provide a discussion on the updates on the air and noise quality, i.e. results in the EIS vis-a-vis results in the EPMRP

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
	☐ others: _____ (for sampling methods refer to Clean Air Act) ☑ sampling site map	dispersion modeling (as may be applicable) Show in a map, sampling sites for monitoring purposes based on the above assessment. *Compare changes in air quality over time using statistical tools e.g. across sampling sites over time, and test for significant changes*	
3.2.2 Increase in ambient noise level	Characterization of ambient noise level sampling site map	Use DENR standard methods and procedures for sampling and measurement. Identification and assessment of impact to ambient noise level using noise attenuation modeling and comparing it with relevant standards. (applicable if estimated total noise level will exceed noise standard).	-Provide a discussion on the updates on the air and noise quality, i.e. results in the EIS vis-a-vis results in the EPMRP
4.0 THE PEOPLE			-Provide Impact Analysis, Environmental Management and Monitoring Plans -Revise Section 2.4 based on this outline -Provide a discussion on the updates on the baseline status for this section, i.e. results from EIS vis-a-vis results from EPRMP
4.1 Displacement of settler/s Displacement / disturbance of properties	Demographic data of impact area:	Identify and assess project impacts on demography of affected communities. Use	- Provide the required information and discussion

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
Change/conflict in land ownership Change/conflict Right of way Impact on Public Access	- Number of households and household size - Land area, - Population, - Population density /growth - gender and age profile, - literacy rate, profile of educational attainment - settlements map Census of population / property that will be displaced / disturbed Housing ownership profile / availability of housing/ number of informal settlers	assessment in the formulation of SDP/IEC Assess availability of alternative public access and housing options for displaced settlers For project with displacement/ disturbance of properties/settlers, change/conflict in land ownership and change/conflict right of way, formulate resettlement framework plan or RAP	
4.2 In-migration proliferation of informal settlers		Identify and assess project impact due to in-migration patterns including proliferation of informal settlers	- Provide the required information and discussion
4.3 Cultural/Lifestyle change (especially on Indigenous People, if any)	Demographic data on Indigenous People (if any) and existing Culture/Lifestyle that may be significantly affected	Identity and assess project impact in terms of Culture/Lifestyle that may be affected and/or introduced	- Provide the required information and discussion
4.4 Impacts on physical cultural resources	Inventory and description of physical cultural resources and landscapes that have archaeologic, paleontologic, historical, religious, aesthetic, or cultural significance: Movable or immovable objects, below ground or under water, sites, structures, groups of structures, and natural features	Identify all potential project impacts in an integrated manner considering the type, significance, and value/importance of the physical cultural resource/s Identify risks in terms of capacity and commitment in managing the impacts	- Provide the required information and discussion

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
	Classify cultural interest value/ importance into local, provincial, national, or international level *Sources of information: UNESCO, National Museum (NM), National Historical Commission of the Philippines (NHCP), National Commission for Culture and Arts (NCAA) and the Local Government Units (LGUs) in the project area and other UN or National Publications*	*(protocols in handling chance finds shall be implemented)*	
4.5 Threat to delivery of basic services /resource competition	Availability of public services in terms of: • Water supply • Power supply • Communications /transportation • peace and order / crime • education facilities • recreational facilities / sports facilities statistical data / information related to public services: • literacy rate, profile of educational attainment • Crime rate • Food security	Identify and assess project impact in terms of threats to delivery of basic services including potential for resource competition in the area including effects of in-migration	- Provide the required information and discussion

List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Remarks
4.6 Threat to public health and safety	Availability of public services in terms of: health resources (Government and Private) Statistical data / information related to public services: • Morbidity and mortality rates (infants and adults - 5-year trend) • Common diseases in the area including endemic diseases; Environmental Health and Sanitation Profile	Identify and assess specific threats to public health and safety due to project impacts. Relate discussions to land, air and water (Item 1 to 3) Analysis of the impact of project implementation on existing disease profile including weather sensitive diseases and impact aggravation as a result of climate change as projected by PAGASA	- Provide the required information and discussion
4.7 Generation of Local Benefits from the project Enhancement of employment and livelihood opportunities Increased business opportunities and associated economic activities Increased revenue of LGUs	Socioeconomic data: • Main sources of Income • Employment rate/ profile • Poverty incidence • sources of livelihood • commercial establishments and activities • banking and financial institutions	Identify and assess local benefits of the project in terms of enhancement of employment and livelihood opportunities, increased business opportunities and associated economic activities and increased revenue of LGU	- Provide the required information and discussion
4.8 Traffic congestion	Road network/ systems Existing Transportation/traffic situation	Identify and assess project impact on the traffic situation in the area including congestion based on existing capacity of road system	- Provide the required information and discussion particularly the impacts of the bridges connecting the reclamation area to the mainland of Pasay.

Table 4. Environmental Risk Assessment to be included in EIS/EPRMP

Level of Coverage & Type of Risks	CONTENTS OF ERA AS PART OF EIS/EPRMP For the identified safety risks in column 1	REMARKS
Level of Coverage: Refer to Annex 2-7e of the RPM for DAO 2003-30 ☐ Level 2 (QRA Required) ☐ Level1 (Emergency Plan based on hazard analysis) ☐ Risk Screening Level	For EPRMP, include HAZOP or QRA for existing facilities and compare with that for the expansion. Also include discussions on safety incidents/records/history (in relation to environmental risks) classified into first aid, medical attention cases, days away from work cases, fatalities (including contractors), record of drills (fire, spills, explosion, among others) and any experience in implementing the ERP For EIS, check type of report to be submitted prior to Operation: ☐ Quantitative Risk Assessment(QRA) ☐ HAZOP ☐ Others : _____	For further evaluation of EIA Review Committee
Safety Risks Type: ☐ Fire ☐ Explosion ☐ Release of toxic substances	☑ Description of conditions, events and circumstances which could be significant in bringing about identified safety risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards, both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the release of toxic substance, as applicable ☑ The safety policy and emergency preparedness guidelines consistent with the regulatory requirements. Emergency Preparedness should also consider natural hazards to the infrastructures and facilities. For EPRMP, present actual Emergency Response Policy,record of drills and recorded events.	For further evaluation of EIA Review Committee

Level of Coverage & Type of Risks	CONTENTS OF ERA AS PART OF EIS/EPRMP For the identified safety risks in column 1	REMARKS
☐ Physical Risks (Failure of Structure w/c could endanger life, property and/or the environment)	☑ Description of conditions, events and "trigger" which could be significant in bringing about identified physical risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the failure of structure, as applicable	For further evaluation of EIA Review Committee

ADDITIONAL INFORMATION REQUEST FROM EIARC					
First AI	:	✓	Second AI	:	
Project Title	:	**Land Reconfiguration of the 360 ha Pasay Reclamation Project**			
Project Location	:	**Manila Bay, Pasay City**			
Proponent Name	:	**City Government Pasay**			
Date & Venue of Meeting	:	**30 August 2024, 08:30AM – 11:20AM. EIA Conference Room**			

Executive Summary	**EIA Summary** In the summary of baseline data, there are no discussion on the proximity to: • Properties in the Phil Registry of Cultural Properties with 1 km from the project. • National Historical Shrines and Landmarks within 1 km from the project Table ES 3.3 • TSS sampling frequency must be monthly during reclamation phase • Add the following parameters: -turbidity as one of the parameters -transparency using Secchi disc No discussion on the risk and uncertainties relating to the EIA findings
Project Description	**Summary of Modifications** • Table 1.2 – The distance from Island B to Island C is approx. 183 meters, shorter by 17 meters from the original design. • See hydrodynamic model – rationale for a shorter distance by 17 meters **Project Rationale** • There is no discussion on the access ways between islands and inter-island connecting roads and bridges. **Project Alternatives** • The siting did not consider the following factors: -perceived potential impact of the project to nearby communities e.g. cause severe flooding in these areas -potential impact/disturbance to navigation to government activities (PPA, PCG) -natural calamities and other factors which may affect the project

	Project Components • From the summary of modifications, the distance from Island B to Island C is shorter by 17 meters. Results of the hydrodynamic models • The indicative design of the bridges between islands and connection of the islands with the mainland must be provided. • Provide a brief discussion on the status of the project. **Section 1.4.2.1** • Please provide the source resources required including the estimated power and water requirements. • Notes: disposal of unsuitable materials and its location. Siltation in the excavation/dredging of the originally reclaimed portion. Provide controls
Water	**Section 2.2.1.3** Figure 2.50, 2.51 – The observed tidal heights used in the project was January 2010. Please provide more recent data. **Section 2.2.2 Water Quality** Please make necessary corrections in the statement "*Water sampling was conducted by on 23 April 2024*" Table 2.25, please indicate the minimum volume collected for each parameter collected. Clarification – Were the sampling bottles prepared by the DENR Recognized Laboratory? Describe also the preservation and handling of samples (from collection to transport to acceptance of the laboratory)? Are there any duplicate or replicate samples? Trip blanks? During the collection of samples, there were no discussion whether reclamation activities were on-going or not. A narrative of the activities in relation to water quality sampling must be described in detail
Marine	• Overlay in the map the nearest coastal resources, e.g. LPPWP, mangrove areas, etc… and provide discussions on its impacts. • Provide a comparative analysis of the original configuration vs the land reconfiguration with respect to the baseline data (same as inputs of BMB)
Air	**Section 2.3.2.1 Air Quality** Table 2-39, there were no PM10, SO2 and NO2 sampling for the first quarter of 2024. Any justification why no sampling was conducted.
People	1. Complete barangay level baseline data. Use most recent data. 2. Determine changes in baseline data by comparing most recent socio-economic demographic data with data collected for previous EIS to show how the impact communities have changed. 3. Conduct perception survey in the impact communities. Discuss the formula used in determining the sample household size. Include a discussion on the profile of the sample households.
EMP	**Section 3.2.2**

	During the review of the original EIS, silt curtains were committed to be implemented during reclamation activities. While the installation and maintenance of the silt curtains require complex logistics and pose navigational hazards/risks, an equivalent method must be implemented. Water quality monitoring results are good indicator of the effectiveness of any mitigation. The results as depicted in Table 2.26 may not be conclusive for the following reasons: •a short-term measurement does not provide a good description of the effectiveness of the substitute mitigation •the results are a snapshot at the time of sampling •no description of the reclamation activities in relation to the water quality sampling The proposed or alternate mitigation should be in combination with other methods to ensure that the degradation of coastal/marine waters is minimal.
SDP and IEC	Include a discussion of previously implemented SDP and IEC. Use the suggested table below: SDP • Year of implementation • - projects/activities - • status of completion (completed, on-going, not implemented and reason for not implementing) • Number and category of Beneficiaries IEC • Year of implementation - • IEC program/activity - • Audience
Environmental Compliance Monitoring	**Section 6.1.2 Compliance to EMP Conditions** Please a discussion by indicating a matrix of the planned and the actual implementation of the EMP. Table 6.1 is a brief/detailed compliance with the ECC condition (which should have been included in Section 6.1.1 **Table 6.4** There is no sufficient compliance with commitment to monitor noise levels daily (with reference to Table 6.9 – Noise levels were measured twice e.g. January 2013 and August 2014. Table 6.11 showed quarterly monitoring to monthly). Please justify or provide explanations about the non-compliance with the commitment. **Table 6.14 to 6.23** Majority of the monitoring were quarterly. No data for the first 2 quarters of 2024.

Others	1. A statement shall be provided in the Project Rationale that the design of the project is in accordance with the DRR plans of the City of Pasay 2. Provide a statement in the EPRMP that the tree species that will be considered for the establishment of the green space are endemic.
BFAR	1. Enhance mitigating measures for suppressing fugitive dust during the reclamation and soil stabilization process (e.g., increase of frequency on road watering on open spaces). 2. Provide status on the City Ordinance related to fisheries and coastal management. 3. Include selected direct and indirect impact barangays in the SDP and IEC.
DENR NCR	1. Provide Shapefile of the reconfigured island of the project (E-copy only) 2. Terrestrial and Marine in the EMP: provide statement that there will be no harmed biodiversity. Include concise indicator such as migratory birds observed in the area during migrating season.

Agreements:

1. The City of Pasay shall apply for a separate ECC amendment for bridges considering there is no DED yet and on the process of acquisition of land through City Government of Pasay and the PRA.
2. The revised EPRMP integrating all the comments of EIARC, Resource Persons, and EMB shall be submitted on or before September 13, 2024, before 12noon. In case the revised EPRMP may not be submitted on the agreed date, the proponent and its joint venture partner will officially inform EMB through written communication.
3. Tentative schedule of final/second EIA review meeting: September 17, 2024, 09:00 AM.

Requested by:			
Engr. Jose Reynato Morente	**Dr. Soledad Natalia Dalisay**	**Dr. Maria Lourdes Moreno**	**Mr. Edmundo Vargas**
EIARC Chairperson	EIARC Member	EIARC Member	EIARC Member
Mr. Justin De Ramos	**Engr. Zara Selyn Alaira**		**Mr. Grick Cordero**
DENR NCR	**EMB NCR**	**FMB**	**BMB**
Engr. Elizabeth S. Mendoza	**Mr. Rene Zaldy P. Porlaje**		
PRA	DA-BFAR		

Proponent:	**JV Partner:**	**Preparer:**	
Engr. Achilles L. Robiso, EnP	**Atty. Leah M. Quiambao**	**Dr. Jose M. Regunay**	
City of Pasay	SM Smart City	PLANADES – EIA Preparer	
Prepared by:		**Concurred by:**	
Engr. Carlo Vic Arida, EnP/ Engr. Christine Solo		**Engr. Marivic E. Yao**	
EMB Casehandlers		OIC-Chief, EIAMD In concurrent capacity as Chief, SPPS	

APPENDIX S.
TURBIDITY MANAGEMENT PLAN

PASAY RECLAMATION DEVELOPMENT PROJECT
TURBIDITY MANAGEMENT PLAN (TMP)



Deliverable Information	
Employer doc. no.	PRDP-CON-EN-XX-XX-PL-0004
Contractor doc. no.	CHEC-PRDP-HSE-102

Contractor	Name / position	Date	Signature
Approved	**Felix Liu** Contractor's Representative	20-Sep-24	
Checked	**Robert Davies** HSE Director	20-Sep-24	
Originated	**Carl Phillip Lantecsi** Environmental Manager	20-Sep-24	

Revision Change Log		
Revision	**Date**	**Change**

Amendment Table		
Rev. No.	**Section Reference**	**Amendment/Page**

Employer Information	
Company	**SM Smart City Infrastructure and Development Corporation**
Project name	Pasay Reclamation Development Project
Contract no.	PRDP-SMP-SMRT/02

Engineer Information	
Company	Haskoning Philippines Inc.
Address	U4 22F, Tower 6789, Ayala Avenue, Brgy. Bel-Air, Makati City 1209 Philippines
Other details	Part of Royal Haskoning DHV

Contractor Information	
Contractor setup	**China Harbour Engineering Company (CHEC)**
CHEC Project no.	CHEC/PH/2019/001

1 INTRODUCTION 5

1.1 Background 5

1.2 Purpose of this Report 5

2 DESCRIPTION OF WORKS 7

2.1 Scope of Construction work 7

2.2 Sequencing of work 9

3 ROLES AND RESPONSIBILITIES 10

3.1 Organisational chart 10

3.2 Important Groups and Key Personnel for TMP Implementation 11

3.3 The Contractor 11

3.4 Subcontractor 14

3.5 Environmental Consultant/ Environmental Laboratories 15

3.5.1 GHD 15

3.5.2 Dedicated Laboratory for analysis 15

3.6 Environmental policy 16

3.6.1 Environmental Policy Statement 16

3.7 Environmental management frameworks 16

4 EXISTING ENVIRONMENT 16

4.1 Regional setting 16

4.2 Marine environmental quality 17

4.3 Baseline turbidity monitoring 17

5 TURBIDITY MANAGEMENT PLAN 19

5.1 Turbidity monitoring program 19

5.1.1 Monitoring program design 19

5.1.2 Turbidity Management Group (TMG) 20

5.2 Trigger levels and tiered management framework 21

6 REPORTING 24

6.1 Trigger level notification register 24

6.2 TMG assessment 24

6.3 Non-conformance 24

6.4 Inspections/checklists 24

6.4.1 Corrective and preventative actions 25

6.4.2 EMP compliance 25

7 INDUCTION AND TRAINING REQUIREMENTS 26

8 COMMUNICATION AND NOTIFICATION REQUIREMENTS 27

8.1 Communication 27
8.2 Management plan review requirements 27
9 REFERENCES, ABBREVIATIONS, DEFINITIONS 28
9.1 References 28
9.2 Abbreviations 29
9.3 Definitions 29
9.4 Legislation, Standards and other documents 30
10 HEALTH, SAFETY AND ENVIRONMENT 30
ATTACHMENTS 32
ATTACHMENT A ENVIRONMENTAL POLICY 33
ATTACHMENT B LIST OF VESSELS CURRENTLY IN THE PROJECT 34
ATTACHMENT C INTERNAL NON-CONFORMANCE REGISTRY 37
ATTACHMENT D EMP COMPLIANCE CHECKLIST 38
ATTACHMENT E NCR REGISTER (TBD) 40

1 INTRODUCTION

1.1 Background

The Pasay Reclamation Development Project (PRDP) in Manila Bay, Philippines is a reclamation project by SM Smart City Infrastructure and Development Corporation (the Employer) (Figure 1-1). The Project is being developed in close cooperation with the Philippine Reclamation Authority (PRA) and the local government of Pasay City.

A turbidity study for the proposed development was conducted by China Harbour Engineering Company Limited (CHEC) (the Contractor) in 2020. The study contains details of the conducted 3-dimensional hydrodynamic and sediment plume model. The study found that turbidity levels at the vicinity of the project spike above nominated water quality objectives.

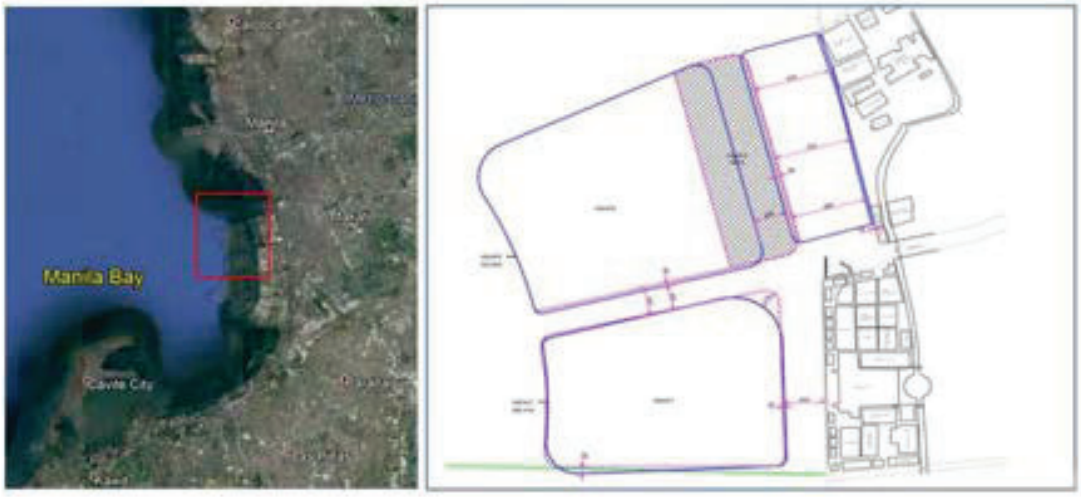


Figure 1-1: PRDP location and site plan.

1.2 Purpose of this Report

The Contractor and Subcontractor commit to taking a series of measures to comply with all associated environmental requirements within a management system. The management system described within this TMP is complementary to the overarching Environmental Management Plan (EMP) and Environmental Emergency Response Plan (EERP) for the project, and:

- Reflects the Contractor's and Subcontractor's commitments to implementing and adhering to work practices that will lead to protection of environmental resources.
- Describes the environmental policies and systems adopted for the Construction, Dredging and Reclamation works for the PRDP in relation to management of turbidity.
- Outline project environmental objectives, implementation strategies to meet these objectives, and mechanisms to monitor and ensure compliance with this Plan.
- Provides measures to avoid, minimize and mitigate potential adverse impacts of elevated turbidity associated with the construction works, and

- Identify roles and responsibilities of key personnel responsible for the implementation of the TMP.

The TMP is designed in accordance with the environmental requirements and criteria set forth in the Employers Requirements. This TMP is prepared in accordance with the ISO 14001:2015 standards and takes due consideration of the principles laid out in the Department Order No. 198, Series 2018, Labor Code of the Philippines 2017, and in compliance with Municipal bylaws.

This TMP is revised due to the termination of the Buoy base system, which is the main source of monitoring data and new scope of CON in WQM had been approved and implemented. Additional revisions were made for the new ECC Amendment.

2 DESCRIPTION OF WORKS

2.1 Scope of Construction work

The PRDP is comprised of multiple elements including dredging of an access channel, swing basins, sandkey and borrow area, and placement of dredged material offshore or at the reclamation area.

Table 2-1 *Contractor's Marine Work Areas for Dredging/Reclamation and Disposal Activities* provides an overview of each project element, and identifies which elements are relevant to this TMP.

***Table 2-1:** PRDP project elements and their relevance to this TMP.*

Footprint	Description	Equipment/Method	Relevance to TMP	Reference document
Access channel and swing basins	Approximately 3.4M m3 of material will be dredged from channel and two swing basins to support dredger access to the reclamation site (Figure 2-1 Contractor's Marine Work Areas for Dredging/Reclamation and Disposal Activities). If unsuitable for reclamation, dredged material will be placed offshore at a disposal site outside Manila Bay.	1 x Jumbo Trailer Suction Hopper Dredge (TSHD); 1 x Medium sized TSHD-Bottom dumping of unsuitable dredge material at offshore disposal location	Dredging action included in TMP scope.	[B12] PDRP-CON-CO-XX-DR-MS-0001
Sandkey	Dredging of the sandkey to remove unsuitable bed material prior to reclamation (Figure 2-2). If unsuitable for reclamation, dredged material will be placed offshore at a disposal site outside Manila Bay.	1 x Medium sized TSHD 2 x Grab dredges Bottom dumping of unsuitable dredge material at offshore disposal location	Dredging action included in TMP scope. Offshore disposal excluded from TMP scope.	[B11] PDRP-CON-CO-XX-SK-MS-0001
Sandkey & Borrow area	Filling of sand key with sand sourced from borrow area PRA2000 and / or Bucao river Reclamation works are described further following. Approximately 13M m^3 of material will be sourced to fill the sandkey. The current areas (PRA2000 and Zambales as named in COM latest offer, and state that the TMP therein will be subject to specific ECCs for each borrow area).	1 x Jumbo TSHD 1 x Medium TSHD Pelican Barges Placement of sands via spreader pontoons 21 Pelican Barges-Unloading of sand via conveyor	Dredging at borrow area covered under the Borrow Area ECC, therefore excluded from TMP scope. Placement of sands at sandkey included in TMP scope.	[B11] PDRP-CON-CO-XX-SK-MS-0001

The reclamation works associated with this TMP include the following main activities:

- Island A
  - Dredge of sandkey around perimeter of Island A and deposition of dredge material to create the perimeter 'bunds' of the island.
  - Deposition of hydraulic sand fill within the bunds to meet design level requirements at Island A
  - Compaction, rehandling and grading of fill material at Island A
  - In situ casting of wave wall at Island A and associated backfill

- Island B
  - Dredge of sandkey around perimeter of Island B and deposition of dredge material to create the perimeter 'bunds' of the island.
  - Deposition of hydraulic sand fill within the bunds to meet design level requirements at Island B
  - Compaction, rehandling and grading of fill material at Island B
  - In situ casting of wave wall at Island B and associated backfill
- Island AB Reconfiguration
  - Dredging of Zone 1 and Zone 4 (Island A) up to desired channel depth of -6.0m MSL
  - Land-based and sea-based excavation of Zone 3 and Zone 6 (Island A) with slope protection
  - Land-based and sea-based (if necessary) excavation at Groyne Area (Zone 7 – Island A)
  - Land-based and sea-based excavation of Zone 2 and 5
  - Land-based excavation to modify surcharge elevation for the 470-meter temporary (sand bridge) access.

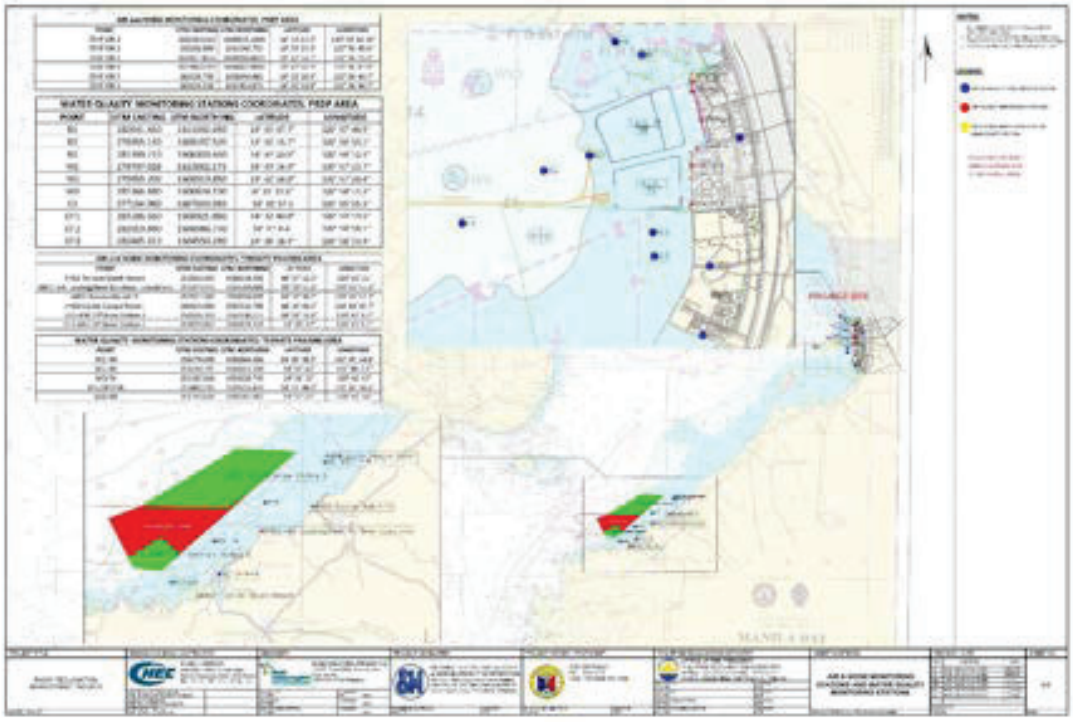


Figure 2-1: Contractor's Marine Work Areas for Dredging/Reclamation and Disposal Activities.

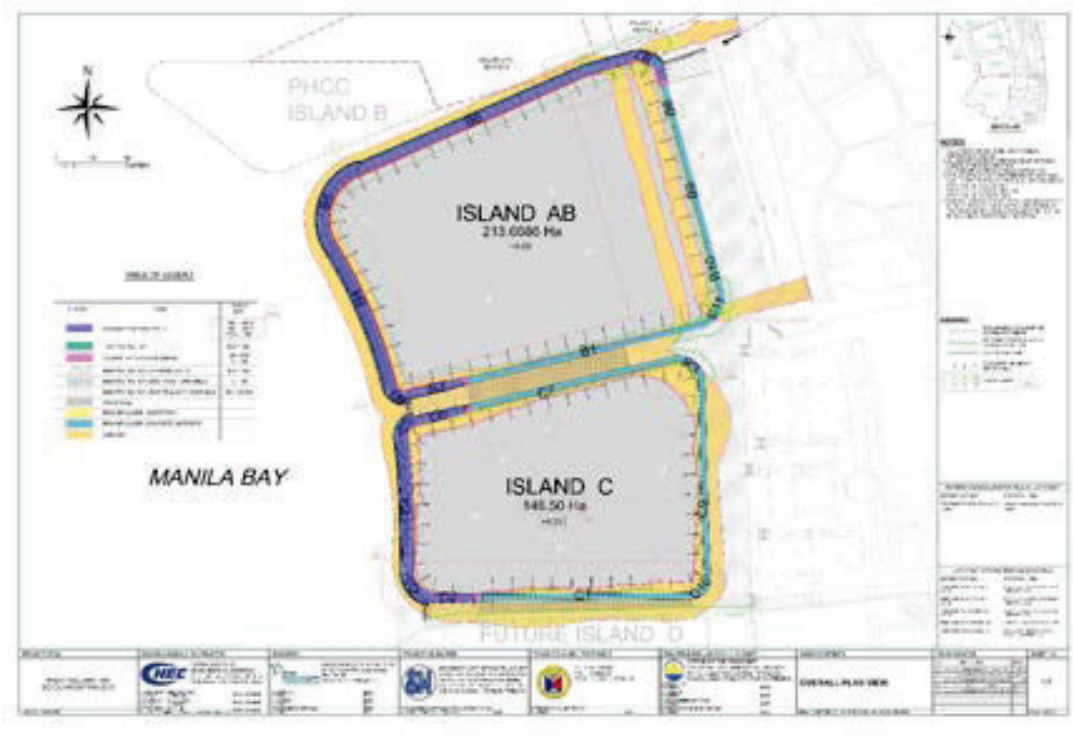


Figure 2-2: *Revised Sandkey layout (from method statement B11).*

2.2 Sequencing of work

The sequencing of work is detailed in the overarching PRDP program (reference: Pasay Reclamation Development Project Sub-clause 8.3 Baseline Program). The following provides an overview of the sequencing of works relevant to this TMP:

- Removal of soft unsuitable materials at the seabed via dredging
- Deposit of the dredged materials at a suitable offshore area to be pre-approved
- Deposit of hydraulic sand fill at the reclamation site
- Continued deposit of hydraulic sand fills to cover an area that will allow for compaction plant to operate
- Compaction of the reclamation area and surface grading
- Placement of geotextile fabric
- Placement of rock and concrete mattresses to enclose reclamation area
- Construction of wave-walls where applicable.

3 ROLES AND RESPONSIBILITIES

3.1 Organisational chart

The organisational chart for environmental management, inclusive of turbidity management is shown below (Figure 3-1). The complete organisation chart for Contractor and Subcontractor's highlighting key personnel can be found in the Contractors EMP [B10].

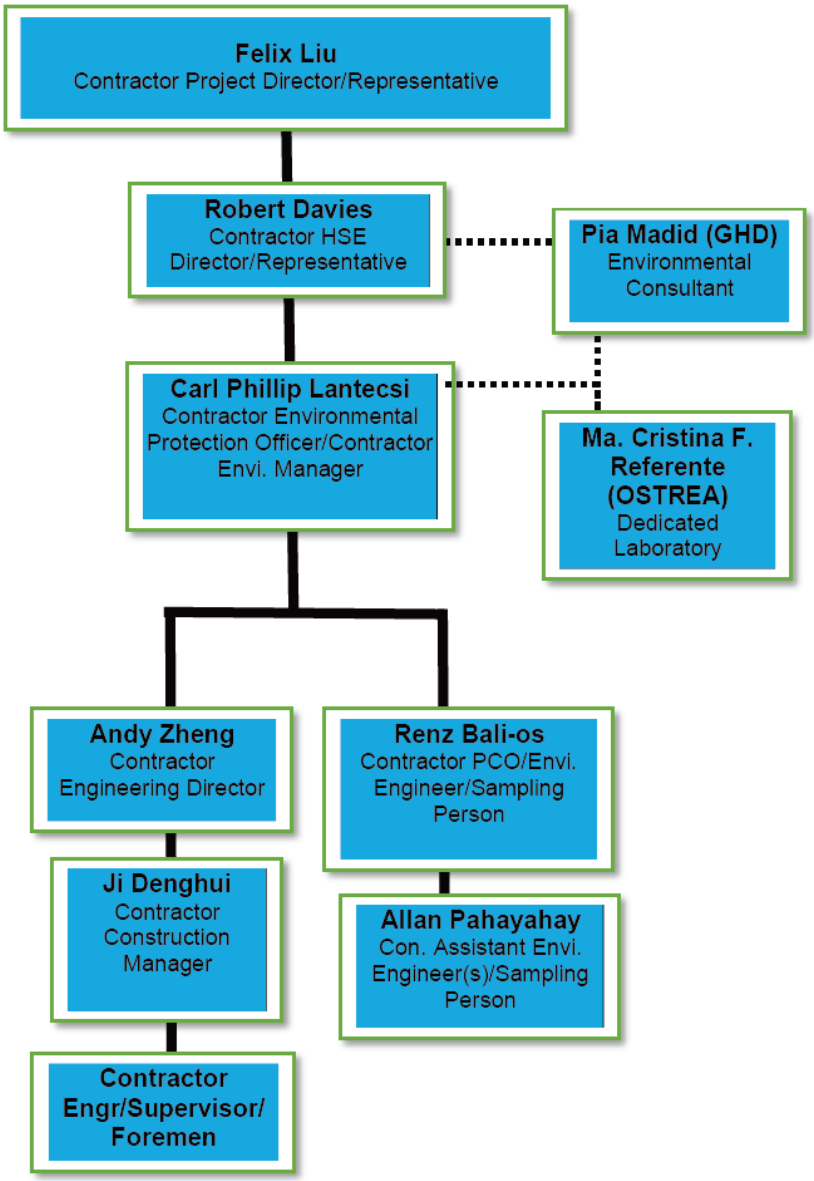


Figure 3-1: Organizational Chart.

3.2 Important Groups and Key Personnel for TMP Implementation

A. Turbidity Management Group (TMG)

Name	Company	Designation	TMG/Key Person	Email Address	Contact No.
Contractor					
Felix Liu	CHEC	Project Director	Con Representative	Liuzhi@dredging-chec.com	+639166104923
Benjamin Guo	CHEC	Dep. Project Director	Con Representative	benjamin.guo@dredging-chec.com	+639560252663
Robert Davies	CHEC	HSE Director	Key Person, TMG Member	Robert.Davies@dredging-chec.com	+639493970715
Carl Phillip Lantecsi	CHEC	EPO/EM	Head, TMG	HSE.Environmental@dredging-chec.com	+639672506006
Renz Bali-os	CHEC	PCO/EE	Member, TMG	renzzzbalios.work@gmail.com	+639062919896
Allan Pahayahay	CHEC	Asst. Envi. Engineer	Staff	pahayahayallan@gmail.com	+639394337506
Andy Zheng	CHEC	Engineering Director	Member, TMG	Andy.zheng@dredging-chec.com	+639682431376
Ji Denghui	CHEC	Construction Manager	Member, TMG	denghuiji@dredging-chec.com	+639493970582

B. Environmental Consultants/Service Providers

Consultants/Services					
Name	**Company**	**Designation**	**Key Person**	**Email Address**	**Contact No.**
Pia Madid	GHD	Project Director	GHD Rep.	Cassiophiea.Madid@ghd.com	+639988665831
Ma. Cristina F. Referente	OSTREA Lab	Laboratory Head	Lab Rep	results@ostrealabs.com.ph	+639178703393

C. Contract/Works Administrators

Engineer/Employer					
Name	**Company**	**Designation**	**Key Person**	**Email Address**	**Contact No.**
Darwin Montemayor	SM SCIDC	Construction Representative		darwin.montemayor@smsmartcity.com	+639209012455
Raymond Cabanilla	SM SCIDC	PCO		mon.cabanilla@smsmatcity.com	+639151276462
Brian Higgins	RHD	Engineer's Representative		brian.higgins@rhdhv.com	+639171536796

3.3 The Contractor

The roles and responsibilities of the Contractor in the execution of this TMP are as follows:

Environmental Protection Officer/ Environmental Manager (EPO/EM) will be responsible for all Contractor teams including those from the Subcontractors;

- Undertakes work in accordance with the requirement of this TMP, the EMP and abide Environmental Laws, legislations, regulations and guidelines of the Philippine government.

- Disseminate TMP and EMP requirements and relevant site-specific procedures to all CHEC employees and subcontractors working on the project;
- Implements and maintains (for the duration of the construction contract) a management system that includes procedures and forms for recording and documenting environmental accidents/incidents, non-conformances and complaints, and procedures for undertaking corrective and or preventive actions to rectify any accidents/incidents, non-conformances and complaints;
- Maintain register of all environmental accidents/incidents, non-conformances and complaints These documents will be made available upon the PD's approval;
- Undertake routinely environmental inspection/monitoring works to verify compliance with this TMP and the EMP;
- Correct all non-conformances to the satisfaction of the Engineer, Employer and the Regulatory authority in the agreed timeframe through reporting of non-conformances and conducting series of meetings and consultations;
- Train all relevant CHEC personnel (including all subcontractors, where appropriate) effectively so they are able to implement the requirements of this TMP and the EMP; and
- Monitor all subcontractor's performance to ensure environmental compliance of all assigned works.

Roles and responsibilities of key personnel are detailed below. The Senior members of CHEC as the Contractor have the ultimate responsibility and obligation to develop and implement this TMP, the EMP and manage all environmental aspects throughout the project duration. All these responsibilities are stipulated below in Table 3-1.

Table 3-1: Contractor roles and responsibilities.

Role	Responsibilities
Project Director (PD)	• Ensures that all work is carried out in accordance with the Project Environmental Policy, Plans and Procedures, is consistent with Contractor's Project requirements and local legislations and regulations; • Ensures that there is full implementation of this TMP, and the EMP and its requirements at each work location; • Coordinates and supports the Subcontractor Project Director this TMP and the EMP implementation • Supports and co-operates with the EPO/EM to discuss and resolve environmental problems arising from the subcontractors and all site operations; • Ensures that all resources needed by the environmental requirements are available. This include but not limited to human resources, specialized skills, organizational infrastructure; technology and financial resources; and • Ensures that subcontractor's environmental performance is up to the required standard
Environmental Protection Officer (EPO) / Contractor Environmental Manager (EM)	• The Environmental Manager will act as the Environmental Protection Officer in the project; • He/She shall report directly to the Project Director with regards to this TMP and the EMP implementation; • He/She shall be the contact person for environmental matters and shall be responsible in reporting any non-compliances, incidents and complaints to the Engineer; • He/She, at any time assist the Employer or the Engineer with any request of a review of all environmental records and compliance inspections on Site. • He/She shall be in charge in all environmental implementation and the contact person for environmental related activities and environmental matters; • Develops, implements, updates and reviews this TMP and the EMP and all environmental management frameworks and policies and ensures that the site operates in accordance with most updated and applicable statutory & regulatory requirements;

	• Liaise and coordinates with the Subcontractor EM with regards to this TMP and the EMP implementation; • Manages company environmental procedures and records; • Manages all matters related to environment and acknowledge requirements of contract and procedures for the project; • Ensures effective implementation and performance of this TMP and the EMP and all environmental management frameworks; • Reviews and updates environment management plan, procedures, records and assists in dealing with any public complaints related to environment; • Takes relevant action if any environmental-related emergency occurs; • Ensures attendance to management meetings and site meetings or walk throughs; • Reports all Environmental issues to CHEC Management, Engineer, Client and to other concerned parties; • Initiates the conducts of Environmental Risk Assessments; • Coordinates and conducts Environmental training at all levels on site and head office; • Initiates reviews of non-compliances relating to the construction activities and Environmental Management System (EMS); • Reviews project environment reports and initiates actions to resolve environment related issues; • Reviews environmental monitoring and inspection reports prepared by the Environmental Engineer; • Reports any non-compliances, incidents and complaints to the Engineer; • Participate in the environmental works with the Engineer Representative (ER) and Environmental Unit (EU) when necessary and review environmental inspection report submitted by Environmental Unit; • Ensure appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the relevant procedures; • Assists in handling any complaints received from the public; • Ensure remedial action to be taken immediately if there is a non-compliance of statutory or contractual requirements in respect of environmental protection issues; and • Communicates with Project Director and Engineer Representative with regards to the conduct of multi-party monitoring. • The EPO/EM heads the environmental implementation as per ER, EIS, ECC, Government Regulations, approved MS and other pertinent documents. EE/PCO will assist the EPO in its implementation.
Environmental Engineer (EE)	• Assists and coordinates with the EPO/EM with regards to all environmental-related activities/works; • Assists in the update of environmental procedures and records; • Conducts site inspections to identify potential hazards to the environment, and to report findings with recommendations for corrective actions; • Reports to the EPO/EM with regard to environmental monitoring and inspection result; • Conducts all environmental trainings, environmental inductions and toolbox talks; • Provides advice on measures to be taken in the interest of environmental protection, and how to implement such measure; • Applies for or renews the relevant environmental permits and licenses; • Liaises on all matters relating to environmental monitoring and auditing; • Carries out inspections of the site to identify potential hazards to the environment, and to report findings with recommendations for corrective actions; • Participates in the weekly environmental talks with the Engineer Representative and the Environmental Unit, and monitors the environmental performance on the site; • Checks and ensures that any polluting or potentially polluting situation is promptly rectified; • Conducts and organizes environmental promotional activities; • Makes sure that the Waste Management plan is properly being implemented; • Reports to the EPO/EM regarding non-compliance of any environmental protection issues and ensure any non-compliance is handled; • Advises emergency actions or alternative arrangements when monitoring results show exceedance of the limit and action levels; • Ensures complaints are handled properly; and • Keeps related documents and records filed properly (According to QA System).
Contractor Construction Manager (CM)	• Supports the EPO/EM with regards to this TMP and the EMP implementation at the project site; • Ensures that all works are executed in accordance with this TMP and the EMP and all environmental management frameworks; • Implement of this TMP and the EMP in all project works and activities; • Ensures the availability of all necessary environmental mitigation measures, emergency preparedness and response equipment; • Ensures that onsite activities comply to the contract requirements pertaining to quality, duration and environmental requirements;

	• Ensures that all equipment/plants on site are operated in a safe and efficient manner, and in accordance with the manufacturer's operating instructions; and • Participate in the environmental walks with the Engineer Representative (ER) and Environmental Unit when necessary and review environmental inspection reports submitted by Environmental Unit; • Arranges and or participates routine joint site inspection with the HSE Manager and/or Environmental Unit when necessary • Attends and participates in the multi-party monitoring as stipulated in EIS; • Ensure appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the relevant procedures; • Assist in handling any complaints received from the public; • Ensure remedial action to be taken immediately if there is a non-compliance of statutory or contractual requirements in respect of environmental protection issues; and • Communicates environmental related information and reports to all employees, and other concerned parties. • Ensures that the works are recorded in such a way that incidents can be traced back to work activities if needed
Contractor Assistant Environmental Engineers (AEE)/ Safety Officer	• Carries out environmental activities as assigned by the EPO/EM; • Assists the Environmental Engineer in carrying out his/her duties; • Assists carrying out environmental monitoring and inspections to ensure that follow-up actions have been taken promptly against violations and non-conformances identified; • Makes sure that the project site is practicing and maintaining correct environmental standards; • Attends the weekly environmental walk if required; • Supervises and promotes the execution of environmental work by the workers on the Site; • Conducts toolbox talks to the workers on relevant environmental topics. • Reports to the Environmental Engineer any environmental incidents/accidents, non-conformances and violations observed at the project site; and • Assists the Environmental Engineer in proper waste management implementation.
Vessel Captain/ Site Engineers / Assistant Engineers	• Monitors and controls the works including those of subcontractors to ensure compliance of both contractual and statutory requirements; • Assists the Construction Manager and Environmental Unit in the implementation of this TMP and the EMP and other all environmental management frameworks; • Reports to the Construction Manager/Environmental Unit any environmental incidents/accidents; non-conformances and violations within the project site; • Implements waste management plan onsite; • Investigates and verifies any complaints received from public; and • Ensures the remedial actions or mitigation measures are carried out as planned.
Vessel Crews/Foreman (FM)	• Controls the works, including those of subcontractors, to fulfil environmental protection requirements, TMP and EMP implementation; • Reports to the Site Engineers/ Assistant Engineers any environmental accidents/incidents, non-conformances and violations of this TMP, the EMP and all environmental management frameworks; • Investigates the complaint received from public; • Carries out remedial actions or mitigation measures to rectify the non-compliance. • Attends Environmental trainings, inductions and toolbox talks; • Assists in the proper waste management plan implementation.

3.4 Subcontractor

In this TMP, it is the Subcontractor's obligation to do the following:

- Comply with all relevant Laws, legislation, guidelines, rules and regulations mandated by the Philippine Government
- Comply with this TMP, the EMP and all environmental management frameworks
- Report any non-conformances or environmental issues to the Contractor immediately and provide necessary assistance in addressing and closing environmental non-conformances
- Subcontractor's Environmental Managers shall report to the Project EPO/EM

- Undertake Environmental induction, all environmental training and toolbox talks as required by the Contractor, and
- Are subject to the checklist, inspection, and reporting requirements outlined in this TMP as well as the EMP.
- Contractor shall be 100% responsible in managing its subcon for the PRDP TMP obligations.

3.5 Environmental Consultant/ Environmental Laboratories

3.5.1 GHD

The Environmental Consultant's role in this TMP is to assist the Contractor in coming up with a sound and effective TMP that is applicable in the project implementation. They are also responsible in giving advice and technical expertise to particular issues and concerns that may arise in the TMP's implementation within the PRDP.

3.5.2 Dedicated Laboratory for analysis

The OSTREA Laboratory will be contracted to conduct water quality sampling and analysis selected parameters such as TSS, and metals. This laboratory team will be involved in water quality sampling and analysis during Access Channel dredging works and Sandkey formation and other upcoming works, relating to water quality.

Environmental legal framework and other requirements:

The legislative requirements applicable to the PRDP are summarized below:

- Presidential Decree 1586 Philippine Environmental Impact Statement System
- Republic Act 6969 Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990
- Republic Act 8749 Philippine Clean Air Act
- Republic Act 9003 Ecological Solid Waste Management Act
- Republic Act 9275 Philippine Clean Water Act
- Administrative Order No. 16, s. 2019 Expediting the Rehabilitation and Restoration of the Coastal and Marine Ecosystem of Manila Bay and creating the Manila Bay Task Force
- Administrative Order No 993-90 Creating a Project Management Office on Solid Waste management under the Presidential Task Force on Waste Management
- Department Order No. 198, Series of 2018 (Implementing Rule and Regulations of RA #11058)
- Department Order No. 13, Series of 1998 (Guidelines Governing Occupational Safety and Health in the Construction Industry)
- Occupational Safety and Health Standards 2020 Edition (Department of Labour and Employment)
- Labour Code of the Philippines 2017

3.6 Environmental policy

An Environmental Policy is established to demonstrate the Contractor's commitment in improving environmental performance. It aims to communicate the Contractor and the Subcontractor parties' mission, vision and beliefs towards the environment to their staff and provides a framework for guiding Contractor and the Subcontractor's ongoing environmental improvement efforts. The policy will be reviewed by relevant parties periodically and will be displayed on noticeboards in languages suitable for the nationalities of the workforce.

3.6.1 Environmental Policy Statement

It is the policy of the Contractor to ensure that all its activities are carried out in a manner that causes minimum adverse impacts on the environment. This will be achieved through the establishment of clear objectives and implementation of an effective environmental management system. The Contractor aims to:

- Comply with all environmental legal and other requirements.
- Prevent pollution by providing sufficient resources for implementation of environmental nuisance control and waste management.
- Reduce the production of construction waste and to minimise the consumption of natural resources by careful planning and implementation.
- Provide appropriate training to all staff including subcontractor's staff.
- Strive to achieve continual improvement through periodic review of then environmental objectives and performance.

The Project Manager is responsible for the overall co-ordination and implementation of this policy. However, environmental protection is one of the prime responsibilities of every employee, all staff shall ensure that this policy is understood, implemented and maintained. This policy will be reviewed annually and whenever necessary.

3.7 Environmental management frameworks

The principal aim of the Environmental Management Frameworks (EMFs) is to direct the Contractor, the Subcontractor, and its corresponding subcontractors/suppliers to minimize any negative impact of the reclamation activities. All works and movement of equipment will be undertaken so that disturbance to the marine environment is minimized.

Refer to the Contractors Environmental Management Plan [B10] for applicable EMFs.

4 EXISTING ENVIRONMENT

4.1 Regional setting

Manila Bay (the Bay) is a semi-enclosed estuary that is considered to be one of the most important ports in the Philippines and in Asia. The Bay has an average depth of 17 m with 190 km of coast covering a

total sea area of 1,800 km2 (Jacinto et al., 2011; Vallejo et al., 2019). Manila Bay also receives drainage from approximately 17,000 km2 of watershed consisting of 26 catchment areas and three main tributaries, the Pasig, Bulacan and Pampanga Rivers (Olivares et al., 2019). Water quality within the Bay is heavily influenced by high suspended sediment loads originating from terrestrial sources, particularly during the wet season.

Historically, the Bay hosted extensive mudflats, sandflats, seagrass meadows, mangroves, coral reefs and significant estuarine habitats. Today however, Manila Bay is subject to the impacts of urbanisation including terrestrial and marine pollution, sedimentation, harmful algal blooms, overexploitation of local fisheries resources, land reclamation and invasive marine species (Vallejo et al., 2019). Less than 20% of effluent discharge into the Bay is treated (Jacinto et al., 2011).

4.2 Marine environmental quality

Manila Bay is considered to be eutrophic with elevated nutrient levels in proximity to the shore (Chang et al., 2009). The total load of organic matter in Manila Bay was estimated at 250,000 tonnes BOD/year in 2009 (Chang et al., 2009). Eutrophic marine waters have, in turn, resulted in hypoxic conditions near the seabed throughout the Bay, with dissolved oxygen (DO) levels in the coastal and mid-section of the Bay ranging between 0.79 mg/L and 3.76 mg/L (Chang et al., 2009; Jacinto et al., 2011).

The effects of eutrophication and hypoxia is evident from the very low DO levels recorded previously (Chang et al., 2009) and can result in widespread die-off of fish and invertebrate populations and cause major shifts in ecosystem community structure. High near-bed phosphorus and nitrate concentrations were also found to correlate to regions of hypoxia within the Bay (Jacinto et al., 2011).

4.3 Baseline turbidity monitoring

Water quality monitoring buoys were established by the PLANADES at monitoring locations around the PRDP area on April 2024. A total of 13 stations were established (10 offshore stations and 3 outfall stations).

Table 4-1: *Baseline WQM - Turbidity result.*

Code	Sampling Date	TSS
		mg/L
SW01	23-Apr-24	20
SW02	23-Apr-24	18
SW03	23-Apr-24	18
SW04	23-Apr-24	15
SW05	23-Apr-24	14
SW06	23-Apr-24	20
SW07	23-Apr-24	20
SW08	23-Apr-24	7
SW09	23-Apr-24	7
SW10	23-Apr-24	5
SW11	23-Apr-24	15

DAO 2016-08 and DAO 2021-19b Water Quality Guidelines (WQG) Values, Class – SB		**50**
SW12 WTP Upstream (Libertad channel)	23-Apr-24	28
DAO 2016-08 Water Quality Guidelines Values, Class – C		**80**
SW13 Drainage Outfall	04-23-2024	107
DAO 2016-08 Water Quality Guidelines Values, Class – C		**80**
DAO 2016-08 WQV, Class – C (effluent)		**100**

5 TURBIDITY MANAGEMENT PLAN

5.1 Turbidity monitoring program

5.1.1 Monitoring program design

Monitoring locations

Table 5-1 shows the new monitoring locations and coordinates of each of the monitoring locations.

Table 5-1: *Monitoring locations.*

Monitoring Points	Monitoring location	Latitude	Longitude
P1	800 m away from the North Boundary of the PRDP Project	14°33'33.28"N	120°57'54.53"E
P2	800-m from the West boundary of PRDP	14°31'59.95"N	120°57'20.67"E
P3	800-m from the South boundary of PRDP	14°31'22.98"N	120°58'4.48"E
OF1	Outfall Stations	14^0 32' 40.8"	120^0 59' 19.5"
OF2		14^0 31' 08.4"	120^0 58' 58.1"
OF3		14^0 30' 18.4"	120^0 58' 53.4"

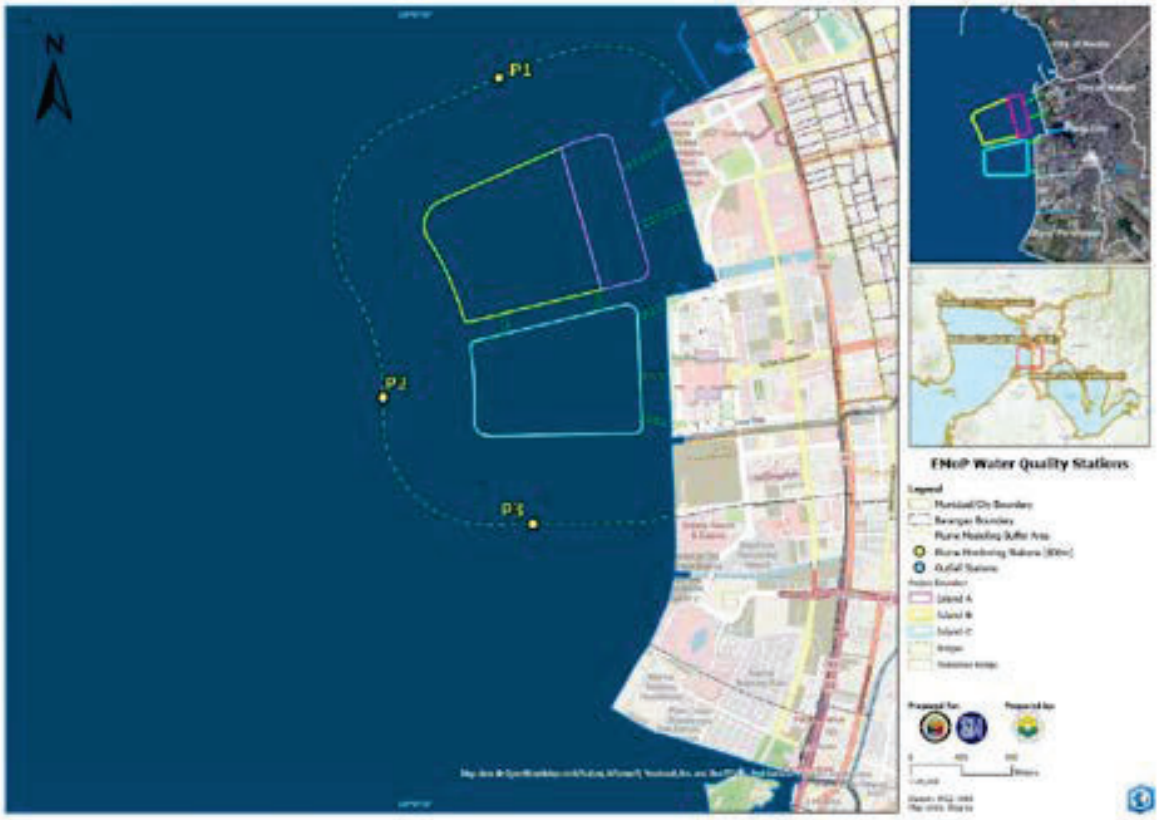


Figure 5-1: *New turbidity monitoring for threshold and actions.*

The new markers are based on the sediment plume modeling prepared by RHD for EPRMP. The modeling shows the spreading behavior of sediment from the reclamation site during inter-monsoon and monsoon season.

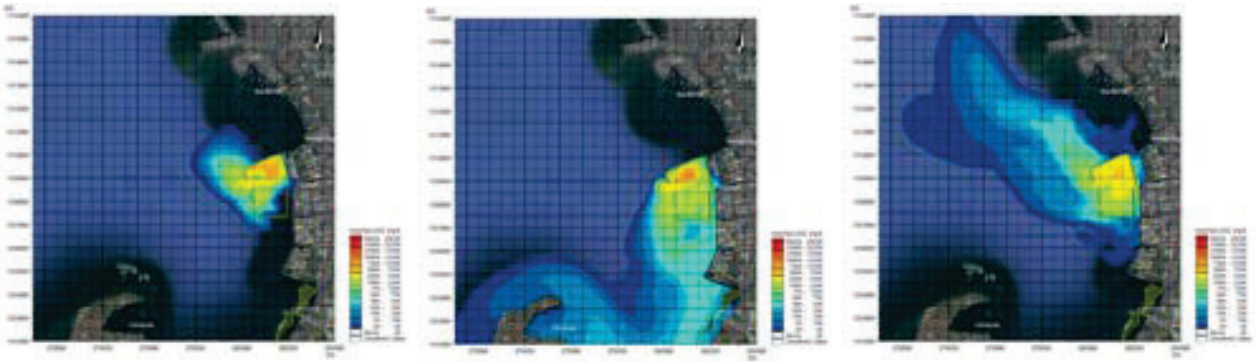


Figure 5-2: *Results of Sediment Plume Modelling*

Parameters

Water samples will be taken on the above-mentioned locations and will be analyzed by the accredited laboratory. The water quality parameters will include the following:

- TSS (mg/L)
- Turbidity (NTU)

Monitoring Frequency and Methodology:

a. Daily Visual Monitoring using drone survey (Secchi disc and/or turbidity meter, as needed) at Stations P1, P2, and P3.

b. Monthly TSS Monitoring by DENR-Accredited Environmental Laboratory and as needed based on Daily Visual Monitoring (Stations P1, P2, and P3).

c. Outfall Stations TSS monitoring will be done quarterly along with other significant parameters during Quarterly Water Quality Monitoring.

Data handling

All data from the laboratory, released within 10 days minimum, will be any calculated, analysed and interpreted. Data will be reported in the Quarterly Environmental Report.

5.1.2 Turbidity Management Group (TMG)

A Turbidity Management Group (TMG) is established to provide oversight of the dredging/sandfilling activity and implementation of the Turbidity Management Plan (TMP). The TMG will comprise representatives from the Contractor.

If trigger values nominated below are exceeded during dredging and sand key filling, the TMG will meet and agree on management measures to be applied to bring performance within approved limits. Section 3.1 shows the Turbidity Management Group (TMG) and Key Persons of this TMP.

5.2 Trigger levels and tiered management framework

Table 5-2: *Trigger levels for compliance monitoring.*

Trigger level	TSS value
Level 1 – initial warning (ALERT)	≤ 27 mg/L
Level 2 – secondary warning (ACTION)	≤ 36 mg/L
Level 3 – compliance breach (LIMIT)	≤ 45 mg/L

Table 5-3: *Trigger levels for compliance monitoring and Management Measures.*

Trigger level	TSS Threshold Values	Management Measures
Alert	**27 mg/L**	• Daily Visual monitoring • Continuous monitoring at gradient monitoring markers (see Figure 5-1) • Alert TMG
Action	**36 mg/L**	• Alert TMG for source assessment • Identification of weather conditions • Identification of turbidity source (positioning and activity of vessels in close proximity to the gradient monitoring marker) • Temporary suspension of activity at source near the gradient monitoring marking until TSS levels stabilize • Resampling for TSS monitoring every hour until the TSS value returns to ALERT level
Limit	**45 mg/L***	• Alert TMG for source assessment • Identification of weather conditions • Identification of turbidity source (positioning and activity of vessels in close proximity to the gradient monitoring marker) • Stoppage of all dredging activity at the active portion of the Island

		• Resampling for TSS monitoring every hour until the TSS value returns to ALERT level

**Note: 50 mg/L is based on DENR DAO 2016-08 Water Quality Guidelines for Total Suspended Solids for Class SB. The limit value was set at slightly lower than the TSS limit of 50 mg/L.*

***Table 5-4:** Mitigation measures for Tiered Management Framework.*

Mitigation Measure	Description
Additional Monitoring as monitoring station replicates	If Level 1 and Level 2 exceedances attributable to dredging/sand key filling are being regularly experienced, additional spot monitoring, such as via vessel may be taken around the reclamation footprint (Employer's Requirement-Section 4). The location of the monitoring points will be dictated by the interpretation of the existing water quality data in relation to dredging/sandfilling activity.
Preferential Movement of Dredge/Sandfilling to Alternate Areas	The vessels will have flexibility in terms of the sequencing of operations. While a sequential pattern has been adopted for construction of the reclamation areas, if turbidity exceedances are detected at a particular monitoring location a change to the planned sequencing could be adopted. Dredging/sandfilling sensitive areas during night-time hours is also a potential mitigation assuming plume impacts are dispersing quickly. This would result in no risk of reduction in the light climate caused by elevated turbidity during night time hours. Opportunistically, it should also be noted that the dredge vessel will need to undertake routine maintenance, refueling and crew changes. The activity schedule includes allowance for: • One day downtime per month for maintenance where no dredging activities are undertaken • Crew changes rotating on a three-month cycle During these 'down time' periods, there will be environmental benefits accrued related to settlement of fines for reduced turbidity. To a certain extent, the Contractor can plan such maintenance to maximize environmental benefits and minimize operational downtime. For example, there may be potential for such maintenance activity, crew changes and refueling to be pre-emptively planned to take place in the event of a dredging-attributed exceedance of the Level 3 trigger.
Dredging/Sandfilling to Weather Conditions	Weather conditions will influence sediment plume behavior and the short-term fate of fine sediment particles that are released to the environment from the dredging.

	Regular observation and correlation of metocean conditions with the monitoring data will allow the TMG to understand those weather conditions that pose higher risks to turbidity levels. Potential actions include reduction in dredge effort for the duration of such weather conditions, or movement of dredging effort to alternate areas where the risk of exceedances is assessed as being less likely.
Provision of required mitigation measures	Any mitigation measures as proposed in the ECC/EIS will be followed, if necessary.
Temporary Suspension of Dredging	Suspension of dredging is generally a last resort option if/when all other mitigation measures and corrective actions as outlined within this document have been undertaken, but have proven unsuccessful in controlling dredge related turbidity exceedances, and the compliance (Level 3) value has been exceeded. Notwithstanding this, suspension of operations is to be undertaken if compliance trigger levels (Level 3) are exceeded at any monitoring site with exceedances attributed to dredging activities. Activities (with standard mitigation measures) may re-commence upon agreement with TMG and ENG/EMP based on the WQ results.

6 REPORTING

6.1 Trigger level notification register

The Contractor will maintain a register of all trigger level notifications. Any actions that are put in place as a response to the trigger levels are to be noted in the register. The register will be appended to quarterly and annual compliance reports.

6.2 TMG assessment

The TMG will be required to undertake an assessment in the event that the Level 2 or Level 3 turbidity trigger limits are breached. Records of each inference assessment shall be logged by the Contractor Environmental Protection Officer (EPO)/Environmental Manager (EM). Should the inference assessment identify non-conformance attributable to dredging activities additional reporting outlined below will be required.

6.3 Non-conformance

Quarterly and annual compliance reports relating to turbidity management will be prepared in accordance with the Turbidity Monitoring Program (Figure 6.1). Compliance reports shall be submitted by the Contractor to the Engineer and Employer in accordance with DENR Standards.

All exceedances of trigger values are to be recorded in the Environmental Non-Conformance Register (ENCR) as required by the EMP. Contractor should act on any non-conformance based on threshold exceedance and shall be maintained by the Contractor Environmental Protection Officer (EPO)/Environmental Manager (EM) where all non-conformances shall be recorded. The non-conformance shall be managed in accordance with the procedures outlined in the EMP.

The procedure in addressing non-conformances includes the following:

- All incidences of exceedance of Employer Requirements for turbidity are considered to be a non-conformance and shall be documented for corrective actions
- Investigate the cause of the non-conformance including stop work if applicable
- Identify potential corrective and preventative actions
- Implement mitigation measures to prevent recurrence
- Provide feedback and disseminate information to all responsible personnel.

6.4 Inspections/checklists

The following checklists are available for reporting purposes for carrying out compliance and non-conformance reporting obligations and are available in the EMP attachments:

- Corrective and preventative action request and tracking log
- EMP compliance checklist

The EMP Compliance Checklist and the Non-conformance Register will be included in the initial TMP Compliance Report bearing the Contractor's Representatives signature.

6.4.1 Corrective and preventative actions

A corrective and preventive action request and tracking log shall be used to address environmental non-conformance events. Action requests are issued by the EPO/EM to the Construction managers or supervisor responsible for the area in which the non-conformity was identified. The tracking log records corrective/preventive actions planned and implemented by the Construction Managers/supervisors to prevent recurrence of an environmental conformity/incident.

6.4.2 EMP compliance

An EMP compliance checklist is used to record evidence of compliance and additional conditions and/or commitments. Its purpose is used as an auditing tool and must be prepared alongside documents that are relevant to the TMP and EMP.

7 INDUCTION AND TRAINING REQUIREMENTS

All project site personnel, subcontractors, consultants and visitors must receive inductions regarding environmental obligations prior to commencing work on site. The site induction will present specific environmental requirements relevant to turbidity management and established in the TMP such as:

- The nature of the works and environmental values at the reclamation area
- Any environmental risks associated with the reclamation activities
- Any environmental legislative and contractual requirements
- Specific environmental objectives and mitigation measures such as those measures relating to water quality and flora and fauna
- Roles and responsibilities in relation to implementing mitigation measures, monitoring, reporting and implementing corrective actions
- What to do in the event of an environmental incident
- Other relevant information such as communication processes, protocols and document control.

The site induction will also focus on the following points outlined in the TMP:

- The project and environmental policy
- Environmental roles and responsibilities
- Addressing complaints and complaints register
- Environmental impacts and controls
- Environmental Reporting- Incidents and near misses and investigations
- Emergency procedures
- Best Practices
- General housekeeping
- Addressing complaints and complaints register; and
- Documentation and Reporting

Environmental training will be mandatory to ensure project personnel are sufficiently trained prior to commencing work on site, as detailed in the EMP.

8 COMMUNICATION AND NOTIFICATION REQUIREMENTS

8.1 Communication

Table 8-1 presents a list of contacts that may be required for environmental management purposes during the reclamation dredging period. This list may be notified in the unlikely event of an environmental incident or issue.

Table 8-1: *Contact information for environmental management issue reporting.*

Role	Contact Details
Contractor EPO / EM (Carl Phillip Lantecsi)	+639672506006
Contractor CM (Ji Denghui)	+639493970582
Contractor's Representative (Felix Liu/ Benjamin Guo	+639616104923 (Felix) +63 956 025 2663 (Benjamin)

No notification requirement is stipulated in the permit and license conditions and that quarterly reporting will be conducted as described in Section 7.

8.2 Management plan review requirements

A systematic review of objectives and targets of this TMP must be carried out when any of the following occurs:

- Changes to reclamation design methodology.
- Changes in environmental policies.
- Changes in understanding of baseline water quality conditions.
- Changes in understanding impacts of metocean conditions on sediment plume behaviour.
- Changes in relevant legislation that impacts on environmental control limits.
- Enforcement action by a government agency.
- Where requested or required by any relevant Authority.
- Relevant environmental objectives have been met.
- Status/conditions change.
- Relevant environmental objectives have failed to be met on three repeated occasions.

This will ensure that objectives and targets are relevant for maintaining and improving environmental performance. Updated versions of the TMP must be given a new version number on the cover page. Any changes must be conveyed to the Contractor, Engineer and Employer via Asite immediately after the change is identified. A copy of the latest (updated) version of the TMP must be provided to the Contractor, Engineer and Employer via Asite within 24 hours of finalisation of the document. A yearly mandatory management review of the plan shall be conducted, and a revised plan be submitted thereafter. This revision will be depicted in the EMP.

9 REFERENCES, ABBREVIATIONS, DEFINITIONS

9.1 References

China Harbor Engineering Company (CHEC) (2021). Paday-SM Reclamation Development Project Environmental Management Plan. PRDP-CON-EN-ZZ-ZZ-PL-0001

Jacinto, G., Sotto, L., Senal, M., Diego-McGlone, M., Escobar, Amano, A., Miller, T (2011). Hypoxia in Manila Bay, Philippines during the northeast monsoon. Marine Pollution Bulletin. 63 (2011), 243-248

Technotrix (2017). Environmental Impact Statement Final Report for the Proposed 360 Hectare Reclamation Project. Pasay City Government and Technotrix Consultancy Services Inc.

Vallejo, B. Aloy, A., Ocampo, M., Conejar-Espedido, J and Manubag, L (2019). Manila Bay Ecology and Associated Invasive Species. Institute of Environmental Science and Meteorology, University of the Philippines.

Employer Documents			
No.	**Document No.**	**Rev**	**Document Title**
A1.	PRDP-RHD-TD-ZZ-ER-0001	P02	Pasay Reclamation Development Project – Volume IVA – Employer requirements - General Requirements
A2.	RPDP-RHD-TD-ZZ-ER-0004	P02	Pasay Reclamation Development Project - Volume IVD - Employer requirements - Basic Construction Requirements
A3.	RPDP-RHD-TD-ZZ-RP-0001	P01	Environmental Impact Statement
A4.	RPDP-RHD-TD-ZZ-CE-0001	P01	Pasay Reclamation Environmental Compliance Certificate

Contractor Documents		
No.	**Document No.**	**Document Title**
B1.	PRDP-CHEC-HY-ZZ-ZZ-HS-0002	Health and Safety Manual
B2.	PRDP-CON-PE-ZZ-ZZ-CV-0001	Key Personnel
B3.	PRDP-CON-PE-ZZ-ZZ-OC-0001	Organization Chart
B4.	PRDP-CON-HY-ZZ-ZZ-RA-0001	HSE Baseline Risk Assessment
B5.	PRDP-CHEC-HY-ZZ-ZZ-HS-0002	HSE Baseline Standards Manual
B6.	PRDP-CON-EN-ZZ-ZZ-PL-0001-Appendices	Toolbox Schedule
B7.	PRDP-CON-EN-XX-XX-PL-0003_C01	Project Waste Management Plan (PWMP)
B8.	PRDP-CON-EN-XX-XX-PL-0004	Turbidity Monitoring Plan (TMP)
B9.	PRDP-CON-PL-ZZ-ZZ-PE-0001	Regulatory Approval Checklist
B10.	PRDP-CON-EN-ZZ-ZZ-PL-0001 (C01)	Environmental Management Plan (EMP)
B11.	PRDP-CON-CO-XX-DR-MS-0001	Sand Key Formation
B12.	PRDP-CON-CO-XX-SK-MS-0001	Access Channel Dredging
B13.	PRDP-CON-EN-XX-OO-DR-0001-P02	Contractor's Marine Work Areas for Dredging/Reclamation/Disposal Activities
B14.	PRDP-CON-DN-XX-XX-MS-0001	Island Reconfiguration

9.2 Abbreviations

Abbreviation	Full meaning
CHEC	China Harbour Engineering Company
CM	Construction Manager
DAO	Department Administrative Order
DPWH	Department of Public Works and Highways
DGPS	Dynamic Global Positioning System
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EE	Environmental Engineer
EM	Environmental Manager
EPO/EM	Environmental Protection Officer/Environmental Manager
EMP	Environmental Management Plan
EMS	Environmental Management System
EPO	Environmental Protection Officer
ER	Engineer Representative
EU	Environmental Unit
FM	Foreman
HSE	Health Safety and Environment
IEC	Information Education and Communication
LPPCHEA	Las Pinas-Paranaque Coastal Habitat and Ecotourism Area
MMAD	Metro Manila Development Authority
MMT	Multi-Party Monitoring Team
NHCP	National Historical Commission of Philippines
NGO	Non-Government Organisation
OSCMP	Oil Spill Contingency Management Plan
PD	Project Director
PM	Project Manager
PRA	Philippine Reclamation Authority
PCG	Philippines Coast Guard
PCO	Pollution Control Officer
PIR	Preliminary Incident Report
PRA/ND	Philippines Reclamation Authority/National Development Authority
PWMP	Project Waste Management Plan
WMP	Waste Management Plan

9.3 Definitions

Definition	Full meaning
Employer	SM Smart City Infrastructure and Development Corporation
Engineer	Haskoning Philippines Inc.
Contractor	China Harbour Engineering Company

Definition	Full meaning
Contractor Parties	China Harbour Engineering Company & Subcontractor
Subcontractor	Companies contracted by the Contractor to perform a specific portion of the work.
Supplier	A company that is requested to supply (temporary) materials or services on behalf of the Contractor.
Hazard	Something that has the potential to cause harm, including death or injury to people or damage to property, environment or reputation
Incident	Any unplanned event resulting in, or having a potential for injury, ill health, damage or other loss
Employee	Any person on the Project who is not a Visitor

9.4 Legislation, Standards and other documents

No.	Legislation
C1	Presidential Decree 1586 Philippine Environmental Impact Statement System
C2	Republic Act 6969 Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990
C3	Republic Act 8749 Philippine Clean Air Act
C4	Republic Act 9003 Ecological Solid Waste Management Act
C5	Republic Act 9275 Philippine Clean Water Act
C6	Administrative Order No. 16, s. 2019 Expediting the Rehabilitation and restoration of the coastal and marine ecosystem of Manila Bay and creating the Manila Bay Task Force.
C7	DEPARTMENT ORDER NO. 198, SERIES OF 2018 (Implementing Rule and Regulations of RA #11058)
C8	DEPARTMENT ORDER NO. 13, SERIES OF 1998 (Guidelines Governing Occupational Safety and Health in the Construction Industry)
C9	OCCUPATIONAL SAFETY AND HEALTH STANDARDS 2020 Edition (Department of Labor and Employment)
C10	LABOR CODE OF THE PHILLIPPINES 2017
C11	DAO-2016-08-WQG-and-GES-Water Quality Standard
C12	RA 7942-Philipine Mining Act of 1995
C13	ISO 14001:2015 and Dept. Order 198

International, National Standards, Guidelines and Codes of Practice
BS 6349-5:2016 [Maritime structures - Part 5: Code of practice for dredging and land reclamation];
PIANC Report No.100:2009 [Dredging Management Practices for the Environment].

10 HEALTH, SAFETY AND ENVIRONMENT

All work will be performed in a safe, efficient and environment-friendly manner. Before the start of any monitoring activities, CHEC HSE will conduct an induction. Induction procedures will be strictly followed and safe work procedures will be implemented. Before starting the works, a toolbox meeting will be held on all job-related subjects.

The following main hazards have been identified:

- Working on or near water, which could lead to drowning. Life jackets will be provided for working on the water and deployment or monitoring will be carried out when the weather is safe to do so.

- Exposure to heat and sun is one of the main concerns. In this case an awareness campaign would be executed during the summer months and consideration will be given to the summer working hour's restrictions. A sheltered area will be available on board.
- Other hazards with lesser risks can be identified: slipping/tripping/falling, muscular stress while lifting, carrying or moving objects (anchors, buoys, sample bottles and samplers etc.).
- Appropriate safety gear (PPE) shall be worn at all times; this will include, but is not limited to:
    - ✓ Coveralls or clothes with long sleeves and long trousers
    - ✓ Safety helmet
    - ✓ Safety boots
    - ✓ Safety glasses
    - ✓ High visibility jackets
    - ✓ Buoyancy Aids
    - ✓ Gloves when appropriate
    - ✓ Life jackets, others
- A sufficient supply of drinking water for all personnel will be available on site and sanitary facilities will be made available.
- All equipment used on site will be of high-quality standards and be well maintained.

ATTACHMENTS

ATTACHMENT A **ENVIRONMENTAL POLICY**

Environmental Policy Statement

It is the policy of the Company to ensure that all its activities are carried out in a manner that causes minimum adverse impacts on the environment. This will be achieved through the establishment of clear objectives and implementation of an effective environmental management system. We aim to:

- comply with all environmental legal and other requirements;
- prevent pollution by providing sufficient resources for implementation of environmental nuisance control and waste management;
- reduce the production of construction waste and to minimise the consumption of natural resources by careful planning and implementation;
- provide appropriate training to all staff including subcontractors' staff;
- strive to achieve continual improvement through periodic review of the environmental objectives and performance.

The Project Manager is responsible for the overall co-ordination and implementation of this policy. However, environmental protection is one of the prime responsibilities of every employee, all staff shall ensure that this policy is understood, implemented and maintained. This policy will be reviewed annually and whenever necessary.

Mr. Felix Liu
Project Director

ATTACHMENT B **LIST OF VESSELS CURRENTLY IN THE PROJECT**

No.	Vessel Name	Type	NOTAM Number	Work Location	Status
1	HANG BO 3001	Split Barge	NSD 105-2024	PRDP	Active
2	HANG BO 3002	Split Barge	NSD 105-2024	PRDP	Active
3	LONG XIANG 8	Anchor Boat	Underrenewal		
4	PU SHA 1	Spreader Pontoon	NSD 237-2024	PRDP	Active
5	JIANG HAI 22 (ATI)	Anchor Boat	Underrenewal		
6	YI HANG JUN 1068	Barge	Underrenewal		
7	XING HANG JUN 1088	Split Barge	Underrenewal		
8	JIN XIONG	Grab Dredger	NSD 237-2024	PRDP	Under repair
9	LI LONG	Cutter Suction Dredger	NSD 237-2024	PRDP	Active
			NSD 237-2024	PRDP	
10	HUA TAI LONG	Cutter Suction Dredger	NSD 237-2024	PRDP	Active
11	HANG FENG 3	Tug Boat	NSD 237-2024	PRDP	Active
12	HONG HAI 199	Pelican Barge	NSD 012-2024	Zambales/ Project Site	Active
13	YONG XIN 1	Pelican Barge	NSD 221-2024	CAOAYAN ILOCOS SUR	Active
14	LIANG KU 88	Discharge Barge	NSD 503-2023	Zambales/ Project Site	Active
15	LIANG KU 89	Discharge Barge	NSD 503-2023	Zambales/ Project Site	Active
16	LIANG KU 9	Discharge Barge	NSD 503-2023	Zambales/ Project Site	Active
17	LIANG KU 99	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 123-2024	AMNAY MINDORO	
18	HONG FU 588	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
19	ZHONG XING HANG 268	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 068-2024	AMNAY MINDORO	
20	JIN HAI FU 168	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 068-2024	AMNAY MINDORO	
21	HENG DA 188	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
22	HONG FU 598	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 068-2024	AMNAY MINDORO	
23	HONG FU 558	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 068-2024	AMNAY MINDORO	
24	HONG FA 178	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
25	XIANG HANG 555	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active

			NSD 150-2024	CAOAYAN ILOCOS SUR	
26	HONG FA 158	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
27	HUI JIN QIAO 139	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
28	HENG DA 19	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 068-2024	AMNAY MINDORO	
29	HENGDA 17	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 068-2024	AMNAY MINDORO	
30	DE XIN 7	Pelican Barge	NSD 221-2024	CAOAYAN ILOCOS SUR	Active
31	DCOC-3	Spreader Pontoon	NSD 237-2024	PRDP	Active
32	DCOC-4	Spreader Pontoon	NSD 237-2024	PRDP	Active
33	JIN MAO 10	Anchor Boat	NSD 237-2024	PRDP	Active
			NSD 237-2024	PRDP	
34	HONG FU 518	Pelican Barge	NSD 221-2024	CAOAYAN ILOCOS SUR	Active
35	TAI SHUN 88	Pelican Barge	NSD 221-2024	CAOAYAN ILOCOS SUR	Active
36	HENG DA 988	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 123-2024	AMNAY MINDORO	
37	RUN TAI ZHI HANG	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 123-2024	AMNAY MINDORO	
38	SHENG PING 009	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
39	LIANG LONG	Cutter Suction Dredger	NSD 237-2024	PRDP	Active
40	JIAN LONG	Cutter Suction Dredger	NSD 237-2024	PRDP	Active
41	HONG FA 567	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
42	HENG DA 99	Pelican Barge	NSD 503-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
			NSD 068-2024	AMNAY MINDORO	
43	HENG DA 169	Pelican Barge	NSD 483-2023	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
44	HENG DA 179	Pelican Barge	NSD 483-2024	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	

45	HENG DA 7	Pelican Barge	NSD 483-2025	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
46	FENG SHOU 178	Pelican Barge	NSD 012-2024	Zambales/ Project Site	Active
			NSD 150-2024	CAOAYAN ILOCOS SUR	
47	JIN XIN 23	Anchor Boat	NSD 068-2024	AMNAY MINDORO	Active
48	HMI AIRE	Barge	NSD 503-2023	Zambales/ Project Site	Standby
49	HMI RMG 001	Barge	NSD 503-2023	Zambales/ Project Site	Standby
50	HMI RMG 002	Barge	NSD 503-2023	Zambales/ Project Site	Standby

ATTACHMENT C INTERNAL NON-CONFORMANCE REGISTRY

Pasay Reclamation Development Project

ICR No.	Date	Time of Incident	Location (GPS)	Time Reported	Reported By	Turbidity Reading	Turbidity Standard Limit	Buoy Details	TMG Action Taken	Immediate Mitigation Measure Applied	Preventive/Corrective Action Identified	Action Taken	Notes
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

ATTACHMENT D **EMP COMPLIANCE CHECKLIST**

ATTACHMENT I **EMP COMPLIANCE CHECKLIST**

HEC 中国港湾	PASAY RECLAMATION DEVELOPMENT PROJECT Contract No.: Dredging and Reclamation Construction	Form Ref. Revision Date

Location:	**Date:**
Construction activities Description:	**Date of Last Inspection:**
Environmental Incidents since last inspection (if YES, describe):	
Complaints or non-conformances since last inspection? (if YES, describe):	
Any breaches to Licenses/Permits/Agreements Conditions:	

	Housekeeping	YES	NO	22	Oil drums properly contained?	YES	NO
1	Good General Housekeeping?				*Dust Suppression:*		
2	Segregated stacking of Materials?			23	Any Visible uncontrolled Dust Generation activity?		
3	Proper Storage of Tools?			24	Dust Suppression Procedures in place & sufficient?		
	Waste Management			25	Dust suppression equipment in place/working?		
4	Recyclables System in place?				*Hazardous Material Storage Areas (H.M.S.A):*		
5	Waste bags used in bins?			26	Designated storage for Hazardous Material? (COSH)		
6	No Waste accumulation?			27	H.M.S.A Contained and Ventilated? (COSH)		
7	Skips and bins emptied regularly?			28	M.S.D.S in Place and updated?		
8	Waste Storage Areas maintained clean and barricaded?			29	Uncontrolled mixing of chemicals?		
9	Proper Waste Segregation?			30	Signage in place?		

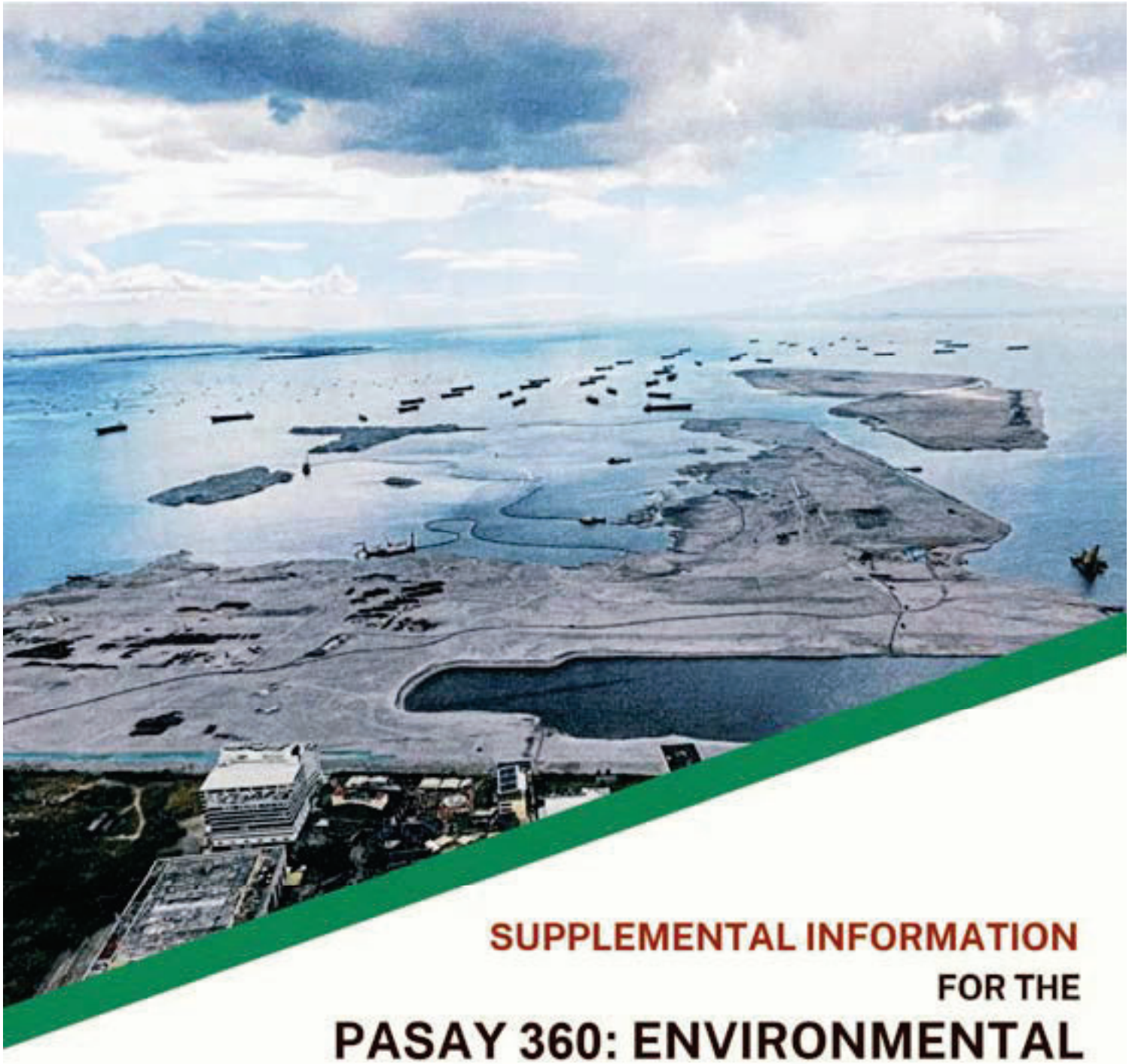
10	Sewage Tanks emptied regularly?			31	Fire extinguisher and Spill Kits in close proximity?		
11	Waste Management Signs in place and visible?				*Dewatering Activities:*		
12	Hazardous waste stored within impermeable bins and indicated properly (temporary before transport to hazardous waste storage)?			32	Any abrasion/Leakage on Dewatering pipelines or drainage channels?		
				33	Any unstable bund of dewatering ponds?		
13	Hazardous waste in designated storage area				*Noise & Vibration:*		
	Wastewater			34	Noise attenuation fittings installed to noise producing equipment?		
14	Any stagnant water present?			35	Employees wear hearing protection?		
15	Any unauthorized disposal activities?				*Fuel Storage & Refueling*		
16	Any Leakages observed from wastewater/sewage tanks?			36	Fuel containers are in good conditions?/No leaks?		
	Environmental Controls			37	Bunds utilized in all storage locations?		
	Spill Management:				*Dredging:*		
17	Any Leakages observed?			38	Any abrasion/Leakage on Discharge pipelines?		
18	Generators contained in drip trays with sufficient capacity?			39	Sediment plume reaching any sensitive environment?		
19	Fuel tanks contained in drip trays with sufficient capacity?				*Silt Management & Discharge*		
20	Spill Kits present in proximity of fuel tanks?			40	Breached/leaks on reclamation bunds/settling basins?		
21	Fire Extinguishers present in close proximity of Generators & Fuel Tanks?			41	Sediment plume reaching any sensitive environment?		

Any Environmental Audits Conducted during this period? YES ☐ NO ☐	Audit Aspects:
Any Cultural Heritage site discovered? YES ☐ NO ☐	If YES Describe:
Where Previous Non-conformances been Corrected YES ☐ NO ☐	If NO Describe:
Cultural Heritage Area	
Any breaches to the installed barrication YES ☐ NO ☐	Any signs of unauthorized entry to the area? YES ☐ NO ☐
Any damage observed to the existing archeological features? YES ☐ NO ☐	If NO, describe:
Random Checks:	
Staff received appropriate training for their position/function? YES ☐ NO ☐	If NO, state action to be taken:

Service/maintenance records vehicles/equipment maintained according to manufacturer? YES ☐ NO ☐	If NO, state action to be taken:

Name of Inspector:	**Date & Time of Inspection:**
Signature:	
Corrective Action Request (CAR)	
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	

APPENDIX T. SUPPLEMENTAL INFORMATION REPORT



SUPPLEMENTAL INFORMATION
FOR THE

PASAY 360: ENVIRONMENTAL PERFORMANCE REPORT AND MANAGEMENT PLAN

NOVEMBER 2024

Submitted by:

CITY GOVERNMENT OF PASAY

For the amendment of the ECC issued for Pasay 360 (ECC-CO-1601-0003)

EXECUTIVE SUMMARY

This Supplemental Information for Pasay 360: Environmental Performance Report and Management Plan addresses the enhanced previous Supplemental Information Report Versions 1 and 2 as a response to EMB's comments sent via email on 10 October 2024 and on November 2024. The hard copies of the version 1 supplementary reports were submitted on 14 October 2024 (See Annex A), while the hard copies of version 2 were submitted on 21 October 2024 (**See Annex B**).

Table ES-1 and **Table ES-2** shows the Supplemental Information Comment-Response Matrix of the Supplemental Information Report Versions 3 and 2, respectively.

Table ES-1 Supplemental Information Comment-Response Matrix Version 3

Components	DENR EMB Comments	Response / Remarks
Temporary Support Facilities		
• Sand Stockpile Pit	Use of Temporary Sand Stockpile outside the ECC Boundary is not allowed; and	The Temporary Sand Stockpile Pit has been removed in the Project 360 Schematic / Site Plan as shown in **Figure 2.1** and in the discussions.
Temporary Access bridges • Between Island AB and C	Use of Temporary Land Bridge that can impede the natural water circulation	A separate flushing study (can be found in Annex D) was conducted to verify the impact of the proposed temporary access bridges on water circulation during the construction phase. The following are the temporary access bridges considered: 1) The 476m wide temporary access bridge in the north-south (N-S) channel connecting island AB with the hinterland; and 2) The 180m wide temporary access bridge in the east-west (E-W) channel connecting islands AB and C. A. Key findings/ conclusion: • During the rainy season, water moves quickly through the N-S and E-W channels, clearing out in less than 4 days. This means the temporary access bridges do not hinder the water flow. • In the dry season, water in the larger N-S channel moves at an acceptable

Components	DENR EMB Comments	Response / Remarks
		rate, fully refreshing in 10 days. The E-W channel takes slightly longer at 11 days. However, it should be noted that the E-W channel will be situated far from the existing land, and no developments have yet been constructed on the islands. Temporary water quality issues in that channel would not cause hindrance and can easily be mitigated through constant monitoring and cleaning of the water channel, in case of excessive algal bloom. • Considering that this is only a temporary condition during a construction stage of approximately 18 months, we can conclude that the proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-S channel (476m wide), still allow an adequate water exchange in between the islands.

Table ES-2 Supplemental Information Comment-Response Matrix Version 2

Components	Required Information/ Details	Response / Remarks
Inter-Island Connecting Bridges Between Islands A and B with Island C (Bridge 5 and 6) – Permanent Bridge	Technical specifications/descriptions	See **Section 1**
	Geographical coordinates of the bridge alignment	
Wastewater treatment units	Technical specifications/ descriptions	See **Section 2.13**
	Activities for construction and decommissioning of temporary facilities. This should be included in the Environmental Management Plan	Wastewater Treatment Units shall be part of the future ECC application of the locators and not covered in this ECC application. "Wastewater Treatment Units" have been changed into "Sanitation Facility – Portalets".
	Will an STP be constructed for this application?	

<table>
<tr><th>Components</th><th>Required Information/ Details</th><th>Response / Remarks</th></tr>
<tr><td colspan="3">Temporary Support Facilities</td></tr>
<tr><td rowspan="4">• Precast Yard
• *Material Storage
• Site Office
• Rock Stockpile
• **Sand Stockpile Pit
• Steelpipe Area
• Materials Recovery Facility (MRF)
• Hazardous Waste Facility
• Concrete Block Mattress Stockpile
• Clinic
• Movable/ Transferable Jetty
• Rock Wharf</td><td>Technical specifications/descriptions</td><td rowspan="4"><table><tr><th>Component</th><th>Section</th></tr><tr><td>Precast Yard</td><td>Section 2.1</td></tr><tr><td>Site Office</td><td>Section 2.2</td></tr><tr><td>Rock Stockpile</td><td>Section 2.3</td></tr><tr><td>Pipeline Stockpile</td><td>Section 2.5</td></tr><tr><td>Material Recovery Facility and Hazardous Waste Facility</td><td>Section 2.6</td></tr><tr><td>Concrete Block Mattress Stockpile</td><td>Section 2.7</td></tr><tr><td>Clinic</td><td>Section 2.8</td></tr><tr><td>Movable Transferable Jetty</td><td>Section 2.9</td></tr><tr><td>Temporary Rock Wharf</td><td>Section 2.10</td></tr><tr><td>Temporary Access Bridge Between the Mainland and Island AB and Annex C</td><td>Section 2.11</td></tr><tr><td>Temporary Access Bridge Between Island AB And C</td><td>Section 2.12</td></tr><tr><td>Sanitation Facility - Portalets</td><td>Section 2.13</td></tr></table></td></tr>
<tr><td>Detailed site development plan for the Temporary Support Facilities</td></tr>
<tr><td>Geographical coordinates of the locations of the temporary support facilities</td></tr>
<tr><td>Detailed activities for construction and decommissioning of temporary facilities.

This should be included in the Environmental Management Plan</td></tr>
<tr><td rowspan="3">Temporary Access bridges
• Between the mainland and Island AB
• **Between the mainland and Island C
• Between Island AB and C</td><td>Technical specifications/descriptions.</td><td rowspan="3">*Material Storage is located within the Precast Yard and discussed in Section 1

**Project will not include sand stockpile pit.

**Temporary Access bridge - Between the mainland and Island C will not be pursued anymore.</td></tr>
<tr><td>Barangay in the mainland, and the proof of authority over the project area for the temporary access bridges in mainland.</td></tr>
<tr><td>Specification on materials, and the activities for construction and decommissioning of temporary facilities.

This should be included in the Environmental Management Plan.</td></tr>
</table>

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

LIST OF TABLES VI

LIST OF FIGURES VII

LIST OF ANNEXES VII

1. INTER-ISLAND CONNECTING BRIDGES (PERMANENT) 1-1

1.1. TECHNICAL SPECIFICATIONS/ DESCRIPTION 1-1
1.2. SCHEMATIC/ SITE PLAN 1-1

2. TEMPORARY SUPPORT FACILITIES 2-1

2.1. PRECAST YARD 2-2
2.1.1. PURPOSE 2-2
2.1.2. DESCRIPTION OF ACTIVITIES 2-2
2.1.2.1. CONSTRUCTION 2-2
2.1.2.2. DECOMMISSIONING 2-2
2.1.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-2
2.1.4. SCHEMATIC / SITE PLAN 2-4
2.1.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-6
2.2. SITE OFFICE 2-9
2.2.1. PURPOSE 2-9
2.2.2. DESCRIPTION OF ACTIVITIES 2-9
2.2.2.1. CONSTRUCTION 2-9
2.2.2.2. DECOMMISSIONING 2-9
2.2.3. TECHNICAL SPECIFICATIONS 2-9
2.2.4. SCHEMATIC PLAN 2-9
2.2.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-11
2.3. ROCK STOCKPILE 2-12
2.3.1. PURPOSE 2-12
2.3.2. DESCRIPTION OF ACTIVITIES 2-12
2.3.2.1. CONSTRUCTION 2-12
2.3.2.2. DECOMMISSIONING 2-12
2.3.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-12
2.3.4. SCHEMATIC / SITE PLAN 2-12
2.3.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-14
2.4. PIPELINE STOCKPILE 2-16
2.4.1. PURPOSE 2-16
2.4.2. DESCRIPTION OF ACTIVITIES 2-16
2.4.2.1. CONSTRUCTION 2-16

2.4.2.2. DECOMMISSIONING 2-16
2.4.3. TECHNICAL SPECIFICATIONS/ DESCRIPTIONS 2-16
2.4.4. SCHEMATIC/ SITE PLAN 2-16
2.4.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-18
2.5. MATERIAL RECOVERY FACILITY (MRF) AND HAZARDOUS WASTE FACILITY 2-20
2.5.1. PURPOSE 2-20
2.5.2. DESCRIPTION OF ACTIVITIES 2-20
2.5.2.1. CONSTRUCTION 2-22
2.5.2.2. DECOMMISSIONING 2-22
2.5.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-23
2.5.4. SCHEMATIC/ SITE PLAN 2-23
2.5.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-25
2.6. CONCRETE BLOCK MATTRESS (CBM) STOCKPILE 2-26
2.6.1. PURPOSE 2-26
2.6.2. DESCRIPTION OF ACTIVITIES 2-26
2.6.2.1. CONSTRUCTION 2-26
2.6.2.2. DECOMMISSIONING 2-26
2.6.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-26
2.6.4. SCHEMATIC/ SITE PLAN 2-26
2.6.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-28
2.7. CLINIC 2-29
2.7.1. PURPOSE 2-29
2.7.2. DESCRIPTION OF ACTIVITIES 2-29
2.7.2.1. CONSTRUCTION 2-29
2.7.2.2. DECOMMISSIONING 2-30
2.7.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-30
2.7.4. SCHEMATIC/ SITE PLAN 2-30
2.7.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-32
2.8. MOVABLE TRANSFERABLE JETTY 2-33
2.8.1. PURPOSE 2-33
2.8.2. DESCRIPTION OF ACTIVITIES 2-33
2.8.2.1. CONSTRUCTION 2-33
2.8.2.2. DECOMMISSIONING 2-33
2.8.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-33
2.8.4. SCHEMATIC/ SITE PLAN 2-34
2.8.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-37
2.9. TEMPORARY ROCK WHARF 2-38
2.9.1. PURPOSE 2-38
2.9.2. DESCRIPTION OF ACTIVITIES 2-38
2.9.2.1. CONSTRUCTION 2-38
2.9.2.2. DECOMMISSIONING 2-38
2.9.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-38
2.9.4. SCHEMATIC/ SITE PLAN 2-38
2.9.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-41
2.10. TEMPORARY ACCESS BRIDGE BETWEEN THE MAINLAND AND ISLAND AB 2-42
2.10.1. PURPOSE 2-43
2.10.2. DESCRIPTION OF ACTIVITIES 2-44
2.10.2.1. CONSTRUCTION 2-44
2.10.2.2. DECOMMISSIONING 2-44

2.10.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-44
2.10.4. SCHEMATIC/ SITE PLAN 2-45
2.10.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-49
2.11. TEMPORARY ACCESS BRIDGE BETWEEN ISLAND AB AND C 2-51
2.11.1. PURPOSE 2-51
2.11.2. DESCRIPTION OF ACTIVITIES 2-51
2.11.2.1. CONSTRUCTION 2-51
2.11.2.2. DECOMMISSIONING 2-51
2.11.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-52
2.11.4. SCHEMATIC/ SITE PLAN 2-52
2.11.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-52
2.12. SANITATION FACILITY - PORTALETS 2-55
2.12.1. PURPOSE 2-55
2.12.2. DESCRIPTION OF ACTIVITIES 2-55
2.12.2.1. CONSTRUCTION 2-55
2.12.2.2. DECOMMISSIONING 2-55
2.12.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION 2-55
2.12.4. LOCATION OF PORTALETS 2-55
2.12.5. IMPACT ASSESSMENT AND MITIGATING MEASURES 2-1

3. SUPPLEMENTAL ENVIRONMENTAL MANAGEMENT PLAN 3-2

LIST OF ANNEXES 3-1

LIST OF TABLES

Table 1.1 Inter-Island Bridges (Permanent) 1-1
Table 2.1 List of Supplemental Temporary Facilities 2-1
Table 2.2 Components of the Precast Yard 2-3
Table 2.3 Impact Assessment and Mitigating Measures 2-6
Table 2.4 Impact Assessment and Mitigating Measures 2-11
Table 2.5 Impact Assessment and Mitigating Measures 2-14
Table 2.6 Impact Assessment and Mitigating Measures 2-18
Table 2.7 List of Hazardous Waste 2-20
Table 2.8 Impact Assessment and Mitigating Measures 2-25
Table 2.9 Impact Assessment and Mitigating Measures 2-28
Table 2.10 Impact Assessment and Mitigating Measures 2-32
Table 2.11 Impact Assessment and Mitigating Measures 2-37
Table 2.12 Impact Assessment and Mitigating Measures 2-41
Table 2.13 Comparative Summary of Results of Flushing Study 2-49
Table 2.14 Impact Assessment and Mitigating Measures 2-50
Table 2.15 Impact Assessment and Mitigating Measures 2-1
Table 3.1 Supplemental Environmental Management Plan for the Construction and Decommissioning of the Temporary Support Facilities 3-3

LIST OF FIGURES

Figure 1.1 Inter-Island Bridge Landing Points..... 1-2
Figure 1.2 Inter-Island Bridge Schematic/ Site Plan 1-3
Figure 2.1 Project 360 Schematic / Site Plan 2-1
Figure 2.2 Precast Yard Schematic / Site Plan 2-5
Figure 2.3 Site Office Layout..... 2-10
Figure 2.4 Rock Stockpile Schematic / Site Plan..... 2-13
Figure 2.5 Pipeline Stockpile Schematic / Site Plan 2-17
Figure 2.6 Location of Materials Recovery Facility and Hazardous Waste Storage 2-24
Figure 2.7 Concrete Block Mattress Schematic / Site Plan..... 2-27
Figure 2.8 Clinic Schematic / Site Plan..... 2-31
Figure 2.9 Movable Transferable Jetty front, Vertical and Side View and Elevation..... 2-35
Figure 2.10 Movable Transferable Jetty Schematic / Site Plan..... 2-36
Figure 2.11 Rock Wharf Cross Section View..... 2-39
Figure 2.12 Rock Wharf Schematic / Site Plan..... 2-40
Figure 2.13 Contract of Lease..... 2-42
Figure 2.14 DPWH Letter of No Objection..... 2-43
Figure 2.15 Temporary Access Bridge Between the mainland and Island AB (L: 476m between the mainland and Island AB & L: ±255m between Island AB and C) Schematic / Site Plan .. 2-46
Figure 2.16 Temporary Access Bridge Between the mainland and Island AB Longitudinal Section A-A (L: 476m between the mainland and Island AB) Concept-level Design..... 2-47
Figure 2.17 Temporary Access Bridge in the CCP Leased Area and DPWH Area Site Layout 2-48
Figure 2.18 Temporary Access Bridge Between Island AB and C Schematic / Site Plan .. 2-53
Figure 2.19 Temporary Access Bridge Between Island AB and C Concept-level Design .. 2-54
Figure 2.20 Location of Portalets..... 2-56

LIST OF ANNEXES

Annex A Email From EMB re Supplemental Information for the 360-Hectare Pasay Reclamation Project and Acknowledgement Receipt for the First Submission of the Supplemental Information Report

Annex B Supplemental Information Report Version 2 Submission to DENR EMB on 21 October 2024

Annex C Proof of Authority Over the Temporary Access Road
- CCP Contract of Lease
- DPWH Letter of No Objection
- CHEC Letter to DPWH

Annex D Flushing Study: Verification of Flushing Time for Pasay 360 Temporary Access Bridges

1. INTER-ISLAND CONNECTING BRIDGES (PERMANENT)

1.1. TECHNICAL SPECIFICATIONS/ DESCRIPTION

Inter-Island connecting Bridge Between Project Islands A and B with Island C - Middle (Bridge 5)

- Type: Reinforced Concrete Beam Bridge
- Width: 46 mts.
- Number of Lanes: 10 lanes (5 lanes per direction)

Inter-Island connecting Bridge between Project Islands A and B with Island C - Middle (Bridge 6)

- Type: Reinforced Concrete Beam Bridge
- Width: 35 mts.
- Number of Lanes: 6 lanes (3 lanes per direction)

1.2. SCHEMATIC/ SITE PLAN

The permanent Inter-Island Connecting Bridges Between Project Islands A and B with Island C (Bridge 5 and 6) landing points are shown in Figure 1.1 while the schematic / site plan is shown in Figure 1.2.

Location

The Inter- Island bridges geographic coordinates is shown in Table 1.1 and Figure 1.1.

Table 1.1 Inter-Island Bridges (Permanent)

Bridge	Technical Specifications/ Description	No.	Latitude	Longitude
Middle (Bridge 5)	Connects Islands A/B and C Length: ±225mts. Width: ±46mts.	1	14°32'24.20262"N	120°57'55.28187"E
		2	14°32'24.56739"N	120°57'56.79045"E
		3	14°32'18.56213"N	120°57'57.35853"E
		4	14°32'18.19665"N	120°57'55.85003"E
Middle (Bridge 6)	Connects Islands A/B and C Length: ±225mts. Width: ±35mts.	1	14°32'30.91922"N	120°58'23.06119"E
		2	14°32'31.19633"N	120°58'24.20734"E
		3	14°32'25.20848"N	120°58'24.83726"E
		4	14°32'24.93820"N	120°58'23.69042"E

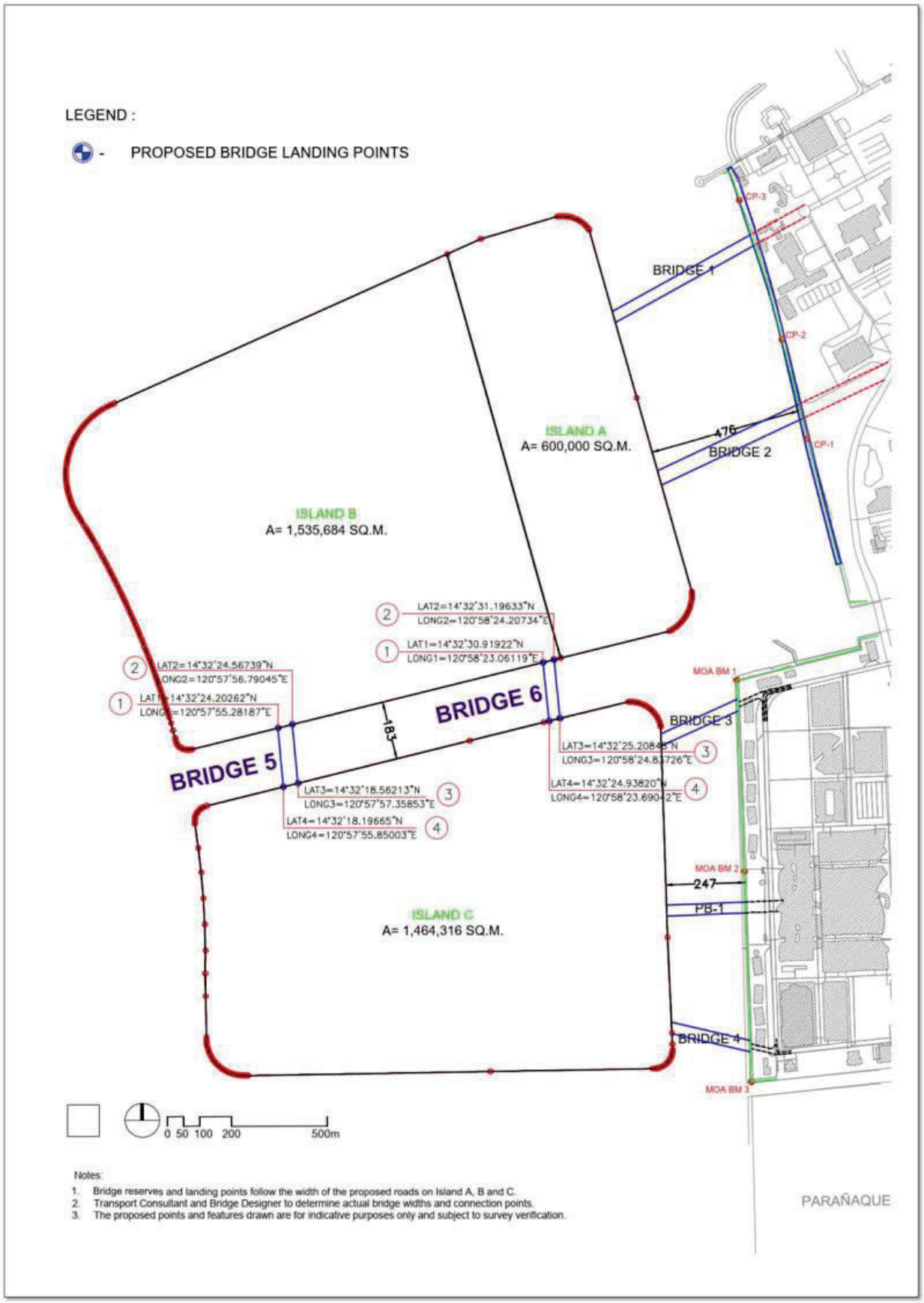
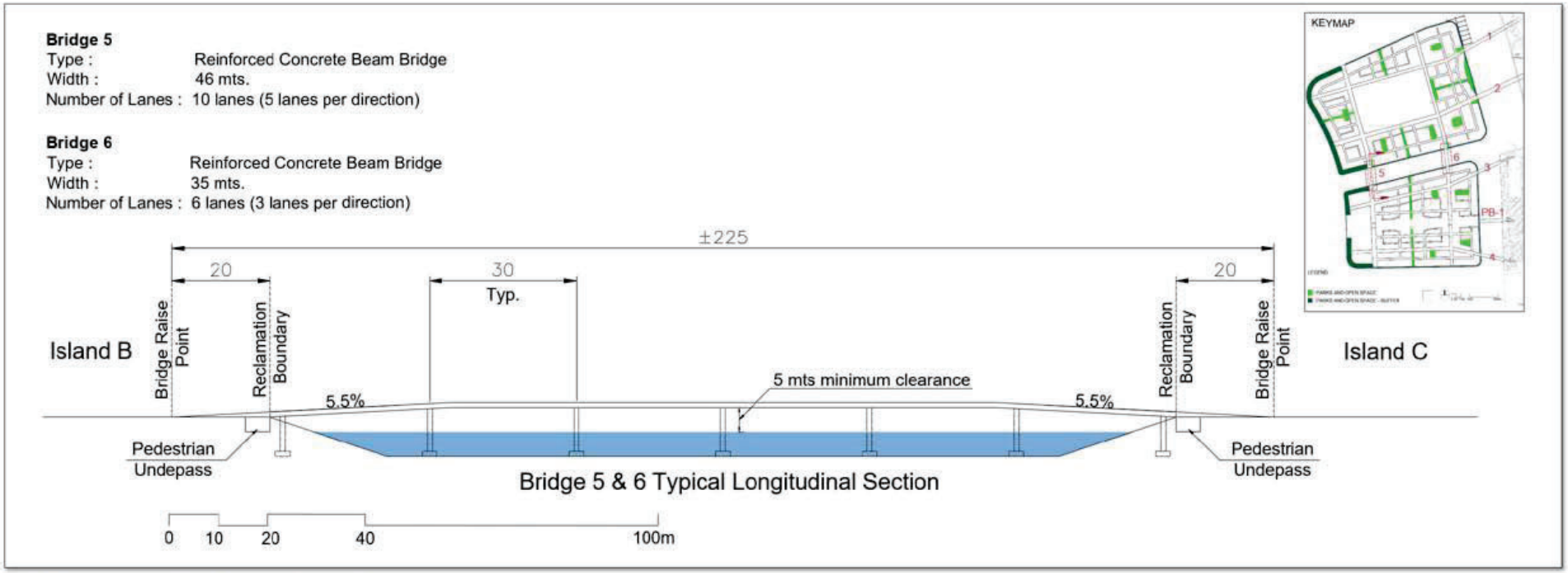


Figure 1.1 Inter-Island Bridge Landing Points



Note: To be firmed up in the Detailed Engineering Design and Final Project Masterplan

Figure 1.2 Inter-Island Bridge Schematic/ Site Plan

2. TEMPORARY SUPPORT FACILITIES

As part of the reclamation and horizontal development construction methodology there will be temporary facilities such as those listed in Table 2.1.

Table 2.1 List of Supplemental Temporary Facilities

Components	Section
Precast Yard	Section 2.1
Site Office	Section 2.2
Rock Stockpile	Section 2.3
Pipeline Stockpile	Section 2.4
Material Recovery Facility and Hazardous Waste Facility	Section 2.5
Concrete Block Mattress Stockpile	Section 2.6
Clinic	Section 2.7
Movable Transferable Jetty	Section 2.8
Temporary Rock Wharf	Section 2.9
Temporary Access Bridge Between the Mainland and Island AB	Section 2.10
Temporary Access Bridge Between Island AB And C	Section 2.11
Sanitation Facility - Portalets	Section 2.12

Figure 2.1 shows the general location of project components - temporary facilities.

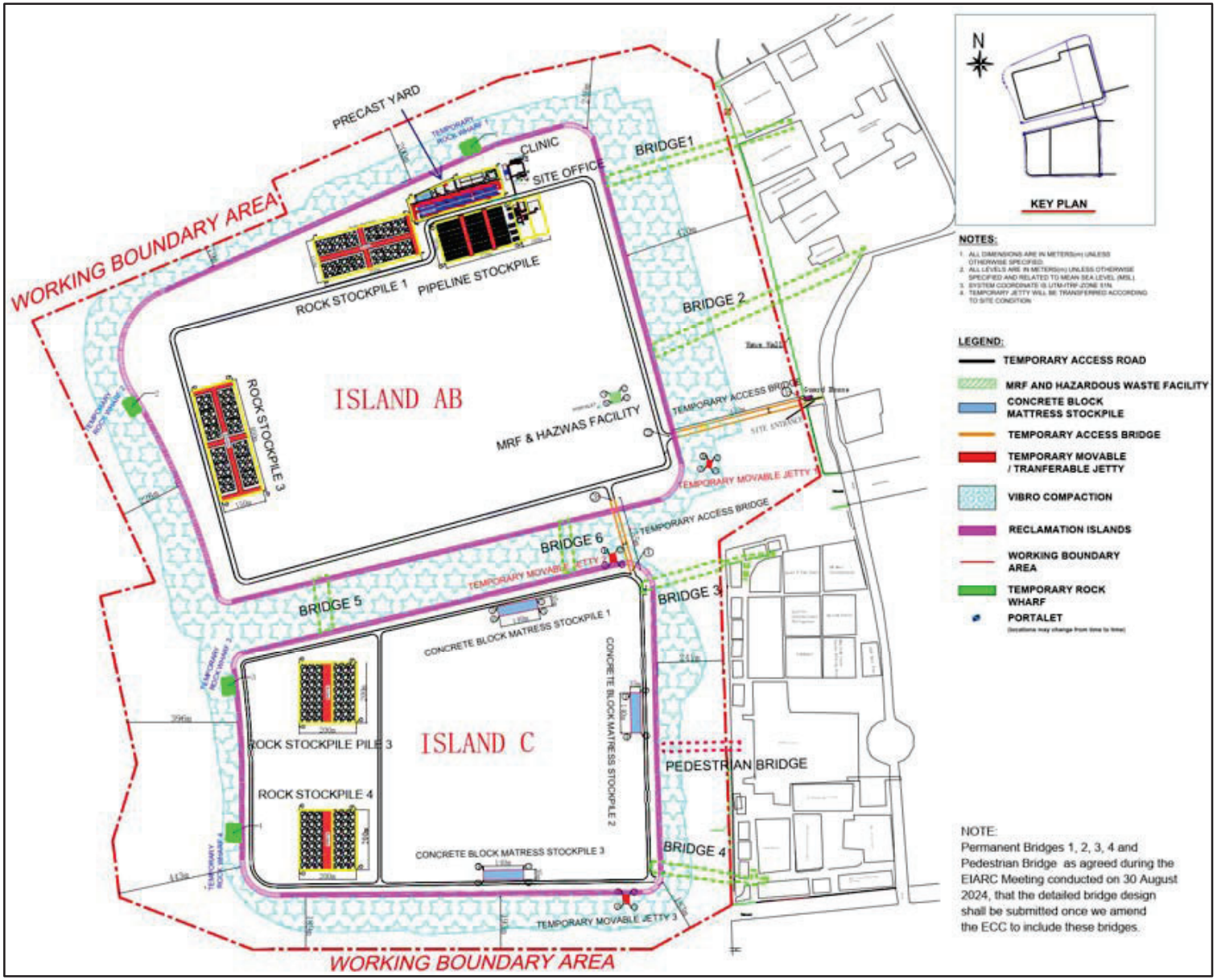


Figure 2.1 Project 360 Schematic / Site Plan

2.1. PRECAST YARD

2.1.1. PURPOSE

The precast yard's function is primarily to prefabricate Concrete Block Mattresses (CBM) for channel revetments for slope protection. It also serves functional areas for the office, worker's rest area, geotextile processing, equipment parking, and material storage.

2.1.2. DESCRIPTION OF ACTIVITIES

2.1.2.1. CONSTRUCTION

The precast yard construction activities are as follows:

- Steel fence installation
- Placement of small rocks as a base for the construction of the workshop yard
- Installation of precast concrete bedding
- Mould delivery on site
- Installation of steel railing for gantry cranes
- Lifting Beam
- Concrete trial
- Prefabrication of Concrete mattress

For site offices, this includes placement of containers in designated areas.

2.1.2.2. DECOMMISSIONING

The decommissioning of the precast yard and its subcomponents will involve the following:

- Removal of offices and all equipment and facility
- Pullout of containers (prefab cabins for site offices)
- Breaking of concrete base and hauling of debris from site to a designated dumping area
- Site clean-up

2.1.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

The total length of the precast yard (workshop yard) is 326m, the maximum width is about 100m, and the total area is 31,770m^2, the yard is divided into an office area, prefabrication area, CBM storage area, and other functional areas as shown in Figure 2.2. It is planned to be built on the north side of Island AB, near the temporary rock jetty and 50 meters away from the reclamation boundary. The material specification of most of the precast yard subcomponents is concrete bedding with steel railing for gantry cranes and enclosed by a steel fence. The list of the precast yard subcomponents is presented in Table 2.2.

Table 2.2 Components of the Precast Yard

Components	Description/ Specifications
Prefabricated Area	The prefabricated area is 280m long and 33m wide. There are four production lines, each with 30 prefabricated pedestals. The single block mattress size is L*W=6.32m*2.92m. Individual pedestals are set up according to the block mattress size. Each pedestal is equipped with a set of block mattress bottom molds, allowing the prefabrication to accommodate up to 120 pieces of block mattresses. Flooring: 10cm *C25 concrete. Fences are set up on both sides of the prefabrication area. Two gantry cranes with a 15 T lifting capacity, a 33-meter span, and a 9-meter lifting height are planned. Track beams will be installed on both sides, and the gantry crane track will be 33 meters wide.
CBM Storage Area	Three storage areas are set up: • Area A : length 56m, width 13m, and total area of 728m^2 • Area B : length 56m, width 9m, and total area of 504m^2 • Area C : length 26m, width 32m, and total area of 832m^2 The stacking height shall not exceed 2 meters.
Geotextile processing area	Includes a geotextile storage area, processing area, and processed geotextile storage area. Used for geotextile sewing and processing. The dimensions are 100m x 32m
Generator Placement/ Power Distribution:	Flooring: 20cm *C25 concrete Power consumption plan: Utilization of one 200 kW generator for primary power, supplemented by a 50 kW and a 20-kW generator for backup.
Access Road	There are two horizontal roads in the workshop area: Access 1 is a gravel road, 9 meters wide, and a double lane; Access 2 is located in the prefabrication area, with a concrete road, 6 meters wide, and a single lane. There is also a pedestrian walkway.
Water Tanks	Three water tanks for curing water, each made of steel plates with a capacity of 20m^3, are set up for curing water used in concrete mattresses
Fuel Storage Tank (Diesel)	The 6m × 6m fuel storage area located at least 15 meters away from the generator, separated by caution / danger tape. Fuel tanks and storage area will be bunded with at least 110% of storage capacity of the largest tank.
Precast Yard Site Office	Flooring: 20cm *C25 concrete

Components	Description/ Specifications
	Steel Insulated cabin with aircon. Used as work space for site personnel. Approximately 40m long and 30m wide, accommodating on-site offices, warehouse, meeting rooms, and workers' rest area. All rooms are constructed as assembled box-type cubicles, which are procured externally and then placed on the site.
Geotextile processing area	Includes a geotextile storage area, processing area, and processed geotextile storage area. Used for geotextile sewing, and processing. The dimensions are 100m x 32m
Maintenance area and Material storage area	It includes equipment maintenance, parking areas, material storage areas such as chemical storage for paint, oil, grease and spray cans for precasting.

*C25 concrete is the specification of the concrete to be used for the flooring with 20 cm thickness.

2.1.4. SCHEMATIC / SITE PLAN

The schematic / site plan including the technical geographic coordinates of the precast yard are shown in Figure 2.2.

PRECAST YARD		
S/N	LATITUDE	LONGITUDE
1	14°33'8.05"	120°58'6.39"
2	14°33'10.40"	120°58'11.60"
3	14°33'11.85"	120°58'16.63"
4	14°33'8.62"	120°58'17.61"
5	14°33'5.60"	120°58'7.13"

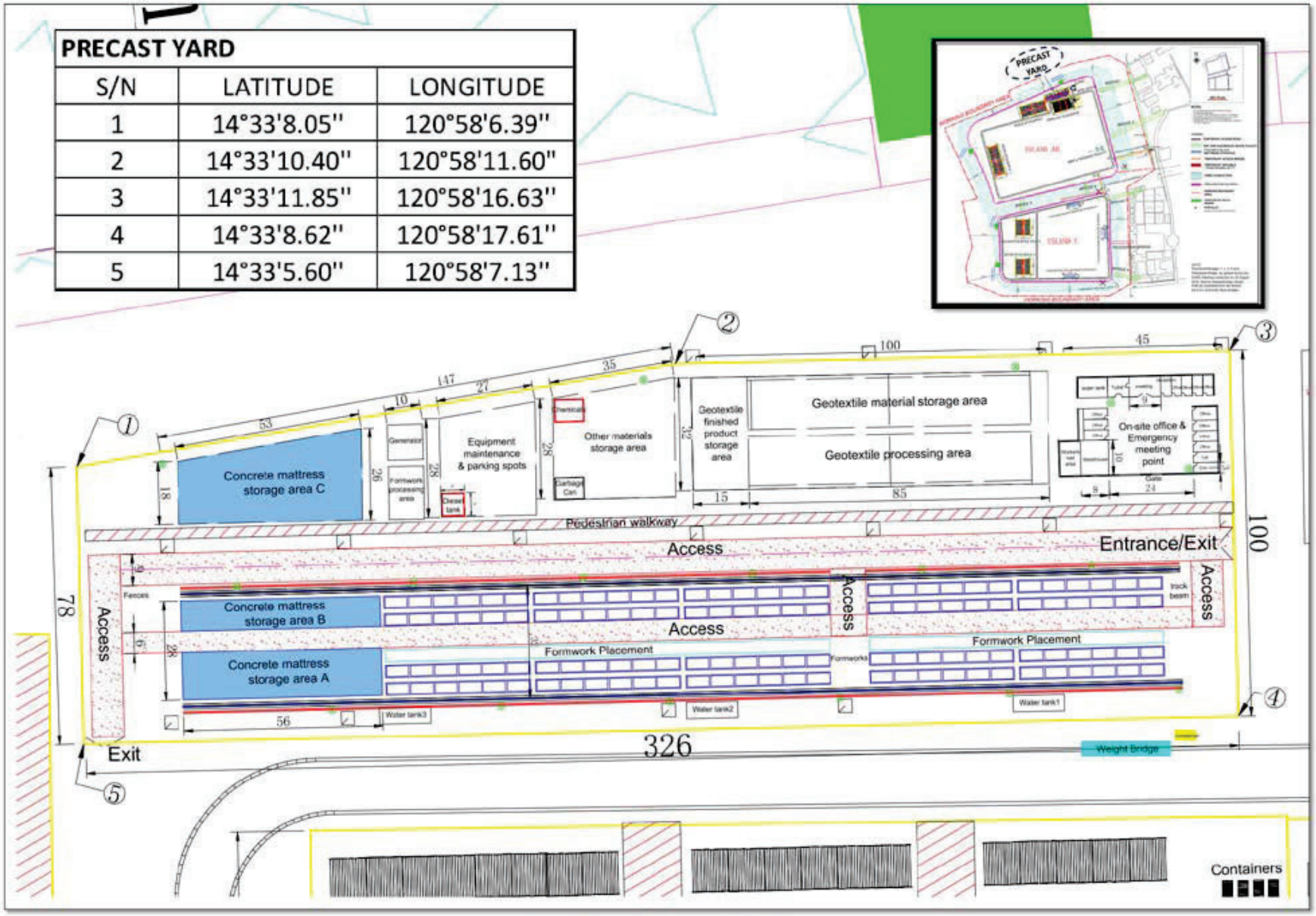


Figure 2.2 Precast Yard Schematic / Site Plan

2.1.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the precast yard is presented in Table 2.3.

Table 2.3 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	✓	✓	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust
Mobilization of land-based equipment and vehicles	Road Accident	✓	✓	Separate pedestrian walkway (Personnel Entrance and Exit) and access for vehicles (Vehicle Entrance and Exit) Set up warning strips for isolation Main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher or / linemen
Use of engines of generators, ships, vehicles and machinery, Whistles, horns, reversing alarms, intercom communication noise, workers' voices, etc. of machinery and vehicles in the site area	Increase in Noise and Vibration	✓	✓	Take sealing measures or sound-absorbing materials to reduce the noise intensity of generators and equipment engines Control the working hours and reduce unnecessary equipment movement at night Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs and train and supervise personnel to use them correctly

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Construction and Decommissioning Activities	Generation of Solid Waste	✓	✓	Implementation of waste management plan
Construction and Decommissioning Activities	Oil Spills	✓	✓	Set up a chemical storage area with proper signages, spill kits, fire extinguisher and ventilation, all chemicals will have MSDS, use warning tape to isolate, and put up warning signs. Hot work is prohibited near the chemical storage area, and extinguishers shall be set up The disposal of hazardous wastes and/or expired chemicals will be through DENR accredited Treatment, Storage and Disposal (TSD) facility. Implementation of the Oil Spill and Contingency Plan
Construction and Decommissioning Activities	Occurrence of Accidents Threat to Health and Safety	✓	✓	Induction and PPE to be given to all the new workers and staff toolbox to be conducted prior to each activity Mandatory of PPE compliance Provide proper barricading and signage to be installed. Security Personnel to be deployed to control the entry and exit of Equipment, Materials and Workers Safety Officer and First Aider will be assigned 24/7 to ensure the implementation of Safety Management System All moving equipment's will be controlled by certified operator and assisted by trained spotter, Temporary fence of operational area must be installed During night operation proper illumination will be provided and night work permit to be applied. Welfare Facilities to be ensure in place prior to start the activities: Toilet, Rest

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
				Shelter, Storage of Materials Provision of water and Security booth. Basic requirements for all heavy/light vehicle must be provided as well as operator certification, Rucker's Personal Conveyance (TPC's), License, Vehicle registration, etc. Proper Waste Management implementation
Storage of fuel	Fuel leaks	✓	✓	Establishment of secondary containment/bund wall that can contain 110% capacity by the actual total volume of stored fuels. Readily available oil spill kit and fire extinguisher.
Use of generator set	Fuel leaks and emissions	✓	✓	Secure and adherence to permit to operate. Proper handling of diesel fuel.

2.2. SITE OFFICE

2.2.1. PURPOSE

This site office, along with the offices located in the precast yard, will be used as a work space for the general use of site personnel.

2.2.2. DESCRIPTION OF ACTIVITIES

2.2.2.1. CONSTRUCTION

The establishment of site office include clearing of the location and placement of office containers (prefabricated cabins) on designated area.

2.2.2.2. DECOMMISSIONING

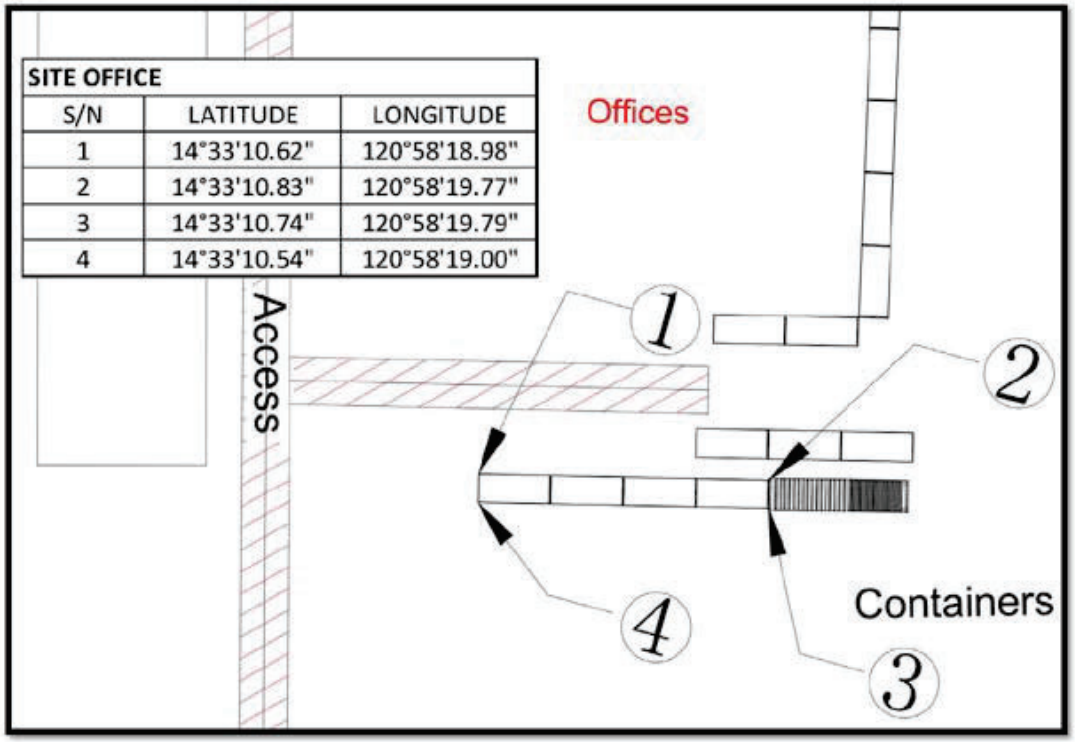
The decommissioning activity include pull-out of office containers (prefabricated cabins) and site clean-up.

2.2.3. TECHNICAL SPECIFICATIONS

The site office is made up of steel insulated cabins. Air conditioning units will be installed in the site office containers.

2.2.4. SCHEMATIC PLAN

The schematic / site plan including the technical geographic coordinates of the site office are shown in Figure 2.3. The site office is located at the upper right of north side of Island AB and right side of the precast yard.



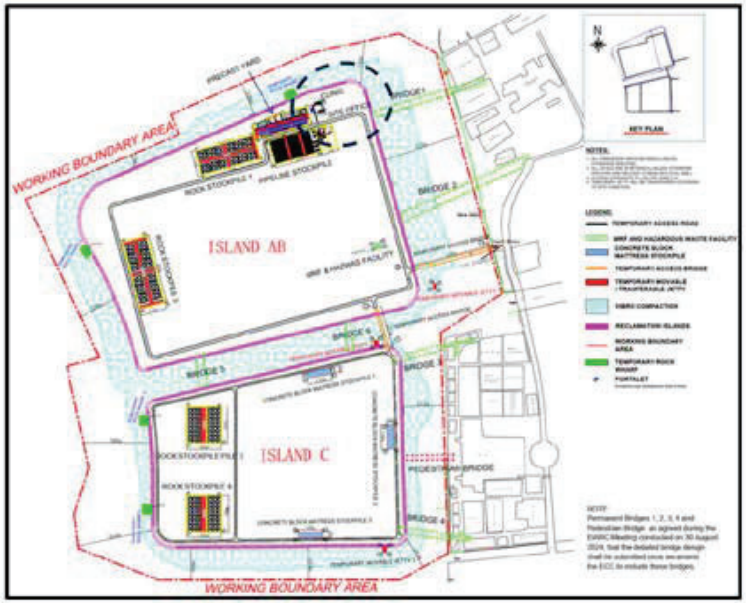


Figure 2.3 Site Office Layout

2.2.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the site office is presented in Table 2.4.

Table 2.4 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Clearing of the location and placement of office containers (prefabricated cabins)	Generation of Solid Waste	✓	x	Implementation of waste management plan Proper housekeeping
Pull out of office cabins	Generation of Solid Waste	x	✓	Implementation of waste management plan Proper housekeeping

2.3. ROCK STOCKPILE

2.3.1. PURPOSE

The rock stockpiles will be used to store rock materials. These rock materials will be used for coastal revetments, which deflect the energy of waves and prevent erosion along coastlines.

2.3.2. DESCRIPTION OF ACTIVITIES

2.3.2.1. CONSTRUCTION

The construction activities for the rock stockpile are as follows:

- Clean and clear the designated area for the stockpile
- Placing of cones to act as fence

2.3.2.2. DECOMMISSIONING

Site clean-up, removal of cones and cyclone wires that act as fence, proper housekeeping and disposal of solid and residual waste.

2.3.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

The rock stockpile is laid on sand with a soft boundary barricade, such as cones, cyclone wire fences, etc.

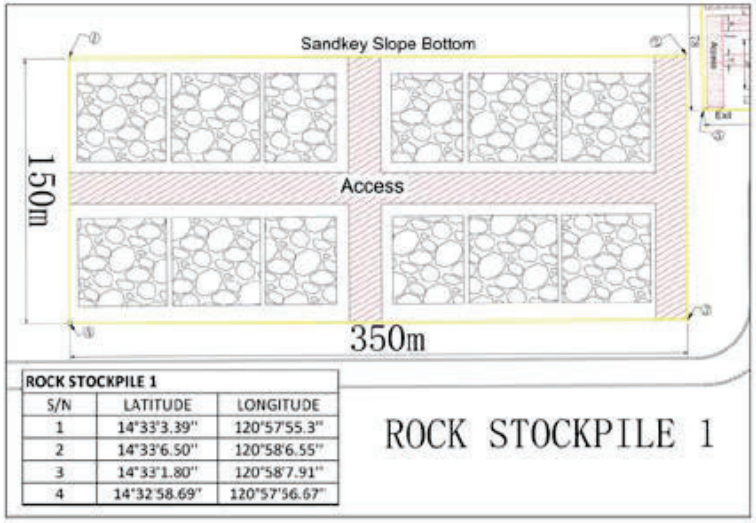
The size of the four rock stockpile areas are as follows:

- 1 pc – 150m x 350m (See Rock Stockpile 1 in Figure 2.4)
- 1 pc – 400m x 150m (See Rock Stockpile 2 in Figure 2.4)
- 2pcs - 200m x 200m (See Rock Stockpiles 3 and 4 in Figure 2.4)

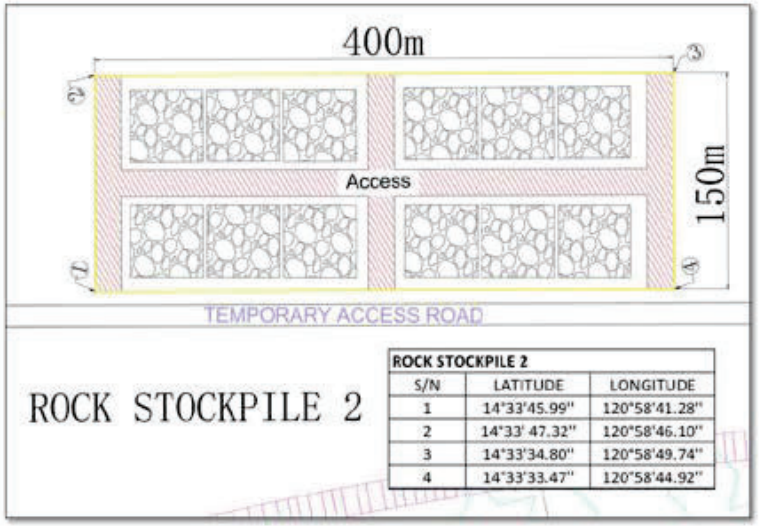
Stockpile "1" is located at the North side of Island AB. Left side of Precast Yard and Pipeline stockpile. Stockpile "2" is located on the West side of Island AB. Stockpile "3" is located at the upper west of Island C side near rock wharf 3. Stockpile "4" is located at the lower west side of Island C near wharf 4.

2.3.4. SCHEMATIC / SITE PLAN

The schematic / site plan including the geographic coordinates are shown in Figure 2.4.

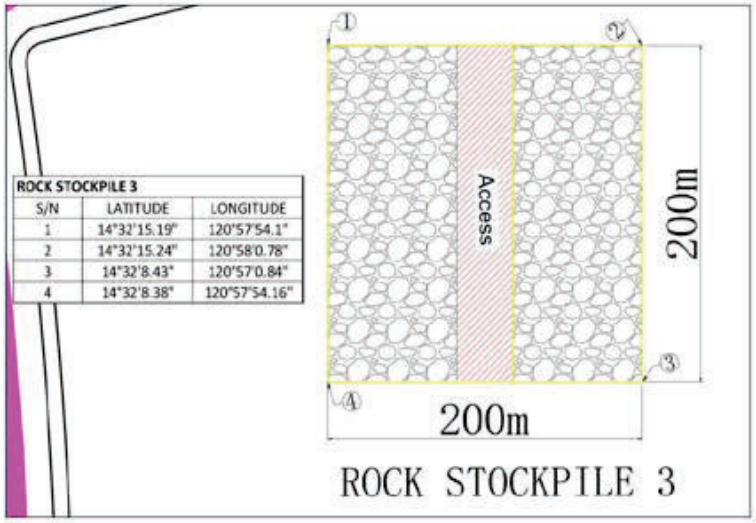


ROCK STOCKPILE 1		
S/N	LATITUDE	LONGITUDE
1	14°33'3.39"	120°57'55.3"
2	14°33'6.50"	120°58'6.55"
3	14°33'1.80"	120°58'7.91"
4	14°32'58.69"	120°57'56.67"

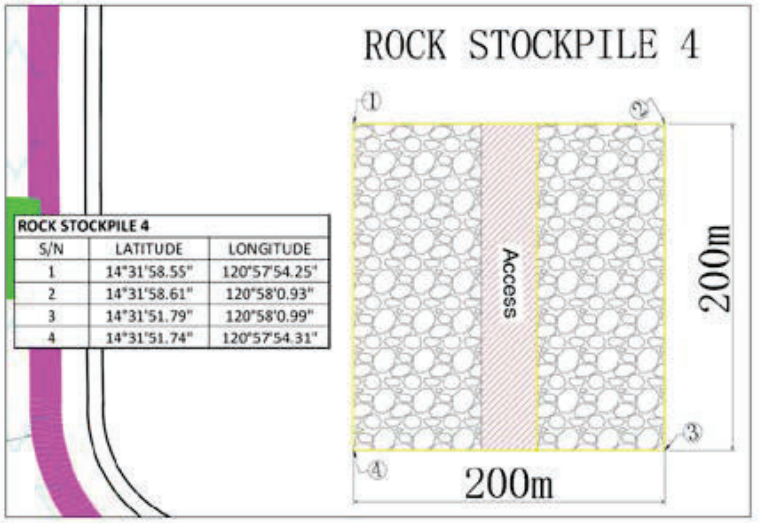


ROCK STOCKPILE 2		
S/N	LATITUDE	LONGITUDE
1	14°33'45.99"	120°58'41.28"
2	14°33' 47.32"	120°58'46.10"
3	14°33'34.80"	120°58'49.74"
4	14°33'33.47"	120°58'44.92"





ROCK STOCKPILE 3		
S/N	LATITUDE	LONGITUDE
1	14°32'15.19"	120°57'54.1"
2	14°32'15.24"	120°58'0.78"
3	14°32'8.43"	120°57'0.84"
4	14°32'8.38"	120°57'54.16"



ROCK STOCKPILE 4		
S/N	LATITUDE	LONGITUDE
1	14°31'58.55"	120°57'54.25"
2	14°31'58.61"	120°58'0.93"
3	14°31'51.79"	120°58'0.99"
4	14°31'51.74"	120°57'54.31"

Figure 2.4 Rock Stockpile Schematic / Site Plan

2.3.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the rock stockpile is presented in Table 2.5.

Table 2.5 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	✓	✓	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust Use of truck cover during delivery
Mobilization of land-based equipment and vehicles	Road Accident	✓	✓	Separate pedestrian walkway (Personnel Entrance and Exit) and access for vehicles (Vehicle Entrance and Exit) Set up warning strips for isolation Main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher or / linemen
Operation of engines of vehicles and machinery, whistles, horns, reversing alarms, intercom communication noise, workers' voices, etc. of machinery and vehicles in the site area	Increase in Noise and Vibration	✓	✓	Control the working hours and reduce unnecessary equipment movement at night Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs, and train and supervise personnel to use them correctly

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Construction and Decommissioning Activities	Generation of Solid Waste	✓	✓	Proper housekeeping Implementation of waste management plan
Stockpiling	Presence of rock debris	✓	✓	Rock stockpiles should be limited and confined on its designated area. Proper hauling and delivery.

2.4. PIPELINE STOCKPILE

2.4.1. PURPOSE

The pipeline stockpile will store pipes for sand rehandling. These pipes connect the CSD and sprayer pontoons used in sand reclamation activities.

2.4.2. DESCRIPTION OF ACTIVITIES

2.4.2.1. CONSTRUCTION

The construction of the pipeline stockpile will include cleaning and clearing the designated area, which is laid on level ground.

2.4.2.2. DECOMMISSIONING

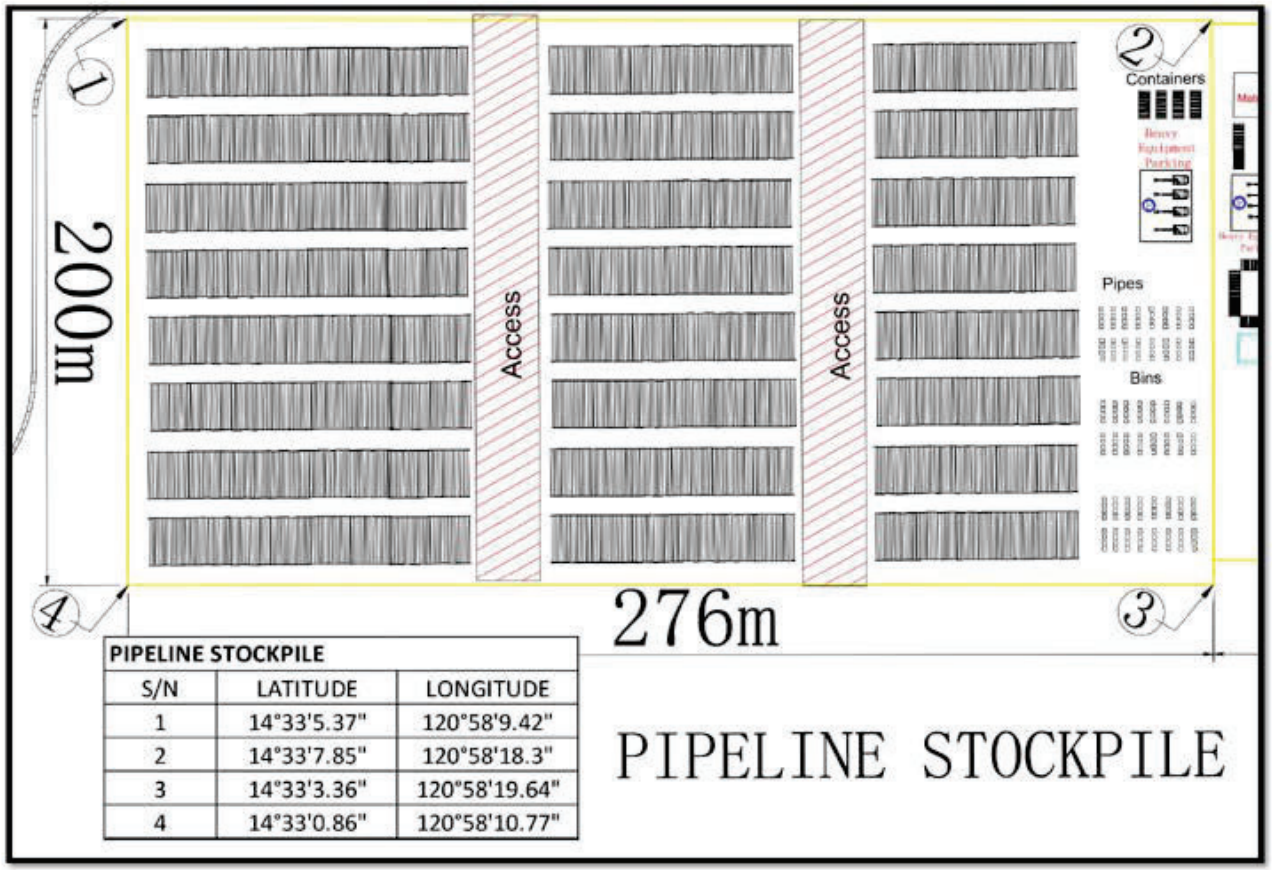
The decommissioning of the pipeline stockpile includes the removal of all the pipes and site clean-up activities.

2.4.3. TECHNICAL SPECIFICATIONS/ DESCRIPTIONS

The pipeline stockpile will be laid on sand with a boundary soft barricade such as cones or cycle wires.
The pipeline stockpile size is 200m x 276m, including an access road in between.

2.4.4. SCHEMATIC/ SITE PLAN

The schematic/ site plan, which includes the technical geographic coordinates of the pipeline stockpile, is shown in Figure 2.5. The pipeline stockpile is located north side of Island AB, below the precast yard.



PIPELINE STOCKPILE		
S/N	LATITUDE	LONGITUDE
1	14°33'5.37"	120°58'9.42"
2	14°33'7.85"	120°58'18.3"
3	14°33'3.36"	120°58'19.64"
4	14°33'0.86"	120°58'10.77"

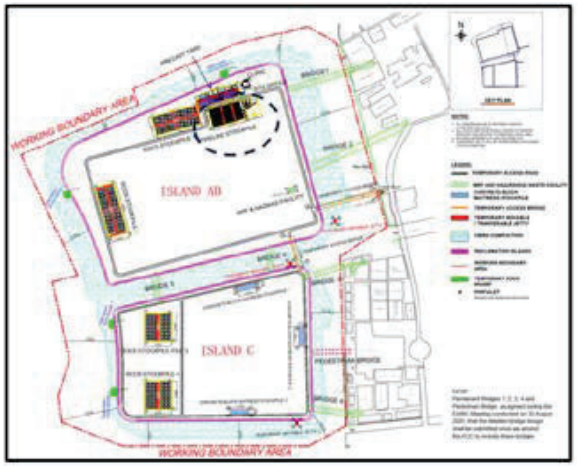


Figure 2.5 Pipeline Stockpile Schematic / Site Plan

2.4.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the pipeline stockpile is presented in Table 2.6.

Table 2.6 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	✓	✓	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust Use of truck cover during delivery
Mobilization of land-based equipment and vehicles	Road Accident	✓	✓	Separate pedestrian walkway (Personnel Entrance and Exit) and access for vehicles (Vehicle Entrance and Exit) Set up warning strips for isolation Main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher / linemen
Operation of engines of vehicles and machinery, whistles, horns, reversing alarms, intercom communication noise, workers' voices, etc. of machinery and	Increase in Noise and Vibration	✓	✓	Control the working hours and reduce unnecessary equipment movement at night Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs, and train and supervise personnel to use them correctly

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
vehicles in the site area				
Construction and Decommissioning Activities	Generation of Solid Waste	✓	✓	Proper housekeeping Implementation of waste management plan
Stockpiling	Presence of debris	✓	✓	Pipeline stockpiles should be limited and confined to their designated areas. Proper hauling and delivery.

2.5. MATERIAL RECOVERY FACILITY (MRF) AND HAZARDOUS WASTE FACILITY

2.5.1. PURPOSE

The Material Recovery Facility (MRF) will include segregation, recycling, reuse and storage of solid waste which include domestic and construction wastes.

The Hazardous Waste Facility will be used for temporary storage of hazardous waste for eventual disposal.

2.5.2. DESCRIPTION OF ACTIVITIES

A waste management system is already being practiced for the Project. The on-site waste management involves process and practices used to handle, segregate, and dispose of waste materials generated on site and wastes from the sea. The collected wastes are stored and segregated in a Materials Recovery Facility (MRF) until disposal by DENR-accredited waste service providers. The MRF is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes. The MRF also has a designated hazardous waste section consisting of 3 partially closed areas for liquid and solid hazardous wastes, as shown in Plate 2-1.

The project generates various hazardous wastes (Table 2.7) such as used oil and other oily wastes, among others. The facility is designed to provide open-air ventilation to the stored hazardous waste. Secondary containment, such as drip trays, is provided inside the hazardous waste storage area for liquid hazardous wastes. Spill kits, fire extinguishers, gloves, eye protection, and hazard signages are also provided. Permit-to-transport and Certificates of Treatment are also posted in the hazardous waste storage area. Notably, for pathological/infectious waste (M501), and pharmaceuticals and drugs (M503), there exists a service agreement between CHEC and M Diagnostics Philippines Inc. This agreement outlines the responsibility for the collection, treatment, and disposal of hazardous waste.

Third-party DENR-accredited waste Service Providers, such as Vertex and RMS, are contacted to collect the solid waste for disposal in a landfill. The dredging activity on Island A includes extracting previously installed PVD materials. These extracted PVDs are stored in a temporary stockpile for drying before disposal.

Table 2.7 List of Hazardous Waste

HW No.	HW Class	Remarks
I101	Used Waste Oil	Subcontracted by RMS and/or DENR accredited TSD Facility
I102	Cooking Oil	Subcontracted by RMS and/or DENR accredited TSD Facility
I104	Oil Contaminated Materials	Subcontracted by RMS and/or DENR accredited TSD Facility

HW No.	HW Class	Remarks
M506	E-waste (WEEE)	Subcontracted by RMS and/or DENR accredited TSD Facility
L402	Waste with specific non-halogenated toxic organic chemical	Subcontracted by RMS and/or DENR accredited TSD Facility
M501	Pathological or Infectious Waste	Service Agreement with M. Diagnostics Philippines Inc. Hospital and/or clinic for medical waste disposal
M503	Pharmaceuticals and Drugs	
E501	Oxidizing Agents	Subcontracted by RMS and/or DENR accredited TSD Facility
J201	Containers previously containing toxic chemical substances	Subcontracted by RMS and/or DENR accredited TSD Facility
F601	Solvent based	Subcontracted by RMS and/or DENR accredited TSD Facility
D406	Lead Compounds	Subcontracted by RMS and/or DENR accredited TSD Facility
G704	Non-halogenated organic solvents	Subcontracted by RMS and/or DENR accredited TSD Facility



Plate 2-1 Existing Materials Recovery Facility and Hazardous Waste Storage in the Original Island A

Most active works will be at sea. All types of waste except sewage (See Section 2.12) will be properly segregated and collected by an approved waste service provider. Waste bins were painted according to waste classification and strategically placed on its designated waste management area. The contractor has secured memorandum of agreement with DENR-Accredited Sanitary Landfills for the transport of residual waste coming from foreign vessels and has secured disposal agreement with a waste management corporation to handle transport and disposal of residual waste. The onshore and offshore existing waste management practice is shown in Plate 2-2.

Chemicals that will be used in the project implementation activities will have its own storage that is segregated and stored properly. Both the chemical and hazardous waste will have its own inventory. Regular Spill Kit inspection and inventory is also currently being implemented.

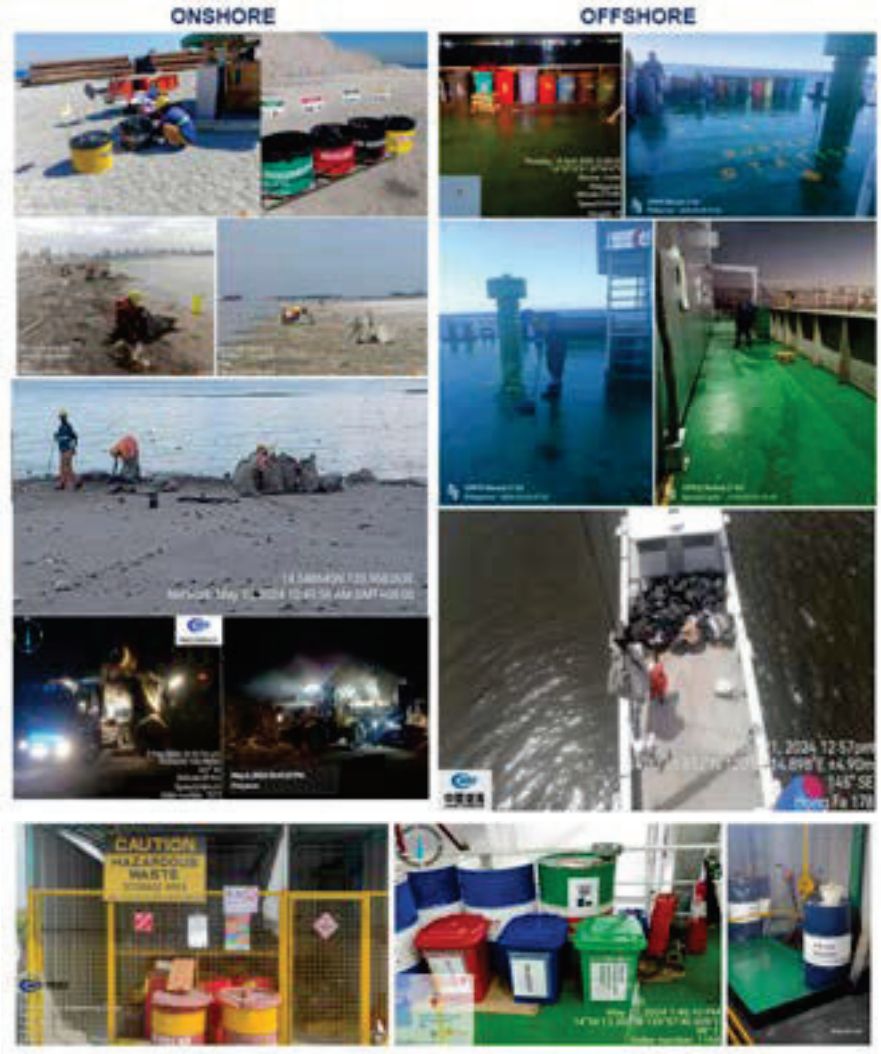


Plate 2-2 Onshore and Offshore Waste Management Practice

2.5.2.1. CONSTRUCTION

The MRF and Hazardous Waste Facility (HWF) include the transfer of the existing steel and galvanized iron (GI) (repurposed metal pipes) fabricated facilities from the original island A to the south east portion of Island AB (see location in Island AB, Figure 2.1).

2.5.2.2. DECOMMISSIONING

Decommissionin the MRF and the HWF will include the following:

- Site clean-up includes hauling of all residual solid and hazardous wastes through DENR accredited haulers.

- Dismantling construction equipment, such as screens, steel and galvanized iron sheets, roofing, makeshift materials, etc.

2.5.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

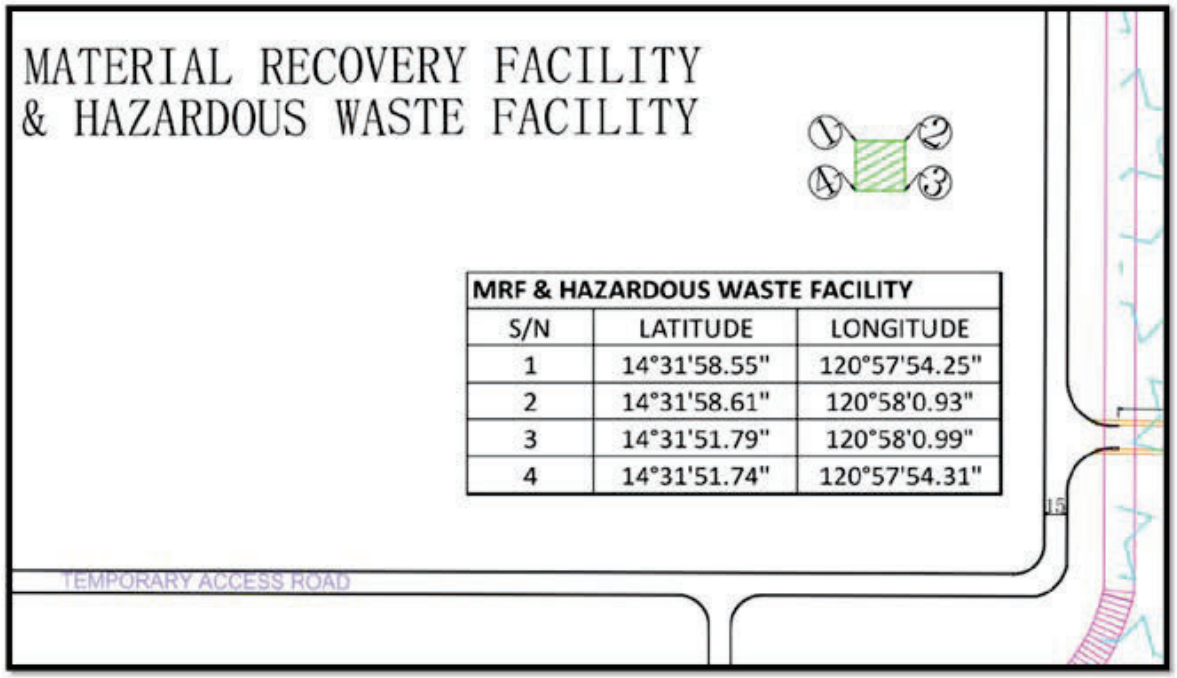
The made up of materials for the Material Recovery Facility (MRF) and Hazardous Waste Facility (4.10ft x 10.2ft x 9.8ft for HWF) are steel and galvanized iron (GI) Sheets.

The MRF and Hazardous Waste Facility lot size is approximately 41,892 sqm.

The MRF is a temporary facility made from repurposed metal pipes and is consists of 6 sections for recyclables, wood, metals, general waste, plastics, and paper/boxes. The MRF also has a designated hazardous waste section, consists of 3 partially closed areas for liquid and solid hazardous wastes.

2.5.4. SCHEMATIC/ SITE PLAN

The schematic / site plan including the technical geographic coordinates is shown in Figure 2.6.



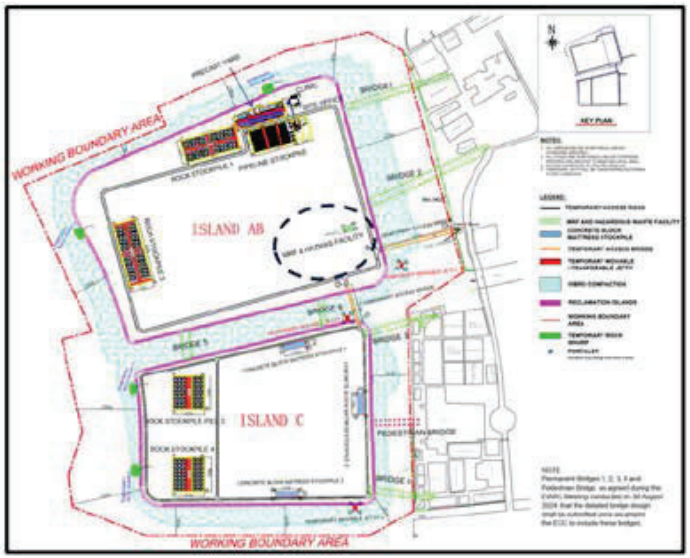


Figure 2.6 Location of Materials Recovery Facility and Hazardous Waste Storage

2.5.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the Materials Recovery Facility and Hazardous Waste Storage is presented in Table 2.8.

Table 2.8 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Transfer of the existing steel and galvanized iron (GI) (repurposed metal pipes) fabricated facilities from the original island A to the south east portion of Island AB	Generation of Solid Waste Soil contamination	✓	x	Proper housekeeping and hauling of solid waste. Provision of secondary containment and/or containment bund wall with 110% capacity by volume.
Dismantling the construction equipment such as screen, steel and galvanized iron sheets, roofings, make shift materials		x	✓	
Transport and mobilization	Road accident	✓	✓	Observe vehicle speed limit. No overloading. Keep linemen at its post to observe and give signal to moving vehicles

2.6. CONCRETE BLOCK MATTRESS (CBM) STOCKPILE

2.6.1. PURPOSE

The concrete block mattress stockpile will be used for storing of Concrete Block Mattresses (CBM). This CBM will be used for for channel revetments for slope protection.

2.6.2. DESCRIPTION OF ACTIVITIES

2.6.2.1. CONSTRUCTION

The construction activities for the establishment of CMB stockpile include cleaning and clearing the designated area for stockpiles.

2.6.2.2. DECOMMISSIONING

Site clean-up include removal or transfer of all CBM and clearing the site.

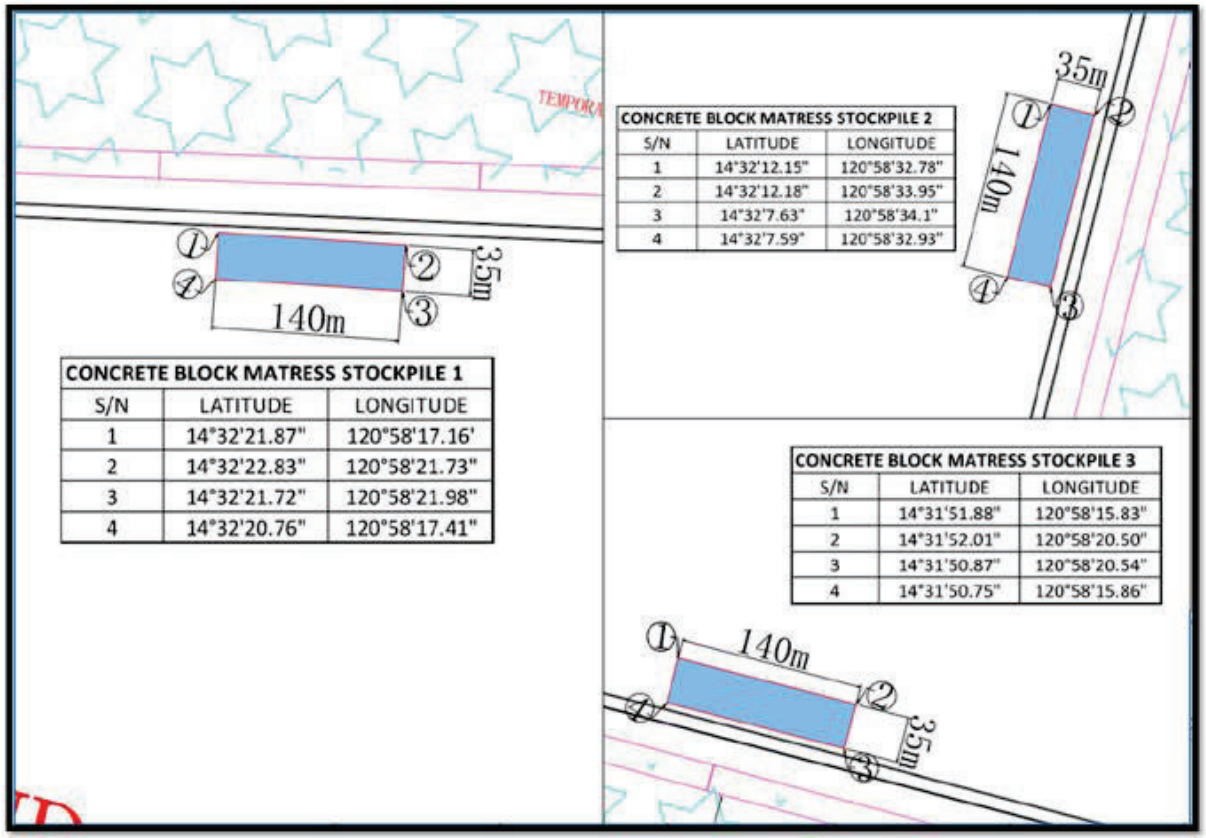
2.6.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

The concrete block mattress stockpile will be laid on sand with a boundary soft barricade. There will be three (3) CBM as follows:

- CBM 1 is located at north side of Island C. The lot dimension is 35x140m.
- CBM 2 is located at east side of Island C. The lot dimension is 35x140m.
- CBM 3 is located at south side of Island C. The lot dimension is 35x140m.

2.6.4. SCHEMATIC/ SITE PLAN

The schematic / site plan including the technical geographic coordinates is shown in Figure 2.7.



CONCRETE BLOCK MATRESS STOCKPILE 1

S/N	LATITUDE	LONGITUDE
1	14°32'21.87"	120°58'17.16'
2	14°32'22.83"	120°58'21.73"
3	14°32'21.72"	120°58'21.98"
4	14°32'20.76"	120°58'17.41"

CONCRETE BLOCK MATRESS STOCKPILE 2

S/N	LATITUDE	LONGITUDE
1	14°32'12.15"	120°58'32.78"
2	14°32'12.18"	120°58'33.95"
3	14°32'7.63"	120°58'34.1"
4	14°32'7.59"	120°58'32.93"

CONCRETE BLOCK MATRESS STOCKPILE 3

S/N	LATITUDE	LONGITUDE
1	14°31'51.88"	120°58'15.83"
2	14°31'52.01"	120°58'20.50"
3	14°31'50.87"	120°58'20.54"
4	14°31'50.75"	120°58'15.86"

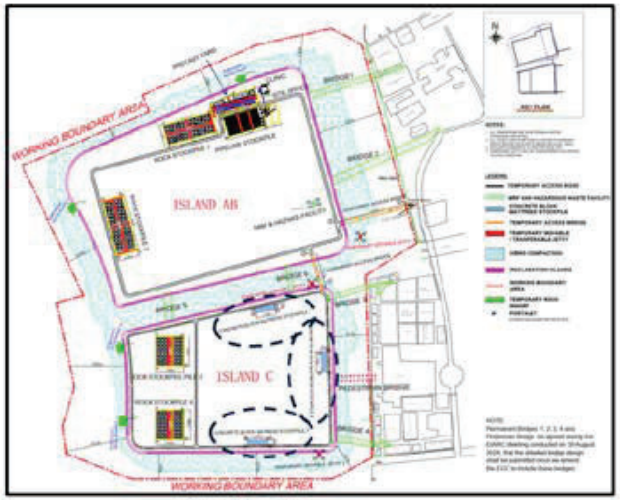


Figure 2.7 Concrete Block Mattress Schematic / Site Plan

2.6.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the concrete block mattress is presented in Table 2.9.

Table 2.9 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Cleaning and clearing the designated area for stockpiles.	Generation of solid waste - debris	✓	x	Proper housekeeping and hauling of solid waste.
Removal or transfer of all CBM		x	✓	
Transport and mobilization	Road accident	✓	✓	Observe vehicle speed limit. No overloading. Keep linemen at its post to observe and give signal to moving vehicles

2.7. CLINIC

2.7.1. PURPOSE

The site clinic allows the on-site nurse or doctor to administer the necessary first aid for the immediate treatment of injuries.

The site clinic (Plate 2-3) is dedicated to provide accessible medical care for all staffs working on site and for visitors. The site clinic offers a comprehensive range of health services, from routine medical surveillance and providing immediate medical attention and care to various health concerns. It includes basic medicines/ kit for first aid treatment purposes, body pain and bowel problems.



Plate 2-3 Existing Site Clinic in the Project Site

2.7.2. DESCRIPTION OF ACTIVITIES

2.7.2.1. CONSTRUCTION

The installation of the clinic involves clearing the site and transfer/placement of containers in the designated area.

2.7.2.2. DECOMMISSIONING

The decommissioning activity for the on-site clinic includes site clean-up, waste disposal, and the removal of containers (prefab cabins).

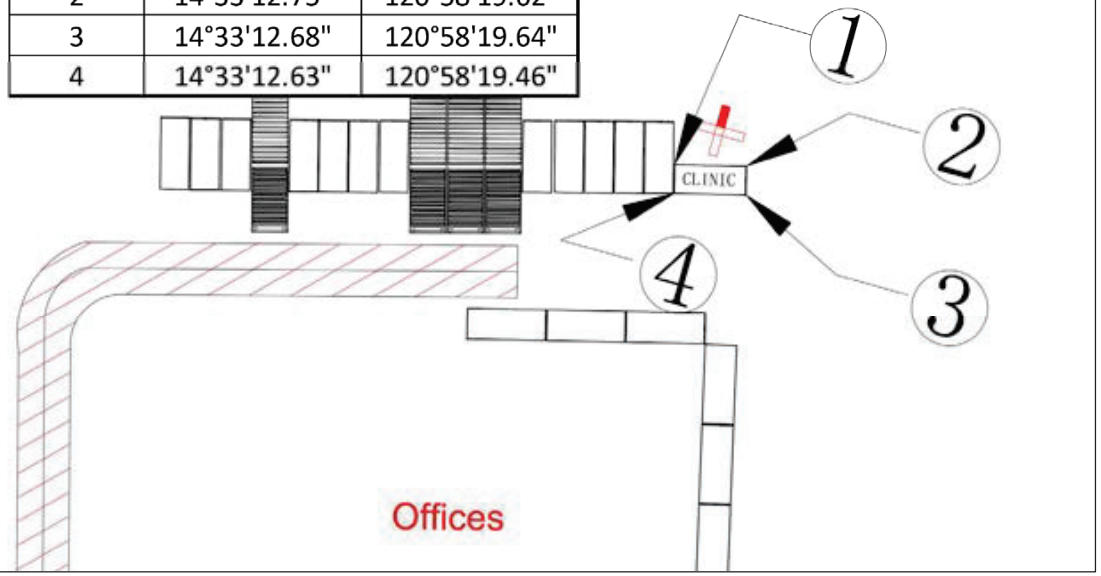
2.7.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

The site clinic is made up of steel Insulated cabin with aircon. The site clinic is approximately 12.51 sqm. Beside the clinic is a parking space for the ambulance (1), and an emergency pick-up vehicle,

2.7.4. SCHEMATIC/ SITE PLAN

The site clinic schematic / site plan including the geographic coordinates are shown in Figure 2.8. The site clinic is located at the upper right of north side of Island AB which is also at the right side of precast yard.

CLINIC		
S/N	LATITUDE	LONGITUDE
1	14°33'12.70"	120°58'19.44"
2	14°33'12.75"	120°58'19.62"
3	14°33'12.68"	120°58'19.64"
4	14°33'12.63"	120°58'19.46"



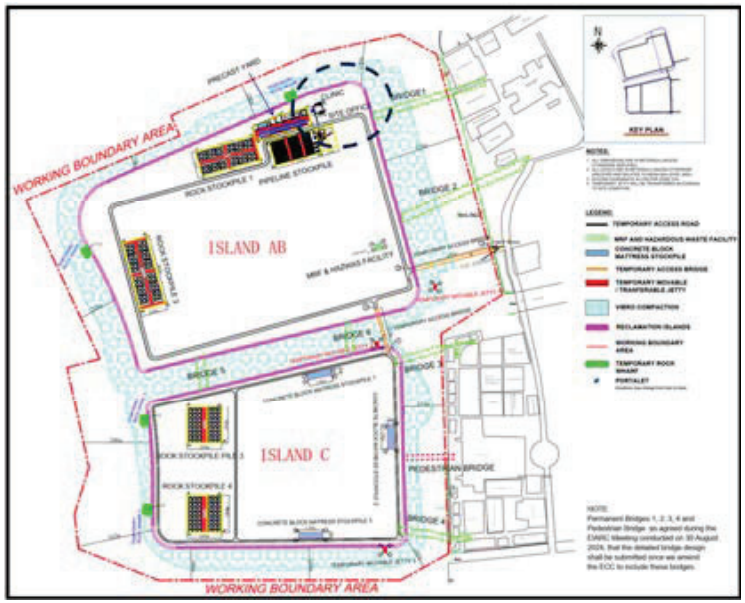


Figure 2.8 Clinic Schematic / Site Plan

2.7.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the Clinic is presented in Table 2.10.

Table 2.10 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Transfer / placement of clinic containers on the designated area	Road Safety	✓	✓	Observe vehicle speed limit. No overloading. Assigning of watcher / linemen
	Generation of solid and hazardous waste	✓	✓	Proper housekeeping and hauling of solid waste.
Site-clean up during decommissioning		X	✓	Hauling of pathological/infectious waste (M501) and pharmaceuticals and drugs (M503) will be hauled by DENR accredited hauler.

2.8. MOVABLE TRANSFERABLE JETTY

2.8.1. PURPOSE

The movable transferable jetty will facilitate the movement of staff and workers using water vessels around the reclamation areas.

2.8.2. DESCRIPTION OF ACTIVITIES

2.8.2.1. CONSTRUCTION

The construction of the movable transferable jetty will include:

- Excavation and preparation of the designated area
- Fabrication of jetty and installation (such as pontoon installation, deck installation, fender and guardrail Installation) near the shore

2.8.2.2. DECOMMISSIONING

The decommissioning of movable temporary jetty will include:

- Dismantling of the Jetty Connection
- Use of excavator to pull out the Pontoon to land.
- Utilizing Land Based Equipment (LBE) to transfer pontoon to designated area/storage for future use.

2.8.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

The movable transferable jetty (up to 45 ton load capacity) is made up of steel pipe, plate, chain, floating tank and rubber tires. The specification of the jetty is shown in Figure 2.9.

There are two types of jetty (Plate 2-4) that will be utilized for the Project, and these are the jetty steel type and jetty pontoon type which is made of High-Density Polyethylene (HDPE) hollow cylinder.



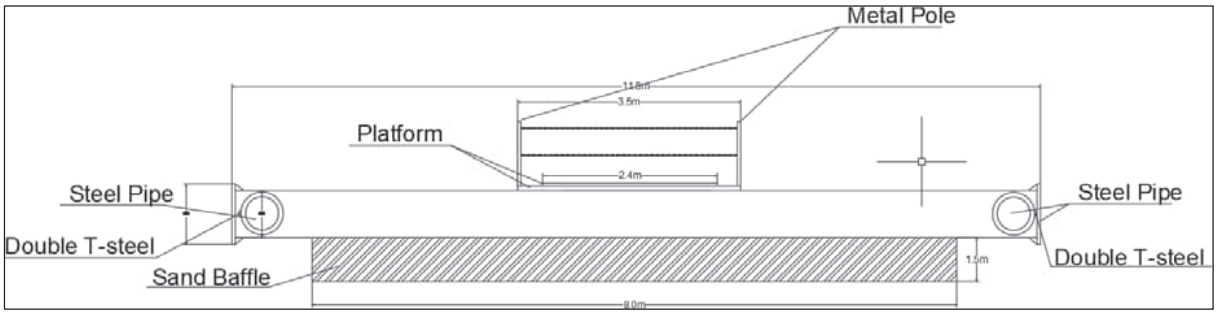
Plate 2-4 Jetty Steel Type (Left) and Jetty Pontoon Type (Right)

2.8.4. SCHEMATIC/ SITE PLAN

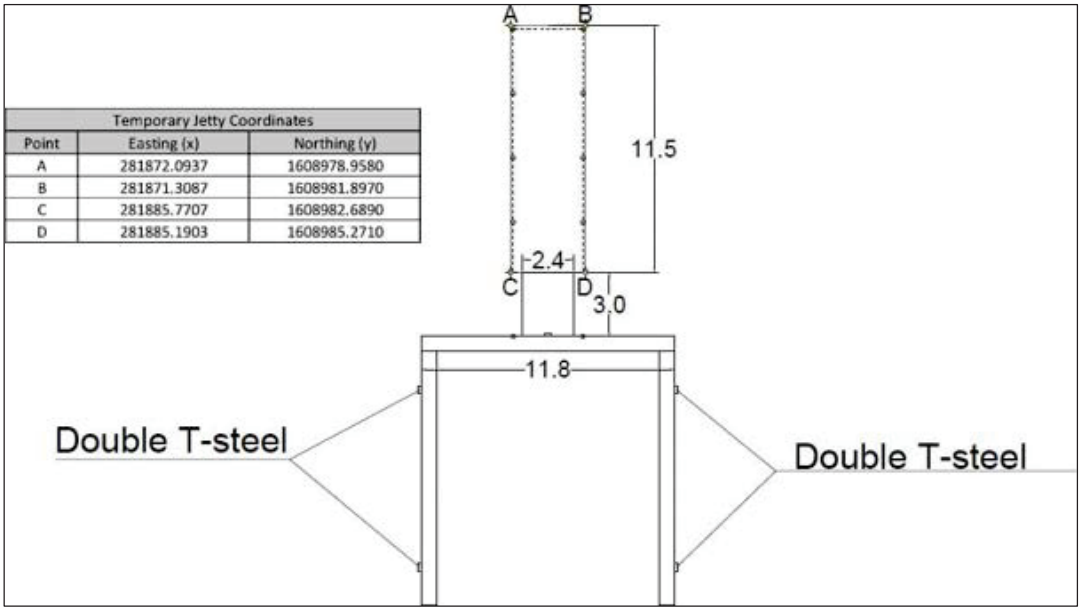
The location of the jetty are as follows:

- Jetty 1 is on the southern side of Island AB.
- Jetty 2 is at the northeastern part of Island C.
- Jetty 3 is at the southeastern part of Island C.

The movable transferable jetty front and side elevation and vertical view is shown in Figure 2.9 while the schematic / site plan including technical geographic coordinates is shown in Figure 2.10. The jetty location, however, is not fixed and can be moved around the reclamation site.

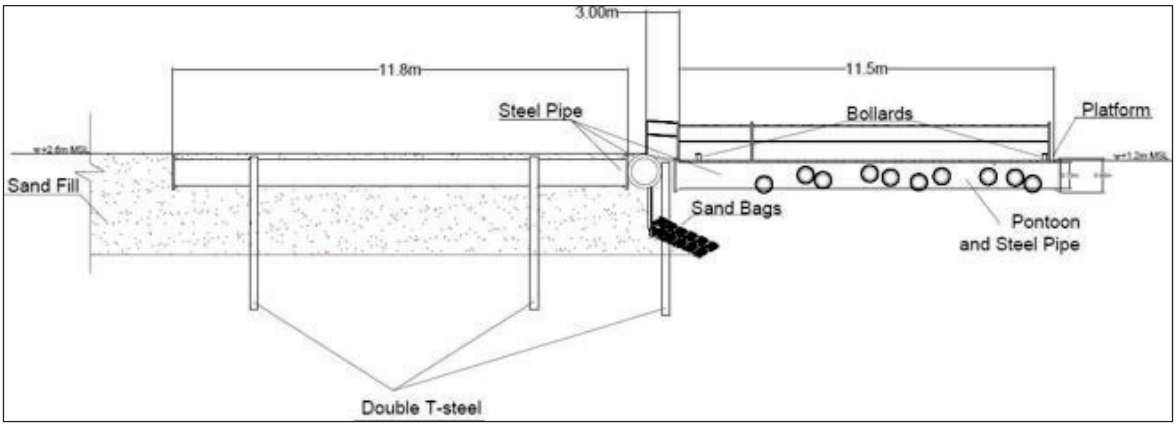


Front elevation - Temporary Jetty Steel Type



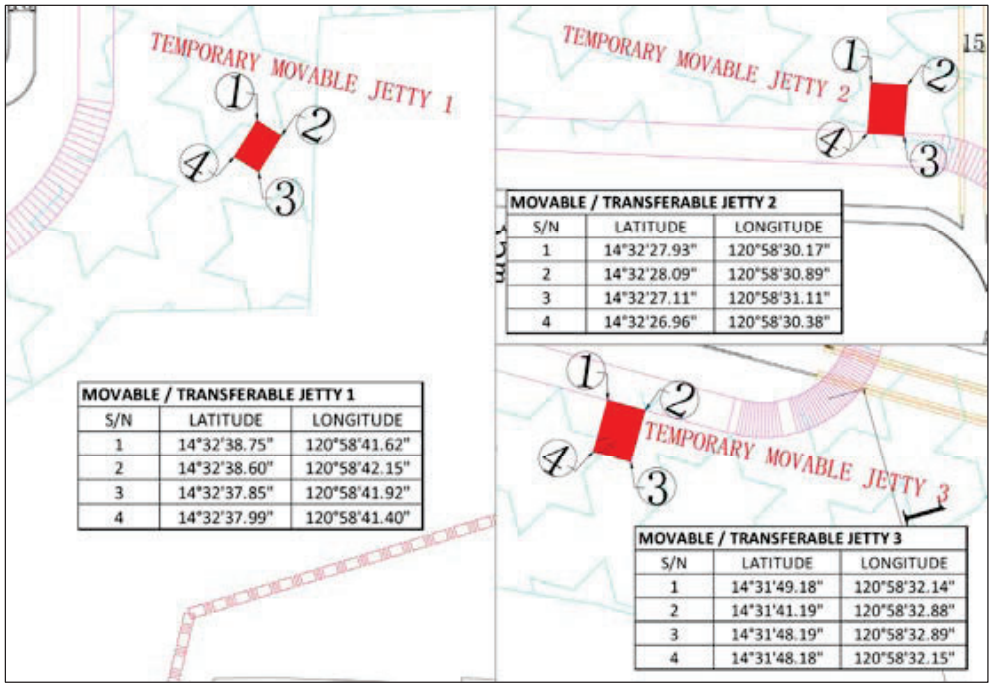
Temporary Jetty Coordinates		
Point	Easting (x)	Northing (y)
A	281872.0937	1608978.9580
B	281871.3087	1608981.8970
C	281885.7707	1608982.6890
D	281885.1903	1608985.2710

Vertical (Top) View – Temporary Jetty Steel Type



Side Elevation – Temporary Jetty Steel Type

Figure 2.9 Movable Transferable Jetty front, Vertical and Side View and Elevation



MOVABLE / TRANSFERABLE JETTY 1

S/N	LATITUDE	LONGITUDE
1	14°32'38.75"	120°58'41.62"
2	14°32'38.60"	120°58'42.15"
3	14°32'37.85"	120°58'41.92"
4	14°32'37.99"	120°58'41.40"

MOVABLE / TRANSFERABLE JETTY 2

S/N	LATITUDE	LONGITUDE
1	14°32'27.93"	120°58'30.17"
2	14°32'28.09"	120°58'30.89"
3	14°32'27.11"	120°58'31.11"
4	14°32'26.96"	120°58'30.38"

MOVABLE / TRANSFERABLE JETTY 3

S/N	LATITUDE	LONGITUDE
1	14°31'49.18"	120°58'32.14"
2	14°31'41.19"	120°58'32.88"
3	14°31'48.19"	120°58'32.89"
4	14°31'48.18"	120°58'32.15"

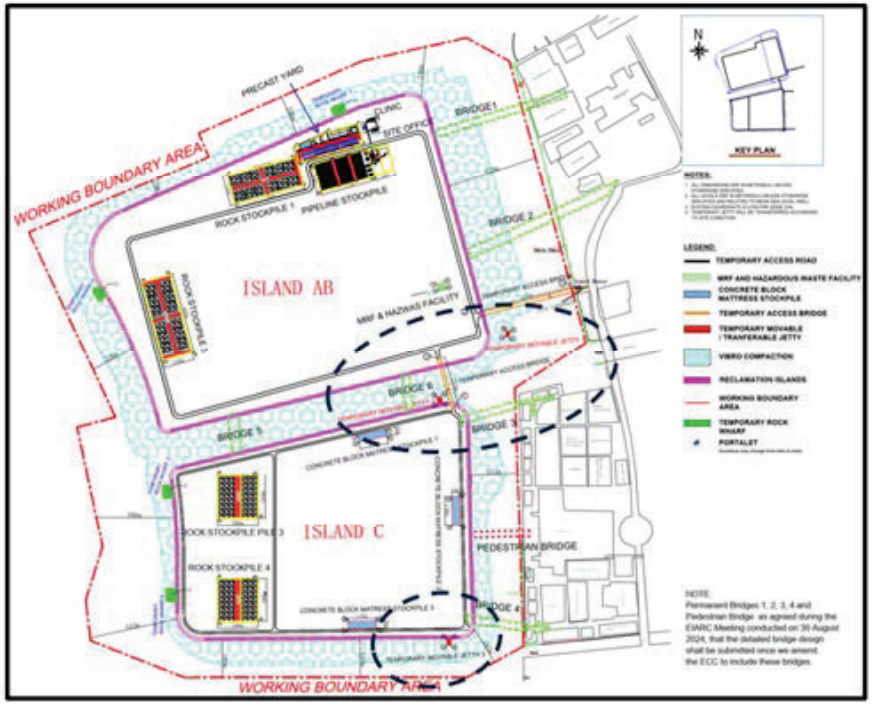


Figure 2.10 Movable Transferable Jetty Schematic / Site Plan

2.8.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the movable transferable jetty is presented in Table 2.3.

Table 2.11 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Installation and use of temporary movable jetty Dismantling of temporary jetty	Contamination of water and soil due to rustling of steel	✓	✓	Proper maintenance of movable transferable jetty
Steel works	Threat to Health and Safety	✓	✓	Proper PPE of construction workers
Transfer of temporary movable jetty	Degradation of water quality / turbidity	✓	✓	Control of speed limit especially near the sand filling activities.
Moving around / vessel transport	Threat to Health and Safety	✓	✓	Wearing of PPE particularly life-vest Avoid and stop transport during inclement weather.
Moving around / vessel transport	Vessel Collision	✓	✓	Compliance with MARINA, PCG and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan

2.9. TEMPORARY ROCK WHARF

2.9.1. PURPOSE

The temporary rock wharf will be used for docking and access of Landing-Craft Tank (LCT) Barges. It will also be used for rock deliveries to facilitate the offloading of rocks from barges or ships. It will be built at strategic locations at the reclamation site to support marine-based logistics, ensuring efficient delivery of rocks intended for revetments.

2.9.2. DESCRIPTION OF ACTIVITIES

2.9.2.1. CONSTRUCTION

The construction activities for the installation of temporary rock wharf are as follows:

- Laying of smaller rocks or gravel to create a stable base
- Laying of geotextile to prevent soil erosion
- Installation of bigger rocks on the center and boulders on outer edge
- Backfilling and compaction
- Installation of precast mooring, barricades and safety signages

2.9.2.2. DECOMMISSIONING

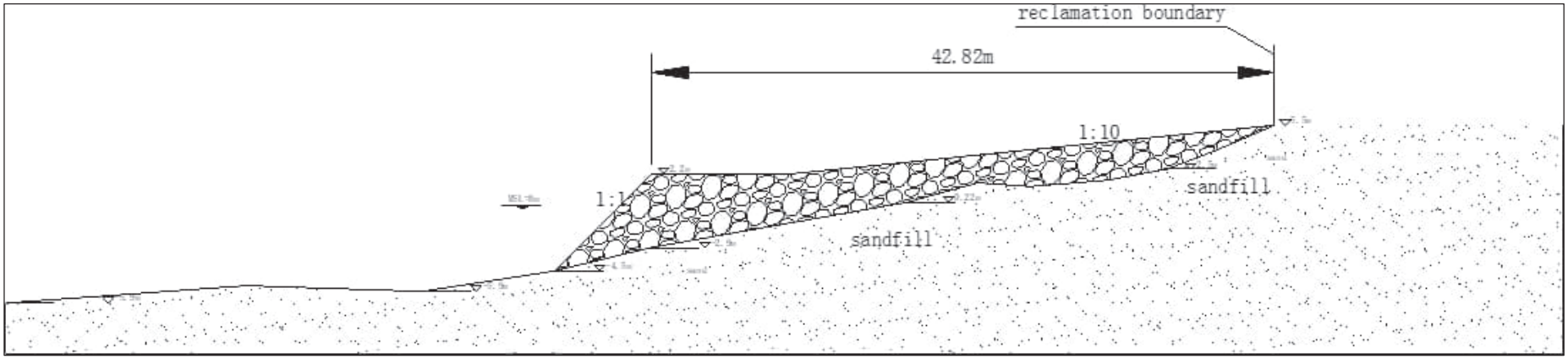
The decommissioning of the temporary rock wharf will include excavation and removal of rocks, barricades, and site clean-up.

2.9.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

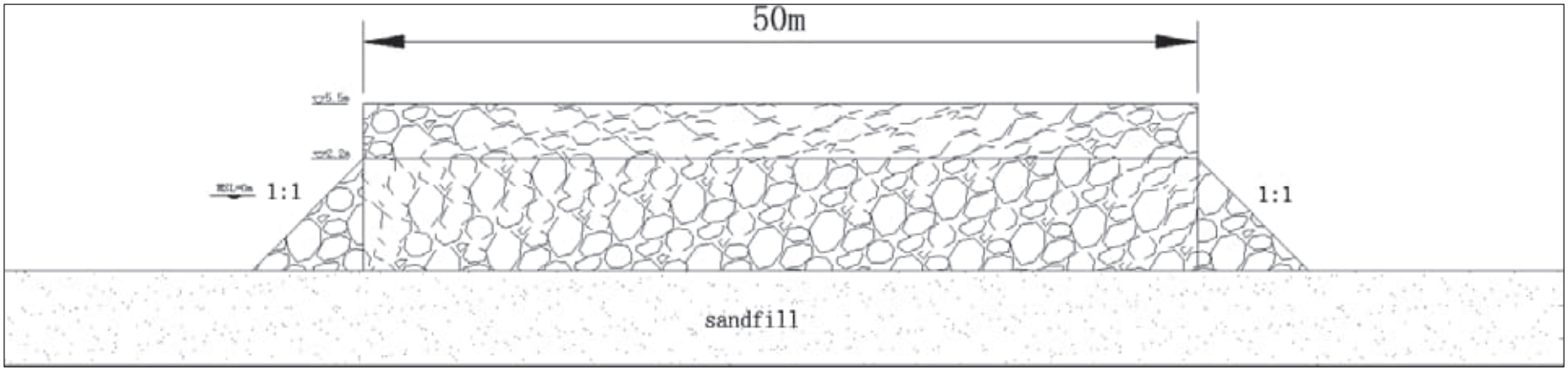
The temporary rock wharf will be constructed from boulders and rock with precast mooring. There are four (4) sites where the temporary rock wharf will be located. The rock wharf dimensions are shown in Figure 2.11.

2.9.4. SCHEMATIC/ SITE PLAN

The schematic / site plans with technical geographic coordinates are shown in Figure 2.11 and Figure 2.12.

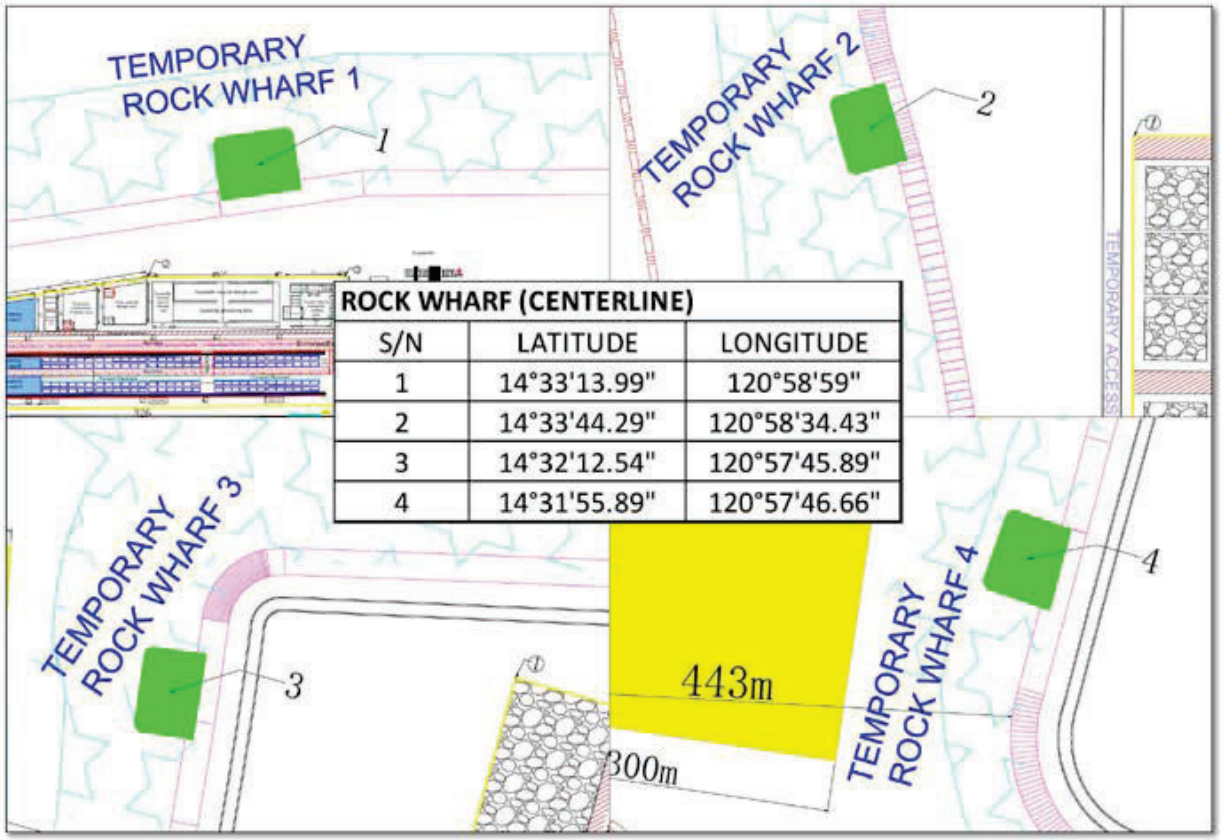


Cross-section of Wharf (AA')



Cross-section of Wharf (BB')

Figure 2.11 Rock Wharf Cross Section View



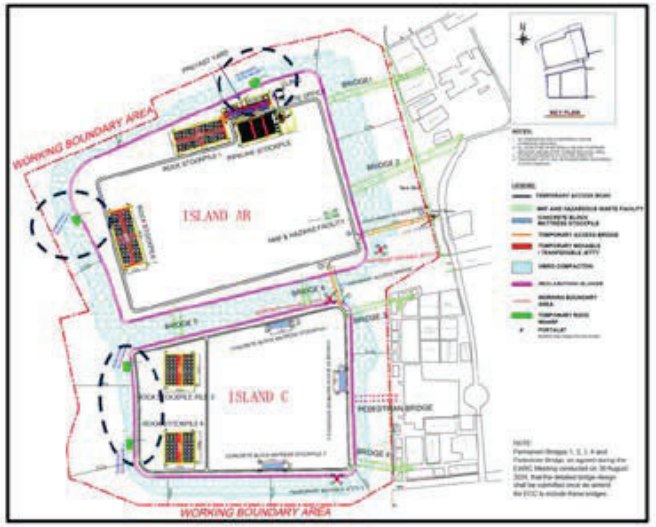


Figure 2.12 Rock Wharf Schematic / Site Plan

2.9.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the rock wharf are presented in Table 2.12.

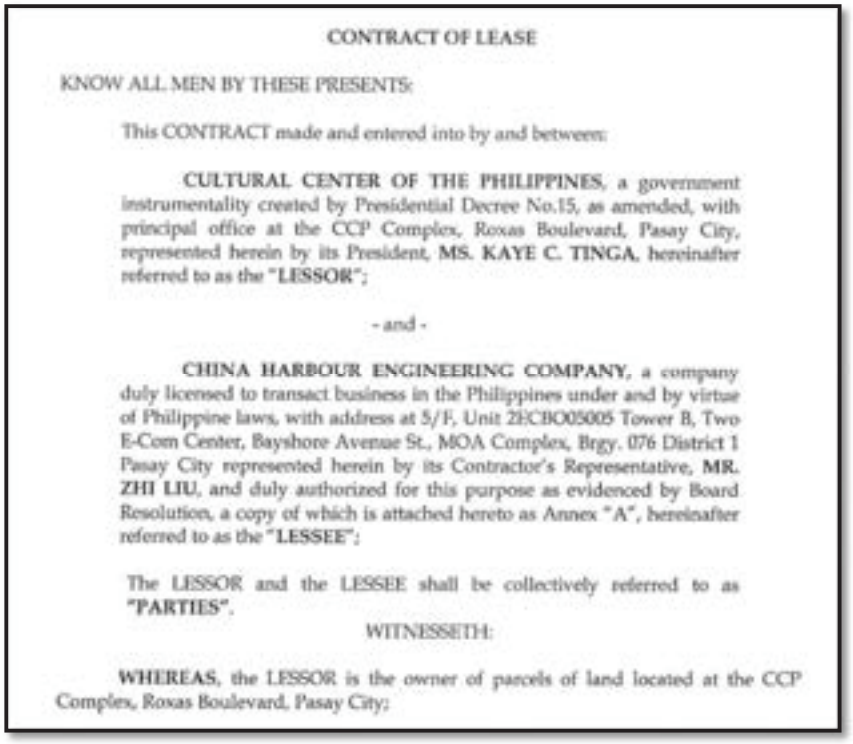
Table 2.12 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Laying of smaller rocks or gravel to create a stable base Laying of geotextile to prevent soil erosion Installation of bigger rocks on the center and boulders on outer edge Backfilling and compaction Installation of precast mooring, barricades and safety signages	Degradation of water quality / turbidity	✓	x	Proper handling of rocks and gravel Control of speed limit especially near the sand filling activities. Implementation of Turbidity Management Plan
Moving around / vessel transport	Threat to Health and Safety	✓	✓	Wearing of PPE particularly life-vest Avoid and stop transport during inclement weather.
Moving around / vessel transport	Vessel Collision	✓	✓	Compliance with MARINA, PCG and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan
Mobilisation and Transport of vehicles and vessels	Potential oil spill leaks	✓	✓	Regular inspection and maintenance of machineries, vehicles, vessels and equipment to avoid oil leaks/ spills. Implementation of Oil Spill Contingency Plan.

2.10. TEMPORARY ACCESS BRIDGE BETWEEN THE MAINLAND AND ISLAND AB

Proof of Authority Over the Temporary Access Road

The proof of authority over the temporary access road, which is located in Barangay 76, is through the contract of lease between the Cultural Center of the Philippines (CCP) and China Harbour Engineering Company (CHEC) as shown in Figure 2.13. The CHEC is the main contractor of SM Smart City Infrastructure and Development Corporation which is the Joint Venture partner of Pasay City. The landing points in the CCP Complex are shown in Figure 2.17. This temporary access road will be connected to the DPWH area which leads towards Diokno Boulevard as shown in Figure 2.17. The DPWH issued a No Objection Letter (Figure 2.14 or Annex C) for the use of the DPWH area for the access road. Annex C also includes a Letter from CHEC dated 31 August 2022, the Main Contractor for this Project, with regard to the request for non-objection to construct and maintain a temporary access ramp/road which was granted by DPWH in its Letter of No Objection dated 8 September 2022.



CONTRACT OF LEASE

KNOW ALL MEN BY THESE PRESENTS:

This CONTRACT made and entered into by and between:

CULTURAL CENTER OF THE PHILIPPINES, a government instrumentality created by Presidential Decree No.15, as amended, with principal office at the CCP Complex, Roxas Boulevard, Pasay City, represented herein by its President, **MS. KAYE C. TINGA**, hereinafter referred to as the "**LESSOR**";

- and -

CHINA HARBOUR ENGINEERING COMPANY, a company duly licensed to transact business in the Philippines under and by virtue of Philippine laws, with address at 5/F, Unit 2ECBO05005 Tower B, Two E-Com Center, Bayshore Avenue St., MOA Complex, Brgy. 076 District 1 Pasay City represented herein by its Contractor's Representative, **MR. ZHI LIU**, and duly authorized for this purpose as evidenced by Board Resolution, a copy of which is attached hereto as Annex "A", hereinafter referred to as the "**LESSEE**";

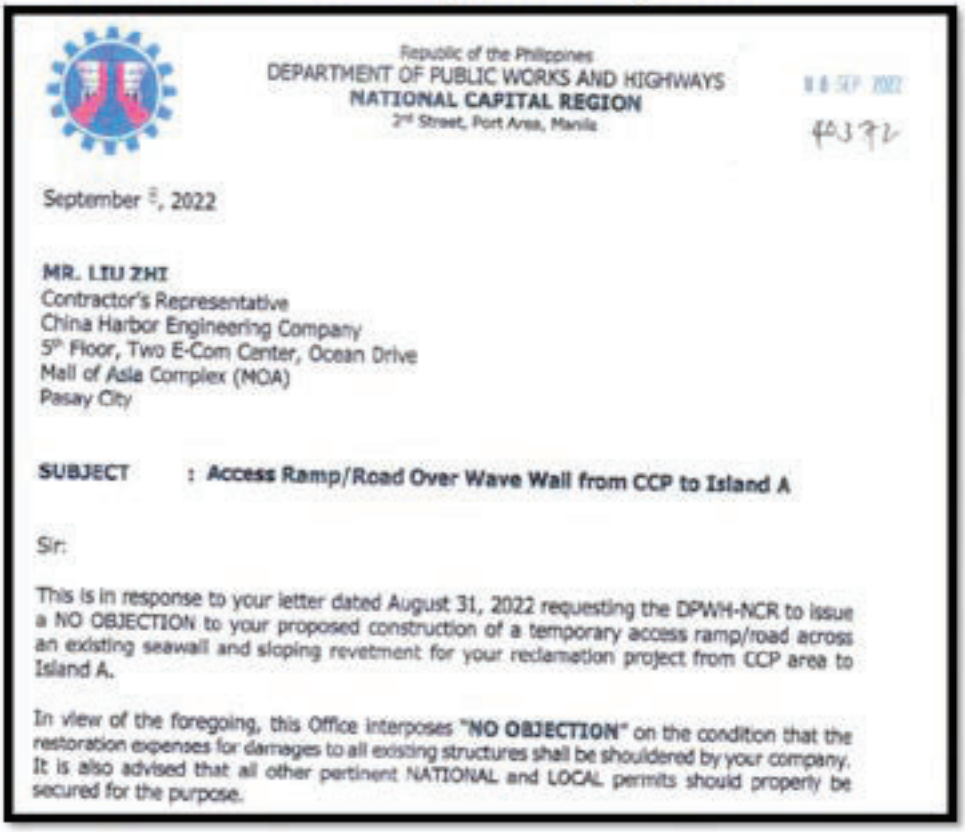
The LESSOR and the LESSEE shall be collectively referred to as "**PARTIES**".

WITNESSETH:

WHEREAS, the LESSOR is the owner of parcels of land located at the CCP Complex, Roxas Boulevard, Pasay City;

Note: Can be found in Annex C

Figure 2.13 Contract of Lease



Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
NATIONAL CAPITAL REGION
2nd Street, Port Area, Manila

8 SEP 2022

40372

September 8, 2022

MR. LIU ZHI
Contractor's Representative
China Harbor Engineering Company
5th Floor, Two E-Com Center, Ocean Drive
Mall of Asia Complex (MOA)
Pasay City

SUBJECT : Access Ramp/Road Over Wave Wall from CCP to Island A

Sir:

This is in response to your letter dated August 31, 2022 requesting the DPWH-NCR to issue a NO OBJECTION to your proposed construction of a temporary access ramp/road across an existing seawall and sloping revetment for your reclamation project from CCP area to Island A.

In view of the foregoing, this Office interposes **"NO OBJECTION"** on the condition that the restoration expenses for damages to all existing structures shall be shouldered by your company. It is also advised that all other pertinent NATIONAL and LOCAL permits should properly be secured for the purpose.

Note: Can be found in Annex C

Figure 2.14 DPWH Letter of No Objection

2.10.1. PURPOSE

This temporary bridge between the mainland and island AB will be used for the access of vehicles, equipment, material and personnel during the reclamation and horizontal development. The assigned contractor is responsible for creating this temporary bridge from the mainland to Island AB to enable the smooth passage of personnel, vehicles, and materials across the channel during the construction phase from Island AB to the mainland up to the access road through Diokno Boulevard.

2.10.2. DESCRIPTION OF ACTIVITIES

2.10.2.1. CONSTRUCTION

The construction of this temporary bridge includes:

- Site Preparation
- Surcharge Elevation Adjustment
- Steel Sheet Piles (SSP) Installation
- Bailey Bridge Installation
- Slope Formation
- Geotextile Installation
- Installation of Rock Layers
- Concrete cap and Concrete Pavement

This will also involve:

- Land based excavation to modify the surcharge elevation and achieve a desired level of +4.0 meters MLLW.
- Excavate to a depth of -0.5m MSL in preparation for the installation of drainage.
- Construction of five (5) 10m-wide openings made of Steel Sheet pile (SSP) Type IV and Bailey Bridge to strategically allow the continuous and unobstructed flow of water in the area. These openings will be supported by steel sheet piles driven to retain the sand on both sides of the openings, and steel (bailey) bridges will be constructed over the openings to allow full access.
- Establishing a 1:3 side slope design for the access road to achieve an optimal design that prioritizes stability and safety.
- Installation of geotextiles and placement of sandbags along the slope to prevent erosion and improve the overall stability of the slope.
- After compaction on the road access, installation of aggregates with a thickness of 0.4 meters.

2.10.2.2. DECOMMISSIONING

The decommissioning activities include:

- Demolition of concrete pavement
- Removal of slope formation and protection
- Removal of sand fill and SSP
- Site clearing and clean-up activities

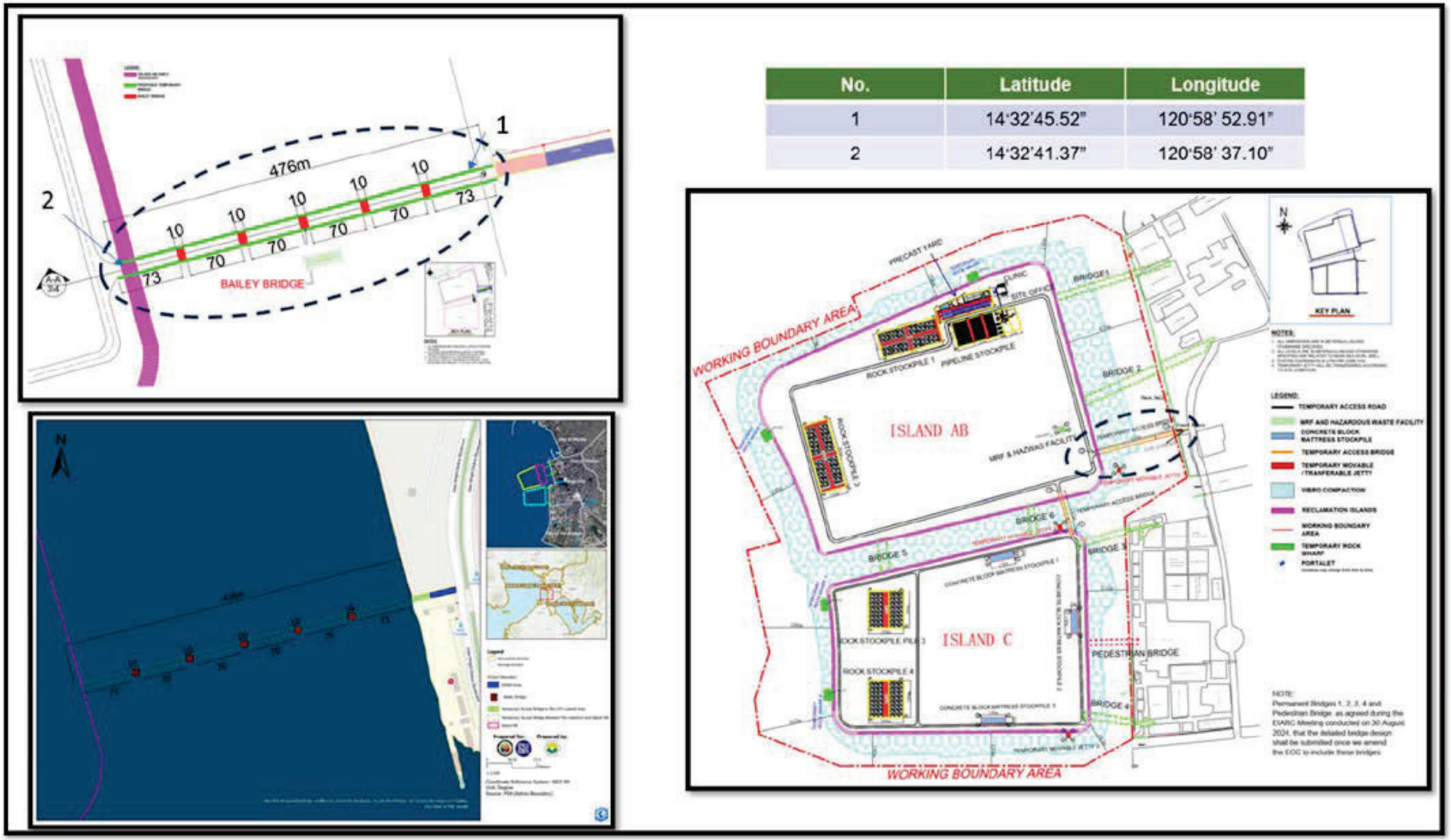
2.10.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

This temporary bridge will be constructed through sand filling with concrete pavement as carriageway and slope protection (rocks and geotextile). The length is approximately L= ±476m. It has width of 9 meters and a 20 kilopascal (kpa) design load capacity. The concept-level design will progress further until the detailed design is completed.

This temporary bridge will be connected to the CCP Leased Area (L: 26.96, W: 8m) and DPWH Area (L: 35.94m, W: 8m). The total length of the temporary access road (CCP Leased Area and DPWH area) is 62.9 m as shown in Figure 2.17.

2.10.4. SCHEMATIC/ SITE PLAN

The schematic / site plan including the geographic coordinates is shown in Figure 2.15 and Figure 2.16. The landing points in the CCP Complex is shown in Figure 2.17. This also include the connection of the CCP Leased area to DPWH Area and Diokno Boulevard.



No.	Latitude	Longitude
1	14°32'45.52"	120°58' 52.91"
2	14°32'41.37"	120°58' 37.10"

Figure 2.15 Temporary Access Bridge Between the mainland and Island AB (L: 476m between the mainland and Island AB & L: ±255m between Island AB and C) Schematic / Site Plan

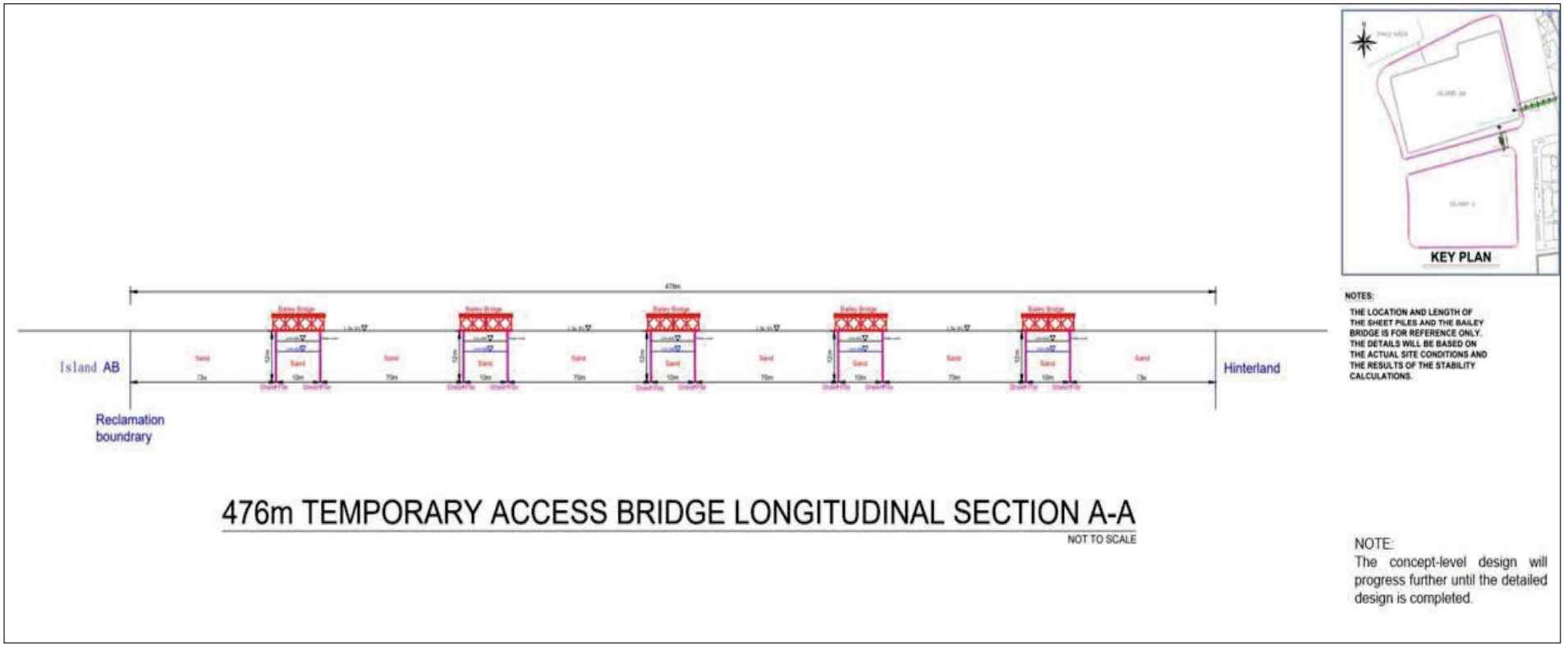


Figure 2.16 Temporary Access Bridge Between the mainland and Island AB Longitudinal Section A-A (L: 476m between the mainland and Island AB) Concept-level Design

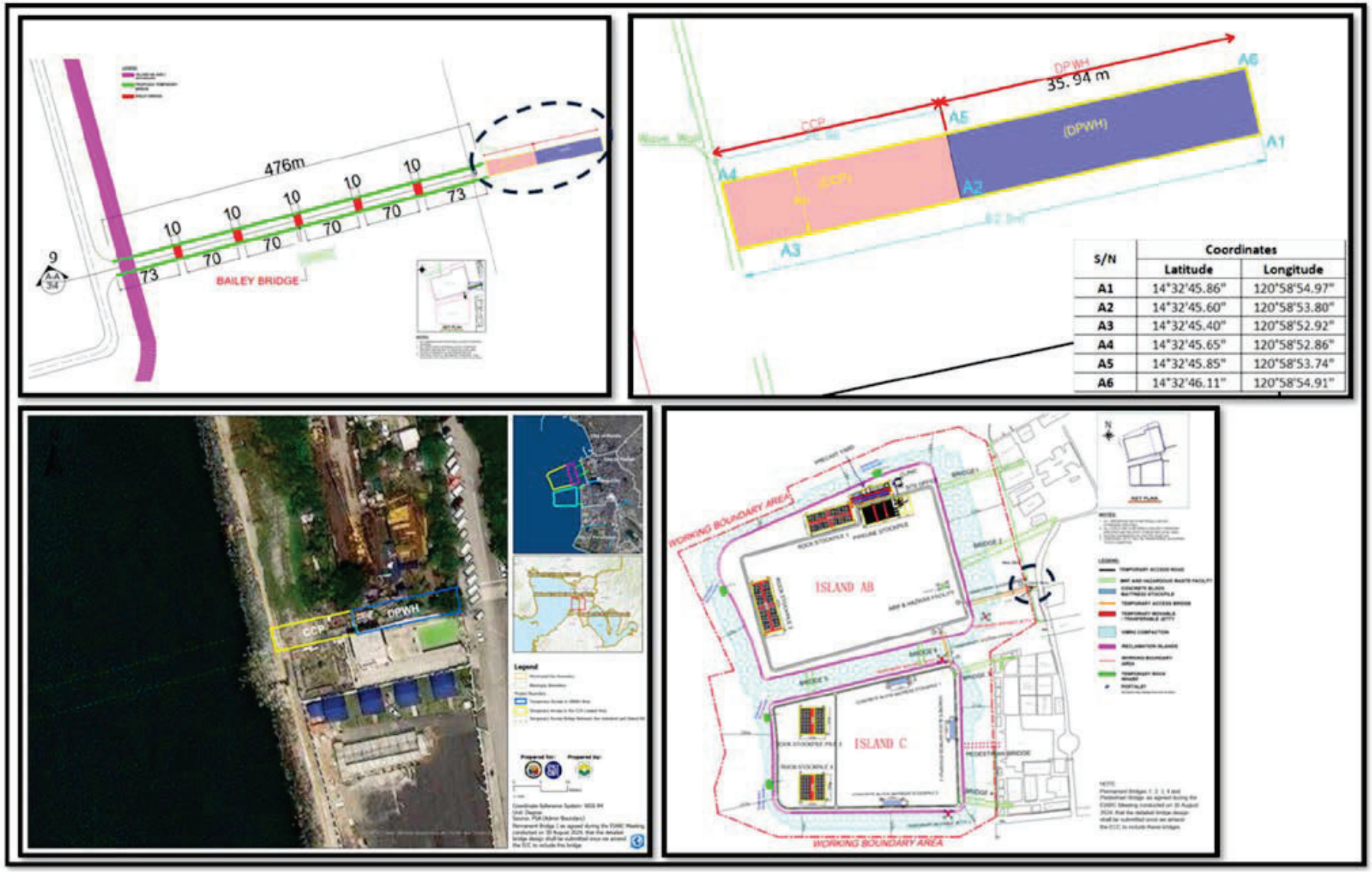


Figure 2.17 Temporary Access in the CCP Leased Area and DPWH Area Site Layout

2.10.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

Verification Of Flushing Time for Temporary Access Bridges Through Flushing Study

A separate flushing study (which can be found in Annex D) was conducted to verify the impact of the proposed temporary access bridges on water circulation during the construction phase. The following are the temporary access bridges considered:

1) The 476m wide temporary access bridge in the north-south (N-S) channel connecting island AB with the hinterland; and
2) The 180m wide temporary access bridge in the east-west (E-W) channel connecting islands AB and C.

A. Key findings/ conclusion:

- During the rainy season, water moves quickly through the N-S and E-W channels, clearing out in less than 4 days. This means the temporary access bridges do not hinder the water flow.
- In the dry season, water in the larger N-S channel moves at an acceptable rate, fully refreshing in 10 days. The E-W channel takes slightly longer at 11 days. However, it should be noted that the E-W channel will be situated far from the existing land, and no developments have yet been constructed on the islands. Temporary water quality issues in that channel would not cause hindrance, and can easily be mitigated through constant monitoring and cleaning of the water channel, in case of excessive algal bloom.
- Considering that this is only a temporary condition during a construction stage of approximately 18 months, we can conclude that the proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-S channel (476m wide), still allow an adequate water exchange in between the islands.

B. Comparative Summary of Results of Flushing Studies

Table 2.13 Comparative Summary of Results of Flushing Study

Project activities	Layout	Flushing Time	Remarks
During Construction	Updated Pasay 360 Island A&B and C (470m wide channel and all channel bed levels at -6m MSL) + proposed temporary land access bridges with 3 nos. x 10m openings in the E-W channel (180m wide) and 5 nos. x 10m openings in the N-Schannel (476m wide)	Day-10 to 11	Acceptable (for temporary condition)
Post Construction	Updated Pasay 360 Island A&B and C (470m wide channel and all channel bed levels at -6m MSL) + PHCC Island A and B	Day-8	Acceptable

The impact assessment and mitigating measures for the Temporary Access Bridge is presented in Table 2.14.

Table 2.14 Impact Assessment and Mitigating Measures

Activities	Potential Impacts	Construction	Decommissioning	Mitigations
Construction and usage of temporary bridge during transport and mobilization	Alteration of water flow	✓	✓	Construction/Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges
Installation of temporary bridge (sand filling) and Decommissioning of temporary bridge	Loss of topsoil / soil erosion	✓	✓	Installation of geotextiles and placement of sandbags along the slope Implementation of Turbidity Management Plan
Installation of temporary bridge (sand filling) and Decommissioning of temporary bridge	Water quality degradation / Turbidity	✓	✓	Implementation of Turbidity Management Plan
Moving around / vessel transport	Vessel Collision	✓	✓	Compliance with MARINA, PCG and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan
Mobilisation and Transport of vehicles and vessels	Potential oil spill leaks	✓	✓	Regular inspection and maintenance of machineries, vehicles, vessels and equipment to avoid oil leaks/ spills. Implementation of Oil Spill Contingency Plan.
Moving around / vessel transport	Threat to Health and Safety	✓	✓	Wearing of PPE particularly life-vest Avoid and stop transport during inclement weather.

2.11. TEMPORARY ACCESS BRIDGE BETWEEN ISLAND AB AND C

2.11.1. PURPOSE

The temporary access bridge between Island AB and Island C is to facilitate the access of vehicles, equipment, materials, and personnel.

2.11.2. DESCRIPTION OF ACTIVITIES

2.11.2.1. CONSTRUCTION

The construction of this temporary bridge includes:

- Site Preparation
- Surcharge Elevation Adjustment
- Steel Sheet Piles (SSP) Installation
- Bailey Bridge Installation
- Slope Formation
- Geotextile Installation
- Installation of Rock Layers
- Concrete cap and Concrete Pavement

This will also involve:

- Land based excavation to modify the surcharge elevation and achieve a desired level of +4.0 meters MLLW.
- Excavate to a depth of -0.5m MSL in preparation for the installation of drainage.
- Construction of three (3) 10m-wide openings made of Steel Sheet pile (SSP) Type IV and Bailey Bridge to strategically allow the continuous and unobstructed flow of water in the area. These openings will be supported by steel sheet piles driven to retain the sand on both sides of the openings, and steel (bailey) bridges will be constructed over the openings to allow full access.
- Establishing a 1:3 side slope design for the access road to achieve an optimal design that prioritizes stability and safety.
- Installation of geotextiles and placement of sandbags along the slope to prevent erosion and improve the overall stability of the slope.
- After compaction on the road access, installation of aggregates with a thickness of 0.4 meters.

2.11.2.2. DECOMMISSIONING

The decommissioning activities include:

- Demolition of concrete pavement
- Removal of slope formation and protection
- Removal of sand fill and SSP
- Site clearing and clean-up activities

2.11.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

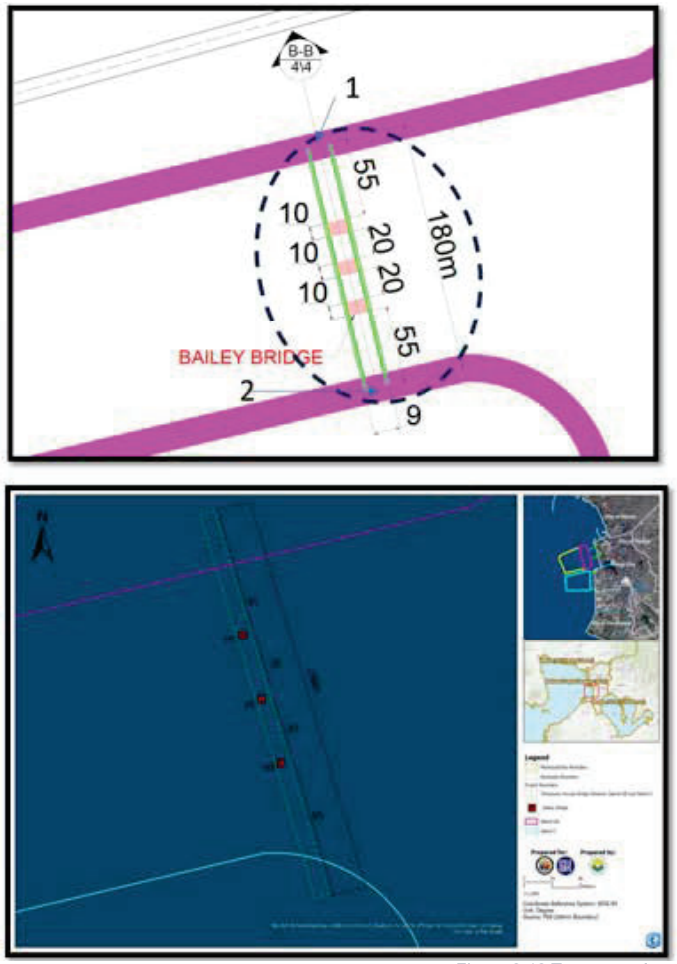
This temporary bridge will be constructed through sand filling with concrete pavement as a carriageway and slope protection (rocks and geotextile). The length is approximately L= ±180m. It has a width of 9 meters and a 20 kpa design load capacity. The concept-level design will progress further until the detailed design is completed.

2.11.4. SCHEMATIC/ SITE PLAN

This temporary bridge is located at south edge of Island AB and North edge of Island C. The schematic / site plan is shown in Figure 2.18 and Figure 2.19.

2.11.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the Temporary Access Bridge is the same with the temporary access bridge in Table 2.14. Section 2.10.5 discusses the verification of flushing time for temporary access bridges through a flushing study.



No.	Latitude	Longitude
1	14°32'34.09"	120°58' 30.50"
2	14°32'26.10"	120°58' 32.89"

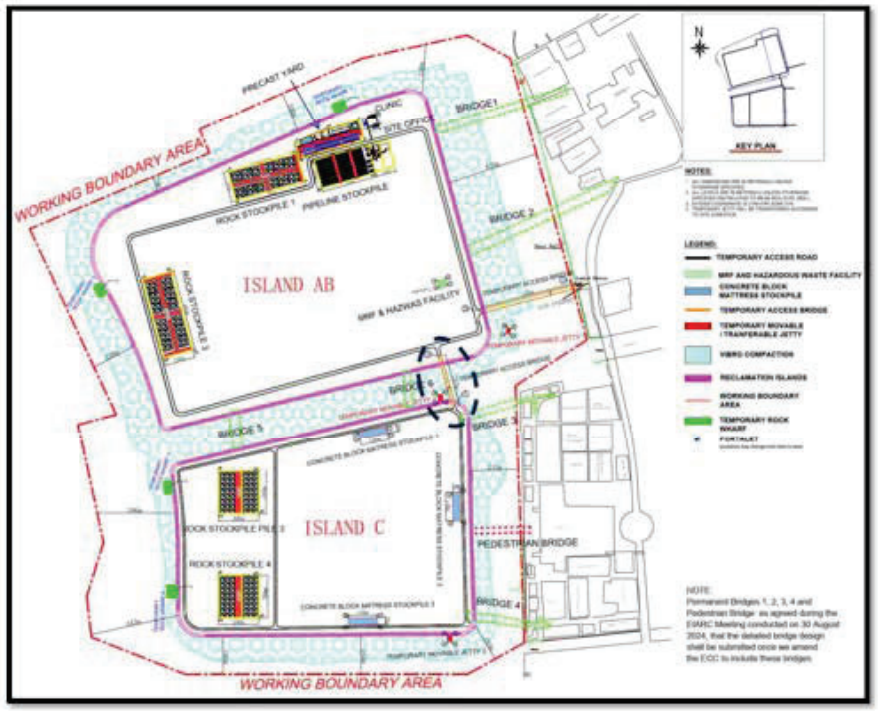


Figure 2.18 Temporary Access Bridge Between Island AB and C Schematic / Site Plan

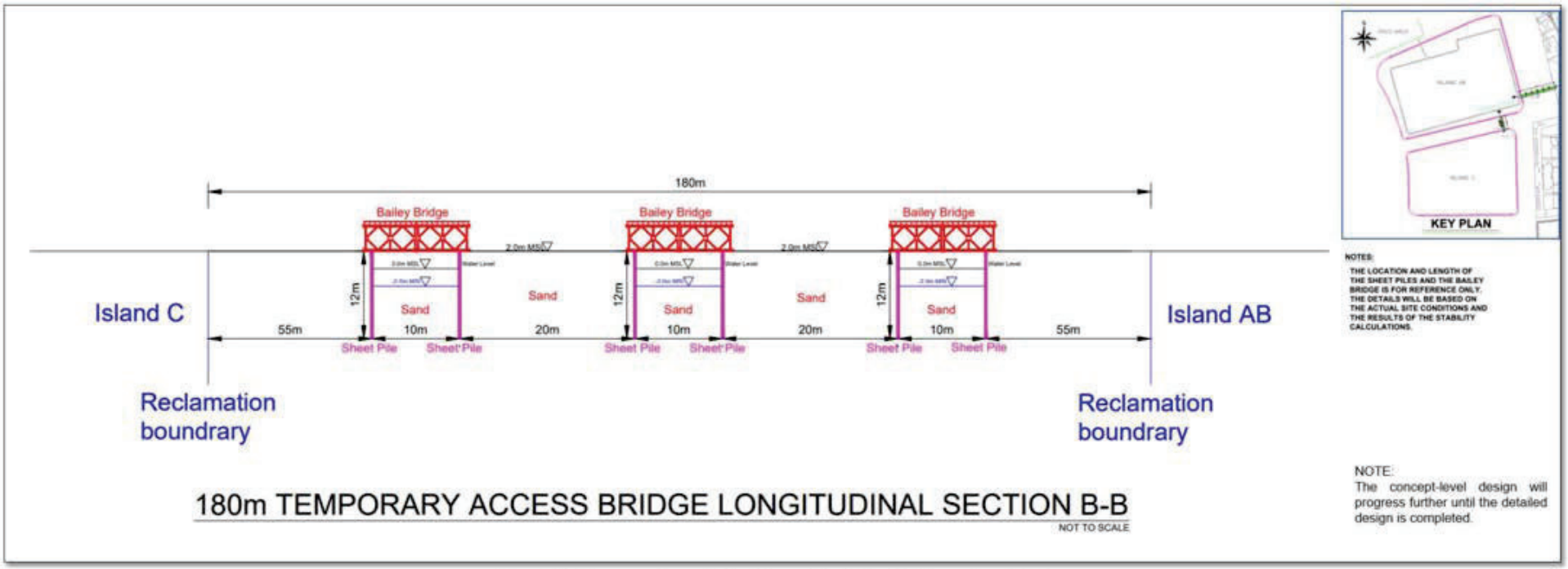


Figure 2.19 Temporary Access Bridge Between Island AB and C Concept-level Design

2.12. SANITATION FACILITY - PORTALETS

2.12.1. PURPOSE

The portalets will be used to provide restroom facilities for the construction and office workers in the reclaimed land.

2.12.2. DESCRIPTION OF ACTIVITIES

2.12.2.1. CONSTRUCTION

The activities will include preparing site for portalets, delivery and installation of portalets.



Plate 2-5 Sanitation System

For sewage disposal management, regular maintenance and weekly disposal is conducted by authorized service providers. Sewage from the portalets is siphoned and directed to an accredited Sewage Treatment Plant (STP), where it undergoes the treatment process. The STP will then issue a certification as proof of acceptance and treatment of wastes, validating the proper and environmentally responsible handling of sewage disposal within the framework of established agreements and regulations

2.12.2.2. DECOMMISSIONING

The decommissioning will involve siphoning, pull-out of portalets and site clean-up where these portalets were located.

2.12.3. TECHNICAL SPECIFICATIONS/ DESCRIPTION

In house sanitation facilities includes toilets in barges and use of approved portable toilet contractor. The disposal is through accredited waste handling entities as shown in Plate 2-5. The installation of portlets will follow the Requirement per Occupational Safety and Health (OSH), which is 1 portalet:20 manpower (1:20).

2.12.4. LOCATION OF PORTALETS

The location of portalets is shown in Figure 2.20.



Figure 2.20 Location of Portalets

2.12.5. IMPACT ASSESSMENT AND MITIGATING MEASURES

The impact assessment and mitigating measures for the Portalets is presented in Table 2.15.

Table 2.15 Impact Assessment and Mitigating Measures

Project activities	Potential Impacts	Construction	Decommissioning	Mitigations
Preparing site for portalets, delivery and installation of portalets	Generation of Solid waste Soil Contamination	✓	x	Proper housekeeping and hauling of solid waste
Siphoning, pull-out of portalets and site clean-up where these portalets		x	✓	Proper housekeeping and pulled up of portalets Proper siphoning and collection by the siphoning contractor and contractor of the portalets

3. SUPPLEMENTAL ENVIRONMENTAL MANAGEMENT PLAN

The Supplemental Environmental Management Plan (SEMP) for the construction and decommissioning of the temporary support facilities is presented in Table 3.1. The SEMP includes activities for the construction and decommissioning of Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets.

Table 3.1 Supplemental Environmental Management Plan for the Construction and Decommissioning of the Temporary Support Facilities

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Construction Phase	Construction of temporary support facilities - mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	Air	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary support facilities - mobilization of land-based equipment and vehicles	Road Accident	People	Separate pedestrian walkway (Personnel Entrance and Exit) and access for vehicles (Vehicle Entrance and Exit) Set up warning strips for isolation The main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher or / linemen Observe vehicle speed limit. No overloading. Keep linemen at its post to observe and give signal to moving vehicles	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C - moving around / vessel transport	Threat to Health and Safety	People	Wearing of PPE particularly life-vest Avoid and stop activities during inclement weather.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
		Vessel Collision	People	Compliance with Maritime Industry Authority (MARINA), Philippine Coast Guard (PCG) and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Mobilisation and Transport of vehicles and vessels	Potential oil spill leaks	Water Quality	Regular inspection and maintenance of machineries, vehicles, vessels and equipment to avoid oil leaks/ spills. Implementation of Oil Spill Contingency Plan.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary facilities	Oil Spills	Land Water Quality	Set up a chemical storage area with proper signages, spill kits, fire extinguisher and ventilation, all chemicals will have MSDS, use warning tape to isolate, and put up warning signs.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				Hot work is prohibited near the chemical storage area, and extinguishers shall be set up The disposal of hazardous wastes and/or expired chemicals will be through DENR accredited Treatment, Storage And Disposal (TSD) facility. Implementation of the Oil Spill and Contingency Plan			
Construction Phase	Construction of Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C, and Sanitation Facility – Portalets including transfer of materials, clearing of site location, hauling, mobilization and transport,	Generation of Solid Waste Soil contamination	Land Water People	Implementation of waste management Plan Proper housekeeping and materials handling Collection and disposal of solid waste by a DENR accredited 3rd party Waste Service Provider (WSP) Proper housekeeping and hauling of solid waste. Provision of a Hazardous Waste Storage Area with proper labeling, segregation and storage of wastes. Collection, transport, treatment, and disposal by a DENR accredited 3rd party hauler and TSD facility Provision of secondary containment and/or containment bund wall with 110% capacity by volume.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Stockpiling of materials such as CBM, rock and pipes	Presence of debris	Land	Materials such as CBM, rock and pipe stockpiles should be limited and confined on its designated area. Proper hauling and delivery.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Storage of fuel	Fuel leaks	Land Water	Establishment of secondary containment/ bundwall that can contain 110% capacity by the actual total volume of stored fuels. Readily available oil spill kit and fire extinguisher.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Use of generator set	Fuel leaks and emissions	Air	Secure and adherence to permit to operate. Proper handling of diesel fuel.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of temporary facilities - Use of engines of generators, ships, vehicles and machinery, Whistles, horns, reversing alarms, intercom	Increase in Noise and Vibration	Air and Noise	Take sealing measures or sound-absorbing materials to reduce the noise intensity of generators and equipment engines Control the working hours and reduce unnecessary equipment movement at night	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	communication noise, workers' voices, etc. of machinery and vehicles in the site area			Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs and train and supervise personnel to use them correctly			
Construction Phase	Construction of temporary support facilities	Occurrence of Accidents Threat to Health and Safety	People	Induction and PPE to be given to all the new workers and staff toolbox to be conducted prior to each activity Mandatory of PPE compliance Provide proper barricading and signage to be installed. Security Personnel to be deployed to control the entry and exit of Equipment, Materials and Workers Safety Officer and First Aider will be assigned 24/7 to ensure the implementation of Safety Management System All moving equipment's will be controlled by certified operator and assisted by trained spotter, Temporary fence of operational area must be installed During night operation proper illumination will be provided and night work permit to be applied. Welfare Facilities to be ensure in place prior to start the activities: Toilet, Rest Shelter, Storage of Materials Provision of water and Security booth. Basic requirements for all heavy/light vehicle must be provided as well as operator certification, Rucker's Personal Conveyance (TPC's), License, Vehicle registration, etc. Proper Waste Management implementation	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Installation and use of temporary movable jetty	Contamination of water and soil due to rustling of steel	Water Quality	Proper maintenance of movable transferable jetty	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Temporary movable jetty steel works	Threat to Health and Safety	People	Proper PPE of construction workers	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Transfer of temporary movable jetty	Degradation of water quality / turbidity	Water Quality	Control of speed limit especially near the sand filling activities.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Construction of rock wharf: Laying of smaller rocks or gravel to create a stable base	Degradation of water quality / turbidity	Water Quality	Proper handling of rocks and gravel Control of speed limit especially near the sand filling activities.	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Laying of geotextile to prevent soil erosion Installation of bigger rocks on the center and boulders on outer edge Backfilling and compaction Installation of precast mooring, barricades and safety signages			Implementation of Turbidity Management Plan			
Construction Phase	Construction and usage of temporary bridges during transport and mobilization	Alteration of water flow	Hydrology	Construction/Provision of openings made of Steel Sheet pile Type IV and Bailey Bridge that strategically allow the continuous and unobstructed flow of water in the area considering the results and recommendations of the Flushing Study for Temporary Access Bridges	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Installation of temporary bridge (sand filling)	Loss of topsoil / soil erosion	Water Quality	Installation of geotextiles and placement of sandbags along the slope	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Construction Phase	Installation of temporary bridge (sand filling)	Water quality degradation / Turbidity	Water Quality	Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Construction Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Construction of temporary support facilities - mobilization of land-based equipment and vehicles	Degradation of Air Quality - Exhaust gas and dust emissions	Air	Select vehicles that meet the exhaust gas emission standards Perform daily inspections and maintenance on machinery, vehicles, generators, etc., keep the equipment in good condition, and promptly eliminate abnormal exhaust emissions Sprinklers regularly spray water to mitigate dust	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary support facilities - mobilization of land-based equipment and vehicles	Road Accident	People	Separate pedestrian walkway (Personnel Entrance and Exit) and access for vehicles (Vehicle Entrance and Exit) Set up warning strips for isolation Main activity areas for personnel and construction machinery are separated Avoidance of cross-operation of various construction machines Assigning of watcher or / linemen Observe vehicle speed limit.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
				No overloading. Keep linemen at its post to observe and give signal to moving vehicles			
Decommissioning Phase	Decommissioning of Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between Island AB and C - moving around / vessel transport	Threat to Health and Safety	People	Wearing of PPE particularly life-vest Avoid and stop activities during inclement weather.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
		Vessel Collision	People	Compliance with Maritime Industry Authority (MARINA), Philippine Coast Guard (PCG) and international regulations. Proper training of vessel crew and personnel. Proper implementation of approved Vessel Traffic Management Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Mobilisation and Transport of vehicles and vessels	Potential oil spill leaks	Water Quality	Regular inspection and maintenance of machineries, vehicles, vessels and equipment to avoid oil leaks/ spills. Implementation of Oil Spill Contingency Plan.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary facilities	Oil Spills	Land Water Quality	Set up a chemical storage area with proper signages, spill kits, fire extinguisher and ventilation, all chemicals will have MSDS, use warning tape to isolate, and put up warning signs. Hot work is prohibited near the chemical storage area, and extinguishers shall be set up The disposal of hazardous wastes and/or expired chemicals will be through DENR accredited Treatment, Storage And Disposal (TSD) facility. Implementation of the Oil Spill and Contingency Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of Precast Yard, Site Office, Rock Stockpile, Pipeline Stockpile, Material Recovery Facility and Hazardous Waste Facility, Concrete Block Mattress Stockpile, Clinic, Movable Transferable Jetty, Temporary Rock Wharf, Temporary Access Bridge Between the Mainland and Island AB, Temporary Access Bridge Between	Generation of Solid Waste Soil contamination	Land Water People	Implementation of waste management Plan Proper housekeeping and materials handling Collection and disposal of solid waste by a DENR accredited 3rd party Waste Service Provider (WSP) Proper housekeeping and hauling of solid waste. Provision of a Hazardous Waste Storage Area with proper labeling, segregation and storage of wastes. Collection, transport, treatment, and disposal by a DENR accredited 3rd party hauler and TSD facility	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
	Island AB and C, and Sanitation Facility – Portalets including transfer of materials, clearing of site location, hauling, mobilization and transport,			Provision of secondary containment and/or containment bund wall with 110% capacity by volume.			
Decommissioning Phase	Pull out/ Removal of excess materials such as CBM, rock and pipes	Presence of debris	Land	Proper hauling and delivery.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Use of generator set	Fuel leaks and emissions	Air	Secure and adherence to permit to operate. Proper handling of diesel fuel.	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary facilities - Use of engines of generators, ships, vehicles and machinery, Whistles, horns, reversing alarms, intercom communication noise, workers' voices, etc. of machinery and vehicles in the site area	Increase in Noise and Vibration	Air and Noise	Take sealing measures or sound-absorbing materials to reduce the noise intensity of generators and equipment engines Control the working hours and reduce unnecessary equipment movement at night Post safety tips in areas where the noise exceeds 85 decibels, distribute earplugs and train and supervise personnel to use them correctly	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary support facilities	Occurrence of Accidents Threat to Health and Safety	People	Induction and PPE to be given to all the new workers and staff toolbox to be conducted prior to each activity Mandatory of PPE compliance Provide proper barricading and signage to be installed. Security Personnel to be deployed to control the entry and exit of Equipment, Materials and Workers Safety Officer and First Aider will be assigned 24/7 to ensure the implementation of Safety Management System All moving equipment's will be controlled by certified operator and assisted by trained spotter, During night operation proper illumination will be provided and night work permit to be applied. Basic requirements for all heavy/light vehicle must be provided as well as operator certification, Rucker's Personal Conveyance (TPC's), License, Vehicle registration, etc. Proper Waste Management implementation	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

Phase	Activities	Potential Impact	Affected Environment	Options For Prevention/ Mitigation/ Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Decommissioning Phase	Dismantling of temporary movable jetty	Contamination of water and soil due to rustling of steel	Water Quality	Proper maintenance of movable transferable jetty	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Dismantling of jetty steel works	Threat to Health and Safety	People	Proper PPE of construction workers	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of rock wharf	Degradation of water quality / turbidity	Water Quality	Proper handling and hauling of rocks and gravel Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary bridge	Loss of topsoil / soil erosion	Water Quality	Placement of sandbags along the slope	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Decommissioning of temporary bridge	Water quality degradation / Turbidity	Water Quality	Implementation of Turbidity Management Plan	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s
Decommissioning Phase	Siphoning, pull-out of portalets and site clean-up where these portalets	Generation of Solid waste Soil Contamination	Water Land	Proper housekeeping and pulled up of portalets Proper siphoning and collection by the siphoning contractor and contractor of the portalets	Project Developer/ Contractor	Project Decom-missioning Cost	Project Developer Contract / Agreement with the Contractor/s

LIST OF ANNEXES

Annex A Email From EMB re Supplemental Information for the 360-Hectare Pasay Reclamation Project and Acknowledgement Receipt for the First Submission of the Supplemental Information Report

Annex B Supplemental Information Report Version 2 Submission to DENR EMB on 21 October 2024

Annex C Proof of Authority Over the Project Area for the Temporary Access Bridge Between the Mainland and Island AB
- CCP Contract of Lease
- DPWH Letter of No Objection
- CHEC Letter to DPWH

Annex D Flushing Study: Verification of Flushing Time for Pasay 360 Temporary Access Bridges

ANNEX A.

Email From EMB re Supplemental Information for the 360-Hectare Pasay Reclamation Project and Acknowledgement Receipt for the First Submission of the Supplemental Information Report

Pasay 360: Environmental Performance Report and Management Plan

From: ea <ea@emb.gov.ph>
Sent: Thursday, October 10, 2024 2:18 PM
To: pasay360environmentalunit@gmail.com; Admin Office Pasay City <pasay.cwoffice@gmail.com>; pasay360@gmail.com
Cc: scmadrona@gmail.com; Raymond M. Cabanilla <mon.cabanilla@ymsmartcity.com>; Mary Kristine R. Dator <kr.dator@ymsmartcity.com>
Subject: Supplemental Information for the 360-Hectare Pasay Reclamation Project

Dear Sirs and Ma'ams:

This has reference to the submitted Environmental Performance Report and Management Plan (EPRMP) covering the Landform Reconfiguration of the 360-Hectare Pasay Reclamation Project along the coast of Manila Bay, City of Pasay which is the subject of your application for Environmental Compliance Certificate (ECC) amendment.

Upon further review and assessment of this Office, the information and details of the following project components shall be provided in the EPRMP:

Components	Required Information/details
Connecting bridges between Islands A and B with island C	• Technical specifications/descriptions • Geographical coordinates of the bridge alignment
Wastewater treatment units	• Technical specifications/descriptions • Activities for construction and decommissioning of temporary facilities. This should be included in the Environmental Management Plan *Will an STP be constructed for this application?*
Temporary Support Facilities	
• Precast Yard • Material Storage • site office • Rock Stockpile • Stockpile/steelpipe Area • Materials Recovery Facility (MRF) • Hazardous Waste Facility • Concrete Block Mattress Stockpile • Clinic • Movable/ Transferable jetty • Rock Wharf	• Technical specifications/descriptions • Geographical coordinates of the locations of the temporary support facilities • Detailed activities for construction and decommissioning of temporary facilities. This should be included in the Environmental Management Plan • Detailed site development plan for the Temporary Support Facilities
• Temporary Access bridges • Between the mainland and island AB • Between the mainland and island C • Between island AB and C	• Technical specifications/descriptions. • Barangay in the mainland, and the proof of authority over the project area for the temporary access bridges in mainland. • Specification on materials, and the activities for construction and decommissioning of temporary facilities. This should be included in the Environmental Management Plan.

For this Office to facilitate the processing of your ECC amendment application, kindly submit the above documents as supplemental information to the submitted EPRMP to this Office on or before **October 14, 2024 (Monday) at 09:00 AM.** For the payment of your processing fee for the ECC amendment, please proceed to our Office for the issuance of the Order of Payment.

Please let us know if you have any questions or clarifications.

Thank you.

Regards,

Environmental Impact Assessment and Management Division

ENVIRONMENTAL MANAGEMENT BUREAU - CENTRAL OFFICE
Department of Environment and Natural Resources

DENR Compound, Visayas Avenue, Diliman, Quezon City, Philippines

w (632) 8539-4375 | http://emb.gov.ph | http://eia.emb.gov.ph

CONFIDENTIALITY NOTICE: This message and its contents are confidential and are subject to restrictions contained in this [illegible]. If you received this in error, please do not read or take action in reliance on it. Instead, please inform the sender and then delete it immediately.

RECORDS SECTION

ippines
ronment and Natural Resources
TAL MANAGEMENT BUREAU

ACKNOWLEDGEMENT RECEIPT

October 14, 2024

Greetings!

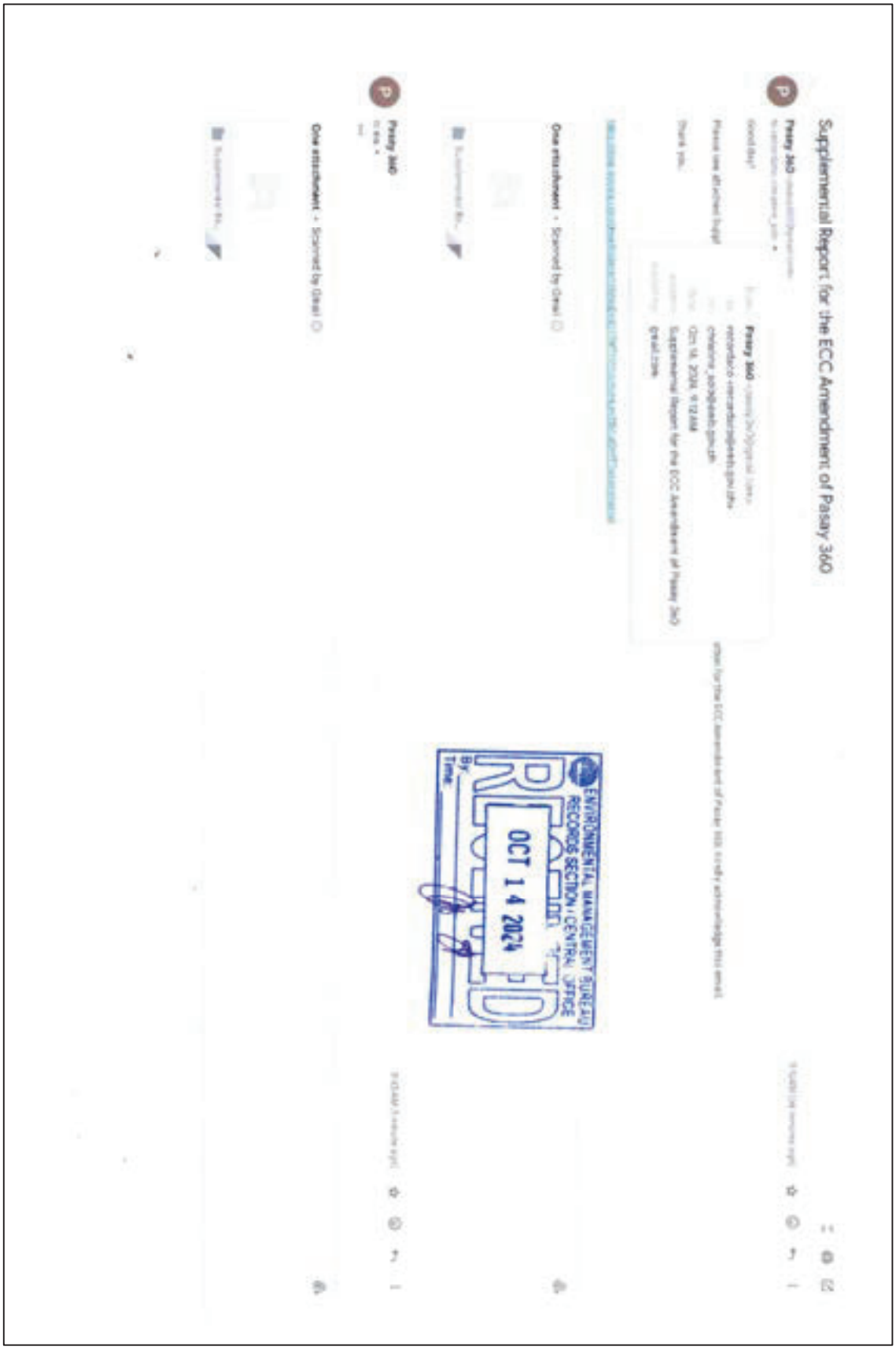
This is to Acknowledge Receipt of your COMMUNICATION with the Subject : **Email dtd. Oct.14,2024 from Pasay 360<pasay360@gmail.com> RE: Supplemental Report for the ECC Amendment of Pasay 360**, submitted on October 14, 2024, 3:00pm.

Your transaction has been tagged as IIS No. **CO-2024-035728** with Company ID **EMBNCR-893300-163115**. For follow-ups, you may provide the given details.

For further inquiries, you may contact our designated EMB Office in your area from Monday to Friday 8:00 a.m. to 5:00 p.m. office hours, or email us at recordsco@emb.gov.ph.

Please be guided accordingly.

Thank you.


Supplemental Report for the ECC Amendment of Pasay 360
ENVIRONMENTAL MANAGEMENT BUREAU
RECORDS SECTION - CENTRAL OFFICE
OCT 14 2024
By:
Time:

ANNEX B.

Supplemental Information Report Version 2
Submission to DENR EMB on 21 October 2024

Republika ng Pilipinas
Lungsod ng Pasay, Kalakhang Maynila
TANGGAPAN NG ALKALDE

RECEIVED
OCT 21 2024

October 16, 2024

DIRECTOR JACQUELINE A. CAANCAN
Director, Environmental Management Bureau (EMB)
Department of Environment and Natural Resources (DENR)
DENR Compound, Visayas Avenue
Diliman, Quezon City

Subject: **Supplemental Information for the 360-Hectare Pasay Reclamation Project (Pasay 360)**

Dear Director Caancan,

We respectfully endorse the attached Supplemental Information for the amendment of the ECC for Pasay 360, as submitted by our Joint Venture Partner (Annex "A").

The Supplemental Information complies with the request of the Environmental Impact Assessment and Management Division (EIAMD) in its email dated 10 October 2024.

We trust that this submission will be duly acknowledged.

Thank you.

Very truly yours,

IMELDA CALIXTO-RUBIANO
City Mayor

Assisted by:

ATTY. SEVERO C. MADRONA, JR.
City Legal Officer

Pasay City Hall Room 203 2nd Floor F.B Harrison Street.
Pasay City, Philippines

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

BAGONG PILIPINAS

ACKNOWLEDGEMENT RECEIPT

October 21, 2024

Greetings!

This is to Acknowledge Receipt of your COMMUNICATION with the Subject : **EMAIL DTD.OCT.16,2024 FROM Pasay 360<pasay360@gmail.com> RE:Pasay letter to DENR-EMB on Suplemental Information for the 360-Hectare Pasay Reclamation Project (Pasay 360)**, submitted on October 21, 2024, 12:05pm.

Your transaction has been tagged as ITS No. **CO-2024-036516** with Company ID **EMBNCR-1053620-25679**. For follow-ups, you may provide the given details.

For further inquiries, you may contact our designated EMB Office in your area from Monday to Friday 8:00 a.m. to 5:00 p.m. office hours, or email us at recordsco@emb.gov.ph.

Please be guided accordingly.

Thank you.



SUPPLEMENTAL INFORMATION
FOR THE

PASAY 360: ENVIRONMENTAL PERFORMANCE REPORT AND MANAGEMENT PLAN

OCTOBER 2024

Submitted by:
CITY GOVERNMENT OF PASAY

For the amendment of the ECC issued for Pasay 360 (ECC-CO-1601-0003)

ANNEX C.

Proof of Authority Over the Temporary Access Road

- Contract Lease to CCP
- DPWH Letter of No Objection
- CHEC Letter to DPWH

CONTRACT OF LEASE

KNOW ALL MEN BY THESE PRESENTS:

This CONTRACT made and entered into by and between:

CULTURAL CENTER OF THE PHILIPPINES, a government instrumentality created by Presidential Decree No.15, as amended, with principal office at the CCP Complex, Roxas Boulevard, Pasay City, represented herein by its President, **MS. KAYE C. TINGA**, hereinafter referred to as the "**LESSOR**";

- and -

CHINA HARBOUR ENGINEERING COMPANY, a company duly licensed to transact business in the Philippines under and by virtue of Philippine laws, with address at 5/F, Unit 2ECBO05005 Tower B, Two E-Com Center, Bayshore Avenue St., MOA Complex, Brgy. 076 District 1 Pasay City represented herein by its Contractor's Representative, **MR. ZHI LIU**, and duly authorized for this purpose as evidenced by Board Resolution, a copy of which is attached hereto as Annex "A", hereinafter referred to as the "**LESSEE**";

The LESSOR and the LESSEE shall be collectively referred to as "**PARTIES**".

WITNESSETH:

WHEREAS, the LESSOR is the owner of parcels of land located at the CCP Complex, Roxas Boulevard, Pasay City;

WHEREAS, the LESSEE has Contract with the LESSOR for a Right-of-Way access of its operations to the reclamation area, which was expired on 19 April 2024;

WHEREAS, the LESSEE signified its interest to renew the said Contract for a period of one (1) year;

WHEREAS, the LESSOR and the LESSEE agreed that the application of the contract is retroactive beginning 20 April 2024;

WHEREAS, the LESSOR accepted the offer after finding the same to be in order, valid and beneficial to the government, subject to the terms and conditions stipulated hereunder;

NOW, THEREFORE, the PARTIES hereby agree as follows:

1. LEASED PREMISES

1.1. The LESSOR hereby leases to the LESSEE a portion of Timor area measuring 215.70 square meters, more particularly specified in the location plan which is attached hereto as Annex "B (hereinafter referred to as "**LEASED PREMISES**"), subject to seven percent (7%) annual rental escalation and renewable every year at the option of the LESSOR.

1.2. The LESSEE shall utilize the Leased Premises for a temporary Right-of-Way access to Island A only.

2. **TERM**

2.1. This Contract shall take effect from 20 April 2024 to 19 April 2025.

3. **RENTAL**

3.1. The LESSEE shall pay the LESSOR not later than every 20th day of the month as follows:

☐ RENTAL in the amount of **THREE HUNDRED SIXTY TWO THOUSAND THREE HUNDRED SEVENTY SIX PESOS ONLY (Php362,376.00)**, inclusive of 12% VAT but exclusive of parking, janitorial, garbage disposal, security and utilities.

3.2. Upon signing of this Contract, the LESSEE shall pay three (3) months rental fees from 20 April 2024 to 19 July 2024 in the amount of **ONE MILLION EIGHTY SEVEN THOUSAND ONE HUNDRED TWENTY EIGHT PESOS ONLY (Php1,087,128.00)** and shall issue nine (9) postdated checks to cover the nine (9) months rental fees from 20 July 2024 to 19 April 2025 in the amount of **THREE HUNDRED SIXTY TWO THOUSAND THREE HUNDRED SEVENTY SIX PESOS & 44/100 (Php362,376.00)** for each check.

3.3. Delinquent payment of rental shall bear interests at the rate of 1.5% per month, from due date until fully paid. In addition, failure of the LESSEE to deliver any of the checks or fund any one of the issued checks upon maturity date shall be sufficient ground for the LESSOR to terminate this Contract upon 15-day advance notice, and, upon the expiration of the said 15-day period to immediately repossess the Leased Premises without the necessity of instituting any court or judicial action. In this connection, the LESSEE hereby names, constitutes, and appoints the LESSOR, its authorized agents, employees, and/or representatives as its attorney-in-fact, with full power and authority to do and perform any or all of the following acts and things, to wit:

[i] To open, enter, occupy, secure, padlock, enclose, fence and otherwise take full and complete physical possession of the Leased Premises and control to the Leased Premises without resorting to court action.

[ii] To take inventory and possession of whatever equipment, furniture, articles, merchandise, appliances, etc. may be found therein belonging to the LESSEE, unauthorized sublessee and/or other persons, as security for the payment of the LESSEE's obligation under this Contract, and to place it for safekeeping in the LESSOR's warehouse, charging the LESSEE the corresponding storage fees; and in case the LESSEE or other owners thereof fail to claim said equipment, furniture, articles, merchandise, appliances, etc. from storage and liquidate any liability to the LESSOR within thirty (30) days from the date of the LESSOR's taking possession of the leased premises or of the LESSEE's personal properties, the LESSOR shall exercise its right to enforce its preferred lien on the personal properties, to dispose of said properties and to apply the proceeds thereof to whatever liability and/or indebtedness the LESSEE may have to the LESSOR plus reasonable expenses for the sale, including storage fees, without any prejudice to any action as may be appropriate for the recovery of any deficiency.

[iii] To suspend and/or disconnect the electricity and/or water supply to the Leased Premises by whatever means without incurring any civil and/or criminal liability or whatever therefor.

[iv] To automatically forfeit in favor of the LESSOR, the deposits referred to in Section 4 below.

4. DEPOSITS

4.1. The non-interest bearing advance rental and deposits made under the previous Contract in the amount of **THREE HUNDRED TWENTY SIX THOUSAND ONE HUNDRED THIRTY EIGHT PESOS & 40/100 (Php326,138.40)** under O.R. number 9676212 dated 06/13/2023, shall be carried over to this Contract. However, due to the increase in the monthly rental the LESSEE shall put up an additional rental deposit in the amount of **SEVEN HUNDRED SIXTY THOUSAND NINE HUNDRED EIGHTY NINE PESOS & 60/100 (Php760,989.60)**, which shall be remitted by the LESSEE to the LESSOR upon signing of this Contract. The said deposit shall cover the required one (1) month advance rental which shall answer in full or in part for any unpaid rental which accrued as of the termination of the lease and two (2) months rental deposit to answer for any damages caused to the Leased Premises by the LESSEE or its employees, guests or customers, and other third persons for any reason other than by ordinary wear and tear. This is without prejudice to the right of the LESSOR to claim from the LESSEE other amounts representing other damages as may be warranted by the circumstances, which shall be paid by the LESSEE to the LESSOR within five (5) days from the receipt by the LESSEE of the LESSOR's demand therefor.

In case a portion or the whole amount of said deposits is used to answer for whatever claims, charges or damages mentioned above, during the effectivity of this Contract, the amount used must be replenished by the LESSEE and the LESSEE must restore the original amount of the deposit immediately within one (1) week from receipt of the written demand of the LESSOR;

Should said deposits be insufficient to cover the damages, the LESSEE shall pay the deficiency within five (5) days from notification thereof by the LESSOR;

Any excess in the deposits shall be returned by the LESSOR to the LESSEE without any interest upon expiration or termination of this contract within two (2) months upon receipt of the LESSEE'S written demand together with original copy of official receipt, subject to government rules and procedure.

5. PERFORMANCE BOND

5.1. The Performance Bond made under the previous Contract in the amount of **SIXTY FIVE THOUSAND TWO HUNDRED TWENTY SEVEN PESOS & 68/100 (Php65,227.68)** under O.R. number 9676212 dated 06/13/2023, shall be carried over to this contract to guarantee complete and faithful performance of all its obligations under the Contract, including the restoration of the Leased Premises to its original condition, to guarantee the proper care and preservation of the Leased Premises and the properties of the LESSOR therein *[ordinary wear and tear excepted]* and to reimburse the LESSOR for any death or injury that the LESSOR or the latter's employees and guests and third parties may suffer as a consequence of any fault or negligence of the LESSEE or its employees. However, due to the increase on the monthly rental fee, LESSEE shall put up additional Performance Bond in the amount of **ONE HUNDRED FIFTY TWO THOUSAND ONE HUNDRED NINETY SEVEN PESOS & 92/100 (Php152,197.92)**, which the LESSEE must remit to the LESSOR upon signing of this Contract. Should there be no claim by the LESSOR against the LESSEE, the said performance bond shall be returned by the LESSOR without

interest, upon expiration or termination of this Contract within two (2) months upon written demand, subject to government rules and procedures.

5.2. Should the Performance Bond be insufficient to guarantee complete and faithful performance of all its obligations under the Contract, the LESSEE shall pay the deficiency within five (5) days from the notification thereof by the LESSOR. Failure to comply with the foregoing shall be a ground for the termination of this Contract.

6. **IMPROVEMENTS**

6.1. Subject to prior written consent of the LESSOR, the LESSEE may introduce improvements, renovations, or otherwise make alterations or repairs on the Leased Premises at the latter's expense; provided, however, that with respect to all existing and future improvements, renovations, alterations or repairs, electrical circuits and waterlines, made by the LESSEE in, or upon the Leased Premises, herein before and during the lease period, the LESSOR shall have the option of either appropriating such improvements, to be surrendered with the Leased Premises as part thereof at the expiration/termination of this Contract without compensation to the LESSEE, except movable furniture and other fixtures that may be removed without deforming or injuring the Leased Premises, or demanding upon the LESSEE to remove all such improvements at the LESSEE's expense. The movable furniture and other fixtures can be removed only the LESSEE with the prior written consent and in the presence of the LESSOR or the latter's duly authorized representative.

6.2. All alterations, changes, and improvements built, constructed, or placed on the Leased Premises without the prior written consent required under Section 6.1 shall be immediately removed by the LESSEE upon written demand to remove from the LESSOR, *provided that*, should the LESSEE fail to heed the demand, the LESSOR shall have the right to have the unauthorized improvements removed at the expense of the LESSEE.

6.3. Any unauthorized improvement, change or alteration shall be a ground for the termination of this contract.

7. **UTILITIES**

7.1. The LESSEE shall pay its own electricity and water bills and other additional utilities, including installation and disconnection fees.

8. **CCP RULES**

8.1. The LESSEE shall comply with the rules issued by the CCP, from time to time, with respect to the security, health, sanitation, cleanliness and safety, among other things.

8.2. The LESSEE shall provide a work schedule and duly signed engineering plans prior to commencement of any work to be performed for cross-evaluation of the LESSOR.

8.3. The LESSEE is not allowed to construct concrete road or use other non-permeable materials, and the LESSEE is not allowed to construct any new roads beyond the covered right-of-way area.

8.4. Extreme care shall be exercised by the LESSEE during the excavation works to prevent damage on the Leased Premises and all other properties of CCP.

8.5. Any structure, streamer, banner, décor and other directional signage that will be put up within the Complex shall have the prior written approval of the CCP Management; Otherwise, CCP may immediately remove such structure, streamer, banner, décor and other directional signs and the cost of such removal shall be charged to and paid by the LESSEE.

8.6. The LESSEE shall be exclusively responsible and liable for all and/or municipal taxes such as Real Property Tax on land, licenses, permits, insurance of the Construction laborers/employees and on the structure to be put up necessary for its operations at the leased premises.

8.7. The LESSEE shall furnish the LESSOR valid permits for the renovation or reconstruction of the Leased Premises

8.8. The LESSEE shall install sufficient warning devices/signs during the operations, especially of equipment to promote public convenience and safety of the public.

8.9. The LESSEE shall properly place all excavated materials in jute sacks for disposal outside the CCP Complex by the LESSEE and shall maintain the cleanliness and sanitation of its work areas.

8.10. The LESSEE shall ensure that all its personnel shall refrain from cooking, gambling and drinking intoxicating liquor within the Leased Premises .Likewise; the LESSEE shall assure the LESSOR that no personnel under the influence of liquor shall be involved its any work in the Leased Premises.

8.11. The LESSOR shall have the right to inspect the Leased Premises, anytime or during LESSEE's business operation without asking for permission to the LESSEE.

8.12. Upon signing of this Contract, the LESSEE shall pay for the Documentary Stamp Tax in the amount of **SEVEN THOUSAND SEVEN HUNDRED SIXTY SEVEN PESOS ONLY (Php7,767.00)** for remittance by the LESSOR to the BIR for the twelve (12) months rental on the Leased Premises.

8.13. CCP can display/distribute collaterals in the establishment or leased premises.

9. **PRE-TERMINATION**

9.1. In addition to the grounds for termination provided in this Contract, the LESSOR may, within its sole discretion, terminate this Contract anytime when it becomes necessary to use the Leased Premises in connection with but not limited to the implementation of the CCP Asset Development Program by giving a written notice of termination at least sixty (60) days from effective date of termination to the LESSEE.

9.2. In case of termination of the Contract by the LESSOR or upon expiration of its term, the LESSEE and its employees shall vacate the premises and surrender the same to the LESSOR quietly and peacefully without need of judicial action within twenty-four (24) hours from the date of said pre-termination or expiration.

9.3. After the expiration of the 24-hours mentioned in paragraph 9.2 above, the LESSOR shall have automatic possession of the Leased Premises and can perform any or all of the acts enumerated in paragraphs (i), (ii), (iii) and (iv) of Section 3.3 above.

9.4. The LESSEE shall have the option to pre-terminate this contract before expiration by giving a thirty (30) day written notice to the LESSOR and for any reasons acceptable to the LESSOR. In the event of pre-termination by the LESSEE, the Advance Rental, the Security Deposit and one (1) month worth of rental payment shall be forfeited as LIQUIDATED DAMAGES in favor of the LESSOR.

10. **FREEDOM FROM LIABILITY**

10.1. The LESSEE agrees and obligates itself to hold the LESSOR free and harmless from any and all actions, suits, and damages and other claims of whatever kind or nature which may be brought or instituted by any party for any cause including but not limited to non-observance or non-performance by the LESSEE of any law or any government imposed rule or regulation, ordinance or law or any rules issued by the CCP pursuant to Section 8.1 above.

11. **REPRESENTATIONS AND WARRANTIES**

11.1. The signatories to this Contract hereby represent and warrant that they are duly authorized to execute this Contract.

12. **ATTORNEY'S FEES**

12.1. In case of court litigation arising from breach by the LESSEE of the terms and conditions of this Contract, the LESSEE shall be liable to pay the LESSOR attorney's fees in the amount equivalent to twenty five percent (25%) of the amount being claimed by the LESSOR, which attorney's fees shall not be less than P50,000.00, aside from the damages, costs of litigation and other expenses which the law may entitle the LESSOR to recover from the LESSEE, which shall all be paid by the LESSEE whether litigation is prosecuted to judgment or not.

13. **VENUE OF SUIT**

13.1. The parties agree that in the event of a legal dispute arising out of the Contract, the venue shall be laid exclusively before a court of proper jurisdiction in Pasay City, to the exclusion of any other courts.

IN WITNESS WHEREOF, the parties hereunto have set their hands this 22 AUG 2024 day of _____ 2024 in Pasay City, Philippines.

CULTURAL CENTER OF THE PHILIPPINES

By:

KAYE C. TINGA
President

CHINA HARBOUR ENGINEERING COMPANY

By:

ZHI LIU
Contractor's Representative

SIGNED IN THE PRESENCE OF:

JOSE VICTOR M. GAITE
Vice President for Administration

TERESA S. RANCES
Department Manager III
Administrative Services Department

ACKNOWLEDGEMENT

REPUBLIC OF THE PHILIPPINES)
CITY OF CITY OF MANILA) S.S

BEFORE ME, a Notary Public, for and in the City of CITY OF MANILA on this _____ day of _____ 2024 personally appeared the following person:

KAYE C. TINGA — Passport No.: P5561880A, Expiration Date: January 08, 2028

known to me and me known to be the same person who executed the foregoing instrument and she hereby acknowledged to me that the same is her free and voluntary act and deed, as well as that of the entity herein represented.

WITNESS MY HAND AND SEAL on the date, year and place first above mentioned.

ATTY. JOHN EDWARD TRINIDAD ANG
Notary Public for Manila until Dec 31, 2024
Notarial Commission No. 2023-091
2nd Floor Midland Plaza Hotel, Adriatico St., Ermita Mla
IBP No. 329702 - Jan. 3, 2024
P.T.R. No. 1535522 - Jan. 3, 2024
Roll No. 63731 / MCLE No. VII-0011675-04/14/2025
TIN NO. 252-279-193000000

Doc. No. 756-A;
Page No. 153;
Book No. I;
Series of 2024.

ACKNOWLEDGEMENT

REPUBLIC OF THE PHILIPPINES)
CITY OF CITY OF MANILA) S.S

BEFORE ME, a Notary Public, for and in the City of CITY OF MANILA on this _____ day of 22 AUG 2024 personally appeared the following person:

ZHE LIU — Chinese Passport No. PE2191680, Expiration Date: June 10, 2027

known to me and me known to be the same person who executed the foregoing instrument and he hereby acknowledged to me that the same is his free and voluntary act and deed, as well as that of the entity herein represented.

WITNESS MY HAND AND SEAL on the date, year and place first above mentioned.

ATTY. JOHN EDWARD TRINIDAD ANG
Notary Public
Notary Public for Manila until Dec 31, 2024
Notarial Commission No. 2023-091
2nd Floor Midland Plaza Hotel, Adriatico St., Ermita Mla
IBP No. 329702 - Jan. 3, 2024
P.T.R. No. 1535527 - Jan. 3, 2024
Roll No. 63731 / MCLE No. VII-0011675-04/14/2025
TIN NO. 252-279-193000000

Doc. No. 756-B;
Page No. 153;
Book No. I;
Series of 2024.

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
NATIONAL CAPITAL REGION
2nd Street, Port Area, Manila

08 SEP 2022
40372

September 8, 2022

MR. LIU ZHI
Contractor's Representative
China Harbor Engineering Company
5th Floor, Two E-Com Center, Ocean Drive
Mall of Asia Complex (MOA)
Pasay City

SUBJECT : Access Ramp/Road Over Wave Wall from CCP to Island A

Sir:

This is in response to your letter dated August 31, 2022 requesting the DPWH-NCR to issue a NO OBJECTION to your proposed construction of a temporary access ramp/road across an existing seawall and sloping revetment for your reclamation project from CCP area to Island A.

In view of the foregoing, this Office interposes "**NO OBJECTION**" on the condition that the restoration expenses for damages to all existing structures shall be shouldered by your company. It is also advised that all other pertinent NATIONAL and LOCAL permits should properly be secured for the purpose.

For your information.

Very truly yours,

NOMER ABEL P. CANLAS
Regional Director

NCR.1 IEE / JBB / AMP
Letter China Harbor_CCP Reclamation -NO OBJECTION

China Harbour Engineering Company
Pasay Reclamation Development Project (PRDP)

Date: 31-Aug-2022
Our Ref.: CHEC-PRDP-EXT-124

By Hand / Email

Engr. Nomer Abel P. Canlas
Regional Director
DPWH – NCR
2nd Street, Port Area, Manila,
Metro Manila, Philippines

Thru : **Engr. Juby B. Cordon**
Assistant Regional Director

Subject : **Access Ramp/Road Over Wave Wall from CCP to Island A**

Our Ref : **Memorandum of Agreement dated November 10, 2021**

Dear Sir,

We write with regards to the on-going works at the SM Pasay Reclamation Development Project (Pasay 360 Project), where China Harbour Engineering Company is the Main Contractor.

In reference to the Memorandum of Agreement (MOA) between the City of Pasay and the Department of Public Works and Highways (DPWH), pursuant to sub-section 4.1.3 under section 4, would like to request your good office for a non-objection to construct and maintain a temporary access ramp/road, across the DPWH owned seawall and sloping revetment, from CCP area adjacent to Island A of the reclamation project all as shown on the drawings enclosed herewith.

We believe and ensure that there will be no damage the wave wall will incur and if there is any, CHEC will shoulder all the expenses for any repair or rehabilitation required in order to restore the DPWH property to its original condition.

In addition, whilst not discussed during the meeting, we also request you "no objection" to us constructing a temporary fence along the top of, and across the ends of, the seawall in order to prevent members of the public accessing the site, please see attached drawing for details. This is a matter of public safety and your assistance would be greatly appreciated.

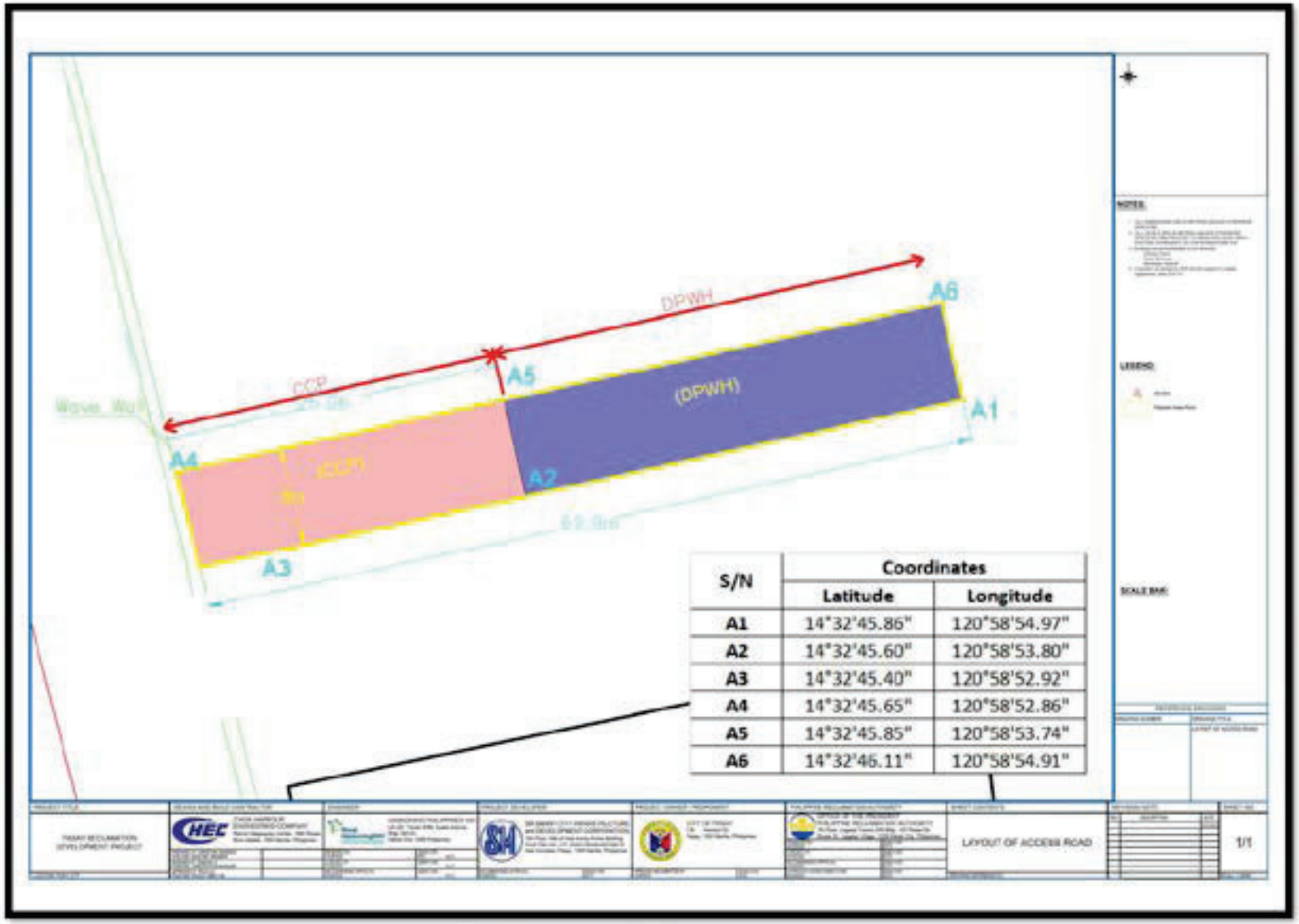
Thank you for your consideration, we are looking for your confirmation and approval for us to proceed with the works on site.

Best regards,

LIU ZHI
Contractor's Representative
China Harbour Engineering Company

QAQC-HE / Construction-MK / Contracts-SH / Deputy P.M - WG
Cc: D.C – GO

Encl: MOA dated Nov. 11, 2021
Temporary Access Plan
Fencing Details



S/N	Coordinates	
	Latitude	Longitude
A1	14°32'45.86"	120°58'54.97"
A2	14°32'45.60"	120°58'53.80"
A3	14°32'45.40"	120°58'52.92"
A4	14°32'45.65"	120°58'52.86"
A5	14°32'45.85"	120°58'53.74"
A6	14°32'46.11"	120°58'54.91"

ANNEX D.

Flushing Study: Verification of Flushing Time for Pasay 360 Temporary Access Bridges

Royal HaskoningDHV
Enhancing Society Together

Note / Memo

PT. Haskoning Indonesia
Water & Maritime

To:	SM Smart City Infrastructure and Development Corporation (SMSCIDC)
From:	Andaru Katri Lasrindy, Jashley Kesha Diaz Ng
Date:	14 November 2024
Copy:	Michiel Smits, Trevor Morrish-Hale
Our reference:	SF1013-RHD-L11-XX-TN-X-0001-P01
Classification:	Project related
Checked by	Michiel Smits, Trevor Morrish-Hale

Subject: **Verification of Flushing Time for Pasay 360 Temporary Access Bridges**

Contents

1 Introduction 2
2 Flushing studies 3
2.1 Introduction and scenarios 3
2.2 Model domain and settings 3
2.3 Methodology 4
3 Flushing study results 6
3.1 Effects Results Dry Season 6
3.2 Effects Results Wet Season 8
4 Conclusions and recommendations 10
5 References 11

Royal HaskoningDHV

1 Introduction

SM Smart City Infrastructure and Development Corporation (SMSCIDC) requested Royal HaskoningDHV (RHDHV) to carry out an assessment of the flushing times within the channels between PRDP islands. The objective of the assessment is to assess the implications on the flushing conditions from the temporary access bridges which are required during the construction period. The following temporary access bridges are considered:

- at the 476m-wide North-South (N-S) channel, having 5 x 10m openings; and
- at the 180m-wide East-West (E-W) channel, having 3 x 10m openings.

The locations of the proposed temporary access bridges are shown in Figure 1-1.

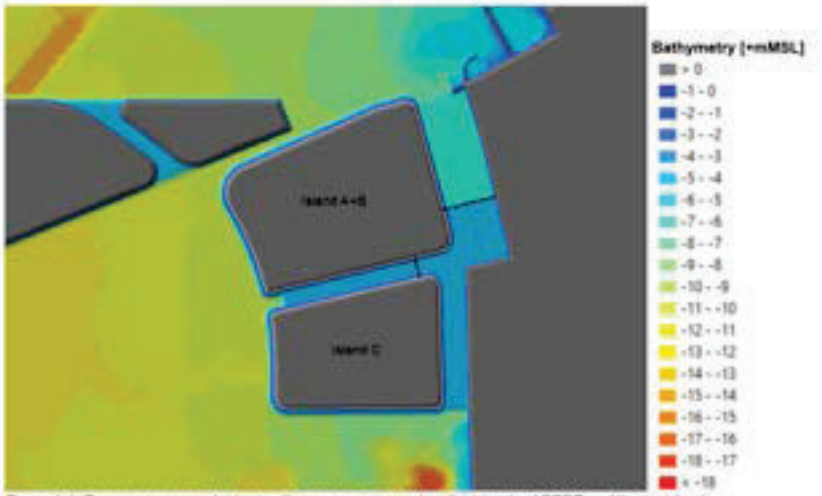


Figure 1-1 Temporary access bridges with openings, connecting the islands of PRDP and the mainland

2 Flushing studies

2.1 Introduction and scenarios

Flushing studies were conducted for the simulation scenarios shown in Table 2-1. The most critical condition is under the dry season (Amihan – northeast monsoon) where wind is low and less fresh water is coming into the channel system as the discharges from adjacent rivers and outfalls are low; the wet season (Habagat – southwest monsoon) simulation is only to observe any substantial changes between the two seasons.

Table 2-1: Model simulations for wet and dry seasons

Scenario	Island Overview	River/Channel Discharge	Wind field	Season
1	PRDP Island A&B and Island C + PHCC Island A and Island B	Low discharge	Normal winds dry season	Dry Season
		High discharge, 1:100-year return period	Normal winds wet season	Wet Season

2.2 Model domain and settings

The Hydrodynamic and Mud Transport Modules of a MIKE21 Flexible Mesh (FM) model were used for the flushing studies. The model domain covers the entire Manila Bay, and all model settings remain the same as outlined in *BE8289-R0009-WdH_Phil Pasay and Parañaque Reclamation Development - Hydraulic and Morphological Study* [1]. Grid refinement was performed close to the Project Site to enhance the detail in the area of interest, which is in the channels between the islands and the area where the access bridges will be built. The smallest distance between the elements at the Project Site is 30m.

The bridges were incorporated into the model as weir structures. The span of the access bridges is represented as yellow lines in the figure below, where the openings are **10.0m wide** which are placed along the 476m stretch in the N-S channel (five in total) and the 180m stretch in the E-W channel (three in total).

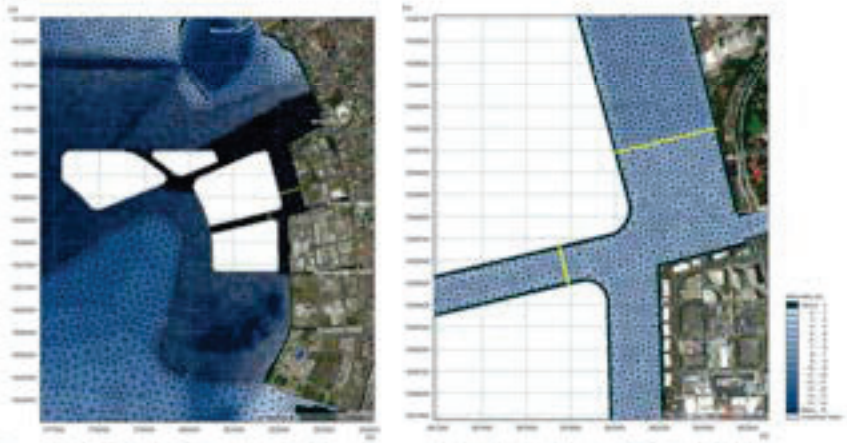
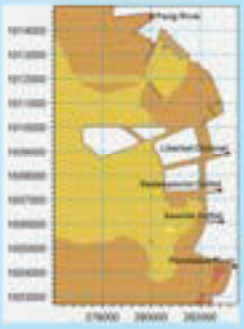


Figure 2-1: Mesh at Project Site surroundings (left) and temporary bridges location between PRDP islands (right)

The discharge applied for simulations is obtained from previous RHDHV studies [1], values are provided in Table 2-2.

Table 2-2: Inflow discharges during wet and dry seasons

Source	Wet Season Discharge [m³/s]	Dry Season Discharge [m³/s]	Inflow Location
Pasig River	275	50	
Libertad Channel	75	-	
Redemptorist Outfall	75	-	
Seaside Outfall	59	-	
Parañaque River	696	5	

2.3 Methodology

The objectives of this study are to see whether the proposed access bridges allow sufficient water exchange, to ensure the system has the time to process any pollution before they exceed limits that may lead to major problems like algal bloom and low oxygen levels. In terms of changes in water quality, the flushing time (T_f) can be correlated to the water exchange parameter. A criterion for water exchange has been suggested by the Permanent International Association of Navigation Congresses [2], which is based on the United States Environmental Protection Agency (USEPA) criteria:

Table 2-3: PIANC and USEPA water exchange criteria [2]

Criteria	Description
Good	Flushing time required up to 8 tidal cycles (4 days)
Fair	Flushing time required up to 10 days
Poor	Flushing time required more than 10 days

The flushing time T_f is defined by the time it takes for an initial concentration to have dropped to 37% of its original value [1]. The initial tracer concentration field is shown in Figure 2-2 (the area with a red colour) which is set at (an arbitrary value of) 100 kg/m³ at the N-S and E-W channels where the proposed bridges will be built, whereas the remainder has been set to 0 kg/m³.

The above references are valid for permanent structures. In case of temporary obstructions, such as the temporary access roads required for construction of the islands, such criteria would not necessarily apply. The temporary structures are expected to be in place for approximately 18 months, during which time any algal bloom can be monitored and cleaned in case it becomes excessive. A flushing time between 10-15 days is targeted for such temporary situations.

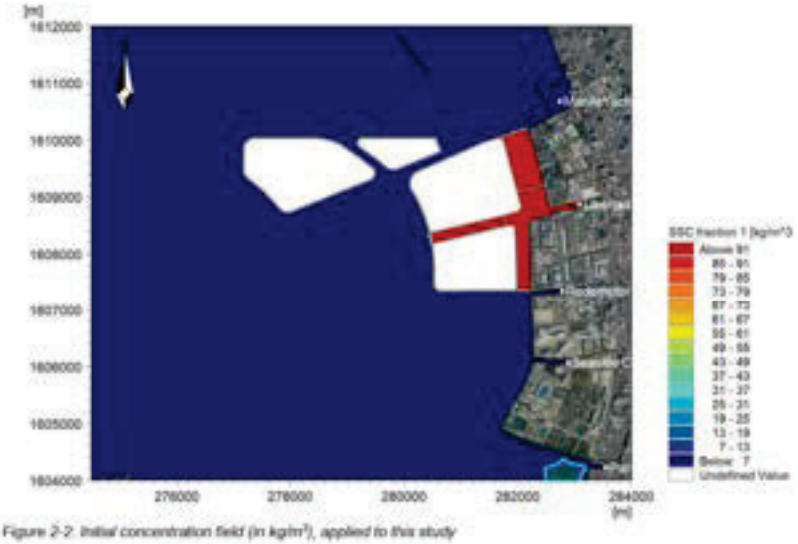


Figure 2-2 Initial concentration field (in kg/m³), applied to this study

Royal HaskoningDHV

3 Flushing study results

3.1 Effects Results Dry Season

The 2D plots of concentration at various moments in time are presented Figure 3-2 during the dry season. The T_f is provided as the time required to achieve a concentration value below 37 kg/m³, which is shown by a bright light blue colour. It is visible from Figure 3-2 that the flushing time is reached within 11 days.

In the dry season, it is expected that limited discharges go into the channel, hence the force to move the concentration out of channels system mainly depends on tidal movement and winds. As the wind is coming from the northeast during the dry season, most of the initial concentration is being pushed towards the south along the N-S channel instead of to the north or through E-W channel. During flood tide condition, water enters from both north of N-S channel and west of W-E channel, pushing concentration out through the channel between PRDP Island C and mainland. The concentration is only able to move out of the E-W channel during low tide, since the existence of the temporary bridge in the E-W channel will hinder the movement of water coming into the system at flood tide (see Figure 3-1).

The N-S channel (the 476m wide channel) generally has higher current speeds compared to the E-W channel, which results in a day faster of T_f, meaning that the T_f can be reached **within 10 days** and still be categorised as "Fair" condition in terms of water exchange. Ensuring the flow of the N-S channel is more sensitive due to its position directly adjacent to existing facilities and buildings on the mainland.

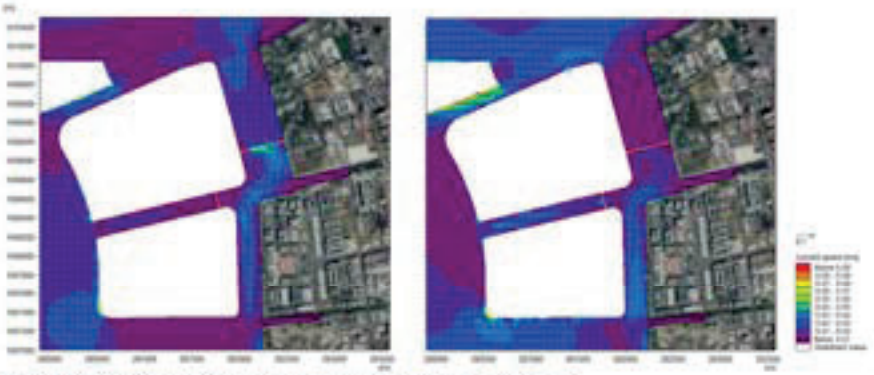


Figure 3-1: Current speed during flood tide (left) and ebb tide (right) in the dry season

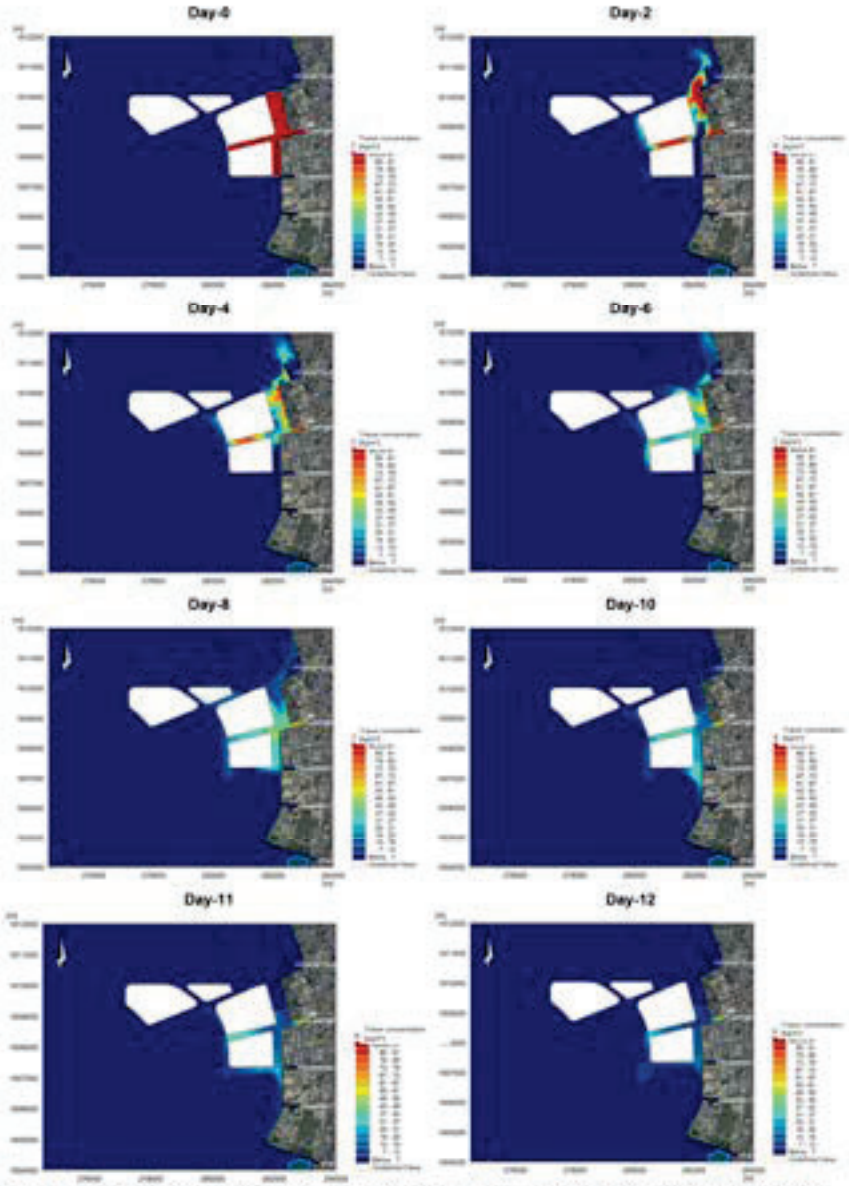


Figure 3-2: Tracer distribution (in kg/m³) in various time steps during the dry season; ***In the 475m wide channel flushing is achieved within 10 days****, in the 180m wide channel within 11 days*

Royal HaskoningDHV

3.2 Effects Results Wet Season

Figure 3-3 displays 2D concentration plots during the wet season at different times. During this season, the movement of concentration out of the channel system is significantly faster, due to higher current speeds which are influenced by the southwest wind in combination with the discharges coming from the outfalls (see Figure 3-4). This condition efficiently flushes the concentration from the channels between the islands, mostly towards northeast following the wind direction, providing a shorter T_f despite the presence of temporary land bridges. The T_f is reached way faster compared to the dry season allowing it to fall in the "Good" criteria requirement of 4 days.

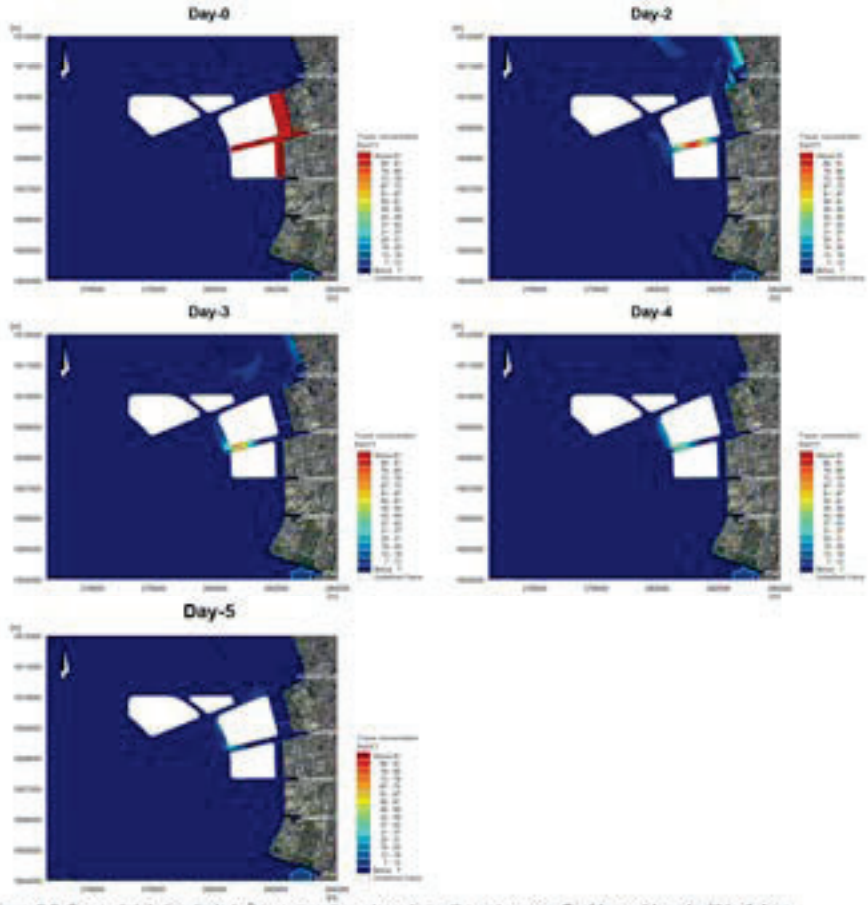


Figure 3-3 Tracer distribution (in kg/m³) in various time steps during the wet season, ***flushing achieved within 4 days***

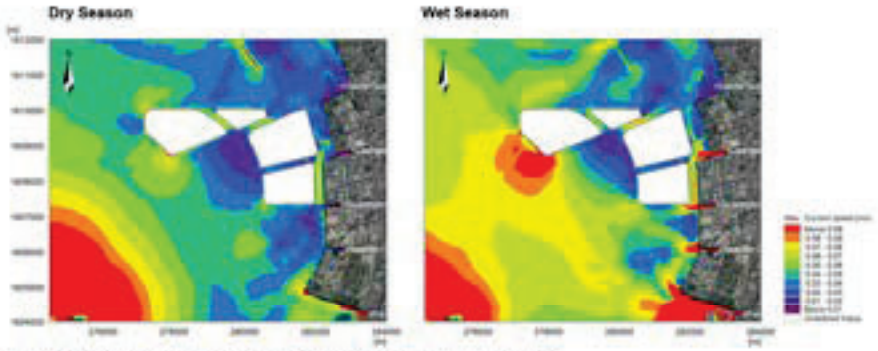


Figure 3-4: Maximum current speed during dry season (left) and wet season (right)

4 Conclusions and recommendations

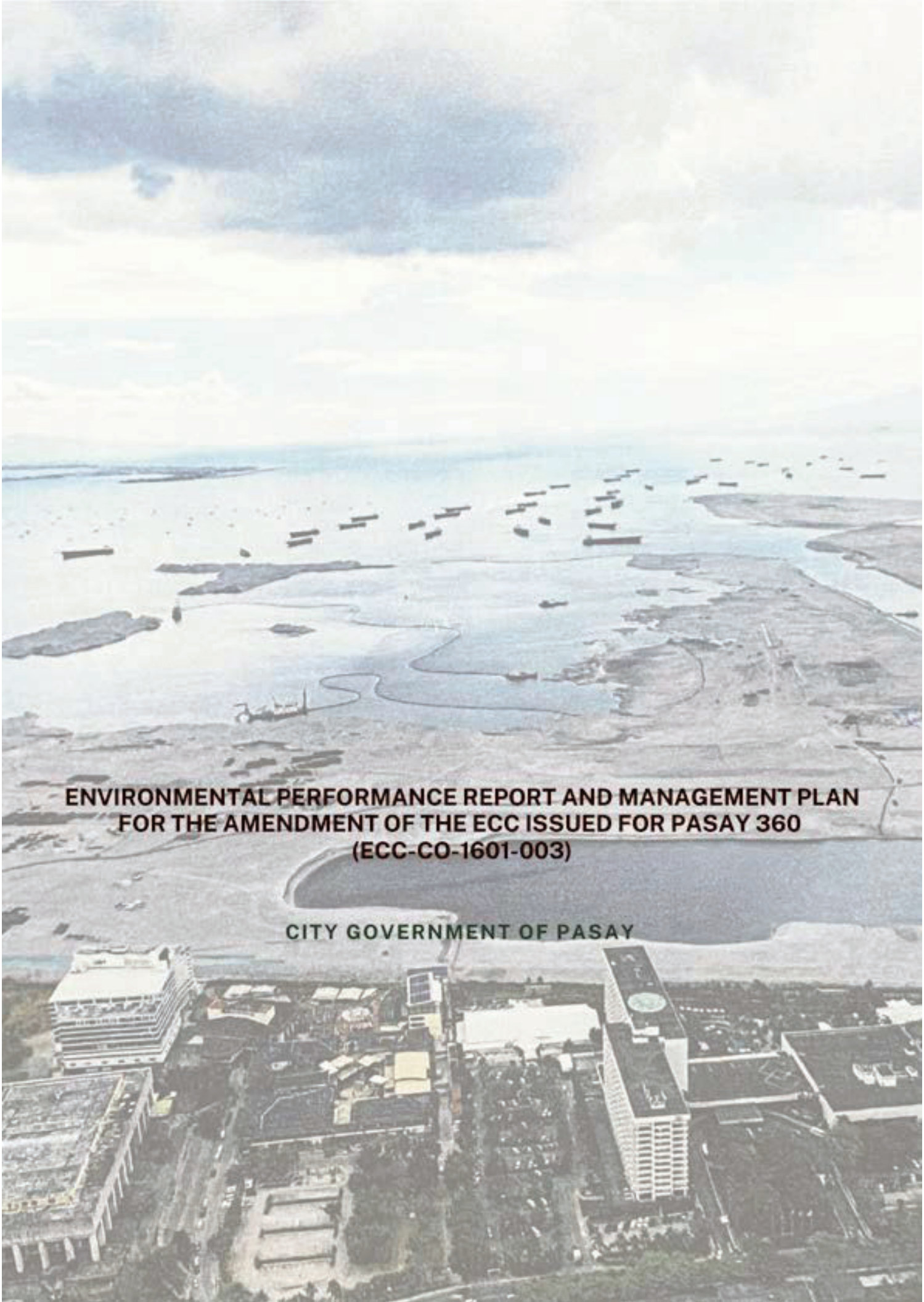
The proposed temporary access bridges aim to connect islands A+B and C of the PRDP reclamation with the mainland, during construction of the islands. Potential water quality issues because of these temporary access bridges were evaluated by means of flushing studies. The following conclusions were drawn from this assessment:

- For a temporary situation (less than 2 years), flushing criteria of 10-15 days are suggested. This may be done in combination with monitoring and if needed cleaning of water in case of excessive algal bloom;
- **During the wet season**, both channels (the 476m wide channel and the 180m wide channel) flush very well, with flushing time, **less than 4 days**. This shows the flow of water is not significantly hindered by the presence of the temporary bridges;
- During the dry season, the flushing time required in the **N-S channel (476m wide channel)** is still within the "Fair" water exchange category, reaching the required flushing level **within 10 days**. For the **E-W channel (the 180m wide channel)** the flushing time required is slightly more, the required flushing level is reached **within 11 days**, however:
    - The E-W channel is located far from existing land, and no developments are constructed yet on the islands. Temporary water quality issues in that channel would not cause hindrance, and can easily be cleaned should it be required;
    - During the wet season flushing conditions can be considered "Good" (within 4 days), water quality issues that might have built up during the dry season will flush during the wet season.
- Considering that this is only a temporary condition during a construction stage of approximately 18 months, we can conclude that the proposed temporary land access bridges with three 10m openings in the E-W channel (180m wide) and five 10m openings in the N-S channel (476m wide), still allow an adequate water exchange in between the islands.

5 References

[1] Royal HaskoningDHV, "Pasay and Parañaque Reclamation Development - Hydraulic and Morphological Study," Ref no. BE8289-R0009-WdH_Phil, 2017, 2017.

[2] PIANC, "Protecting water quality in marinas," PIANC Report No.98-2008, 2008.



ENVIRONMENTAL PERFORMANCE REPORT AND MANAGEMENT PLAN FOR THE AMENDMENT OF THE ECC ISSUED FOR PASAY 360 (ECC-CO-1601-003)

CITY GOVERNMENT OF PASAY