PROJECT DESCRIPTION REPORT (PDR) for SCOPING

1.0 BASIC PROJECT INFORMATION

Table PD-1. Project Fact Sheet/PD Summary

ITEM	Project Information
Name of Project	**PROPOSED DIAMOND RECLAMATION AND DEVELOMENT PROJECT**
Location	Along Coast of Manila Bay in the territorial jurisdiction of the Bacoor City
Nature of Project	Reclamation Project ECP in an ECA (Presidential Proclamation 2146 dated 14 December 1981)
Project Classification & Type	Major Reclamation Project ≥ 50 hectares
Project Classification Code	D.1.
Size/Scale	100 Hectare
Status of ECC	Being Applied For

Tble PD-2. Project Proponent/EIA Preparer

ITEM	Project Information
Project Proponent	**Bacoor City Government**
Proponent Address	Molino Boulevard, Bacoor, Cavite, Philippines
Telephone Number	**Office of the City Mayor:**
Responsible Officer	**The Honourable Mayor Lani Mercado Revilla**
EIA Preparer	Technotrix Consultancy Services, Inc.
Contact Person	**Edgardo G. Alabastro, Ph.D.**
Address	Unit 305 FMSG Building, Balete Dr. QC 1101
Contact Numbers	(632) 416.4625; 0917.8255203
Email address	technotrixinc@gmail.com

2.0 PROJECT DESCRIPTION

Project Area, Location and Accessibility

Location and Political Boundaries

This proposed project forms part of a larger reclamation effort that is is divided into two Area A (Bacoor Reclamation and Development Project-BRDP) and Area B (Diamond Reclamation and Development Project DRDP). Area B covers 100-hectare reclamation which is the proposed project and Area A ECC application will be subject to a separate application.

The proposed project will include 1 reclaimed area. The impact barangay for the Proposed Project are Sinegueslasan, Alima, Campo Santo, Tabing Dagat, Digman, Kaingin, Maliksi III, Maliksi I, Talaba II, Talaba I and Zapote V.

Geographic Coordinates (Shape File Data) of Project Area

Table PD-3. Geographic Coordinates (Shape File Data) of Project Area

NAME / ID	LATITUDE PRS92 (Decimal)	LONGITUDE PRS92 (Decimal)	LTITUDE PRS92 (Deg Min Sec)	LONGITUDE PRS92 (Deg Min Sec)
D-01	120.9457810	14.4717880	120°56'45"	14°28'18"
D-02	120.9462960	14.4712320	120°56'47"	14°28'16"
D-03	120.9466810	14.4707300	120°56'48"	14°28'15"
D-04	120.9469920	14.4701810	120°56'49"	14°28'13"
D-05	120.9470970	14.4698110	120°56'50"	14°28'11"
D-06	120.9470820	14.4694410	120°56'49"	14°28'10"
D-07	120.9468820	14.4690230	120°56'49"	14°28'8"
D-08	120.9465050	14.4686950	120°56'47"	14°28'7"
D-09	120.9459230	14.4684460	120°56'45"	14°28'6"
D-10	120.9450440	14.4682300	120°56'42"	14°28'6"
D-11	120.9442380	14.4680700	120°56'39"	14°28'5"
D-12	120.9430530	14.4678510	120°56'35"	14°28'4"
D-13	120.9422660	14.4677090	120°56'32"	14°28'4"
D-14	120.9415070	14.4675760	120°56'29"	14°28'3"
D-15	120.9406650	14.4674060	120°56'26"	14°28'3"
D-16	120.9400170	14.4672740	120°56'24"	14°28'2"
D-17	120.9390630	14.4671570	120°56'21"	14°28'2"
D-18	120.9384220	14.4672420	120°56'18"	14°28'2"
D-19	120.9377590	14.4677240	120°56'16"	14°28'4"
D-20	120.9375230	14.4681730	120°56'15"	14°28'5"
D-21	120.9373980	14.4686600	120°56'15"	14°28'7"
D-22	120.9372440	14.4692640	120°56'14"	14°28'9"
D-23	120.9371380	14.4696880	120°56'14"	14°28'11"
D-24	120.9368500	14.4708240	120°56'13"	14°28'15"
D-25	120.9365610	14.4719600	120°56'12"	14°28'19"
D-26	120.9362810	14.4730970	120°56'11"	14°28'23"
D-27	120.9360020	14.4742150	120°56'10"	14°28'27"
D-28	120.9356940	14.4754770	120°56'8"	14°28'32"
D-29	120.9355500	14.4760270	120°56'8"	14°28'34"
D-30	120.9354710	14.4765410	120°56'8"	14°28'36"
D-31	120.9355680	14.4769850	120°56'8"	14°28'37"
D-32	120.9357880	14.4772850	120°56'9"	14°28'38"
D-33	120.9361290	14.4775140	120°56'10"	14°28'39"
D-34	120.9365080	14.4776710	120°56'11"	14°28'40"
D-35	120.9371560	14.4778210	120°56'14"	14°28'40"
D-36	120.9378500	14.4779450	120°56'16"	14°28'41"
D-37	120.9385260	14.4780770	120°56'19"	14°28'41"
D-38	120.9392020	14.4782100	120°56'21"	14°28'42"
D-39	120.9398870	14.4783240	120°56'24"	14°28'42"

NAME / ID	LATITUDE PRS92 (Decimal)	LONGITUDE PRS92 (Decimal)	LTITUDE PRS92 (Deg Min Sec)	LONGITUDE PRS92 (Deg Min Sec)
D-40	120.9404630	14.4782660	120°56'26"	14°28'42"
D-41	120.9409470	14.4780890	120°56'27"	14°28'41"
D-42	120.9414420	14.4777140	120°56'29"	14°28'40"
D-43	120.9417610	14.4772290	120°56'30"	14°28'38"
D-44	120.9419780	14.4768330	120°56'31"	14°28'37"
D-45	120.9423090	14.4762130	120°56'32"	14°28'34"
D-46	120.9426580	14.4755740	120°56'34"	14°28'32"
D-47	120.9431480	14.4747200	120°56'35"	14°28'29"
D-48	120.9435330	14.4741360	120°56'37"	14°28'27"
D-49	120.9440680	14.4734540	120°56'39"	14°28'24"
D-50	120.9446020	14.4728890	120°56'41"	14°28'22"
D-51	120.9451820	14.4723520	120°56'43"	14°28'20"

Figure PD-1. Expanded Google Earth Map indicating the Proposed Project

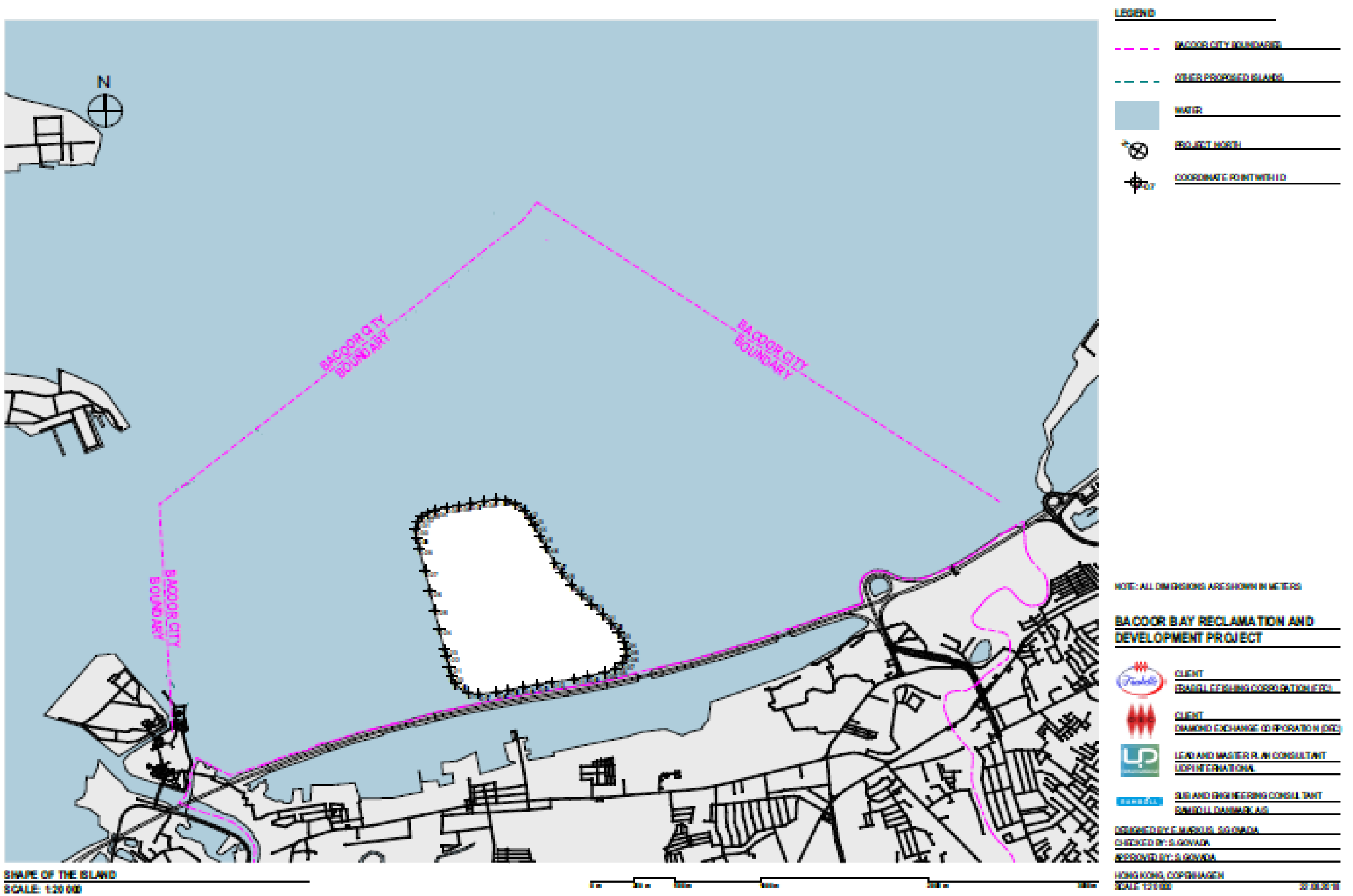


Figure PD-2. Proposed Project indicating its Geographical Points (NAMRIA Map)

Accessibility

The project site lies along both sides of CAVITEX. The access to the islands is key to the success for the development. In this case, there has to be at least 2 access points to the upper island and 2 access points to the lower island between the mainland and CAVITEX.

There will be two access points to secure sufficient capacity, to distribute traffic loads at a larger part of the transportation network and to secure accessibility even in a situation where an event of emergency occurs at one of the access points. In this case, there will always be another access option in case it will be congested.

The existing intersection on CAVITEX has to be supplemented with 'the second half' of the intersection providing access to the upper island. Based on traffic data collected, a study of the existing intersection will validate if this interchange can be expanded in a cost-efficiently way to provide sufficient capacity to all directions needed for the traffic flow between the project and Bacoor/Cavite/Manila.

At the western end of the BRDP island, it is proposed to secure an access to the other proposed "Diamond" island and subsequent to the BRDP Island from CAVITEX and from Bacoor Bypass Road. This can serve as access to the lower islands as well. In this case, two high capacity access points to the upper islands as well as to the lower islands are planned. The distance between the two interchanges is approximately 2.5 km.

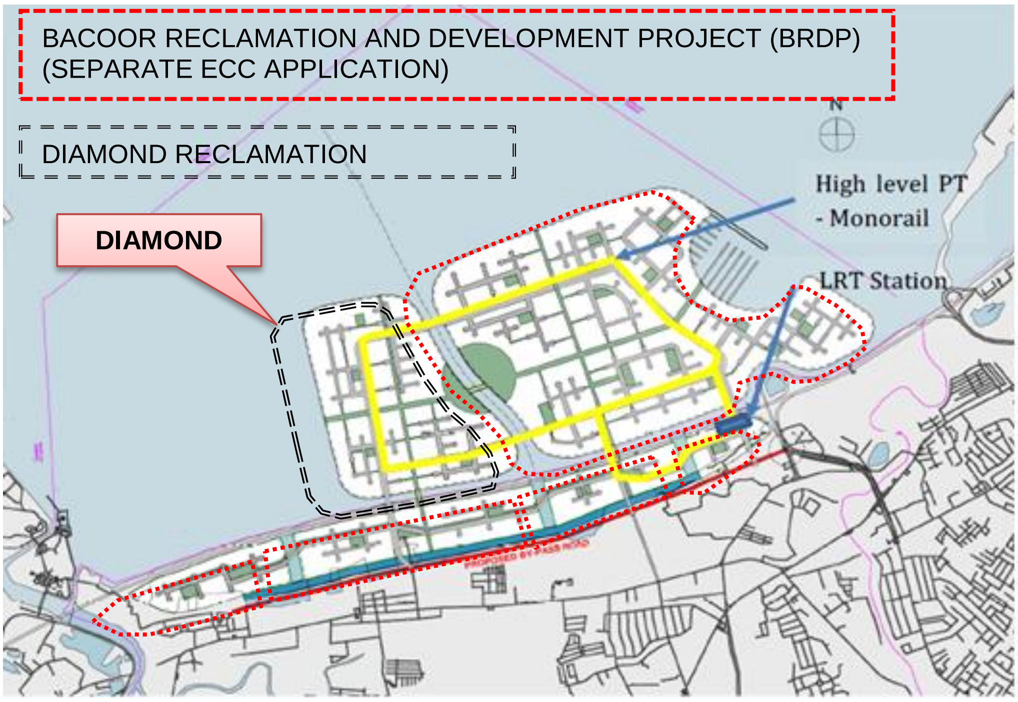


Figure PD-3. Proposed Access Ways

Vicinity Map and Adjacent landmarks

Important landmarks adjacent to the project site include: Muntinlupa-Cavite Expressway; Iglesia ni Cristo Bacoor Bay; Fish pens in Bacoor; St. Michael the Archangel Parish Church Bacoor; Cavite Post Office; Bacoor National High School Main; Digman Elementary School; Cavite Solas Training Site; Sineguelasan Elementary School; Imus River; and. Las Piñas – Parañaque Wetland Park. The vicinity map is shown in page **PD-4.**

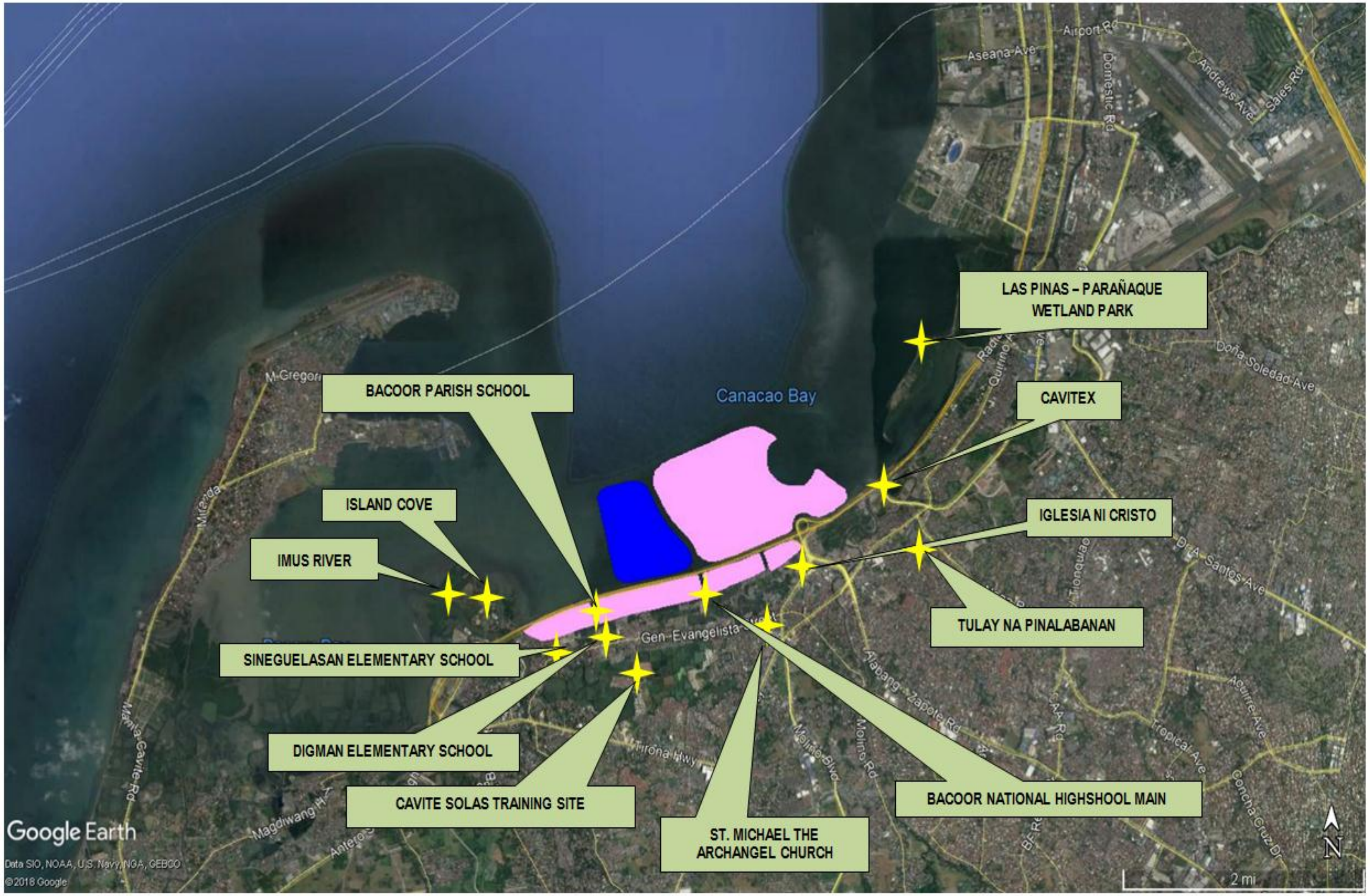


Figure PD-4. Vicinity Map Showing the Important Landmarks

3.0 Project Rationale

Bacoor was once famous for its long established agri-fishery industry. However, being in close proximity to Metro Manila, Bacoor has converted from a historic town to a city in 2011. It is estimated that Bacoor's population will be doubled to 1 million in 2024. With such rapid growth, land developments are much needed to facilitate this expansion.

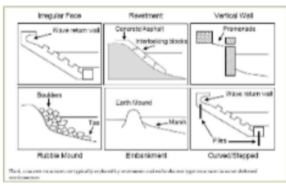
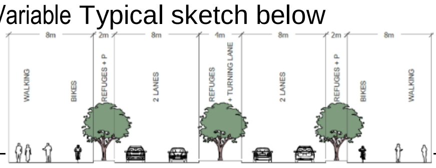
The City of Bacoor is known to be the gateway and a bedroom community of Metro Manila. To reposition the city's image and rise to new heights, this project aims to create a unique identity for Bacoor Reclamation and Development project with well-planned, integrated and mixed-use development characteristics. It will also address some of the city's need for extra residential and commercial land, as well as to provide much needed community, high quality landscape and public open space to the people of Bacoor.

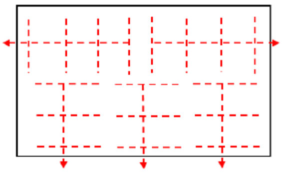
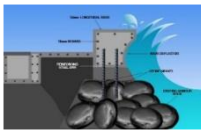
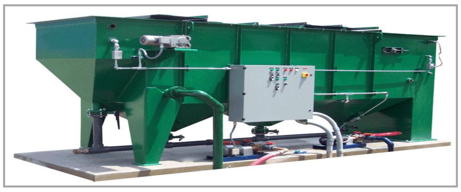
The City of Bacoor primarily depends on income from trade, commerce and service sectors. Being a historic and coastal town, the city also developed its tourism based on heritage sites and seafood restaurants. Bacoor Bay has strong accessibility to Metro Manila especially as the mid and major access point from the Cavite province through the CAVITEX, which makes the city increasingly attractive to live given its proximity and lower cost of living. However, it is still dealing with informal settlements with lack of employment opportunities. Building a waterfront CBD of mixed-use developments will attract economic developments in the City of Bacoor by enhancing and creating new sectors as well as provide adequate housing to support the future growth of the city. Other than a CBD, the site also has a great potential for a Science Park with mixed-use developments including, retail, entertainment, cultural and historic preservation area. The project can help bring research and technology sector to the Bacoor Bay, especially from Manila where the institutes are overwhelmed.

In addition, the project allows the city to address the issue of public open space. Currently, there are no public green spaces and development that is large enough to become a tourist attraction. The City Government implemented policies to encourage urban forestry throughout Bacoor and has required developers to enhance the green and sustainable development of the city. Taking the opportunity, the project aims to create a "Green and Blue Network", which prioritizes public green space, to make this reclamation project an environmentally-friendly and pedestrian-oriented development. A Central Park is designed as a shape large enough to function as an urban forest and serve as a tourist attraction. The Marina is placed strategically facing Metro Manila to provide a city skyline. To complement the Central Park and Marina, a promenade will loop through the entire outer islands to make the whole waterfront an active open space. The Bacoor Reclamation and Development Project will create a smart, walkable, livable, and sustainable community.

4.0 Project Components

The initial project developmental concept is shown in page **PD-9.**

Component	General Description	Size / Capacity
Island 1: Bacoor Reclamation Outer Island	To be based on Final Design and Engineering Details (DED) especially the Containment Structures	100 hectares
Containment Structures	Based on Final Design and Engineering Details	Typical 
Internal Road Networks	To be based on Final Master Plan	Variable Typical sketch below 

Component	General Description	Size / Capacity
Drainage System	Based on Final Master Plan	Typical 
Storm Surge Protection	Based Final Design	Typical 
Access ways	Based Final Master Plan	Initial Concept 
Pollution Control Devices		
Waste Water from Sea Vessels	Bilge Oily Water Treatment System	
Air Pollution Control System	Specification Marine Diesel Fuel	Not Applicable
Sedimentation Pond During Soil Stabilization	To be designed based on storm water flow	
Support Facilities (for Construction Works)		
• **Electricity (Stabilization Works)**	Meralco	As Needed Basis
• **Water**	To be Purchased	Stored in Water Tanks
• **Communication**	Radio; mobile phones	AS needed Basis

100-hectare outer island

The main feature of the 100-hectare island will be the Science Park, a technology and research hub that cultivates innovative developments, on the south side of the Central Park. The Science Park will consist of hi-tech industrial and mixed-use development. The clustering of businesses will encourage interaction and cooperation between companies to foster new ideas. Provisions of indoors and outdoors open-spaces are envisioned for providing leisure space and stimulating creative innovations.

Mirroring the 230-hectare island, the North of Central Park in the 100-hectare island is also part of the CBD. Similarly, commercial and retail mixed-use will facilitate the different use in CBD. Together the outer islands share a core business center with a sizeable green open space that forms a vibrant lifestyle.

Figure PD-5. Preliminary Master Development Plan

5.0 Project Alternatives

Alternatives in Siting: Establishing the Location of the Proposed Project

The key to siting of the project is to determine the best option available that will not result in serious environmental and social impacts.

- **Territorial Jurisdiction**

The site should be legally within the jurisdiction of the LGU-Proponent, hence this project will be within the municipal waters (foreshore and offshore areas) of Bacoor City.

- **Distances from important landmarks**

Bacoor City is home to a lot of historical and cultural sites and important landmarks. This is the location of the Battle of Zapote Bridge (a.k.a. Tulay na Pinaglabanan), which happened in 1897 and 1899. Other historical landmarks in the city include: Bahay na Tisa (The First Malacañang); St Ezekiel Moreno Park; St. Michael The Archangel Church built in 1669; Prinza Dam built in the 18^{th} century on the Zapote River found on the border between Barangay Talon Dos, Las Piñas and Barangay San Nicolas, Bacoor; and Molino Dam located in Brgy. Molino 3 which was constructed in the 18^{th} century. Among these, the nearest important landmarks to the project site are Tulay na Pinaglabanan and St. Michael Church.

- **Must not be in or conflict with ECAs or Protected Areas as declared in the NIPAS, principally the LPP Wetland Park and mangrove communities**

The project site is not within the LPP Wetland Park nor does it infringe on the mangrove communities (see **page PD-4**). As the municipal waters of Bacoor City are all relatively near these ECAs, there is not much options left but to ensure they are at least at a safe distance, and potential impacts were evaluated by mathematical modeling.

Furthermore, there is an area visited by migratory birds in the fishponds along Brgy. Habay 1, during November and December. This site is about 1 km south of the inner reclamation islands.

- **Must not be in or cause disturbance of significant marine resources**

Bacoor has long been known for its mussel and oyster farms. However, this industry has rapidly dwindled in recent years. The site behind CAVITEX shall be partly infringing on these farms, and hence, considerations on just compensation and provision of alternate livelihood should be factored in.

- **Must not conflict with existing settlers**

The "inland" landforms are close to onshore institutions such as public schools and churches as well as private properties. Moreover, there are numerous informal settlers and a few commercial establishments such as floating restaurant on the foreshore areas that fall within the project site.

As repeatedly declared by the Bacoor LGU in various IEC fora on this project, the informal settlers shall be provided with in-city relocation.

- **With respect to the other possible reclamation projects in the future**

There is sufficient buffer zone between the site and these other projects.
Other factors considered were:

- Must not be in very deep waters otherwise dredging and reclamation costs would be prohibitive. Bacoor Bay is essentially shallow.
- Environmental impacts associated with the site must be minimal and/or readily manageable
- Site must be in conformance with the CLUP
- Site must be acceptable to other concerned government entities

Factors considered for the project components were:

The siting of the major components is largely determined by the master plan, which for the project involves mixed-used developmental structures/facilities and the allocations for the government and private sector.

The siting of the government offices will be determined by the government entities, i.e. the City Government of Bacoor and the Philippine Reclamation Authority (PRA).

The siting of the access way from the shore to the island is determined from the most feasible connecting points to the CAVITEX and the shortest feasible lengths.

Alternatives in Design: Establishing the Alignment of the Reclamation Layout

<u>The process of determining the of islands and shaping them</u>

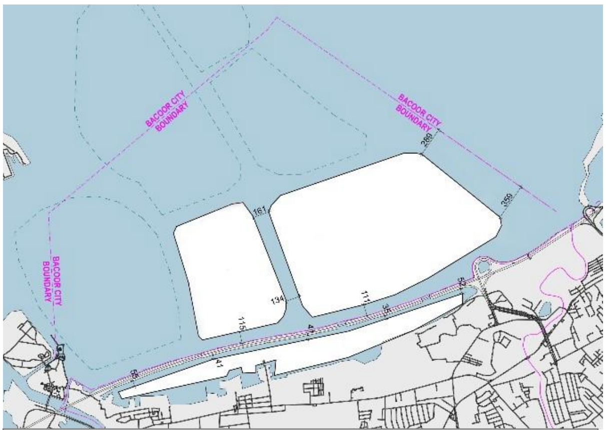
Note: this process was made with the combined two reclamation projects, Bacoor Reclamation and Development Project (BRDP) and Diamond Reclamation and Development Project (DRDP) to ensure compatibility and holistic approach.

Given the size of the project, the islands have been carefully shaped so that it would make the most sense in achieving high quality of the space while making it financially feasible. During the process of shaping the islands, concerns and issues have been considered to ensure the end result would be a win–win situation for everyone.

The initial coordinates for the 2 projects were first taken as a starting point for preliminary concepts and ideas. Initially, the project envisioned a marina at the center of the island to serve as the main attraction and gathering point for the people. An "organic" approach was also taken to the design of road and pedestrian networks to bring vibrancy and character to the development, all in all, to bring significant value to the projects by enhancing the quality of life on the islands.

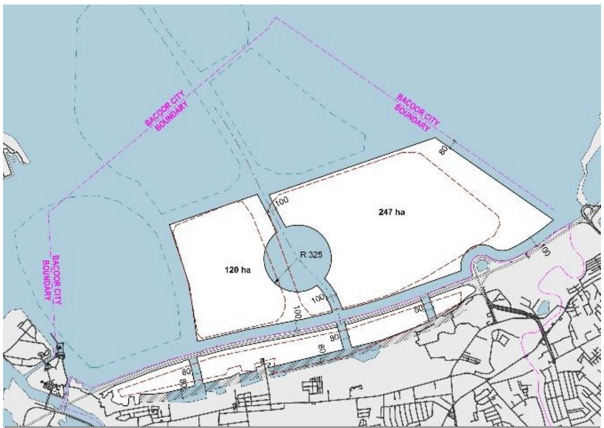
Through the ongoing discussion, concerns of existing flooding issues and feasibility of a center marina were identified. Finally, it was decided that it is better to add water canals to address the flooding issues, which will be in line with waterways of the existing traffic bridges and potential future reclamation projects. To better serve the expected high density of residential and working population, it was decided that moving the marina to the northeast side will be more suitable and replacing the designated location with a Central Park. The Central Park will give the development a unique identity and image while serving as a gathering point for the people. Meanwhile, the marina will be closer to the Bacoor City border with Las Piñas to give the flexibility to connect both reclaimed islands and grant the marina with a "front-row" view to the skyline of Metro Manila. Most importantly, the marina echoes Metro Manila’s developments and directly faces the Port Area, which allows the possibility of water transport connections to enhance connectivity in the future.

Below is a series of images that better illustrates the steps.



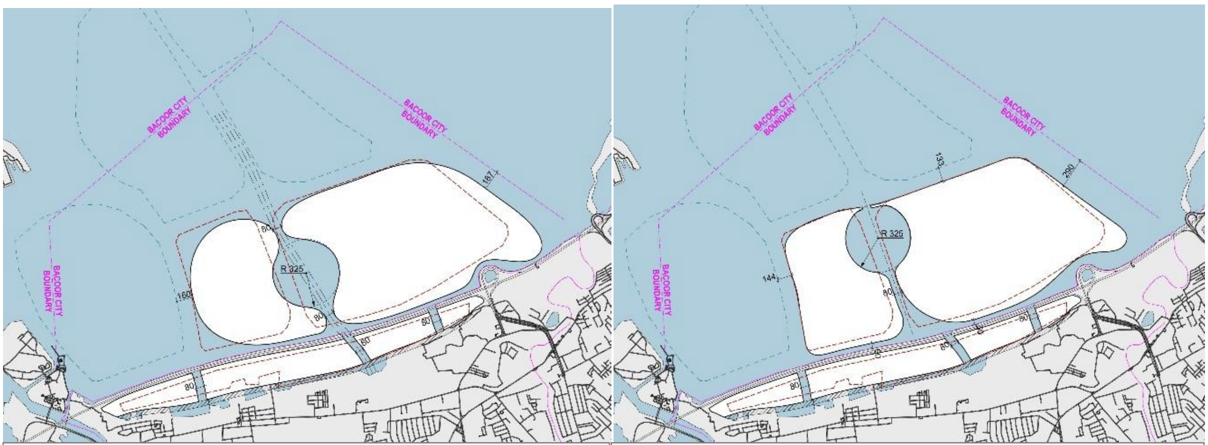
Step 1

The provided coordinates for the BBRD development were first taken as a starting point for initial concepts and ideas. The two outer islands are two from total of 6 potential reclamation projects in the Bacoor Bay. There is an additional inner island between Cavitex and Bacoor City.



Step 2

It was envisioned that the marina can serve as the main attraction for the islands and a gathering point for the people. However, due to the flooding issue in Bacoor, it was decided it is better to create water channels which will also be in line with the next reclamation projects.



Step 3	**Step 4**
Having a more "organic" development was taken into consideration to generate more exciting road and pedestrian path street perspectives that would increase the quality of the neighborhoods.	The financial feasibility came into concern of additional dredging required for the previous location of the marina, therefore exploring an option of moving the marina to the north was done.

Figure PD-6. Alternative Shapes of Landform (Steps 1-4)

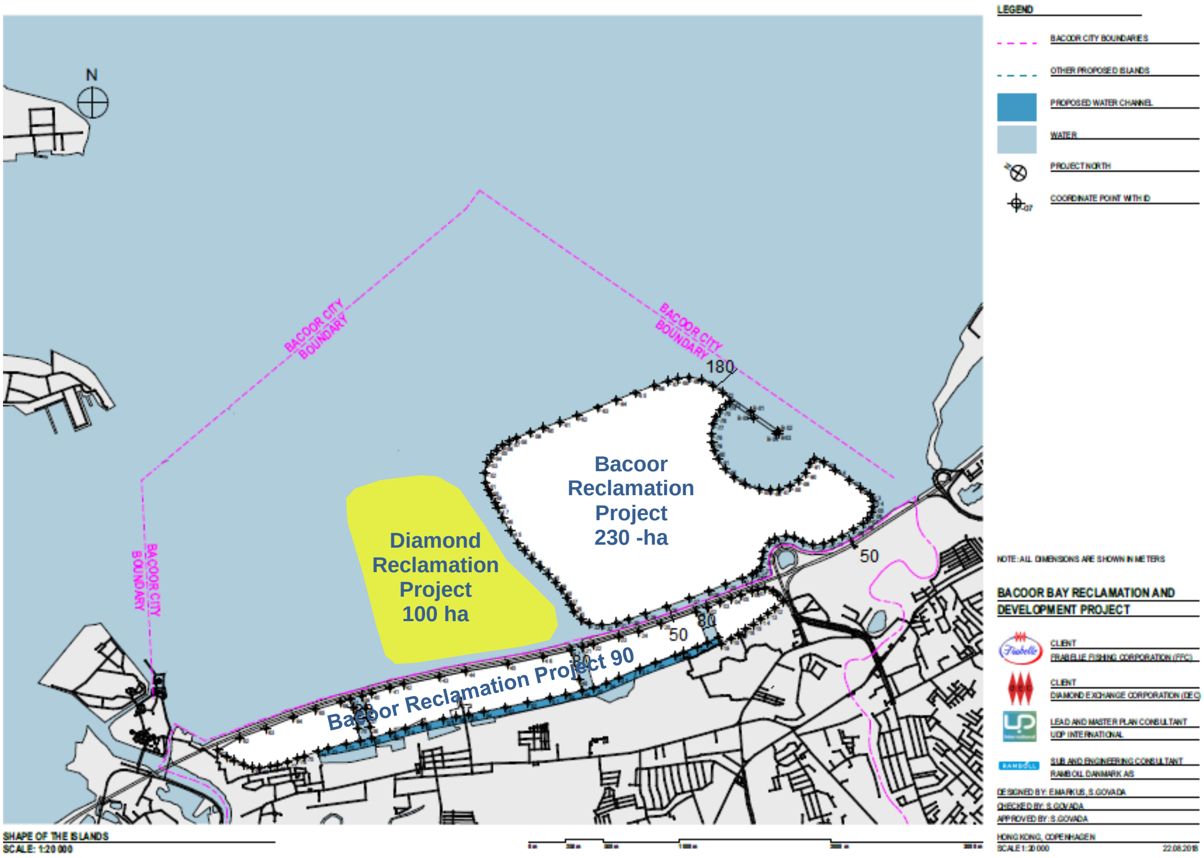


Figure PD-7. Final Shape of Landform (Step 5)

Taking into consideration that there might be around one million combined population of residents, visitors and working population, it was decided that moving the marina to the northeast side will be more suitable. By moving the marina closer to Bacoor 's border with Las Piñas gives more flexibility to connecting both of the islands with additional bridges if and when needed.

Technology Selection / Operation Processes

Choice of most suitable equipment for dredging and filling operation

Upon the determination of the reclamation/dredging contractor, details of the design and engineering will be discussed with them.

The methods are to be first evaluated on the basis of 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 and timetable factors will necessarily be considered also.

Choice of Methodology for Reclamation

The determining factors in the choice of the methodology are:

- The most environmentally sound filling method which is by direct discharge from the TSHD without the need for using temporary storage (re-handling pit) of fill materials before discharging by high pressure pumps. Another method which is "rainbowing" illustrated at the right plate could result in significant silt dispersal.
- The optimum method and choice of equipment by the Reclamation Contractor considering that each contractor has its own particular vessels and dredging equipment.
- The required timetable to complete the project noting also that each contractor will have different timelines based on the equipment available.
- The geotechnical aspects which will dictate the type and amount of containment structure, i.e. whether made of rocks or steel piles or a combination.

Choice of Methodology for Dredging

Choice of Methodology for Soil Stabilization

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

Raw Materials

The *"raw materials"* needed for reclamation is the fill materials and rocks. There will be no wastes or recycle streams when using these raw materials.

General Specifications for the Fill Materials (Preliminary)

- All materials used for fill shall be free of rock boulders, wood, scrap materials, and refuse.
- These should not have high organic content.
- Not more than 10 percent (10%) 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.

Estimated requirements = **8-10 million cu.m.**

General Specifications for Rocks (Preliminary)

- Rocks should be angular, hard, durable and not likely to disintegrate in seawater,

- Minimum unit weight is 2,650 kg/m^3 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

The firm requirements for the quantity and specifications will be made after the final reclamation methodology and contractor shall have been selected. Initially, the alternatives considered for making the best source option is provided below.

Option 1: San Nicholas Shoal (SNS) Since materials are also coming from Manila Bay, the characteristics are relatively similar to the seabed at project site, minimizing introduction of foreign materials. Also, this is closest to project site. However, the securing of necessary permits by the PRA to extract the sand is currently nowhere near completion, hence, other options are being looked into.

Option 2: **Lahar" from Mt. Pinatubo** its suitability with respect to quality is still to be evaluated. There are also other considerations such as transport, costs and permitting requirements

Option 3: Pampanga River considerations the same as in option 2

Power and Water Supply

Power Supply

During the dredging/reclamation works, electrical power that will be required by sea craft and auxiliary equipment (e.g. pumps) will be sourced onboard these sea vessels.

During soil consolidation, which may take approximately 1 to 2 years, the minimal power requirements of the maintenance crew and for lighting on the reclaimed land will be sourced through MERALCO.

Water Supply

The reclamation works are "dry" in nature. Water supply by the vessel/barge crews will also be onboard. Mobile water tanks most likely to be used by contractors. Underground water extraction will not be undertaken. Internal sourcing by individual contractors or water can be tapped from the MWSS-designated concessionaire.

No other alternatives considered.

6.0 Process Technology (Methods of Reclamation and Dredging)

The specific methodology for the dredging and reclamation works to be applied will depend on major factors such as:

- The Contractor to be selected noting that each Contractor may possess different equipment and technologies
- The result of the geotechnical and soil investigations which will be undertaken to serve as inputs to the Design and Engineering Details (DED) post ECC.
- The source and properties of the filling materials.
- The volume and properties of the sea bed silts at the reclamation site.
- The requirements for protection against natural hazards as well as for compliance with the PRA guidelines prior to securing of the Notice to Proceed (NT).

The major activities or aspects of the reclamation works are:

1. **Clearing of the site of debris, scraps, plastic wastes and silts.**

The soil wastes will be collected and disposed on shore through a third-party disposal entity.

Silts are accumulated soil wastes discharged with storm water from onshore and are not natural components of the sea bed. Depending on the reclamation technology these will most likely be disposed outside of the reclamation site and in likelihood in an approved dump site on shore.

2. **Dredging at the Reclamation Site to remove unwanted seabed materials and prepare the seabed for filling.**

The initial layer of sub seabed of up to approximately 10 meters that is composed mainly of soft clayey fine soils which by themselves may not be suitable but which in combination with the filling sands may be fitted for re use as reclamation fill. The re-use or alternately the disposal would depend on the technology to be used by the prospective reclamation Contractor. If not suitable, these layers would be disposed outside of the reclamation site.

The dredging operation could be undertaken either hydraulically or mechanically and the former method may likely be adopted. Hydraulic dredging is a floating dredge or pump by which water and soil, sediment, or seabed are pumped onboard they are discharged overboard to an approved disposal site.

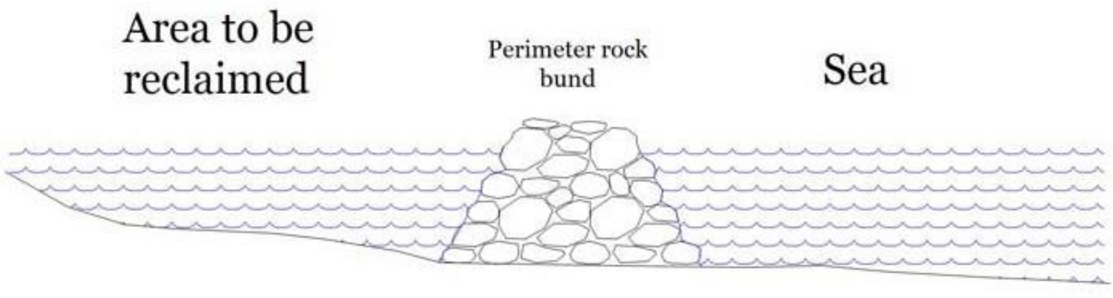
Hydraulic digging makes use of the erosive working of a water flow. For instance, a water flow generated by a dredge pump is lead via suction mouth over a sand bed. The flow will erode the sand bed and forms a sand-water mixture before it enters the suction pipe. Hydraulic digging is mostly done in cohesion less soils such as silt, sand and gravel. A hydraulic dredger is shown in the plate below for illustration purposes.

Plate PD-1. An Illustration of a Typical Hydraulic Dredger

3. **Creating a perimeter rock bund or silt curtain.**

Part of the environmental requirement is to provide a perimeter bund surrounding the proposed reclamation area. A rock bund is constructed along this perimeter to: contain the sand on the site, preventing the sand from being washed back to sea; protect the reclaimed site from storm waves and flooding; and control the level of turbidity during reclamation works.

Plate PD-2. Cross-section of a Typical Perimeter Rock Bund



Source: http://www.stp2.my/technology.php. Tanjung Pinang Development.

Another option for temporary containment is the use of silt curtains as illustrated below.

Plate PD-3. Illustration of Silt Curtain

4. Transport of materials from source and Sand filling.

Sand is dredged from a sand source location using trailer suction hopper dredger (TSHD) and sand carrier vessel. The sand is then transported to the site and then conveyored or directly discharged through steel pipes onto the site. During this process, both sand and seawater are pumped onto the site. The seawater subsequently drains away leaving only the cleaned sand behind. This essentially forms the reclaimed land. http://www.stp2.my/technology.php

Plte PD-4. Illustration of Sand Filling by Rainbowing

5. Construction of Containment Structures

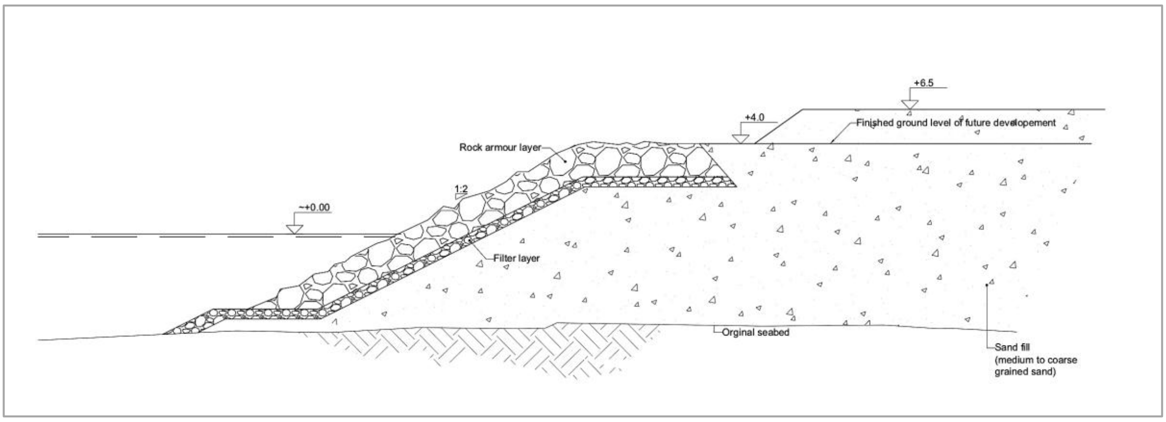
This may be done by reinforcing the rock bund into a rock revetment wall. Concurrently during the reclamation works, the rock bund is further strengthened into a rock revetment wall which makes the structure even stronger and more efficient in absorbing the force of storm waves.

The core layer (inner layer) of the structure is made using the perimeter bund that was constructed earlier to contain the fill material in the early reclamation stage.

There are different solutions to creating a boundary for the containment of the reclaimed areas. Viable methods are a revetment, an anchored sheet pile wall or a caisson wall.

Revetments

Revetments constructed as boulder embankments are recommended around the perimeter of the development to contain the reclamation areas. This type of construction behaves in a ductile manner during seismic loads, allowing the structure to deform without losing its ability to retain the reclamation. A typical cross section of a rock revetment at a concept design level is shown below. The revetment might be supplemented by a wave-breaking structure, such as a concrete barrier or an elevated crest as indicated in the figure below. The effects of the wave action may also be mitigated by the construction of an elevated area, extending as far inland as the waves are anticipated to reach during extreme weather situations. Optimum ground level is to be determined through hydraulic / flood analyses.



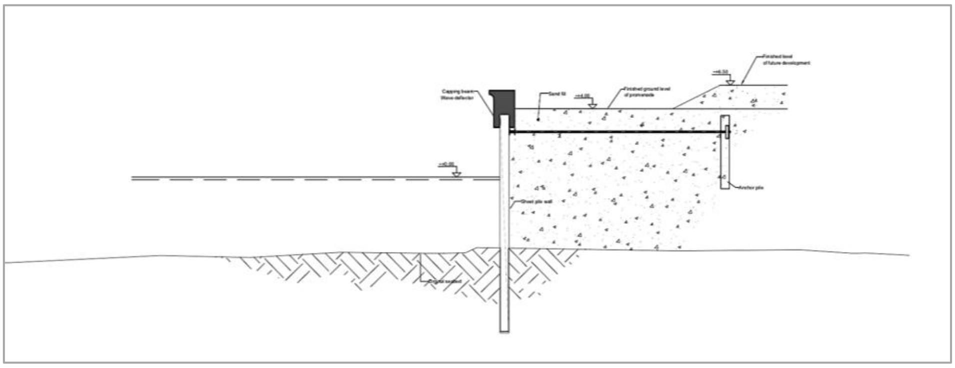
Typical Cross Section of Rock Armored Revetment

Anchored sheet pile wall

As an alternative to the revetment, the outer perimeter of the islands can be constructed as anchored sheet pile. This allows for a vertical island boundary. The construction is likely to be more expensive than the revetment and is less robust under seismic loading due to the anchor system. The anchor rod can sustain smaller deformations but can fail if the system experiences large deformations.

The anchor piles should comprise of sheet piles or steel sections, as this type of construction allows for some excavation (roads, utilities and similar near surface structures) between the anchor pile and the sheet pile wall after the reclamation area is complete. A typical cross section of an anchored sheet pile structure at a concept design level is shown below.

Due to the presence of rock at shallow depths encountered within some of the boreholes, it may prove to be difficult or costly to install sheet piles as refusal of sheet piles can be foreseen in hard layers with SPT N-values exceeding 50 blows. Further geotechnical field investigations are required to estimate, at which depth the hard pan is encountered. Alternatively, if vertical boundaries are required, precast concrete cofferdams or other similar structures could be used to create shallow internal canals within the reclaimed areas.



Caisson Wall

A caisson wall consists of vertically drilled holes to form an interlocking secant wall. A sequence of soldier piles and caisson fillers make up the shoring wall with the piles reinforced with steel beams and fillers left unreinforced and filled with low strength concrete. Piles are typically spaced with every second pile reinforced. The seismic shear load on the caisson wall may be substantial, increasing the diameter of the piles and consequently the cost of the wall.

At this stage, the preferred containment structures primarily consist of sloped revetments, as they are most cost-effective when taking into account the design for seismic loads. Other vertical structures (such as sheet pile walls) will be vulnerable to seismic design loads, and will be far more expensive to construct. A solution using anchored sheet piles may require two levels of anchoring, depending on the height of the finished elevation of the reclaimed land. Dimensions of sheet piles will be substantial, and much higher than normal sheet piles in non-seismic areas

Vertical structures (such as sheet pile walls) should only be used in limited areas, where revetments are not possible.

The presence of anchor rods in a sheet pile structure would prevent the use of the area closest to the sheet piles from using it for buildings. This means a strip of approximately 15-20 m behind the sheet pile wall, which would be reserved for anchor rods, which would mean that land utilization is not optimized.

Possible boardwalk structures and other recreational areas along the coast for pedestrians etc. can be constructed as simple platforms on piles over the revetments, where it is desirable, utilizing also the revetment footprint.

6. Soil Stabilization

Treating and firming the foundation

The newly reclaimed area needs to be compacted and consolidated to a specified strength so that it can support the roads, infrastructure, utilities, and buildings. Ground treatments are done to accelerate consolidation of the clay layer when the sand has accumulated to reach the designed platform level.

Several stabilization methods are available but the most common is the paper wick drain with surcharge method. This method can accomplish the compaction process within a year or less.

This stabilization process involves the installation of vertical drains (flexible hoses like fireman's hose). A special PVD crawler rig inserts the vertical drains through the layer of sand and into the clay material underneath. This is to drain the water within the clay strata when the clay is compressed/surcharged.

Surcharging the site

This involves the placement of a thick layer of earth or sand on the surface of the reclaimed land to use the weight of the surcharge to accelerate the compression of the clay layer. The clay material is naturally saturated with water. When it is compressed, water is squeezed out and flows up and out onto the surface through the vertical drains. During the surcharging and settlement of clay layer stage, monitoring is done. The data from soil investigations and laboratory tests are used to determine the depth and thickness of the clay layer and the amount of surcharge needed to compress the clay

Surcharging the site usually takes 6-9 months. During this time, settlement readings are taken every 2 weeks and results are plotted on a graph. Upon reaching a period of 6 months or until the clay strata reaches the targeted magnitude, the surcharging will seize. The consolidation process requires 90% degree of consolidation to be achieved in order for the land to be safely used for future development.

When it is observed that site has fully settled, the surcharge layer is removed to the designed platform level. Once the clay strata have been surcharged and loses its water content, the clay material remains compressed and does not expand. The site is then ready for horizontal development work to begin.

7.0 The Direct and Indirect Impact Areas

The guidelines provided in the Revised Procedural Manual relevant to this project are used for the delineation of the Direct Impact Area (DIA) and the Indirect Impact Area (IIA). These form the study areas which are identified in the discussions of the specific modules, i.e. Land, Water, Air and People.

<u>THE PRE-EIS IMPACT AREAS FOR THE CONSTRUCTION PHASE UP THROUGH THE FORMATION OF LAND</u>

The guidelines provided by the Revised Procedural Manual for the DENR Administrative Order 2003-30 relevant to this project are used for the delineation of the DIA and IIA, to wit:

Direct impact area (DIA) is … the area where ALL project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken. For most projects, the DIA is equivalent to the total area applied for an ECC.

For the proposed project, the DIAs are:

- The reclamation area itself wherein the construction activities will be undertaken. This area is currently the body of water and portions of the coastal barangays covered by the planned landform.

- All barangays fronting the proposed site such as: Sinegueslasan, Alima, Campo Santo, Tabing Dagat, Digman, Kaingin, Maliksi III, Maliksi I, Talaba II, Talaba I and Zapote V
- CAVITEX segment fronting the proposed reclamation islands
- Lift nets and mussel farms that will be dislocated
- Established fishing areas that are within the proposed site
- Existing properties within the 90-hectare area that will be displaced
- Nearest existing road where access ways will be built
- Competition or otherwise enhancement of livelihood or businesses adjacent to site
- Employment and livelihood

Indirect Impact Area (IIA) …an IIA can be the stretch of the river/s OUTSIDE the project area but draining the project site which can potentially transport Total Suspended Solids and other discharges from the project towards downstream communities.

For the proposed project, the IIAs are:

- Rivers and creeks situated near the proposed project.
- Impacts on traffic in nearby existing roads.
- Adjacent cities and municipalities such as Las Piñas, Kawit, Imus and Dasmariñas
- Impacts to Las Piñas – Parañaque Wetland Park and nearby mangrove communities
- Impacts to adjacent Bacoor Reclamation

Table PD-4. Impact Areas – Reclamation/Construction Phase

RATIONALE	MAJOR IMPACTS	SITES/IMPACT AREAS
DIRECT IMPACT AREA		
Land	Impacts in terms of compatibility with existing land use	Entire Proposed Project Site
	Impact in existing land tenure issue/s	Barangays Sinegueslasan, Alima, Campo Santo, Tabing Dagat, Digman, Kaingin, Maliksi III, Maliksi I, Talaba II, Talaba I and Zapote V CAVITEX segment fronting the project site
	Improper Solid Waste Management and other related Impacts	At and vicinity of site
	Inducement of natural hazards such as liquefaction, storm surge, tsunami, debris flow	Bacoor City
	Soil Erosion	At and vicinity of site
Water	Change in drainage morphology	At and vicinity of site
	Flooding	Barangays Sinegueslasan, Alima, Campo Santo, Tabing Dagat, Digman, Kaingin, Maliksi III, Maliksi I, Talaba II, Talaba I and Zapote V
	Change in bathymetry	At and vicinity of site
	Change in water circulation	Project site and vicinities
	Degradation of surface water quality	Project site and adjacent waterbodies
	Degradation of coastal water quality	Project site and adjacent waterbodies
	Displacement of lifts and mussel farms Displacement of Existing Properties	Barangays Sinegueslasan, Alima, Campo Santo, Tabing Dagat, Digman, Kaingin, Maliksi III, Maliksi I, Talaba II, Talaba I and Zapote V
People	Positive impacts on employment and livelihood	Bacoor City
	Positive impacts on economic uplift of the City	Bacoor City
	Competition or otherwise enhancement of livelihood or businesses adjacent to site	Bacoor City
INDIRECT IMPACT AREAS		
Land	Impacts on Las Piñas – Parañaque Wetland Park and nearby Mangrove Communities	Las Piñas – Parañaque Wetland Park and nearby Mangrove Communities

RATIONALE	MAJOR IMPACTS	SITES/IMPACT AREAS
	Impacts to adjacent Bacoor Reclamation	Adjacent Proposed Diamond Reclamation
Water	Potential Damage to fish cages due to Navigation of Dredging Vessel	Municipal waters of Bacoor City
	Potential damage to adjacent creeks and rivers	Adjacent waterbodies
Air	Degradation of Air Quality and Increase of Ambient Noise	Adjacent areas
People	Competition with Small Establishments	Bacoor City
	Impacts on traffic in nearby existing roads	Project site and adjacent areas, Cavitex

The Direct and Indirect Impact Areas Map is provided in page **PD-24.**

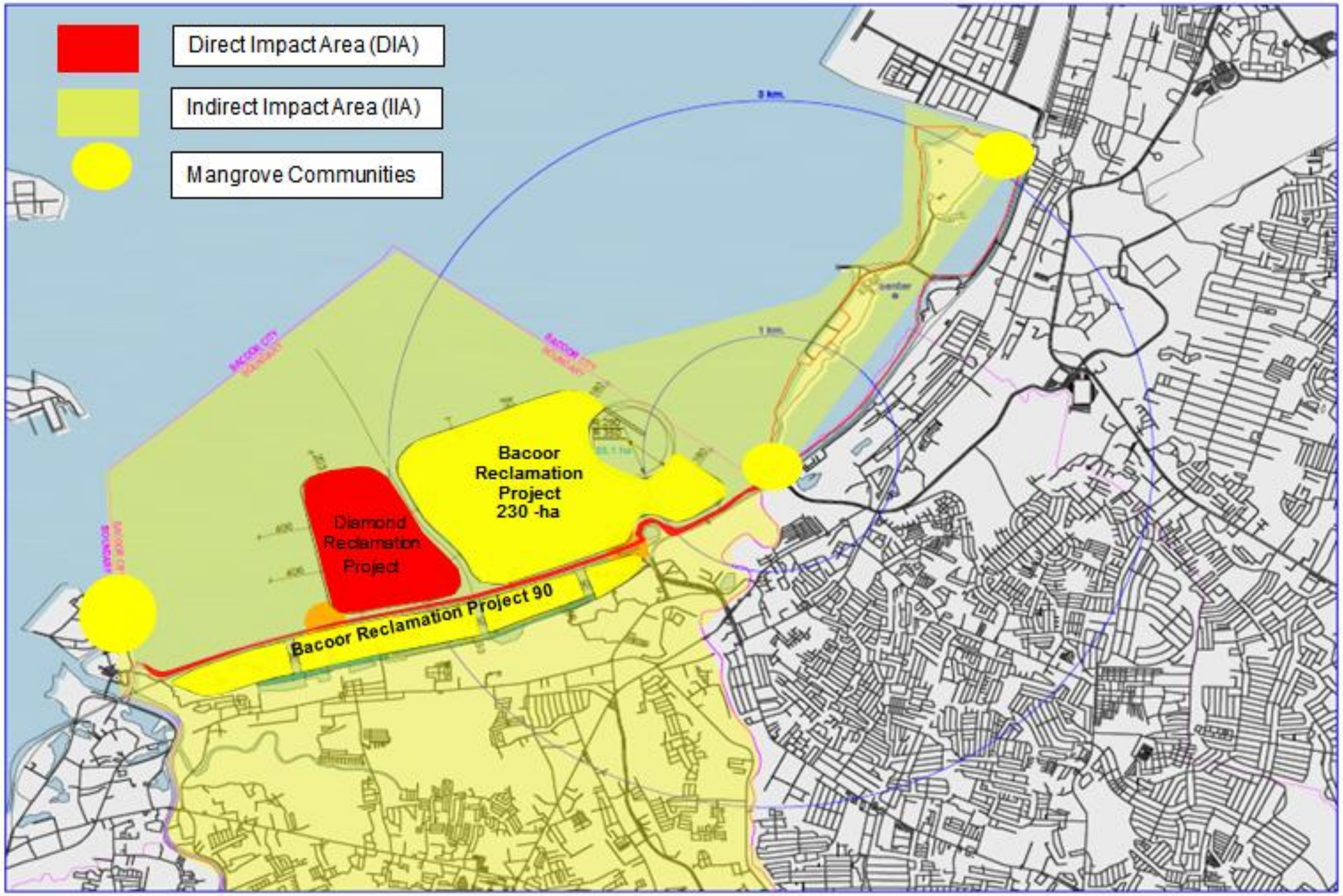


Figure PD-8. Pre-EIA Direct and Indirect Impact Areas

8.0 Development Phases. Development Phases in terms of specific activities (with 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.)*
- ***Pre-construction*** *(e.g. planning, acquisition of rights to use land, etc.)*

The significant Environmental Impacts during this Phase is the displacement of existing properties, establishments and institutions and the displacement of lift nets and mussel farms that are inside the proposed **Bacoor Reclamation and Development Project Inner Islands (90 ha).**

- ***Construction*** *(e.g. land/site clearing, temporary housing, transport of materials, health and other services for the workforce)*

The various dredging and reclamation activities described in the previous sections are summarized in **Table PD-5** with focus on potential environmental impacts.

Table PD-5. Summary of Various Dredging and Reclamation Activities

Major Activities	Environmental Impacts
Dredging at Site	Sediment dispersal
Filling Reclamation	Sediment Disperal
Works of Construction Crews	Domestic Waste Water Discharges
Operation of equipment in vessels	Possible oil leaks
	Air Discharges

- ***Operation*** *(projected period of start-up/commissioning/full operation of various project components) include discussion on the operation of various components (as identified above) in terms of raw materials and fuel requirements, infrastructure requirements (transport—road/rail/ship, power, water supply and storage, storm water drainage, sewerage, telecommunications, accommodation and other infrastructure), waste management (characteristics and quantities of waste materials: wastewater, air emissions, solid wastes - toxic and hazardous, non-toxic and non-hazardous)*

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.

- ***Abandonment.*** *Final Rehabilitation/ Decommissioning Plan, to include Land/soil restoration, decontamination or remediation activities and procedures & projected schedule. Should discussions about strategies and methods for final rehabilitation of the environment disturbed by the project. The land use suitability of the various land disturbance types should also be described.*

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 by the time of the decommissioning of the Project.
Remediation of contaminated soil and water resources due to spills and leakage of chemicals and other materials used in the operation

From the dredging of the site to the sand filling period, the TSHD (or other sea vessel/s) will be transporting to and from the project site. This is the only source of oil, grease and fuel that could potentially spill into Bacoor Bay/Manila Bay and cause contamination. Nevertheless, the amount of contaminants will not be that significant.

There are no spills and leakages during the process of soil stabilization.

Alternatives for the future use of abandoned area

Not applicable. The reclaimed areas, once constructed, will be a permanent land area of Bacoor City.

Rehabilitation/ restoration plans, if any

Not applicable. The reclaimed areas, once constructed, will be a permanent land area of Bacoor City.

Project Timeline

- The proposed reclamation works is estimated at 3-5 years.

9.0 Project Size

Table PD-7. Project Size

Island	Area
Proposed Diamond Reclamation and Development Project	100 ha
Total	100 Hectares

10.0 Project Cost Estimates

Estimate at this time of the total Project Cost is placed at **PhP 13.5 Billion.**

11.0 Initial Environmental Impacts and Management Plan (IMP)

Table PD-8. Initial Environmental Impacts and Management Plan (IMP)

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement
I. PRE-CONSTRUCTION PHASE-		
A. People	Displacement of established fishing areas within the proposed site	Inventory of affected area and In-City Relocation
II. CONSTRUCTION PHASE		
B. The Land	Perception of flooding onshore as a result of reclamation	Reclamation itself provides protection against storm surges and thus, against floods. Proper drainage plan to give consideration to existing drainage outfalls.
		Project will not block or disturb existing drainage system of the City or the nearest Rivers
	Storm surges/waves and flooding on land	Reclamation Platform itself with wave deflector gives sheltering effect against strong waves. Drainage planning for the reclamation landform shall incorporate the existing drainage outfalls on pre-existing land

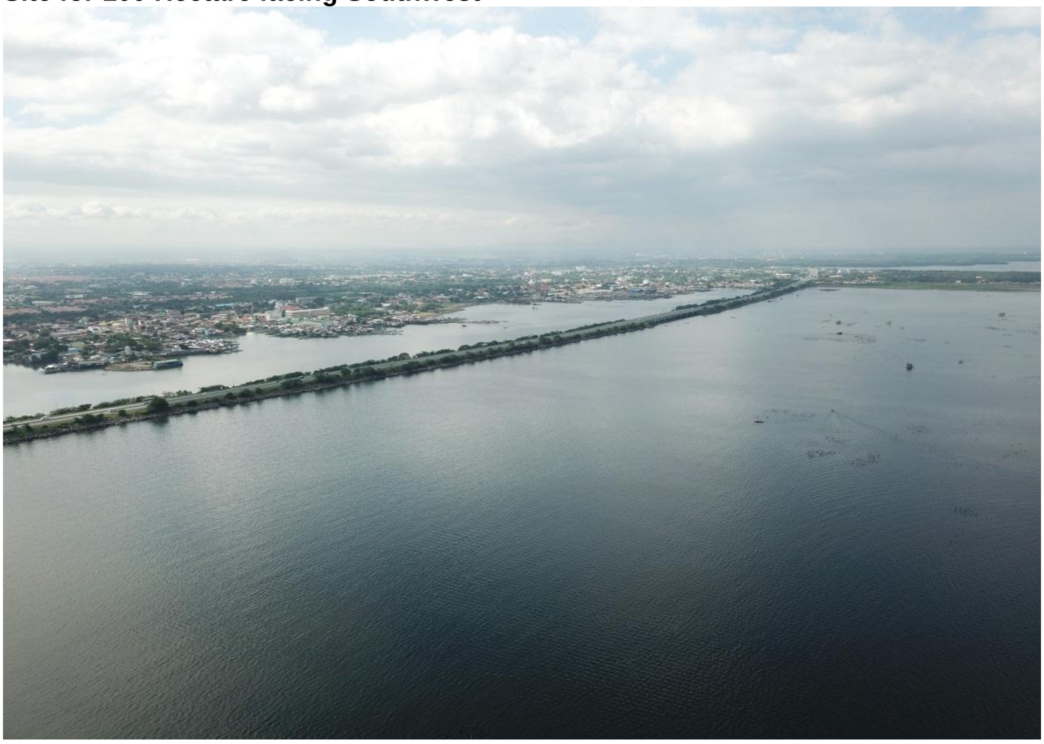
Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement
		and ensure that the flow will not be hampered.
	Land Subsidence	Caused by underground water extraction which will not be undertaken. Reclaimed land will rest on solid foundations. Engineering interventions will be undertaken.
	Liquefaction	Engineering intervention: structural and engineering designs to withstand earthquakes and liquefaction.
		Philippine Standards
	Disturbance of flora and fauna	Avoidance of disturbance of habitat and faunal species food
	Protected Area	Project not in Protected Areas
	Mangroves absent at the project site	Not applicable
	Exotic and rare bird species sighted hovering over the site and immediate vicinity.	
	Damage to roads	Avoidance/Location of access roadways
	Incl. Diversions of access points	
	Aesthetics (Manila Bay sunset)	Viewing spot in the master plane
C. The Water-Manila Bay- No rivers, creeks, lakes at site Manila Bay	Permanent loss of Manila Bay water body (Compensated by water created during dredging at SNS)	Irreversible. Comply with PRA Notice to Proceed. Creation of equivalent water volume at the San Nicholas Shoal
	Silt dispersal to Bay due to dredging/filling operations	Silt curtains/containment at perimeters
	Increase in turbidity	Dredging/filling methodology; Stockpiling of earth fill shall be placed away from water bodies and covered with suitable material during rainy season
	Potential contamination with substances in filling materials	Pre-screening of filling materials; possible sourcing from Manila Bay
		Observe project boundaries
	Disposal of unwanted dredged materials	Strictly not wastes because source is Manila Bay sea bed itself
	Reclamation does not use significant water	• Arrangement with concessionaires • No underground abstraction
	Sea Level Rise	Due to other global climate change and not to the reclamation project
	Water contamination, e.g. oil leaks, domestic wastes from construction workers	• Onboard vessel oil containment and recovery equipment • Own temporary toilet facilities, Disposal on land by 3rd parties
	Domestic wastes from construction crew and possible hazardous waste material accidental spillage	Appropriate toilet facilities
		Oil and lubricants (used or spent) should be collected and treated by TSD facility
	Potential accidents and damages to marine ecosystems during transport of dredging vessel	• Sea-worthy vessels • Navigational Devices • Proper training • Avoid transport during inclement weather • Compliance with PCG and International regulations

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement
	• Potential damage to marine life • Disturbance of marine species/Damage to or impairment of economically significant marine life.	Absence of significant marine species at impact areas of project
		Containment wall
D. The Air	Noise	Temporary-construction -short time only
	Emissions if power generating sets used and fossil fuel using equipment	Use of quality fuel
		Proper maintenance of gensets
D. The People	Livelihood and employment opportunity	Enhancement

12.0. Drone Photographs of the Project Site

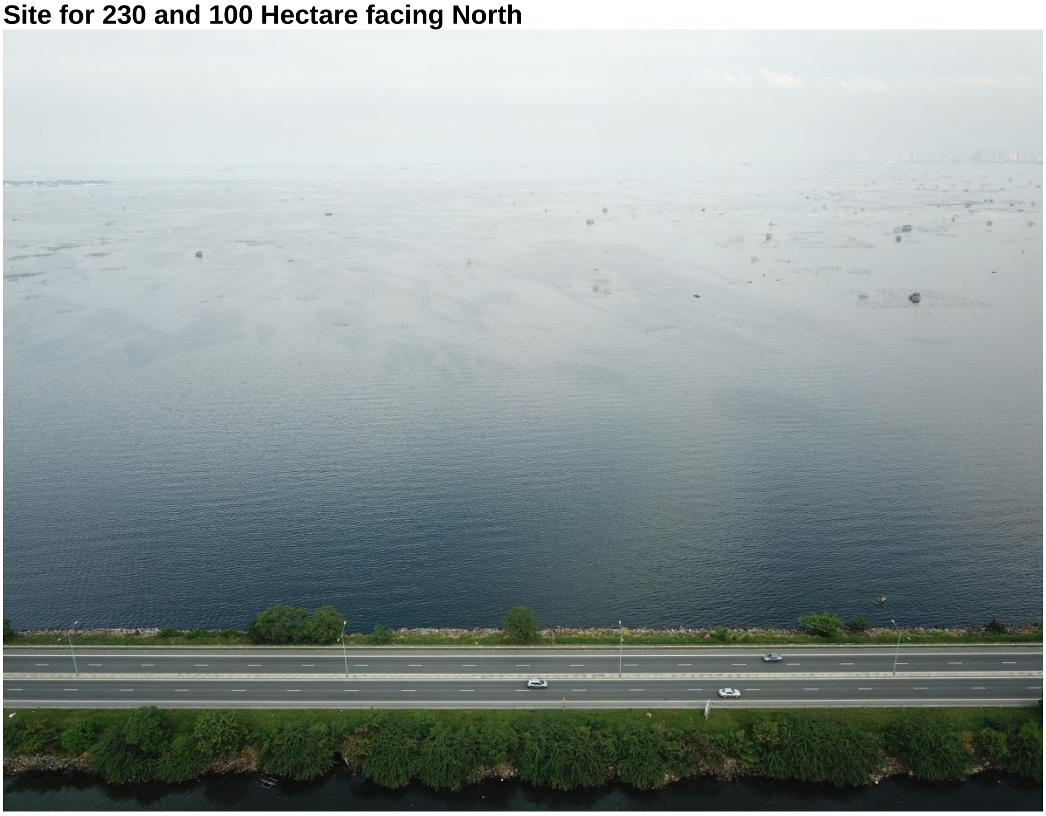
Site for 100 Hectare facing West

Site for 100 Hectare facing Southwest



Site for 230 and 100 Hectare facing South

Site for 230 and 100 Hectare facing North



Site for 100 Hectare Facing Northwest