12 January 2021

ENGR. WILLIAM P. CUÑADO
Director
ENVIRONMENTAL MANAGEMENT BUREAU
Department of Environment and Natural Resources
DENR Compound, Visayas Avenue,
Diliman, Quezon City

Thru:	**ENGR. ESPERANZA A. SAJUL** Chief, EIA Management Division
Subject:	Submission of Environmental Impact Statement (EIS) of Ilijan LNG Import Facility Project for 2nd Procedural Screening

Dear Director Cuñado:

We hereby submit the 2nd procedural screening of the Environmental Impact Statement (EIS) of Ilijan LNG Import Facility Project located in Barangay Ilijan, Batangas City, Batangas.

We hope this will comply with your requirements.

Thank you.

Very truly yours,

LINSEED FIELD CORPORATION

By:

HERBERT B. HERNANE
President

ENVIRONMENTAL IMPACT STATEMENT

ILIJAN LNG IMPORT FACILITY PROJECT

LINSEED FIELD POWER CORPORATION

January 2021

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ES.1 PROJECT FACT SHEET / PROJECT DESCRIPTION SUMMARY

ES.1.1 BASIC PROJECT INFORMATION

Project Information

Project Name	**Ilijan LNG Import Facility Terminal**
Project Type	Import Terminal Project
Project Location	Barangay Ilijan, Batangas City, Batangas
Project Size	9 hectares onshore Storage capacity of 137,000m³
Project Cost	~USD 304 million / Php 14.6 billion

Proponent Profile

Project Proponent	**Linseed Field Power Corporation**
Authorized Representative	Atty. Herbert B. Hernane
Designation	President
Proponent Address	Suite 2402 Discovery Center, 25 ADB Avenue, Ortigas Center, San Antonio, Pasig City
Proponent Contact Details	
EIA Preparer	**RHR Consulting Services, Inc.**
Contact Person/	For. Ryan Filiberto P. Botengan
Designation	Managing Director
Address	Unit 606 FSS Bldg. II, Barangay Laging Handa, Quezon City
Contact Details	info.rhrconsult@gmail.com

ES.1.2 PROJECT LOCATION

The Ilijan LNG Import Facility will be located in Batangas Bay, approximately 9.5km south of Batangas City, Philippines. The proposed project is adjacent to existing Ilijan Power Plant and Kepco Ilijan Corporation.

ES.1.3 PROJECT COMPONENTS

The terminal off-shore components consist of structures to support berthing and mooring of the FSU and LNGCs, loading arms, access gangway, ancillary equipment such as fire-fighting, lighting, and control room, and access to the various platforms and equipment. The principle marine structures comprise the following:

- Berthing dolphins (4)
- Mooring dolphins (6)
- Service Platform
- Mooring platform
- Access trestle
- Pipe support trestle
- Gangway
- Catwalks
- LNG spill containment and separator.

ES.2 EIA PROCESS/PROCESS DOCUMENTATION

The Linseed Field Power Corporation has commissioned RHR Consulting Services, Inc. to conduct an Environmental Impact Assessment and prepare an Environmental Impact Statement (EIS) for the proposed Ilijan LNG Import Facility Project. This EIS evaluates the existing environmental and socio-economic conditions of the proposed project site as well as assess the potential impacts of the project.

This EIS will guide the proponent to implement environmental management strategies for all the stressors that will be generated in the operation of Ilijan LNG Import Facility Project. These strategies would determine the kind of development that will be allowed within the project site.

This study follows essentially the revised procedural guidelines of MC 2014-005.

The New Manila Reclamation Project EIS contains the following:

- Project Description;
- Analysis of Key Environmental Impacts;
- Impacts Management Plan;
- Environmental Risk Assessment and Emergency Response Policy and Generic Guidelines;
- Social Development Plan and IEC Implementation;
- Environmental Compliance Monitoring;
- Abandonment/Decommissioning/ Rehabilitation Policies and Generic Guidelines; and
- Institutional Plan for EMP Implementation.

In terms of process, a participative process was adopted thru public consultation and IEC. Implicit in the approach was allowing the proponent and the various project stakeholders to provide their inputs and ideas from which the Impact Management Plan (IMP) was crafted so that appropriate measures can be developed to ensure greater acceptance, commitment and support for the project.

ES.2.1 LIMITATIONS OF THE STUDY

The scoping process essentially determined the coverage of the study. Sensitive issues as well as other applicable parameters were included in the scoping activity. The study was limited to the primary and secondary data gathered on-site, other related literatures and fieldwork conducted. The provision of precise data determines the effectiveness of the report in supplying all the appropriate conclusion and recommendations. The study team put forth its thoroughness in completing the entire EIS. Details on the scoping checklist were carefully considered to generate a reliable and accurate report.

ES.2.2 THE PROJECT TEAM

The members of the team who professionally conducted the Environmental Impact Assessment (EIA) are depicted on the following:

Table ES-1. EIA Study Team

Name	Registration Number	Field of Expertise
Mr. Henry James P. Botengan	IPCO-063	Project Management, Social Impact Assessment
Mr. Restituto G. Taganas		EIA Team Leader
Engr. Ronald R. Pahunang	IPCO-173	Air and Noise Quality, Hydrodynamic Modeling
Ms. Thelma Dela Cruz, MOH		Environmental Risk Assessment
Engr. Catherine L. Addawe		Water Quality
Ma. Luisa Martinez, Ph.D.		Storm Surge Modelling
Mr. Benjamin Francisco	IPCO-038	Marine Ecology
Mr. Arnel Mendoza		Geology
For. Armando V. Gillado Jr.	IPCO-312	Terrestrial Flora
For. Kristine Ann P. Gillado	IPCO-282	EIA Integration

ES.2.3 EIA STUDY SCHEDULE

The schedule of activities performed as part of the preparation of the EIS is detailed in the table below:

Table ES-2. EIA Study Schedule

Activity	Date
Pre-Public Scoping Activities	03-08 September 2020
Public scoping	30 September 2020
Technical scoping	21 October 2020
Conduct of field sampling and surveys	September to November 2020
Conduct of perception survey	03-08 September 2020
Public consultation	-

ES.2.4 EIA STUDY AREA

The EIA study was undertaken within the vicinity of the proposed project footprint and its potential impact areas, particularly in Barangay Ilijan, Batangas City. The coverage of the EIA study is based on the agreed scope of the EIA Review Committee (EIARC) during the technical scoping activity conducted on 21 October 2020. The primary and secondary impact zones of the project are delineated and discussed in Section 1.1.2.

ES.2.5 EIA METHODOLOGY

Table ES-3. EIA Study Methodology

Module	Methodology	Data sources and references
Land use and classification	Secondary Data Gathering and Review	Batangas City CLUP
Geology and geomorphology	Review of existing literatures	Geotechnical Report, Government maps, etc.
Pedology	Soil Sampling Duration: 1 day - 05 November 2020	BSWM, PhilRICE, Philippine GeoPortal
Terrestrial Ecology	Quadrat sampling Duration: 2 days - 19-20 September 2020 Location: Brgy. Ilijan, Batangas City Personnel: 3 Equipment: Camera Vehicle Handheld GPS Diameter tape Meter tape Key Findings: In general project area was brush land dominated by ipil-ipil and kakawate	
Marine ecology	**Method**: Actual in-situ documentation and observation with scuba and fishing operations documentation **Duration**: 3 Days - September 27-28, 2020; November 5 to 6, 2020 **Location** Ilijan proper: 18 tow stations; 1 LIT station; 15 spot dive stations; 3 plankton sampling stations; 2 macro-invert stations; Actual fishing documentations **Personnel:** 4 scuba divers on field; 1 in lab;	

Module	Methodology	Data sources and references
	1 work from home (mapping) **Key equipment:** Cameras (2) Boat Scuba gear; Depth finder; Transects; Plankton sampling bottles; GPS units (2)	
Water Quality	**Method:** In-situ water analysis and water sampling procedures following the guidelines presented in Water Quality Monitoring Manual Volume I: Manual on Ambient Water Quality Monitoring (EMB-DENR 2008) **Duration:** 1 day **Location:** foreshore of the project site; 6 sampling stations **Personnel:** 3 persons	
Air quality and Noise	**Method:** TSP and PM10 was carried out by using a high-volume sampler with cyclone separator for PM10. Sulfur dioxide (SO2) and nitrogen dioxide (NO2) in the ambient air were sampled by aspirating air at a controlled flow rate over the specified sampling period through glass midget impingers containing absorbing solutions of 0.04 M sodium tetrachloromercurate for SO2 and an azo dye forming reagent for NO2. The absorbing solutions were retrieved after sampling and transported to a laboratory for further treatment and analysis. Air Dispersion Modeling using AERMOD View Version 9.9.9 **Duration:** October 19, 2020 and October 27-31, 2020 **Location:** 5 sampling stations	
People	**Method:** Perception survey and review of secondary data **Duration:** 5 days (4-8 September 2020) **Location:** Barangay Ilijan, Batangas City **Personnel:** 5 persons **Respondents:** 98	Comprehensive Land Use Plan of Batangas City 2008-2018 (latest available) Barangay Ilijan Profile 2018

ES.2.6 PUBLIC PARTICIPATION

Design of Public Participation

i. Review of Secondary Information

All secondary data from the concerned LGUs and other relevant agencies were collected to accurately assess the issues raised by stakeholders, as well as to provide a background on the socio-economic situation of the stakeholder communities. This include, but will not be limited to the following:

- Barangay Profiles
- Barangay Profile and Survey;
- Barangay Socio-economic and Health Profile
- Barangay Development Plan
- National Statistics Office
- Comprehensive Land Use Plans

- Provincial Physical Framework Plan
- Ecological Profile
- Other pertinent documents

ii. Perception Survey

A perception survey were conducted to determine the stakeholder's awareness and perception of the project. The survey will involve questions about the respondents' demographic profile, socio-economic profile, perception of the current state of the environment, knowledge about the project, and perceived opportunities, issues, and concerns about the project. The sample of the survey were determined based on the technical scoping requirement. The focus were given to stakeholders directly affected by the project.

Analysis of Issues

The issues that were raised during the public scoping were considered and addressed in the formulation of SDP. Moreover, issues obtained from perception survey were also included. Most of the issues and concerns raised by stakeholders relate to the project's impacts on the marine environment and safety during operations:

- Impacts on marine life and livelihood
- Temperature of the seawater discharge
- Safety regarding the inlet
- Possible leak of gas from the terminal
- Increase in noise level
- Livelihood programs for the impact communities
- Spread of illness/diseases
- Possible loss of wildlife
- Flooding
- Accidents

ES.3 EIA SUMMARY

ES.3.1 SUMMARY OF BASELINE CHARACTERIZATION

Table ES-4. Summary of Baseline Characterization

Module	Summary of Baseline Condition / Key Findings
Land Use	The Ilijan LNG Import Facility Project is located in a Heavy Industrial Area
Geology/ Geomorphology	• The project area is prone to ground shaking hazards • Based on the recorded hazards associated with the eruption of Taal Volcano, the project area being 44km away from the said volcano could only experience ashfall. • Flooding is not expected to happen within the upslope area which is of higher elevation, however, the coastal area with elevations of less than 1msal to 2masl which is part of the project area might experience flooding during periods of continuous and/or heavy rains and also during high tides. • There is a possibility of storm surge within the project area and its vicinities but with not of significant height.
Terrestrial Ecology	• Based on the land cover map of the city, the project area is composed of perennial crop, grassland, and built-up • During site visit it was observed that the area is mainly brushland with patches of secondary growth in the gully where an intermittent river was observed • There were 30 plant species that belonged to 30 genera under 19 families found in the area during field assessment. • Among the plant habit groups, trees, with 50% have the largest percentage among the observed species in the sampling sites. • Majority or 57% of the plant species observed in the project area were indigenous plants. The remaining 43% observed species were considered as exotics or introduced species. No endemic species was recorded within the established transect during field assessment. • Among the species recorded within the established transects, no threatened species was observed.

Module	Summary of Baseline Condition / Key Findings
	• Five (5) species found on the project site were classified as invasive by the Global Invasive Species Database (2020) • Based on Fernando et al (1998) relative measure of diversity scale, the diversity of the Project site ranged from very low to low diverse (H'=0.56 – 2.16) while Species evenness (e') recorded in transects were found to have very high (0.81 to 0.97) • Majority of dominant species in the project area were exotic species. Most of these species were planted in the area as crops and forage • Impacts of the project to terrestrial flora are vegetation removal and loss of habitat and threat to abundance, frequency and distribution of species. • Replacement planting in accordance to DENR DMO 2012-02 using indigenous species and regular monitoring and maintenance is recommended. Limiting of vegetation clearing within the direct impact of the Project to avoid vegetation damage on adjacent areas is also suggested. Securing of tree cutting permit prior to any cutting activities from the DENR, City Agricultural Office (CAO) of Batangas City and Philippine Coconut Authority (PCA) shall also be secured whenever applicable
Water Quality	Color, O&G, surfactants, phenols, and metals Cr6+, Cd, Cr, Pb, Hg, and Zn – were found to be below their respective method detection limits in all of the marine water samples tested. In-situ temperature ranged from 30.1 °C to 30.9 °C which were within Class SC WQG range (25-31 °C). Dissolved oxygen in all water samples were at 6 mg/l. Total suspended solids concentration in all samples were within the CLASS SC WQG. TSS found in samples MW3 and MW4 were 1 mg/l while the rest of the samples exhibited TSS levels below method detection limit. Phosphate concentration in samples ranged from 0.02 mg/l to 0.05 mg/l which are all within the Class SC WQG. Nitrate as nitrogen were detected at low concentrations, ranging from 0.01 to 0.04 mg/l, relative to the 10 mg/l WQG. Traces of arsenic were also found in the marine water samples with concentrations ranging from <0.0007 mg/l (MW5) to 0.0042 mg/l (MW6) and were within the Class SC guideline which is at 0.02 mg/l. Arsenic can be naturally found in seawater in concentrations ranging from 0.002 mg/l to 0.004 mg/l. Fecal coliform in marine water sample MW2 was above the 200 MPN/100 ml WQG with value equal to 540 MPN/100 ml. The rest of the marine water samples had fecal coliforms within the Class SC WQG ranging from 7.8 MPN/100 ml to 170 MPN/100 ml.
Freshwater Ecology	No rivers present.
Marine Ecology	The coastal impact area of the project site in Bgy Ilijan, Batangas City is a narrow shelf that drops abruptly in 20 to 50 meters of water. Coastal waters in Ilijan are part of the Verde Island Passage conservation corridor. There are no major coral formations in the impact area. The only major coral reef is located in 1.2 km west of the project site in Sitio Silangan. The marine ecology baseline assessment eventually established seventeen (17) manta tow survey pathways for characterization of benthic life forms and abiotic components, one (1) line intercept station for detailed coral reef assessments in patches of coral reefs a significant distance west of the project site, twelve (12) spot dive in front of the project site, three (3) plankton community sampling stations, three (3) macro-benthos survey stations, and two (2) sampling stations for macro-invertebrates of economic value to local fishers. No corals were seen in the impact area of the project site even as presence/absence of corals was validated through rapid broad area assessments using repetitive and rigorous manta tow surveys and spot dives. Several rocky formations were seen in front of the site for the floating facility through spot dives but none of the rocky structures hosted live coral cover. Macro-invertebrate populations were insignificant; plankton community is typical and no harmful algal aggregations were detected. Nearshore fisheries operations are few as fish catch have declined. Major fishing grounds are located in the open sea 3 hrs by fishing boat away from the project site. No seagrass meadows occur in the impact area and nearby sandy coastal shelves.
Contribution in Terms of Greenhouse Gas Emissions	The construction, commissioning, and operation of the proposed project is expected to discharge greenhouses (GHG). Although intermittent and of short period during construction/commissioning, GHG would be emitted due to the operation of construction equipment, such as dozers, generators, and trucks. Discharges of GHG are expected during operation of the proposed project due to combustion of natural gas in the boiler and to some extent from flare emissions and operation of the stand-by generator, and use of maintenance and service vehicles.
Ambient Air Quality	The predicted ambient air concentrations of CO and NO2 at various averaging periods, i.e., 1 hour and 24 hour averaging period.

Module	Summary of Baseline Condition / Key Findings
	Results of predicted ambient air concentrations were all within the ambient guideline values set for CO and NO2. The highest predicted concentration is located at complex terrain adjacent the northeast and northwest boundaries of the project. Results of air dispersion modelling showed that dispersed air emissions from the proposed project arising from the operation of the flare and the boiler stack were within the ambient guideline value set for NO2 and CO.
Ambient Noise Quality	Noise levels during construction period at the project site and vicinities and along access roads are expected to increase due operation of heavy equipment, such as dump trucks, front end loaders, and generators. Typical noise levels of these equipment at 15-m distance.

ES.4 ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Table ES-5. Impacts and Mitigating Measures

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
I. Pre-construction Phase				
Completion of requisite MOAs, endorsements, and clearances/ permits	Socio-economic	Social Acceptance and Support for the project	▫ IEC on Project to inform, respective institutions, agencies, offices, bodies and organizations for providing their respective endorsements and/or clearances ▫ MOAs with respective bodies	100% compliance with the agreements, permits
Integrate air quality mitigation measures in the design and secure permits related to air quality	Air Quality	Social Acceptance and Support for the project with regards to air quality	▫ Prepare detailed air quality mitigation plan on the mitigation measures to be undertaken during construction of the project ▫ Conduct air dispersion modelling using the final design plans of the proposed project and submit to DENR-EMB for review and approval prior to the commissioning and operation of the processing plant. The modelling report shall include in detail the final site development plan, locations of emission sources, detailed discussion of process flow and emissions, computed emission rates, stack gas concentrations in comparison with the NESSAP, and other relevant information ▫ Secure Permit to Operate air pollution control source from DENR EMB prior to the commissioning and operation of the processing plant	100% compliance with the agreements, permits
II. Construction Phase				
i. Site Development, Piling and Foundation Works *Initial activities for construction stage includes surveying, setting up of temporary roads, clearing and grubbing,*	Marine Water Quality	(-) Generation of silted runoff resulting to increase in TSS of the receiving water body (marine surface water)	▫ Enclose the construction area within the 9-hectare project area and MLA area ▫ Installation of silt traps along the existing natural channel	100% compliance Ambient Water Quality Guideline Values
	Marine Ecology - Corals	(-) Sediment intrusion into coral reef that can cause coral polyp suffocation;	▫ There are few corals in the deep rocky formations underneath the proposed area for floating storage facility and are unlikely to be significantly affected.	100% compliance Ambient Water Quality

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
excavation, backfilling, and compaction, piling, and foundation works. Foundations of the following facilities will be established: • Jetty • Flare • RegasTainers • Truck-Loading Bays • LNG Storage Tanks • Seawater System • Buildings: E-house, Workshop, • Warehouse, Fire Station, Gas • Metering, Control Building, Machinery • Room • Gas Boiler/Furnace Skid • Gas Receiving Metering System • Utilities		(-) Potential loss of fish habitat and spawning areas;		Guideline Values
	Marine Ecology - Fish population	(-) Noise pollution can be carried way beyond the construction area - Altered fish population structure as some species will seek to evade areas of noise generation; loss of fisheries productivity.	▫ Containment of all construction activities within the construction site/project area (9-hectare onshore and MLA area) to avoid sediment deposition in the coastal shelf; ▫ Placement of silt curtains and geo-textile around the port area and other construction sites; ▫ Containment of spillage of soil filling materials;	100% DENR standards for noise
	Marine Ecology	(-) Potential sediment intrusion in coastal waters can lead to: ▫ Increased seawater turbidity and decrease in photosynthesis, affecting fish and plankton grazing ▫ Loss of bivalve veligers and other benthos; ▫ Disturbance to plankton community and grazing of fish;	▫ The most modern sediment curtailment measures and engineering designs will be adopted by the project to address all waste discharges from the wharf and port site and inland facilities. Diversion canals will be built, silt curtains and geo-textile traps and filters will be installed and other entrapment mechanisms will be adopted in order to prevent sediments and silt from spilling into coastal waters.	100% compliance Ambient Water Quality Guideline Values
	Air Quality Noise	*Increase in background air quality levels* (-) Heavy equipment during construction will be the main source of emissions to air. *Transient vehicles (i.e., trucks, service vehicles) of proponent and contractors at residential areas and other sensitive receptors* (-) Increase in background air and noise levels (-) Possible nuisance to residents and other receptors along access roads	▫ Include in the contractor's contract the air quality mitigation plan. Compliance requirements and possible penalties should be specified in the contracts in the event of non-compliance by contractors and sub-contractors as regard to air quality emissions ▫ Strictly impose speed limits in the project area, along residential areas and other sensitive receptors ▫ Regular wet suppression or water spraying during dry weather condition ▫ Grading to be phase in with hauling activities to reduce cumulative increase of fugitive dusts Phasing with hauling ▫ Provide trucks with appropriate cover, such as solid sliding cover on top of trucks or tarp that completely covers the whole transported material ▫ During wet season, provide wheel washing facilities for vehicles leaving the project site going to residences. The wheel washing facility should be used to remove muds at the tires of trucks and heavy equipment, ▫ Regular maintenance of trucks to reduce or maintain tailpipe emissions	100% Compliance to DENR standards for air quality

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
			▫ Regular maintenance of access roads, particularly at areas with residences and other sensitive receptors ▫ Provision of effective noise mufflers of all project vehicles	
ii. Daily construction activities	Land	Increase in Solid and Hazardous waste	▫ The proponent will implement waste segregation, a collection of scrap and recyclable materials that can be sold, and composting of biodegradable wastes in accordance with the Batangas City LGU requirements and the Ecological Solid Waste Management Act of 2000 or RA 9003. ▫ Workers must be briefed in seminars/workshops about proper waste management in and outside the project site. Placards/posters may also be posted on work areas as constant reminders for the workers. ▫ Implement RA 6969 through proper segregation and storage of hazardous waste ▫ Tapping DENR accredited waste transporter to dispose of hazardous waste	100% Republic act 6969 and 9003
	Geology	The project area is composed of both onshore and offshore areas. Site grading of the onshore area will involve mostly cutting of slopes and backfilling, thus a change in surface landform/geomorphology/topography/terrain and slope is expected.	▫ If ever there is a need for some areas to be backfilled, the backfill materials shall be compacted to the required density. If soft soil materials or undesirable clayey deposit will be encountered in areas where heavy structures are to be constructed or where heavy equipment will be installed, the soft or undesirable materials have to be excavated and replaced by engineered backfill. ▫ If some cavities will be encountered within the reef limestone during the site preparation, the cavities have to be filled with suitable materials. If necessary, grouting may be done to improve the soil condition.	-
	Terrestrial Flora	▫ Vegetation removal and loss of habitat ▫ Threat to existence and/ or loss of important local species ▫ Threat to abundance, frequency and distribution of important species	▫ Replacement planting with preference to indigenous species found in the area and in accordance to DMO 2012-02 ▫ Monitor replacement planting to ensure growth and survival	100% Compliance to DMO 2012-02 guidelines
	Terrestrial Ecology – Fauna	▫ Loss of habitat and displacement	▫ Avoidance and minimization of the extent of clearing	100%

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
		▫ Reduction in the abundance, frequency and distribution of fauna species due to pollution effects (i.e. noise, vibration, light pollution, traffic) ▫ Habitat fragmentation	▫ Replacement of trees cut in accordance to DMO 2012-02 ▫ Enrichment planting/tree planting within and adjacent the project site ▫ Implement no hunting/poaching policy ▫ Conduct CEPA programs in relation to biodiversity protection and conservation ▫ Establish, maintain and enhance buffer areas ▫ Regular maintenance of vehicles and heavy equipment ▫ Install temporary barriers/walls, mufflers and/or luminaires to manage noise and light pollution ▫ Implement speed limits and establish fixed routes for vehicles and heavy equipment ▫ Allow fauna species to cross over or pass through the project area unharmed ▫ Enrichment planting along project boundaries parallel to the gully.	Compliance to DMO 2012-02 guidelines
	Noise Quality	(-) Noise levels during construction period at the project site and vicinities and along access roads are expected to increase due operation of heavy equipment, such as dump trucks, front end loaders, and generators. Typical noise levels of these equipment at 15-m distance are as follows. ▫ Backhoe – 80 dBA ▫ Front end loader – 82 dBA ▫ Dump truck – 84 dBA ▫ Generator – 82 dBA ▫ Pick-up truck – 55 dBA ▫ Concrete pump truck – 82 dBA	▫ To avoid significant increase on the background noise levels during construction, mitigation measures should include installation of effective or appropriate mufflers at tailpipes of mobile equipment and generator sets and strictly impose speed limits at access and barangay roads. If necessary, provide partial or total enclosure of high noise sources, if practicable as possible, and as necessary.	100% DENR standards for noise
	Air Quality	(-) Increase of GHG emissions from construction equipment	▫ Prepare and implement GHG emissions monitoring program in accordance with the GHG Protocol developed by the World Resources Institute (WRI) and the World Business Council on Sustainable Development (WBCSD). ▫ Support to reforestation and coastal management programs of the LGU	100% DENR standards for air quality
	People	(-) Occupational safety and health hazards	▫ Provision of PPE's including safety vests and harness for laborers involved in the construction	0 case of work-related accident/ injury

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
			▫ Conduct of safety seminars, training and proper orientation to construction workers ▫ Strict implementation of HSE program as well emergency response plan	
	People	(+) Increased employment opportunities	▫ The proponent shall give priority hiring to locals whose skills and experience match the project's specific needs. A local hiring scheme will be established in close coordination with the concerned barangay Local Government Units (LGUs). In general, the proponent will provide a list of anticipated job requirements with corresponding qualifications to the concerned barangay LGUs. These potential opportunities will be promoted by the barangay LGUs in their respective jurisdictions and potential applicants will be forwarded to the proponent, for further review and evaluation by the Human Resources Office. ▫ Consultations shall be made with the LGUs and host communities to finalize a scheme for hiring residents from host communities. Qualified local residents will be given priority in hiring. For technical positions not available in the host communities, the proponent reserves the option to source its manpower requirements elsewhere. Compensation terms and the process of hiring will comply and adhere with existing labor laws, rules, and regulations ▫ The project shall be fully compliant with the General Labor Standards of the Department of Labor & Employment across the yard, offices, and project site in Ilijan. There will be in-house technical training customized for project requirements across welding, pipe fitting, rigging, scaffolding, and electrical & instrumentation disciplines. Two-day client-specific refresher training will be conducted before deploying personnel to site.	____% qualified locals hired
	People	(-) Loss of livelihood and income source for fisher folks previously mooring in or passing through the	▫ Just Compensation and relocation package to be provided to the affected stakeholders	

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
		coastal area of the project site (including the proposed	▫ Provision and development of alternative livelihood through conduct of trainings in coordination with government agencies, e.g. TESDA, BFAR, DOST, etc. ▫ Development of fishery and fishery based livelihood program through implementation of the Social Development Plan of the project	
Operation				
i. Transport of LNG	Marine Ecology	*Increased vessel traffic, human activities and maintenance works in the wharf area leading to:* (-) Disturbance to small-scale fishing operations; (-) Inadvertent introduction of exotic species through disposal of ballast water; can cause alteration of the marine species trophic level; potential loss of key prey.	▫ Effective IEC are imparted to local fishers targeting to avoid any displacement of fishing activities. Any substantiated loss of income from fishing due to project activities will be compensated. Lost permanent gears such as fish pots will be replaced. The project will study the viability of establishing fish aggregating devices to support fishing. ▫ Clear and forceful policy on management of ballast water discharge supported by monitoring schemes ▫ Oil and grease recovery and accident prevention plan will be adopted; ▫ There are no coral colonies in the floating storage facility docks or in coastal waters where ship maneuvering is projected to occur ▫ Policy of no shipboard waste disposal will be rigidly enforced. ▫ A disaster risk reduction and mitigation program will be adopted. ▫ A vessel anchoring system will be imposed.	
	People	Possible collision with other ships	▫ The proponent will comply with the Philippine Coast Guard (PCG)'s traffic separation scheme (TSS) established for the Verde Island Passage under Memorandum Circular 04-03 (Routing System at Verde Island Passage).	0 case of collision
	People	Safety during natural hazards	▫ Assembly areas shall be provided for emergency situations. These areas should be located so that when an emergency is identified the operating personnel can go to the identified assembly area and be in a safe area. This will allow supervisory personnel to account for the operating personnel, where practicable, the orientation of the unit or installation, with respect to wind direction, shall aim to avoid smoke or gas impairment of escape, muster and evacuation areas. The areas shall be identified	100% compliance with Emergency Response Plan

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
			with a large sign and shall be provided with a sheltered telephone. ▫ The whole facility is equipped with Public Address and General Emergency Alarm System (PA and GEA System) which will be used during emergencies.	
ii. FSU unloading (berthing and mooring)	Water Quality	Water quality degradation from bilge and ballast water	▫ Bilge and ballast pumps are installed in the engine room compartment. Bilge and ballast pipe manifold with individual valves was used for easy operation during filling and draining activities. It is also located in the engine room. Oily water separator was used to filter to oily water sediments at the engine room bilge and other compartments before discharging outside the ship's hull. ▫ For the vessel being used as an FSU, the ballast water management system, has been designed and manufactured to meet IMO regulations. The Purimar system comprises of two unit operations: mechanical filtration and disinfection (electrolysis based chlorine). In the first stage particles, sediment and lager organisms are removed. In the second stage a chlorine compound is generated through electrolysis of sea water and is injected into the filtered ballast to disinfect any smaller sized organisms and bacteria. At deballasting a neutralising unit is used to reduce the total residual oxidant concentration of the ballast water to be discharged.	100% DENR Water Quality Guideline values
	Water Quality Marine Ecology	(-) Domestic wastewater generated from FSU	▫ The vessel being used as FSU is fitted IMO approved sewage treatment plant: ▪ Sewage System in use: Hamworthy Super Trident ST-4A ▪ Treatment 3010L/day (max 50 Persons 60 L/day) ▪ Effluent Quality BOD <40ppm, SS <50ppm, Coliform Below 200/100ml ▫ Being an approved treatment plant, treated waste can be discharged directly to sea but will be collected on schedule basis and processed by 3rd party.	100% DENR Water Quality Guideline values

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
	Air Quality	(-) Emissions from the ship's funnel in Port, either from Boilers or Diesel Generators produce Nitrogen oxides (NOx), Sulfur oxides (SOx) and particulate matter (PM). Through chemical reactions in the air, NOx and SOx are converted into very small airborne particles, nitrite and sulphate aerosols. Both NOx and SOx are combustion products that are emitted into the environment in the form of smoke; these are the two main pollutants.	▫ FSU fully complies with the international regulations in regards to emissions. ▫ Inspections will be performed by Port State and other Bodies ▫ Regular maintenance of the engines and boilers including its ancillary equipment to ensure adherence to emissions limits. ▫ Use Lower Sulphur Fuels and Selective Catalytic Reduction (SCR) ▫ Monitoring devices to be used: ▪ Marine Emission Monitoring Analyser capable of reporting the SO2:CO2 ratio as required by IMO's. ▪ Infra-red gas analyser Continuous Emission Monitoring System (CEMS) ▪ Scrubber Monitors/analysers ▪ Measuring unit to capture NOx(g) to power production kWh ▪ Smoke density indicators will be used which alert the operator to combustion issues, so can be rectified quickly	100% DENR Air Quality Guideline values
iii. Transport of LNG through pipes	Marine Water Quality	(-) Degradation of marine water quality due to LNG spill	▫ Concrete lining of LNG piping flanges and unloading arms to collect and transport LNG to impounding pits that shall also be constructed to temporarily store LNG spills	100% DENR Water Quality Guideline values
iv. Regasification of LNG using seawater	Marine Water Quality	(-) Thermal Pollution due to the release of cool water to the sea	▫ Installation of the discharge outlet in a location that will allow maximum mixing of the thermal plume to ensure the change (drop) in temperature will not exceed 3 °C ▫ Implement effective countermeasure on bubble-formation to prevent discharge of bubbles to the sea	100% DENR Water Quality Guideline values
vii. Daily operations - Domestic activities - Operation of land and floating facility - Daily use of equipment/ machineries	Land	(-) Solid waste generation Solid wastes that will be generated by the Projects consist of: • Household waste consisting of compostable waste materials from food and recyclable or residual materials such as plastics, wrappers, crates or boxes for food supply of workers and/or employees • Debris and other materials removed from construction activities such as spoils or excavated materials	▫ Establishment of a Materials Recovery Facility within the project site. Solid wastes, except compostable and dirty residual wastes, will be sorted and temporarily stored in the MRF. Disposal of these wastes will be handed to the governing LGU regularly on a monthly basis or at shorter frequency as necessary. Compostable and dirty residual solid wastes will be collected and disposed daily also through the LGU in order to avoid vermin infestation.	100% Solid waste act / RA 9003

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
		• Industrial solid wastes, such as damaged vehicle and equipment parts, etc. • Hazardous wastes such as used batteries, light bulbs, etc.	▫ The design of the project shall adopt the principles and practice of waste minimization and reduction/elimination of the production of waste wherever practicable. Any waste produced shall be segregated to allow for recycling or safe storage and disposal. ▫ Non-hazardous solid wastes will be classified and sorted as compostable, recyclable, and residual. Hazardous solid wastes will be classified based on Republic Act 6969 or the Toxic Substances and Nuclear Wasted Control Act of 1990.	
	Terrestrial Flora	Threat to abundance, frequency and distribution of important species	▫ Replacement planting with preference to indigenous species found in the area and in accordance to DMO 2012-02 ▫ Monitor replacement planting to ensure growth and survival	100% DMO 2012-02
	Terrestrial Ecology -Fauna	Pollution effects on species (light pollution, traffic) Habitat fragmentation	▫ Maintain and enhance buffer areas ▫ Use luminaires that direct light to designated areas that requires lighting and avoid dispersion of lights to surrounding areas. ▫ Implement speed limits and establish fixed routes for vehicles ▫ Allow fauna species to cross over or pass through the project site unharmed ▫ Enrichment planting along project boundaries parallel to the gully. ▫ Conduct CEPA programs in relation to biodiversity protection and conservation	100% DMO 2012-02
	Hydrology Marine Ecology	(-) Water resources competition *The primary water supplier of the terminal is under Batangas City Water District. The required potable water for the terminal office buildings will be 5 cbm/hr maximum.*	▫ The freshwater will be supplied by desalination unit as secondary source for all the utility station such as Jetty, BOG Compressor Area, fire water pond/tanks, etc.	
	Marine Water Quality Marine Ecology	(-) Contamination of marine surface water due to the stormwater discharge coming from the plant area	▫ Installation of a stormwater discharge system consisting of pipes and concrete open ditch channels with provisions to prevent silt, oil and grease and other contaminants from being transported to the sea (e.g. silt traps, oil water separators)	100% DENR Water Quality Guideline values
	Marine Water Quality Marine Ecology	(-) Oil contamination of marine surface water	▫ Provision of drip pans, curbing or oil sumps to collect oil-contaminated water	100% DENR Water Quality

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
			▫ Installation of Oil-contaminated Water Drainage System with sufficient capacity	Guideline values
	Marine Water Quality Marine Ecology	(-) Degradation of marine water quality from sewage	▫ Sanitary wastewater from toilets in buildings and from the kitchen in the canteen shall be collected to septic. The sanitary wastewater shall be transported in underground piping. ▫ Wastewater from dishwashing areas in the canteen shall be directed into a grease trap to separate grease before flowing into sanitary sewers.	100% DENR Water Quality Guideline values
	Marine Ecology	(-) Accidental oil and lubricant spills; oil pollution in the inter-tidal zone; (-) Slicks may reach coral reefs leading to loss of species and associated demersal fish (in primary and secondary impact areas).	▫ Implementation of accidental oil spill and ship bilge water treatment and recovery plan.	100% DENR Water Quality Guideline values
	Marine Ecology	*Increased human inhabitation of the port complex area can induce potential increase in domestic wastes that leads to:* (-) Marine pollution can be triggered if fugitive domestic wastewaters reach coastal sea leading to loss of fish and invertebrate habitats and nutrient loading in shallow waters. Biotoxin (PSP) in shellfish populations can happen together with health hazards to consumers.	▫ Waste management in all aspects of project operation will be implemented forcefully. ▫ Human traffic in inter-tidal area will be restricted and managed to ensure very little disturbance to natural processes. ▫ Conduct of regular plankton community monitoring focusing on presence and density of HAB-causing organisms will be monitored periodically in collaboration with the BFAR; ▫ All drainage water shall be filtered through a series of filtering devices. ▫ Collaboration with the City Government of Batangas to enable adoption of clean practices and domestic wastewater management.	100% DENR Water Quality Guideline values
	Marine Ecology	*Alteration of inter-tidal zone contiguous to the wharf/port complex if structures to further accommodate human and cargo access by sea leading to:* (-) Disruption to benthic and in-faunal population of mollusks in the inter-tidal zone; (-) Loss of commercially important macro invertebrate/bivalve stocks	▫ No additional permanent structures shall be set in areas contiguous to the port, in the wharf itself or inter-tidal areas near the port complex. ▫ Alterations in the wharf area will be kept to the minimum and on-going investigations to monitor any alteration of coastal habitats will be undertaken in order to adopt control measures. All temporary structures will be removed immediately. ▫ Shellfish populations will be monitored for potential enhancement of stocks especially in identified breeding grounds; ▫ Bivalve spawning and nursery areas near the project site will be identified	100% Philippine Coast Guard (PCG)'s traffic separation scheme (TSS) established for the Verde Island Passage under Memorandum Circular 04-03 (Routing System at Verde Island Passage).

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
			and cordoned as closed to intensive worker movement	
	Air Quality	(-) Increase of air pollutants (mainly SOX, NOX, CO, and PM) from the exhaust stacks during operation, thus increasing ambient air quality (-) During diesel engines intermittent operation (ca. 350KVA EDG nearby the E-house, Firewater pumps of ca. 500BHP each nearby the shoreline for water intake), CO2 may be released in intermittent cases.	▫ Use of stack height in accordance with the Good Engineering Practice (GEP) stack height. Pollutants dispersed at lower stacks tend to be forced at the surface or ground resulting to very high pollutant concentrations. This is due to presence of cavities or wakes around buildings. ▫ Use of diesel fuel for diesel engine generators with low sulfur content and subsequently, lower SOX emissions compliance with SOX emission standard set at 700 mg/Nm3 ▫ Use of diesel engines compliant with NOX emission standards set at 2000 mg/Nm3. ▫ Regular maintenance of the diesel engines (i.e., change oil and filter change) to reduce particulate and carbon emissions ▫ Conduct stack emissions monitoring in accordance with the requirements of DENR-EMB	100% DENR Air Quality guidelines values
	Ambient noise	(-) Increase in noise level During project operation, noise from the LNG facility is not expected to significantly at residences/households due to wide distance between the power plant and the former (about 500 m).	▫ Provision of effective noise mufflers of all project vehicles ▫ Strictly implement speed limits in access road in vicinity of residences ▫ Provide noise mitigation measures, i..e, barriers, noise enclosures, should noise levels from sources (e.g., pumps) exceeded ambient standards	100% DENR ambient noise guidelines values
-	People	(-) Occupational safety and health hazards	▫ Provision of PPE's including safety vests and harness for laborers involved in the construction ▫ Conduct of safety seminars, training and proper orientation to construction workers ▫ Implementation of HSE program as well emergency response plan	0 case injury/ accident
	People	(+) Employment opportunities	▫ Prioritization of locals for hiring ▫ Conduct of IEC regarding policy on local prioritization in hiring manpower, contractors, and suppliers ▫ Provision of Capacity Building and Skills Training Program	100% implementation of hiring policy 100% of employees undergone training program
	People	(-) Loss of livelihood and income source for fisher folks previously mooring in the coastal area w/in the vicinity	▫ Just Compensation and relocation package ▫ Provision and development of alternative livelihood	100% compensation and relocation package

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	TARGET EFFICIENCY
			▫ Development of fishery and fishery based livelihood program	provided to affected stakeholders
IV. Decommissioning Phase				
Removal of project facilities	Terrestrial Ecology	Proliferation of invasive species on opened areas	▫ Rehabilitation of disturbed areas through revegetation (i.e., indigenous tree planting, cover crops planting) ▫ Avoid use and deliberate introduction of invasive species	100% revegetation using native plants

CHAPTER 1 PROJECT DESCRIPTION

Linseed Field Power Corporation proposes to develop an integrated LNG import terminal located in Barangay Ilijan, Batangas City intended to service the nearby Ilijan Power Plant as well as future SMCGPH projects.

Given the timelines / requirements associated with this project, the terminal shall first be designed to utilize onshore regasification, storage, utilities and balance of plant, supplemented with a Floating Storage Unit ("FSU").

The Ilijan LNG Import Facility, which will cater to the LNG supply demands of the current 1,200MW Ilijan Combined-cycle Power Plant and 850MW Combined Cycle Power plant future expansion will be located in Barangay Ilijan, Batangas City within a 9-hectare property which will be leased from Ilijan Primeline Holdings, Inc. **Annex A** shows the Proof of Authority for the project.

A Miscellaneous Lease Agreement (MLA) for an area covering approximately 3.7 hectares of the foreshore and sea will be secured from the DENR to accommodate the jetty and mooring facilities and the Floating Storage Unit (including the mandated exclusions zone).

1.1 PROJECT LOCATION AND AREA

The Ilijan LNG Import Facility will be located in Batangas Bay, approximately 9.5km south of Batangas City, Philippines. The proposed project is adjacent to existing Ilijan Power Plant and Kepco Ilijan Corporation.

Annex A shows the Tax Declaration of Real Property and the Certificate of Agreement dated October 15, 2020 between Ilijan Primeline Industrial Estate Corp. and Linseed Field Power Corporation allowing the latter "to possess, use and develop certain parcels of land owned and controlled" by the former. As per the approved Batangas City Zoning Ordinance, the site is classified as an Agro-Forestry Zone (**Annex C**). However, the Batangas City Planning and Development Office stated that the area under the new CLUP 2019-2028 and the City integrated Zoning Ordinance CY 2019, the project area will be classified as Industrial Zone and Forest Multiple Use Sub-Zone (**Annex C**).

Table 1-1 shows the geographic coordinates of the project area.

Table 1-1. Geographic Coordinates of the Project Area

Corners	Latitude	Longitude
1	13°37'17.21"N	121°4'54.775"E
2	13°37'19.17"N	121°4'59.081"E
3	13°37'20.301"N	121°4'58.743"E
4	13°37'20.261"N	121°4'57.005"E
5	13°37'23.964"N	121 °4'51.624"E
6	13°37'19.929"N	121°4'52.51"E
7	13°37'21.162"N	121°4'57.23"E
8	13°37'22.082"N	121°5'0.551"E
9	13°37'25.168"N	121°4'58.985"E
10	13°37'23.2"N	121°4,54.854"E
11	13°37'23.487"N	121°4'54.493"E
12	13°37'26.508"N	121°5'1.002"E
13	13°37'33.817"N	121°4'57.455"E
14	13°37'33.788"N	121°4'53.668"E
15	13°37'28.557"N	121°4'54.364"E
16	13°37'24.8"N	121°4'52.461"E
17	13°37'25.098"N	121°4'51.127"E
18	13°37'29.696"N	121°4'53.229"E
19	13°37'33.808"N	121°4'52.23"E
20	13°37'33.841"N	121°4'50.203"E
21	13°37'28.196"N	121°4'47.508"E

Figure 1-1. Project Location Map

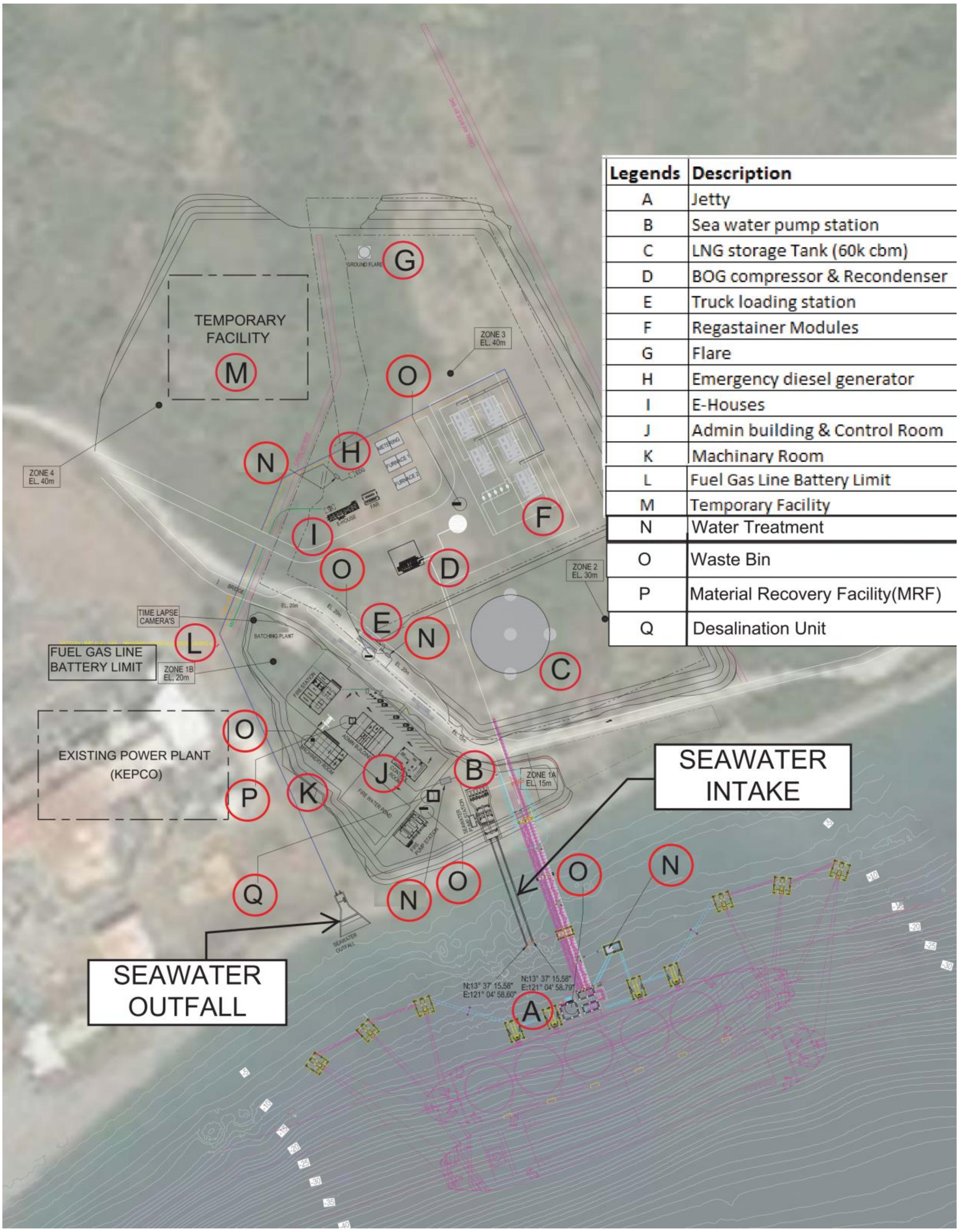


Figure 1-2. Project Footprint

1.1.1 SITE ACCESSIBILITY AND VICINITY

Batangas City is approximately 112 kilometers south of Manila and can be reached within 2.5 hours land travel via two existing expressways in the region, namely the South Luzon Expressway (SLEX) and the Southern Tagalog Arterial Road (STAR Tollways). Batangas City is accessible from any province in Luzon by land via the network of inter-town national roads.

The public utility bus system provides daily routes between Manila and Batangas. Batangas City is also accessible from any province in the islands of Visayas and Mindanao by sea through the Batangas International Port, locally known as Batangas Pier. The Batangas Pier, which is under the administration of the PPA, primarily serves the neighboring island provinces of Mindoro, Romblon, Palawan, Aklan, Iloilo and Capiz.

From the Batangas City Hall, the project site can be accessed via Batangas-Tabangao-Lobo Road.

The project is adjacent to the Ilijan Power Plant. More than 200 meters east from the site, patches of houses can be found while the residential area of Barangay Ilijan is located more than 500 meters west of the project.

1.1.2 DELINEATION OF IMPACT ZONES

1.1.2.1 DIRECT AND INDIRECT IMPACT AREAS

The direct and indirect impact areas of the Project were delineated based on DENR Administrative Order No. 30 Series of 2003 (DAO 03-30) and DENR Administrative Order 2017-15.

As per DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), the direct impact areas (in terms of the physical environment) are those areas where all project components are proposed to be constructed/situated which is the 9-hectare area where the floating storage unit, regasification site, including the offices and other auxiliary facilities is located. Indirect impact areas, on the other hand, are areas located immediately outside the coverage of the project facilities and operations and activities.

DENR Administrative Order 2017-15, on the other hand, provides a more detailed description of the impact areas:

Table 1-2. Direct and Indirect Impact Areas for the Project

Impacts	Direct Impact Areas	Indirect Impact Areas
Biophysical Impacts	• The 9-hectare LNG Terminal Facility • Barangay Ilijan • Areas about 1-2 km radius from the project boundaries which will be the receptors of air and noise impacts during construction and operation. • The proposed 500-m exclusion zone • The proposed 200-m safety zone outside the exclusion zone	• The adjacent coastal waters and seabed of the FSU. • Surrounding/adjacent barangays and tourism sites
Social Impacts	• Barangay Ilijan as primary beneficiaries of the Social Development Programs and whose lifestyle would be affected by the project. • Residents of Barangay Ilijan who will most likely be affected by the construction and construction works (livelihood and employment, health, etc.) and operation of the project. • Batangas City as the direct beneficiary of the revenue of the development.	• Adjacent barangays/cities other than the primary beneficiaries of the SDP that will benefit at a provincial and regional level from potential revenues and taxes of the Project. • Adjacent communities other than direct impact areas that will benefit from potential livelihood and employment opportunities both during development and eventual operations.

1.1.2.2 EXCLUSION AND SAFETY ZONES

For security concerns and for the safety of the immediate and surrounding environment, an exclusion zone shall be established in coordination with concerned agency. Using the definition of Proclamation No. 72 (Proclamation For Establishing Safety And Exclusion Zones For Offshore Natural Gas Wells, Flowlines, Platform, Pipelines, Loading Buoy And Other Related Facilities For The Malampaya Deep Water Gas-To-Power Project Over Certain Waters And Submerged Lands Adjacent To Batangas, Mindoro And Palawan) series of 2001, the exclusion zone is for the construction, operation and maintenance of the project facilities.

On the other hand, the safety zone establishes the area in which some activities are prohibited without prior consent from the authorizing activities.

The proposed exclusion zone will be at least 500 meters radius from the Floating Storage Unit and additional 200 meters as safety zone for re-supply and ship maneuvering activities.

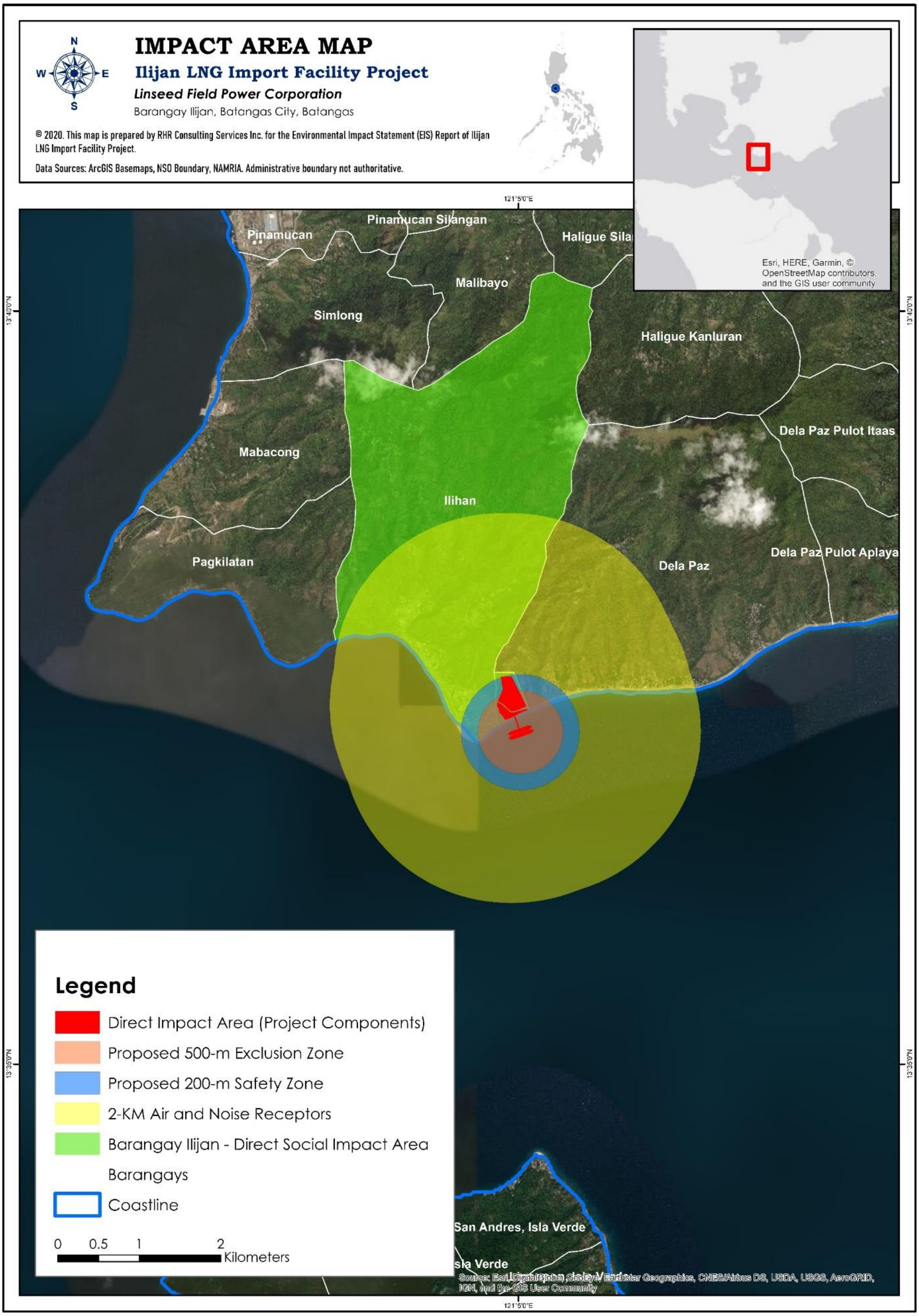


Figure 1-3. Impact Area Map

1.2 PROJECT RATIONALE

1.2.1 NATIONAL AND REGIONAL DEVELOPMENT

As the country is transitioning to cleaner energy sources such as natural gas, the Department of Energy (DOE) has crafted the Natural Gas Roadmap with the intent of establishing a world-class, investment-driven and efficient natural gas industry to make it the preferred fuel for end-use subsectors. The table below shows the demand and supply targets for energy outlook by the Department of Energy for 2018 to 2040 where natural gas is targeted to increase by 3% in the Clean Energy Scenario.

Table 1-3. Demand and Supply Targets for Energy Outlook 2018-2040

Scenarios	Assumptions	
	Reference Scenario *(Business as Usual)*	**Clean Energy Scenario *(Alternative Scenario)***
Energy Demand	• Response to the requirements of the *Build, Build, Build* infrastructure program and *AmBisyon Natin 2040*. • Maintain 2.0 percent biodiesel and 10.0 percent bioethanol until 2040.	• Assumptions under the Reference Scenario, including the following: √ 10.0 percent penetration rate for electric vehicles for road transport (motorcycles, cars, jeepneys) by 2040; √ 3.0 percent increase in aggregate natural gas demand between 2018 and 2040; and, √ 5.0 percent aggregate energy savings from oil and electricity by 2040.
Energy Supply	• Present development trends and strategies continue. • Consider 6,300 MW committed and 33,200 MW indicative power projects as of December 2018. • Increase renewable energy (RE) installed capacity to at least 20,000 MW by 2040. • Consider the aspirational target of 35.0 percent share of renewables to the generation mix by 2030. • Adopt 25.0 percent reserve margin. • Assume 70.0 percent load factor for the total Philippines	• Assumptions under the Reference Scenario, including the following: √ Highly-efficient power technologies; √ 10,000 MW additional RE capacity by 2040; and, √ 1,200 MW from other emerging technologies by 2035.

Note: lifted from DOE Philippine Energy Plan for 2018-2040

By 2040, the DOE further aims to achieve via Clean Energy Scenario (CES) the reduction in the utilization of coal as fuel input for power generation as compensated by Renewable Energy and Natural Gas at 7.3 percent and 5.1 percent growth, respectively, across the planning horizon (**Figure 1-4**).

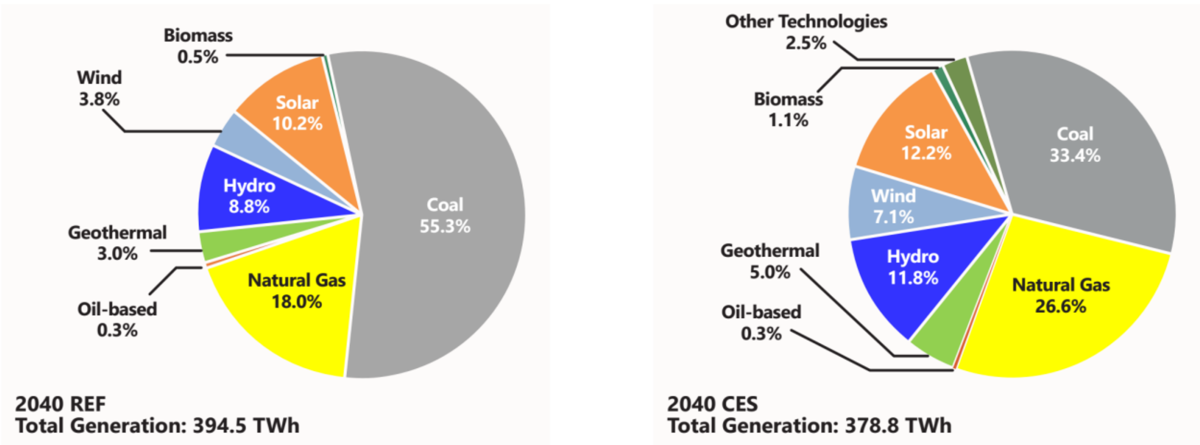


Figure 1-4. Reference (REF) vs. Clean Energy Scenario (CES), 2040 Power Generation Mix, by Fuel Shares

In September 2020, the DOE reported that the natural gas currently provides for 3,200 megawatts of electricity and accounts for 21.1% in the 2019 Gross Generation of the country. But in Luzon alone, natural gas' contribution last year was at 29.3%[1].

Malampaya, the deep-water gas-to-power project located in the West Philippine Sea near the Province of Palawan, was launched in 2001 with a single offshore platform. An additional platform began operating in 2015. Malampaya is critical to the country's energy needs and provides up to 20% of the country's power[2].

With Malampaya's depletion estimated to occur in 2022, there is an urgent need to attract more investments in the downstream LNG industry, the DOE noted.

The Project is in line with this goal which is to supply clean and reliable liquefied natural gas to the adjacent Kepco Power Plant and to other industries (through future expansion). In doing this, the Project will contribute to the national economy, improve the quality of life of the people and meet the projected need for power in the Luzon grid.

1.2.2 LOCAL ECONOMIC DEVELOPMENT

Linseed Field Power Corporation is proposing to build an LNG import facility that will supply regasified LNG to the 1,200MW Ilijan Combined-cycle Power Plant currently sourcing gas from the Malampaya gas field, the supply agreement for which is expiring by June 2022. The terminal is also designed to supply gas to the 850MW Combined Cycle Power plant future expansion. Linseed is targeting to commission this import facility by June 2022 so that the power plant can seamlessly secure supply and continue its operations thereafter. Therefore, the Project will contribute to the national economy, improve the quality of life of the people and meet the projected need for power in the Luzon grid.

Without the proposed LNG terminal, the power plant (which supplies more than 10% of the 11,304MW capacity of the Luzon grid) would have to try extending its supply agreement with Malampaya (not likely due to almost depleted supply available) or cease operations altogether. The terminal is also going to supply to SMCGP's proposed 850MW mid-merit plant scheduled to commence operations in 2022. This terminal therefore is an important component of securing almost 20% of the power demand of the entire Luzon Island. The continued operation of the Kepco Ilijan Gas Plant plays a crucial role in maintaining the country's current power generation capacity even if Shell Philippines Exploration b.V. stops its supply of natural gas to the Power Plant when the Malampaya field nears the depletion of its gas reserves.

The continuous operation of the existing Ilijan Combined-cycle Power Plant, the 850MW mid-merit expansion and the proposed LNG terminals will increase the employment and business opportunities available to not just the residents of Barangay Ilijan but for the nearby communities as well.

The project is also deemed to contribute to the local economy particularly of the host barangay – Ilijan, and Batangas City through taxes, employment of more than 1,500 workers, social development programs and CSR projects.

1.3 PROJECT ALTERNATIVES

1.3.1 SITING

Based on the known impacts of LNG facilities, the selected site has a number of distinct advantages over alternatives sites. The location selected considered the following design parameters:

- Adjacency to the 1,200MW Ilijan Combined-Cycle Power Plant;

[1] Department of Energy (2020). DOE Promotes PH Liquefied Natural Gas Investors' Guide. Retrieved https://www.doe.gov.ph/press-releases/doe-promotes-ph-liquefied-natural-gas-investors%E2%80%99-guide?ckattempt=1 from

[2] US Energy Information Administration (2020). Natural Gas. Retrieved from https://www.eia.gov/international/analysis/country/PHL

- The project site is uniquely deep with proximity to the plant and near to shore (i.e., 15.5 meters draft available at this location, 165 meters from shore). Other locations in the Batangas Bay do not have the same available draft and suitable Metocean conditions without significant dredging.
- Project location will be classified as Industrial Development Zone, the suitable land use for an LNG receiving facility;
- Availability of protected/sheltered vessel berthing and access to the sea for offshore LNG receiving terminal/regasification and sea water cooling;
- Not influenced by wave action from Batangas Bay or alternatively can have a means of protection from wave action;
- Sufficient water depth for the barge to float at low tide;
- Sufficient shoreline for the power barge;
- Consistent with DOE standards with regard to siting of the LNG import terminal based on a risk assessment study;
- Accessibility to utilities such as fresh water supply, possible fire water supply, and pipelines with connecting manifolds for gas and diesel supply;
- Accessibility to landside roads; and
- Minimum disturbance to current habitants in the area.

Table 1-4. Summary of Hazard Susceptibility

Description of Hazard	Level of Vulnerability
Ground Shaking / Ground Acceleration	High
Ground Rupture	Low
Liquefaction	Low
Landslide (Earthquake-induced)	Medium
Landslide (Rain-induced)	Medium
Tsunami	High
Flooding	Low
Storm Surge	Medium

There are no other feasible alternative location for this project as it aims to primarily supply LNG to the existing KEPCO power plant.

1.3.2 TECHNOLOGY SELECTION/OPERATION PROCESSES

LNG tankers unload their cargo at dedicated marine terminals which store and regasify the LNG for distribution to domestic markets. There are two common types of terminals for LNG regasification. Onshore terminals consist of docks, LNG handling equipment, storage tanks, and interconnections to regional gas transmission pipelines and electric power plants. On the other hand, offshore terminals regasify and pump the LNG directly into offshore natural gas pipelines or may store LNG for later injection into offshore pipelines.

The project will employ an onshore terminal-based regasification that is often applied over longer distance transport of LNG by ocean-going vessels. LNG is regasified into a natural gas at a land-based terminal, which receives it from vessels (LNG carrier-LNGC) that transport LNG produced at liquefaction plants to 1,200MW Ilijan Combined-cycle Power Plant.

All the components and processes involved in the project are crafted based on the site factors, established experience of the proponent contractor, and the aim of supplying LNG into the adjacent power plant in the most efficient and sustainable way. Hence, there are no other alternative technologies and operation processes that would fit the project.

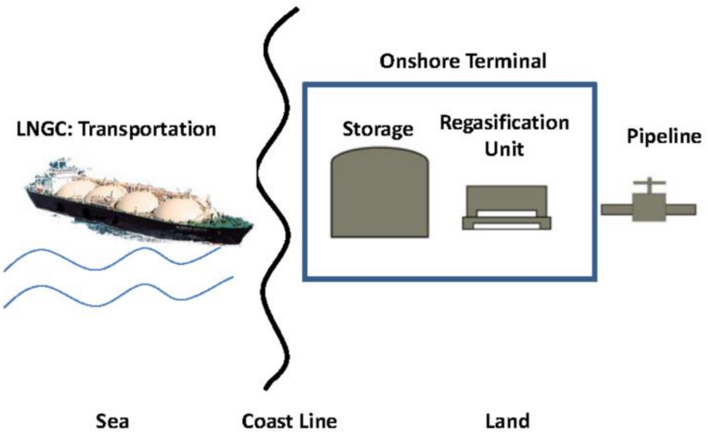


Figure 1-5. Generalized LNG regasification technology illustrated by Sönmez, et al (2010)[3]

1.3.3 RESOURCES

1.3.3.1 WATER SUPPLY

Alternative sources of water for domestic and operations use include the Batangas City Water District which is the primary water supplier of in Batangas City. In 2013, the average water supply/production capacity/month is 567,804 cubic meters while the average demand/consumption capacity/month is 318,756 cubic meters (www.batangascity.gov.ph). Sea water may be used for firefighting in case of emergency. There is no groundwater available for use in the barangay. Hence, seawater from desalination unit and the local water district are the principal source of water for the project.

1.3.3.2 POWER SUPPLY

Power sources include the Manila Electric Company (MERALCO) which serves the host barangay. No other option is available. The project will use of a diesel powered generator during power interruption.

The FSU AND LNGC have their own power supply on board.

1.3.4 COMPARISON OF ENVIRONMENTAL IMPACTS FOR EACH ALTERNATIVE

The comparison of environmental impacts of each alternative for facility siting, development design, process/technology selection, and resource utilization is presented in the following table:

Table 1-5. Summary of environmental impacts for each alternative considered for the project

Parameters	Alternative 1	Alternative 2	Remarks	Impact
Project Location	Proposed site at Barangay Ilijan, Batangas City adjacent to the Kepco Power Plant	None	• Proximity to the power plant (**Figure 1-1**) • Has authority over the project site (**Annex A**) • Will be classified as Industrial Zone (**Annex C**) • Accessibility (**Figure 1-1**) • Consistent with DOE standards with regard to siting of the LNG import terminal based on a risk assessment study.	• Minimal impact in terms of land use and presence of hazards

[3] Sönmez, E., Kekre, S., Scheller-Wolf, A., & Secomandi, N. (2010). *Comparative Analysis of Incumbent and Emerging Liquefied Natural Gas Regasification Technologies*. Retrieved September 15, 2020 from isapapers.pitt.edu.

Parameters	Alternative 1	Alternative 2	Remarks	Impact
Technology Selection	**Onshore terminal**	Offshore terminal	• Applied over longer distance transport of LNG by ocean-going vessels.	• Alternative 1 has more impacts to the marine environment (including but not limited to fishing access restrictions, ship collision, among others) than Alternative 2. Strict compliance to local and international standards as well as proper implementation of the mitigating measures in the succeeding chapters of this report will be conducted.
Resources: Water Supply	Batangas City Water District	Water from desalination	• No groundwater and surface water available for use of the project. • The local water district will be the primary source of water for the project and seawater as secondary source for domestic and firefighting purposes.	• Alternative 1 may induce resource competition with households and other industries using the same water source in the district. The project will utilize seawater as secondary source as mitigating measure.
Resources: Power Supply	Manila Electric Company (MERALCO)	None	The primary source of electrical power for the auxiliary facilities shall be provided by the grid (local electricity provider). In addition to the independent power supply, the project will utilize one (1) unit of 350kVa skid diesel generator set during power interruption.	• Alternative 1 may induce resource competition with households and other industries using the same power source in the barangay. Proper implementation of the mitigating measures in the succeeding chapters of this report will be conducted.

1.3.5 NO PROJECT ALTERNATIVE

The 'no-go' alternative is the option of not proceeding with the proposed LNG Import Facility Project. This alternative will result in the continuation of the project site's current state. As the future supply of natural gas for the existing and proposed natural-gas fired power plant depends on the Project, the power plant would either be decommissioned or converted to run on more expensive and higher emission fuels such as condensate and diesel. If the power plant will be decommissioned and replacements will not be built in time for this, the Luzon grid will experience major power outages.

In addition, the projected social and economic benefits of the LNG Import Terminal Project will not be realized. These include employment generation, local business growth, increase in government revenue through local and national taxes and permitting fees, host community development through the corporate social responsibility programs, among others.

1.4 PROJECT COMPONENTS

The following table shows the summary of project components. On the other hand, **Figure 1-6** shows the project boundary, proposed buffer (including the safety and exclusion zones) and industries nearby. The Kepco Power Plant is the nearest and only existing facility. West of the power plant is where the Barangay Hall of Ilijan is located as well as the residential and eco-tourism areas of the barangay. Located on the east of the project are few resorts or café near the shore. **Figure 1-7** depicts the Project Layout.

Table 1-6. Summary of Project Components

Major Components	Details/Description	Specifications	Capacity	Dimensions
Marine Facilities				
Floating Storage Unit (FSU)	LNG Carrier to be chartered and used as an FSU located ~165 meters from shore	LNG/C Ish from ADNOC	137,000 m^3	Length: 293 mtr Width:45.5 mtrs Depth: 14.8 mtrs
Jetty and Mooring	Jetty / mooring designs reapplied from our expertise from other LNG import terminals	• 4 berthing dolphins • 6 mooring dolphins • 3 LNG unloading arms	4000 cbm/hr each	Jetty Platform : 45 mtrs X 32 mtrs
RegasTainers®	5 x 84 mmscfd RegasTainers®	Refer 1.4.1.4.	420 mmscfd	N/A
Storage LNG Tank	Double wall containment steel tank	9 % Nickel	1 x 60,000 cbm Storage storage tank, equivalent to 7 days' storage	Dia : 53 Mtr Height : 29 Mtr.
Flare	Ground Flare		2000 kg/hr	Height : 10 mtr (Approx) Dia : 4.4 mtr (Approx.)
Truck Loading Facilities	Two-truck loading facilities to allow for LNG-by-truck to 3rd party customers	Hose connections enclosed system	2 X 80 cbm/hr	N/A
Cryogenic pipelines	Stainless Steel -Above ground insulated	SS304L	N/A	12- 20 " diameters
Send out system	Carbon steel insulated above ground up to the battery limit	CS	680 cbm/hr	12 "
Low and High pressure pumps	Submersible LNG pumps	Cryogenic service	3 x 420 cbm/hr (LP) @ 8 bar 5 X 175 cbm/hr(HP) @ 75 bar	N/A
Boil-Off Gas (BOG) compressors and re-condenser	Due to heat ingress BOG produced and the same will be reliquified by BOG compressor and recondensor	Reciprocating compressor Recondenser cools by LNG	Capacity: 2 t/hr.	N/A
Metering	Custody transfer	redundant metering skid with chromatograph	750 cbm/hr 65 degC @ 60 bar	N/A
Seawater pump station	Sea water pump station is located near the shore line. Discharge will be ca. 20,000m^3/h max after future expansion; temperature difference between intake and outfall is limited to 3 degrees.	Onshore Concrete pit with water intake below sea level. .	5 x 5,000m^3/h (One spare)	N/A
Boilers/Furnaces	To heat the send out gas from 15 deg to 65 deg C.	Hot water system	5 tonns/hr	N /.A

Major Components	Details/Description	Specifications	Capacity	Dimensions
Fire Water Pumps	Firefighting installation for Terminal & Jetty	5 x 1000 cbm/hr Diesel driven fire water pump	4286 cbm/hr	N/A
Inland Facilities				
Admin building	Office, technical ,pantry , toilets etc.	Concrete building with concrete slab	NA	30m X 20m
Machinery Room	Utilities Equipment's (N2 generator, Compressors, etc.)	Concrete building with concrete slab	NA	30m X 16m
Control Room	Terminal monitoring building	Concrete building with concrete slab	NA	26m X 15m
Fire Station	Fire vehicle shelter	Concrete building with concrete slab	NA	20m X 20m
Road Networks	Interconnected roads for connecting facilities	Concrete reinforced cemented	NA	6 mtr width
E-Houses	Substation and switchgear	Structural steel with corrugated MS roof	NA	25 m X 10m
Security Huts (Guar Houses)	Guard shelter	Sandwich panels	NA	4m X 4m
Truck Loading Facilities	Two-truck loading facilities to allow for LNG-by-truck to 3rd party customers	Hose connections enclosed system	2 X 80 cbm/hr	N/A

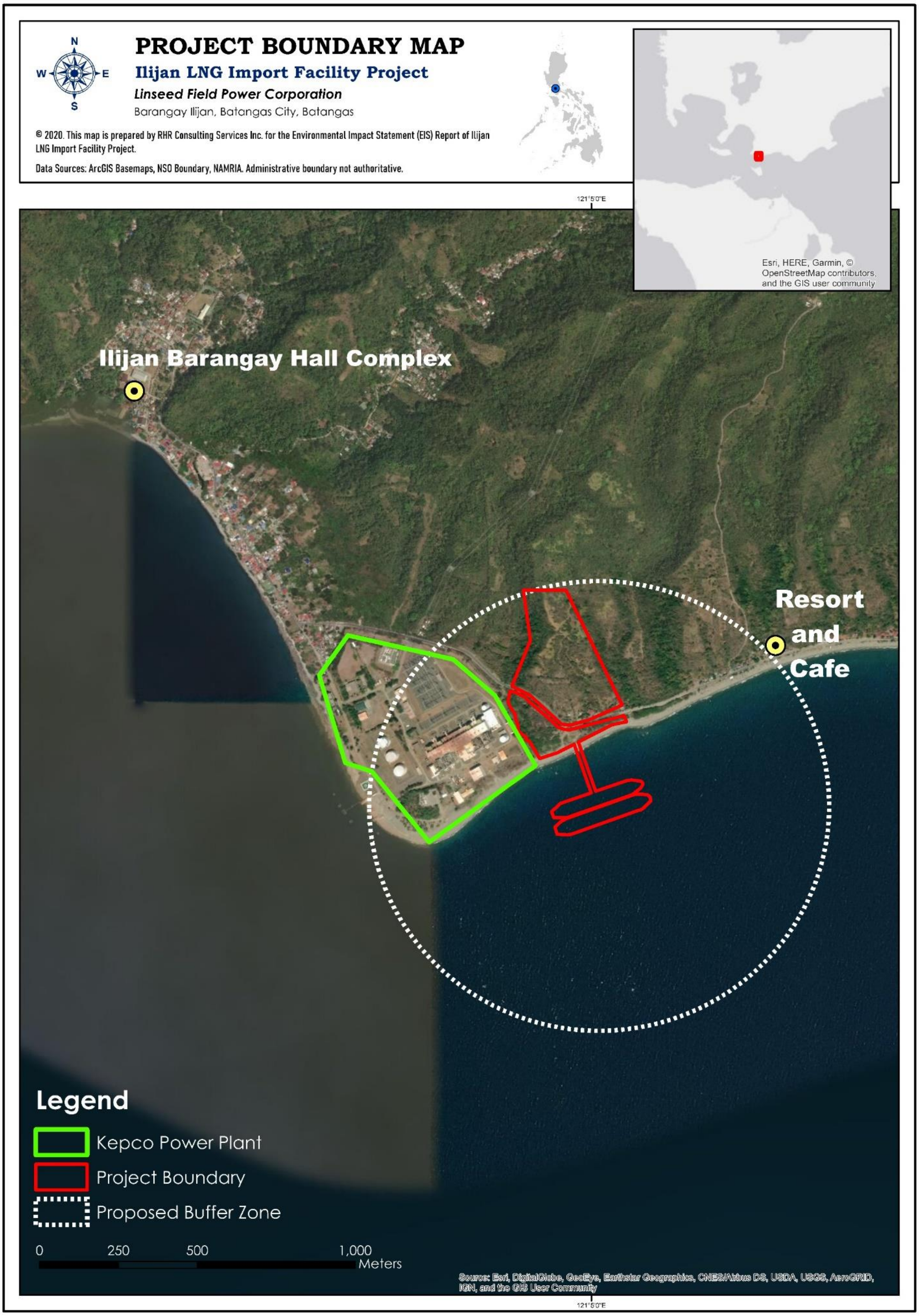


Figure 1-6. Project Boundary Map

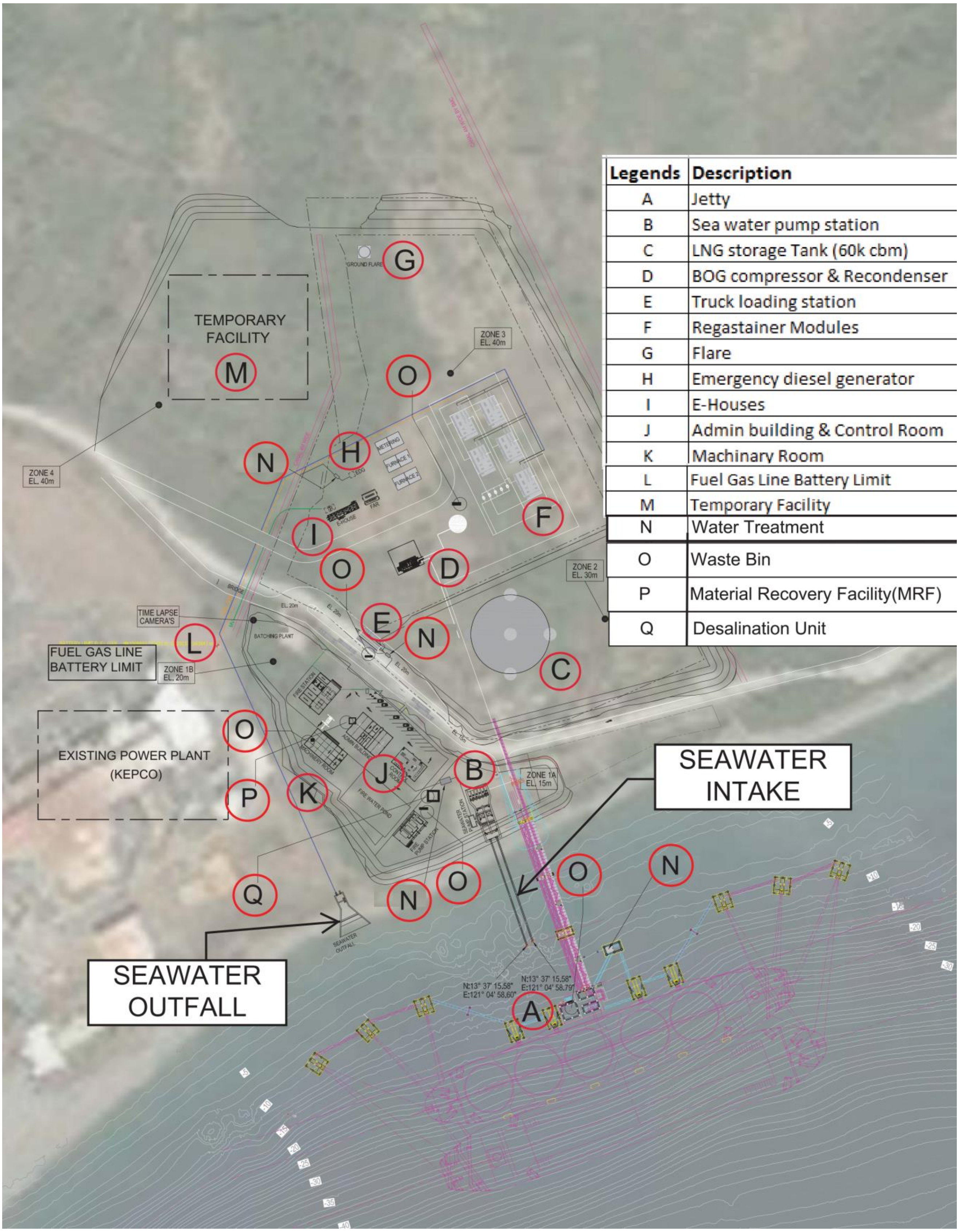


Figure 1-7. Project Layout

1.4.1 MAJOR COMPONENTS

The terminal off-shore components consist of structures to support berthing and mooring of the FSU and LNGCs, loading arms, access gangway, ancillary equipment such as fire-fighting, lighting, and control room, and access to the various platforms and equipment. The principle marine structures comprise the following:

- Berthing dolphins (4)
- Mooring dolphins (6)
- Service Platform
- Mooring platform
- Access trestle
- Pipe support trestle
- Gangway
- Catwalks
- LNG spill containment and separator.

The general arrangement of the marine structures is shown in figure below.

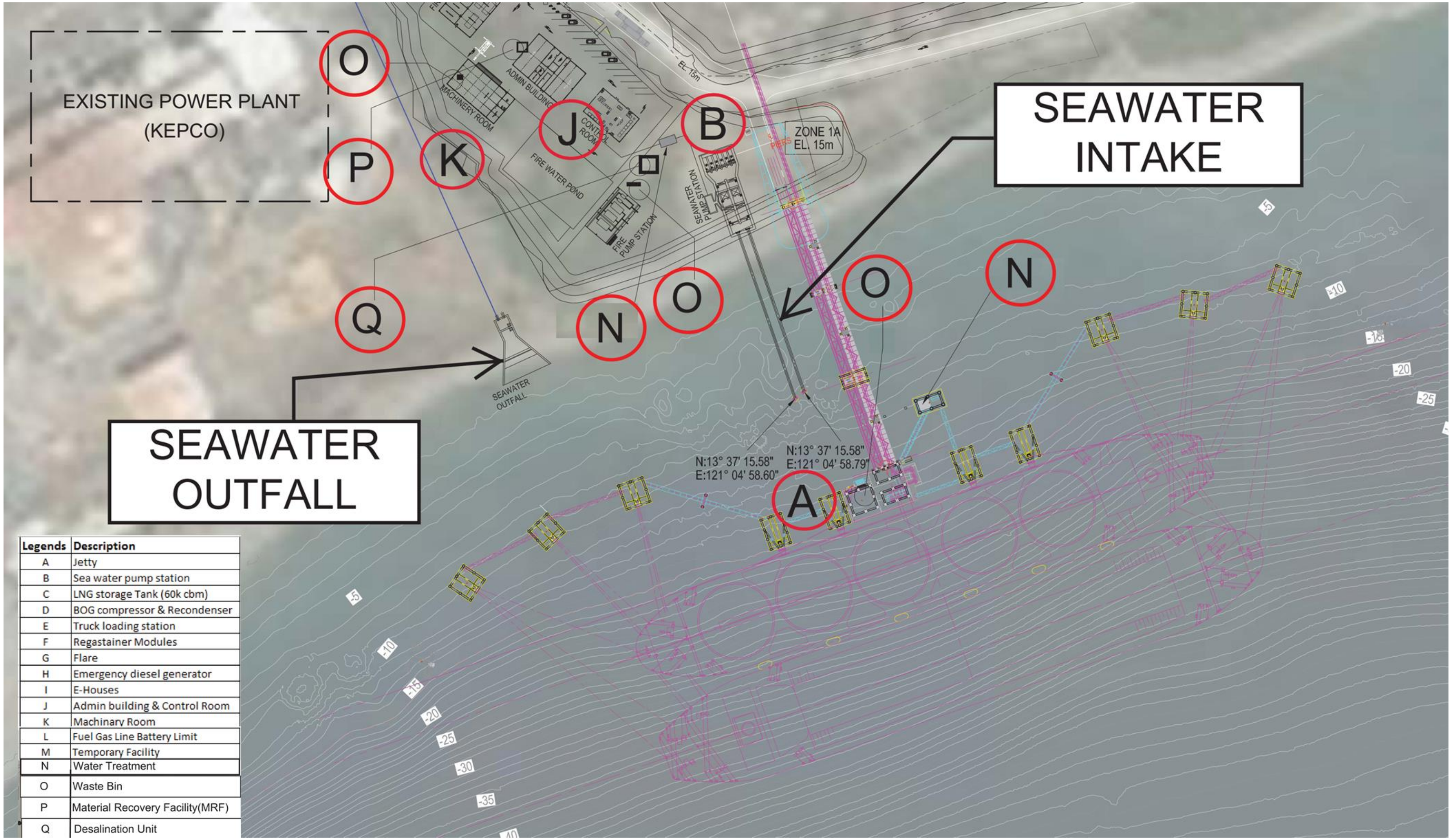


Figure 1-8. Marine structures general arrangement

1.4.1.1 FLOATING STORAGE UNIT

A 137,000 cbm LNG Carrier from ADNOC will be chartered and used as a Floating Storage Unit (FSU). The FSU will be located ~165meters from shore.

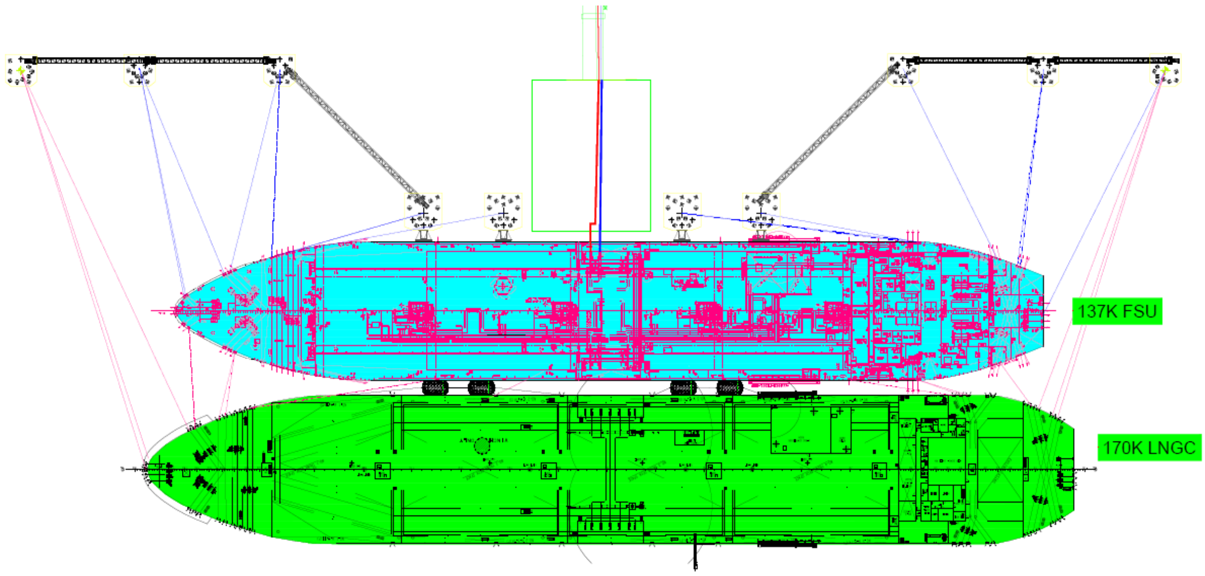


Figure 1-9. Illustration of FSU Mooring and Berthing Platform

The FSU and contracted LNG ships comply with all relevant local and international regulatory requirements of pertinent organizations such as but not limited to the International Maritime Organization (IMO), the International Gas Carriers Code (IGC), or the Society of International Gas Tanker and Terminal Operators (SIGTTO), among others.

1.4.1.2 JETTY AND MOORING

Jetty / mooring designs reapplied from our expertise from other LNG import terminals mainly consists of the following:

- 4 berthing dolphins
- 6 mooring dolphins
- 3 LNG unloading arms
- 2 Remote fire monitors
- 1 Gangway
- 1 E-House (Containerized 20” blast proof)

1.4.1.3 LNG STORAGE TANK

One 60,000-cbm storage tank will be installed. The capacity based on 7 days retention.

1.4.1.4 REGASTAINERS® MODULES

There will be five (5) regas modules to be used with total regas capacity of 420 mmscfd. Each RegasTainer® contains the following:

- LNG booster pump
- Regas vaporizer
- Glycol heating system
- Metering system (non-fiscal type)
- Manifold skid
- Fire & gas detection system
- An emergency shutdown system

- An electric panel including control & alarm monitoring system

1.4.1.5 BOG COMPRESSOR

Boil-Off Gas (BOG) generated from the onshore storage tank and flows through the onshore BOG header, which is connected to the Compressor knock out drum. The BOG Compressor package will consist of two reciprocating compressors, operating on 2 x 100% philosophy.

Boiled Off Gas (BOG) generated during the storage and transportation of LNG will be used for:

- Creation of electrical energy on board of the FSU for BOG generated on FSU.
- Onshore BOG will be used for reheating the fuel gas to be supplied to the power plant up to a temperature of 65°C or liquefied again using BOG compressors and recondensor.

The aim is to use all BOG gas in a sustainable way instead of burning it off via a ground flare (**Figure 1-10**). The flare will only be used at startup when a lot of natural gas is created due to cooling down of the installation and situations where the BOG compressors cannot handle the generated mount of BOG gas (i.e. a rollover).

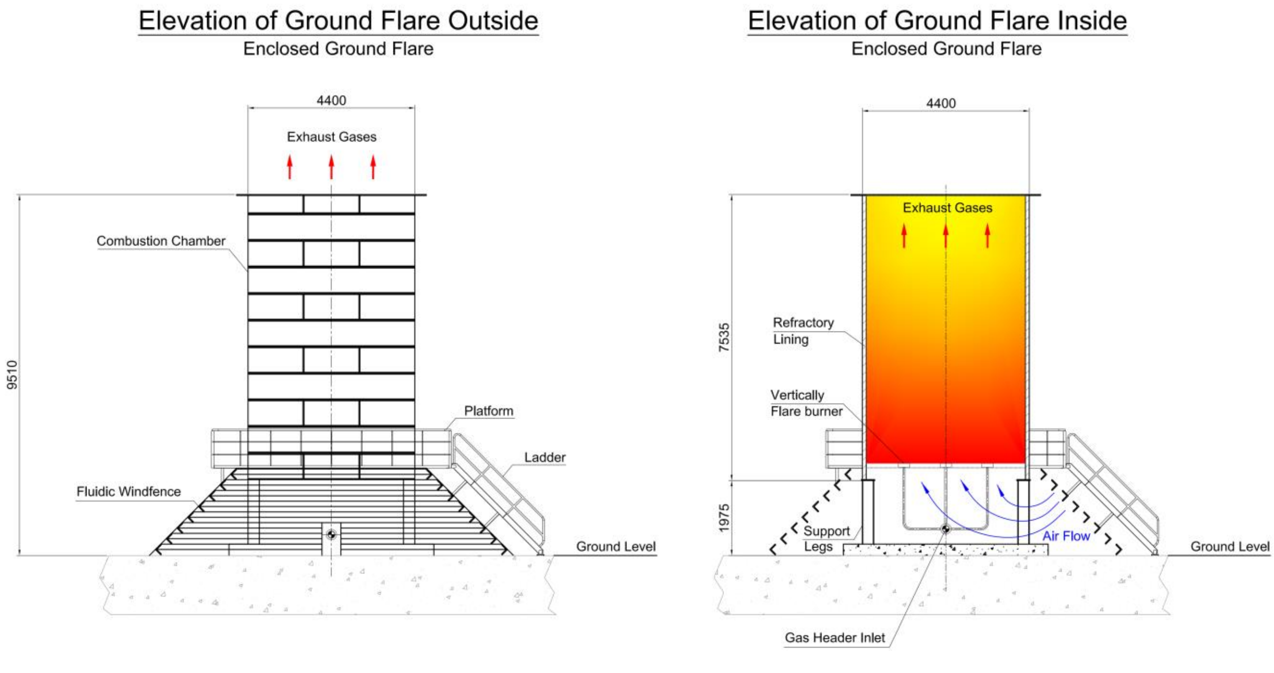


Figure 1-10. Elevation view of Ground Flare

Safety valves and emergency relief valves on the LNG storage tank are only used if any other safety precaution fails. This will cause a release of BOG gas to atmosphere.

Sensitive locations for LNG spills or leakage are foreseen with drip trays for collection and further processing.

1.4.1.6 UTILITIES

Flaring, plant air, instrument air and nitrogen generation, seawater intake and outfall system, and firefighting system in accordance to Philippines and international safety standards.

1.4.1.7 TRUCK LOADING FACILITY

LNG for the truck loading facility will be supplied from the LNG storage tank by LNG LP pumps discharge manifold to the LNG Truck Loading Package. Common truck loading lines are designed for two LNG truck-loading filling stations. All vapor from the truck-loading facility will be sent to the common vapor manifold.

Two truck loading lanes will be provided, each equipped for one truck loading service.

1.4.1.8 GAS/CUSTODY TRANSFER METERING

Custody metering package is designed for 1+1 (2 x100%) service, at rated operating range of 420 MMSCFD of pipeline gas at 60 barg and 65°C. The two meters are arranged in parallel with crossover line for Z configuration intended for online probing. Mixed gases from compressor discharge and vaporizer pass through the metering before proceeding to the send out pipeline. The metering skid is provided with online gas analyzer (gas chromatography) and pressure/ temperature compensation capability. The metering package flow computer generates data pertaining to gas composition, volumetric flow (actual/standard), mass flow, wobbe index, calorific value, etc., which can all be monitored and read at the control room of the terminal.

1.4.1.9 STRUCTURAL DESIGN (JACKET SUPPORT SYSTEM)

The supports for the major structural elements of the terminal will be jacket structures. Jacket structures are tubular steel frames fabricated on shore prior to load-out and placement at the terminal site. The construction schedule favors the use of jacket structures over piled structures.

The jackets provide the major support for the top-side structures and rest on a level surface at the seabed. Piles are placed inside of the jacket, and either driven through the overburden to bedrock, or if no overburden exists, just drilled and anchored into bedrock. Piles are anchored to the jacket by grouting the annulus between them. Oversized sockets are drilled into the rock, creating an annulus between the rock and pile which is subsequently grouted to anchor the pile in place. The piles serve as their own anchors, eliminating the need for pin piles or reinforced concrete anchors.

After completion of the socketing and anchoring, the deck support element, complete with a transition piece, is added onto the jacket to provide a level surface for the top side structures. The decking elements are added last. The transition piece and the truss framework supporting the decking are also pre-fabricated elements, and can be placed in a modular fashion.

1.4.1.10 SERVICE PLATFORM

The service platform is designed primarily for vertical (gravity) loads. It is, however, designed to withstand environmental (wave, wind) and seismic lateral loads and surge loads. The dimensions of the supporting structure are not affected by the size of the vessels being handled.

The loading platform plan area is governed by the space requirement for equipment and design vehicle access. The marine arms are arranged along the berth edge of the platform. Product piping leading back to shore runs through an expansion loop supported off the side of the platform, to the access trestle. Allowance for control station, fire-fighting equipment, access gangway for ship's personnel and supplies, and maintenance envelopes for all of the aforementioned equipment is to be provided.

The underside of the decking is clear of the splash zone of the maximum design storm wave. The decking consists of pre-cast concrete elements, with an in-situ topping. Handrails and bull rails as appropriate run the perimeter of the loading platform.

1.4.1.11 ACCESS AND PIPELINE SUPPORT TRESTLE

As with the loading platform, the access trestle and pipeline support trestles are designed primarily for gravity loading, with environmental, surge loads and seismic loading a consideration in the design.

The access trestle width is sufficient to handle service vehicle, and the pipeline support trestle width is sufficient to handle the product pipelines, as well as other utility support and access requirements. Maintenance envelope and access requirements and the provision of anchoring points for the piping requires that the piping be laid out horizontally. The length of the trestle is not so long that a thermal expansion loop for the piping is required over the trestle length. In addition to the product piping, the trestle also carries other services, such as firewater and electrical conduits for equipment at the terminal.

The trestle supporting structures consist of one traditional vertical pile bent and one rectangular jacket. The bent and jacket are located at approximately 45 m spacing and support the trestle superstructures. The deck superstructures consist of plate girders to span the distance between supports. The deck of the access trestle has a pre-cast concrete decking, and the deck of the pipeline trestle will have hot dip galvanized grating.

Some earthwork and slope protection may be required at the abutment to provide a support for the first spans of the trestle superstructures. The support at this location would be a piled spill-through concrete abutment with concrete wing walls.

1.4.1.12 BREASTING STRUCTURES

Unlike the loading platform and the access trestles, the size of the design vessel and the lateral load that vessel berthing imparts, as well as seismic loading, are the governing factors in sizing the support structure for the breasting dolphins. Four breasting dolphins are required.

The size of the supporting structure for the breasting dolphins has been designed to accommodate the FSU and LNGCs. The fender units, fender panels and associated structures and connections have been sized to suit design vessels.

The plan area at the top of the breasting structure is a function of the width required for the structure to effectively resist the lateral berthing loads, the plan area required to land the catwalks, and the operating envelope required for the quick-release mooring hooks. Each of the breasting dolphins requires mooring hooks for handling the vessels' spring lines.

The breasting structure is a single jacket structure. The top of the structure consists of a steel frame welded into place. The decking is heavy duty galvanized grating spanning between steel frames, and a reinforced concrete section to allow anchorage of the mooring hooks.

1.4.1.13 MOORING STRUCTURES

The mooring structures are similar in dimension and construction to the breasting dolphins. The mooring dolphins have also been designed to accommodate design vessels and seismic loading. Lateral loads govern the design of the dolphins. Six dolphins are likely adequate to accommodate mooring loads but two provisional dolphins are included subject to completion of a vessel mooring analysis.

The plan area at the top of the mooring structure is a function of the width required for the structure to effectively resist the lateral loads. Each of the mooring dolphins typically supports a quadruple quick-release mooring hook for the bow and stern lines of the vessels at berth.

The mooring structure is a single jacket structure. The top of the structure consists of a steel frame welded into place. The decking is heavy duty galvanized grating spanning between steel frames, and a reinforced concrete section to allow anchorage of the mooring hooks.

1.4.1.14 CATWALKS

Catwalks span between the loading platform, breasting dolphins and mooring dolphins, and are essentially steel box trusses to allow access to the dolphins. The catwalks would be required to carry electrical conduits to supply power to the mooring hooks and navigation aids.

1.4.2 SUPPORT FACILITIES

1.4.2.1 OFFICE BUILDING AND OTHER STRUCTURES

The administration building and other structures will be constructed of reinforced concrete block and structural steel materials. It will house the offices for the power plant personnel that will manage the day to day operation of the power plant during its existence.

1.4.2.2 ROADS AND PATHWAYS

Additional minor road or pathways will be constructed for the project. Cemented roads and pathways will be built to support construction of the facilities and also to prevent major road traffics.

1.4.2.3 POWER SUPPLY

The primary source of electrical power for the auxiliary facilities shall be provided by the grid (local electricity provider). In addition to the independent power supply, the project will utilize one (1) unit of 350kVa skid diesel generator set during power interruption.

The FSU AND LNGC have their own power supply on board.

1.4.2.4 WATER SUPPLY

The primary water supplier of the terminal is under Batangas City Water District.

The required potable water for the terminal office buildings will be 5 cbm/hr maximum. As a secondary source, seawater from the desalination unit is also designed for all the utility station such as Jetty, BOG Compressor Area, fire water pond/tanks, etc.

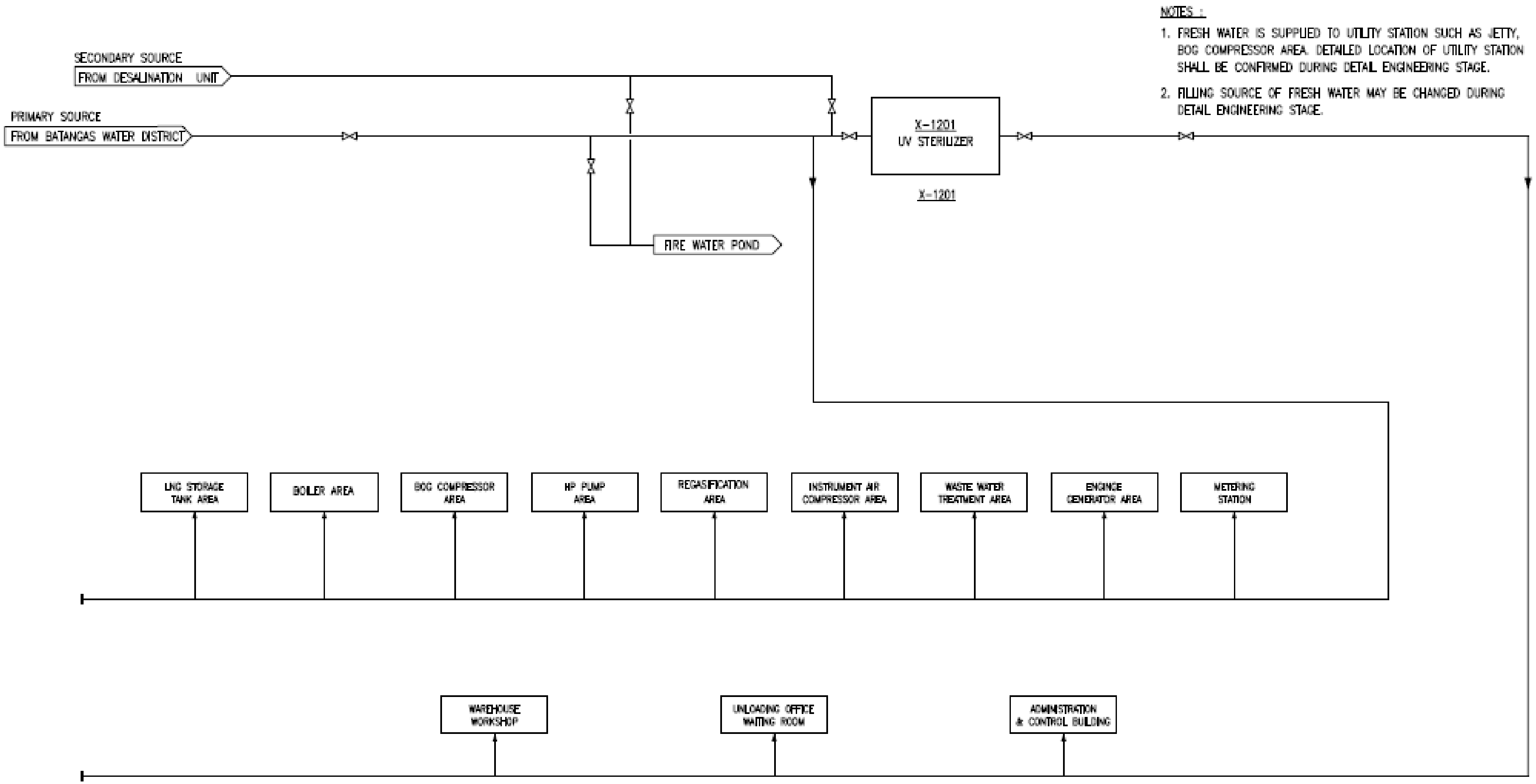


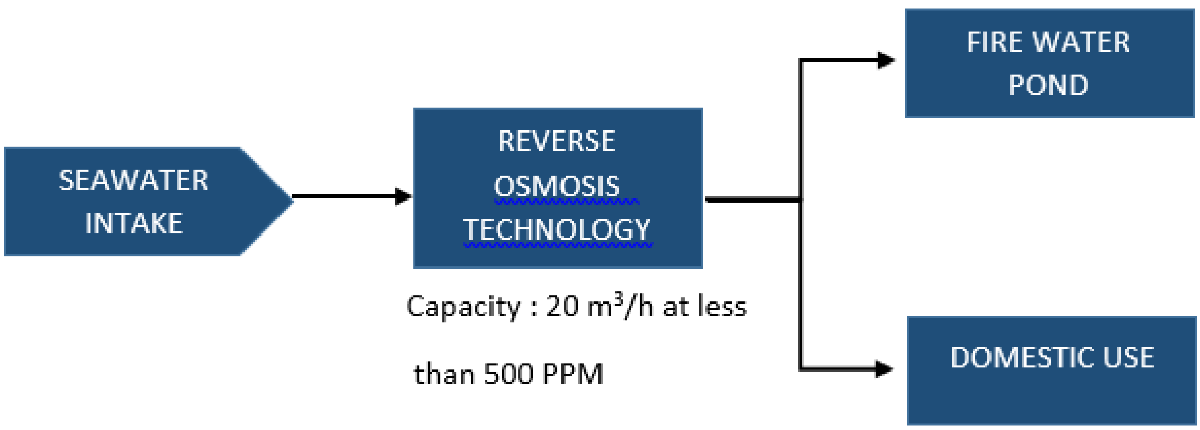
Figure 1-11. Utility and Potable Water Supply System

Desalination system will be secondary source as the primary source will be from Batangas water district.

Sea water will come from sea water intake system and be processed through a desalination, single stage reverse osmosis system. The desalinated water will be used to fill the Fire water pond as well as for domestic use.

Technical specification for desalination unit

1) Quantity : 1 sets
2) Type : Reverse Osmosis, single stage
3) Capacity : 20m3/h at less than 500 PPM
4) Temp. : Ambient
5) Feed pump : Single stage, centrifugal type
6) High pressure pump : Vendor's standard
7) Pressure vessel : Membrane
8) Electric power : 400/230V, 3 phase, 5 wires, 60 Hz Neutral Solid Earthed
9) Electric sanitary indicator : 230V, 1 pahse, 2 wires, 60 Hz
10) Material : Vendor's standard



Fire water demand calculations for LNG storage tank (60,000 cbm) is presented in **Table 1-7** to determine the fire water pond/tank size. The total calculated freshwater demand flow rate is 4,513 m3/hr. The estimated design pond/tank size based on the flow rate is 45.0m (L) x 30. 0m (L) x 8.0m (D) with a capacity of 9,180 m3.

Table 1-7. Fire water demand calculations for LNG storage tank

Surface	W (m)	L (m)	Q'ty	Area (m2)	Unit Water Flow Rate Flowrate (lpm/m2)	Total Flowrate (lpm)	Total Flowrate (m3/hr)
Tank outer surface area of wall	4,563	-	1	4,563	10.2	46,542	2,793
Tank roof surface area of wall (except roof top)	2,006	-	1	2,006	10.2	20,457	1,227
LP Pump Area	4	4	4	64	20.4	1,306	78
Instrument Stage A	3	13	1	39	10.2	398	24
Instrument Stage B	4	13	1	52	10.2	530	32
Equipment Stage	4	4	3	48	10.2	490	29
Roof Top	168.0	-	1	168	10.2	1,713	103
Hand Hose Stream	-	-	-	-	-	3785	227
Total Flowrate (m3/hr)						75,220	**4,513**

Required Storage Volume (4,513 m3/hr x 2hr = 9,026 m3)
Design Pond Size: 45.0m (L) x 30. 0m (L) x 8.0m (D)
Pond Capacity (85%*V): 10,800 m3 x 85% = 9,180 m3

The maximum fire water demand is based on the assumption that only one single largest fire plus one hand hose will occur at the time. Each fire water pump capacity is presented in **Table 1-8**.

Table 1-8. Fire Water Pump Capacity

Fire Water Pump Type	Capacity
Diesel-driven Fire Water Pump (Five)	1,136 m3/h x 12 bar
Fire Jockey Pump A	70 m3/h x 12 bar
Fire Jockey Pump B (Stand-by)	70 m3/h x 12 bar

1.4.2.5 TELECOMMUNICATION

1.4.2.5.1 INTEGRATED COMPUTER NETWORK SYSTEM (ICNS)

One (1) set of the ICNS shall be provided as follows:

Table 1-9. Components of ICNS

Components of the ICNS	Number of Units
VOIP automatic telephone exchanger, main server and/or switching hub	1
TCP-IP/analogue signal convertor(s) for the conventional analogue telephone(s)	1
IP based CCTV system main server and/or network-video-recorder (NVR)	1
TCP-IP/analogue signal convertor(s) for the conventional analogue CCTV camera(s)	1
Computer network system main server	1
ICNS main server and/or switching hub for the integration of VOIP automatic exchange telephone system, IP based CCTV system and computer network system	1
Interface module for the external interface	1
System UPS having the capacity of 30 minutes duration for the transient power supply during the emergency operation, such as blackout	1
Internal power distribution provision(s) for the VOIP automatic exchange telephone system, IP based CCTV system and computer network system	1

The system shall be interfaced with Onshore internet network service system (OFE), external system(s)/equipment(s) to make possible the system to access to the Onshore internet via fiber-optic cable (OFE) connection.

The system shall be fed from the Terminal's emergency AC 220 V power supply system.

1.4.2.5.2 PORTABLE COMMUNICATION EQUIPMENT

One (1) set of the portable communication equipment shall be provided as follows:

Five (5) intrinsically safe type UHF portable two-way radio transceiver with a battery charger and a primary battery for the Owner's general use, including the firefighter's communication use, in the control room (OFE)

Each one (1) set of the AC 220 V power receptacle shall be provided for the mentioned intrinsically safe type UHF portable two-way radio transceiver on the above, and it shall be fed from the Terminal's emergency AC 220 V power supply system.

1.4.2.5.3 VHF RADIO TELEPHONE SYSTEM

One (1) set of the semi-duplex type VHF radio telephone system with the international channel and US channels shall be provided.

The equipment shall be fed from the Terminal's emergency AC 220 V power supply system and the Terminal's DC 24 V power supply system.

1.4.2.5.4 PUBLIC ADDRESS AND GENERAL EMERGENCY ALARM SYSTEM (PA AND GEA SYSTEM)

One (1) set of the PA and GEA system shall be provided as follows:

- 1 System main cabinet in the control room, including:
  - 1 System main control panel with a microphone and a monitor speaker
  - 1 PA broadcasting module with single amplifier
  - 1 Alarm interface/generation module with the GEA signal generator
  - 1 Entertainment program broadcasting module (ex. USB/CD music player, etc.)
  - 1 AC 220 V power supply unit
  - 1 DC 24 V power supply unit (or UPS) for the transient power supply during the emergency operation, such as blackout, according to the manufacturer's standards
- 1 System remote control with a microphone and a monitor speaker in the control room
- 1 10-W loud speaker at the control room top space, machinery room top space and fire control station top space
- 1 5-W loud speaker at the Re-gasification Terminal's muster station, machinery room, fire control station and seawater pumping station
- 1 Explosion-proof 10-W loud speaker at the Regastainer, BOG handling module and re-gasified natural gas send-out manifold station
- 1 5-W speaker with a volume control provision at the Control room, high voltage switchboard room and low voltage switchboard room
- 1 2-W speaker with a volume control provision at the Cabin (such as rest room, if applied) and change room (if applied) in the control room
- 1 1-W speaker with a volume control provision at the Public toilet (if applied) in the control room
- 1 GEA push button at the Control room, fire control station and Re-gasification Terminal's muster station

The equipment shall be fed from the Terminal's emergency AC 220 V power supply system and the Terminal's DC 24 V power supply system, in case the DC 24 V power supply unit is applied instead of the UPS according to the manufacturer's standards.

1.4.2.5.5 SHIP-TO-SHORE LINK AND COMMUNICATION SYSTEM (SSLCS)

One (1) set of the SSLCS shall be provided for the ship-to-shore connection between the Regasification Terminal and Floating-Storage-Unit (FSU).

The system shall able to transfer the ESD order to the cargo process system inside of the FSU, and receive the ESD request from the cargo process system inside of the FSU according to the requirement of "ESD ARRANGEMTNS & LINKED SHIP/SHORE SYSTEMS FOR LIQUEFIED GAS CARRIERS (issued by SIGTTO)".

The equipment shall be fed from the Terminal's main AC 220 V power system and emergency AC 220 V power supply system.

1.4.2.6 DRAINAGE SYSTEM

1.4.2.6.1 STORMWATER DISCHARGE SYSTEM

Storm water discharge system shall consist of underground pipes and concrete open ditch channel with cover and/or guard rail on both sides of the plant internal roads.

The open ditches shall be covered with galvanized steel grating in pedestrian area Reinforced Concrete encasement for underground pipe shall be used for vehicle passing area.

Open ditches shall be with a minimum bottom width of 300mm and freeboard equal to 0.3m. The pipes and the channels shall collect runoff water from road surfaces and plant areas and transport it to the main drainage channels.

1.4.2.6.2 SEAWATER FROM THE RE-GASIFYING PROCESS DISCHARGE SYSTEM

The discharge system by pipe should discharge the cool water to surface waters in a location that will allow maximum mixing and cooling of the thermal plume to ensure that the temperature is within 3 degrees Celsius or less, complying with relevant International code, local code and EIA requirement, of ambient temperature at the edge of the mixing zone or within 100 meters of the discharge point. The discharge system shall consider and take reasonable countermeasure on bubble-formation in order to prevent discharge any bubbles to the sea.

1.4.2.6.3 LNG SPILL AND IMPOUNDING PITS

Areas under LNG piping with flanges, unloading arms shall be concrete paved with dike to collect and transport LNG which may leak at pipe joints to the impounding pits/dyke/dip trays.

The impounding pits/spil trays shall be of reinforced concrete construction with no cover and perlite concrete shall be adopted on surface.

The pits shall be kept empty at all times by either providing a sump basin and sump pumps (designed for automatic operation including automatic shutdown at the presence of LNG) or by other means. (Refer to NFPA 59A. 5.2 Site Provisions for Spill and Leak Control).

LNG spills shall be collected to impounding pits in following areas.

Storm water collected on concrete paved area shall flow down to storm water drainage system through Splitter boxes, where LNG spill is prevented from flowing down to storm drainage system.

Splitter boxes are to be provided in the drains to each impounding pit. LNG spills shall be collected from the following areas:

- Process Area: There is to be one impounding pit to serve the process area including the re-gasification/BOG handling equipment.
- Truck Lorry Area: One impounding pit is to be provided

1.4.2.6.4 OIL CONTAMINATED WATER DRAINAGE SYSTEM ON BOP AREA

The oil-contaminated water from BOG equipment, pump area, and diesel tank etc. shall be collected by drip pans, curbing or oil sump. The sewers will transport oil-contaminated water to the primary wastewater treatment package. Effluent from the primary package flows into the secondary wastewater treatment package. Effluent from the secondary package shall be directed to the sea.

The system above-mentioned shall consist of drains, funnels, underground piping, clean-outs, catch basins, manholes, sealed manholes and vent pipes. Open ditches shall be avoided.

The design capacity of oil contaminated water shall be based upon the maximum flow of oily water.

All used water for cleaning activities are to be collected in contaminated water pit for further treatment. Oils and hydrocarbons are removed by a CPI separator. The separated oil will be collected through the special pipe for oil skimming and it will be transferred to portable container/drum. The treated water will be discharged to ditch as clean water.

The clean water system will collect water that is known to be free of any contaminants such as grease, oil, LNG or chemicals such as surface water draining off uncontaminated hardstand areas, road sand buildings, rain and firewater discharges, and water outlet discharge from CPI Separators. Clean water run-off will be collected into an open channel system and routed by gravity for disposal into the nearest local ditch outside the facility.

Oily Water Separator (Onshore and Jetty)

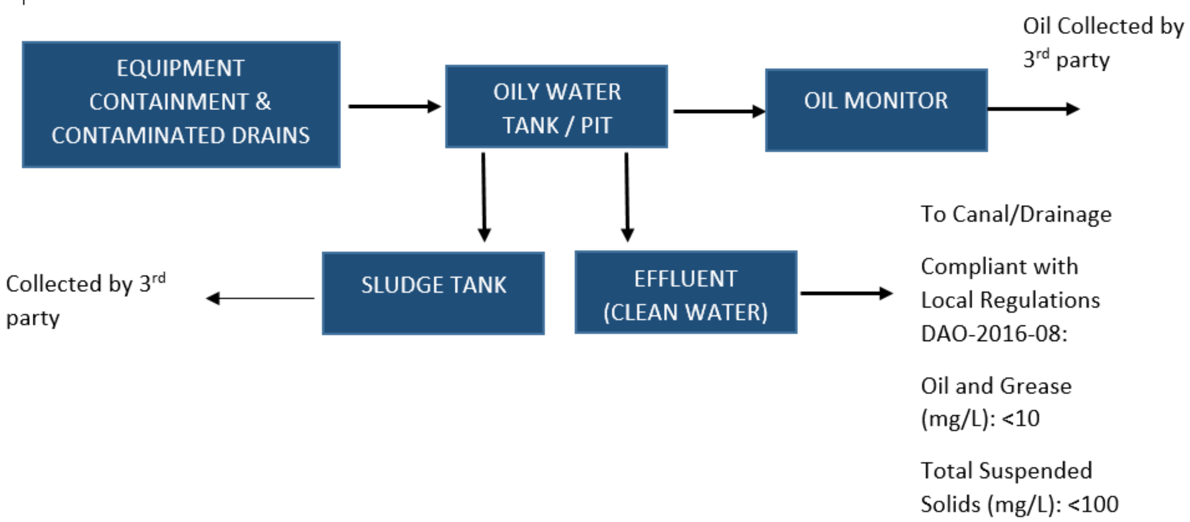


Figure 1-12. Oily Water Separator (Onshore and Jetty) Process

1.4.2.6.5 SANITARY WASTEWATER

Sanitary wastewater from toilets in buildings and from the kitchen in the canteen shall be collected to septic. The sanitary wastewater shall be transported in underground piping.

Wastewater from dishwashing areas in the canteen shall be directed into a grease trap to separate grease before flowing into sanitary sewers.

1.4.2.7 SAFETY DEVICES

Important safety systems and controls shall be located such that they can remain operational during the defined accidental events.

Controls for safety systems shall be located where they are accessible and available for safe, simultaneous use during an emergency.

Safety devices relating to operation of the project is discussed in detail in **Sections 1.4.2.5** and **1.5**.

1.4.2.8 EMERGENCY FACILITIES

The plant facility layout shall provide maximum safety to personnel, asset and environment combined with ease of operation and maintenance.

Assembly areas shall be provided for emergency situations. These areas should be located so that when an emergency is identified the operating personnel can go to the identified assembly area and be in a safe area. This will allow supervisory personnel to account for the operating personnel, where practicable, the orientation of the unit or installation, with respect to wind direction, shall aim to avoid smoke or gas impairment of escape, muster and evacuation areas. The areas shall be identified with a large sign and shall be provided with a sheltered telephone.

1.4.2.9 FUEL SUPPLY SYSTEM

Diesel oil for the emergency generator, boiler, and fire water pump will be stored in a day tank.

1.4.2.10 ROUTE OF TRANSPORTATION OF DIFFERENT MATERIALS

The manufacturing facilities are located in Batangas, close to the work site. The project's modularization yards are located ~20-25 km by barge from the work site and are equipped with fully-automated, state-of-the-art pipe fabrication / cutting / welding shops. Prefabrication of key components will thus be undertaken in our modularization yard. This approach allows to perform key work deliverables in a controlled environment, unimpeded by the monsoon season. Shuttle vessels will be employed, such as the landing craft.

1.4.3 POLLUTION CONTROL DEVICES AND WASTE MANAGEMENT SYSTEM

1.4.3.1 AIR EMISSIONS IN PORT/TERMINAL

Heavy equipment during construction will be the main source of emissions to air. The list of equipment to be used in the yard and site (onshore and offshore) is presented in **Figure 1-14**.

All heavy equipment's causing emissions to follow local regulations prior to mobilization.

During diesel engines intermittent operation (ca. 350KVA EDG nearby the E-house, Firewater pumps of ca. 500BHP each nearby the shoreline for water intake), CO2 may be released in intermittent cases.

On the other hand, emissions from the ship's funnel in Port, either from Boilers or Diesel Generators produce Nitrogen oxides (NOx), Sulfur oxides (SOx) and particulate matter (PM). Through chemical reactions in the air, NOx and SOx are converted into very small airborne particles, nitrite and sulphate aerosols. Both NOx and SOx are combustion products that are emitted into the environment in the form of smoke; these are the two main pollutants.

1.4.3.2 WATER DISCHARGE DURING PORT OPERATIONS

1.4.3.2.1 BILGE AND BALLAST WATER

1.4.3.2.1.1 BALLAST WATER

The untreated ballast water, when released in a coastal area, can destroy the local ecosystem.

1. When the ballast water is discharged and the organisms are released into new environments. If suitable conditions exist in this release environment, these species will survive and reproduce and become invasive species.
2. Invasive species are capable of causing extinctions of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats. This can result in huge economic impacts and fundamental disruptions of coastal ecosystems.
3. Three water characteristics are especially important: salinity, temperature and ultraviolet transmittance.
4. The untreated ballast water of the FSU will be taken locally, which means no destroy of local ecosystem.

1.4.3.2.2 SEWAGE GENERATED EFFLUENT WATER ON FSU

Sewage generated effluent water consists of black and grey water.

1. Black water comprises of the following wastes produced on a FSU;
    a. Waste generated from drainage and in any other form from toilets and urinals.
    b. Waste generated from drainage of a medical dispensary, hospital etc. via wash basins, wash tubs and scuppers located in such premises.
2. Grey Water produced on FSU comprises of;
    a. Waste generated from drainage of dishwasher and washbasin in the galley.
    b. Waste generated from drainage of cabin showers, bath and washbasin drains.
    c. Waste generated from drainage of laundry.
    d. Wastewater from interior deck drains.
    e. Refrigerator and air conditioner condensate
3. Black and grey water will be collected on schedule basis and will be handle by 3rd party.

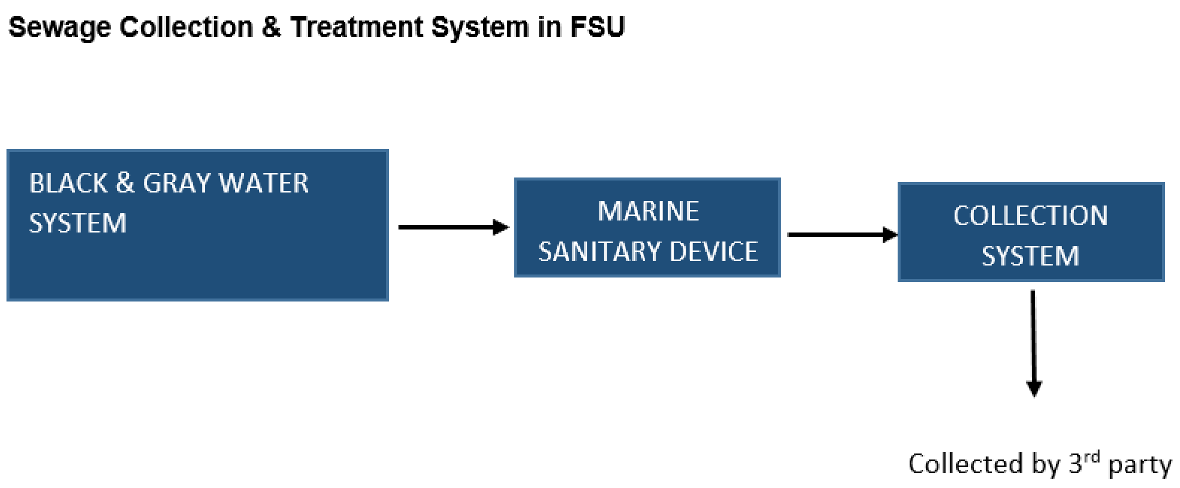


Figure 1-13. Process of Sewage Collection and Treatment System in the FSU

1.4.3.3 ON BOARD POLLUTION MONITORING /CONTROL DEVICES

The continuous monitoring of ship emissions and discharge is a critical measurement in global goals of lowering the environmental impact of all industries as per international regulations.

1.4.3.3.1 EMISSIONS

- FSU fully complies with the international regulations in regards to emissions.
- Inspections by Port State and other Bodies
- Regular maintenance of the engines and boilers including its ancillary equipment to ensure adherence to emissions limits.

1.4.3.3.2 MITIGATIONS OPTIONS IN PORT

- Use Lower Sulphur Fuels and Selective Catalytic Reduction (SCR)

1.4.3.3.3 DEVICES USED FOR MONITORING

1. Marine Emission Monitoring Analyser capable of reporting the SO_2:CO_2 ratio as required by IMO's.
2. Infra-red gas analyser Continuous Emission Monitoring System (CEMS)
3. Scrubber Monitors/analysers
4. Measuring unit to capture NOx(g) to power production kWh

For the vessel being used as FSU, marine steam boiler emissions are well below IMO Tier III requirements (though not included in NOx emissions regulations). Boil off gas is utilised to fire the boilers with the remainder made up with low sulphur fuel. The use of Methane reduces emission's further.

The main pollution control device on board a steam vessel are smoke density indicators which alert the operator to combustion issues, which can be rectified quickly.

The vessels Diesel engines are classed as IMO Tier 1 as they were built before the year 2000. As steam driven Alternators are the main source of Electrical power (feed by LNG boil off gas from FSU) this unit is only for Standby use.

1.4.3.3.3.1 BILGE AND BALLAST WATER MANAGEMENT

The LNG ship to be used has a bilge and ballast piping system. It was previously designed and constructed by Mitsui Engineering and Shipbuilding Co. Ltd. The design was referenced to DNV Class Rules and Regulations. This includes calculations of pipe sizes, material, pump capacity and etc. "Bilge" defines as draining excess seawater from waves during ship voyage or used filtered oily water inside the ship's compartment. While "Ballast" defines as filling and removing of seawater during ship trimming stages.

The ship has various compartment or hold spaces which has individual bilge suction pipe. The bilge suction pipe has an individual bilge well which serve as a lower collecting area, it is also called a sump well. Each bilge pipe ends is included with perforated strainer boxes for preventing any solid debris that will enter the pump. Some other main hold spaces has a ballast system piping that has a hull ballast tanks, it is integrated/attached to the ship's hull.

Bilge and ballast pumps are installed in the engine room compartment. Bilge and ballast pipe manifold with individual valves was used for easy operation during filling and draining activities. It is also located in the engine room. Oily water separator was used to filter to oily water sediments at the engine room bilge and other compartments before discharging outside the ship's hull.

The Ballast pump was also used as a fire and general service pipe system. It will be use as a fire fighting and deck washing throughout the entire ship. Fire and general service pipe was connected to the main ballast pipeline. Fire hydrant outlet were located and placed strategically at every accessible part of the ship. A firehose with storage box was placed strategically also on the fire hydrant outlet.

When ballasting is conducted on the ship, the deck officer's will use an operating manual or a stability booklet. This document will serve as a guidance of how to properly execute a safe trimming on the ship. The document will provide all the necessary information during the said activities. Proper coordination is also needed between the ship's deck officer and the ship's crew.

1.4.3.3.4 DISINFECTION TECHNOLOGIES

1. **Ozonation** - Generates ozone by means of either UV light or high-voltage electricity (corona discharge). Ballast water passes through a Venturi throat, which creates a vacuum that pulls the ozone gas into the water.

2. **Electro-chlorination** - Passes seawater through an electrolytic cell, where direct current produces chlorine and hydrogen gases. The chlorine gas is immediately dissolved in the water to produce the germicides sodium hypochlo- rite (NaOCl) and bromine hypochlorite (BrOCl), which neutralize microorganisms. Prior to discharge, it is important to neutralize total residual oxidants (TRO) in the ballast tank, i.e. any residual hypochlo- rites that may be present. This is usually done through the use of sodium meta- bisulphite or sodium thiosulfate.

3. **Chlorination** - Uses approximately 1-10 ppm (mg/L) of the chlorine-based germicide sodium hy-pochlorite (NaOCl), added to the ballast tank to kill organisms and pathogens that have bypassed the separation step. Prior to discharge, it is important to neutralize total residual oxidants (TRO) in the ballast tank, i.e. any residual sodium hypochlorite that may be present. This is usually done through the use of sodium meta-bisulphite or sodium thiosulfate.

4. **Gas super-saturation** (combination of chemical and physical disinfection) - Depletes the oxygen supply available to marine microorganisms by injecting nitrogen gas into the ballast water in sealed ballast tanks. This causes asphyxiation or suffocation of the microorganisms.

5. **Ultraviolet (UV) irradiation** - Uses low-pressure amalgam or mercury lamps or medium-pressure mercury lamps surrounded by natural quartz sleeves to produce UV light that disrupts the DNA of marine organisms, preventing them from reproducing.

6. **Enhanced UV treatment** - Uses medium-pressure mercury lamps to produce UV light that passes directly through synthetic quartz glass sleeves, thus generating radicals that react with microorganisms and other organic contaminants. This destroys cell membranes and prevents organism reproduction or regrowth.

1.4.3.3.5 MONITORING/CONTROL

1. The examination of ships' log and record of where and how much ballast water was initially loaded and where and how much it was changed.

2. Monitor the quality parameters like turbidity, salinity, temperature concentration of dissolved oxygen and pH.

3. Sample treated ballast water and sediment to check performance of the equipment.

4. Photosynthetic pigment. The amount of chlorophyll present in the water reflects the biomass of living phytoplankton in the water.

For the vessel being used as an FSU, the ballast water management system, has been designed and manufactured to meet IMO regulations. The Purimar system comprises of two unit operations: mechanical filtration and disinfection (electrolysis based chlorine). In the first stage particles, sediment and lager organisms are removed.

In the second stage a chlorine compound is generated through electrolysis of sea water and is injected into the filtered ballast to disinfect any smaller sized organisms and bacteria.

At deballasting a neutralising unit is used to reduce the total residual oxidant concentration of the ballast water to be discharged.

Sewage generated effluent water

The vessel being used as FSU is fitted IMO approved sewage treatment plant:

- Sewage System in use: Hamworthy Super Trident ST-4A
- Treatment 3010L/day (max 50 Persons 60 L/day)
- Effluent Quality BOD <40ppm, SS <50ppm, Coliform Below 200/100ml

Being an approved treatment plant, treated waste can be discharged directly to sea but will be collected on schedule basis and processed by 3rd party.

Figure 1-14. Hazardous Waste Management Facilities Location

The facility shall conform to the emission limits as specified in the environmental operating permit.

1.4.3.4 WASTEWATER

Waste water generated from each facility shall be collected to on-site waste water treatment plant in each zone. The system shall be designed based on the peak load calculated with sanitary fixtures method.

The waste drainage system shall include the followings:

- Gravity main
- Laterals
- Manhole

Sanitary wastewater will be routed to septic tank to meet applicable national and/or local code and standards. The sludge from sanitary wastewater treatment systems should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources Treatment package for treatment which is an aerobic biological treatment unit.

The effluent will be transported to the outfall and discharged to the sea.

1.4.3.5 SOLID WASTE

For the solid waste management, the design shall adopt the principles and practice of waste minimisation and reduction/elimination of the production of waste wherever practicable. Any waste produced shall be segregated to allow for recycling or safe storage and disposal.

Solid wastes that will be generated by the Projects consist of:

- Household waste consisting of compostable waste materials from food and recyclable or residual materials such as plastics, wrappers, crates or boxes for food supply of workers and/or employees
- Debris and other materials removed from construction activities such as spoils or excavated materials
- Industrial solid wastes, such as damaged vehicle and equipment parts, etc.
- Hazardous wastes such as used batteries, light bulbs, etc.

Non-hazardous solid wastes will be classified and sorted as compostable, recyclable, and residual. Hazardous solid wastes will be classified based on Republic Act 6969 or the Toxic Substances and Nuclear Wasted Control Act of 1990. Solid wastes, except compostable and dirty residual wastes, will be sorted and temporarily stored in Material Recovery Facility (MRF). Disposal of these wastes will be handed to the governing LGU regularly on a monthly basis or at shorter frequency as necessary. Compostable and dirty residual solid wastes will be collected and disposed daily also through the LGU in order to avoid vermin infestation.

1.4.3.6 NOISE

The facility shall be designed not to exceed the noise limit standards. Noise measurement, reporting, calculations and acceptance testing shall be made in accordance with codes, specific Philippine laws, and statutory regulations. Noise control measures shall not conflict with the requirements of applicable design/safety codes or specifications. Noise reduction measures considered shall include, in order of preference, the following:

- Selection of low-noise equipment (preferred),
- Modification of design to reduce noise generation,
- Provision of silencers and/or acoustic lagging,
- Enclosure or partition of equipment.

1.5 PROCESS/TECHNOLOGY

1.5.1 TECHNOLOGY DESCRIPTION AND ENVIRONMENTAL CONTROL SYSTEMS

The process flow diagram is presented in **Figure 1-15** which are described in detail in the succeeding sections.

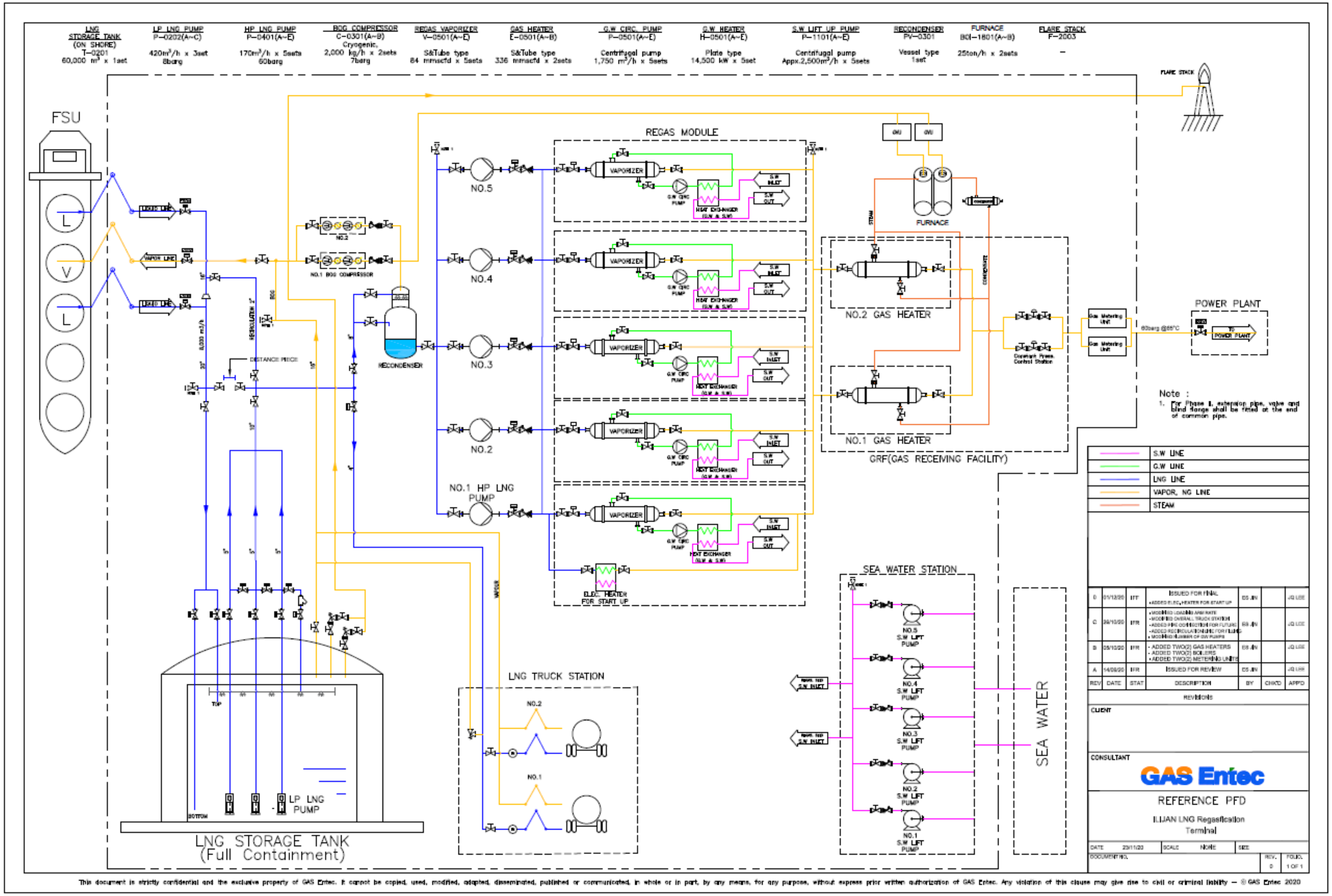


Figure 1-15. Process Flow Diagram for the Ilijan LNG Terminal Facility Project

1.5.1.1 FSU UNLOADING

The marine facilities are designed for FSU unloading by means of unloading arms. These arms, equipped with Powered Emergency Release Coupler (PERC) and Quick Connect / Disconnect Coupler (QCDC), are mounted on the jetty. In case of FSU forced to leave (Typhon etc.) nitrogen connections are provided to drain LNG loading arms to spill collector.

The maximum unloading rate is 8,000m3/h.

LNG is discharged through the unloading line (16") to the LNG storage tank.

1.5.1.1.1 VAPOUR RETURN GAS AND LIQUID UNLOADING ARMS

All arms are controlled from the common arm control panel located on the jetty.

All the information related to the arms operations are monitored from the Jetty Monitoring Room (JMR) and the Central Control Room (CCR). When the arms are approaching their allowable motion limits, firstly a pre-alarm is activated then an alarm and Emergency Shutdown Systems (ESD) are activated.

1.5.1.1.2 LIQUID UNLOADING LINE AND VAPOR RETURN LINE

During the LNG unloading process, the liquid volume in the FSU is replaced by return vapor which was fed from the LNG storage tank by free flow. Pressure control of the return gas line is required to ensure that the pressure of the FSU does not exceed design values.

The process will be monitored in the Central Control Room (CCR) and FSU.

1.5.1.1.3 COLD RECIRCULATION

Between two (un)loading operations for both FSU and truck loading, the main (un)loading line is maintained cold by circulating a small flow of LNG from the LP LNG pumps discharge. LNG is taken from the LP LNG send-out header and sent to the jetty head through the berth circulation line and returns via the unloading line to the LNG storage tank. The flow of the LNG recirculation via berth circulation line is controlled by flow control valve to maintain sufficient flow to keep cold the unloading line.

1.5.1.1.4 FSU UNLOADING SEQUENCE

The operating sequence of a FSU unloading is the following:

- The FSU berthing and mooring are controlled by the Port Authorities.
- When the ship is securely moored and the on-shore / off-shore communication is set, the unloading arms are connected.
- The arms are first moved close to their respective positions using the hydraulic power controller then hydraulically flanged to the ship manifold; the arms are so free to follow the ship movements at berth within the allowable range.
- When the PERC valves on the connected arms are unlocked, leakage of the arms connections are tested before being cooled down.
- Cooling down of the liquid arms is processed by supplying first cold LNG; the produced vapor is fed back to the FSU through the return gas arm.
- LNG unloading is started aligning the unloading lines to the LNG storage tank and selecting the LNG onshore tank's upper or bottom-filling line suitable for the LNG being unloaded.
- The unloading rate is progressively increased up to the design flow rate, 8,000m3/h.
- During LNG unloading operation, unloaded LNG shall be sampled to analyze and verify the composition for custody transfer between FSU and THE TERMINAL.

1.5.1.2 LNG TANK

The storage tank is of the full containment type having a design boil-off rate of maximum 0.10 vol. % per day. All the inlet / outlet nozzles (pump wells, instrument wells, LNG filling lines, vapor inlet / outlet lines, emergency relief and vacuum safety valves) are installed on the tank roof.

Manholes penetrating the tank dome allow for access in the inner tank and open vents in the suspended deck allow for balancing the inner tank pressure and the dome space / annular space pressure.

A splash plate is distributing the incoming LNG for the upper-filling operations and an internal vented stand-pipe is receiving the incoming LNG for the bottom-filling operations.

LP LNG pumps and piping configurations allow for LP LNG pump with minimum flow protection, individual tank mixing, transfer of tank-to-truck station, main header.

The vapor phases of the LNG storage tank are balanced through a common BOG header connected to the vapor handling system and the flare system.

A spray ring is installed under the suspended deck allowing for the tank to be cooled down (initial cooling down procedure) by using LNG.

1.5.1.2.1 CONTROL SYSTEMS

The LNG storage tank is designed in term of pressure above atmospheric pressure; accordingly the pressure monitoring and control systems of the tank are considering gauge pressures. Under normal operation conditions, the tank pressure will be regulated by the BOG compressor capacity control system. The terminal automation system will specify the number of BOG compressors operating, and automatic capacity control will attempt to regulate the tank pressure to a set point. The set point of the tank pressure control system is an operator's determined variable. The operator will normally adjust the set-point depending on the predicted terminal operations e.g. to prepare the tank for FSU unloading, minimum send-out operations.

Due to the relatively large vapor inventory of the tank and BOG header system, the tank pressure is expected to have a relatively slow rate of change. The tank have to be safely operated against too low pressure resulting from a send out rate in excess over the BOG rate or from a quick change of the barometric pressure.

In order to protect the tank from extreme over/under pressure, in case the LNG storage tank pressure control is over, a safety valve releases excess BOG to the atmosphere.

Independent of the pressure control valve, pressure safety relief valves and vacuum relief valves are also applied to avoid accidental overpressure or to break vacuum condition by ambient air. These safety valves are set at design pressures.

BOG is withdrawn from the LNG storage tank by the BOG compressors. The BOG compressors can be run on pressure control. The capacity of the BOG compressors, when running on pressure control, should match the BOG generation since over/under pressure is an undesired situation in this control mode.

The compressors are equipped with on/off system to allow capacity control as required.

The LNG storage tank project will also be equipped with multiple sensors, alarm, and trip settings regarding the tank level (maximum and minimum operating values) as well as tank temperature monitoring at LNG liquid phase, in vapor space, and tank leakage detection.

1.5.1.2.2 OPERATIONS

The maximum unloading rate of 8,000 m3/h will be unloaded into a LNG onshore tank. The tank can be filled using either the upper or the bottom fill connections, depending on the density of the LNG compared with the density of the LNG in the LNG storage tank at the time being unloaded.

The choice of whether to upper or bottom fill is primarily a function of the LNG density of the FSU unloading in comparison with the density of the residual inventory in the tank to be filled. The preferred unloading operation uses differences in density to assist in mixing the unloaded LNG with the heel remaining in the LNG storage tank. A more dense LNG cargo will be unloaded to the upper of the LNG storage tank above a less dense heel, and a less dense LNG shall be bottom unloaded underneath a denser heel.

1.5.1.3 LOW PRESSURE LNG PUMPS

Three LP LNG pumps are provided in LNG storage tank.

The pumps have two primary functions:

- to provide the first stage of send-out pumping
- to circulate LNG in order to keep LNG piping cold

The discharge pipe work on the standby pump is maintained cooled by reverse flow from the discharge of the pumps in operation.

The LP LNG pumps are of the submerged type. They are installed in the bottom of wells close to the inner tank floor; each of them is provided with a kickback line.

The LP LNG pumps are directly coupled to a submerged electrical motor; the motor winding and bearings are cooled and lubricated by the pumped medium.

1.5.1.3.1 CONTROL SYSTEMS

The LP LNG pumps can be started-up / shut-down either from the central control room or locally at the tank upper platform.

1.5.1.3.2 OPERATIONS

The LP LNG pumps are started on their kick-back line, at minimum flow, the discharge isolation valve being closed. Then the operator opens smoothly the discharge isolation valve; this valve can be adjusted at the required LNG flow rate.

The flow through the LP LNG pumps floats with the discharge pressure, suction pressure, pump curve and number of LP LNG pumps running. These LP LNG pumps run on their curves against system resistance created by piping, BOG re-condenser inlet valves and BOG re-condenser operating pressure.

Before stopping a LP LNG pump, the discharge isolation valve is smoothly shut while the minimum flow controller automatically opens the valve in the pump kickback line; the pump can be stopped when the discharge isolation valve is fully closed.

1.5.1.4 BOG COMPRESSORS

The BOG compressors supply the boil-off gas (BOG) generated in the LNG storage tank to the re-condenser.

The BOG compressors are single stage reciprocating machines equipped with VFD controller allowing for constant flow control at 100% of full capacity. In normal operation such as without LNG ship unloading, one compressor is expected to be operated at full capacity. During FSU unloading operation, BOG will be led to FSU tank to maintain the pressure of the LNG storage tank vapor space by free flow.

In case the BOG compressors cannot be operated, the boil-off gas will be sent to flare when the pressure in the BOG header reaches the set point of the flare control valve.

The operating capacity of each compressor shall be regulated with VFD controller.

1.5.1.5 RE-CONDENSER

The re-condenser is a vertical vessel divided in two sections.

- The upper part with a packed bed is used to provide an extended surface area for the re-condensation of boil-off gas by intimate contact with a co-current stream of sub-cooled LNG.
- The bottom section is a buffer capacity for the HP LNG pumps and provides the NPSH required by the HP LNG pumps.

Boil-off gas and LNG enter the upper section of the re-condenser and flow co-currently through the packing bed where the BOG is condensed.

As an alternative for BOG handling Liquefaction unit can be used.

When the Terminal is operated at the nominal send-out rate, the LNG flow quantity exceeds the required quantity to the boil-off gas. In this case, the balance is fed into the bottom section of the re-condenser where it is mixed with the LNG coming from the upper section.

1.5.1.5.1 CONTROL SYSTEMS

Level Control

LNG fed to the bottom section of the re-condenser is level controlled to guarantee a surge capacity for the HP LNG pumps. The Level transmitter controls the LNG flow entering the bottom section of the re-condenser.

Pressure and Flow Control

The flow rate of LNG sprayed into upper section of the re-condenser for condensation is controlled by the sum of BOG compressor load. Additionally, the set value of this LNG flow rate is also corrected by the value of the pressure in the re-condenser.

The pressure in the re-condenser is a function of the ratio LNG / BOG of the flows entering the upper section of the re-condenser which means the pressure of the re-condenser depending on the BOG compressors capacity. To keep smooth variations of the pressure in the re-condenser, the controlled LNG flow entering the re-condenser upper section is adjusted by the BOG compressors load.

Temperature Monitoring

The temperatures of the incoming and outgoing LNG are monitored. A temperature alarm at the bottom of the re-condenser is provided to indicate if the temperature exceeds the maximum value allowed for the HP LNG pumps.

1.5.1.6 HIGH PRESSURE LNG PUMPS

The HP LNG pumps are of the multi-stage, vertical canned, submersible type.

The HP LNG pumps increase the LNG pressure to enable delivery into the gas pipeline via the vaporizers. Each pump set is provided with its own venting system.

Each of the HP LNG pumps is equipped with a venting line to re-condenser and a kickback line to the storage tank. When the re-condenser is not operating and bypassed, for maintenance reason, the vent lines are redirected to the LNG storage tank.

Stand-by HP LNG pump are kept cold by LP LNG cold recirculation flow via restriction orifice on the kick-back line ready for cold start up at all times.

1.5.1.6.1 CONTROL SYSTEMS

The HP LNG pumps are started / stopped either from the central control room or locally. All the HP pumps are tripped on low-low level in the LNG storage tank.

1.5.1.6.2 OPERATIONS

HP Pumps are started on their kick-back line under minimum flow control back to the LNG storage tank.

When pressure and flow are stabilized, the discharge valve is smoothly opened while checking the downstream facilities.

Pumps are generally shut down because of maintenance, decreased send-out demand. The shut-down sequence is operated by throttling the pump discharge valve while monitoring the operation of other pumps. Once the discharge valve is fully closed and the minimum flow controller operating, the pump is stopped.

During send-out operating mode, the HP headers are kept cold by HP LNG from the pumps in operation. The cold circulating LNG returns to the tanks through the drain header. Stand-by HP LNG pumps are kept cold with LP LNG by connecting pump suction pot with re-circulation line.

Evaporation would be occurred in the HP LNG pump suction pot by heat ingress, and then the vapor is returned through the HP vent line to the re-condenser. And discharge pipe between pump and check valve are kept cold by LP LNG. LP LNG for cold keeping flows through by-pass line of minimum flow line to drain header.

1.5.1.7 S&T VAPORIZERS

High pressure LNG is vaporized in S&T Vaporizers designed for indirect heating. During normal operation, the LNG will be vaporized at S&T Vaporizers by Glycol Water (GW). The cooled GW is heated again by the seawater from ILIJAN LNG Terminal bay. S&T Vaporizers are designed with 4 operations and 1 stand-by in maximum flow rate.

Each vaporizer is protected against overpressure by a pressure safety valve discharging to atmosphere.

1.5.1.7.1 CONTROL SYSTEMS

These flow controllers are overridden by a pressure controller on the common send-out line downstream the metering station depending the demand from the power plant. Therefore, a high pressure of the outlet gas result in reducing the LNG flows to the vaporizers.

The common send-out line temperature is controlled by heater (Boiler/Furnaces) .

1.5.1.7.2 OPERATIONS

The LNG flow control valve is kept closed and the vaporizer outlet valve is opened followed by the inlet isolation valve. LNG is smoothly fed to the vaporizer by opening the flow control valve while monitoring the outlet temperature. Once pressure, flow and temperature are stabilized, the LNG flow controller is put in automatic mode.

Shutdown/standby of the S&T Vaporizers are required when the gas send-out demand is reduced. This shutdown/standby operation is processed by smoothly decreasing the set point value of the LNG flow controller to S&T Vaporizers. When the flow control valve is fully closed, the inlet isolation valve is then closed and the outlet valve closed after a time delay.

1.5.1.8 GAS SEND OUT AND METERING

The purpose of the metering station is to monitor and record accurately the quantity and quality of the send-out gas for custody transfer.

The metering station consists of:

- Two (2) metering lines equipped with ultrasonic flow meter. One continuous gas chromatograph upstream of the metering lines allowing for calculation of gas composition, impurity and gas quality.
- A computing system to calculate parameters such as relative density, heating values and WOBBE Index.

1.5.1.8.1 CONTROL SYSTEM

The pipeline operating pressure at the battery limit of THE TERMINAL will fluctuate within the limit of pressure.

Although the working high pressure of the gas send-out fluctuates with the pressure of the pipeline caused by power plant demand, preventive actions can be activated to protect the metering station and the pipeline.

If the pressure in the send-out line reach the maximum allowable pressure or the minimum allowable pressure in the gas pipeline, the ESD system will be activated to shut down THE TERMINAL.

1.5.1.9 TRUCK LOADING SYSTEM

A partial flow from the LNG by the LP LNG pumps built in the LNG storage tank is directed to the truck loading system, where LNG is loaded into trucks and transported off site from THE TERMINAL. Two (2) Truck Loading Hoses and Two (2) Truck Return Gas Hoses will be installed.

During the loading operation, the return gas flows back to Vapor header through the gas return line and the return gas hose which is coupled to the truck.

Truck loading header and each truck loading line is provided with a cold recirculation line to ensure the LNG supply line up to the inlet flow control valve remains ready for cold start up at all times.

The Maximum loading rate per truck loading arm is 80m3/h.

1.5.1.9.1 CONTROL SYSTEMS

The primary control of the truck loading system is the LNG flow controlled by each control valve of loading hose. The custody transfer flow meter will measure the LNG flow rate and the total quantity of the LNG loaded to each truck.

1.5.1.9.2 OPERATIONS

The truck loading is operated as following steps:

- Truck driver parks the lorry truck on the loading bay and stop engine.
- The operator grounds wire.
- The vapor and liquid hoses is connected by operators and / or driver.
- Air in the connection hose is purged by operators and / or driver.
- The vapor hose is opened.
- To start cooling down the hoses and slowly by opening liquid valve manually.
- After cooling down operation, loading operation is performed automatically by mass flow controller. Operator and/or driver check truck tank level and line pressure constantly.
- The loading quantity is integrated by mass flow controller. Accordingly, the loading operation is stopped automatically by the integrated quantity of loaded LNG. The flow control valve is automatically closed.
- Operators and / or drivers would close the vapour / liquid valves and the relevant truck side valves by manual operation.
- Liquid and vapor is purged by nitrogen.
- The vapor and liquid arm is disconnected by operators and / or driver.
- The grounding wire is disconnected.

As loading liquid comes from LP LNG line, before starting cooling down operation, operator in CCR starts LP LNG pumps required due to prevent overload of LP LNG pumps.

At the beginning of loading operation, operator shall watch and keep the pressure of loading header with adjusting the inlet valve at the truck tank manually, in order to avoid an accident of loading process. Operators would close these valves gradually by manual operation after the end of loading.

1.5.1.10 SEA WATER INTAKE AND OUTFALL SYSTEM

Sea water intake will take water from 5 meter below sea level. A 900 mm diameter water inlet pipe will be connected to a concrete pit from where five (5) sea water pumps installed to transfer the water up to regastainer.

The seawater heats up the glycol water passing through the seawater - glycol water heat exchanger. After cooled by glycol water, the seawater shall head to the ILIJAN Power Plant Bay. The available temperature range of seawater is from 27°C to 32°C in order to keep the S&T vaporiser outlet temperature of glycol water to 25°C, for the vaporiser operation. Temperature difference between the seawater inlet and outlet shall be maximum 3°C following the 2016 Water Quality Guidelines and General Effluent Standards. Maximum flow required will be 20,000 cbm/hr. About the seawater outlet temperature, additional sea water pumps with temperature sensors may be installed if necessary.

After regastainer, the sea water outfall thru a piping up to the outfall point at sea level.

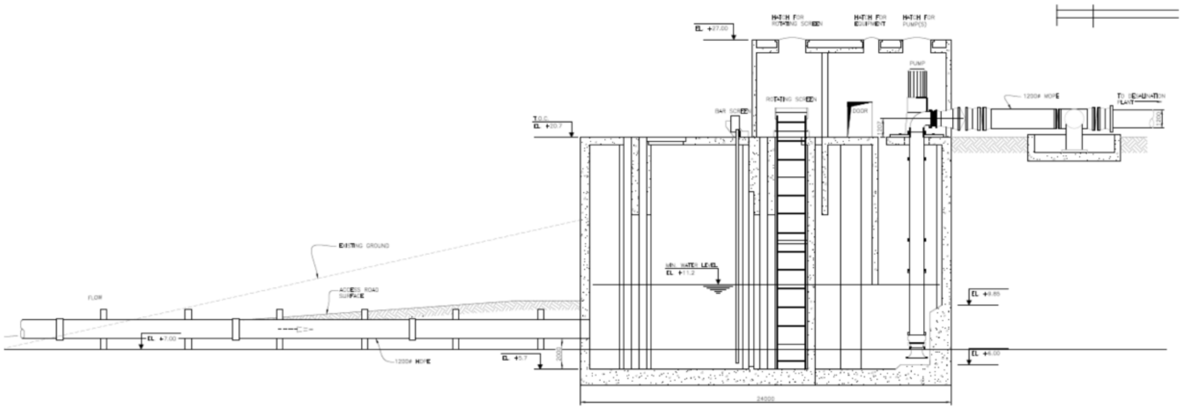


Figure 1-16. Seawater System

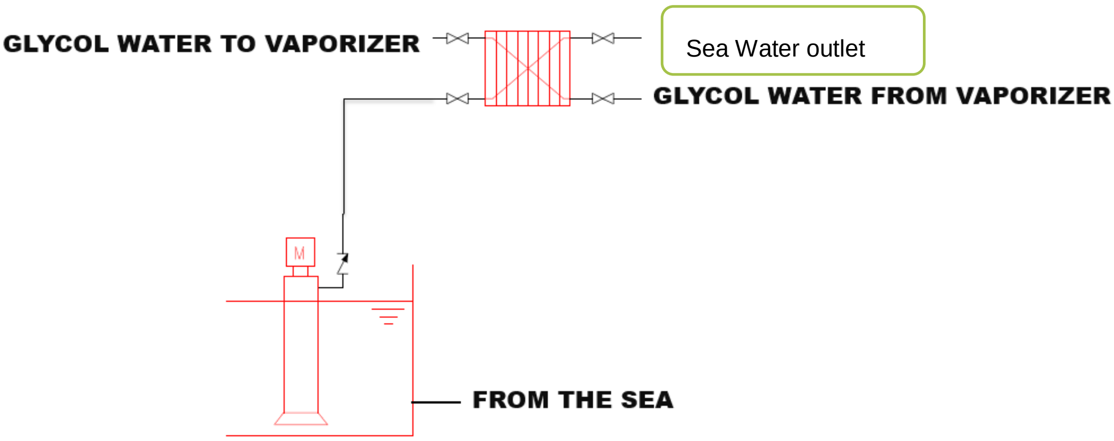


Figure 1-17. Sea Water Intake and Outfall System Process

1.5.2 POLLUTION CONTROL DEVICES AND WASTE MANAGEMENT SYSTEM

Pollution control devices and waste management system are discussed in detail in **Section 1.4.3**.

1.5.3 OPERATIONS AND MAINTENANCE OF FACILITY

1.5.3.1 MISCELLANEOUS OPERATIONAL PHILOSOPHIES

1.5.3.1.1 SIMULTANEOUS OPERATIONS

Simultaneous operations (such as maintenance activities beside “live” plant) are permitted on the basis that an acceptable level of protection is in place to prevent loss of control.

As a minimum, two levels of protection shall be in place such that loss of any one protection measure does not result in loss of control. Common protection measures for two or more operations shall be acceptable.

Functional testing of the agreed protection measures shall be undertaken during pre-commissioning prior to commencing the simultaneous operations.

A simultaneous operations procedure shall be developed during the detailed design phase of the project, detailing the set of simultaneous operations which are permitted and the measures which are required to prevent loss of control. This information shall become the permitted operations, which is part of the operating manual for the regasification facility.

LNG regasification during offloading of LNG from an FSU/LNGC to the regasification facility is a normal operating mode and therefore is a permitted simultaneous operation. The protection measure in place is the loading arms ERS or cryogenic hoses. This system shall be function tested prior to loading commencing.

1.5.3.1.2 INSTRUMENT AIR FAILURE

In the event of an emergency all valves are designed to move to a "fail safe" position, fully opened or closed, depending on the service.

The Operators should familiarize themselves with the "control valve actions on air failure," so as to be able to cope with a situation in which total or local instrument air failure occurs. These control valve actions are indicated on the P&IDs by "FC"(failed closed) or "FO" (failed open) at the valve. The actions are also stated on the control valve data sheets.

1.5.3.1.3 ELECTRICAL POWER FAILURE

In the event of electrical failure, the Essential Generator will automatically start and provide power to allow a safe shutdown of the plant. A list of the items to be powered by the emergency generator can be found in the Electrical Power System Philosophy (Document to be developed during detailed design).

1.5.3.1.4 MATERIALS HANDLING/ACCESSIBILITY/DROPPED OBJECT PROTECTION

1.5.3.1.4.1 MATERIALS HANDLING

Materials handling procedures shall be developed during the detailed design phase based on the results of the materials handing study. Equipment removal routes to designated laydown areas or other areas as necessary, which are easily accessible by cranes, shall be identified.

1.5.3.1.4.2 ACCESSIBILITY

Good access shall be provided to items of equipment which require frequent (more than once per year) testing, inspection or maintenance. This shall also apply to the permanent handling/lifting devices (such as beams, pad eyes) installed for equipment removal. Proper lockout and tagout procedures will be developed during the detail engineering phase.

Scaffolding or other temporary fixtures shall be used where equipment testing, inspection or maintenance is less frequent (greater than 2-years).

1.5.3.1.4.3 IMPACT PROTECTION

The need for dropped object protection or additional protection of “live” process equipment from dropped objects shall be studied as part of the materials handling study.

Crane and mobile vehicle operations shall be minimized near to or over “live” process equipment.

Dropped object protection shall not be required where infrequent heavy material movements near or over equipment are carried out when the equipment has been isolated and depressurized.

1.5.3.1.4.4 SECURITY

A Security Management Plan and Guidelines will be developed during detail design.

1.5.3.1.4.5 GENERAL HOUSEKEEPING

Regasification Facility housekeeping shall be the responsibility of shift personnel. When maintenance work is carried out, the maintenance team shall leave the area clean and tidy.

1.5.3.2 MAINTENANCE PHILOSOPHIES

1.5.3.2.1 OBJECTIVES

The primary objectives of the maintenance function shall be to achieve:

a. Technical integrity within COMPANY requirements;
b. Optimum equipment availability with the minimum of staffing levels;
c. Lowest life cycle cost; and
d. Meet legislative requirements with regard to equipment inspections/testing.

The regasification facility shall be maintained so that it remains in an operable condition to the end of its design life and can be maintained in service without a major re-build.

During the detailed design phase of the project, maintenance personnel shall be involved in order to assist in achieving the above objectives (e.g. optimum equipment availability -through careful selection and equipment arrangement).

A detailed maintenance philosophy for the regasification facility shall be developed at the detailed design stage. This shall detail the maintenance strategy to be applied to equipment and systems; either frontline, preventative, "on condition" or breakdown maintenance. The selection of the maintenance strategy shall be determined against the objectives set out above.

1.5.3.2.2 SERVICING

The optimum means of servicing equipment shall be carefully assessed against maximizing the regasification facility availability. The servicing options, which shall be evaluated, are:

a. Maintain/repair onsite or in the facility workshop; and
b. Remove equipment and repair offsite.

Consistent with the philosophy of minimum staffing, onshore repair or maintenance shall be pursued. Additionally, the option of vendors providing full or part servicing of equipment shall be reviewed during the design to determine the optimum strategy.

1.5.3.2.3 MAINTENANCE MANAGEMENT PLAN

A maintenance, testing and inspection plan shall be developed during detail engineering once enough Vendor information from the selected equipment is available. This shall outline the type of maintenance required on each item of equipment/system (routine, preventative or breakdown) against the objectives for the facility. Maintenance/testing/inspection scheduling shall be based on this plan. As part of this management process, a through-life database shall be developed to ensure continual improvement and enhanced technical integrity.

1.5.3.2.4 FRONTLINE MAINTENANCE

Frontline maintenance, such as condition monitoring, control valve repairs, trouble- shooting and repair of field instrumentation, instrument calibrations and routine equipment servicing (lube oil change, etc.) shall be regularly carried out by the facility maintenance personnel whenever a specialist is not required.

1.5.3.2.5 MAJOR SHUTDOWNS

Major planned shutdowns shall be necessary to meet required storage tanks inspections (either set by legislation including classification society rulings or technical integrity considerations) and the replacement components associated with the regasification units.

Major shutdowns shall be planned to minimize the time offline by having a 24-hour working period with a maximum labor input consistent with safe and efficient practices. Major shutdowns shall be managed by using existing maintenance staff supported by additional contracted maintenance personnel and specialist vendor personnel.

1.5.3.2.6 CONDITION MONITORING, TESTING AND INSPECTION

A maintenance, inspection and test plan shall be developed during the detailed design phase of the project to cover all safety and production critical equipment. This plan shall outline the requirements for the following tasks and activities:

a. Condition monitoring, including monitoring strategy and monitoring data collection and processing;
b. Testing requirements as set out in vendor recommendations. Testing requirements shall also be reviewed and modified as necessary based on equipment/system historical data;
c. Alarm and trip testing of critical trips and alarms;

d. Inspection requirements consistent with maintaining technical integrity and meeting legislation and COMPANY requirements.

1.5.3.2.7 CERTIFICATION

Early in the detailed design phase, the Certifying Authority shall be appointed. The work scope definition for the Certifying Authority shall be developed in consultation with the appropriate government department.

An integrated approach shall be developed whereby the Certifying Authority, design and operations team work together to achieve the desired level of technical integrity.

1.5.3.2.8 SPARES PHILOSOPHY

The sparing philosophy for the regasification facility is described in the AG&P document named “Sparing Philosophy”.

Operational spares are not detailed out in this philosophy document. Commissioning, start-up and first year spares shall be identified during the detailed design phase and will be available prior to commencement of commissioning.

1.5.3.2.9 PERMIT TO WORK/WORK ORDERS

All maintenance work on the LNG Facility shall be carried out under a “Permit to Work” system. Work orders shall be generated and shall be prioritized. In all cases, apart from an emergency or breakdown, work orders shall be issued by the onshore maintenance support personnel

1.6 PROJECT SIZE

The proposed project has a total area of around 9-hectare which will be leased from Ilijan Primeline Holdings, Inc. A 60kcbm tank is foreseen as LNG Storage facility with 420 mmscfd of regasification to supply the existing 1,200MW power plant and future 850MW expansion.

A jetty with trestle will be build 165mtr into the sea to reach a minimum water depth of ca. 16m for mooring the floating storage unit (FSU). The width of the jetty with 4 berthing dolphins and 6 mooring dolphins is ca. 500mtr. The Jetty accepts LNGC vessels of up to 180,000m³ LNG aside of the FSU with a storage capacity of 137,000m³. This configuration will be enough to supply 3MMTPA.

Table 1-10. Project Size

Capacity/Area	Project Size
i. LNG Storage	
a. Floating Storage Unit	137,000 m^3
b. LNG Storage Tank	60,000 m^3 (capacity based on 7 days retention)
ii. Project Area	
a. Onshore	9 hectares
b. Foreshore	3.7 hectares

1.7 DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAMES

1.7.1 PRE-CONSTRUCTION PHASE

During the pre-construction stage, the Proponent will carry out the following activities:

Feasibility Study

- Secure government permits, endorsement or clearances will be undertaken;
- Undertake environmental impact study and secure ECC for the project;
- Social preparation activities, including consultations with the LGUs and other Government Agencies; and
- The feasibility study and social preparation activities have been completed.
- Endorsements from the host barangay, the municipal government of have been secured.

- Preparation conceptual/FEED design

Design Stage

- Definition of final design
- Preparation of site development plan and design of the civil works;
- IEC Action Program;
- Setting up of institutional arrangement to ensure sustainability of the project and complement the physical infrastructure component; and
- Construction permits and clearances.

1.7.2 CONSTRUCTION PHASE

1.7.2.1 PRE-FABRICATION PROCEDURES

The construction of land and offshore facilities will include pre-fabrication of materials and transport to the site assisted by high end structural and engineering technologies.

1.7.2.1.1 SITE DEVELOPMENT, PILING AND FOUNDATION WORK

Initial activities for construction stage includes surveying, setting up of temporary roads, clearing and grubbing, excavation, backfilling, and compaction, piling, and foundation works. Foundations of the following facilities will be established:

- Jetty
- Flare
- RegasTainers
- Truck-Loading Bays
- LNG Storage Tanks
- Seawater System
- Buildings: E-house, Workshop,
- Warehouse, Fire Station, Gas
- Metering, Control Building, Machinery Room
- Room
- Gas Boiler/Furnace Skid
- Gas Receiving Metering System
- Utilities

1.7.2.1.2 FLARE AREA

After the foundation works are completed, the prefabricated structures can be erected.

- Installation of Ground Flare Structure
- Knock-Out Drum
- Flame Front Generator System (fan)

1.7.2.1.3 STRUCTURE FABRICATION & ASSEMBLY

1.7.2.1.3.1 FABRICATION OF STRUCTURAL STEEL MEMBERS

- Material will be cut using CNC plasma cutting machine
- Structural shapes for columns, beams, girders will be drilled and cut to length using CNC coping robot and CNC combined drilling & sawing line
- CNC will include “nesting” the parts to minimize wastage
- Structural members will be fabricated by priorities following the sequence of erection

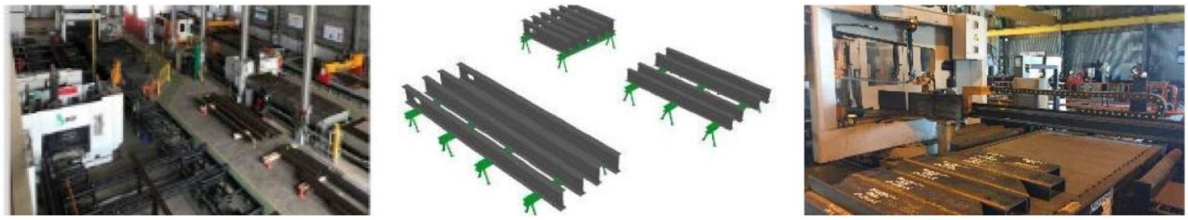


Plate 1-1. Fabrication of Structural Steel Members

1.7.2.1.3.2 PIPING FABRICATION

- Pipes with diameter 4-inch to 48-inch will be fabricated using automated piping machines
- Pipes with diameter below 4-inch and above 48-inch will be laid-out & cut, fitted and welded manually
- Pipe spools will be fabricated by priorities following the sequence of erection
- Fabricated pipe spools will be painted prior to installation

Plate 1-2. Fabrication of Piping Spools

1.7.2.1.4 STRUCTURAL AND ARCHITECTURAL WORKS FOR BUILDINGS

- Control Building construction:
  - ~20 m wide x 30.5 m long RC structure with concrete block walls, to commence after the concrete pad foundations are completed
  - Completion of the plinth beam followed by superstructure and roof slabs
- Installation of electrical, instrumentation, telecom, HVAC and fire suppression equipment, tertiary materials like handrails and architectural out-fittings like doors, windows and external and internal finishing
- Installation of architectural outfitting like doors, windows, plumbing, external finishing and internal finishing

1.7.2.1.5 SMP AND PRE-COMMISSIONING WORKS

Construction of shelters for equipment (air Compressor & dryer)

- Mechanical equipment and supports installation
  - Seawater System
  - RegasTainers
  - Gas Receiving
  - Gas Metering Station
- Final painting
- Box up with N2 blanket preservation

1.7.2.1.6 PIPING INSTALLATION & PRECOMMISSIONING WORKS

- Piping installation
- Installation of pipe and support for:
  - LNG System
  - Gas Feeder
  - Provision for Future Tie-ins
  - Diesel System for EDG
  - Instrument Air System
  - Fire Water System
  - Potable Water System

    - Seawater System
- Hydro-Testing
- Touch-Up painting
- Piping insulation
- Nitrogen purging (drying) and blanketing

1.7.2.1.7 E&I, TELECOM, HVAC, F&G INSTALLATION

- Installation of Electrical and Instrumentation (E&I) bulk Items
    - Cable Trays & Cables
    - E&I Equipment - LV Switchboard / MCC, Transformers, UPS, DC
    - Charger and Distribution Boards, JBs
    - Grounding System
    - Cable Pulling
    - Glanding & Termination of Cables
- Installation of instrumentation Items
- Instrument Control System Panels
    - Field Instruments & Supports, Instrument Tubing, Fire & Gas
    - Equipment, Area Access Control, CCTV, Lighting & Small Power
- Pre-commissioning & Commissioning stages
    - Insulation Resistance Test, CT Test, Trip & Alarm, Protection Device and Operation Test, System Functional Test, Loop Checking and all other tests required prior to Commissioning and Start-up Works

1.7.2.1.8 LNG STORAGE TANK CONSTRUCTION

1.7.2.1.8.1 PILE CONSTRUCTION SEQUENCE

- Two pile rigs are mobilized to site with one Feeder Crane between each rig
- Pile rig accepts the pile from the Feeder Crane; after it is set vertically and checked for plum and position, the pile will be driven into the ground by the pile hammer
- Once the pile takes hold in the ground and the hammer gets close to the pile gate, the gate can be opened to allow the hammer to pass
- When the pile movement is small, about 2 mm to 3 mm per blow, the pile is considered to have reached refusal. The pile hammer is then lifted off the pile and the rig moves to the next pile

1.7.2.1.8.2 CONSTRUCTION SEQUENCE

- The inner and outer tanks are erected in situ in a stepped sequence starting with the outer tank, then the inner tank. A heavy-lift crane is used for ring installation
- The roof is prefabricated as one piece and lifted into position. No air lift is required.
- After roof erection, the bottom insulation and inner tank bottom plate can be installed, providing weather protection to the insulation works
- Enabling works at the project site include temporary unloading ramps founded on a piled ground beam.
- Construct roof on temporary support structure at grade level
- Construct hardstand pad, on a temporary basis, as near as possible to tank foundation
- On the roof pad, erect the temporary center column and roof structure and erect roof plates and weld out
- Erect suspended deck and attach to roof
- Fit temporary roof bracing
- Lift to top of tank, fit and weld

1.7.2.1.9 TRUCK-LOADING FACILITIES INSTALLATION

- Civil Activities: Roads and pavements
- Piperack Installation: Prefabricated structural material will be installed at site
- Piping (NG and Utility)
- E&I and Safety Equipment Installation
- Truck-Loading Skid Installation
- Commissioning

1.7.2.2 TEMPORARY FACILITIES & LAYDOWN

Temporary Facilities at Project Site are presented below and in **Figure 1-19**.

1. Temporary Jetty: 30 m wide
2. Laydown Area: 10,000 m2
    - Pile Yard
    - Precast Yard
    - Precast Storage
    - Break-up, Crush and Stockpile
3. Batching Plant: 5,000 m2
4. Project Site Office for Jetty and Tank Areas

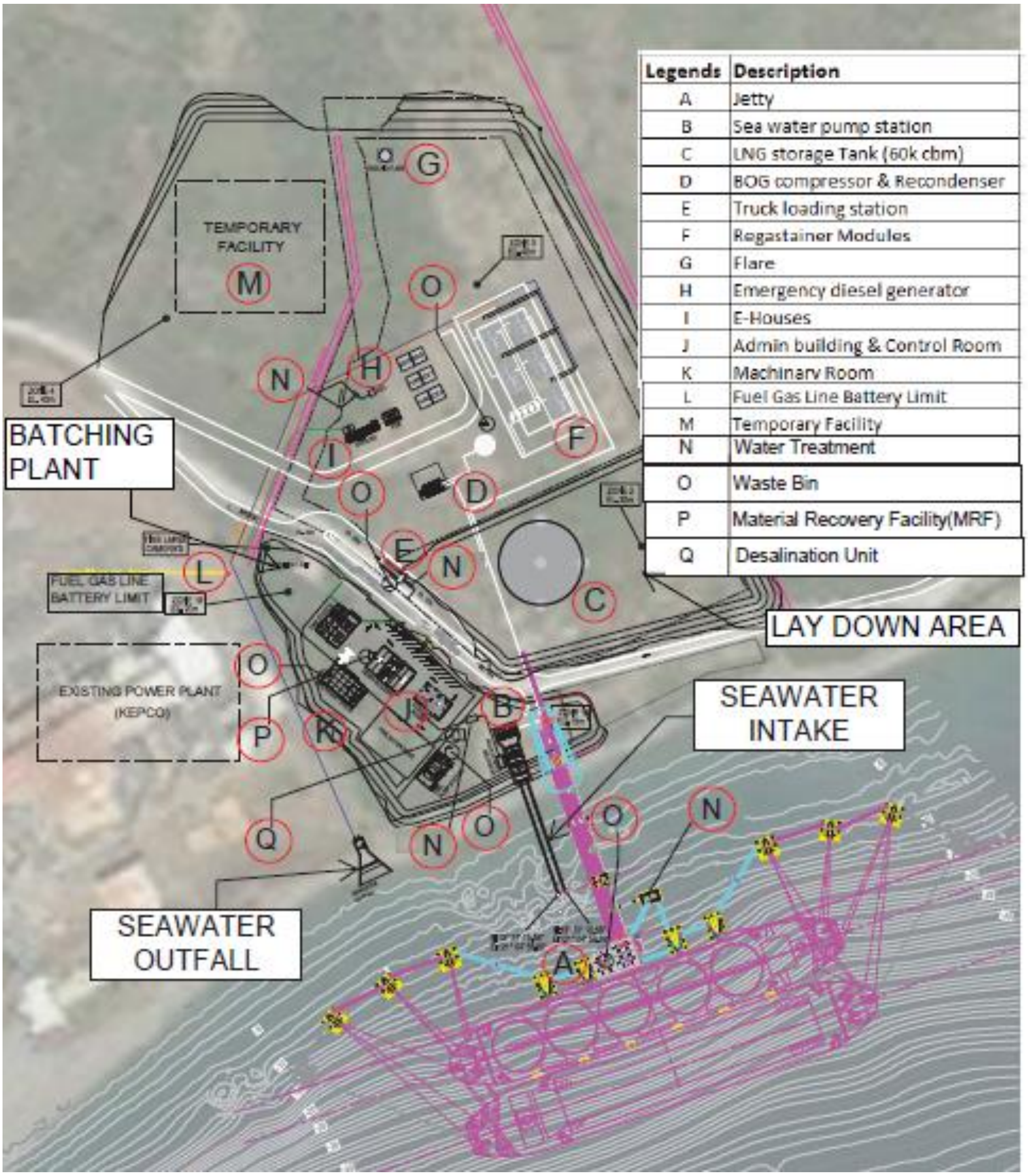


Figure 1-18. Location of Temporary Facilities during Construction

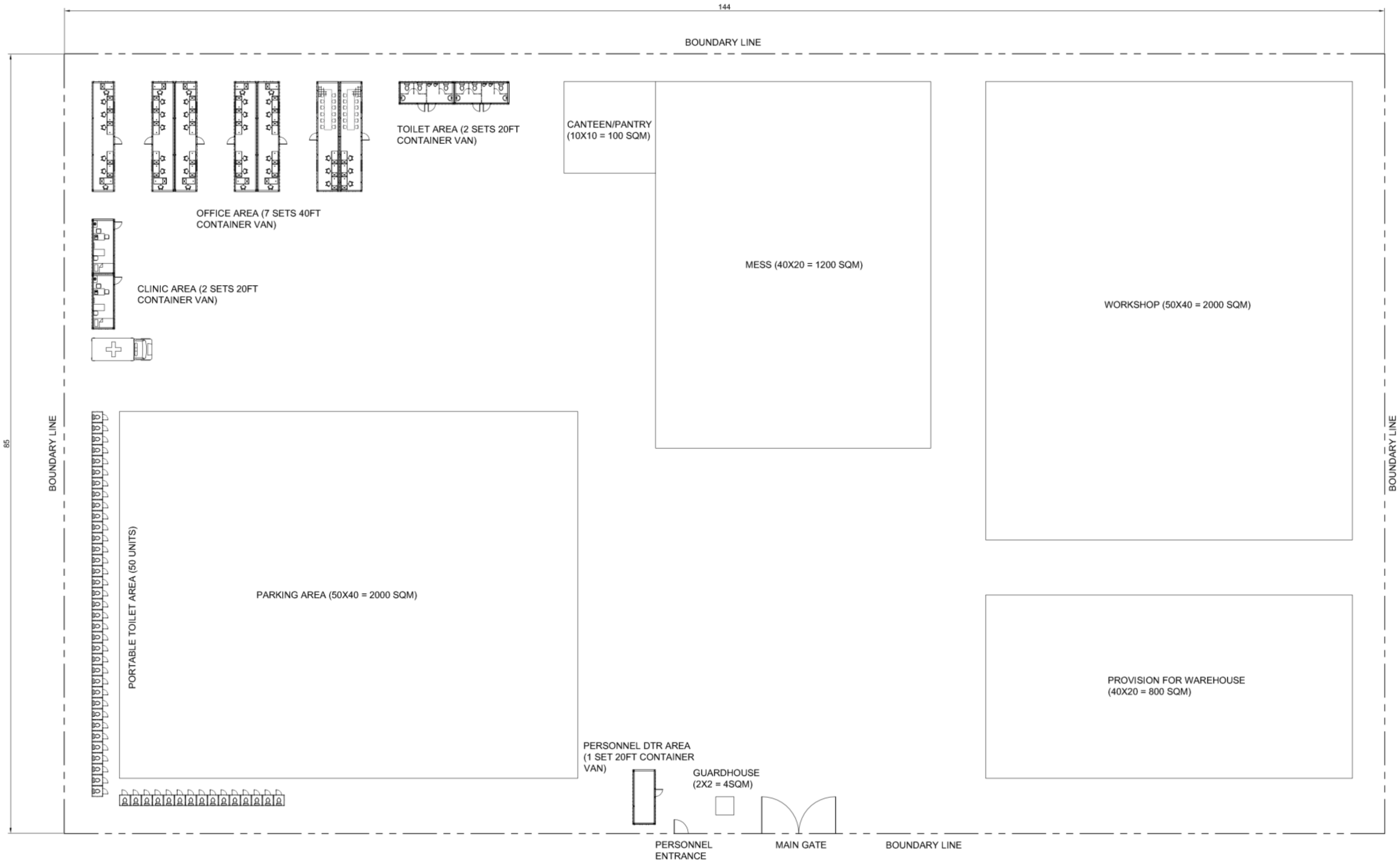


Figure 1-19. Layout of Temporary Facilities during Construction

- The Temporary Jetty will serve as the access for moving equipment and materials to site
  - Construct a temporary causeway from the shoreline
  - Tip suitable fill material & spread with dozer to achieve the final height of the structure
  - Trim slopes using excavator and place a 100 mm top wearing surface layer of fine gravel
- Temporary Jetty will be installed at the head of the access causeway
- Prefabricated temporary jetty will be transported to the site and installed at position with a barge crane.

1.7.2.3 CONSTRUCTION EQUIPMENT

The list of key equipment requirements for the construction of the LNG terminal is presented in the following table:

Table 1-11. Heavy Equipment during Construction

Item No.	Resource	Location	Number	Remarks
Yard Equipment		**Yard**		
1	Welding Machine	Yard	1,044	SMP Yard Fabrication / Modularization
2	Crawler Crane, 300T	Yard	16	SMP Yard Fabrication / Modularization
3	Crawler Crane, 150T	Yard	17	SMP Yard Fabrication / Modularization
4	Rough-terrain Crane, 100T	Yard	9	SMP Yard Fabrication / Modularization
5	Rough-terrain Crane, 70T	Yard	80	SMP Yard Fabrication / Modularization
6	Air Compressor, 750 cfm	Yard	30	SMP Yard Fabrication / Modularization
7	Manlift, 272kgs	Yard	42	SMP Yard Fabrication / Modularization
8	Rough-terrain Crane, 70T	Yard	9	Yard - Handling and Logistics Support
9	Rough-terrain Crane, 45T	Yard	9	Yard - Handling and Logistics Support
10	Tractor Truck with HB Trailer, 20T	Yard	72	Yard - Handling and Logistics Support
11	Forklift, 6T	Yard	18	Yard - Handling and Logistics Support
12	Boom Truck, 10T	Yard	9	Yard - Handling and Logistics Support
13	Self-Propelled Modular Transporter (SPMT)	Yard	5	Yard - Handling and Logistics Support
SITE EQUIPMENT		**Site**		
A. ONSHORE			-	
1	Crawler Crane, 300T	Site	14	SMP Site Assembly
2	Crawler Crane, 150T	Site	7	SMP Site Assembly
3	Rough-terrain Crane, 100T	Site	8	SMP Site Assembly
4	Rough-terrain Crane, 70T	Site	38	SMP Site Assembly
5	Manlift, 272kgs	Site	45	SMP Site Assembly
6	Welding Machine - Electric Driven	Site	593	SMP Site Assembly
7	Hydrotest Pump	Site	12	SMP Site Assembly
8	AIR COMPRESSOR	Site	12	SMP Site Assembly
9	Generator Set	Site	26	SMP Site Assembly
10	Oil Free Portable Compressor	Site	7	SMP Site Assembly
11	Crawler Crane, 150T	Site	10	SMP - Handling and Logistics Support
12	Rough-terrain Crane, 70T	Site	10	SMP - Handling and Logistics Support
13	Low Bed Trailer, 100T	Site	8	SMP - Handling and Logistics Support
14	Forklift	Site	28	SMP - Handling and Logistics Support
15	Boom truck	Site	10	SMP - Handling and Logistics Support
16	Tractor Truck with HB Trailer	Site	46	SMP - Handling and Logistics Support
17	Water Truck 10,000 L	Site	10	SMP - Handling and Logistics Support
18	Diesel Fuel Truck 6,500 L	Site	10	SMP - Handling and Logistics Support
19	Ambulance	Site	12	SMP - Handling and Logistics Support
20	Generator Set	Site	12	SMP - Handling and Logistics Support
21	Bulldozer	Site	40	Civil Works
22	Grader	Site	22	Civil Works
23	Roller	Site	22	Civil Works

Item No.	Resource	Location	Number	Remarks
24	Water truck	Site	22	Civil Works
25	Dumptruck	Site	88	Civil Works
26	Backhoe	Site	44	Civil Works
27	Service truck / Dropsode	Site	24	Civil Works
28	Crane	Site	10	Civil Works
29	Payloader	Site	12	Civil Works
30	Mobile pumpcrete	Site	12	Civil Works
31	Tractor Truck with HB Trailer, 20T	Site	12	Civil Works
B. OFFSHORE			-	
1	Demag 2800 - 600t crawler crane	Site	18	Offshore Works
2	Crawler Crane with fixed piling leader	Site	6	Offshore Works
3	Piling Templates	Site	12	Offshore Works
4	1200 hp Tugboat	Site	18	Offshore Works
5	30T BP Multicat	Site	9	Offshore Works
6	230x80 ft Flat Barge c/w spud piles (CB1)	Site	6	Offshore Works
7	180x60 ft Flat Barge c/w spud piles (CB2)	Site	6	Offshore Works
8	230x80 ft Flat Barge (MB1, MB2)	Site	18	Offshore Works
9	120x40 ft Flat Barge (MB3)	Site	9	Offshore Works
10	Crew Transfer Vessel 12m	Site	9	Offshore Works
11	6m Aluminium Work Boat	Site	9	Offshore Works
12	IHC S-280 Hydrohammer	Site	12	Offshore Works
13	Man-riding Workbox	Site	36	Offshore Works
14	10,000lb Forklift	Site	9	Offshore Works
15	MF 400 Mescolatore Pan Mixer (400L capacity)	Site	9	Offshore Works

1.7.3 OPERATION PHASE

The LNG Carrier will arrive twice a month with 24 hours unloading. The LNG Carrier provides the link in the LNG Chain between where the natural gas is liquefied and where it can be regasified. LNG is shipped commercially in a fully refrigerated liquid state up to sub-zero temperature. LNG ships used enable large amounts of clean natural gas energy to be transported to the power plant over large distances from the LNG Liquefaction Plant. The LNG is delivered to marine import terminals where the LNG is warmed and converted back into a gas, through a regasification process, before being delivered into the gas pipeline network. The specific operational processes are presented in **Section 1.5.1**.

The LNG Terminal will be operated and maintained in accordance with the operation and maintenance philosophies of the project discussed in **Section 1.5.3** that will include the applicable local and international codes and standards, manufacturer's operating and maintenance instructions, good utility practices, and good industry practices.

The proponent and contractors will adhere to HSE Management Plan, Emergency Response Plan and other pertinent operational plans and policies to ensure smooth and incident- and injury-free operations.

Moreover, environmental risks shall be addressed over the whole operational life of the site and project location, to include, but are not limited to, the following: spills to land or water, accidental discharges to the environment, emissions to air, odors, greenhouse gas emissions, ozone depleting substances, fire, noise, ecosystem disturbance, soil conservation, contaminated land and its remediation and heritage impacts.

This project shall ensure compliance to applicable environmental laws and requirements of the jurisdiction (local laws) to its operations. This shall be done to statutory reports, environmental monitoring and pollution prevention programs and activities.

- **Waste Management Program**

Waste Management outlines the overall waste handling activities for the site or project location. It shall identify the type of wastes generated and proper disposal means compliant with the minimum requirements of the jurisdiction (local law).

Programs shall be implemented to minimize the generation of waste and maximize the use of materials. These programs may include execution of the principle of the 7Rs of recycling (Recycle, Refuse, Reduce, Reuse, Repair, Regift, Recover).

- **Resource Management**

The earth and its natural resources are finite. As such, it shall be a mandatory for the Project to implement a resource management program or set of activities aimed to reduce the company's utilization of non-renewable resources.

Programs may focus on all or a combination of, but not limited to, the following:

- Water saving
- Electricity saving
- Paper consumption

1.7.4 DECOMMISSIONING AND ABANDONMENT PHASE

Abandonment for the site is not foreseen in the immediate future, as it will be a vital facility to provide stable power supply in the Luzon Grid for the next 35 years. In the event when the Project reaches abandonment phase, the Proponent shall ensure that the decommissioning and abandonment of the facilities shall be in accordance with the relevant policies and protocol of the DENR-EMB and the Department of Energy.

A detailed decommissioning/ abandonment and rehabilitation plan will be developed, as required by the DENR through DAO 2003-30, six months prior to the end of the Project life. The commencement of the abandonment activities shall start as soon as the necessary government permits are acquired.

There is currently no alternative for projected use of the project site aside from the proposed project.

1.8 MANPOWER REQUIREMENTS

1.8.1 MANPOWER REQUIREMENTS

The total manpower for the construction for the project is estimated to be around 1,800 workers (direct and indirect). The personnel will be mostly composed of operators of heavy equipment and construction workers for support facilities and administrative personnel. The manpower requirements for construction will mostly entail male workers because of the physical nature of the work.

Table 1-12. Manpower Requirement

Manpower Requirement	Numbers
Head office	
Project director	1
Technical manager	1
Project engineer	1
Lead engineer	10
Engineer	12
Procurement manager	2
HSE manager	3
QAQC manager	2
Finance manager	2
PCM manager	1
Planner	1
TOTAL	**36**
Offsite Workshop/Yard	
Work preparator (Work Pack)	6
Procurement lead	2
HSE engineer	1

Manpower Requirement	Numbers
Head office	
HSE supervisor	3
QAQC manager	1
QAQC engineer	3
Facility manager	2
Labour (Skilled Workers including equipment operators)	200
TOTAL	**218**
Project Site (All Contractors/Subcon)	
Project manager	6
Construction manager	6
Site engineer	22
Commissioning manager	4
Safety supervisors	16
Guards	12
supervisors	60
Labour (Skilled Workers including equipment operators)	1200
TOTAL	**1326**
GRAND TOTAL	**1580**

1.8.2 SCHEME FOR SOURCING LOCALLY FROM HOST AND NEIGHBORING LGUS

The proponent shall give priority hiring to locals whose skills and experience match the project's specific needs. A local hiring scheme will be established in close coordination with the concerned barangay Local Government Units (LGUs). In general, the proponent will provide a list of anticipated job requirements with corresponding qualifications to the concerned barangay LGUs. These potential opportunities will be promoted by the barangay LGUs in their respective jurisdictions and potential applicants will be forwarded to the proponent, for further review and evaluation by the Human Resources Office.

Consultations shall be made with the LGUs and host communities to finalize a scheme for hiring residents from host communities. Qualified local residents will be given priority in hiring. For technical positions not available in the host communities, the proponent reserves the option to source its manpower requirements elsewhere. Compensation terms and the process of hiring will comply and adhere with existing labor laws, rules, and regulations.

The project shall be fully compliant with the General Labor Standards of the Department of Labor & Employment across the yard, offices, and project site in Ilijan. There will be in-house technical training customized for project requirements across welding, pipe fitting, rigging, scaffolding, and electrical & instrumentation disciplines. Two-day client-specific refresher training will be conducted before deploying personnel to site.

1.9 INDICATIVE PROJECT COST

The project has an estimated budget of ~USD 304 million or about 14.6B pesos.

CHAPTER 2 ANALYSIS OF KEY ENVIRONMENTAL IMPACTS

2.1 LAND

2.1.1 LAND USE AND CLASSIFICATION

The Land Use and Classification information presented in this Section were lifted from the Comprehensive Land Use Plan of Batangas City for 2009-2018. As of December 2020, the proposed Batangas City Comprehensive Land Use Plan (CLUP) for CY 2019-2028 is still being finalized by the LGU as reported in the City's official website (www.batangascity.gov.ph).

2.1.1.1 RESULTS

2.1.1.1.1 EXISTING LAND USE AND CLASSIFICATION

The land uses with most land area in Batangas City is Agricultural Development Area (28.52%), Agro-Forestry Area (19.35%), and Forest Management Area (13%).

Table 2-1. Existing Land Use (2009-2018) of Batangas City

LAND USES (2018)	Area (has.)	% TOTAL
Residential Area	3,692.05	12.94
Socialized Housing Area	35.59	0.13
Commercial Area	1,910.07	6.69
Mixed Used Area	11	0.04
Institutional Area	205.81	0.72
Light Industrial Area	954.6	3.35
Heavy Industrial Area	1,840.01	6.45
Port Area	175.1	0.61
Eco-Tourism Dev't Area	1,054.00	3.69
Agricultural Dev't. Area	8,140.82	28.52
Agro-Industrial Area	486.3	1.7
Agro-Forestry Area	5,523.00	19.35
Forest Management Area	3,707.26	13
Protected Area	27	0.09
Special Land Use Area	20.18	0.07
Infrastructure (Road/Bridges)	634.96	2.22
River	123.7	0.43
Total	**28,541.44**	**100**

Source: Comprehensive Land Use Plan of Batangas City (2009-2018)

On the other hand, the current land use in Barangay Ilijan shows a mix of five zones: Eco-tourism, General Development, Agro-forestry, Forest/Watershed Management, and Heavy Industrial. The eco-tourism zone comprises the largest area in the barangay (~46%). However, majority of the ecotourism-related facilities, such as resorts and hotels, are mostly found near shores and beach areas within and in the neighboring barangays. The second largest zone in the barangay, agro-forestry area is situated at the northern part of the barangay where slopes are about 25-50% while a small portion of forest/watershed management area is located in a slope of more than 50%. Furthermore, most of the residential houses, schools, and Barangay LGU facilities are hosted in the General Development Area. The heavy industrial zone currently caters only the Kepco-Ilijan Power Plant and surrounding lots which is targeted to be supplied with LNG by the proposed LNG Terminal Project in 2020. This zone is located at the western tip of the barangay boundary. The Ilijan LNG Import Facility Project is to be located in a Heavy Industrial Area as presented in **Figure 2-1** and **Annex C** (Certificate of Compatibility with the Existing Land Use).

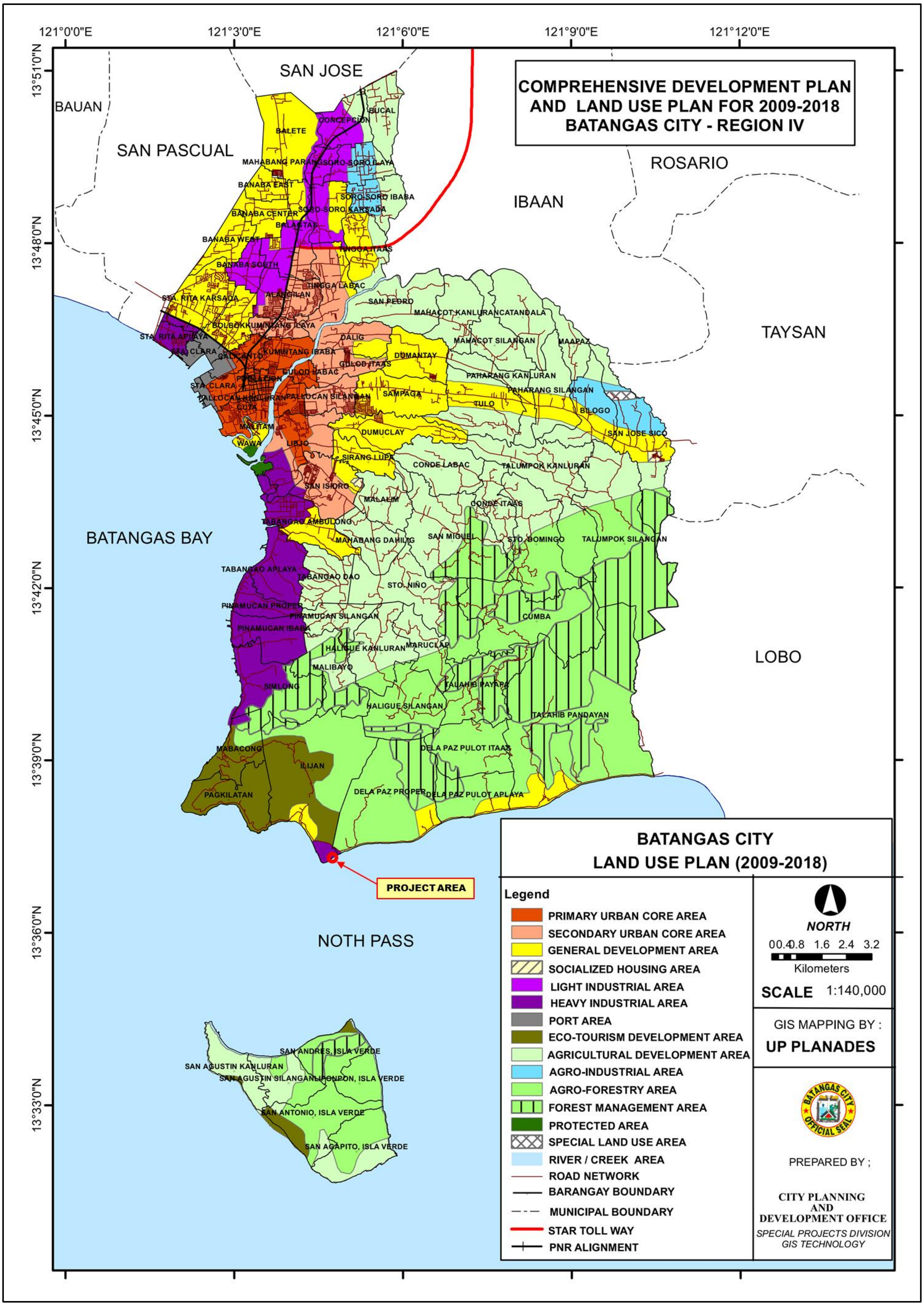


Figure 2-1. Existing Land Use Plan of Batangas City (CLUP 2009-2018)

2.1.1.1.2 ENVIRONMENTALLY CRITICAL AREAS

Environmentally Critical Areas (ECA) under Proclamation 2146 of 1982 are delicate zones where significant environmental impacts are expected. These impacts can be associated with the project and are classified into twelve (12) ECA categories. The Project area falls under ECA Category 6 or Areas frequently visited and/or hard-hit by natural calamities. The details are as follows:

Table 2-2. ECA Categories

ECA Categories		Technical Description (based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
1	Areas declared by law as national parks, watershed reserves, wildlife preserves, sanctuaries	The laws referred to by this provision are Presidential Decree No. 705, as amended, otherwise called as the Revised Forestry Code, Republic Act 7586 or the NIPAS Act, and other issuances including other proclamations, executive orders, local ordinances, and international commitments and declarations.	NO	The project is located in a heavy industrial zone as depicted in **Figure 2-1** and the certification issued by the City Planning and Development Office of Batangas City (**Annex E**).
2	Areas set aside as aesthetic potential tourist spots	Aesthetic potential tourist spots declared and reserved by the DOT or other appropriate authorities for tourism development.	NO	The project site is not a potential tourist spot as it has been classified as a heavy industrial area by Batangas City LGU (**Figure 2-1**).
3	Areas that constitute the habitat of any endangered or threatened species of Philippine wildlife (flora and fauna)	This refers to areas considered as wilderness areas and areas identified by the BMB to be natural habitats of endangered or threatened, rare, and indeterminate species of flora and fauna, as defined by BMB.	NO	The Project site is neither considered nor identified as the habitat for endangered species for flora and fauna and has been classified as a heavy industrial area by the City Government of Batangas. The project site is not identified as KBA.
4	Areas of unique historic, archaeological, or scientific interest	This refers to areas that are more than 100 years old (now superseded by new law RA10066, reduced to 50 years old) and declared by the National Historical Institute, National Museum, or National Commission for Culture and the Arts, through national or local laws or ordinances as areas of cultural, historical, and scientific significance to the nation, (e.g., declared national historical landmarks, geological monuments, and paleontological and anthropological reservations).	NO	There is no identified unique historic, archaeological, or scientific interest within the project site.
5	Areas that are traditionally occupied by cultural communities or tribes	This refers to all ancestral lands of the National Cultural Communities in Section 1 of Presidential Decree No. 410 and settlements designed, implemented, and maintained by the PANAMIN for national minorities (non-Muslim hill tribes referred to in Presidential Decree No. 719) as may be amended by Republic Act 8371 or the Indigenous Peoples Rights Act of 1997 and its Implementing Rules and Regulations.	NO	There is no ancestral domain claim/title located within the project area.
6	Areas frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.)	The area shall be so characterized if any of the following conditions exist: - Geologic hazard areas: This refers to all areas identified by the Mines Geosciences Bureau (MGB) as geologic hazard areas. - Flood-prone areas: This refers to low-lying areas usually adjacent to large active water bodies experiencing inundation of at least 2 m, twice a year for the last five years prior to the	YES	• The project area is prone to ground shaking hazards • Based on the recorded hazards associated with the eruption of Taal Volcano, the project area being 44km away from the said volcano could only experience ashfall.

	ECA Categories	Technical Description (based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
		year of reckoning. For example, a determination made in 2007 will consider the weather records from 2002 to 2006. - Areas frequently visited or hard-hit by typhoons: This refers to all areas where typhoon signal No. 4 was hoisted for at least twice a year during the last five years prior to the year of reckoning. - Areas prone to volcanic activities/ earthquakes: This refers to all areas identified as such by the Philippine Institute of Volcanology and Seismology (PHIVOLCS) (e.g., areas within permanent exclusion zones of active volcanoes or areas within the required minimum buffer zone of fault zones as determined by PHIVOLCS).		• Flooding is not expected to happen within the upslope area which is of higher elevation, however, the coastal area with elevations of less than 1msal to 2masl which is part of the project area might experience flooding during periods of continuous and/or heavy rains and also during high tides. • There is a possibility of storm surge within the project area and its vicinities but with not of significant height.
7	Areas with critical slopes	This refers to all lands with slopes of 50% or more classified as geohazard by MGB. Such slope conditions favor their natural susceptibility to geohazards such as landslides.	NO	The project site is located in the lots with 8-15% slope.
8	Areas classified as prime agricultural lands	Prime agricultural lands refer to lands that can be used for various or specific agricultural activities and can provide optimum sustainable yield with minimum inputs and development costs as determined by the Department of Agriculture.	NO	The project site has been classified as a heavy industrial area by Batangas City LGU.
9	Recharge areas of aquifers	Refers to sources of water replenishment where rainwater or seepage actually enters the aquifers. Areas under this classification shall be limited to all local or non-national watersheds and geothermal reservations.	NO	The project has not been identified as a recharge area for aquifer.
10	Water bodies characterized by one or any combination of the following: tapped for domestic purposes; within the controlled and/or protected areas declared by appropriate authorities; which support wildlife and fishery activities	Water bodies shall refer to waters that are tapped for domestic purposes or those which support wildlife and fishery activities within declared protected areas, including the buffer zones.	NO	The project's marine facilities lie within the Verde Island Passage. However, passage is being used as a sea lane in the Philippines as a main shipping route between the port of Manila and the Visayas and Mindanao ports in the south. The estimated distances of the project from nearest marine KBAs are: • 12 km away from Tingloy Marine KBA • 13 km away from Puerto Galera Marine KBA • 19 km away from Balayan Bay • 23 km away from Lobo to San Juan Marine KBA
11	Mangrove areas characterized by one or any combination of the following conditions: with primary pristine and	Mangrove areas shall be characterized by one or any combination of the following conditions: - With primary pristine and dense young growth - Adjoining mouth of major river systems; - Near or adjacent to traditional productive fry or fishing grounds;	NO	The project is composed mostly of beach forest species and no mangrove species found in the area.

ECA Categories		Technical Description (based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
	dense young growth; adjoining mouth of major river systems; near or adjacent to traditional productive fry or fishing grounds; areas which act as natural buffers against shore erosion, strong winds and storm floods; areas on which people are dependent for their livelihood.	- Areas that act as natural buffers against shore erosion, strong winds and storm floods; and - Areas on which people are dependent for their livelihood, pursuant to and taking into consideration *Republic Act 7161*, which prohibits the cutting of mangrove species.		
12	Coral reefs characterized by one or any combination of the following conditions: • With 50% and above live coralline cover; • Spawning and nursery grounds for fish; • Act as natural breakwater of coastlines	Characterized by one or any combination of the following conditions: • With 50% and above live coralline cover; spawning nursery grounds for fish; and Act as natural breakwater of coastlines.	NO	The average coral cover was catalogued at 10% (=Poor) in the project site as reported in **Section 2.2.5** Marine Ecology.

2.1.1.2 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES – LAND USE AND CLASSIFICATION

2.1.1.2.1 IMPACT IN TERMS OF EXISTING LAND USE

The project is situated in a Heavy Industrial Zone and is compatible with the existing land use of Batangas City. Moreover, the project is consistent with the CLUP's overall strategic development plan which envisioned Batangas as:

> *"as a modern, progressive, livable, and environment-friendly community with a balanced mix of land uses focusing on industrial, agro-industrial and tourism activities".*

The strategy expected to continue in the proposed CLUP for 2019-2028 given its role in the region, the province and its proximity to Metro Manila.

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

Under DENR DAO 2003-30, there are 12 categories for environmental critical areas (ECA). Of the 12 categories, only one (1) is present within the project area: Areas frequently visited and or hard-hit by natural calamities, and Under DAO 2003-30 Environmentally Critical Projects (ECP) whether located within ECA or not are required to prepare an Environmental Impact Statement (EIS). The City Government of Manila complies with the requirements with the submission of this EIS to the DENR Central Office.

Effect to the Verde Island Passage

Verde Island Passage is a strait that separates the islands of Luzon and Mindoro, connecting the South China Sea with the Tayabas Bay and the Sibuyan Sea beyond. It is one of the busiest sea lanes in the Philippines because it is the main shipping route between the Port of Manila and the Visayas and Mindanao in the south.

Verde Island Passage Marine Corridor is covered by the project site's marine structures. However, as reported in the succeeding sections of this Chapter, the existing water quality of the marine water covered by the project is comparable to Class SC guidelines based on the intended beneficial use of the marine waters in the area. It should also be noted that the project area is identified as a zone for industrial use by the City of Batangas.

Both phases of the project will utilize vessels to deliver materials into the project site that could impact the Verde Island Passage. During construction, the project will utilize marine vessels such as barges and shuttle vessels to transport the prefabricated key components from the manufacturing area to the project site which is estimated to be 20-25 kilometers in between. During operations, vessels will transport the LNG to the import terminal. The proponent will comply with the Philippine Coast Guard (PCG)'s traffic separation scheme (TSS) established for the Verde Island Passage under Memorandum Circular 04-03 (Routing System at Verde Island Passage).

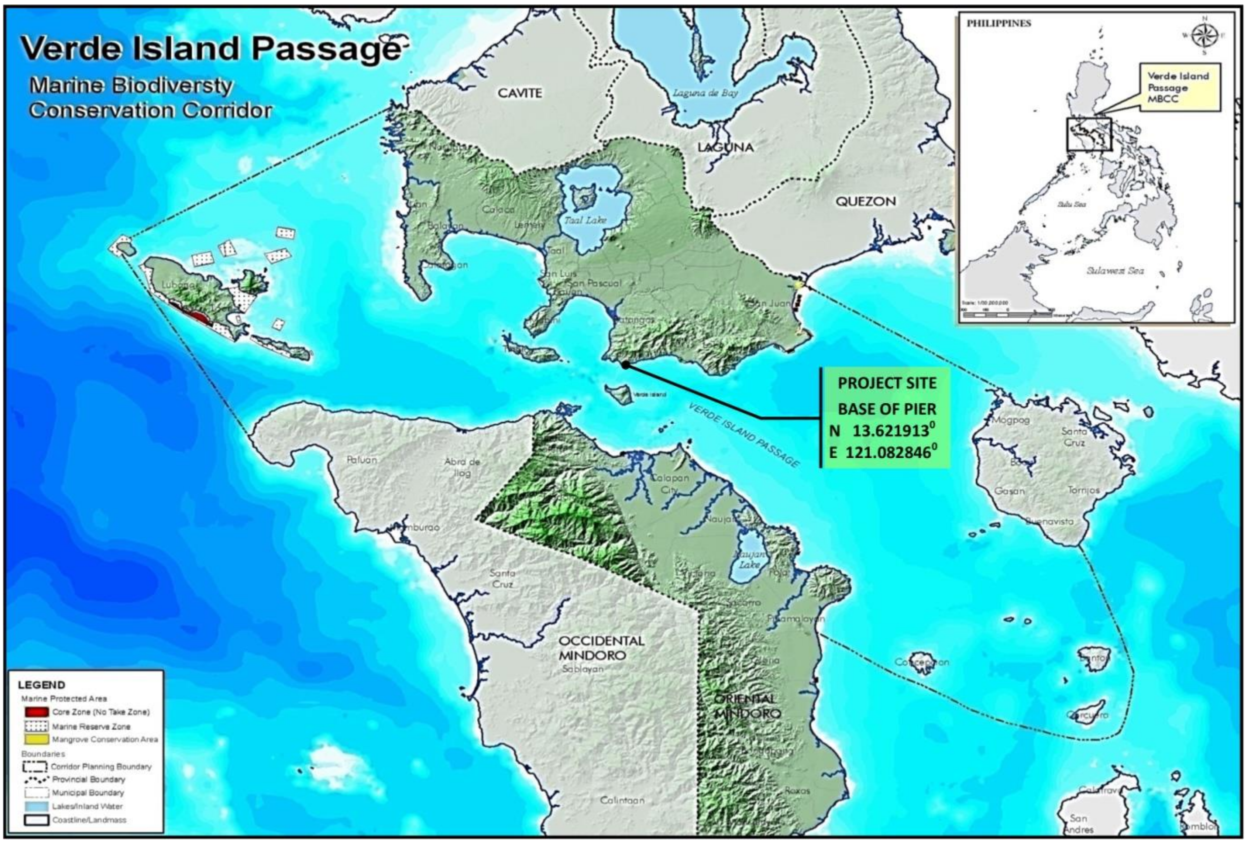


Figure 2-2. The Verde Island Marine Biodiversity Conservation Corridor with the project site shown in arrow.

2.1.1.2.3 IMPACT IN EXISTING LAND USE TENURE ISSUE/S

No tenurial and/or land issues are perceived for the project since it will be located on a private property.

2.1.1.2.4 IMPAIRMENT OF VISUAL AESTHETIC

The proposed project is located in an industrial zone; hence, will not produce visual impairment in the area. Neighboring barangays, as depicted in the City's land use plan, have eco-tourism facilities such as resorts and restaurants. To prevent indirect impacts to these facilities, the project will strictly comply and monitor water quality and its waste management. Moreover, support to LGU and NGO environmental programs and projects such as reforestation, mangrove planting, IEC on environmental conservation, coastal clean ups, solid waste management programs such as recycling, and more are recommended as part of the project's Social Development Plan.

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

High yield of solid waste materials will be expected during construction phase while will be minimal during the operation phase. The proponent will implement waste segregation, a collection of scrap and recyclable materials that can be sold, and composting of biodegradable wastes in accordance with the Batangas City LGu requirements and the Ecological Solid Waste Management Act of 2000. Workers must be briefed in seminars/workshops about proper waste management in and outside the project site. Placards/posters may also be posted on work areas as constant reminders for the workers.

2.1.2 GEOLOGY

2.1.2.1 SURFACE LANDFORM / GEOMORPHOLOGY

In general, the Province of Batangas is characterized by moderate to high relief topography. On the central and southern portion, cliffy mountain sides, steep slopes and narrow ridges are the prominent features. Waterfalls, gorges and cascades are common in the upper reaches of the different streams suggestive of a youthful stage of topographic development.

The landform in the northeastern quadrant is monotonously composed of moderate to broad undulating hills and ridges interspaced with generally U-shaped valleys. Waterfalls and cascades are scarce within this portion of the province. This variation in topography appears to be the effect of the differences in lithology and geologic history.

The western side of the province where the project area is located is being drained by the Malitan, Tabangao and Pinamucan rivers, all flowing west towards Batangas Bay. Farther east, the Kipot, Sampiro and Puting Buhangin flow eastwards, discharging their load at Tayabas Bay.

Drainage system at the western portion of the region displays a radial pattern suggestive of a volcanic area. An angular dendritic drainage pattern is manifested on the eastern half of the province. This drainage behavior is brought about by the rock homogeneity and fractures within the diorite batholiths.

The topography of the project area is relatively flat along the coastline, becoming gently to moderately sloping towards the inland. Steeper slopes were noted within the areas underlain by the Lobo Agglomerate.

The general topography / physiography of the Province of Batangas is shown in **Figure 2-3** while that of the project area is shown in **Figure 2-4**.

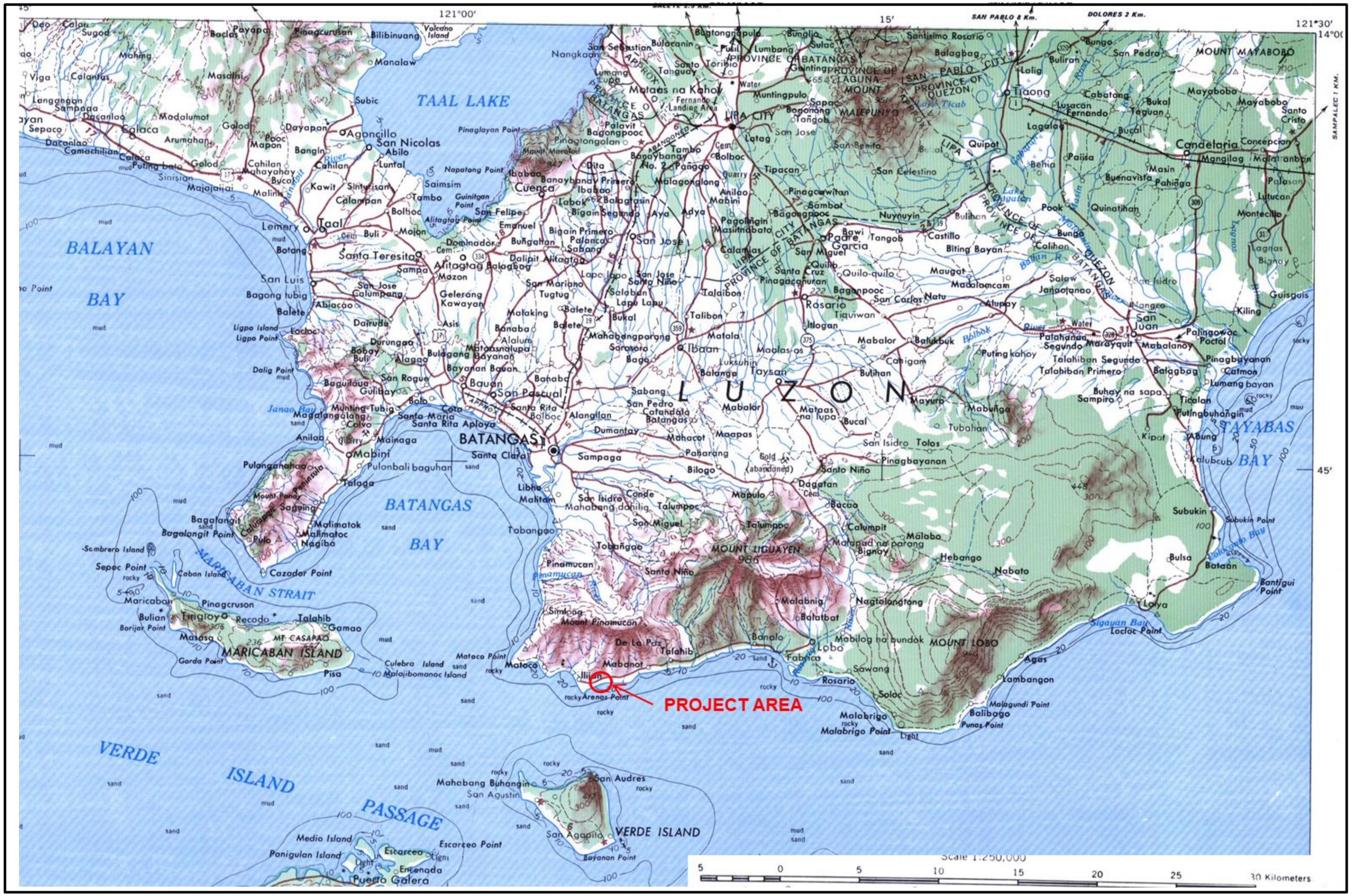
2.1.2.2 HYDROLOGY

As seen from **Figure 2-4**, only the intermittent creeks on the western and eastern sides are the natural drainage system within the project area. These creeks were dry during the time of field investigation.

2.1.2.3 REGIONAL GEOLOGY/ STRATIGRAPHY

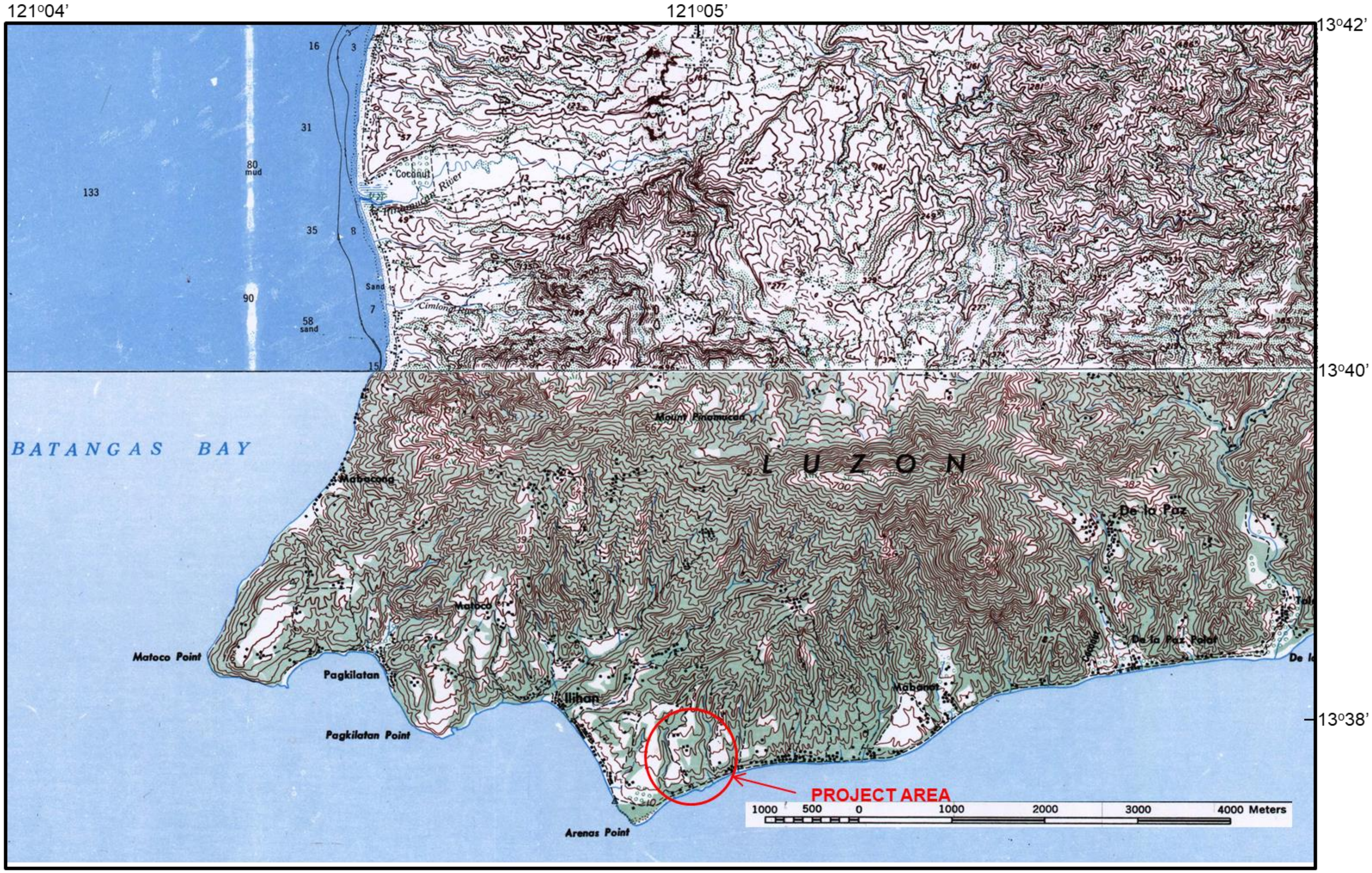
Based on the Physiographic Provinces of the Philippines (**Figure 2-5**), the Province of Batangas falls within the Southwest Luzon Uplands. The stratigraphy of Southwest Luzon Uplands is presented in **Figure 2-6**.

Southwest Luzon is predominantly a volcanic region. The following stratigraphy, arranged from oldest to youngest, are based on the works of Wolfe et al (1980), Avila et al (1980) and Bureau of Mines and Geosciences (1981).



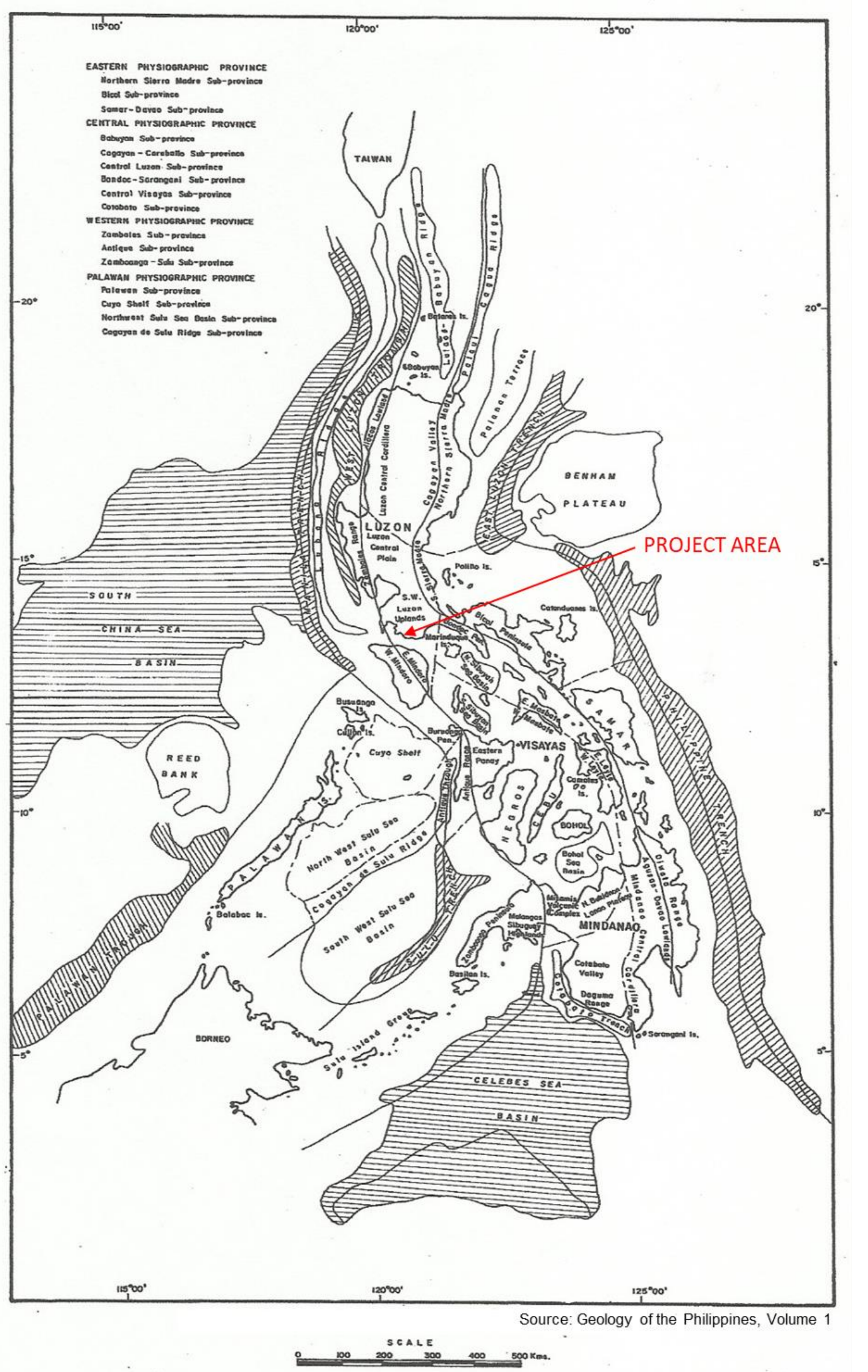
Source: 1:250,000 NAMRIA Map

Figure 2-3. General Topography / Physiography of Batangas Province



Source: NAMRIA 1:50,000 Map

Figure 2-4. General Topography of the Project Area



Source: Geology of the Philippines, Volume 1

Figure 2-5. Physiographic Provinces of the Philippines

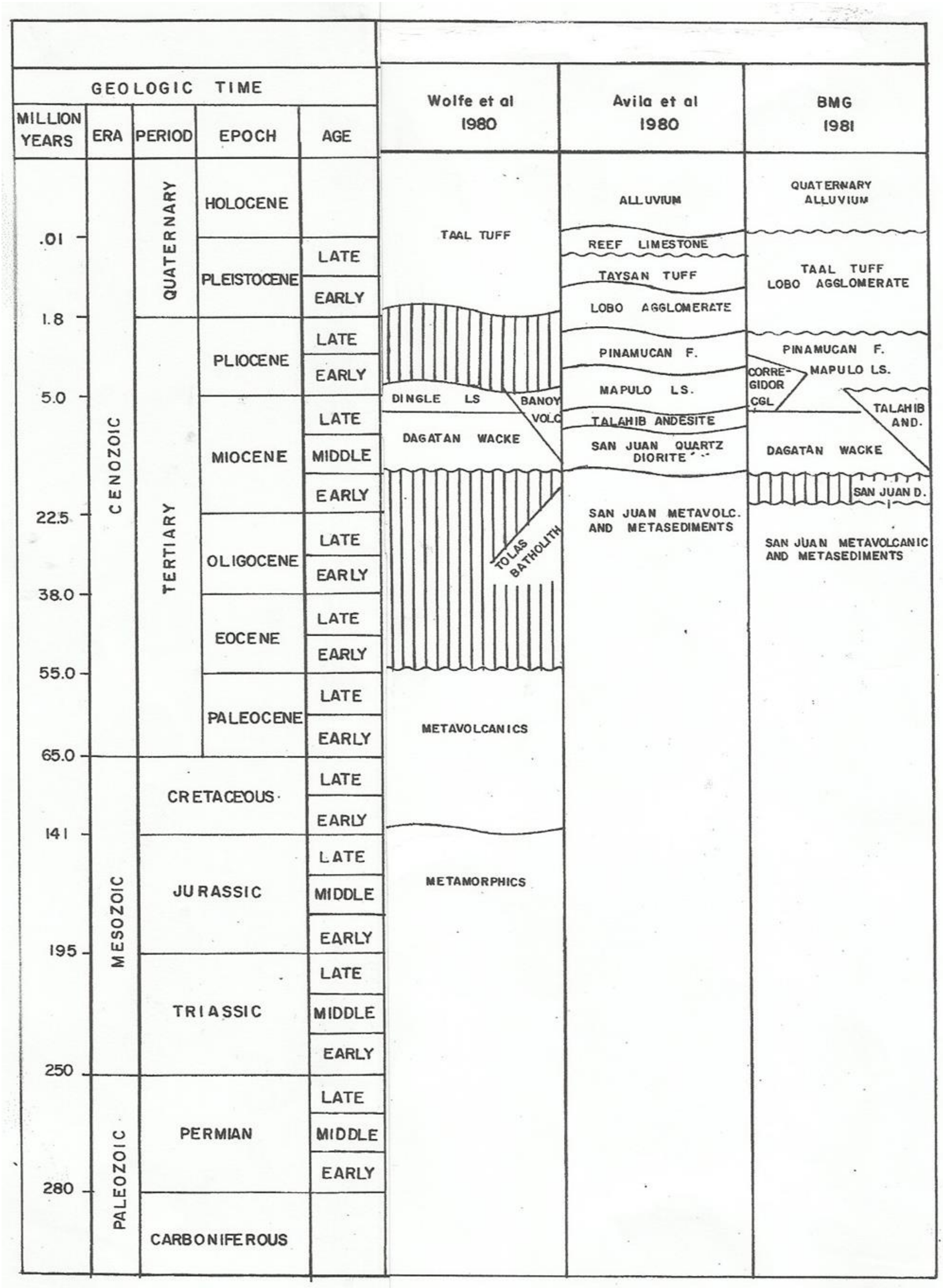


Figure 2-6. Stratigraphy of Southwest Luzon Uplands

2.1.2.3.1 SAN JUAN METAVOLCANICS AND METASEDIMENTS

These oldest extrusive rocks are exposed mainly in the central and southern parts of San Juan, Batangas. They occur as elongated bodies trending north-northwest. Irregular lenses of these rocks are also exposed along Lobo and Calumpit rivers. Associated with the metavolcanics and metasediments are hornfels, slates, paraschists and marble.

The metavolcanics include fine to medium-grained basaltic to andesitic rocks. Megascopic identification of these volcanic rocks had established as meta-basalts and meta-andesite. In some exposures, the metavolcanics exhibit a porphyritic texture with feldspar as phenocrysts.

The intercalated metasedimentary sequence is composed of highly indurated greywacke and ferruginous shale with occasional banded chert. Thickness of individual beds range from 5 cm to about 10 cm and generally strike N30^{o}W dipping 45^{o}SW.

The age of these rocks are Paleocene to Oligocene or older. Wolfe et al (1980) considered the metavolcanics in Taysan as Cretaceous.

2.1.2.3.2 SAN JUAN DIORITE (SAN JUAN QUARTZ DIORITE OF AVILA)

This rock which occupies the eastern half of Batangas is made up mostly of quartz-hornblende diorite but quartz-monzonite and dacite are occasionally present. Foliation and gneissoid structures are observed along the periphery of this batholith near its contact with the intruded intercalated metavolcanics and metasediments. Xenoliths of thermally metamorphosed volcanic are found within the diorite body. Likewise, diorite dikes were noted within the metavolcanics and metasediments.

A probable Middle Miocene age was given to this intrusive rock. Wolfe considered the intrusive mass as Early Miocene, which he called Tolas Batholith.

2.1.2.3.3 DAGATAN WACKE

Wolfe recognized this sandy formation composed of feldspathic to volcanic wacke along the roadcuts at Sto. Niño and along the road from Dagatan to Lobo. The base of this formation lies unconformably upon the meatavolcanics. The bottom of Dagatan is Middle to Upper Miocene. The upper section of this formation is overlain by an Upper Miocene limestone which Wolfe called Dingle Limestone.

2.1.2.3.4 TALAHIB ANDESITE

This Upper Mioene andesite flows interbedded with thin layers of pyroclastics and tuffs were recognized by Avila in the west central and southeastern parts of the Batangas. It is generally grayish to greenish on weathered surfaces, darker when fresh. Texture varies from fine-grained porphyritic to medium-grained equigranular. Vesicules and amyglules are characteristic features of this rock.

The Banoy Volcanics of Wolfe et al is equivalent to the Talahib Andesite. A Middle to Late Miocene age is assigned to the Talahib Andesite.

2.1.2.3.5 MAPULO LIMESTONE

This limestone may be equivalent to Wolfe’s Dingle Limestone. This limestone which occurs along the roadcut at Conde Mataas in Batangas City and Barangay Mapulo in Taysan was dated Late Miocene to Pliocene. This formation overlies the andesite at the upper reaches of the west major tributary of Talahib River and upstream of Laiya River.

This limestone is white to buff, massive to moderately compacted, soft and porous with coral fingers common along its surfaces. It generally strikes east-west dipping moderately to the north.

2.1.2.3.6 CORREGIDOR CONGLOMERATE

The Corregidor Conglomerate of Late Miocene age extends from the north side of the entrance to Manila Bay, south through Corregidor Island to Limbones Island. To the south it merges into the Batangas Volcanics of Corby et al.

This formation consists of stratified, cobble to boulder conglomerate interbedded with massive, cross-bedded sandstones and tuffaceous silty shale.

2.1.2.3.7 CALATAGAN MARL

Overlying the Corregidor Conglomerate is the Calatagan Marl (Corby et al) which varies from soft tuffaceous marine silt to coralline limestone. This is included in the Pinamucan Formation of Avila.

2.1.2.3.8 PINAMUCAN FORMATION

The Pinamucan Formation is made up of alternate beds of conglomerate, sandstone and shale. This Upper Miocene to Pliocene formation is widely exposed near the headwaters of Pinamucan River. It conformably overlies the andesite on the west, within the vicinity of upper Pinamucan. It also overlaps the diorite and intercalated metavolcanics and metasediments at upper Calumpit River and along Lobo River. Its upper horizon is intercalated with agglomerate.

The conglomerate is well sorted but poorly indurated. It is made up of unconsolidated pebbles of relatively older rocks (andesite, diorite, meatvolcanics, metasediments and marble) in a sandy to tuffaceous matrix. The sandstone and shale members which are also poorly indurated are essentially tuffaceous in character.

2.1.2.3.9 LOBO AGGLOMERATE

This agglomerate of generally andesitic composition is scattered throughout the area. Its characteristic topographic expression of cliff-forming peaks with thick vegetation is similar to limestone area in the vicinity.

This thick sequence of relatively unaltered fragmental volcanic rocks consist of angular to sub-angular fragments of andesite of variable sizes that are loosely to tightly embedded in a tuffaceous to sandy matrix.

2.1.2.3.10 TAAL TUFF

This name was given by Corby et al for the Pleistocene pyroclastic deposits that cover most of Batangas. According to Avila, it is light gray to brown, massive and poorly indurated.

2.1.2.3.11 TAYSAN TUFF

Thick tuffaceous shale blankets the topographic lows and is sporadically deposited along river valleys. It is light gray to brown, massive, poorly indurated and occasionally exhibit bedding structures. Observed bedding planes are almost horizontal. The pea-size concretions characteristic of this sequence is suggestive of a sub-aerial deposition.

This rock unit is part of the widely distributed Taal Tuff.

2.1.2.3.12 REEF LIMESTONE

Reef limestone is confined along the present shoreline, extending from Matoco Point on the west to Laiya on the east. Porous and coralline in nature, it is white to buff and contains shells of foramineferas. It is generally flat-bedded but in some places, it dips gently towards the sea.

Along the coastline, this rock unit was observed to be unconformably overlying the tuff.

2.1.2.3.13 ALLUVIUM

This consists of poorly and unconsolidated materials of boulders, gravel, sand, silt and clay deposited recently along the coastal areas and floodplains of large river systems.

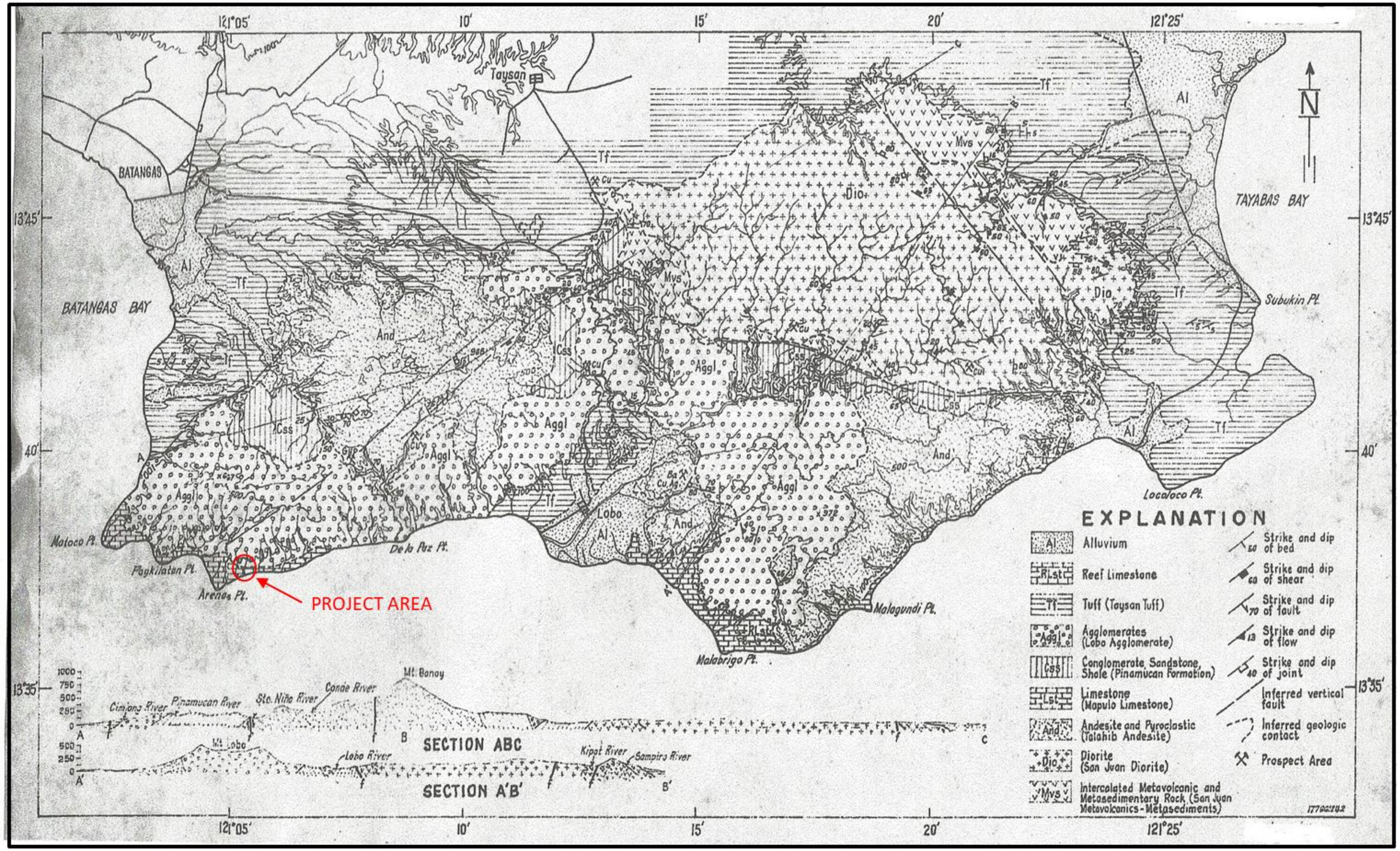
The geology of southern Batangas is shown in **Figure 2-7**.

2.1.2.4 GEOLOGIC STRUCTURES

Batangas had been affected by widespread tectonic disturbances as evidenced by the preponderance of faults of various age and nature. The most prominent structure in southern Batangas is the Laiya Fault (**Figure 2-7**). It is a normal fault that strikes west-northwest separating the younger volcanic in the topographically low areas. It is readily recognized in the vicinity of Laiya and Lobo River.

Minor structures on the western side are the northeast trending gravity faults with associated shears and joints. These series of faults traverse the younger rocks. On the east, northwest striking faults are prominent structures separating the intercalated metavolcanics and metasediments from the relatively younger tuff.

Other structures in the area are flow banding, schistocity and bedding. Flow structures in the andesite strike northeast and dip moderately to the northwest. Schistosity within the intercalated metavolcanics and metasediments strikes northwest and dips from 50o to 80o to the southwest. Bedding on the metasediments also trend northwest and dip moderately to the southwest.



Scale 1:200,000

Source: Report on the Geology and Mineral Resources of Southern Batangas , 1980 by Emil T. Avila, Bureau of Mines & Geosciences

Figure 2-7. Geology of Southern Batangas

Localized folding of the younger clastics along Calumpit River is manifested by a synclinal structure with axis striking northwest and limbs dipping moderately towards the northeast and southwest. The clastics at upper Pinamucan area are characterized by homoclinal beds that strike northeast and dip gently to the northwest.

2.1.2.5 GENERAL / SITE GEOLOGY

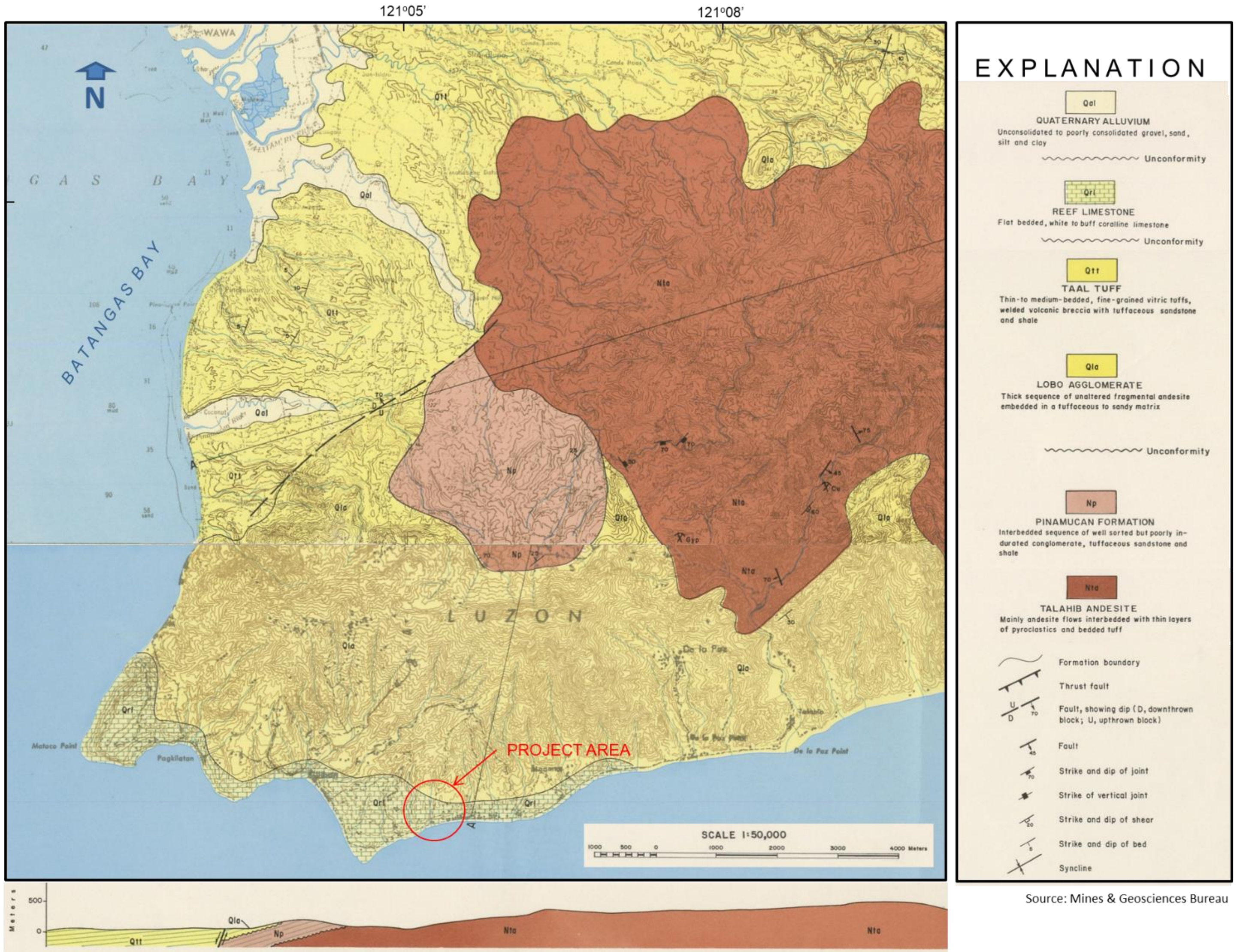
As seen from the general geology of the project area, it is underlain mostly by the Lobo Agglomerate and Reef Limestone.

The Lobo Agglomerate of generally andesitic composition occupies the northern portion of the area. Its characteristic topographic expression of cliff-forming peaks with thick vegetation is similar to limestone area in the vicinity. This thick sequence of relatively unaltered fragmental volcanic rocks consists of angular to sub-angular fragments of andesite of variable sizes that are loosely to tightly embedded in a tuffaceous to sandy matrix.

The reef limestone is porous and coralline in nature, white to buff and contains shells. It is generally flat-bedded but in some places, it dips gently towards the sea.

Alluvium which consists of poorly and unconsolidated materials of boulders, gravel, sand, silt and clay deposited recently along the coastal areas and along the beds and floodplains of the river system.

The general geology of the project area and its vicinity is presented in **Figure 2-8**.



Source: Mines & Geosciences Bureau

Figure 2-8. General Geology of the Project Area and its Vicinity

2.1.2.6 SUBSURFACE CONDITIONS

MJAS Zenith Geo-Mapping & Surveying Services conducted both onshore and offshore geotechnical investigations at the project area. The investigations were conducted to explore the subsurface deposits and conditions at the site, determine the types of materials underlying the project area, analyze the strength and deformation characteristics of the subsoil/rock and specially to determine the founding levels of the different structures to be constructed.

Thirty boreholes with depths of 30 meters each were drilled at the onshore area while 20 boreholes, also with depths of 30 meters each were drilled at the offshore area. Borehole locations for the onshore and offshore areas are shown in **Figure 2-9** and **Figure 2-10**, respectively.

Based on the available borehole logs, all the drilled holes at the onshore area encountered poorly graded gravel with silt or silty poorly graded gravel. Almost all the cored rock samples have zero RQDs. These drilling results suggest that the drilling machine and the core barrel/s and drilling bits used by the drilling contractor are not good enough to do proper coring. Most of the core samples could have suffered mechanical breaks which resulted into zero Rock Quality Designation (RQD). It is my belief that if corings were properly done, the recovered samples could have better RQDs. Most of the recovered gravels especially at the lower sections are believed to be clasts of the agglomerate. Some of the upper sections could be from reef limestone. Photographs of core samples as well as the borehole logs and idealized profiles are presented in Appendix-__.

The borehole logs from the offshore drillings encountered mostly andesite with limestone in some sections. Similar to the onshore drillings almost all the core samples have zero RQDs. The alternate andesite and limestone at the upper 6 meters and 7.5 meters suggest loose deposits of gravel to cobble size limestone and andesite. The encountered andesite below these depths are believed to be clasts of the agglomerate.

It is my belief that if the drillings were done properly, the underlying rocks would have better RQDs and can even be classified as good to very good. Likewise, appropriate foundation type/s and length and sizes of piles can be recommended.

Figure 2-9. Onshore Borehole Locations

Figure 2-10. Offshore Borehole Locations

2.1.2.7 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.

The Philippine Archipelago is situated at the convergence of the Eurasian Plate and the Philippine Sea Plate which belongs to an active trench-arc complex. It consists of several areas of rifts and opposing trench-arc systems. **Figure 2-11**, the latest Philippine Seismic Zone Map in accordance to the Seismic Studies of Torregoza, Sugito and Nojima of the Gifu University in Japan and PHIVOLCS presents 27 zones. Based on this map the project area falls under Zone 9 where the historical maximum magnitude is 7.7.

Table 2-3 presents the characteristics of the different zones based on the studies conducted by PHIVOLCS and some staff of the Gifu University in Japan.

Table 2-3. Characteristics of the Different Zones based on the Studies of PHIVOLCS, et al.

Zone	Occurrence Rate per km^2	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

Zone	Occurrence Rate per km^2	b Value	Historical Max. Magnitude (Ms)
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

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.

2.1.2.8 REGIONAL SEISMICITY

The map of the Philippines shows an archipelagic country. Some 7,100 islands are spread over the area of two million square kilometers of sea. The country is built on a vast array of broken tectonic plates, belonging to the Pacific Rim of Fire.

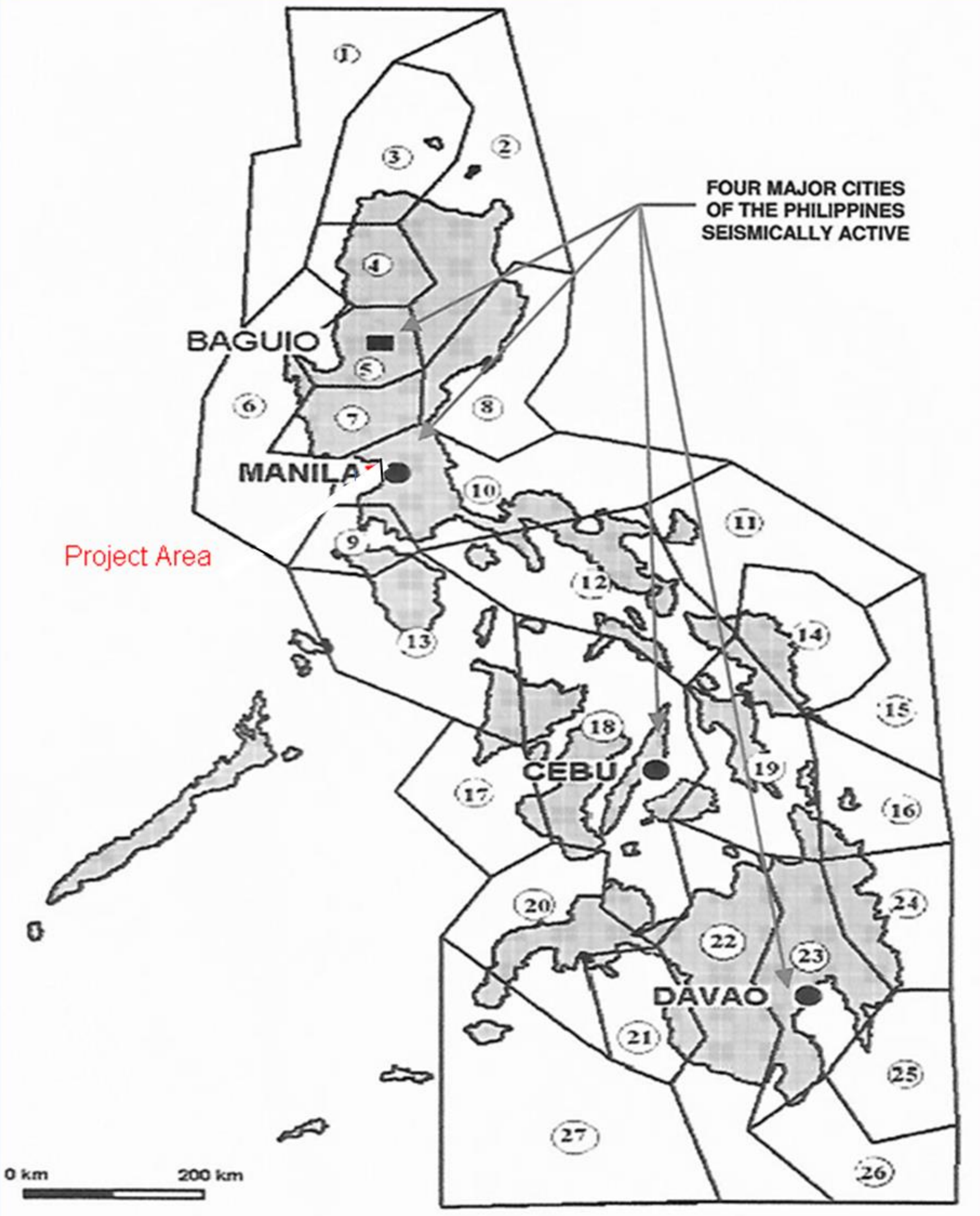
This belt, that runs from the north of Japan, through the Philippines, to New Zealand, is an area with continuous moving tectonic plates, floating on the earth's liquid magma. These movements reveal themselves outwardly in numerous earthquakes and other volcanic activities.

Earthquakes that occur in the Luzon area are mostly attributed to the movement of the Philippine Fault Zone (PFZ). The PFZ is about 1.600 km long, extending from Lingayen Gulf in Western Luzon through the offshore of Pujada Peninsula in Southeastern Mindanao.

The map of Distribution of Active Faults and Trenches in the Philippines which shows the earthquake generators within the Luzon areas and other areas in the Philippines is presented in **Figure 2-12**.

Data from the Philippine Institute of Volcanology and Seismology (PHIVOLCS) show that sizeable earthquakes in the country are not unusual. From 2011 to 2013 alone, the Philippines had 187 earthquakes at least 5.0 in magnitude, of which 18 were 6.0 to 6.9 in magnitude, and three at least 7.0 in magnitude.

Of the latest 21 earthquakes of at least 6.0 in magnitude, five each occurred in Luzon and the Visayas, while 11 hit Mindanao.



Philippine Seismic Zone Map In Accordance To The Seismic Studies
By Torregoza, Sugito & Nojima Of The Gifu University In Japan And PHIVOLCS - Philippines.

Figure 2-11. Seismic Zone Map of the Philippines

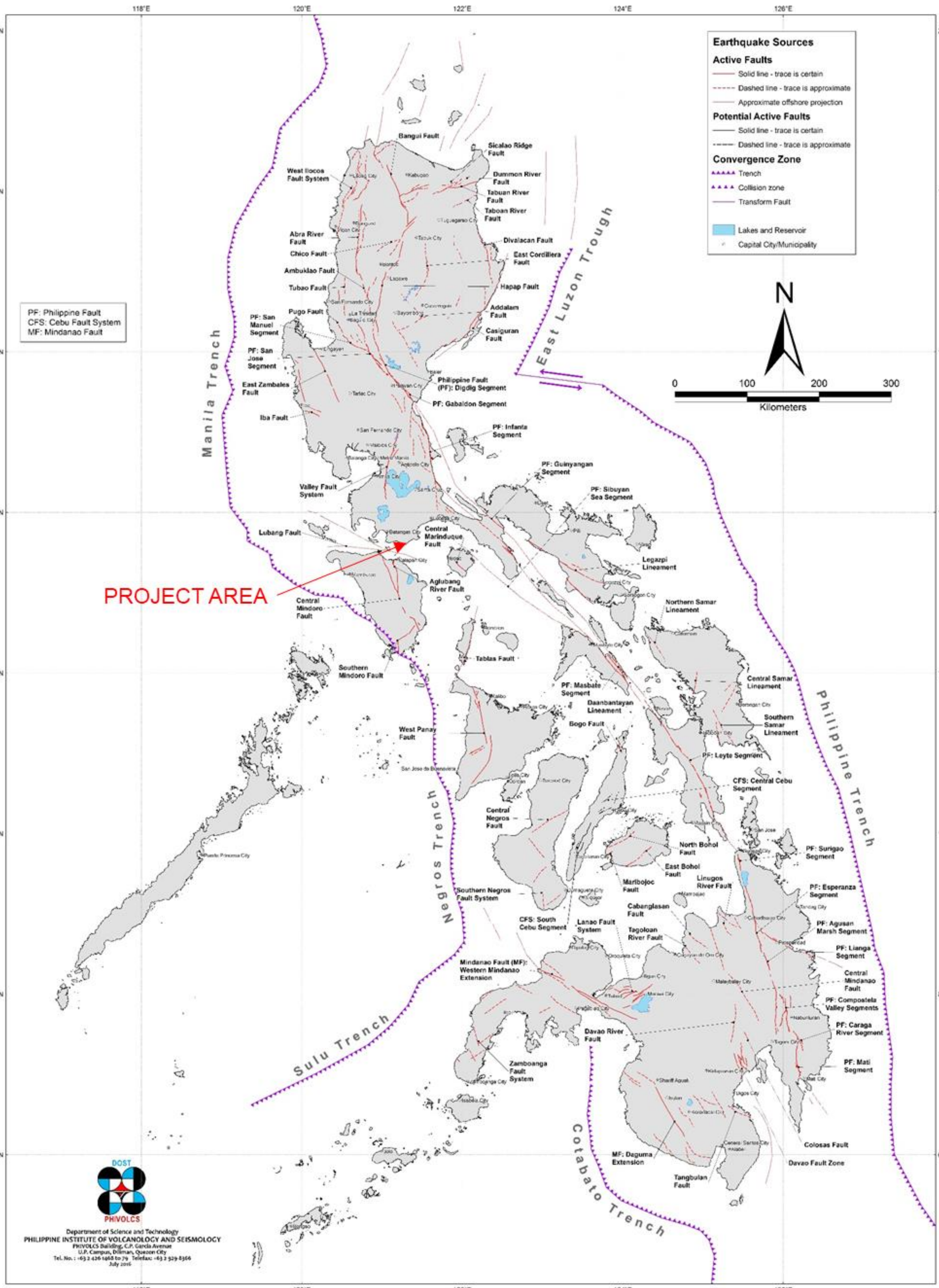


Figure 2-12. Distribution of Active faults and Trenches in the Philippines

2.1.2.9 POTENTIAL SOURCES OF EARTHQUAKES

Based on historical and instrumental data, the following have been identified to be the locus of major earthquakes that have significantly impacted the province of Batangas and nearby areas: 1) Lubang Fault 2) Philippine Fault, and 3) Manila Trench. Though presently inactive the West Valley Fault can be considered as potential source of strong earthquake.

Lubang Fault. Lubang Fault which runs offshore between Batangas and Mindoro is an active strike-slip fault and only about 13.5 km south of the project area had been the source of large earthquakes in the past, notably that of 1675, 1852 and 1972. The intensity 8 earthquake that struck Verde Island in February 1675 destroyed many buildings in Northern Oriental Mindoro and southern Batangas. This led to the occurrences of landslides, opening of ground fissures and subsidence of beaches along the coast of Mindoro. The 7.1 magnitude earthquake that struck Mindoro on November 15, 1994 caused a tsunami, killed 41 persons and destroyed 1530 houses.

The 5.7 magnitude earthquake that surprised Metro Manila, Calabarzon and residents of neighboring provinces last June 25, 2014 was caused by the movement of the Lubang Fault.

The fault generated ground shaking which was felt 100 kilometers from the epicenter. It was recorded to have occurred 39 kilometers southwest of Calatagan, Batangas.

The 5.5 earthquake recorded by PHIVOLCS on April 4, 2017 had the epicenter located 7 kilometers northwest of Tingloy, Batangas. The earthquake was of tectonic origin. Metro Manila and nearby provinces felt shaking at Intensity 3 while Obando, Bulacan felt Intensity 4, and Batangas City experienced Intensity 6 shaking. The earthquake is suspected to be the caused by the movement of the Lubang Fault. On April 7, PHIVOLCS stated that they have recorded 934 aftershocks; 118 of which were plotted and while 14 were reportedly felt.

Philippine Fault Zone (PFZ). Several destructive earthquakes that have impacted several localities in the country were generated from the Philippine Fault Zone, a 1,600 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 Infanta segment of this fault is about 94km away from the projects area.

The magnitude of the 1990 earthquake generated from northern segment of PFZ was 7.8. **Figure 2-13** shows the destructive earthquakes associated with the PFZ.

Manila Trench. Historical data indicates that the 1677 earthquake could be attributed to movements along the Manila Trench. During this earthquake, tsunami was reported along the 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 Manila Trench to the project area is around 113 km southwest of the project area.

The *West Valley Fault* (WVF), a newly classified active fault based on the mapping conducted by Punongbayan and others in 1990 is considered a potential earthquake source. Previously mapped extent of surface rupture associated with WVF is about 60 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 remain to be mapped. PHIVOLCS found it hard to correlate the historical earthquakes with the activity of the WVF because of the limited available data. However, based on the extent of damage in Manila and nearby areas inflicted by the 1599, 1601, and the 1885 events, the possibility, that WVF could have generated these earthquakes cannot be ruled out. No recent seismicity can be attributed to the WVF.

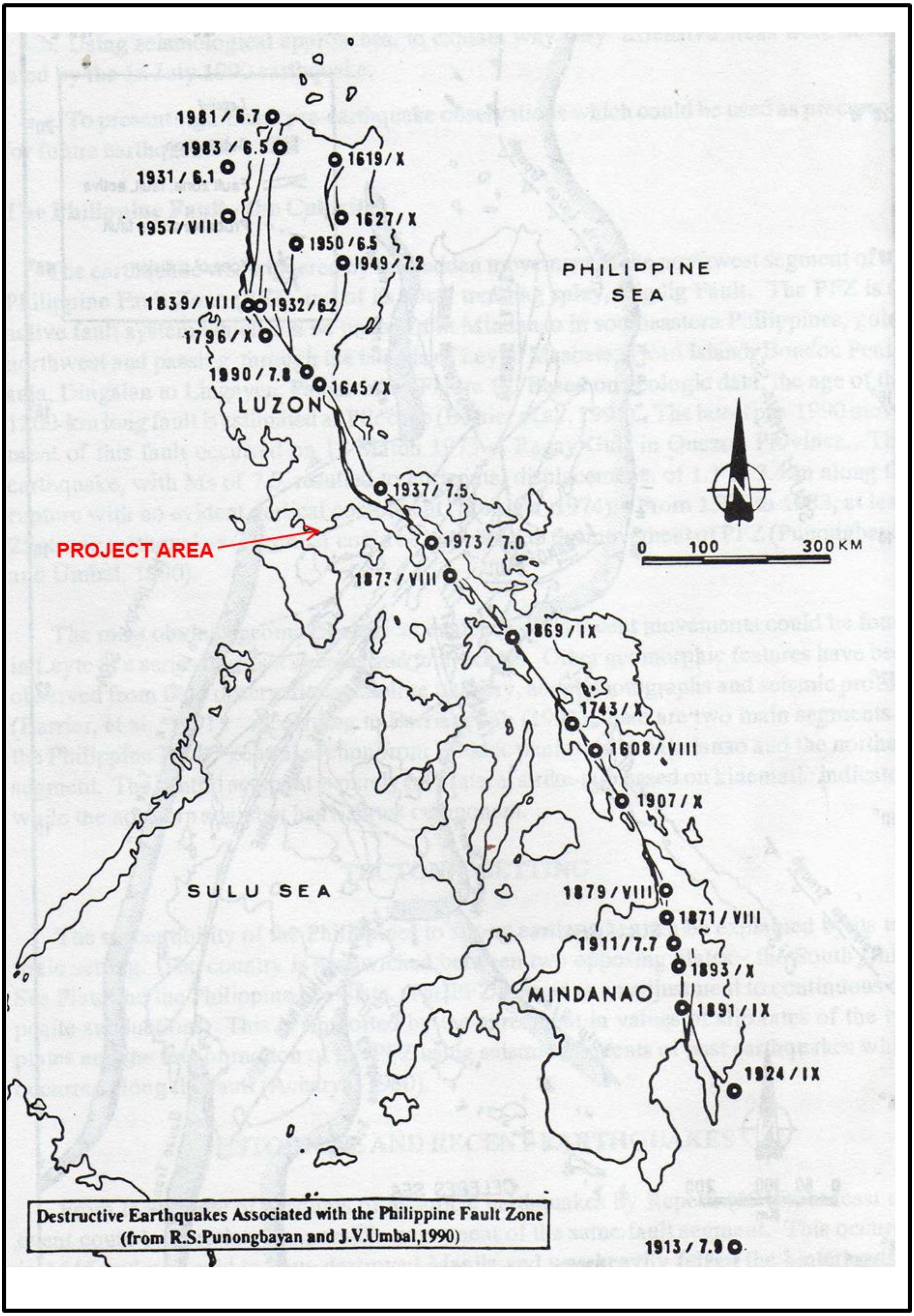


Figure 2-13. Destructive Earthquakes Associated with the Philippine Fault Zone

2.1.2.10 ACTIVE VOLCANO NEAR THE PROJECT AREA

2.1.2.10.1 TAAL VOLCANO

Taal Volcano is an island located near the center of Taal Lake in Batangas Province situated about 44 km southeast 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.

Taal Volcano had several catasthrophic eruptions in the past. Its first recorded eruption dates back in 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.

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.

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.

As a result of a base surge or a rapidly expanding cloud at the base of the eruption column 15 km high about 1,300 people were killed and 800 others were wounded during Taal Volcano's 1911 eruption. 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 km2 while ashes spewed from the volcano reached as far as Manila.

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 km2 with 25 cm of ash.

Taal Volcano erupted on the afternoon of January 12, 2020, 43 years after its previous eruption in 1977. Loud rumbling sounds were also felt and heard from the volcano island. Stronger explosions began by around 3 pm that spewed an ash column exceeding a kilometer high.

Heavy damages to crops, animal industries and fisheries which amounted to billions of pesos were reported. A total of 39 people died as a result of this eruption of Taal, although only one reported case was directly caused by the eruption on January 12, 2020. According to the Manila Bulletin, people either perished because they refused to follow the evacuation order or decided to return to their homes, or died in the evacuation centers of heart attacks caused by anxiety.

Based on the recorded hazards associated with the eruption of Taal Volcano, the project area being 44km away from the said volcano could only experience minor ashfall. **Figure 2-14** shows the relative position of the project area from Taal Volcano.

Figure 2-15 and **Figure 2-16** show the Base Surge Hazard Map and Ballistic Projectile Hazard Map of Taal Volcano, respectively.

Figure 2-14. Relative Position of the Project Area from Taal Volcano

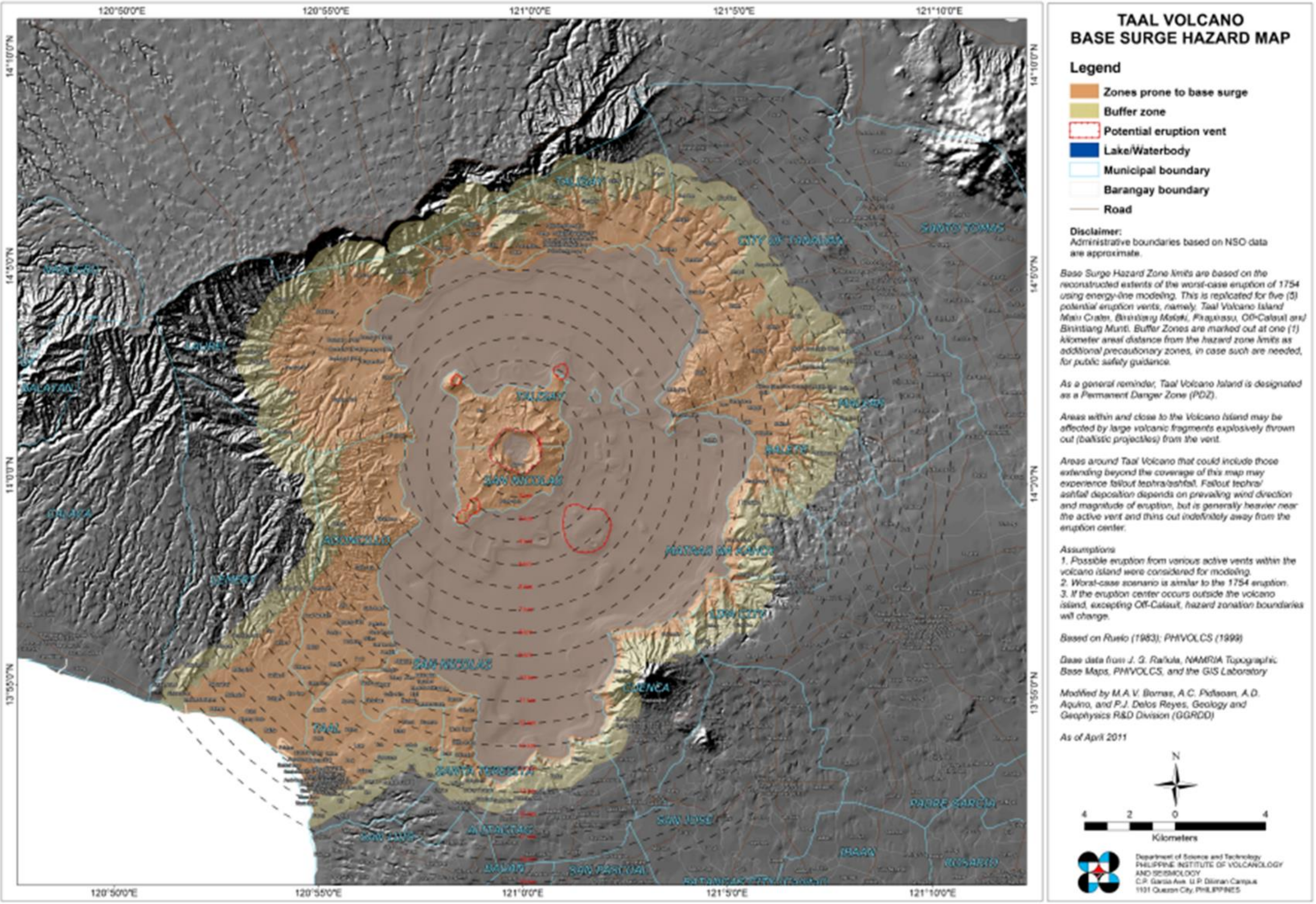


Figure 2-15. Base Surge Hazard Map of Taal Volcano

(The outer radius of this hazard map is 19 km, the project area being 30 km away from Taal Volcano and beyond the coverage of this hazard map may experience only fallout tephra / ashfall)

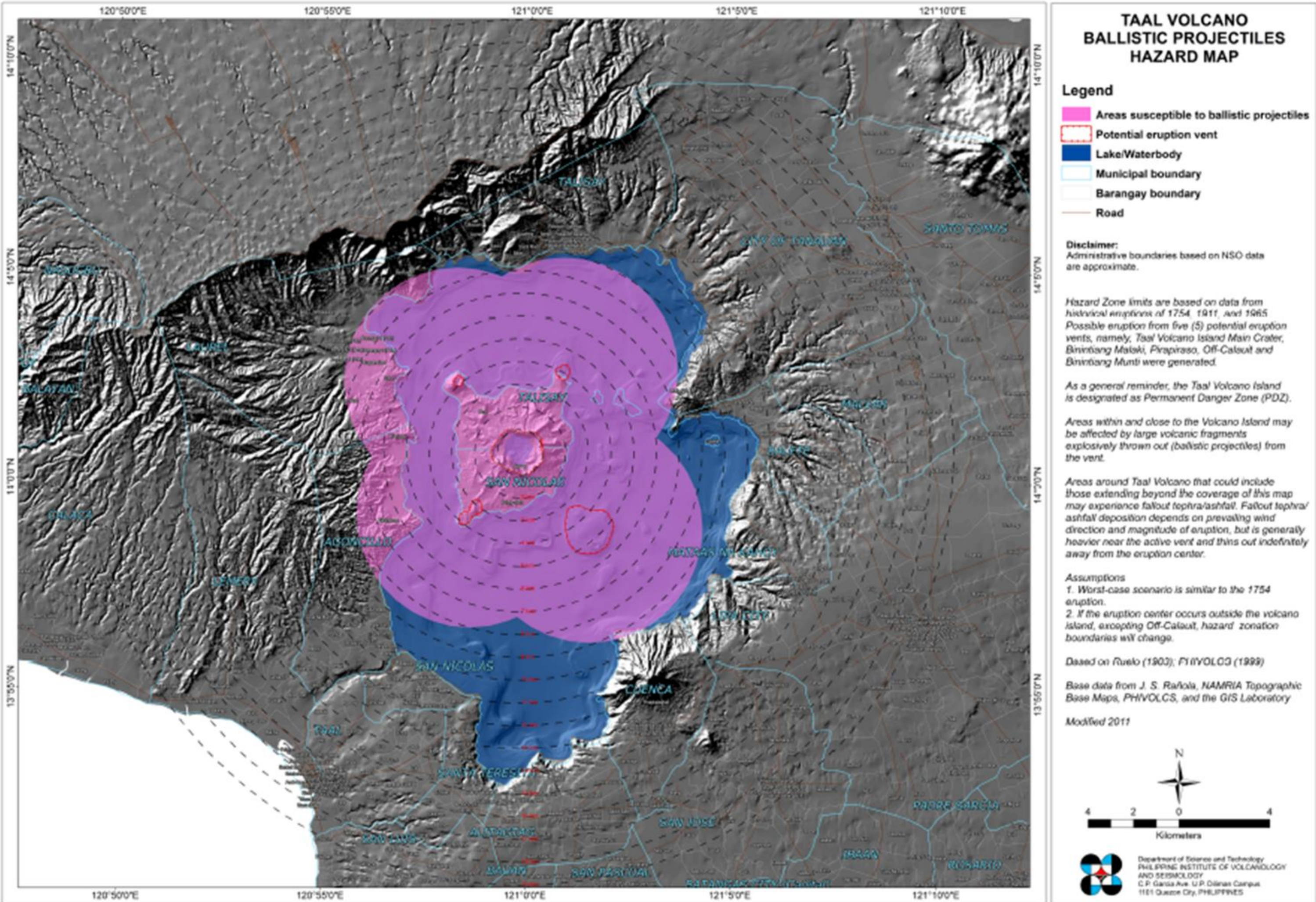


Figure 2-16. Ballistic Projectiles Hazard Map of Taal Volcano

(The outer radius of this hazard map is 19 km, the project area being 30 km away from Taal Volcano and beyond the coverage of this hazard map may experience only fallout tephra / ashfall)

2.1.2.11 HAZARDS ASSESSMENT

2.1.2.11.1 GEOLOGIC HAZARD

2.1.2.11.1.1 TECTONIC / 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 / Ground Acceleration

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. **Figure 2-17** shows the general relationship between near-surface earth material and amplification of shaking during a seismic event.

The project area is prone to ground shaking hazards as manifested by the earthquakes that hit Batangas, Mindoro Oriental and Verde Island for the past years. The project area has already experienced earthquakes of more than Intensity 5. The site has a recorded and experienced intensity of 5 during the July 1990 Luzon earthquake.

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 2-18** to **Figure 2-21**.

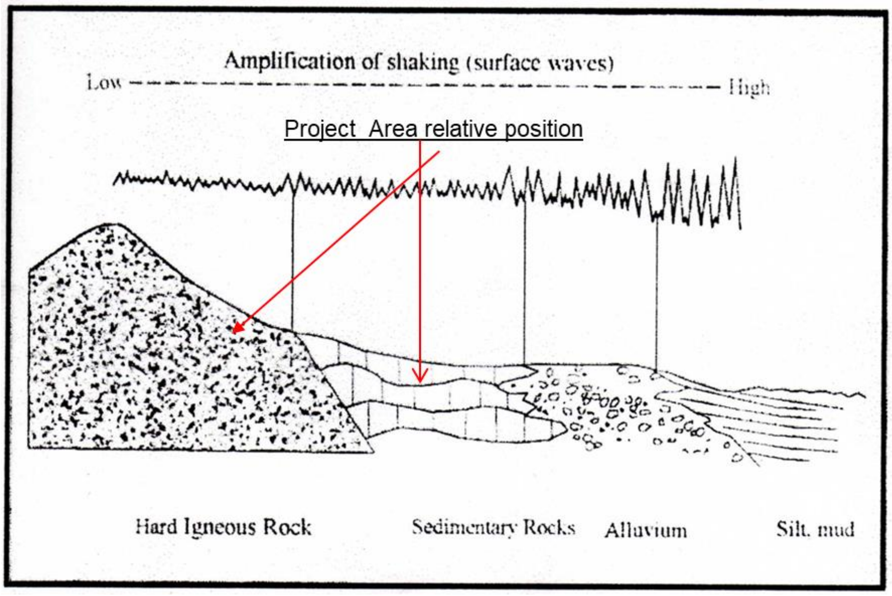


Figure 2-17. Generalized Relationship Between Near Surface Earth Materials and Amplification during a Seismic Event (Keller, E. J., 1996)

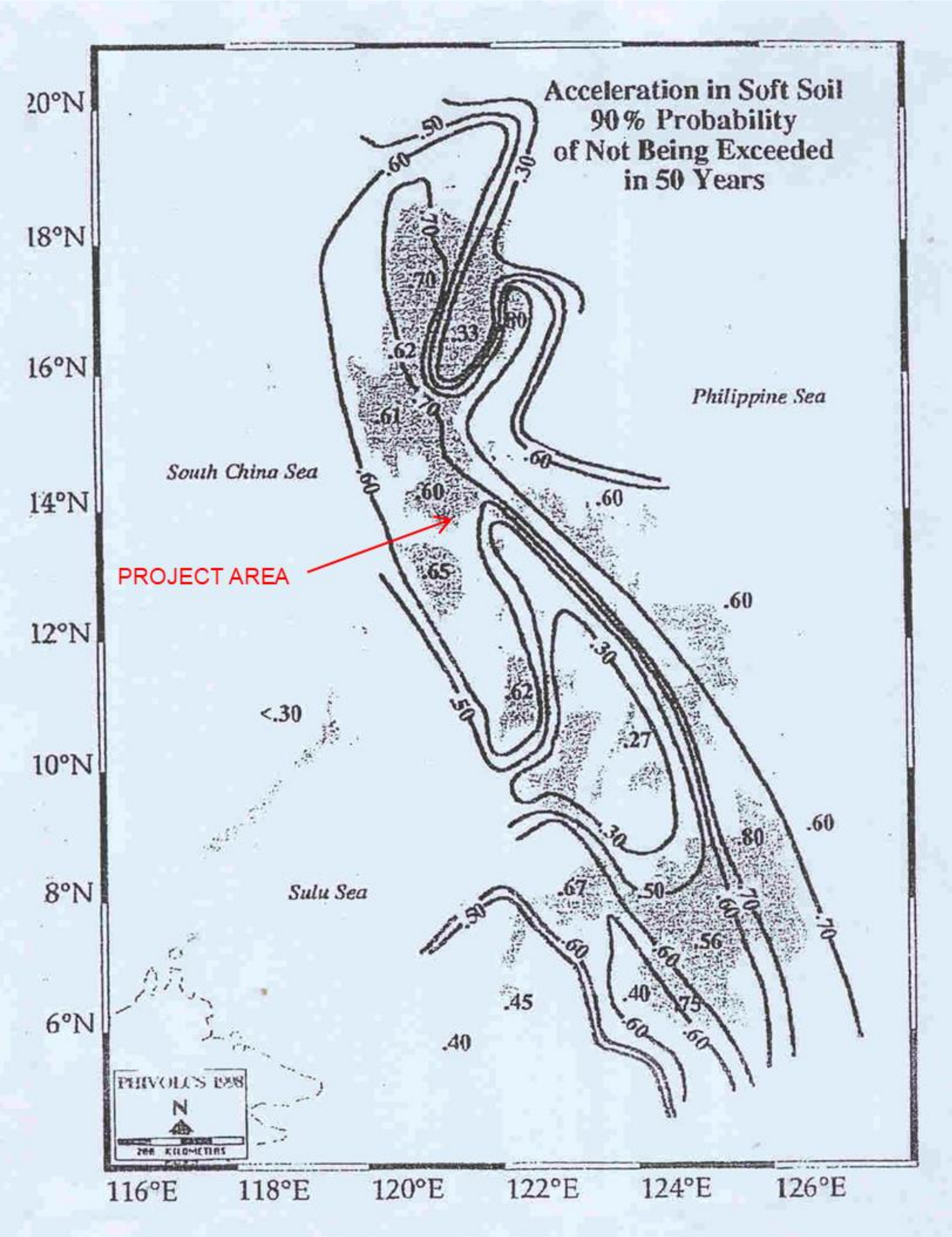


Figure 2-18. Ground Acceleration in Soft Soil

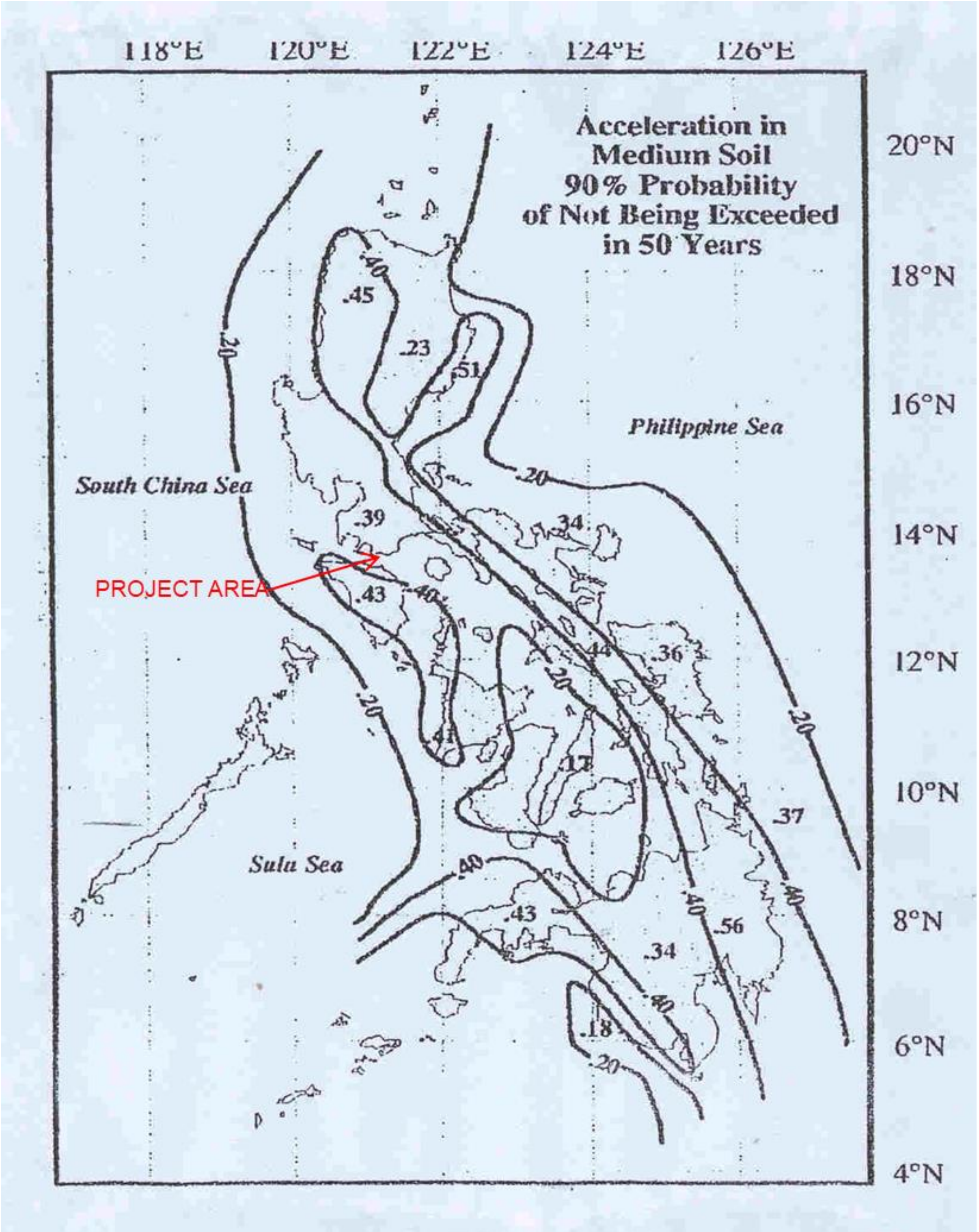


Figure 2-19. Ground Acceleration in Medium Soil

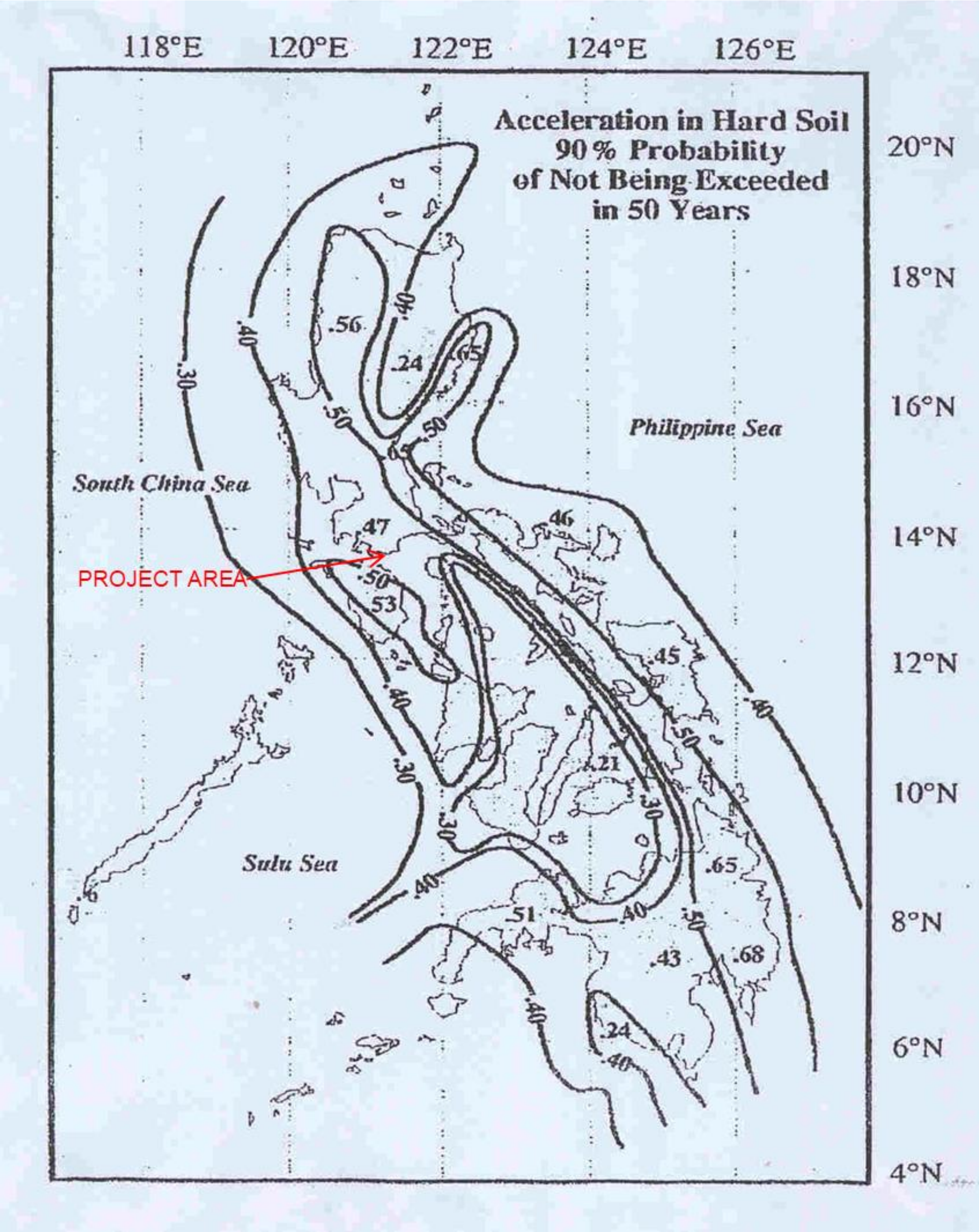


Figure 2-20. Ground Acceleration in Hard Soil

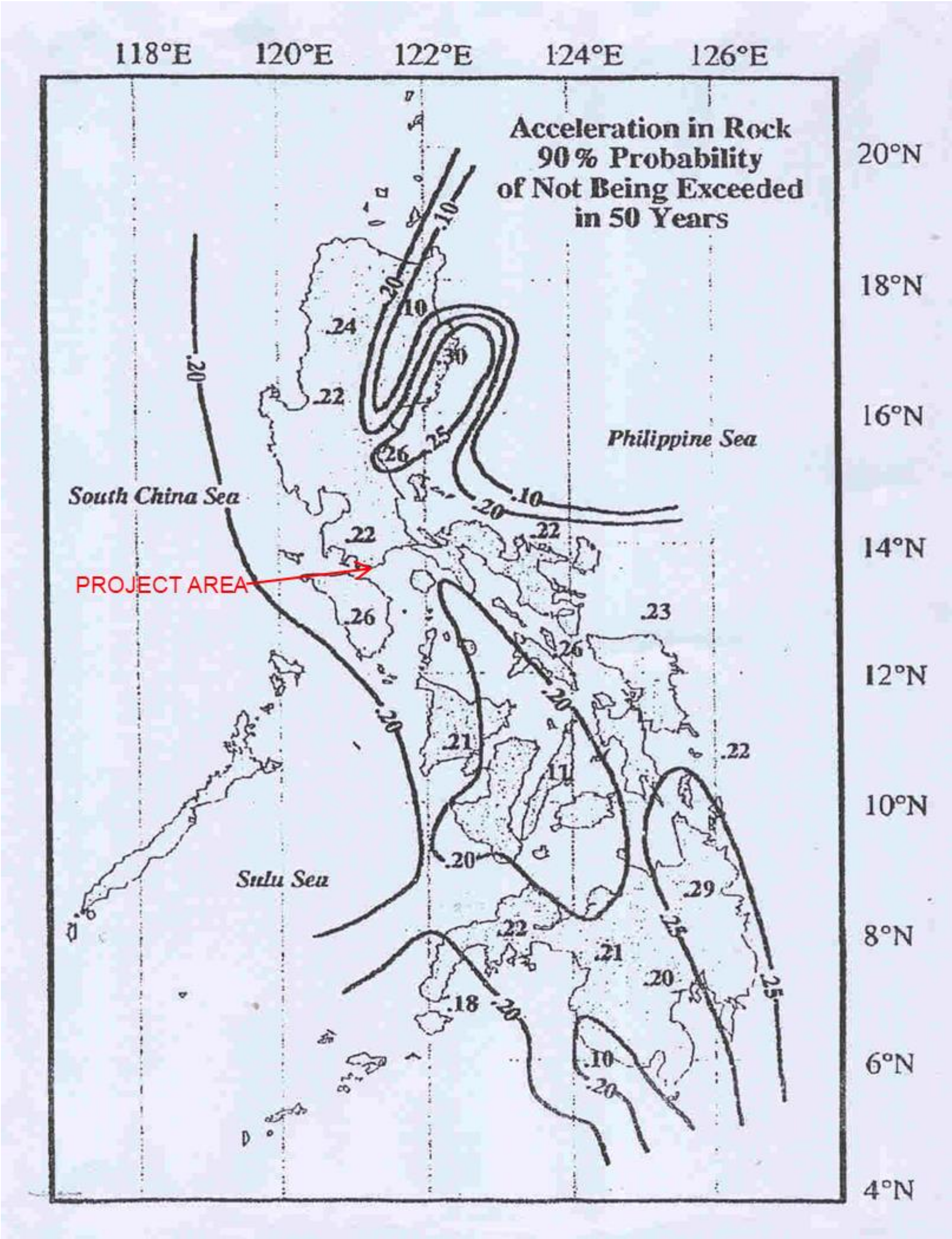


Figure 2-21. Ground Acceleration in Rock

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 (In 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 Lubang 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. The Philippine Fault, the Manila Trench and the West Valley Fault can also be considered as potential earthquake generators for Batangas.

Design Earthquake. The Philippine Fault is such a major fault that it is capable of generating a rare magnitude 8.0 earthquake. Magnitude 7.6 or 7.8 earthquakes might be more reasonable as design earthquake.

Peak Ground Acceleration. Assuming a distance of 13.5 km from the project site to the Lubang Fault, peak ground accelerations are estimated for different design earthquakes (magnitudes 8.0, 7.8, 7.6, 7.0) and foundation conditions (rock, hard soil, medium soil, soft soil). Ground accelerations from earthquakes that can be generated from Philippine Fault, Manila Trench and the West Valley Fault were also estimated.

Table 2-4. Estimated Ground Acceleration in the Project Site

Earthquake Generator	R	M	PGA	Rock	Hard Soil	Medium Soil	Soft Soil
Lubang Fault	13.5 km	8.0	0.468	0.281	0.407	0.501	0.651
	13.5 km	7.8	0.451	0.271	0.393	0.483	0.627
	13.5 km	7.6	0.432	0.259	0.376	0.463	0.601
	13.5 km	7.0	0.365	0.219	0.317	0.390	0.507
Philippine Fault (infanta Segment)	94km	8.0	0.120	0.72	0.104	0.128	0.167
	94km	7.8	0.106	0.64	0.093	0.114	0.148
	94km	7.6	0.094	0.056	0.082	0.100	0.130
	94km	7.0	0.061	0.037	0.053	0.066	0.085
Manila Trench	113 km	8.0	0.092	0.055	0.080	0.098	0.128
	113 km	7.8	0.081	0.049	0.071	0.087	0.113
	113 km	7.6	0.071	0.043	0.062	0.076	0.099
	113 km	7.0	0.046	0.027	0.040	0.049	0.063
West Valley Fault (southernmost section)	60 km	8.0	0.200	0.120	0.174	0.214	0.278
	60 km	7.8	0.182	0.109	0.158	0.194	0.252
	60km	7.6	0.163	0.098	0.142	0.175	0.227
	60 km	7.0	0.113	0.068	0.098	0.120	0.157

Ground Rupture

Ground rupture is a result of significant movement along faults. It occurs within zones of active fault. Since the project area is far from any potential earthquake source, ground rupturing is not expected to happen.

Liquefaction

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.

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.

The onshore portion of the project area being underlain by reef limestone and agglomerate, liquefaction is not expected to happen.

Though the borehole logs for the offshore area indicate the presence of rocks, in places where Upper sections of the offshore area are underlain very loose to loose silty and/or sandy materials might experience liquefaction during times of strong earthquakes.

Landslide Hazard

Slope failures triggered by past earthquakes in the Philippines consist of several discrete landslides that occurred on moderate to steep slopes, along drainage divides, valley heads, and in road cuts. The occurrence of strong aftershocks and heavy rainfall could increase the number of landslide events.

Due to road cuts and the degree of weathering and the clayey soil content of the reef limestone, the occurrence of landslide due to earthquake and/or heavy rains is likely to happen. Some landslides within the weathered limestone in along the roads in Ilijan were reported after Typhoon Rollie.

The occurrence of landslide within the areas underlain by agglomerate which is generally massive or slightly weathered is least expected.

Ground Settlement / Subsidence

Though soil and clay were noted in the upper section of the subsurface profile at the project area, subsidence or differential settlement within the undisturbed soil is not expected to happen. Residual soils of the limestone and agglomerate are not soft or loose like the clay or silt deposited in marine and fluvial conditions.

Because site grading involves cut and fill of soil materials, there is a possibility of ground piping, ground settlement or differential settlement within the backfilled areas where the fill materials were not compacted according to engineering practice or standards.

Tsunami

A tsunami, also known as a seismic sea wave or as a tidal wave, is a series of waves in a body of water caused by the displacement of a large volume of water, generally in an ocean or a large lake.

Tsunami can be generated when the sea floor abruptly deforms and vertically displaces the overlying water. Tectonic earthquakes are a particular kind of earthquake that are associated with the earth's crustal deformation; when these earthquakes occur beneath the sea, the water above the deformed area is displaced from its equilibrium position. More specifically, a tsunami can be generated when thrust faults associated with convergent or destructive plate boundaries move abruptly, resulting in water displacement, owing to the vertical component of movement involved. Movement on normal faults will also cause displacement of the seabed, but the size of the largest of such events is normally too small to give rise to a significant tsunami.

Tsunami waves do not resemble normal sea waves, because their wavelength is far longer. Rather than appearing as a breaking wave, a tsunami may instead initially resemble a rapidly rising tide, and for this reason they are often referred to as tidal waves. Tsunamis generally consist of a series of waves with periods ranging from minutes to hours, arriving in a so-called "wave train". Wave heights of tens of meters can be generated by large events. Although the impact of tsunamis is limited to coastal areas, their destructive power can be enormous and they can affect entire ocean basins.

Based on PHIVOLCS published map of Tsunami Prone Areas in the Philippines (**Figure 2-22**), the project area in Barangay Ilijan is prone to tsunami related to offshore fault and submarine landslide. Up to this date there is no reported significant impact brought about by tsunami events caused by major earthquakes of offshore sources.

Figure 2-23 presents the Tsunami Hazard Map of Batangas Province published by the Philippine Institute of Volcanology and Seismology.

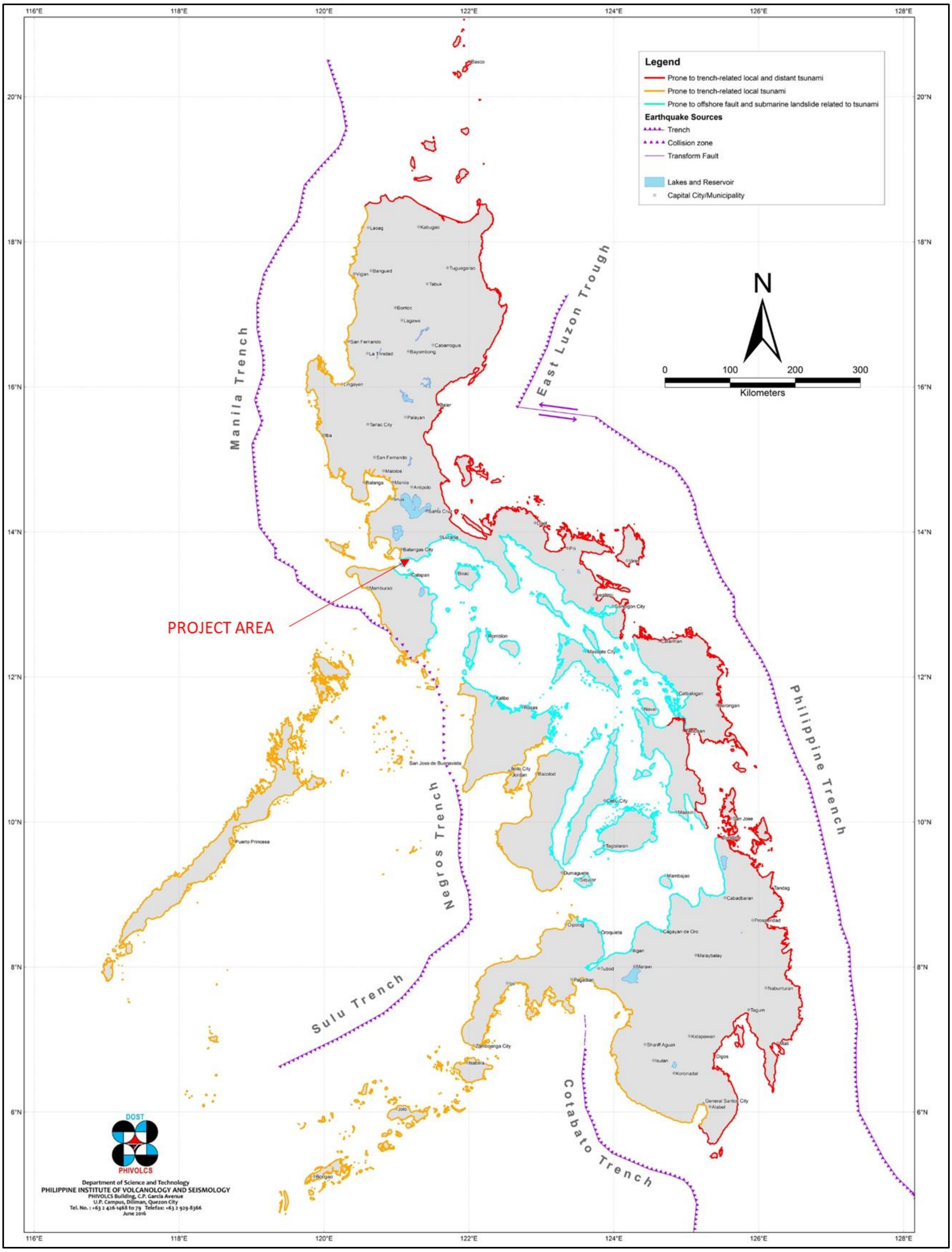


Figure 2-22. Tsunami Prone Areas in the Philippines

Source: PHIVOLCS

Figure 2-23. Tsunami Hazard Map of Batangas Province

2.1.2.11.2 VOLCANIC HAZARDS

Most of the hazards associated with the eruptions of Taal Volcano with the exception of ashfall, are very much localized and are generally confined within the immediate vicinities of these three volcanoes.

A violent eruption of 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 Ilijan based on the review of the extent of impacted areas from the largest eruptions of Taal Volcano. It is thus conceivable that should Taal Volcalo will erupt with the same magnitude in the future, the same level of ashfall impact is expected to likely affect the project area.

Based on the recorded hazards associated with the eruption of Taal Volcano, the project area being 44km away from the said volcano could only experience ashfall.

2.1.2.11.3 HYDROLOGIC AND COASTAL HAZARDS

2.1.2.11.3.1 FLOODING

Flooding is not expected to happen within the upslope area which is of higher elevation, however, the coastal area with elevations of less than 1msal to 2masl which is part of the project area might experience flooding during periods of continuous and/or heavy rains and also during high tides.

The flat area along the coast has be backfilled to prevent flooding.

2.1.2.11.3.2 STORM SURGE

A storm surge is a coastal flood or tsunami-like phenomenon of rising water commonly associated with low pressure weather systems (such as tropical cyclones and strong extra tropical cyclones), the severity of which is affected by the shallowness and orientation of the water body relative to storm path, and the timing of tides. Most casualties during tropical cyclones occur as the result of storm surges.

The two main meteorological factors contributing to a storm surge are a long fetch of winds spiraling inward toward the storm, and a low-pressure-induced dome of water drawn up under and trailing the storm's center.

Based on the Storm Surge Map of the Philippines (**Figure 2-24**) there is a possibility of storm surge within the project area and its vicinities but with not of significant height. The blue color suggests a storm height of 0.8 meter to 1.6 meters. However, the occurrence of higher storm surge height is should not be disregarded.

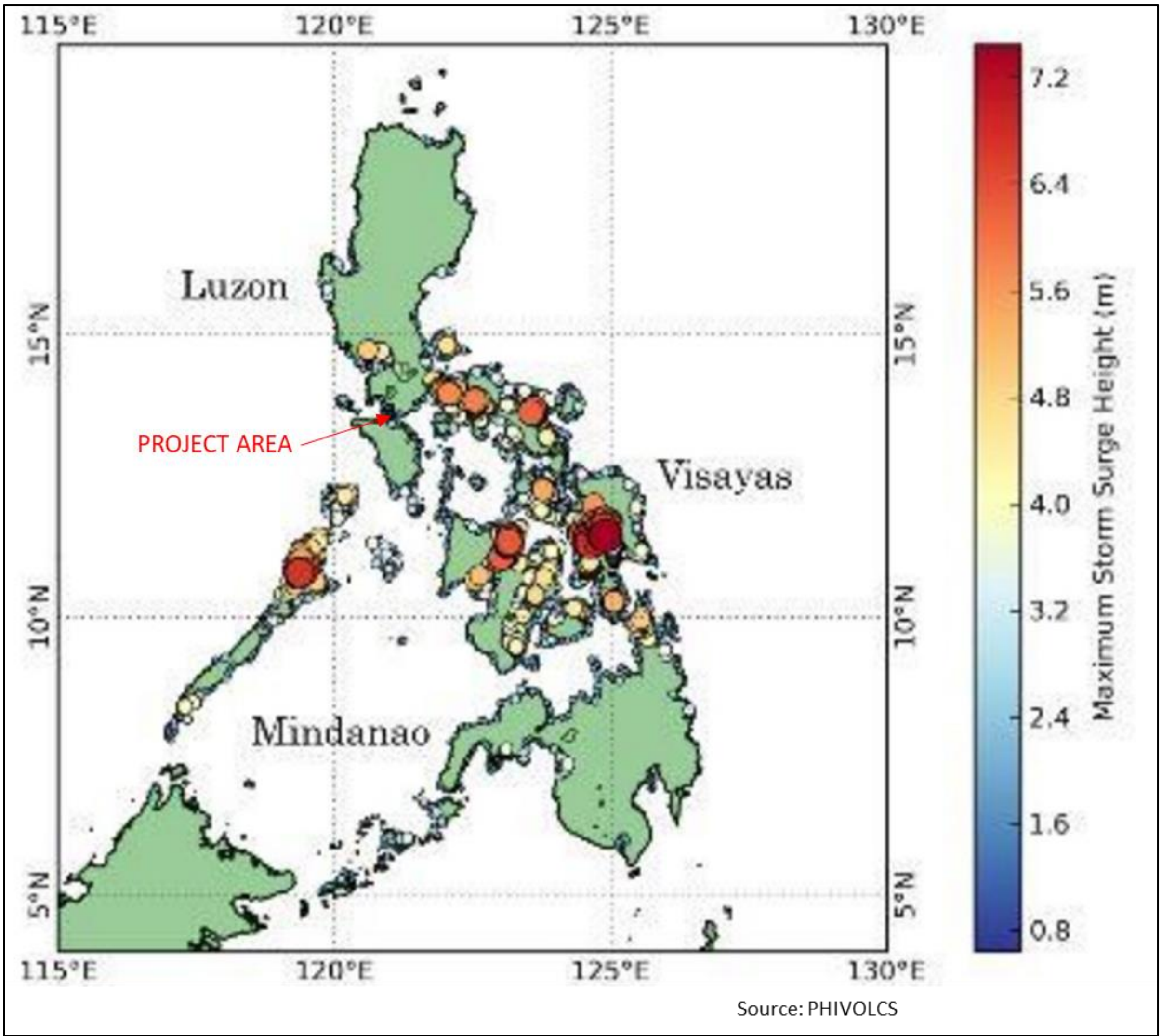


Figure 2-24. Historical Storm Surge Map of the Philippines

2.1.2.12 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES – GEOLOGY

2.1.2.12.1 IMPACTS OF GEOLOGIC HAZARDS AND PLANNED EARTHWORKS ON THE PROJECT FACILITIES

As pointed out in the previous and following discussions no major impacts of geologic hazards is expected on the project area, however, due attention should be given on the piles to be driven at the offshore area. Though the borehole logs at the offshore area did not show undesirable soil/s, some subsurface materials at the offshore area might be soft or loose specially at the upper sections, then driving of concrete files up to refusal level in order to have a good and stable founding level has to be done.

During the site preparation and construction of facilities major impacts will be the dusts, particularly on the onshore area and noise coming the excavation and site grading, file driving and from the heavy equipment working at the area.

Flooding might happen at the coastal area with low elevations, thus backfilling above the recorded and/or computed maximum flood level has to be done.

2.1.2.12.2 CHANGE IN SURFACE LANDFORM/GEOMORPHOLOGY/ TOPOGRAPHY/ TERRAIN/ SLOPE

2.1.2.12.2.1 IMPACT ASSESSMENT

The project area is composed of both onshore and offshore areas. Site grading of the onshore area will involve mostly cutting of slopes and backfilling, thus a change in surface landform/geomorphology/topography/terrain and slope is expected.

2.1.2.12.2.2 MANAGEMENT AND MITIGATION MEASURES

If ever there is a need for some areas to be backfilled, the backfill materials shall be compacted to the required density. If soft soil materials or undesirable clayey deposit will be encountered in areas where heavy structures are to be constructed or where heavy equipment will be installed, the soft or undesirable materials have to be excavated and replaced by engineered backfill.

If some cavities will be encountered within the reef limestone during the site preparation, the cavities have to be filled with suitable materials. If necessary, grouting may be done to improve the soil condition.

2.1.2.12.3 CHANGE IN SUB-SURFACE GEOLOGY/UNDERGROUND CONDITION

There will be no significant disturbance of the subsurface/underground geomorphology of the project area. Although excavations shall cause permanent impact, the level of disturbance is considered to be low.

2.1.2.12.4 INDUCEMENT OF SUBSIDENCE, LIQUEFACTION, LANDSLIDES, MUD/DEBRIS FLOW, ETC.

2.1.2.12.4.1 IMPACT ASSESSMENT

Subsidence may happen if the project area is underlain by soft, clayey soil, loose sandy soil or with cavities and/or sinkholes, in case of limestone deposits. During the site preparation due attention has to be given in locations underlain by the reef limestone. Subsidence is not expected at the locations underlain by agglomerate.

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. Liquefaction is generally accompanied by differential settlement as a result of withdrawal of materials beneath the ground surface. No liquefaction was reported at the area even during the periods when Batangas was affected by strong earthquakes that hit the main island of Luzon and its neighboring islands.

The project area is characterized by relatively flat coastal area to gently and moderately sloping terrain, the possibility of experiencing landslides and/or mud/debris flow is small except for the intensely weathered limestone along the road cuts.

2.1.2.12.4.2 MANAGEMENT AND MITIGATION MEASURES

If undesirable materials will be encountered in areas where heavy structures are to be constructed or where heavy equipment will be installed, the undesirable materials have to be excavated and replaced by engineered fill. If cavities or sinkholes will be encountered, these have to be filled with suitable materials and compacted. If necessary, grouting may be done to improve the soil condition.

The founding level of all structures must be on hard or dense to very dense soil or bedrock of good rock quality designation.

At the offshore area concrete piles have to be driven into the ground down to the depth of refusal in order to have a good and stable founding level.

If ever some unstable slopes in the upslope area will be noted in the future, appropriate measures such as retaining wall, riprapping, benching or installation of wire mesh and shotcreting may be applied.

2.1.3 PEDOLOGY

2.1.3.1 METHODOLOGY

Soil sampling was conducted on 05 November 2020. One (1) was collected representing the soil type in the area. Site description of soil sampling location was described and photographed for documentation. The following are the description of soil sampling location.

Table 2-5. Description of Soil Sampling Stations

Soil Sampling Station	Location	
	Latitude	Longitude
S1	13°37'22.36"N	121° 4'57.63"E

The sampling location was determined and recorded using a handheld Global Positioning System (GPS) receiver. Sampling map is presented in **Figure 2-25**. At the identified location, a composite sample was taken at a depth of 0-30cm using a spade. The composite sample was then placed in a clean resealable plastic container and labeled properly. Samples were brought to the Ostrea Mineral Laboratory and Bureau of Soil and Water Management (BSWM) for laboratory analysis.

Plate 2-1. Soil sample in a labeled resealable plastic container

Figure 2-25. Soil Sampling Map

2.1.3.2 RESULTS

2.1.3.2.1 SOIL TYPE

The project area is underlain mostly by weathered reef limestone and agglomerate. Top soil cover in the reef limestone is generally clayey. Soil from the agglomerate is commonly clay loam with clayey subsoil.

Based on the Socio-economic Profile of Batangas City, there are seven types of soil that composed the land area of the city. These are the Taal Sandy Loam, Hydrosoil, Calumpang Clay Loam, Ibaan Clay Loam, Ibaan Loam, Ibaan Loam (Gravelly Phase) and Sibul. The soil type in Ilijan (**Figure 2-26**) is the Ibaan Loam (Gravelly Phase) which has agricultural potentials for coconut, atis, cacao and coffee.

Soil samplings and chemical analyses of soil samples are deemed unnecessary because the project area and its vicinities are classified as industrial zones. The lands here and nearby areas are not used for agricultural purposes.

Ibaan loam is a residual soil representing the decomposition products of the underlying volcanic tuff material.

2.1.3.2.2 WATER AND WIND ERODIBILITY POTENTIAL

Soil erodibility is affected by the following factors: climate, soil texture, soil structure, land cover, vegetation, and soil moisture.

As the project site is composed of Ibaan loam, such soil is much stickier, better-structured, and hence more resistant from wind and water erosion than sand types. During sampling, it was observed also observed that grasses and shrubs cover the topsoil. Root system of such vegetation helps the soil from minimizing erosion.

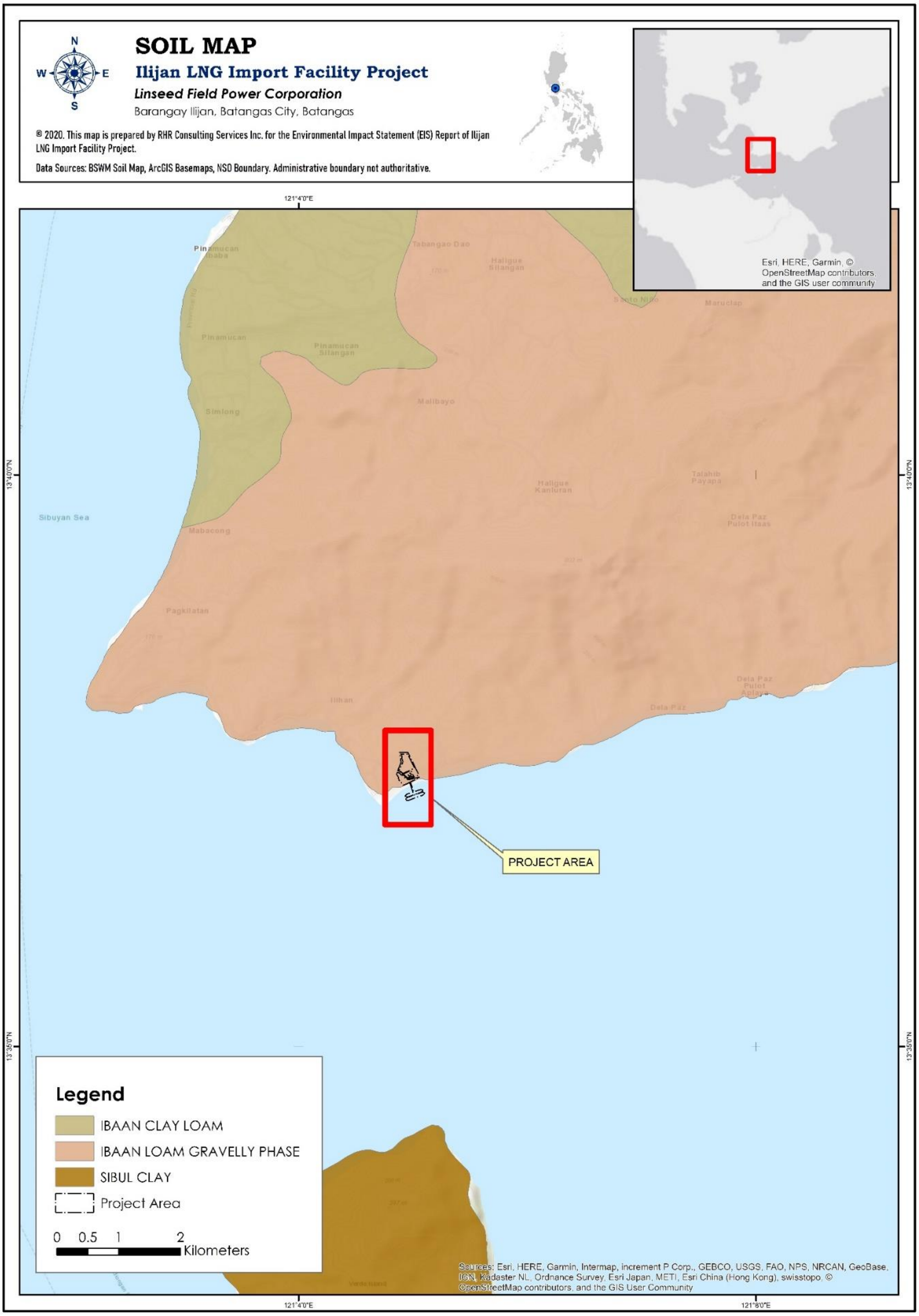


Figure 2-26. Soil Map of the Project Area

2.1.3.2.3 SOIL FERTILITY

For this study, soil sampling was done within the project area to have a baseline data on the soil quality and fertility. Results of soil assessment were shown in **Table 2-6**. Soil sampling map is shown in **Figure 2-25**.

2.1.3.2.3.1 SOIL CHEMICAL PROPERTIES

Table 2-6. Trace metals in Soil

Parameters	Results
Hexavalent Chromium (Cr6+)	<0.10 mg/kg
Arsenic (As)	1.75 mg/kg
Cadmium (Cd)	<0.03 mg/kg
Lead (Pb)	<0.10 mg/kg
Mercury (Hg)	<0.08 mg/kg

2.1.4 TERRESTRIAL ECOLOGY

2.1.4.1 TERRESTRIAL FLORA

2.1.4.1.1 BACKGROUND

The proposed Project is to be located at Barangay Ilijan, Batangas City, Province of Batangas. The city's land use is a major urban commercial and industrial center with marginal forest lands that can be found mostly in the barangays of Talumpok Silangan (where Mt. Banoy is located), Talumpok Kanluran, Talahib Payapa, Sto. Domingo, Cumba and along the boundary line with the municipality of Lobo. The forest resources of Batangas City are not in commercial quantity except for bamboo which are in demand for use in the construction of fish pens. (https://www.batangascity.gov.ph/web/about-the-city/city-profile/physical-geographical-aspects).

The field assessment was conducted to evaluate the vegetation of project site in Brgy. Ilihan, Batangas City. For this study, (1) vegetation analysis of direct and indirect impact areas was employed to conduct inventory of floral species present in the area; (2) assess and evaluate the existing vegetation, specifically, determine the biodiversity of the area through computation of applicable biodiversity indices; (3) review publicly available information about the project (4) use the baseline data and reviewed information gathered to determine the possible impacts the project may induce, (4) propose prevention and mitigation measures.

2.1.4.1.2 METHODOLOGY

2.1.4.1.2.1 SITE DESCRIPTION

The sampling was done on 19-20 September, 2020 on the direct and indirect impact areas of the proposed project. Two transects with at least 3 plots each were established within the Project Area and its vicinity to determine the characteristic of the existing vegetation in consideration of the site's forest cover, land use, and land classification.

As required in Section 1.4 of the approved Technical Scoping Checklist (TSC) for the Project dated 21 October 2020, quadrat sampling was employed for the study. Nestled plots of 10 x 10 m, 3 x 3 m, and 1 x 1 m were laid out according to the vegetation stratification (layers). Distance between sampling plots was approximately 0.5 km depending on the accessibility and terrain of each transect.

There are three layers in a forest or vegetation, namely: Canopy/overstorey, intermediate, and understorey/ undergrowth layers. **Table 2-7** presents the criteria used for plant layer classification. For the canopy layer, a 10 m x 10 m plot was used and trees greater than or equal to 15 cm diameter at breast height (DBH) were measured and recorded. For the intermediate layer, a 5 m × 5 m plot was established randomly inside the canopy plot. Shrubs and saplings were recorded inside the intermediate plot. Lastly, a 1 m × 1 m plot for the understory layer inside the intermediate plot was established randomly to account for the number of species that included wildlings, herbs, vines, grasses, and shrubs.

Table 2-7 Criteria for plant classification

Classification	DBH (cm)	Height (m)
Trees	≥ 15 DBH	≥ 3
Saplings, intermediate species*	< 15 DBH	≥ 1
Saplings, undergrowth species**	< 15 DBH	≤ 1

Note: * Tree species and shrubs
** Wildlings of trees, herbs, shrubs, vines, and grasses

Flora species outside established plots were also documented to characterize the vegetation type of the sampling area but not included in computations of ecological parameters.

Tracks and coordinates of the sampling stations were recorded using a handheld GPS. Geotagging of photos were also taken as a visual reference of the site.

Table 2-8 presents the geographic coordinates of the flora sampling plots for each transect. Meanwhile, the flora sampling map is presented in **Figure 2-27**.

Table 2-8. Flora sampling stations

Transect	Plot	Northing	Easting
1	P1	13°37'26.27"N	121° 4'59.73"E
	P2	13°37'24.18"N	121° 4'57.88"E
	P3	13°37'19.32"N	121° 4'58.58"E
2	P1	13°37'35.71"N	121° 4'55.56"E
	P2	13°37'26.17"N	121° 4'52.13"E
	P3	13°37'16.99"N	121° 4'53.85"E

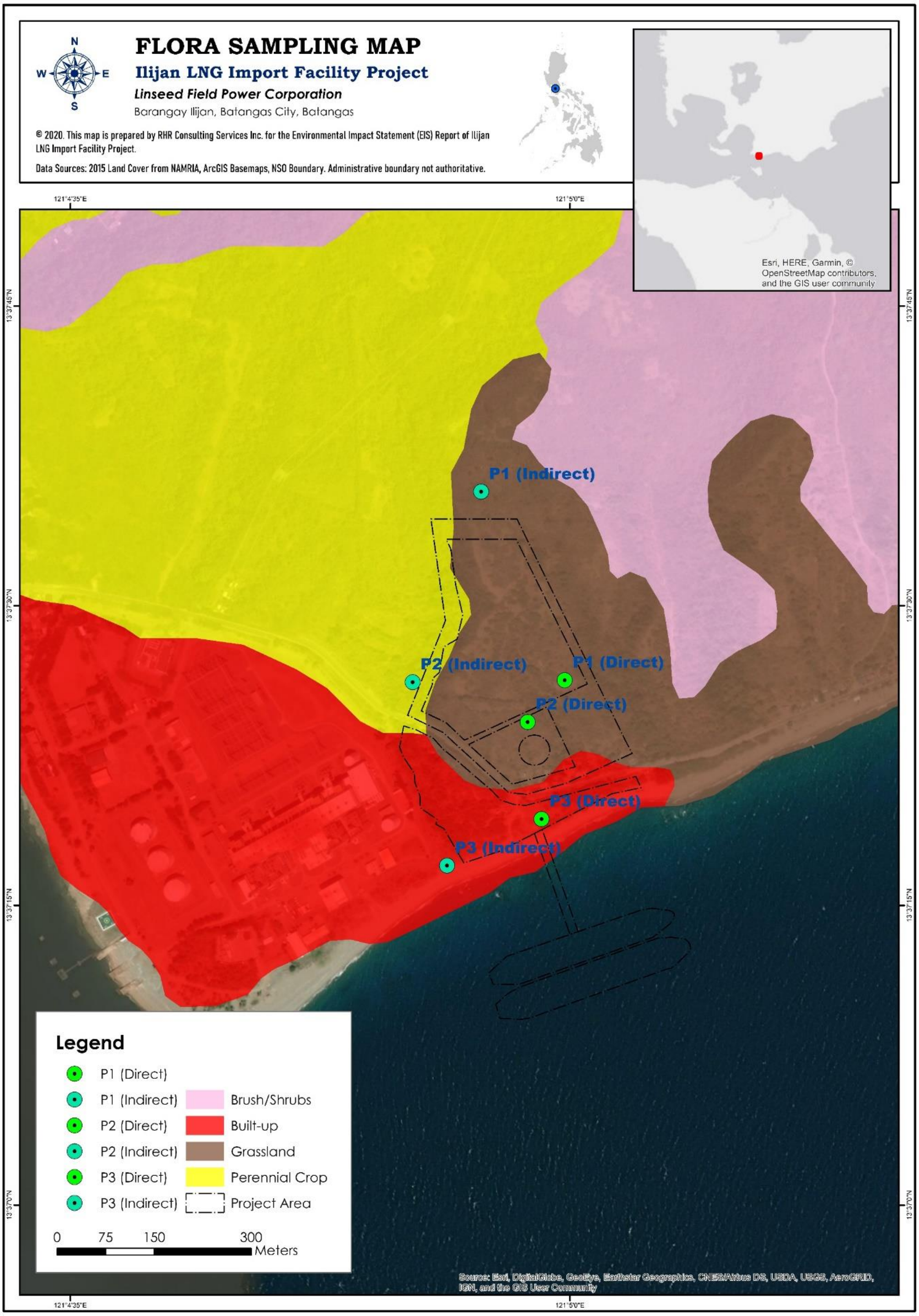


Figure 2-27. Flora Sampling Map

2.1.4.1.2.2 VEGETATION CHARACTERIZATION

A desktop review of publicly available information was conducted to have an overview of the existing vegetation of the Project area. Reviewed data were validated during the field assessment. Using results of baseline data and desktop review, vegetation cover was described and the sites were characterized i.e. secondary forest, grassland, and agro-ecosystem type.

Plants found in each sampling plot were identified and classified either as trees or saplings using the criteria in **Table 2-1**. Species that could not be identified onsite was documented in details. Photos and description of morphological features of the plant was recorded and verified using available published taxonomic literature and the National Herbarium images to identify the species.

2.1.4.1.2.3 CONSERVATION STATUS

After species identification, conservation status of each species was checked using the DENR Department Administrative Order (DAO) 2017-11 list and the latest International Union for Conservation of Nature (IUCN) Red List of Threatened Species (www.iucnredlist.org). Conservation status pertains to the probability of a species to survive in the present and in the future with two major categories: threatened and non-threatened. IUCN defined a threatened species as those that fall under the categories of either Vulnerable, Endangered, or Critically Endangered. Other categories used by the IUCN are Near Threatened, Least Concern, and Data Deficient.

2.1.4.1.2.4 ENDEMISM

Endemism refers to the restriction of a taxon or species to a particular geographical area of the world[4]. A species is classified as endemic if it is unique to a particular geographic location, i.e., province or country. An indigenous species, on the other hand, is found elsewhere. Introduced species or exotic species are plants that are not native in the area but are being planted or cultivated.

The species recorded on the sampling sites were classified into Endemic (En), Indigenous (Ind) and Introduced (Int) based on the books and online sources (IUCN database, 2019).

2.1.4.1.2.5 INVASIVENESS

Invasive species are species which colonize in an area that usually outcompete the natural growing vegetation. Their presence may result in potential damage to the environment, human economy, or human health.

Using the latest Global Invasive Species Database (www.iucngisd.org), species recorded in the project site were classified as Invasive or Non-invasive.

2.1.4.1.2.6 BIODIVERSITY INDICES

The purpose of determining diversity indices is simply to have quantitative comparison between habitats/ecosystems. In this case, species richness and evenness are the common concepts used.

i. **Species richness** (n) is a number of plant species in a given area[5]

   Species richness (n) = $\frac{number\ of\ species}{transect\ line}$

ii. **Shannon diversity index** (H')

   Diversity Index (H') $= -\sum \quad n_i ln\left(\frac{n_i}{N}\right)$

iii. **Evenness** (e') refers to how well-distributed the individuals within a community over different species.

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[4] IUCN Glossary (no date). Retrieved June 25, 2017 from https://www.iucn.org/downloads/en_iucn__glossary_definitions.pdf

[5] Wilsey, B. J. and Potvin, C. (2000). Biodiversity and ecosystem functioning: importance of species evenness in an old field. Ecology, 81: 887–892. doi:10.1890/0012-9658(2000)081[0887:BAEFIO]2.0.CO;2

Evenness (e') = $\frac{H'}{ln ln\,(S)}$

Indices for plant species diversity and evenness were classified using Fernando et al 1998 diversity relative values categories presented in **Table 2-9**.

Table 2-9. Relative values for plant species diversity (Fernando et. al, 1998)

Relative values	Species diversity (H')	Evenness index (e')
Very high	3.500 – 4.000	0.750 - 1.000
High	3.000 – 3.499	0.500 – 0.740
Moderate	2.500 – 2.999	0.250 – 0.490
Low	2.000 – 2.499	0.150 – 0.240
Very low	1.999 and below	0.140 and below

2.1.4.1.2.7 IMPORTANCE VALUE INDEX (IV)

Importance value (IV) index is used to determine the overall importance of each species in the community structure. It reflects the influence a species exerts on the ecosystem. The formulas adapted from Magurran (1988) were used to compute for the following parameters:

iv. **Population Density** is the population count, density per 100 m²

Population Density (De) = $\frac{total\ number\ of\ individuals\ from\ all\ species}{100\ m^2\ or\ hectares}$

Relative Density (RDe) = $\frac{density\ of\ a\ species}{total\ density\ for\ all\ species}$

v. **Frequency** is the number of times the species encountered

Absolute Frequency (Fr) = $\left(\frac{No.of\ species\ occurence\ in\ a\ transect}{no.of\ plots\ in\ each\ transect}\right) x\ 100$

Relative Frequency (RF) = $\frac{Absolute\ frequency\ of\ a\ species}{Total\ frequency\ for\ all\ species}$

vi. **Species Dominance** is the coverage/basal area of a species

Species Dominance (Do) = $0.7854\ (DBH\ in\ cm^2 or\ basal\ area)$

Relative Dominance (RDo) = $\left(\frac{dominance\ of\ a\ species}{dominance\ value\ for\ all\ species}\right) x\ 100$

vii. **Importance Value**

Importance Value IV = RDe + RF + RDo

2.1.4.1.3 RESULTS

2.1.4.1.3.1 VEGETATION SURVEY

The proposed project is located in Barangay Ilijan, Batangas City, Province of Batangas. Based on the land cover map of the city, the project area is composed of perennial crop, grassland, and built-up (**Figure 2-28**). Based on interviewed locals, prior to acquisition of the proponent, the lot is a pasture area of cows and carabaos, hence, the vegetation is mainly composed of forage species such as ipil-ipil (*Leucaena leucocephala (*Lam.) de Wit.) and kakawate (*Gliricidia sepium* (Jacq.) Walp.). During site visit it was observed that the area is mainly brushland with patches of secondary growth in the gully where an intermittent river was observed. Beach forest species were also noted including coconut (*Cocos nucifera* (L.)), aroma (*Acacia farnesiana* (Linn.) Willd.), talisai (*Terminalia catappa* L.) and bagasua (*Ipomoea pes-caprae* (L.) R. Br.). No mangrove species was observed in the area. **Figure 2-28** presents the general vegetation of the project site.

Figure 2-28. General vegetation of the project site

Transect 1 is a direct impact area located from the beach area to steep elevated portion of the project. Brushland is the general land cover of this area. Overstorey species were coconut and Sampaloc (*Tamarindus indica* Linn.). Abundant intermediate and understorey species includes ipil-ipil and kakawate. **Figure 2-29** presents the general vegetation of Transect 1.

Figure 2-29. Transect 1 or the direct impact area

Transect 2 is an indirect impact area surrounding the location of the proposed project. It was established from north side of the project traversing the gully to the beach area. Fruit trees such as manga (*Mangifera indica* L.) and sampaloc were found on the higher elevation while lumber and landscape species such as gmelina (*Gmelina arborea* Roxb.) and fire tree (*Delonix regia* (Bojer.) Raf.) together with secondary growth species, like bangkoro (*Morinda citrifolia* L), binunga (*Macaranga tanarius* (Linn.)), amamali (*Leea indica* (Burm. f.) Merr.) and lanete (*Wrightia pubescens* R. Br. subsp. *laniti* Blanco), were found near the gully. Beach species of talisai, aroma and bagasua were also noted in this transect. **Figure 2-30** presents the general vegetation of Transect 2.

Figure 2-30. Transect 2 or indirect impact area

Floral taxonomy

There were 30 plant species that belonged to 30 genera under 19 families found during field assessment. Most of the species recorded belonged to family FABACEAE with 20 from the total number families recorded (**Figure 2-31**). Fabaceae is also known as legume family which most of the forage species belonged to.

A complete list of species recorded within established transects in the project area is presented in **Appendix A**.

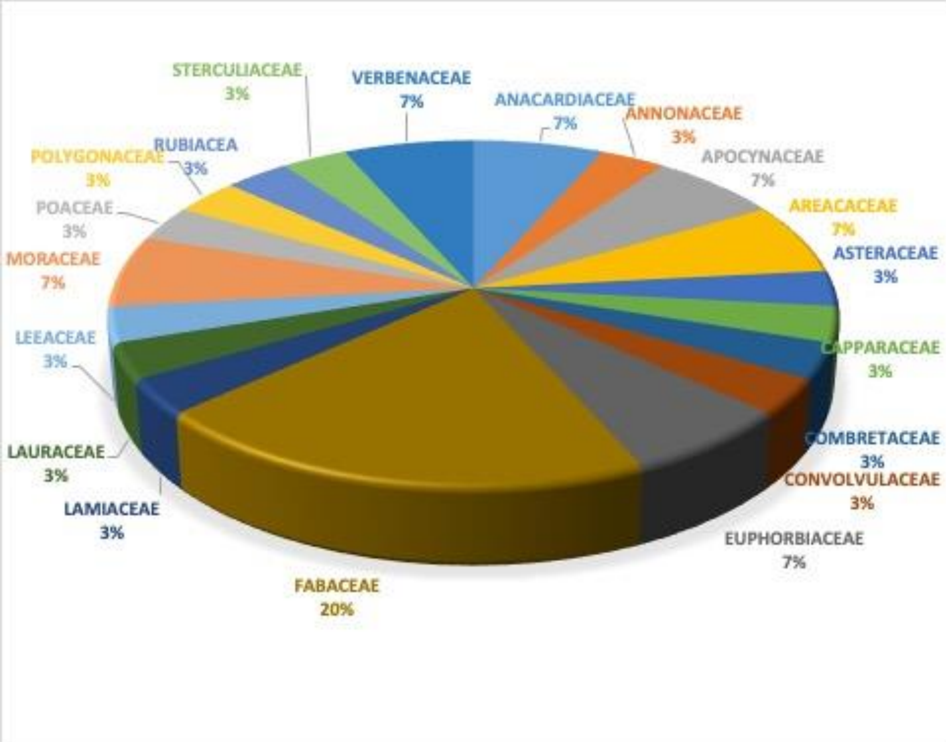


Figure 2-31. Family distribution of flora species recorded

Habit

Among the plant habit groups, trees, with 50% have the largest percentage among the observed species in the sampling sites. However, it should be noted some of the observed trees were still at seedling and sapling stage in undergrowth layer. Another plant group with large number of individuals are shrubs (13%) which is mainly composed of intermediate and groundcover species.

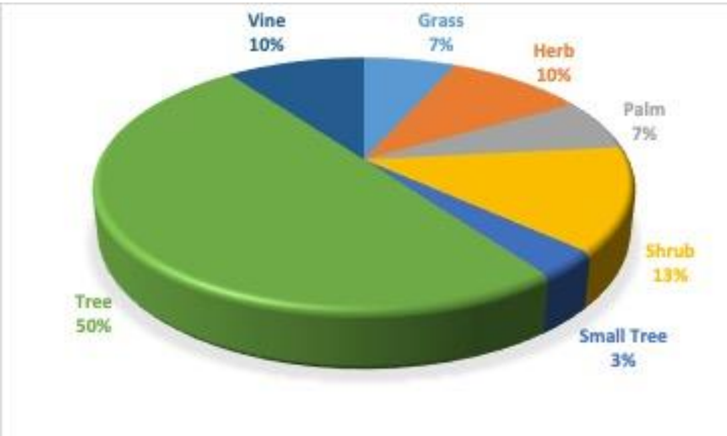


Figure 2-32. Plant habit

2.1.4.1.3.2 EXISTENCE OF IMPORTANT LOCAL SPECIES

Majority or 57% of the plant species observed in the project area were indigenous plants. These indigenous species in the area include Binunga (*Macaranga tanarius* (Linn.)), Talisai (*Terminalia catappa* L.), Pandakaki (*Tabernaemontana pandacaqui* Poir), Lanete (*Wrightia pubescens* R. Br. subsp. *laniti* Blanco), Anubing (*Artocarpus lacucha* Buch.-Ham. ex D.Don), Bayok (*Pterospermum diversifolium* Blume), Balinghasai (*Buchanania arborescens* (Blume) Blume), Alim (*Melanolepis multiglandulosa* (Reinw. ex Blume) Reichb. & Zoll.), Tangisang bayawak (*Ficus variegata* Blume var. *variegata*), Kaong (*Arenga pinnata* Merr.) Amamali (*Leea indica* (Burm. f.)

Merr.), Bangkoro (*Morinda citrifolia* L), Makahiya (*Mimosa pudica* Linn), Halubagat (*Capparis zeylanica* L.), Bagasua (*Ipomoea pes-caprae* (L.) R. Br.), Sablot (*Litsea glutinosa* Lour Rob.).

The remaining 43% observed species were considered as exotics or introduced species. These include forage species of ipil-ipil (*Leucaena leucocephala* (Lam.) de Wit.) and kakawate (*Gliricidia sepium* (Jacq.) Walp.), fruit trees such as sampaloc (*Tamarindus indica* Linn.), atis (*Annona squamosa* L.), and manga (*Mangifera indica* L.) and lumber species including gmelina (*Gmelina arborea* Roxb.). Another group of introduced species in the area were landscape/ garden species and invasive species. Landscape species include fire tree (*Delonix regia* (Bojer.) Raf.) and cadena de amor (*Antigonon leptopus* Hook. & Arn.) while invasive species were coronitas (*Lantana camara*) and hagonoi (*Chromolaena odorata Linn*.).

No endemic species was recorded within the established transect during field assessment.

Conservation status

Among the species recorded within the established transects, no threatened species was observed. However, wildlings and saplings of tindalo (*Afzelia rhomboidea* (Blanco) S. Vidal), a vulnerable species under IUCN red list and classified endangered by DAO2017-11, was noted outside the transects adjacent to the project on the west side (**Figure 2-33**). Presence of wildings suggest that a mother tree of this species might be near within the project area.

Figure 2-33. Wildlings of tindalo (*Afzelia rhomboidea* (Blanco) S.Vidal), located west side outside the project area

Invasive species

Five (5) species found on the project site were classified as invasive by the Global Invasive Species Database (2020) as presented in **Table 2-10**. These invasive species were all present in Transect 1 or in the direct impact area.

Table 2-10. List of invasive species recorded in the project area

Scientific name	Family	Common name
Annona squamosa L.	ANNONACEAE	Atis
Chromolaena odorata (L.) R.M. King & M. Robinson	ASTERACEAE	Gonoi
Leucaena leucocephala (Lam) de Witt	FABACEAE	Ipil-ipil
Mimosa pudica L.	FABACEAE	Makahiya

2.1.4.1.3.3 Ecological parameters and diversity indices

Diversity and indices

Based on Fernando et al (1998) relative measure of diversity scale, the diversity of the Project site ranged from very low to low diverse (H'=0.56 – 2.16) as presented in **Figure 2-34**. This result expected as the area was a pasture land with introduced flora species. Introduction of forage species like ipil -ipil and kakawate which are fast growing and considered invasive by GISD might have contributed to these results.

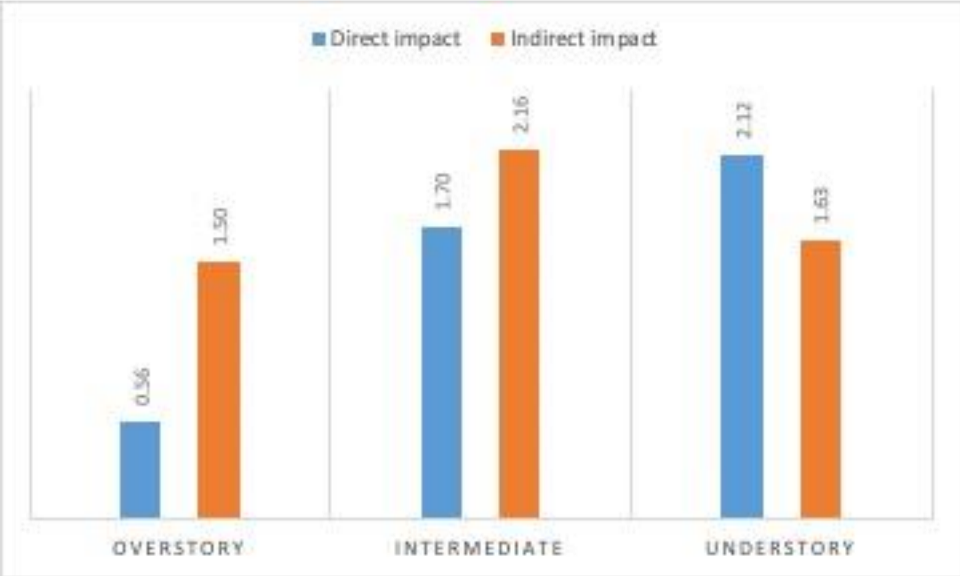


Figure 2-34. Diversity indices (H') of established transects

Species evenness (e') recorded in transects were found to have very high (0.81 to 0.97). Transect 1 overstorey has the lowest evenness with e'=0.81 value. On the other hand, Transect 2 intermediate layer has the highest evenness value with e'=0.94. High values of evenness indicate that the flora species are well distributed in the area.

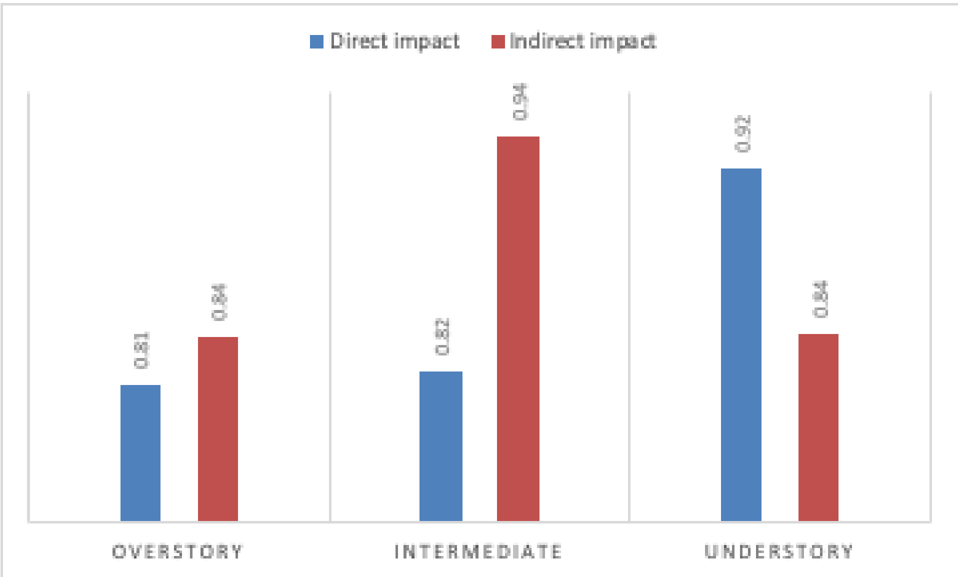


Figure 2-35. Species evenness (e') of established transects

Importance Value (IV)

Importance value (IV) index is used to determine overall importance of each species in the community structure. It reflects the influence a species exerts on the ecosystem. It takes into account the density, frequency, and basal area for the overstorey layer (Curtis, 1959). The intermediate and undergrowth layers species has no basal area data, hence only require density and frequency. List of species with highest recorded IV is presented in **Table 2-11.**

It can be observed majority of dominant species in the project area were exotic species. Most of these species were planted in the area as crops and forage. Sampaloc is a fruit tree species that are common backyard tree while fire tree is a landscape species planted in parks and in this case along the barangay road. Ipil-ipil, as mentioned earlier, is a forage plant and also considered as invasive species. Alim is the only indigenous species in the list of species with IV. This species is common in secondary growth in the country. Cadena de amor is also a landscape/garden species. As suggested by GISD, this is an invasive species, hence, can easily adapt to different environment.

Table 2-11. List of species with highest IV within established transects

Transect	Layer	Scientific name	Common Name	IV
T1	10x10	*Tamarindus indica Linn.*	Sampaloc	157.37
	5x5	*Leucaena leucocephala (Lam.) de Wit.*	Ipil-ipil	61.56
	1x1	*Leucaena leucocephala (Lam.) de Wit.*	Ipil-ipil	36.67
T2	10x10	*Delonix regia (Bojer.) Raf.*	Fire tree	152.83
	5x5	*Melanolepis multiglandulosa (Reinw. ex Blume) Reichb. & Zoll.*	Alim	39.23
	1x1	*Antigonon leptopus Hook. & Arn.*	Cadena de amor	58.04

2.1.4.1.4 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES- FLORA

2.1.4.1.4.1 VEGETATION REMOVAL AND LOSS OF HABITAT

The Project will involve construction of facilities within the area, hence, vegetation removal is inevitable. Most of the plant species that will be affected by the project during construction and operation are exotic species listed in **Table 2-11**. Some of this species were also listed as invasive in GISD.

While removing invasive species can be beneficial as it will reduce their population in the locality, reintroduction of this species should be avoided. Vegetation removal still has to be compensated based on DENR DMO 2012-02 using indigenous species found in the area (discussed in **Section 2.1.4.1.3.2**). Clearing will be confined within the direct Project area only to avoid vegetation damage on adjacent areas. Tree cutting permit from the DENR shall be secured prior to any clearing activities. Cutting clearance from the City Agricultural Office (CAO) of Batangas City and Philippine Coconut Authority (PCA) shall also be secured whenever applicable.

The project will entail removal of vegetation of approximately nine (9) hectares. Based on a study of Lasco & Pulhin (2003) the estimated average Carbon stock of brushland areas in the country is about 29.0t/ha[6]. Using this value, the estimated carbon stock loss due to vegetation removal during project construction and operation will be 261tC[7]. To compensate for the removed vegetation and carbon stock loss, the requirement based on DMO 2012-02 for tree replacement ratio of 1:100 using indigenous tree species, preferably those found in the area, will be complied with. Moreover, replacement seedling can be planted within the designated Enhanced National Greening Program (ENGP) Sites in coordination with the DENR and the concerned LGU office. In addition, coordination with land owners, CAO, and PCA can be initiated by the proponent to compensate for the affected agricultural crops.

2.1.4.1.4.2 THREAT TO EXISTENCE AND/OR LOSS OF IMPORTANT SPECIES

No threatened species were recorded in the established transects either IUCN Red List of or DA 2017-11. Vegetation clearing will be confined within the direct Project area only to avoid vegetation damage on adjacent areas. Securing a tree cutting permit from DENR before any cutting of trees will be implemented if cutting of trees

[6]Lasco, R.D. &Pulhin, F. B. (2003). Philippine forest ecosystems and climate change:carbon stocks, rate of sequestration and thekyoto protocol. *Annals of Tropical Research 25*(2): 37-51 (2003).

[7]29.0tC/hectares x 9hectares = 261tC

cannot be avoided. All conditions of tree cutting permit (e.g. 1:100 replacement ratio) shall be complied. Same species that will be removed or indigenous species that are commonly found in the area can be used as preferred species for replacement. Replacement planting and regular monitoring of planted trees can be conducted to ensure growth and survival.

Five (5) invasive species were recorded within the project site. Possible proliferation of invasive species might occur especially on open areas during abandonment. To mitigate this impact, immediate revegetation with preference to indigenous plant species within the cleared and opened areas should be conducted. Moreover, a list of invasive species can be prepared during revegetation to avoid its deliberate re-introduction in the area. Monitoring and maintenance of revegetated areas will also be done to ensure the growth and survival of planted species.

2.1.4.1.4.3 THREAT TO ABUNDANCE, FREQUENCY AND DISTRIBUTION OF SPECIES

Most of the species with highest IV in three vegetation layers are either introduced and/or invasive species. Construction activities will entail removal of individuals of these species. However, extinction of these species due to the Project is unlikely as these species are cultivated, planted and are already widely distributed throughout the country. Loss of invasive species in the area is also favorable for indigenous species growth.

To mitigate this impact, off-set planting with preference to indigenous species shall be done by the proponent in compliance to DENR and PCA requirements. The Proponent can create and implement no poaching of wild plants policy among Proponent's workers as mitigation measure. The proponent's environment unit will monitor worker's compliance with this policy. Conservation, education and public awareness (CEPA) programs regarding local biodiversity in communities can also be implemented to educate the local people on the importance of these species as part of the Proponent's IEC program.

2.1.4.2 TERRESTRIAL FAUNA

2.1.4.2.1 BACKGROUND

Terrestrial fauna assessment was conducted on 19 to 20 September 2020, within and nearby the location of the proposed Ilijan LNG Import Facility Project in Barangay Ilijan, Batangas City, Batangas. It aims to characterize the baseline information on terrestrial faunas present on site and adjacent areas which could be affected by the proposed development. Specifically, the assessment was conducted to:

1. Review available secondary information in relation to the project, habitat and fauna species records within the area;
2. Identify the terrestrial fauna species present within the direct and indirect impact areas of the proposed project;
3. Calculate for the biodiversity indices (i.e. diversity, evenness and dominance) for each major fauna groups
4. Evaluate the baseline information gathered to aid in determining the potential impacts of the project on fauna assemblages on site; and
5. Identify corresponding mitigation measures to address each potential impact identified.

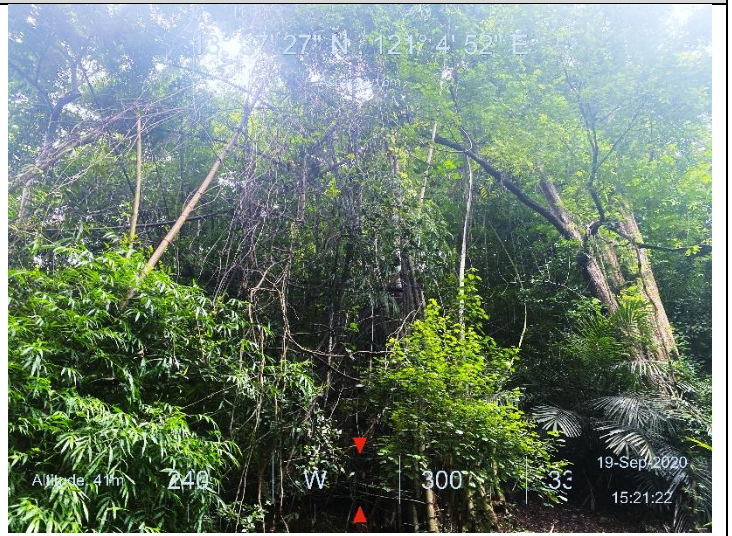
2.1.4.2.2 METHODOLOGY

2.1.4.2.2.1 SITE DESCRIPTION AND SAMPLING STATIONS

The proposed project is located in Barangay Ilijan, Batangas City, which is generally characterized by perennial crops, grassland and built up areas based on the land cover map of Batangas City. Interview with the locals indicated that the areas was previously a grazing/pastureland for livestock such as cows and carabaos. This is still evident in the area with the vegetation predominated by forage species such as ipil-ipil (*L. luecocephala*) and kakawate (*G. sepium*). During the fauna assessment, the project site is generally a brushland with secondary growth forest along the gully and steep areas. Beach/coastal vegetation was also present within the project site; however, no mangrove area or species was recorded.

Three transects were established and distributed to cover all the vegetation types present within the area and survey the fauna assemblage present within the direct and indirect areas of the proposed project (**Table 2-12** and **Figure 2-36**).

Table 2-12. Terrestrial faunas sampling stations

Transect	Start point	Midpoint	Endpoint	Description	Photo/s
1	13.624646° N 121.079292° E	13.626418° N 121.080672° E	13.623480° N 121.081006° E	Approximately 0.60 km of direct and indirect impact area characterized by brushlands and secondary growth along the gully/steep areas	
2	13.622624° N 121.082297° E	13.625856° N 121.082669° E	13.622773° N 121.084239° E	Approximately 0.75 km of direct impact areas characterized by brushlands.	

Transect	Start point	Midpoint	Endpoint	Description	Photo/s
3	13.623073° N 121.080790° E	13.621322° N 121.081654° E	13.622550° N 121.084308° E	Approximately 0.55km of direct and indirect impact areas characterized by beach vegetation	

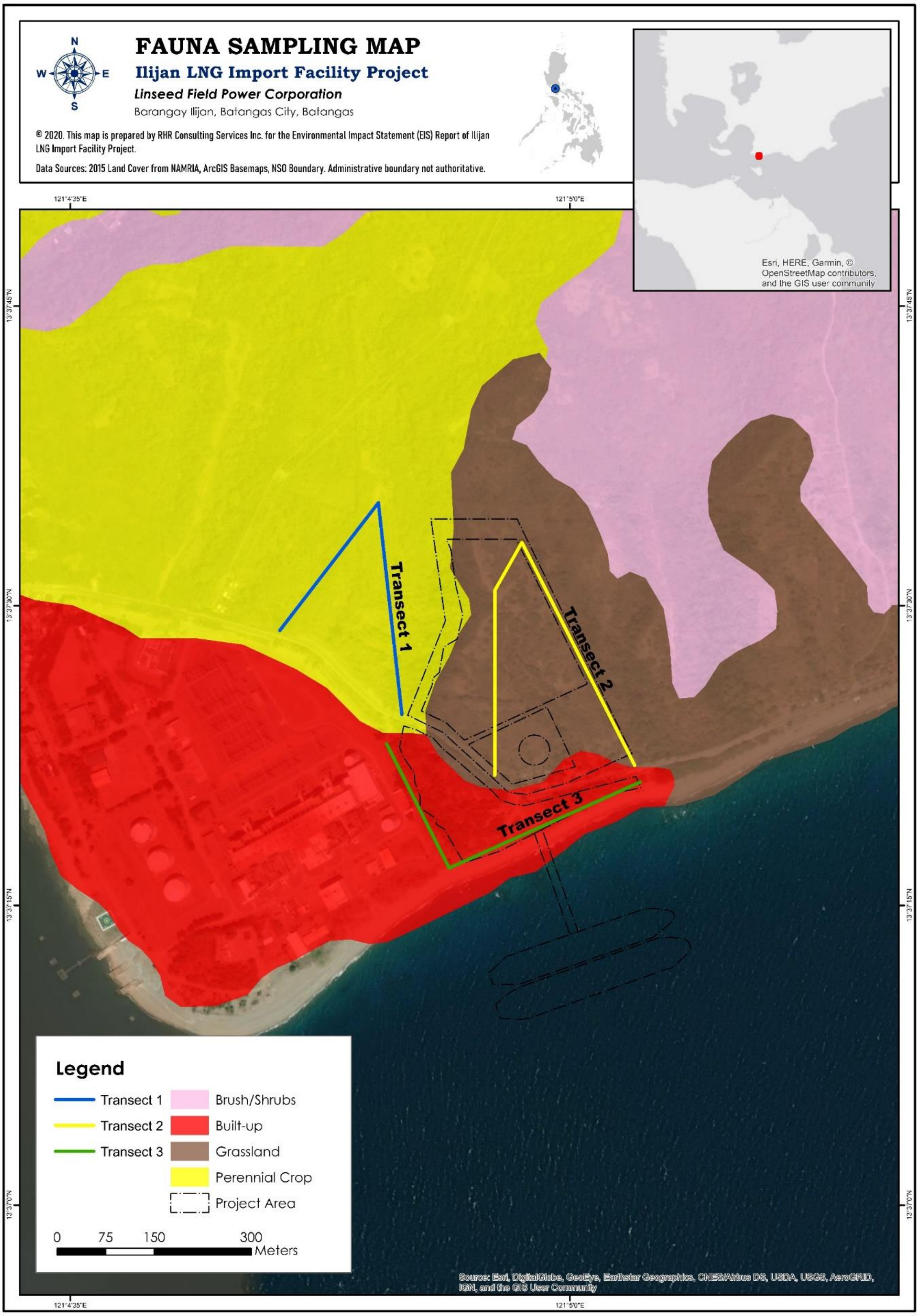


Figure 2-36. Terrestrial fauna sampling stations

2.1.4.2.2.2 REVIEW OF SECONDARY INFORMATION

A desktop review of publicly available information on terrestrial fauna species recorded and likely present in the area was conducted to have an overview of the fauna assemblage within and adjacent the project site. These gather information were then validated during the actual survey.

2.1.4.2.2.3 METHODS

2.1.4.2.2.3.1 TRANSECT SURVEY

Three transects were surveyed, with lengths ranging from .55 to 0.75km and covering brushland, secondary growth and beach vegetation present within and nearby the project site. Transect were established along trail, access roads and accessible paths such as rivers along the direct and indirect impact areas. Then, each of the transects were traversed at a pace of 250m in every 25 minutes from 6am to 9am and 3pm to 5pm. All fauna species observed (seen and/or heard) while traversing the transects were listed, identified to lowest possible taxa, and counted.

2.1.4.2.2.3.2 NETTING AND TRAPPING

Mist nets were installed along the gully where fauna particularly birds and bats are likely to congregate and pass through and forage. Usually netting is employed to survey cryptic, crepuscular or nocturnal species. During the day, the nets are checked regularly every hour to retrieve captured individuals. Also, nets were left overnight to capture crepuscular and nocturnal terrestrial faunas and checked early morning for captured individuals.

Traps were also employed to survey small nonvolant mammals (i.e. rodents, mice, shrew, etc) present in the area. These are baited with either roasted coconut or dried fish and installed in strategic areas such as burrows, feeding areas and pathways of small nonvolant mammals. Left overnight, traps are checked the early morning for captured individuals.

All captured individuals are identified to the lowest possible taxa, counted and listed prior to release.

2.1.4.2.2.3.3 NIGHT SAMPLING

The cruise method was used to survey nocturnal faunas particularly most amphibian and reptile species. Select habitats and areas such as the dry river along the gully were traversed from 6pm to 7pm. While traversing, potential microhabitats such as fallen logs, rocks, tree holes, litter, etc. were searched for terrestrial faunas. All species observed (seen, heard, captured, spotted) were identifed to lowest possible taxa, counted, listed and released.

2.1.4.2.2.3.4 INTERVIEWS

Interview with locals residing near the area was also conducted to supplement the fauna species recorded during the survey and to record any use of fauna species by the locals.

2.1.4.2.2.3.5 CONSERVATION STATUS

Conservation status of each of the species recorded during the survey were determined using the following references:

1. DENR Administrative Order 2019-09 also known as the Updated National List of Threatened Philippine Fauna and their Categories
2. IUCN Red List of Threatened Species (2020)
3. CITES Appendices (2020)

2.1.4.2.2.4 DATA ANALYSIS

Diversity indices of each of the major fauna groups were calculated using the following formula:

Shannon Diversity Index (H’) $= -\sum_{i=1}^{s} p_i \, ln p_i$

Evenness Index (e’) = $\frac{H'}{ln\,(S)}$

Simpson / Dominance Index (D) = $\sum_{i=1}^{s} p_i{}^2$

Indices for plant species diversity and evenness were classified using Fernando et al 1998 diversity relative values categories presented in **Table 2-13**.

Table 2-13. Relative values for species diversity (Fernando et. al, 1998)

Relative values	Species diversity (H')	Evenness index (e') / Dominance (D)
Very high	3.500 – 4.000	0.750 - 1.000
High	3.000 – 3.499	0.500 – 0.740
Moderate	2.500 – 2.999	0.250 – 0.490
Low	2.000 – 2.499	0.150 – 0.240
Very low	1.999 and below	0.140 and below

2.1.4.2.3 RESULTS

2.1.4.2.3.1 EXISTING TERRESTRIAL FAUNAS

A total of 41 terrestrial fauna was recorded during the field survey conducted within the direct and indirect impact areas of the proposed project (**Appendix A**). Of the 41 species are 33 bird species, three (3) mammal species and five herpetofauna (amphibians and reptiles) species (**Figure 2-37**). The high species richness of birds recorded is expected since they are the most conspicuous and represented vertebrate fauna group in the Philippines. On the other hand, mammals and herpetofauna have lesser species richness recorded given their sensitivity to habitat conditions and usually are cryptic.

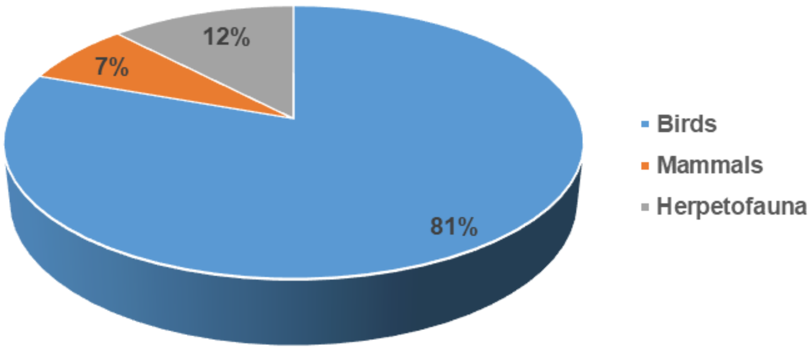


Figure 2-37. Composition of terrestrial faunas recorded during the field survey

In terms of distribution range, majority of the species recorded are residents/natives[8] (29 species), followed by endemics[9] (7 species), migrants[10] (3 species) and the least by introduced[11] (2 species). Resident/native species are expected to dominate the species list because they are adapted to the habitat and climatic conditions of the Philippines including the area of Ilijan and the wider Batangas City. Endemic species are also adapted to the natural Philippine setting; however, they have more specific habitat requirements and are more sensitive to disturbances. On the other hand, the observation of migrant species indicates the onset of the in-migration season of wintering birds from northern countries while introduced species indicate presence of anthropogenic disturbance in the area. in addition, the abundance of resident /native species reflects the disturbed habitat conditions of the project site given the presence of industrial developments (i.e. Iljjan Gas Plant) and residential areas.

[8] species with natural distribution in the Philippines and other countries
[9] species with limited distribution only to the Philippines
[10] species that use the Philippine as wintering grounds and/or species that travel from and to other countries during certain times of the year
[11] species inadvertently brought to the Philippines

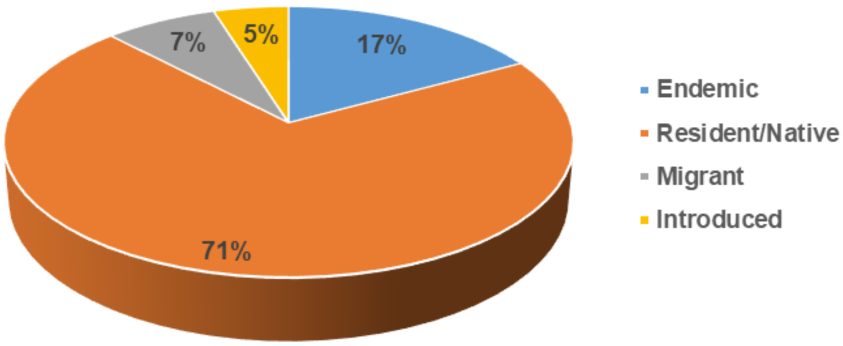


Figure 2-38. Distribution range of terrestrial faunas recorded during the field survey

The most abundant species recorded were birds namely the yellow-vented bulbul (*Pycnonotus goiavier*) with 66 individuals followed by the Asian palm swiftlet (*Cypsiurus balasiensis*) with 48 individuals and pygmy swiftlet (*Collocalia troglodytes*) with 30 individuals. These are common species that are adapted to disturbed habitats including the brushland and beach vegetation present within and nearby the project site.

Plate 2-2. Some of the fauna species recorded during the field survey. A – giant marine toad, B-white-browed shama, C-short-nosed fruit bat, D-musky fruit bat, E-common rousette

2.1.4.2.3.2 IMPORTANT LOCAL SPECIES

There are nine (9) endemic and/or threatened species recorded during the field survey (**Table 2-14**). These important local species are less likely to be significantly affected by the project given the species are very mobile and capable of dispersing to nearby similar and suitable habitats during construction, small project footprint of nine (9) hectares, and availability of the gully with second growth that can serve as refuge and corridor for fauna movement from shore to higher elevations in the area. In addition, these species have certain degree of tolerance to anthropogenic disturbances based on their ability to occupy a wide range of habitats from pristine (i.e. forests) to disturbed areas (i.e. agroforestry, agricultural, plantations, residential, brushland). Also, these species are known to occur in Luzon and some throughout the Philippines which means that loss of species is very unlikely.

Table 2-14. Important local species recorded during the field survey

No.	Scientific Name	Common Name	Distribution / Conservation Status
1	*Centropus viridis*	Philippine coucal	endemic
2	*Collocalia marginata*	grey-rumped swiftlet	endemic
3	*Collocalia troglodytes*	pygmy swiftlet	endemic
4	*Kittacincla luzoniensis*	white-browed shama	endemic; vulnerable
5	*Rhipidura nigritorquis*	pied fantail	endemic
6	*Ptenochirus jagori*	musky fruit bat	endemic
7	*Gekko gecko*	tokay gecko	native; endangered
8	*Malayopython reticulatus*	reticulated python	native; endangered
9	*Varanus marmoratus*	monitor lizard	endemic; endangered

2.1.4.2.3.3 DIVERSITY INDICES

Diversity indices of birds recorded across the transects ranged from 2.52 to 2.96 which can be categorised as moderately diverse based on the categories set by Fernando et.al (1998), see **Figure 2-39**. This reflects the disturbed habitat conditions present within and adjacent the project site which is characterised by brushlands, beach vegetation, and built up areas (residential and industrial area). In addition,certain species have higher abundances recorded during the survey which have infleunce on the diversity index.

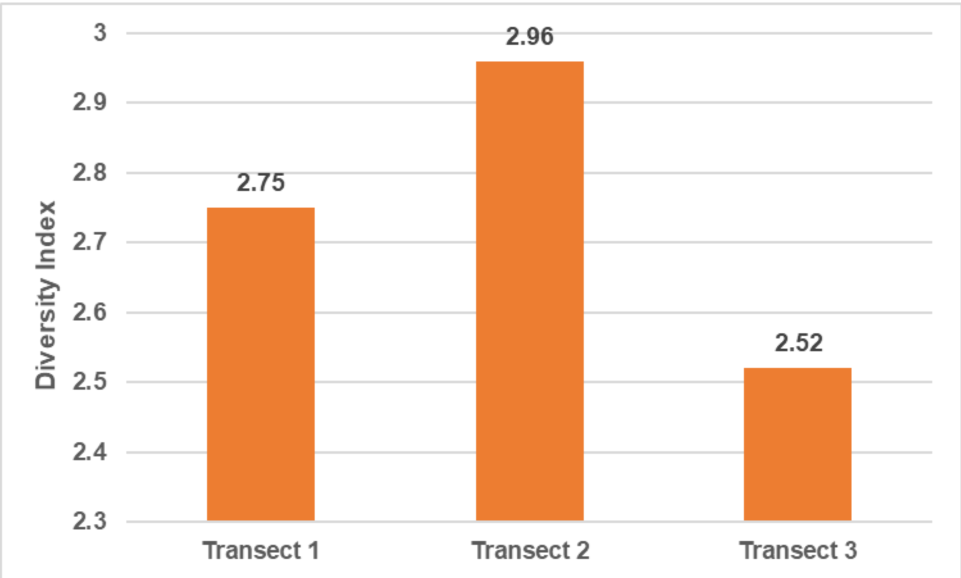


Figure 2-39. Diversity index of birds recorded across the transects

In terms of evenness, computed index values ranged from 0.83 to 0.95 which is categorized as very high while dominance index ranged from 0.07 to 0.11 which is considered to be very low (**Figure 2-40**). The evenness and dominance index values indicate that there are no or very few bird species recorded that significantly outnumbers other bird species.

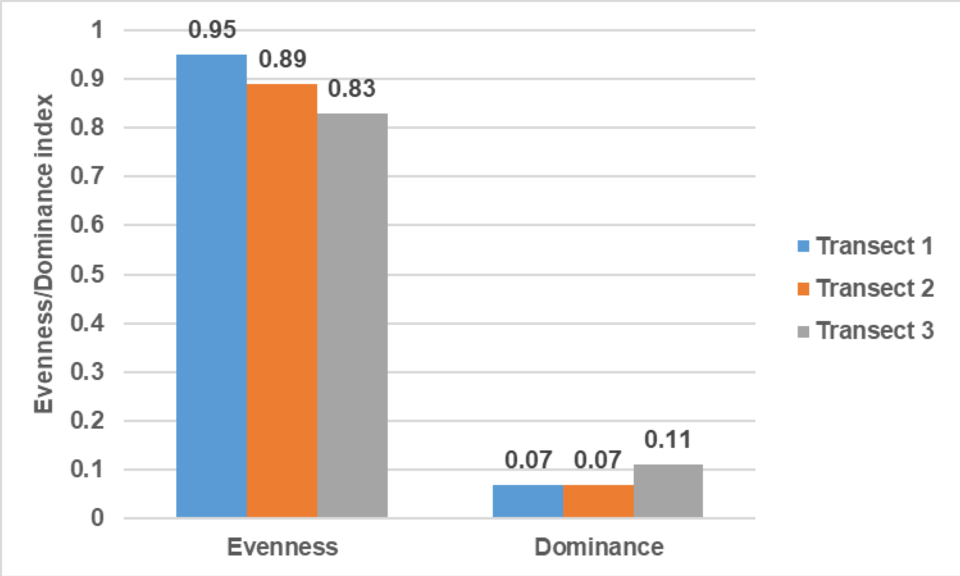


Figure 2-40. Evenness and dominance index of birds recorded across the transects

For the mammals and herpetofauna, the low species richness outrightly indicates that there is low diversity in the area due to disturbed habitats and limited freshwater bodies (i.e. only an intermittent river) and microhabitats that can support these species' existence.

2.1.4.2.3.4 HISTORICAL OCCURRENCE OF FOREST FIRE/S AND/OR PEST INFESTATION

There are no known major historical incidence of forest fire and/or pest infestation in the area.

2.1.4.2.4 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES – TERRESTRIAL FAUNA

2.1.4.2.4.1 LOSS OF HABITAT

Site clearing is necessary to give way for the proposed project and will result in the loss of habitat of the fauna species recorded on site. To mitigate this impact, the project boundary and extent of clearing will be delineated prior to any clearing activities. This will avoid and minimize unnecessary clearing from proposed locations of the project components and ancillary facilities. In addition, tree cutting permit will be secured and trees cut will be replaced in accordance with DENR Memorandum Order 2012-02 or also known as the Uniform Tree Replacement Ratio for Cut Trees. The said memorandum requires replacement of naturally grown trees with 1:100 while 1:50 for planted trees. It is highly recommended that the replacement seedlings are indigenous species thriving in the area and planted within available and applicable areas on the project site and adjacent areas to enhance existing vegetation. Otherwise, replacement seedlings can be planted within designated sites of the Enhanced National Greening Program (ENGP) in coordination with the DENR and the concerned LGU.

2.1.4.2.4.2 THREAT TO EXISTENCE AND/OR LOSS OF IMPORTANT LOCAL SPECIES

Local extinction of important species is unlikely given that the nine endemic and/or threatened species are widely distributed in Luzon and some throughout the Philippines, are highly mobile and very capable of dispersing and taking refuge in adjacent habitats. In addition, the vast surrounding areas where they will take refuge is similar with the existing habitat conditions present within the project site. To minimize the impact of the project to important local species, the following are recommended:

1. Avoid or minimize unnecessary clearing
2. Implement enrichment planting of the adjacent areas to enhance existing habitat conditions and assist in natural regeneration in the area.
3. Implement a no hunting/poaching policy at least within the project boundaries and for all project personnel throughout the project life.

4. Conduct Communication, Education and Public Awareness (CEPA) programs in relation to biodiversity protection and conservation in coordination with DENR and LGUs.

2.1.4.2.4.3 THREAT TO ABUNDANCE, FREQUENCY, AND DISTRIBUTION OF IMPORTANT SPECIES

Other than site clearing activities, pollution effects (i.e. noise, vibration, light pollution, traffic) on site will drive away the terrestrial vertebrate fauna species recorded on site especially during construction. This will result in reduced abundance, frequency and distribution of at least the recorded terrestrial vertebrate fauna species within and adjacent the project site. The following mitigation measures are recommended:

1. Establish, maintain and enhance existing vegetation within the project site that will not be affected by the construction. This will serve as the buffer for noise, vibration and light pollution.
2. Vehicles and heavy equipment should be regularly checked and maintained to reduce unwanted noise and vibration during operation.
3. Temporary walls/barriers and/or mufflers should be used to deal with loud noise exceeding the ambient noise levels.
4. At night, the temporary walls/barriers and use of luminaires that directs light to designated working areas will be used to minimize or control light pollution to nearby areas.
5. Speed limits will be implemented within and outside the project site in accordance to local regulations (60 kph along highways) and construction best practices (20-30 kph within construction site).Vehicles and heavy equipment will also be prohibited to travel in non-designated driving areas to minimize roadkill.

2.1.4.2.4.4 HINDRANCE TO WILDLIFE ACCESS / HABITAT FRAGMENTATION

The proposed project will cause discontinuity or fragmentation of the habitat from the shore to the ridges and from the east to west of the project. Birds will not be affected significantly but other species of mammals and herpetofauna such as monitor lizards may be affected. To mitigate this impact, fauna species will be allowed to pass through the facility unharmed and all personnel will be prohibited from any form of hunting/poaching. The presence of the deep gully/intermittent river that crosses the bridge close to the project site can serve as movement corridor connecting the shore to higher elevation habitats. This area should not be affected significantly as this will address the discontinuity caused by the project development. To further enhance the existing condition of this area, enrichment planting within the riparian areas and tree planting along the project boundaries parallel the gully is recommended.

2.2 WATER

2.2.1 HYDROGEOLOGY

2.2.1.1 DRAINAGE MORPHOLOGY / FLOODING

Only the intermittent creeks on the western and eastern sides are the natural drainage system within the project area as presented in **Figure 2-41**. These creeks were dry during the time of field investigation.

Flooding is not expected to happen within the upslope area which is of higher elevation, however, the coastal area with elevations of less than 1msal to 2masl which is part of the project area might experience flooding during periods of continuous and/or heavy rains and also during high tides.

2.2.1.2 STREAM AND LAKE WATER DEPTH

Only the intermittent creeks on the western and eastern sides are the natural drainage system within the project area as presented in **Figure 2-41**. These creeks were dry during the time of field investigation.

2.2.1.3 WATER RESOURCES

Over 90 percent of economically and/or easily pumped groundwater is stored and moves through the Quaternary pyroclastic and clastic deposits (Qtt). The basement metavolcanics and metasediments, Early Miocene clastics, Middle Miocene andesite and basalt flows, diorite, quartz diorite, Late Miocene to Pliocene lava, agglomerate and ash flows, Quaternary lava, tight agglomerate and ash flows are not considered as sources of pumpable groundwater and/or spring water except in some locally favorable sites.

The project area is underlain mostly by the Lobo Andesite, Reef Limestone and partly by Alluvium. Limited groundwater may occur within the weathered and/or fractured agglomerate. Localized shallow groundwater within the reef limestone in the project area occur within cavities and/or weathered/fractured limestone. This is evidenced by the 5.5 meters deep hand pump well within the property of Mr. Epifanio Maranan that was noted during the field investigation.

The limited deposits of alluvium along the coast of the project area are not expected to yield significant quantity of fresh groundwater. Shallow wells for domestic purposes that will be drilled here may yield brackish or salty groundwater.

Rainfall is the only source of recharge as there are no perennial rivers and/or creeks within the watershed of the project area.

No water samplings and physical and chemical analyses are recommended as there is limited groundwater in the project area. Most of the industries and residents are getting water from private supplier/s.

2.2.1.4 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES

2.2.1.4.1 DEPLETION OF WATER RESOURCES / COMPETITION IN WATER USE

The project is not expected induce depletion of water sources or significant competition in water use in the barangay. It will utilize water from the local water district and supplemented with seawater from desalination plant for domestic and firefighting purposes. Water saving measures will also be implemented by the proponent during construction and operation stages of the project.

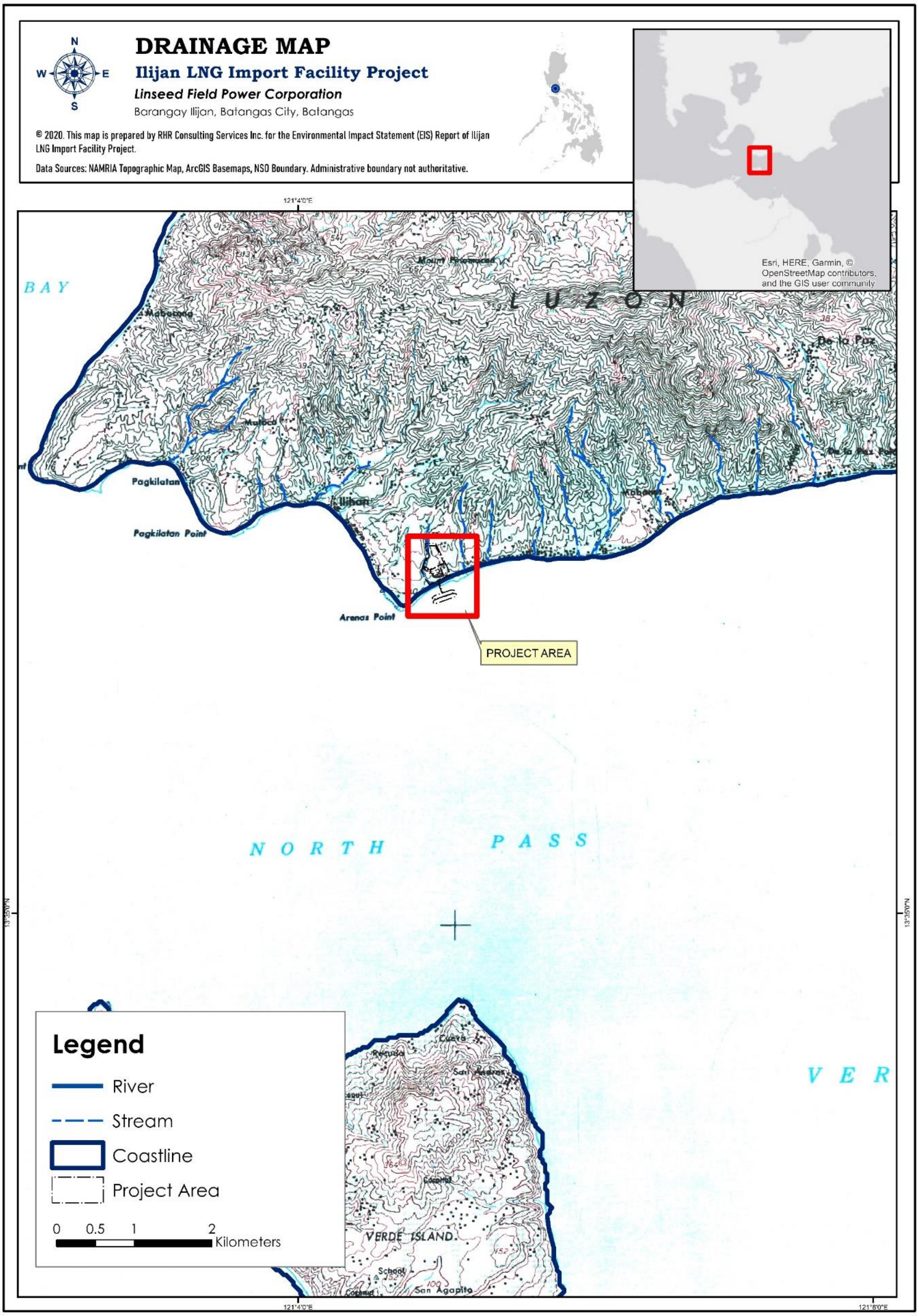


Figure 2-41. Drainage Map of the Project Area

2.2.2 OCEANOGRAPHY

2.2.2.1 BASELINE ENVIRONMENTAL CONDITION

2.2.2.1.1 BATHYMETRY

Figure 2-42 shows the sources of bathymetric data used in the hydrodynamic mode ling. Bathymetric data for the larger part of the modelling domain were based from the bathymetric map of the NAMRIA (Map 1564 – Verde Island Passage). The inset in **Figure 2-42** shows the generated depth contours based on bathymetric survey by AG&P's surveyors at the project site and vicinity.

The above-mentioned bathymetric data (NAMRIA and site survey) formed the bathymetric data for the hydrodynamic modelling, which encompassed the northern part of Mindoro, Verde Island, Maricaban Island, and Batangas Bay. Relatively larger modelling domain or calculation area was considered to ensure that hydrodynamic forces which may influence the project site (tides, currents) are included in the modelling process.

Bathymetric data were processed using Surfer™- a two-and three-dimensional mapping, modelling, and analysis software. Depth contours shown in the insets in **Figure 2-42** and **Figure 2-44** (bottom right) were generated or processed using Surfer™.

Depth profiling using a Garmin Echosounder was also performed during survey on November 20, 2020 (**Figure 2-43**). The depth profiling aimed to determine the bottom elevations during currents and bottom sediment sampling.

Figure 2-44 shows the consolidated bathymetric contours/data based two (2) sources, namely: AG&P's survey and the NAMRIA. Depths of about 557 m below mean lower low water (MLLW) are found along the eastern boundary of the modelling domain (or calculation grid). At the project site, depth of 50 m can be found about 200 m (0.2 km) south-southeast from the shoreline. The 100-m depth contour is located about 360 to 500 m from the shoreline.

In general, bottom elevations in the coastal waters of the project are relatively deep with steep downslopes along the south-southwest portion of the outfall/intake location.

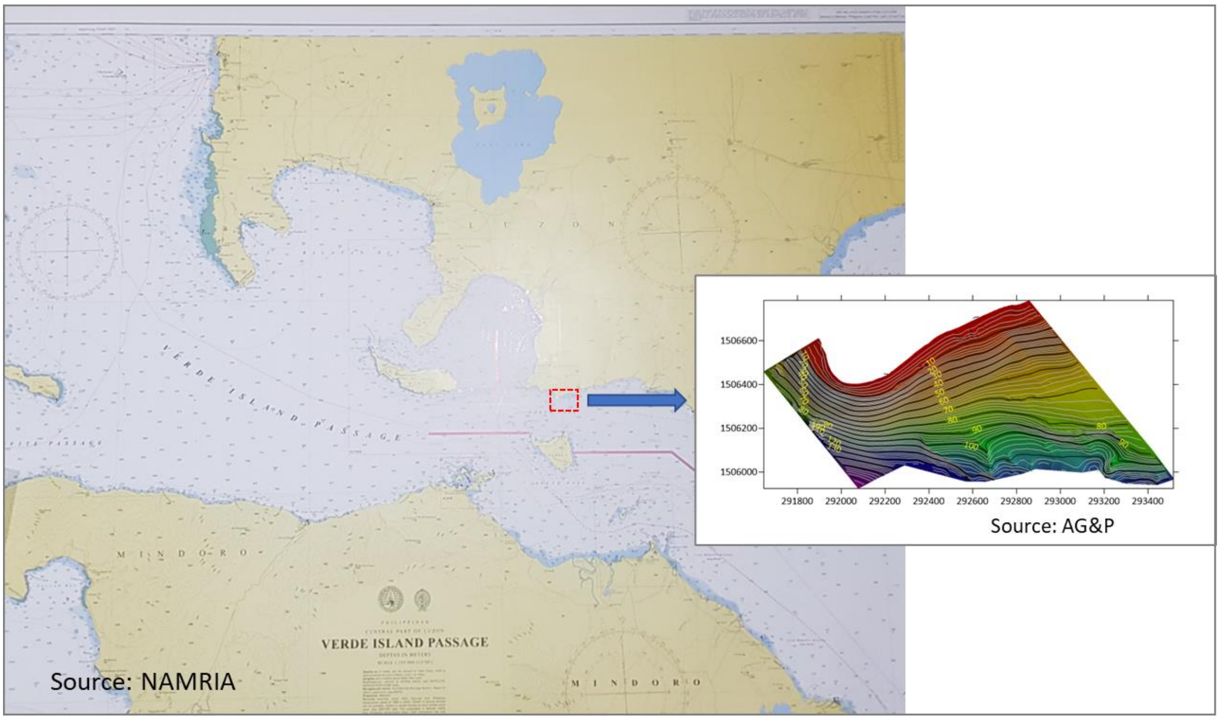


Figure 2-42. Sources of bathymetric data

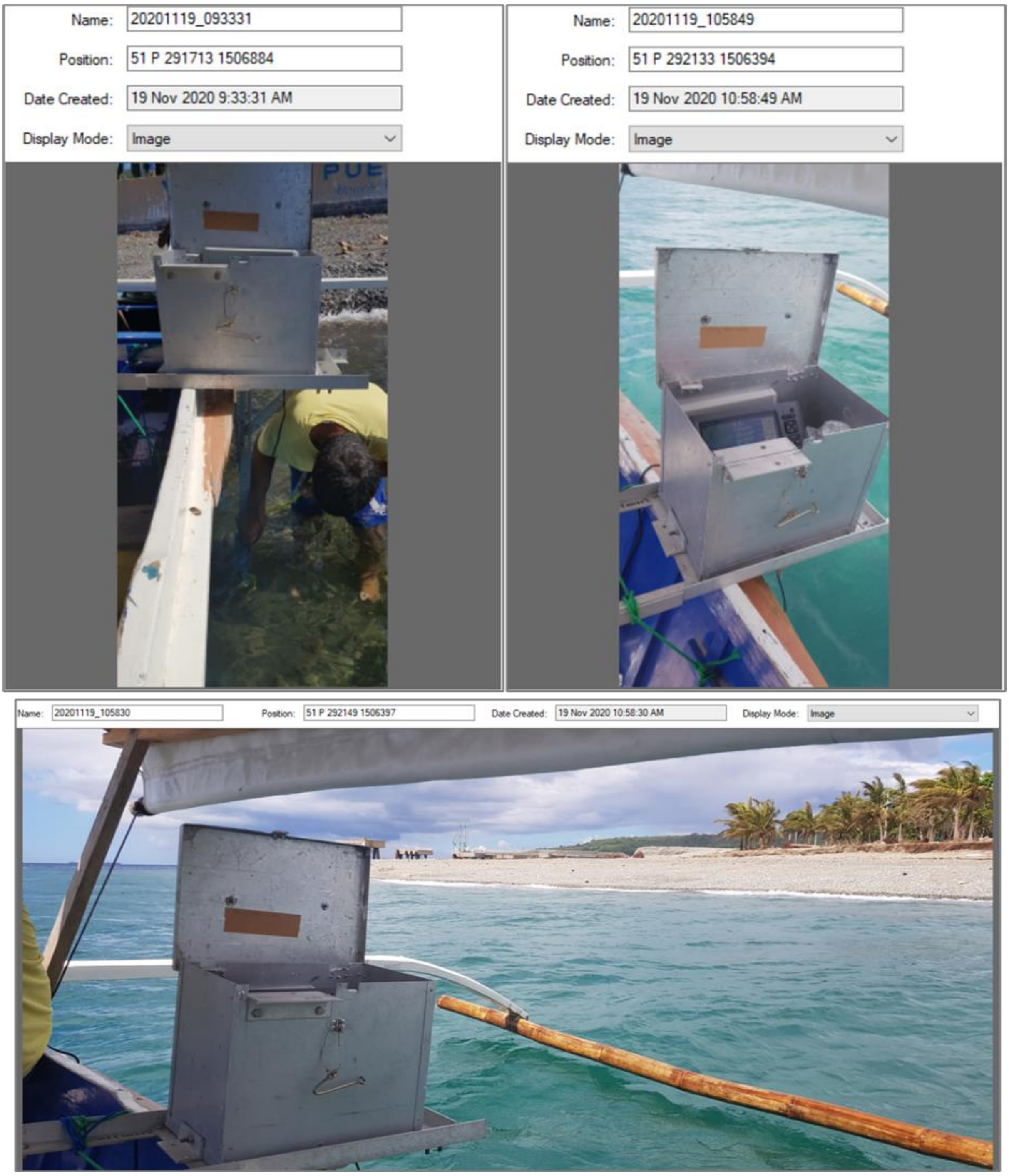


Figure 2-43. Installation of Garmin transducer (Model GT-21) (top left) and depth profiling using a Garmin echosounder enclosed in aluminum case (top right and bottom)

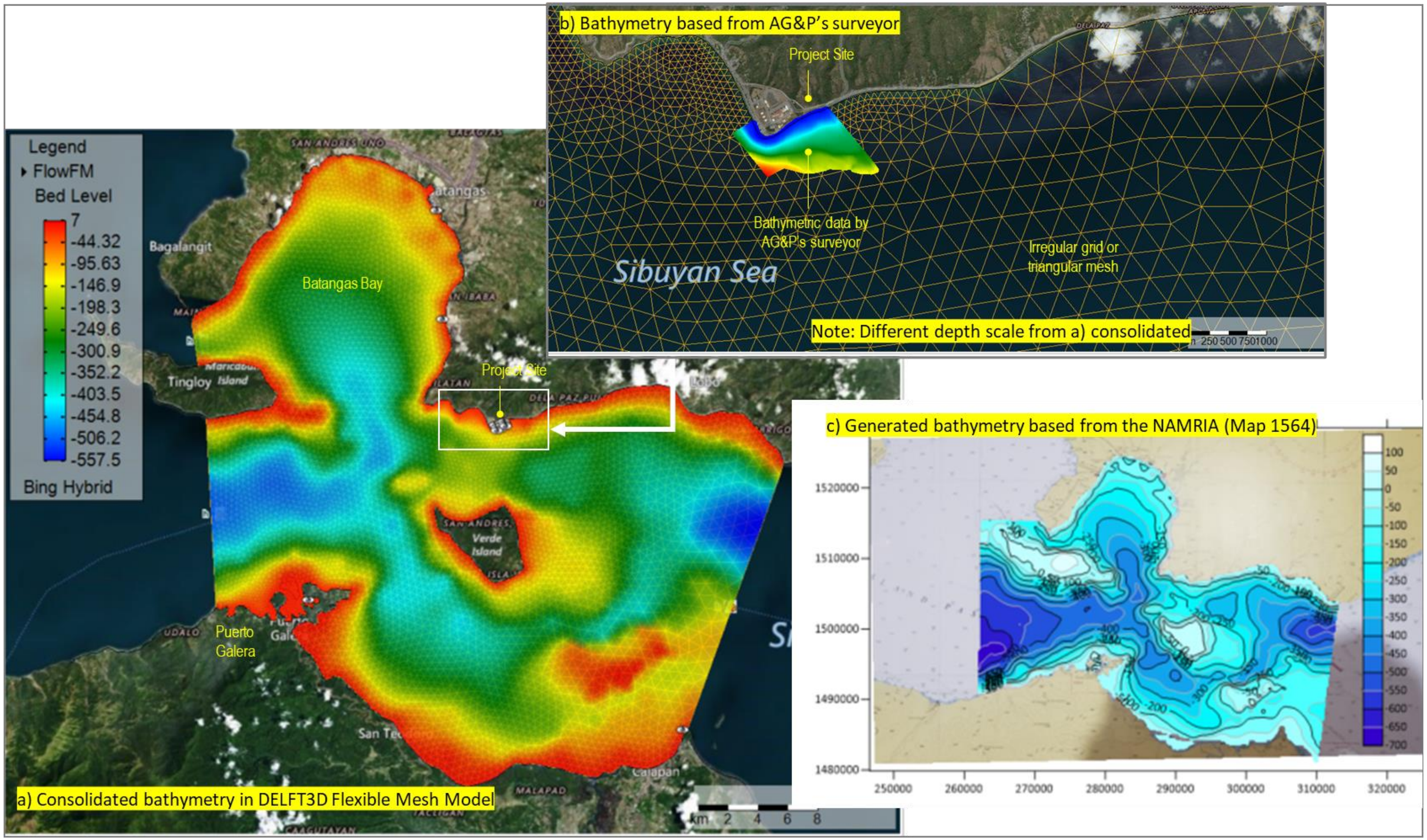


Figure 2-44. Consolidated bathymetry within the modelling domain (left) based on AG&P's surveyor (top right) and bathymetric map from the NAMRIA (bottom right)

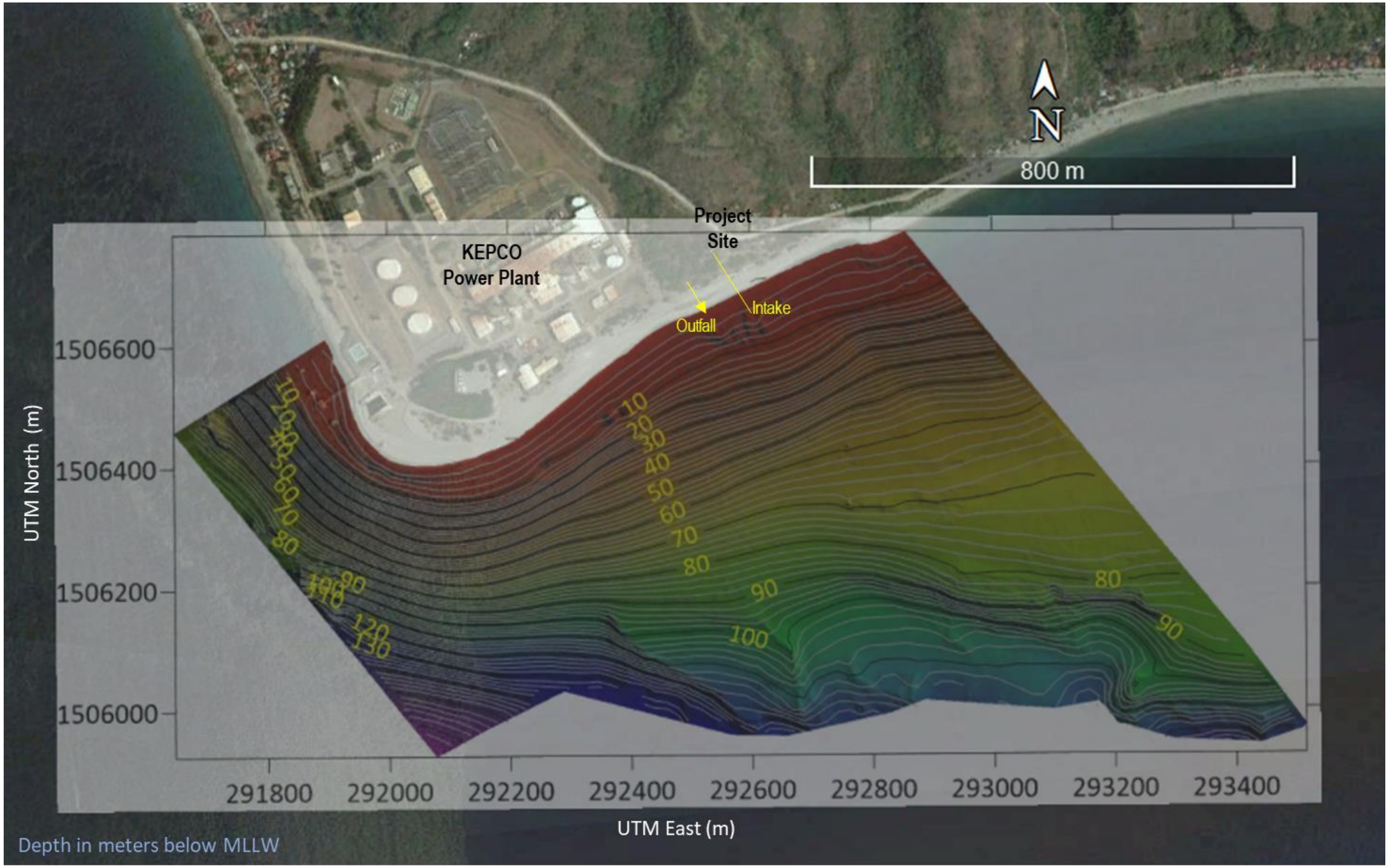


Figure 2-45. Bathymetry at and the vicinity of the project site

2.2.2.1.2 CURRENT SPEEDS AND DIRECTIONS

2.2.2.1.2.1 METHODOLOGY

2.2.2.1.2.1.1 MAROTTE HS TILT CURRENT METER

A tilt current meter (Marotte HS) was used to measure continuous current speed and current direction at two (2) locations (Plate 2-3). The current meter was deployed at two (2) locations- at the proposed outfall and about 380 m east of the proposed outfall. The locations of the two (2) sampling stations are shown in **Figure 2-46**.

The Marotte HS Tilt Current Meter can measure continuously at sampling rate of 1 second. It was developed and manufactured by JCU Marine Geophysics Laboratory in Townsville, Australia. It consisted of a data logger, a microSD card, and batteries, which were enclosed in waterproof buoyant enclosure.

The principle of current measurement using the Marotte HS employed the drag-tilt technology wherein the amount of tilt or tilt angle was proportional to the speed of the water, which was recorded using an accelerometer. The tilt direction determined the current direction using a magnetometer. The measured tilt angles and the tilt directions were then converted to current speeds and directions by a Marotte HS software using a pre-defined tilt-to-speed calibration curve.

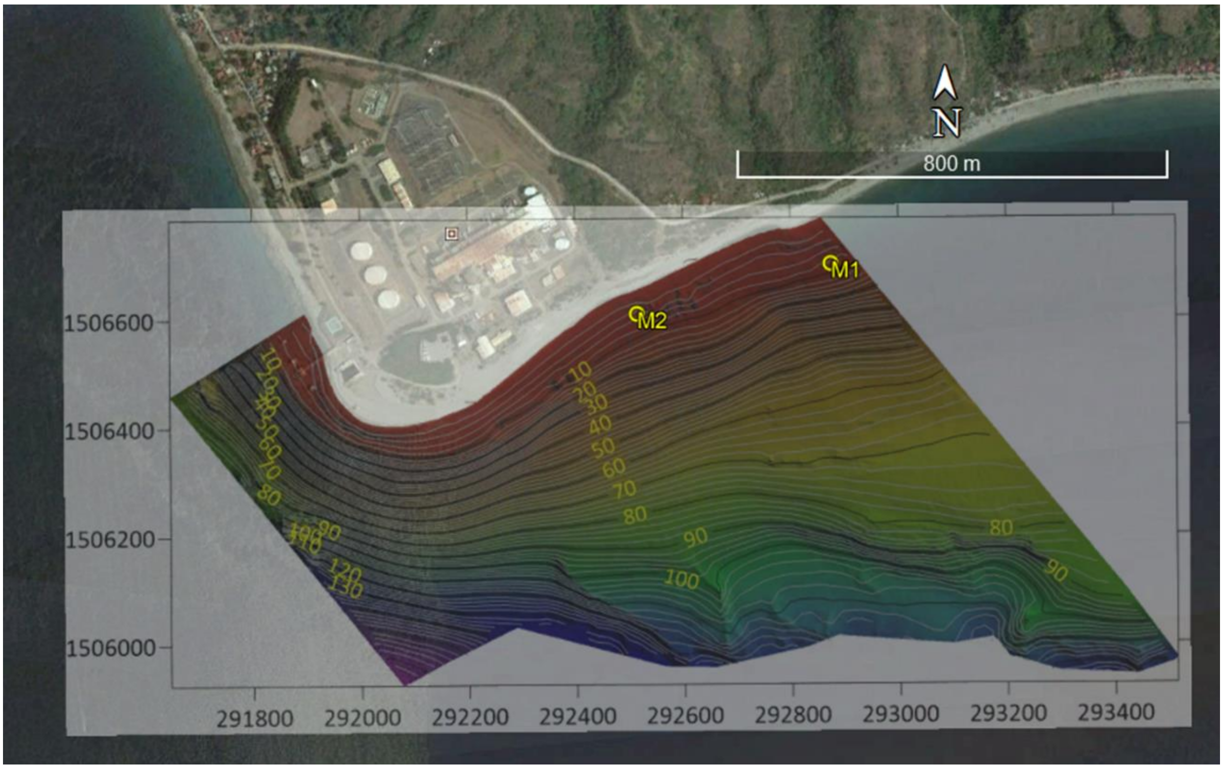


Figure 2-46. Locations of continuous current monitoring stations

2.2.2.1.2.1.2 SURFACE CURRENT PATTERNS USING DROGUE

A drogue was used to track the directions of currents. Drogue tracking involved determination of the initial and final locations of the drogue release and retrieval points, respectively, using a Garmin GPSMAP64S (Plate 2-4; Figure 2-47).

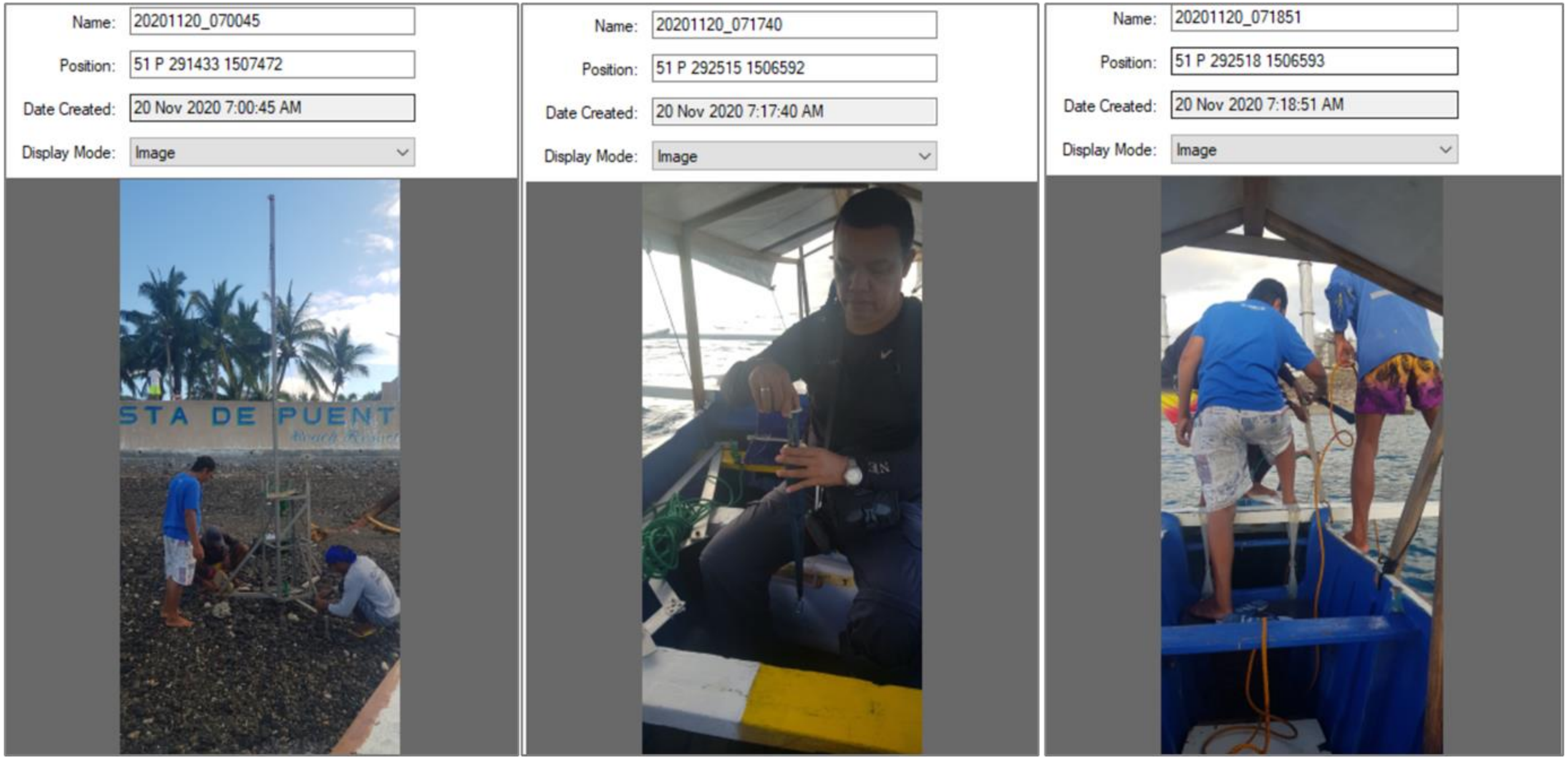


Plate 2-3. Preparation of the aluminum/stainless steel frame (left) and the Marotte HS Tilt Current Meter (middle) and deployment of the Marotte current meter placed on top of the aluminum/stainless steel frame

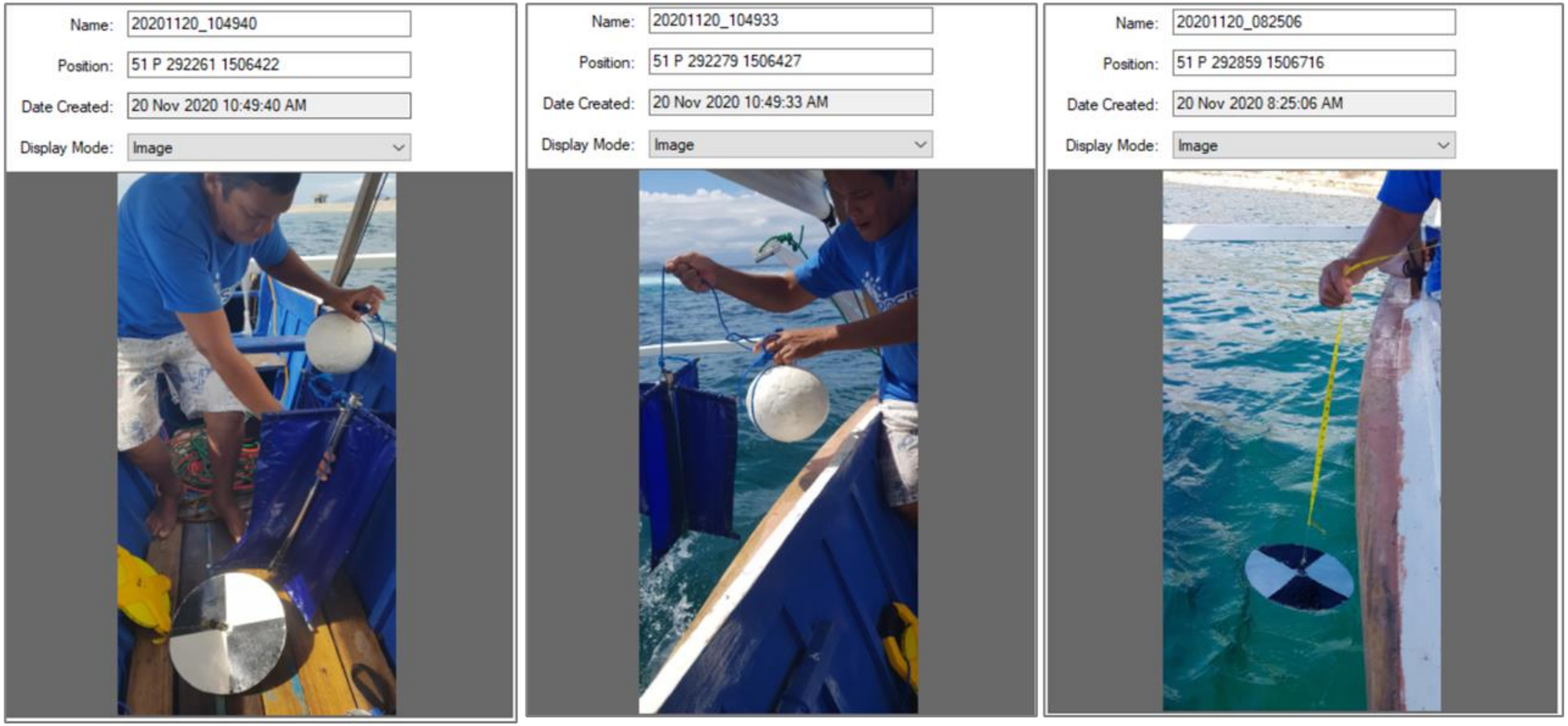


Plate 2-4. Drogue and Secchi disk (left), current tracking using drogue (middle) and Secchi depth measurement (right)

2.2.2.1.2.2 CURRENT SPEEDS AND DIRECTIONS

Figure 2-47 to **Figure 2-49** show the measured current speeds (instantaneous, 1-minute average and 30-minute average) at Station M1, which is located about 371 m ENE of the proposed outfall. At Station M2 (outfall), the plots of the measured current are depicted in **Figure 2-50** to **Figure 2-52**. The summary of the results at both stations is represented in **Table 2-15**.

Table 2-15. Description and statistics of measured currents speeds and directions at Stations M1 and M2

Particulars	Station M1		Station M2	
Location	371 m ENE of the proposed outfall		Proposed outfall	
Coordinates:				
Latitude (deg-min-sec)	13°37'17.93"N		13°37'14.92"N	
Longitude (deg-min-sec)	121° 5'7.52"E		121° 4'55.52"E	
Date and Time of Sampling (local time)	Nov 19, 2020 – 8:10 A.M. to 3:26 P.M		November 20, 2020 -7:21 A.M. to 2:51 P.M.	
Averaging Period	1-minute Average	30-minute Average	1-minute average	30-minute average
Total Readings	437	12	451	13
Minimum (m/s)	0.004	0.018	0.006	0.020
Maximum (m/s)	0.43	0.34	0.28	0.17
Average (m/s)	0.19	0.19	0.08	0.08
98th percentile (m/s)	0.38	0.34	0.22	0.16

The highest measured instantaneous current speed at Station M1 was 0.53 m/s (**Figure 2-47**) with one-minute average and maximum speeds of 0.19 and 0.43 m/s, respectively (**Table 2-15** and **Figure 2-48**). The 98th percentile values of the 1-minute and 30-minute currents speeds were 0.38 and 0.34 m/s, respectively, suggesting persistent strong currents at Station M1.

These observations can be seen at Station M2, although slightly lower in currents speeds than those of Station M1. The highest instantaneous current speed at Station M2 was 0.4 m/s with 1-minute and 30-minute average maximum speeds of 0.28 and 0.17 m/s, respectively. 98th percentile values range from 0.16 to 0.22 m/s (**Figure 2-50** to **Figure 2-52**).

Drogue measurements also show rapid currents in the vicinities of the proposed intake and outfall (**Table 2-15**, **Figure 2-54** and **Figure 2-55**) with maximum current speed of about 0.46 m/s.

Current directions were generally moving to the S-W quadrant and parallel to the shoreline during flood tide, shown in **Figure 2-54**. From ebb tide to flood tide, currents appear reversal of currents or currents flow toward the N-E quadrant (**Figure 2-53**).

Drogue tracking on November 20, 2020 from 7:15 A.M. to 10:30 A.M. fall within the ebb to slack waters. Changes in current directions were also depicted in **Figure 2-54**, with persistent currents flowing toward the S-W quadrant during flood tide but reverses in directions during ebb and slack water (**Figure 2-54** and **Figure 2-55**).

Ideally, at least one (1) month of continuous current measurements should be conducted to cover the spring, neap tides, and other tidal cycles. The extended type of measurement (1 month) will be performed by AG&P's designers as the detailed engineering design of the project. As part on the initial assessment on current behaviors, measurements were performed at limited period (2 to 3 days), however, it already provides the general current patterns in the area as discussed above.

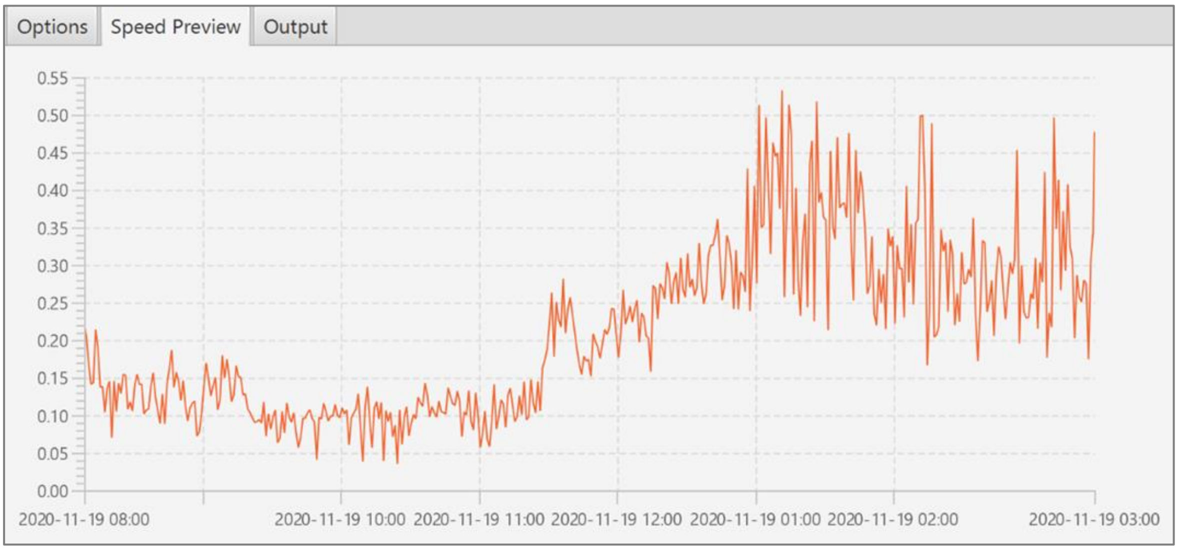


Figure 2-47. Measured current speeds at Station M1 (instantaneous) on November 19, 2020

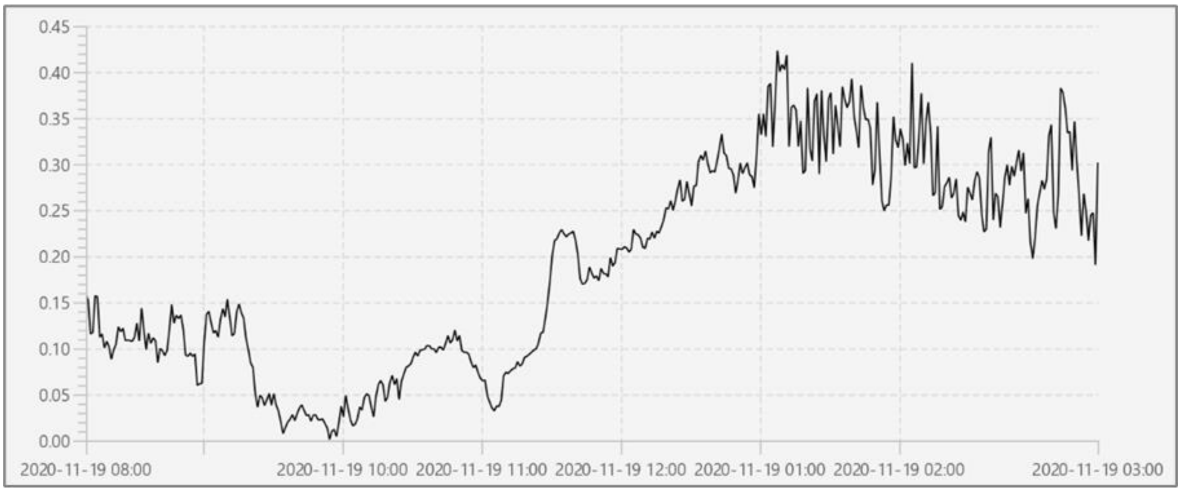


Figure 2-48. Measured current speeds at Station M1 (1-minute average) on November 19, 2020

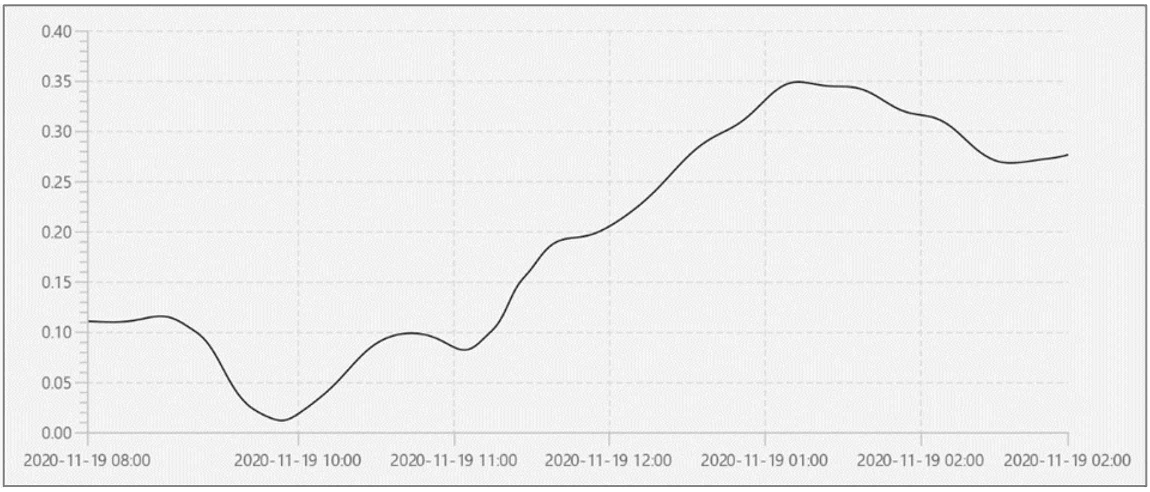


Figure 2-49. Measured current speeds at Station M1 (30-minute average) on November 19, 2020

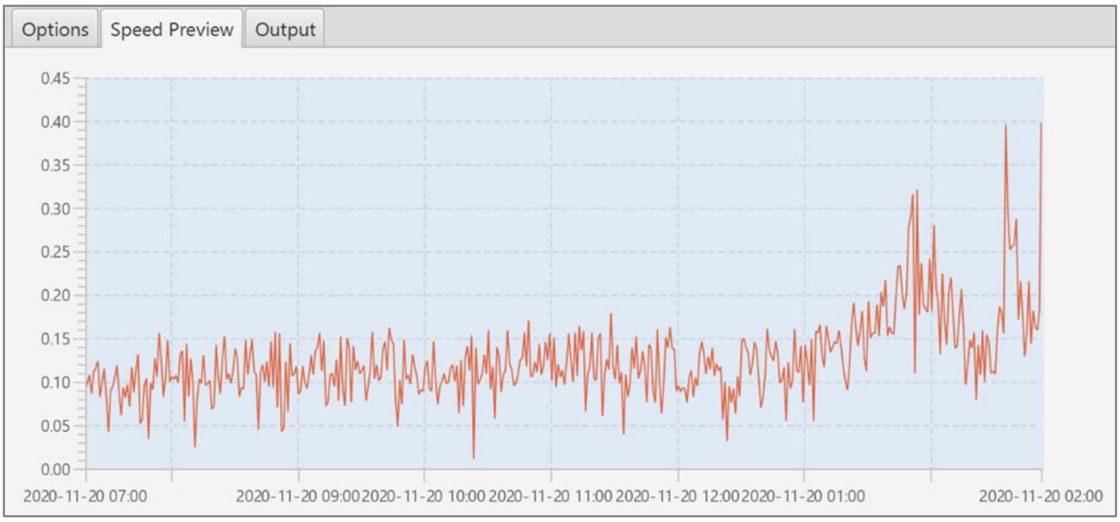


Figure 2-50. Measured current speeds at Station M2 (instantaneous) on November 20, 2020

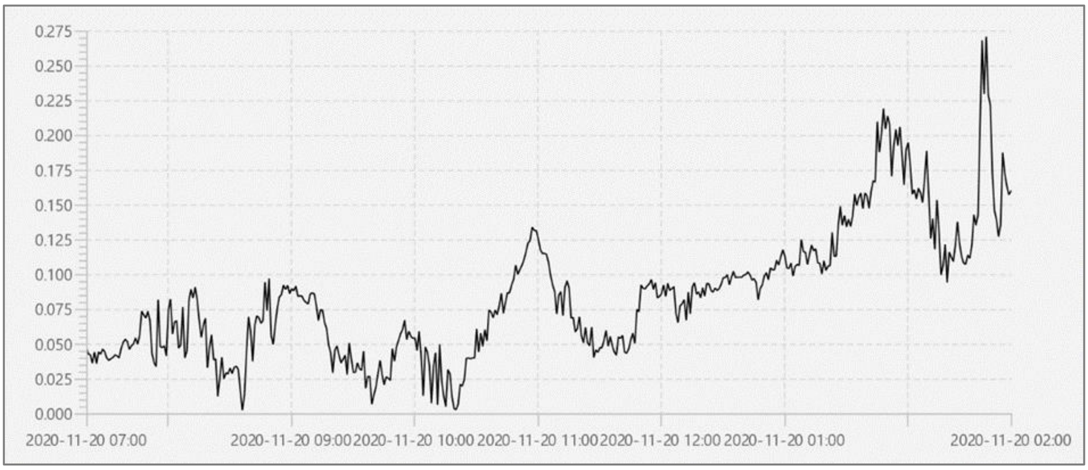


Figure 2-51. Measured current speeds at Station M2 (1-minute average) on November 20, 2020

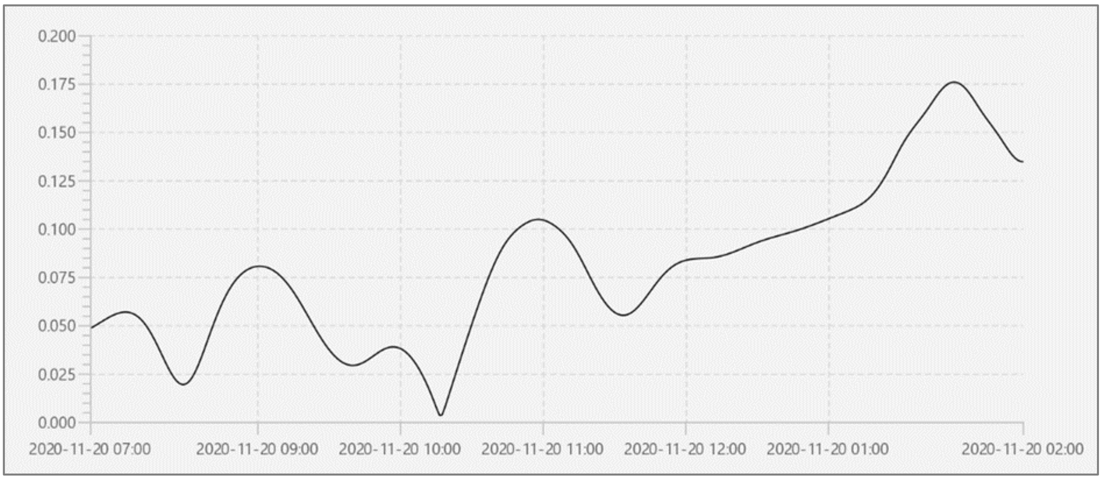


Figure 2-52. Measured current speeds at Station M2 (30-minute average) on November 20, 2020

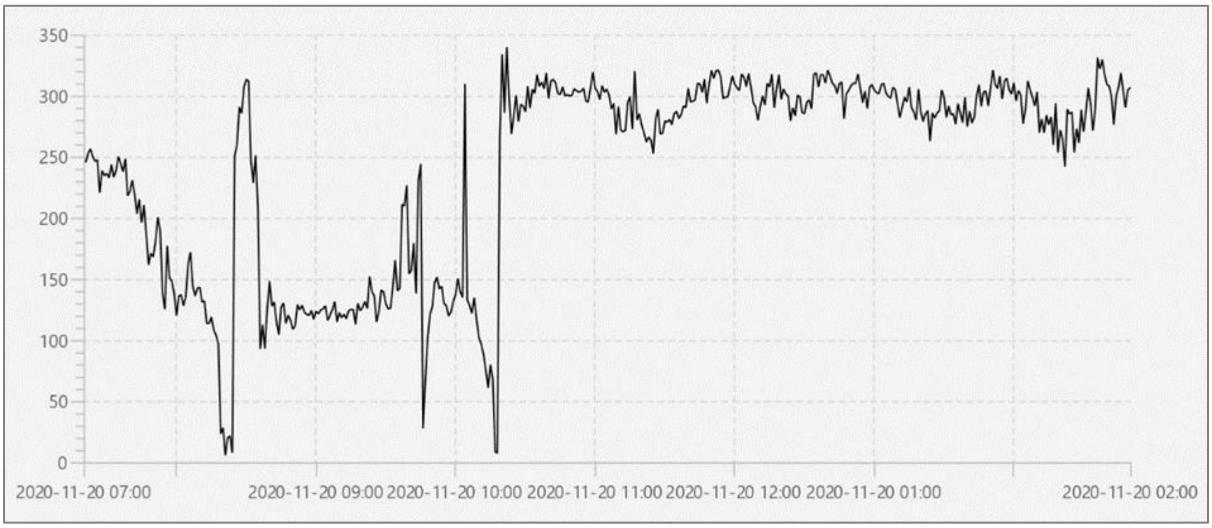


Figure 2-53. Current directions (1-minute) at Station M2 on November 20, 2020

Table 2-16. Drogue release, retrieval points and estimated current speeds (November 19-20, 2020)

Date: November 19, 2020

Drogue Release (GPS Waypoint No., Time, and Position)				Drogue Retrieval (GPS Waypoint No., Time, and Position)							
WP No.	Time Start	UTM (x)	UTM (y)	WP No.	Time End	UTM (x)	UTM (y)	Distance Travelled (m)	Time Travelled (min)	Seconds	Speed (m/s)
1092	10.21722	293,705.83	1,506,909.57	1093	10.490000	293,690.11	1,506,919.87	18.79	16.37	982	0.02
1095	10.60361	292,906.04	1,506,729.73	1096	10.812778	292,758.74	1,506,673.46	157.68	12.55	753	0.21
1097	10.85389	292,500.38	1,506,506.09	1098	11.077778	292,321.73	1,506,427.94	195.00	13.43	806	0.24
1099	11.16889	292,543.32	1,506,366.21	1100	11.360278	292,359.18	1,506,264.32	210.45	11.48	689	0.31
1102	11.55417	292,868.58	1,506,548.66	1103	11.712778	292,732.35	1,506,497.29	145.59	9.52	571	0.25
1107	14.27722	292,579.74	1,506,578.94	1108	14.375278	292,433.32	1,506,512.04	160.98	5.88	353	0.46
1109	14.57417	293,695.95	1,506,919.38	1110	14.740000	293,605.79	1,506,918.43	90.17	9.95	597	0.15
1111	14.79361	293,222.44	1,506,846.64	1112	14.938056	293,153.30	1,506,848.40	69.16	8.67	520	0.13
1113	14.98861	292,872.99	1,506,724.68	1114	15.143889	292,706.80	1,506,661.37	177.84	9.32	559	0.32
1115	15.17139	292,521.15	1,506,559.81	1116	15.504722	292,298.04	1,506,457.00	245.66	20.00	1200	0.20
										Min	0.02
										Max	0.46
										Ave	0.23

Date: November 20, 2020

Drogue Release (GPS Waypoint No., Time, and Position)				Drogue Retrieval (GPS Waypoint No., Time, and Position)							
WP No.	Time Start	UTM (x)	UTM (y)	WP No.	Time End	UTM (x)	UTM (y)	Distance Travelled (m)	Time Travelled (min)	Seconds	Speed (m/s)
1117	7.35472	292,522.75	1,506,597.64	1118	7.383333	292,520.18	1,506,588.15	9.83	1.72	103	0.10
1119	8.22361	292,867.65	1,506,719.63	1120	8.490278	292,905.91	1,506,767.58	61.34	16.00	960	0.06
1121	8.53889	293,198.27	1,506,856.45	1122	8.673333	293,221.61	1,506,878.51	32.12	8.07	484	0.07
1123	8.75333	293,703.15	1,506,912.69	1124	8.981111	293,810.68	1,506,948.25	113.26	13.67	820	0.14
1125	9.04944	293,793.54	1,506,750.42	1126	9.222778	293,807.15	1,506,773.89	27.13	10.40	624	0.04
1128	9.54667	293,246.97	1,506,649.37	1129	9.566944	293,244.44	1,506,671.41	22.18	1.22	73	0.30
1131	9.83083	292,848.73	1,506,516.29	1132	10.096111	292,884.97	1,506,582.95	75.87	15.92	955	0.08
1133	10.16167	292,552.01	1,506,451.79	1134	10.420000	292,568.20	1,506,542.40	92.05	15.50	930	0.10
1135	10.44694	292,515.80	1,506,595.15	1136	10.499167	292,513.63	1,506,608.45	13.48	3.13	188	0.07
1138	10.62111	292,395.94	1,506,410.31	1139	10.871111	292,372.00	1,506,449.01	45.51	15.00	900	0.05
										Min	0.04
										Max	0.30
										Ave	0.10

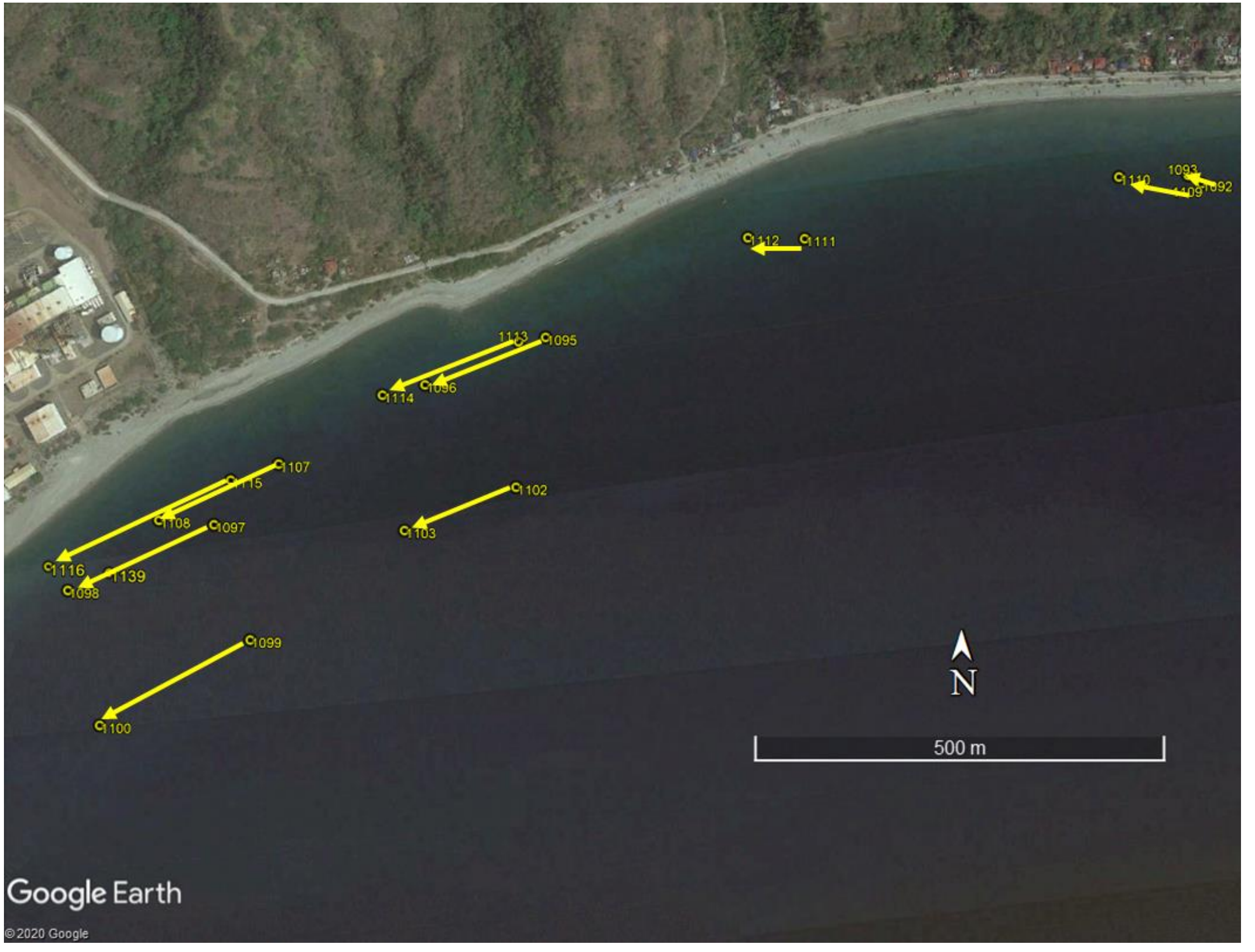


Figure 2-54. Surface current patterns from 10:00 A.M. to 3:00 P.M. on November 19, 2020

Figure 2-55. Surface current patterns from 7:15 A.M. to 10:30 A.M. on November 20, 2020

2.2.2.1.3 TIDES OR WATER LEVELS

Predicted tidal heights from three (3) tide stations of the NAMRIA located in Calapan, Oriental Mindoro, Batangas City, Batangas, and Port Galera, Mindoro, were used as bases for the generated input data along the open boundaries of the calculation area. The predicted tidal heights at the said locations were interpolated at the left and open boundary conditions of the modelling domain or calculation area (**Figure 2-60**).

The period covered the two (2) monsoon periods (northeast and southwest monsoon) and the sampling period (November 2020). For the northeast monsoon period, tidal heights from January 1, 2019 to February 28, 2019 were generated, while for the southwest monsoon, the predicted tidal heights were from July 1, 2019 to August 31, 2019. These months were selected as the strengths of the two (2) prevailing monsoons in the country (northeast and southwest monsoons) attain its maximum strength during these periods.

As the times and heights of low and high waters were only provided in NAMRIA (2020) for the said station (Corregidor), a computer program was developed to generate the hourly tide or water levels. This program was based on the graphical representation of determining the times and heights of waters as published in NAMRIA Tide and Current Tables.

Figure 2-56 shows the plots of water levels in January 2019 to February 2019, July 2019 to August 2019, and November 2020. Depending on the lunar cycle, tidal patterns at the tide stations are generally semi-diurnal and diurnal tides. The summary of the water levels or tidal heights at the referenced tide stations and at the open boundary conditions are shown in **Table 2-17**.

Table 2-17. Statistics of water levels or tidal heights at the reference tide stations and at the open boundaries

Statistics	Calapan, Oriental Mindoro	Batangas City, Batangas	Port Galera, Mindoro	Boundary Condition 1 (left)	Boundary Condition 2 (right)
January 1, 2019 to February 28, 2019:					
Number of readings	1408	1408	1408	1408	1408
Minimum (m)	-0.40	-0.40	-0.34	-0.35	-0.39
Maximum (m)	1.64	1.49	1.52	1.52	1.59
Average (m)	0.59	0.48	0.52	0.52	0.57
Range (m)	2.04	1.89	1.86	1.87	1.98
July 1, 2019 to August 31, 2019:					
Number of readings	1482	1482	1482	1482	1482
Minimum (m)	-0.35	-0.24	-0.14	-0.17	-0.31
Maximum (m)	1.66	1.55	1.72	1.66	1.65
Average (m)	0.64	0.60	0.74	0.70	0.64
Range (m)	2.01	1.79	1.86	1.83	1.96
November 1, 2020 to November 30, 2020:					
Number of readings	Total	669	669	669	669
Minimum (m)	Min	-0.33	-0.31	-0.33	-0.31
Maximum (m)	Max	1.67	1.46	1.44	1.60
Average (m)	Ave	0.64	0.50	0.53	0.61
Range (m)	Range	2.00	1.77	1.77	1.92

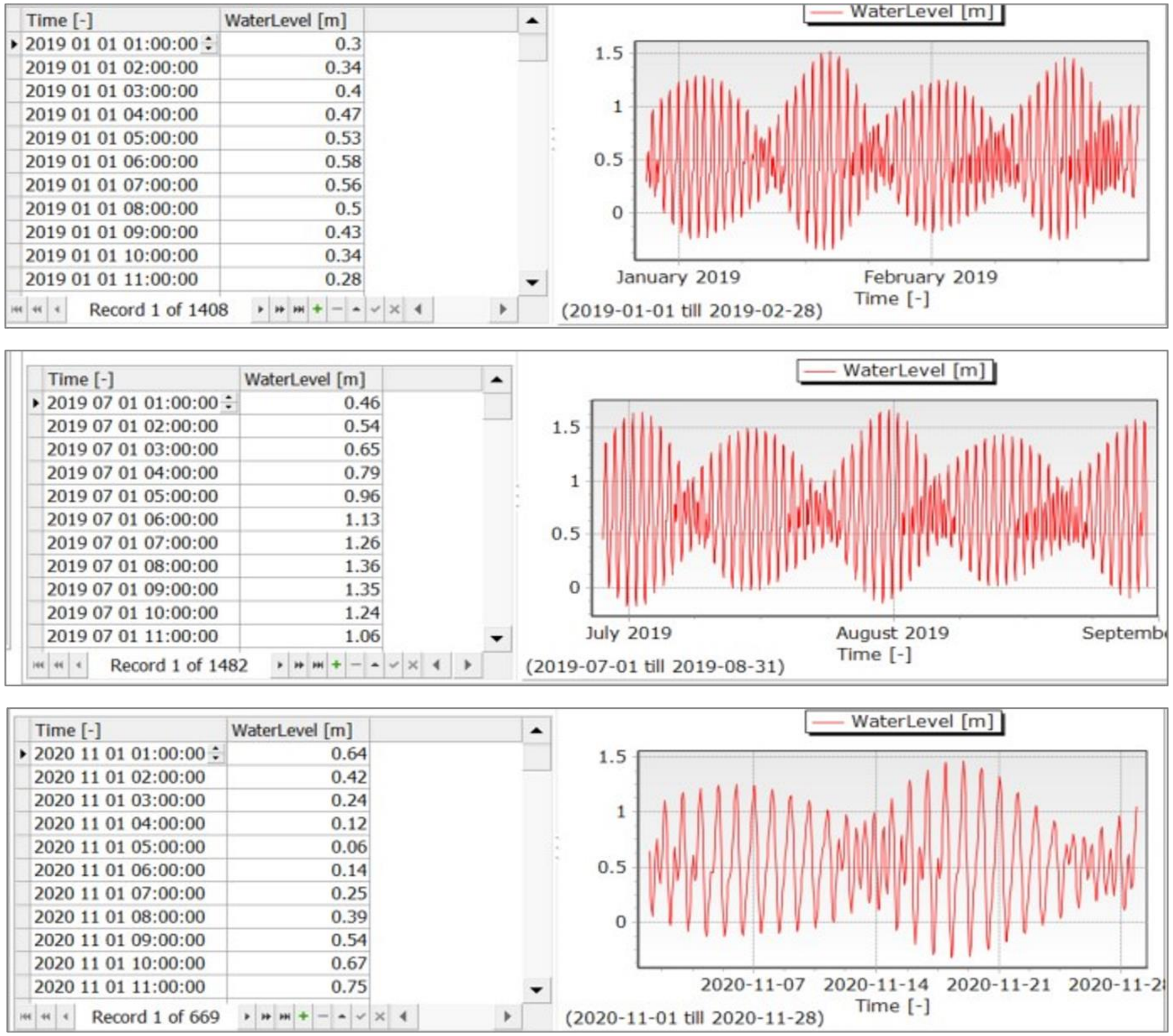


Figure 2-56. Tidal boundary conditions for Jan to Feb 2019 (top), July to Aug 2019 (middle) and November 2020 (bottom)

2.2.2.1.4 TRANSPARENCY OR TURBIDITY AND BOTTOM SAMPLING

2.2.2.1.4.1 TRANSPARENCY

A Secchi Disk and a meter tape were used to estimate turbidity at eight (8) locations in the vicinity of the locations of the proposed intake and outfall (**Figure 2-57**). This Secchi disk has a diameter of 12 inches and painted black and white. Turbidity or transparency measurement was done by determining the depths at which the Secchi Disk were no longer visible. The disk was attached to a meter tape and a rope with weights. Measurement was done three (3) times (or 3 trials) per sampling station

Figure 2-58 shows the depths of the Secchi disk on November 20, 2020. Secchi depths at shallower stations (Stations S1, S2, S3 and S4) extended to the sea bed indicating very clear waters at the time of sampling. At the rest of the sampling stations, Secchi depths ranged from 11 to 14.5 m below water level. These further suggest very clear or no signs of turbidity in the area at the time of monitoring.

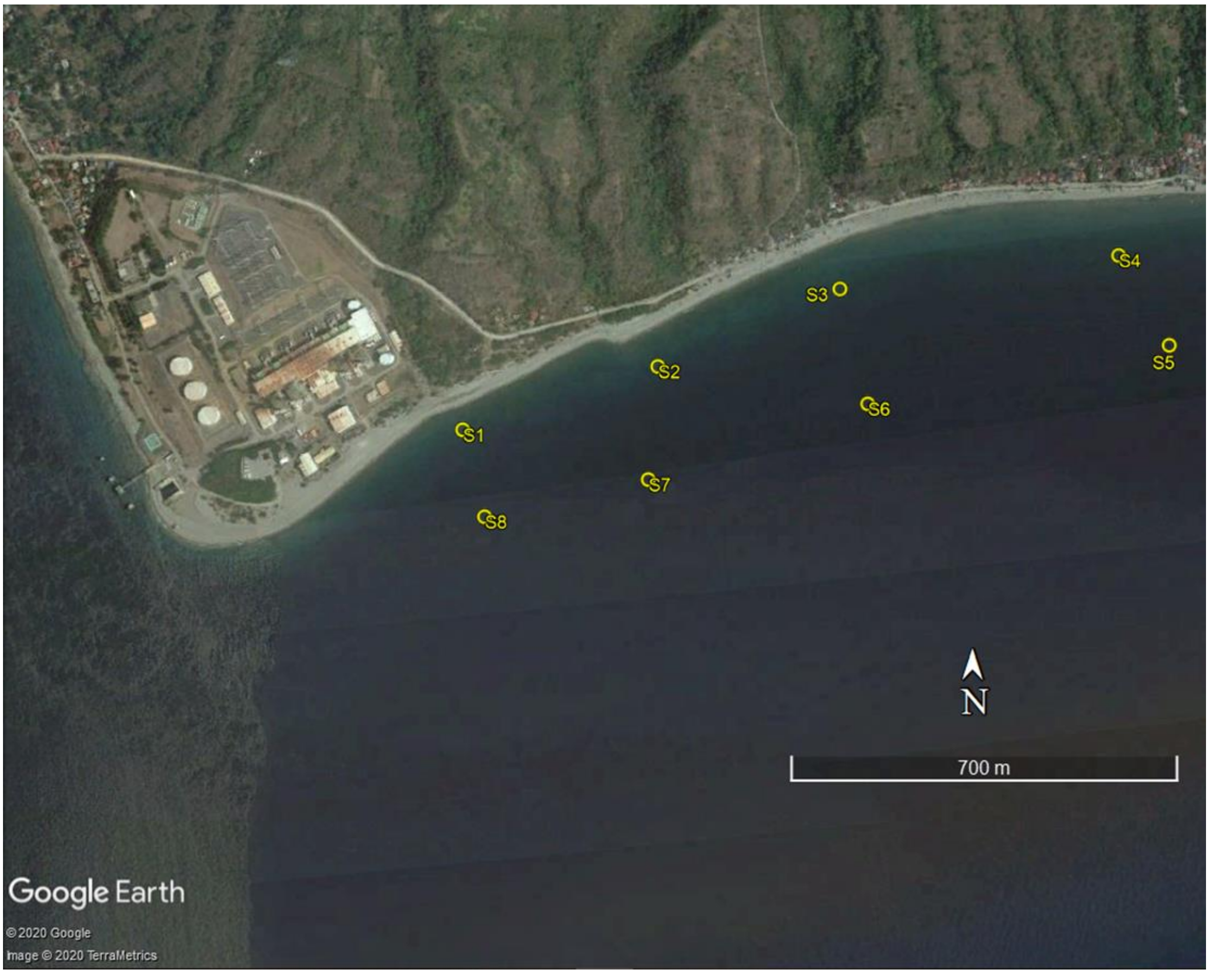


Figure 2-57. Locations of sampling stations for Secchi disk

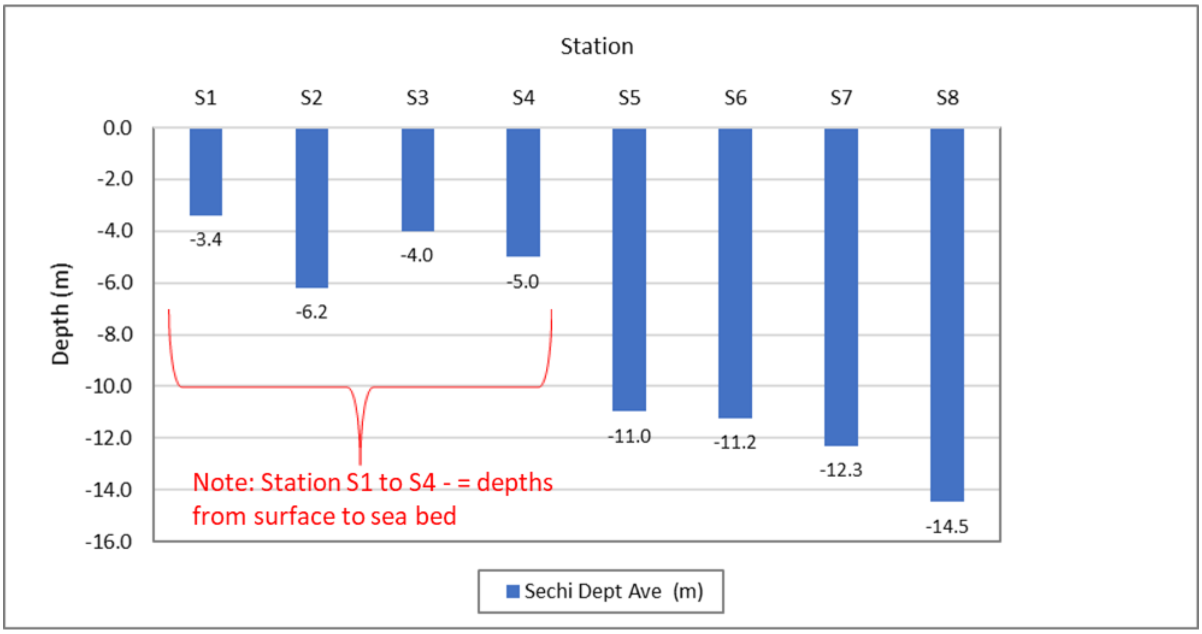


Figure 2-58. Average depths of Secchi Disk on November 20, 2020

2.2.2.1.4.2 BOTTOM SAMPLING

Samples of bottom sediments were extracted from the surface (or motorized banca) using a grab sampler (**Plate 2-5**). The sampling locations were the same as those for Secchi disk. Sampling was done by lowering the grab sampler at the seabed with its "mouth" opened. Samples were taken by loosening the rope to close the grab sampler and by grabbing or pulling the sampler to the surface (motorized banca).

Soil samples (bottom sediments) collected were generally sandy with fractions of pebbles or gravel (**Plate 2-6**). Cobbles and boulders were also noted or observed in the vicinity of the sampling locations, particularly near the shoreline and on the beach.

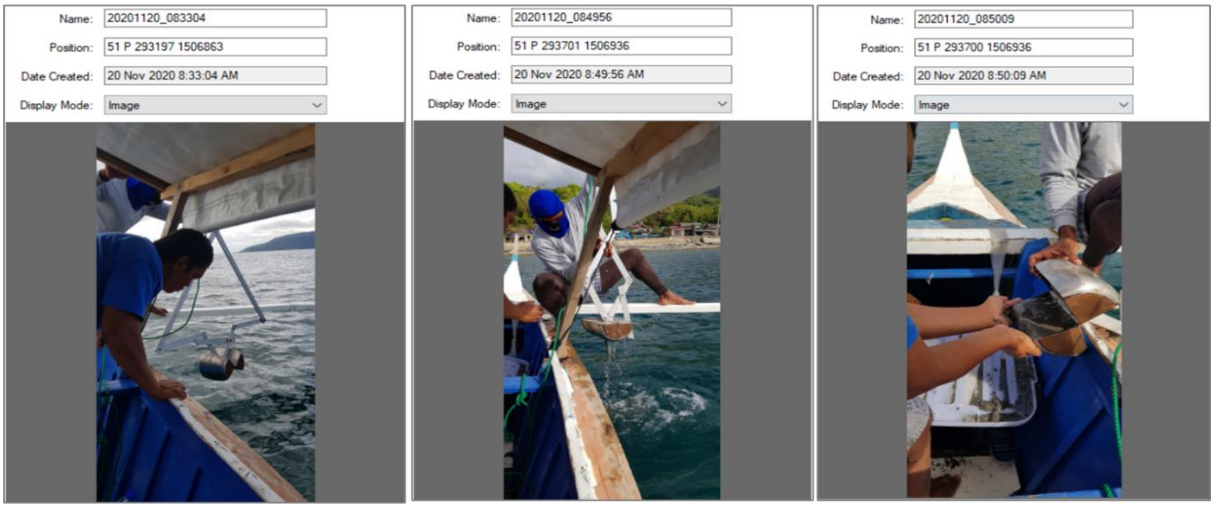


Plate 2-5. Bottom sampling using a grab sampler

Plate 2-6. Bottom sediments collected at eight (8) locations on November 20, 2020

2.2.2.2 IMPACT ASSESSMENT AND MITIGATION MEASURES

The hydrodynamic modelling aims to determine possible changes or disruption in water circulation patterns and water or tide levels including changes in water temperatures emanating from release of relatively cooler water from the outfall. Impact assessment also included brief discussion on the changes in bathymetry as required in the Scoping Checklist, though the proposed project will not involve reclamation of coastal areas, but construction of pier/berthing facilities.

2.2.2.2.1 METHODOLOGY

2.2.2.2.1.1 THE HYDRODYNAMIC AND MORPHOLOGIC MODEL

A licensed Delft3D Flexible Mesh Hydrodynamic Morphologic Model (or Delft3D FM Suite Version 1.6.1.47098) was used in the hydrodynamic modelling for the project (**Plate 2-7**). Delft3D FM is a world leading 3D modeling suite designed to investigate hydrodynamics, sediment transport and morphology and water quality for fluvial, estuarine and coastal environments.

The licensed software package consisted of preprocessors, models, and post-processors. The pre-processors (RGFGRID and QUICKIN) were used to create and process the unstructured grid of the modelling domain. The post-processors included the QUICKPLOT and the Delta Shell – the main graphical user interface (GUI) program of DELFT3D Flexible Mesh Hydrodynamic Model

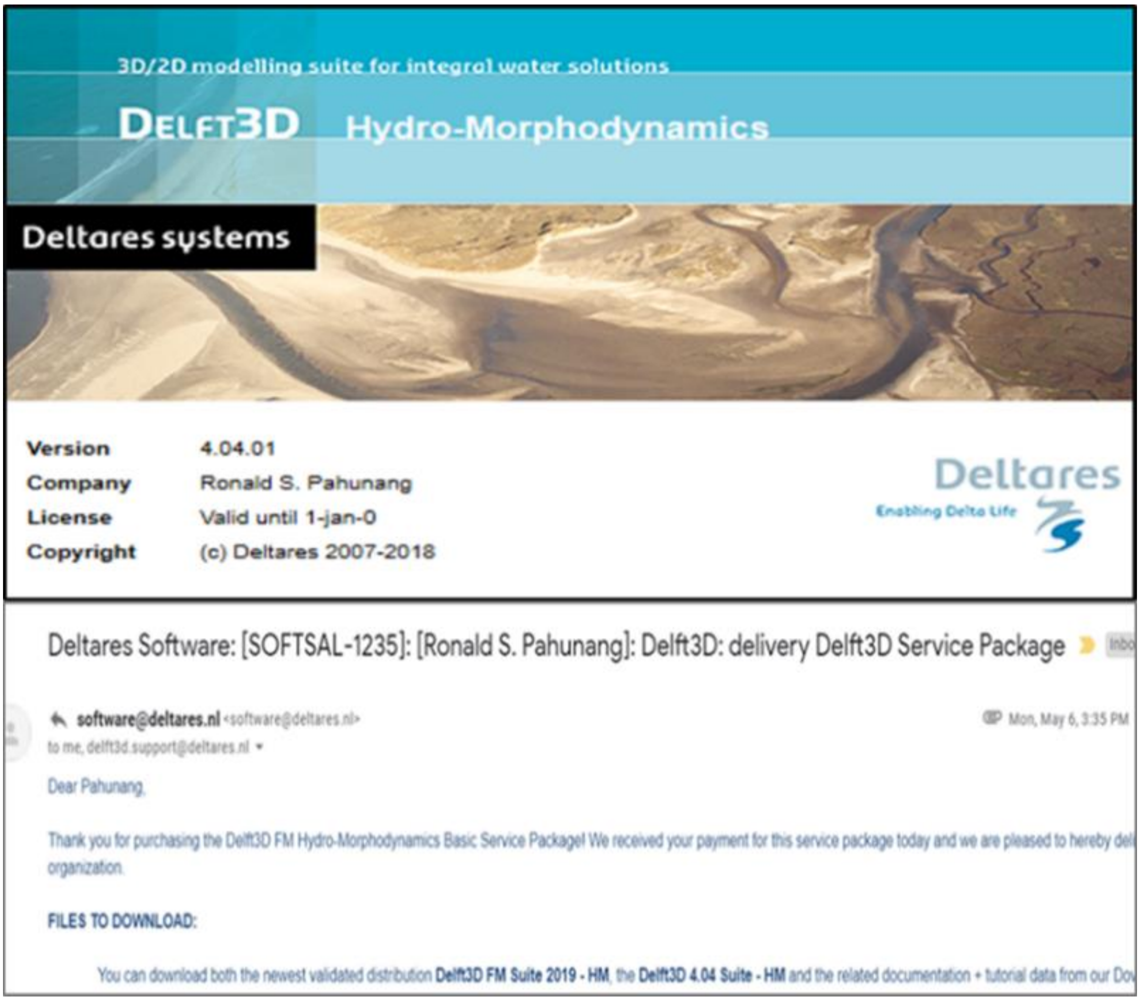


Plate 2-7. Licensed Delft3D Flexible Mesh Hydrodynamic-Morphologic Model (or Delft3D FM)

2.2.2.2.1.2 MODEL SET-UP

DELFT3D Flexible Mesh (DELFT3D FM) model was used to simulate water level (or tidal heights, current speeds, current directions, and dispersion of water temperature emanating from the outfall. The input data and modelling process included the following.

- Computation grid,
- Bathymetry or bottom elevations
- Observation points and observation cross-sections
- Tidal open boundary
- Meteorology (wind speed and wind direction)

2.2.2.2.1.2.1 COMPUTATIONAL GRID

Figure 2-59 shows the modelling domain or calculation area. The calculation area covers considerable domain to ensure that hydrodynamic forces in a mesoscale, which may influence the tides, currents, and waves at the project stie, are included in the modelling process. The domain encompassed the northern part of Mindoro, Verde Island, Maricaban Island, and Batangas Bay.

RDFGRID, a boundary fitted grid generation software, was used to generate the unstructured grid within the computational grid or modelling domain. The unstructured grid is composed of series of triangles representing the coastlines of the project area and the calculation area. Closely spaced irregular grids were assigned at and in the vicinity of the project site (**Figure 2-60**).

Figure 2-61 shows the triangular mesh and the grid orthogonality. Orthogonality values range from 0 to a maximum 0.073 with the sizeable part of the calculation area or domain with orthogonality of 0.011 and lesser. This shows a good quality grid as the orthogonality is generally less than 0.10.

2.2.2.2.1.2.2 BATHYMETRY

The bathymetry of bottom elevations are presented in **Section 2.2.2.1.1 (Bathymetry).** The bathymetry or bottom elevations of the computational grid was generated by importing the bathymetric data files consisting of the coordinates and bottom elevations, and creating or generating the representative depth at each cell by triangulation method.

2.2.2.2.1.2.3 OBSERVATION POINTS

Observation points are locations in the modelling domain or calculation area in which time series of parameters i.e., water levels and currents, were simulated. A total of sixteen (16) observation points were assigned in the domain. Three (3) of these observation points were located at the NAMRIA Tide Stations in Batangas City, Puerto Galera, Mindoro and Calapan, Oriental Mindaro (**Figure 2-59**). The other eleven (11) observation points were assigned at and in the vicinity of the proposed outfall (**Figure 2-60**).

2.2.2.2.1.2.4 TIDAL OPEN BOUNDARIES

Figure 2-59 shows the locations of the open tidal boundaries. The tidal input data are discussed in **Section 2.2.2.1.3 (Tides or Water Levels).**

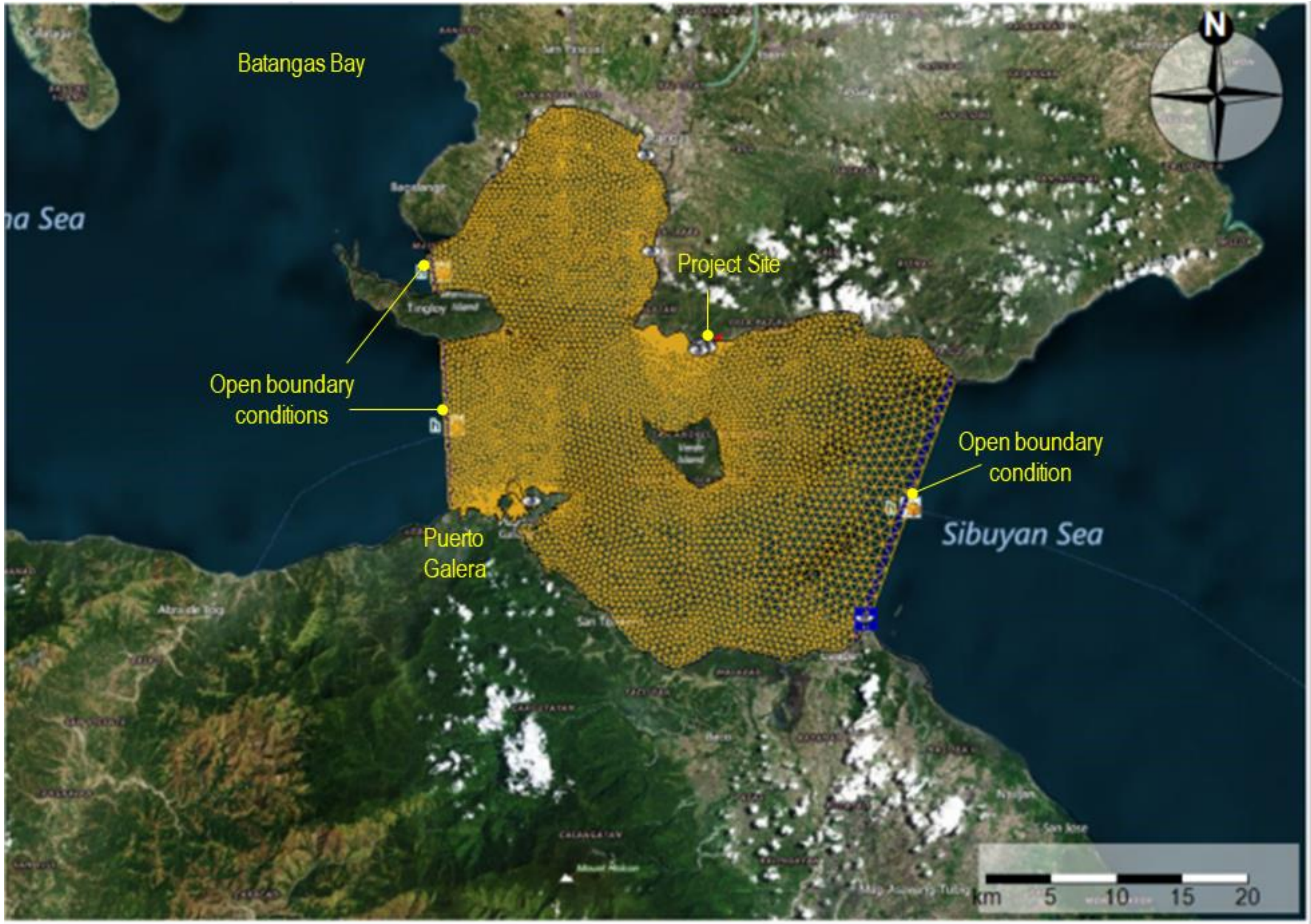


Figure 2-59. Modelling domain and locations of open boundary conditions

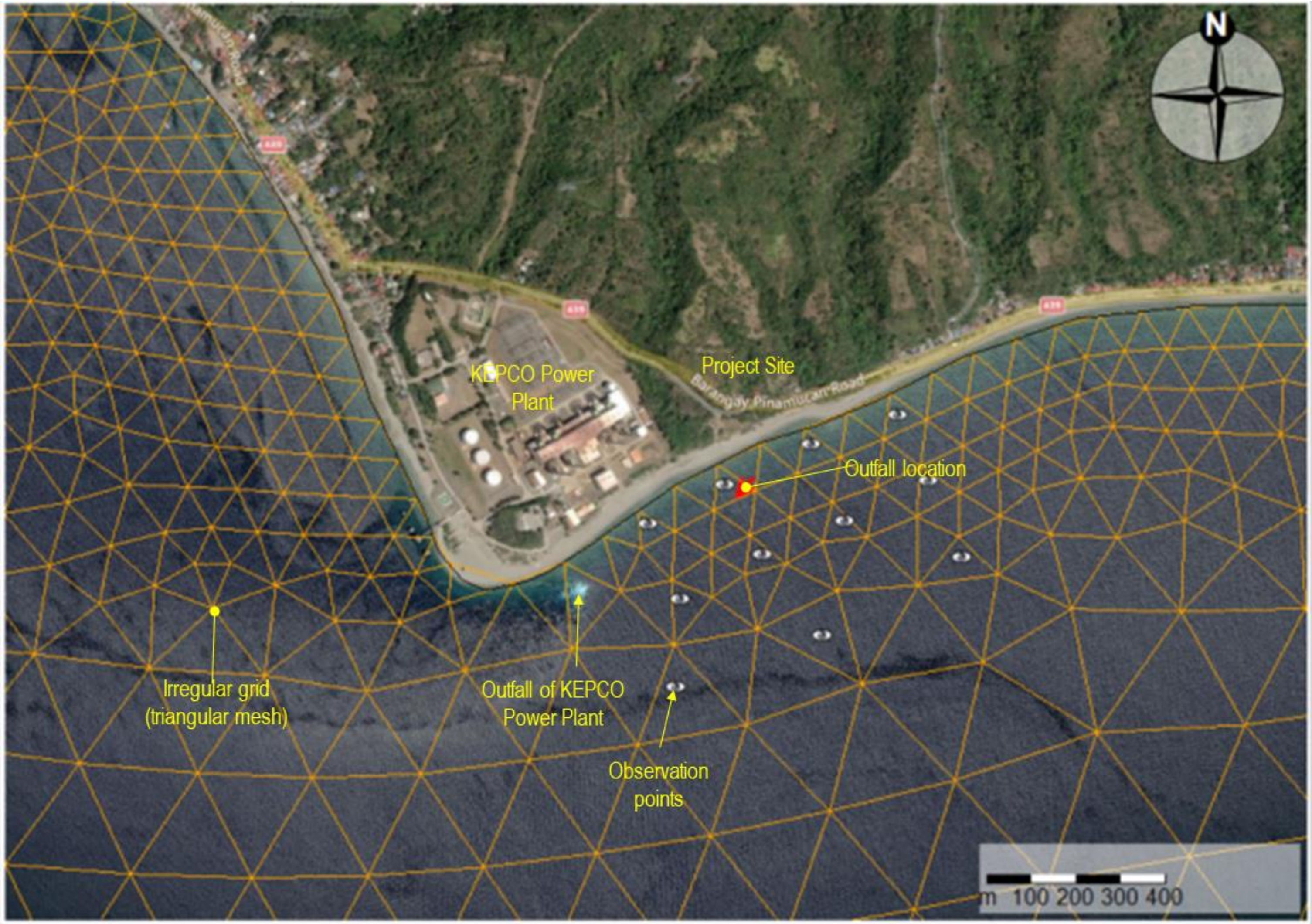
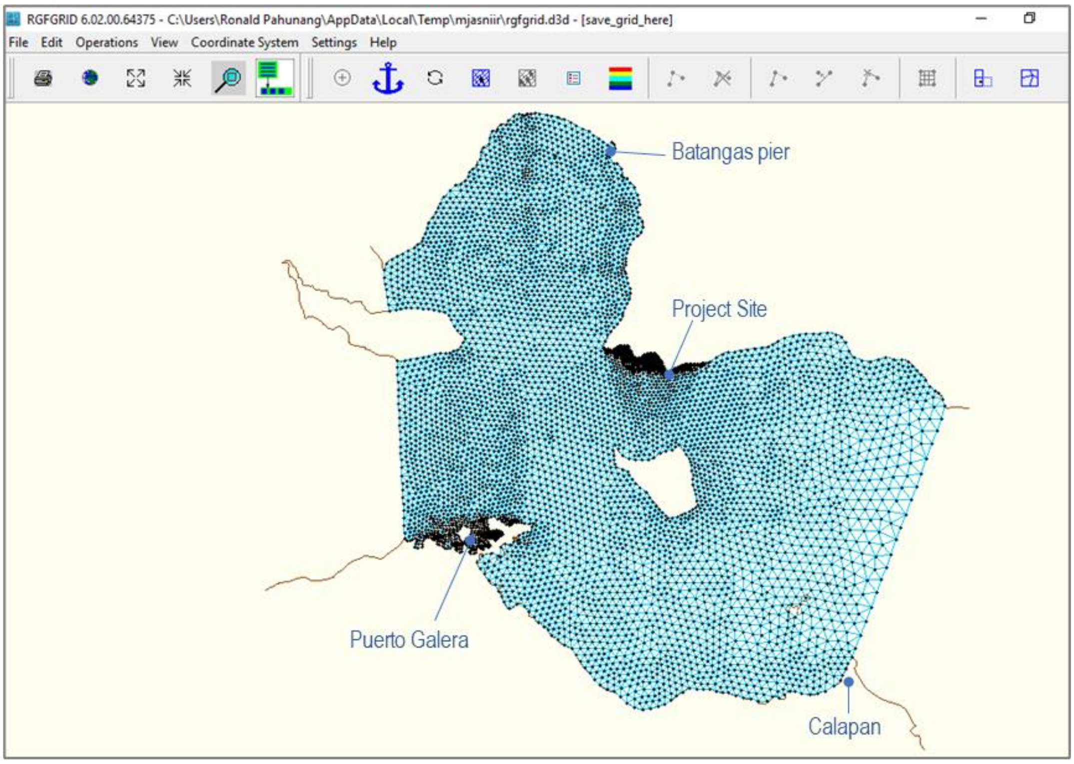
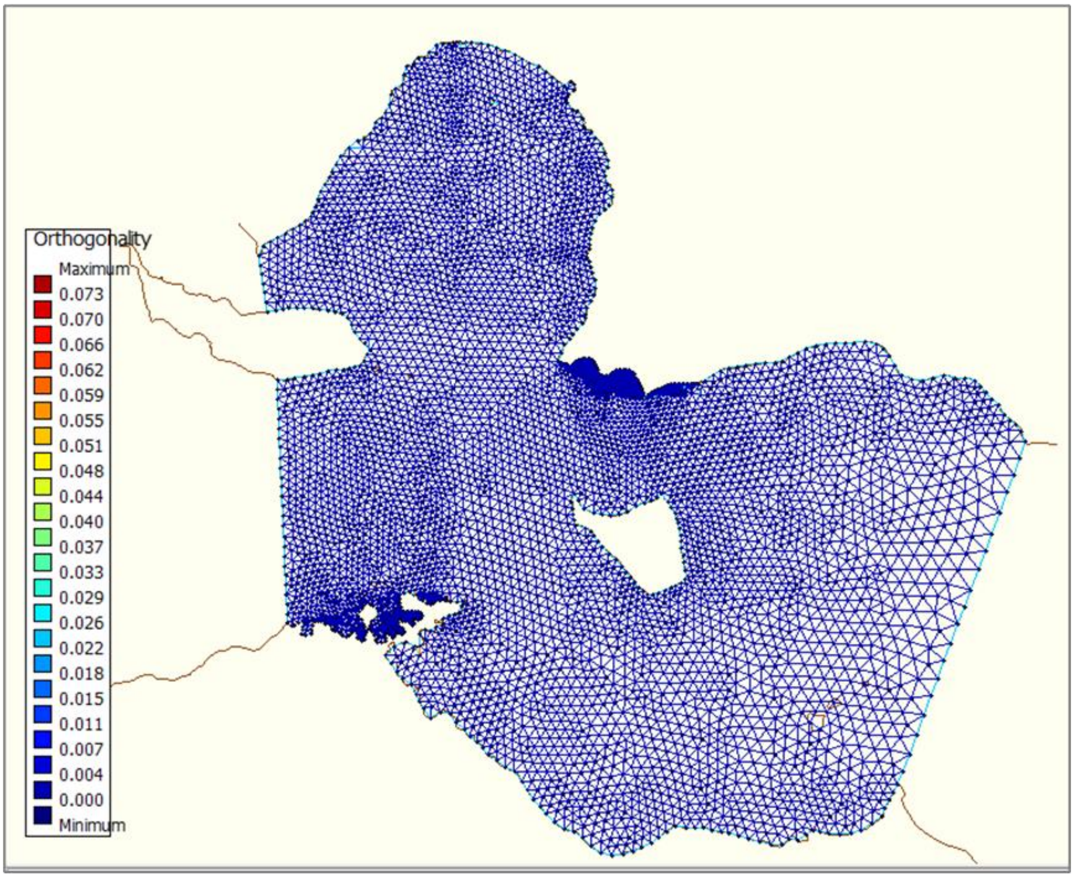


Figure 2-60. Locations of the a) existing outfall of KEPCO power plant and the proposed outfall of the project, and b) observation points



a) Generated irregular grid (triangular mesh) for the calculation area (modelling domain)



b) Orthogonality of the calculation area (modelling domain)

Figure 2-61. Generated irregular grid (top) and grid orthogonality (bottom)

2.2.2.2.1.2.5 METEOROLOGICAL INPUT DATA

Meteorological input data were time series of hourly wind speed and wind direction representing the northeast and southwest monsoons in 2019, including the whole month of November 2020, as shown in **Figure 2-62** to **Figure 2-64**. Data were extracted from the prognostic meteorological data generated for the project, as discussed in the Air Quality Module (**Section 2.3.2.1**).

Light to moderate winds from the east and S-E quadrant prevailed on January 1, 2019 to February 28, 2019 (**Figure 2-62**). Prevailing wind flow was from the east (32%) followed by east-southeast (ESE) of about 28%.

During the southwest monsoon on July 1, 2019 to August 31, 2019, light to moderate winds prevailed at 38.2 and 41.9%, respectively (**Figure 2-63**). The prevailing winds were from the west and west-southwest at total of about 55%.

In November 2019 (transition period), winds coming from the southeast direction prevail at about 18%, though winds from other compass directions were observed (**Figure 2-64**). Light winds (1 to 5 m/s) prevailed about 56.3% of the time. Moderates winds (5 to 9 m/s) accounted to about 40.7%.

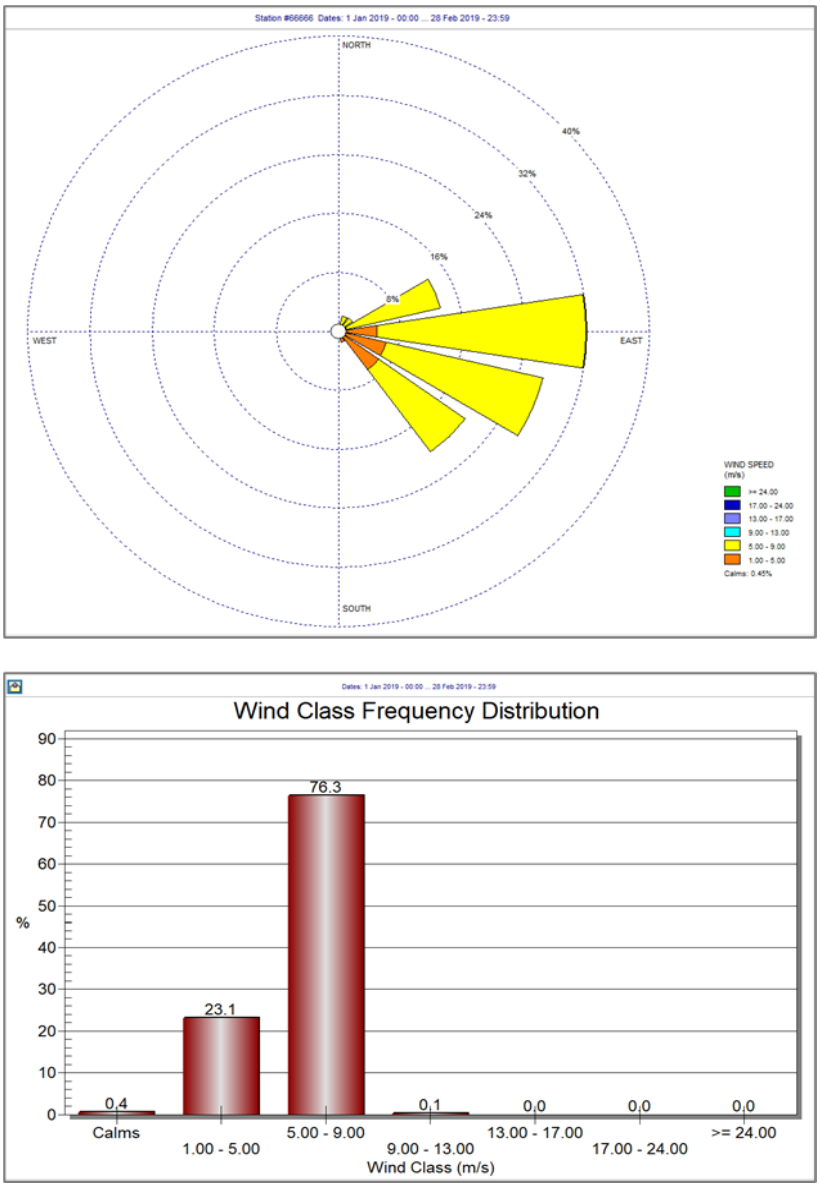
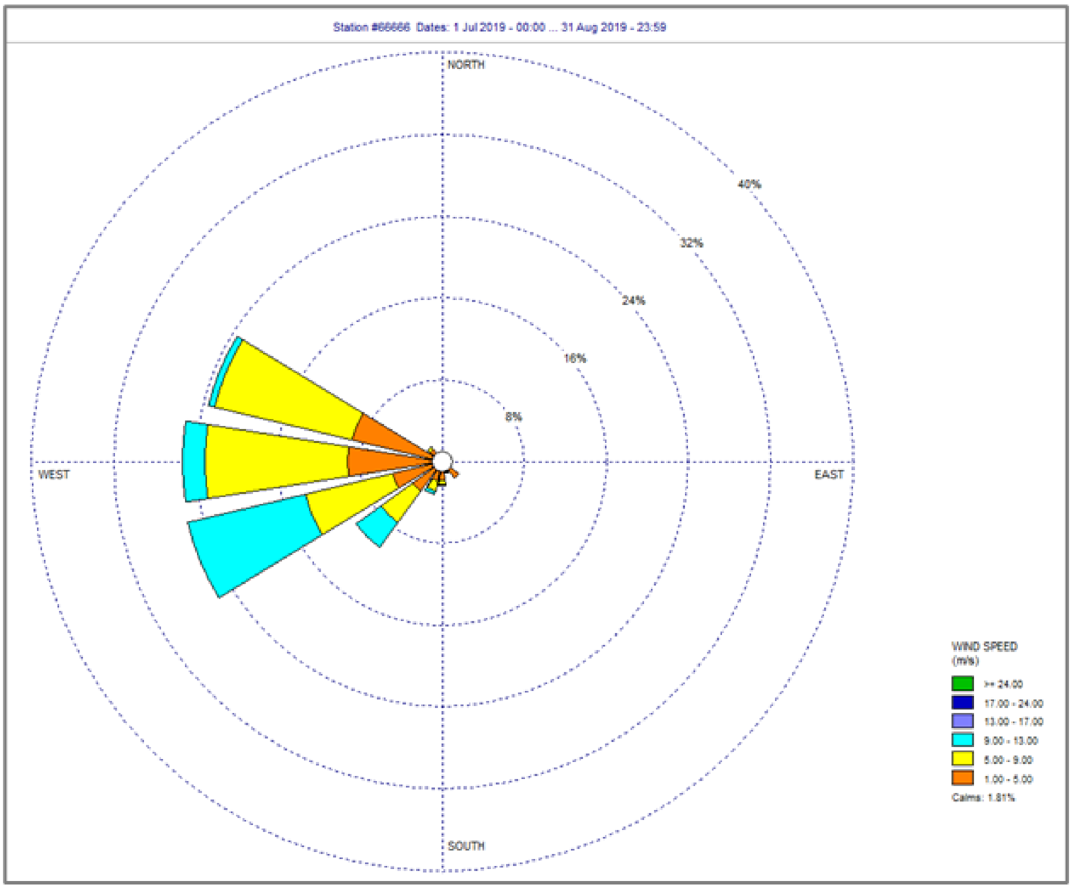


Figure 2-62. Wind rose (top) and wind class frequency distribution (bottom) for January 1, 2019 to February 28, 2019 (based on prognostic meteorological data generated for the project site)



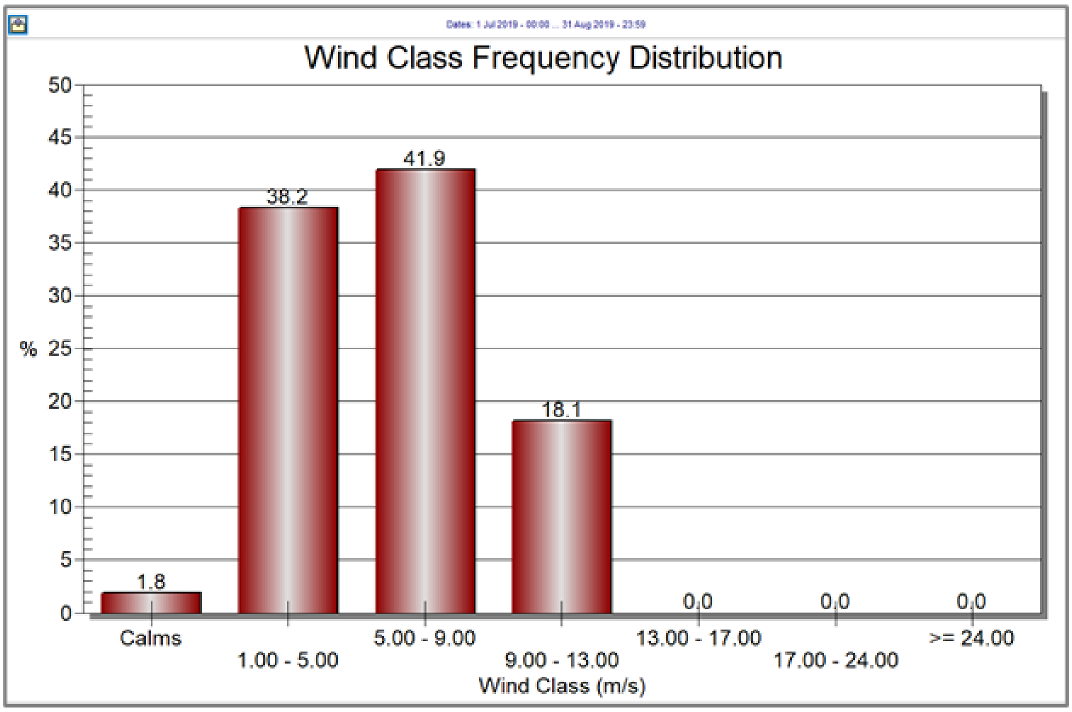


Figure 2-63. Wind rose (top) and wind class frequency distribution (bottom) for July 1, 2019 to August 31, 2019 (based on prognostic meteorological data generated for the project site)

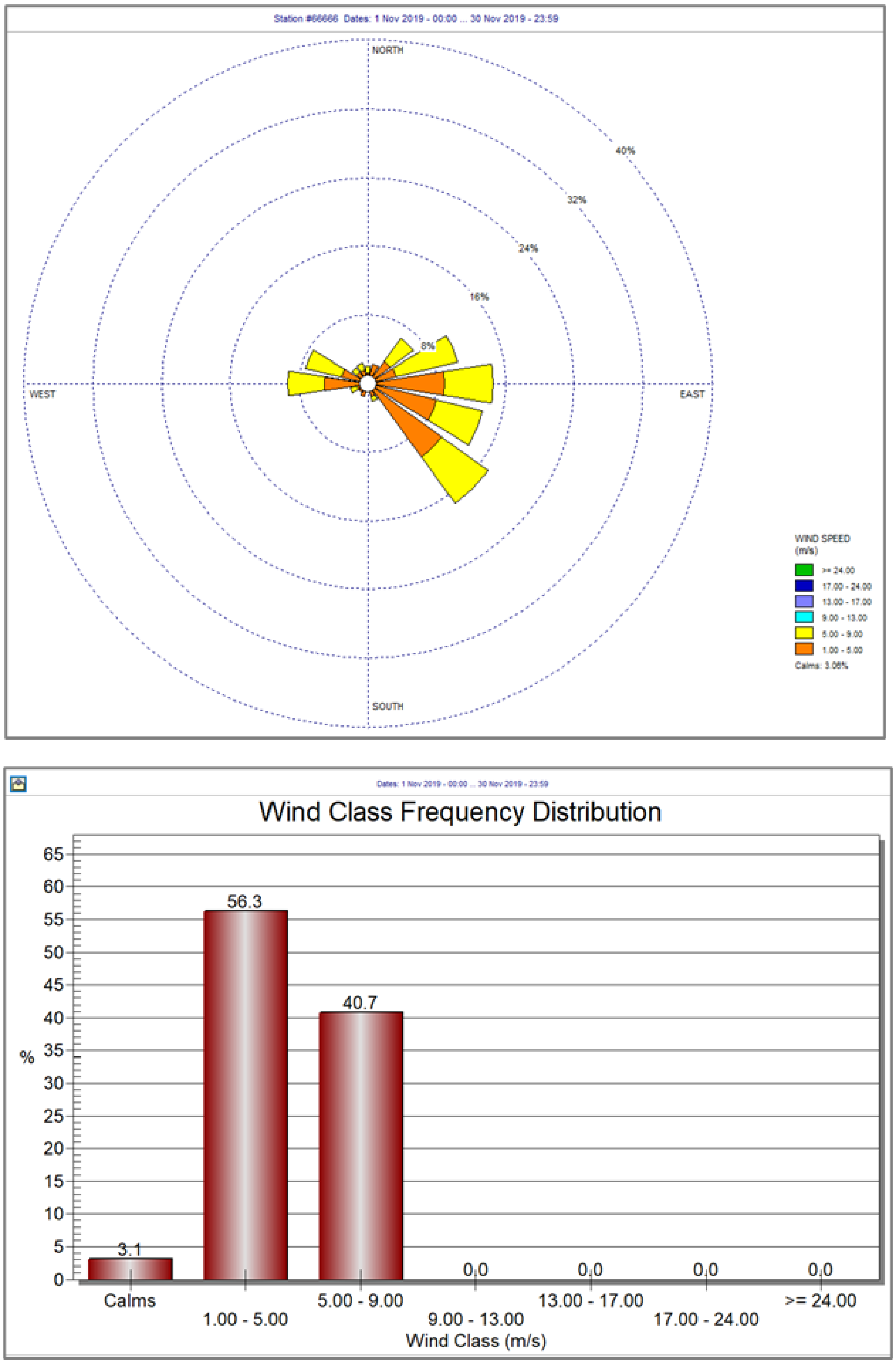


Figure 2-64. Wind rose (top) and wind class frequency distribution (bottom) for November 1 to 30, 2019 (based on prognostic meteorological data generated for the project site

2.2.2.2.2 CHANGE IN BATHYMETRY

The proposed project is not expected to significantly change the bathymetry as there will be no reclamation in the coastal waters of the project site during construction and operation.

2.2.2.2.3 CHANGE/DISRUPTION OF WATER LEVELS AND CURRENTS

Figure 2-65 shows the simulated and predicted/observed tidal heights at the NAMRIA-Batangas City Tide Station. The simulated currents closely coincide with those of the predicted or observed currents. This suggests stability of the simulation throughout the modelling period. The scatter plots of the simulated and predicted/observed show good correlation of about 0.99 (**Figure 2-66**).

Figure 2-67 and **Figure 2-68** show the snapshots of the simulated current patterns during the northeast and southwest monsoon, respectively. Based on baseline observations, currents generally flow to the west during flood tide and reverses during ebb tide. At shallow areas, however, currents may follow the direction of prevailing moderate to strong winds, as depicted in **Figure 2-68**.

In terms of the change or disruption of currents, there could be marginal change or disruption of water currents during construction and operation owing to the presence of piers, barges, and ships in the area. Disruption of water currents would be confined at and in closed vicinity to the pier and berthing facilities at depths of -16 m or less below MLLW.

Further, ships will be anchored at deeper areas at about -17 m to -48 m below MLLW. These depths could provide sufficient clearance between the bottom of seabed and the hull for currents to sufficiently flow below the ships, thus minimizing impacts of currents in vessels. Ships will also be anchored parallel to the coastline and depth contours, thus providing minimal blocking of currents as the latter flows along the direction of the shoreline and the depth contours.

The rise and fall of water (tides) in the area will also not be affected during construction and operation of the project. The project site is in an open sea in which tides are caused by gravitational pull of the moon and to some extent by the sun. The berthing facilities are in relatively deeper part of the coastal area. Water levels will also be affected by other factors, such as seasonal changes and sea level rise due to climate change.

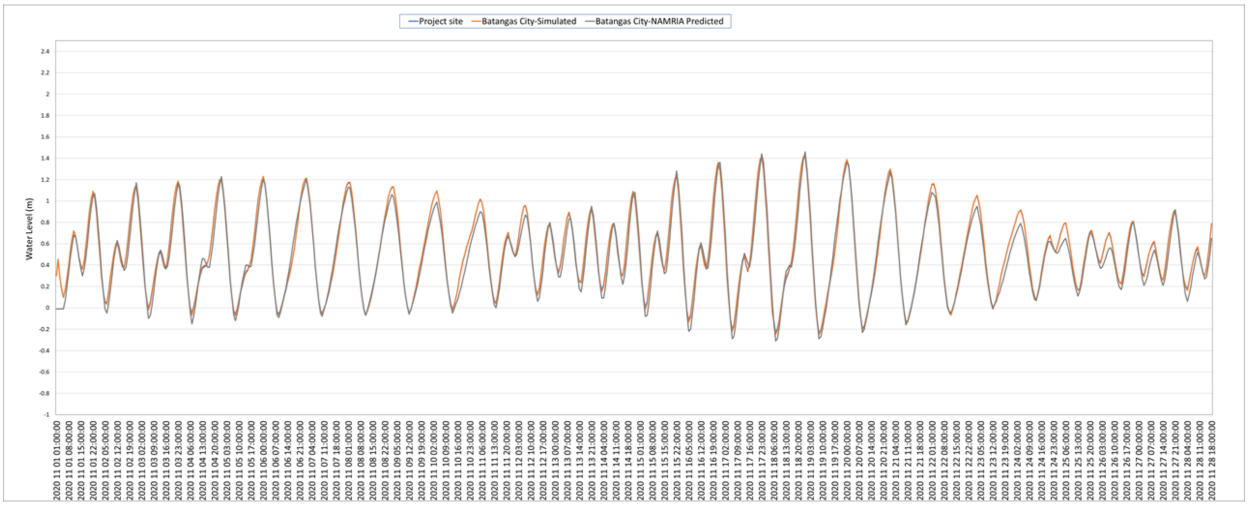


Figure 2-65. Simulated and predicted/observed tidal heights at NAMRIA-Batangas City Tide Station

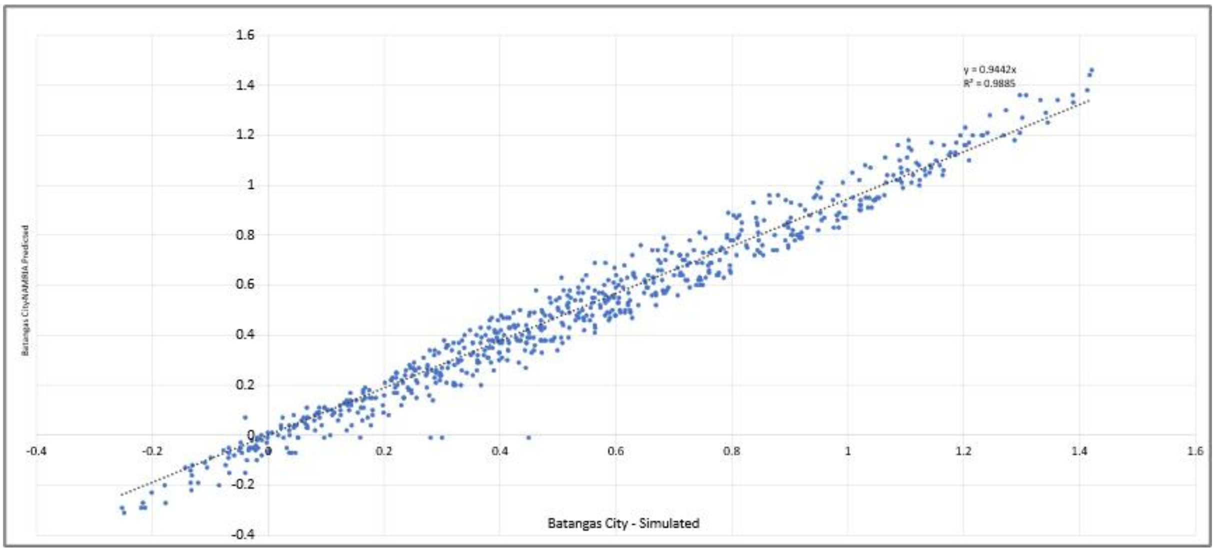


Figure 2-66. Scatter plot of simulated and predicted/observed tidal heights at NAMRIA-Batangas City Tide Station

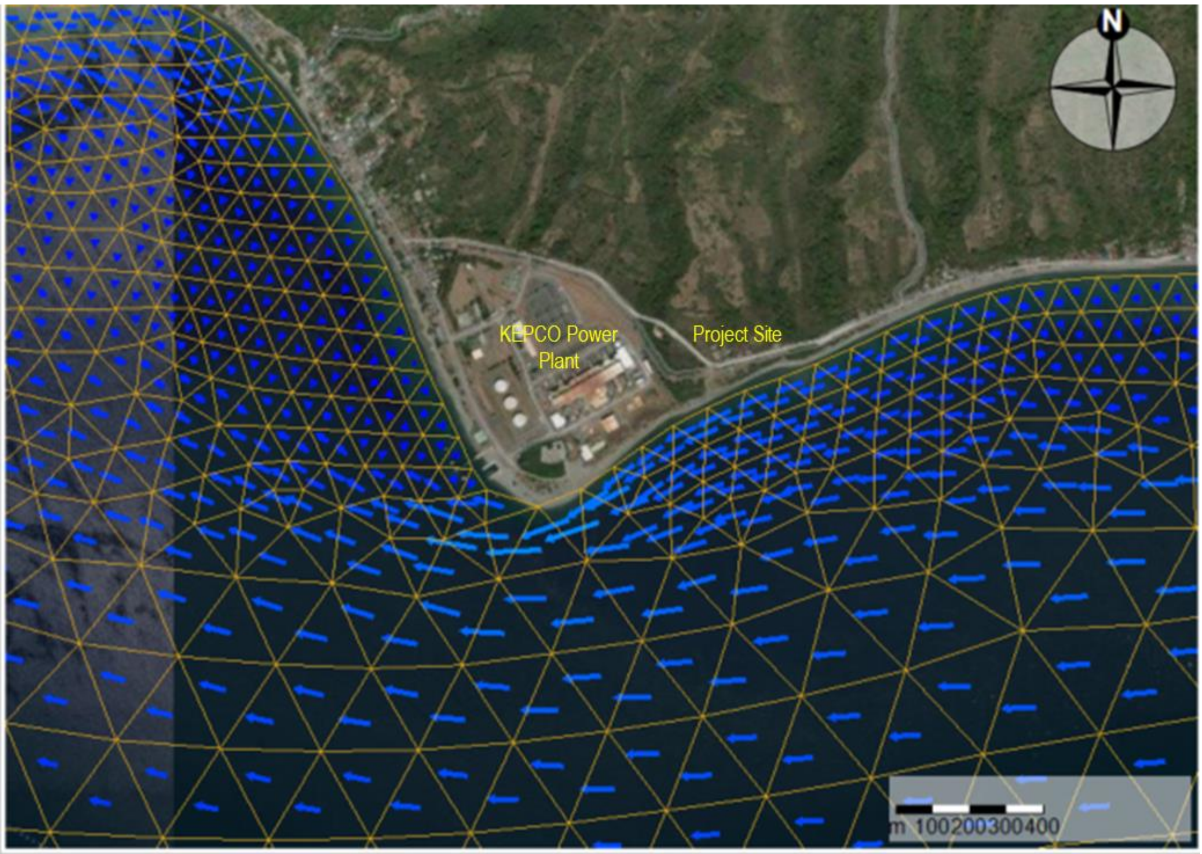


Figure 2-67. Snapshot of simulated water currents during flood tide in northeast monsoon season

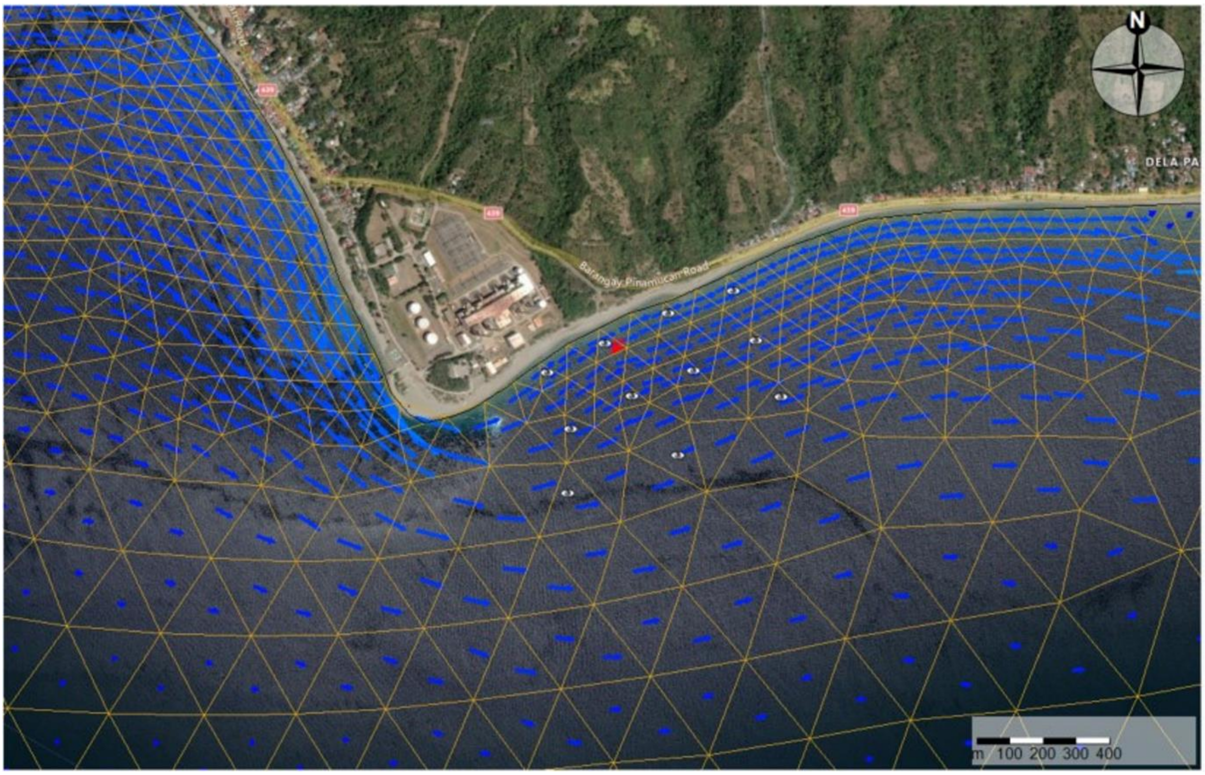


Figure 2-68. Snapshot of simulated water currents during ebb tide in southwest monsoon season

2.2.2.2.4 CHANGE IN WATER TEMPERATURE

Hydrodynamic simulations focused on the release of relatively colder water than the ambient water temperature or intake temperature at the proposed outfall. Per the proponent, the initial design discharge flow is 5.5 m^3/s at temperature of less than or equal to 3°C from the intake. Additional simulations were also performed assuming that the discharge water temperature is 6°C less than the background of ambient water temperature. Simulations were performed using an average background water temperature of 30.5°C, as based on measurements by RHR on October 20, 2020.

Results shown in **Figure 2-69** to **Figure 2-71** indicate varying water temperature levels depending on the currents and wind flows, though notable is that lowest water temperature at grid points or at observation points (Nos. 8, 1, 10, 12, 13, 11, 7, 9, 15, 6 and 14) were greater than 30.1°C (or difference of only about 0.4°C) indicating efficient mixing due to stronger currents and deeper water levels.

As shown in **Figure 2-72** to **Figure 2-74**, simulations included discharges during southwest monsoon season (July 1, 2019 to August 31, 2019), northeast monsoon (January 1, 2019 to February 28, 2019) and November 1-30, 2020 (assuming wind data in November 2019). Note an abrupt decrease in water temperature in the middle of the simulation period (or about 1 month from the start of simulation) as the discharge water temperature was assumed below 6 °C than the ambient levels. This was to allow for constant simulations as the numerical needs to attain stability after the “spin-up” period.

Note that thermal discharges from the outfall of the existing power plant, which is located about 340 m southwest of the proposed outfall, could also augment the increase of water temperature emanating from the relatively cooler water temperature discharges from the proposed project.

In accordance with the proponent’s design specifications, the difference of temperature between the outfall and the intake or ambient levels shall not be greater than 3°C. Hence, any possible impact emanating from large temperature difference between the outfall and ambient water could be avoided or minimized with the prescribed temperature difference.

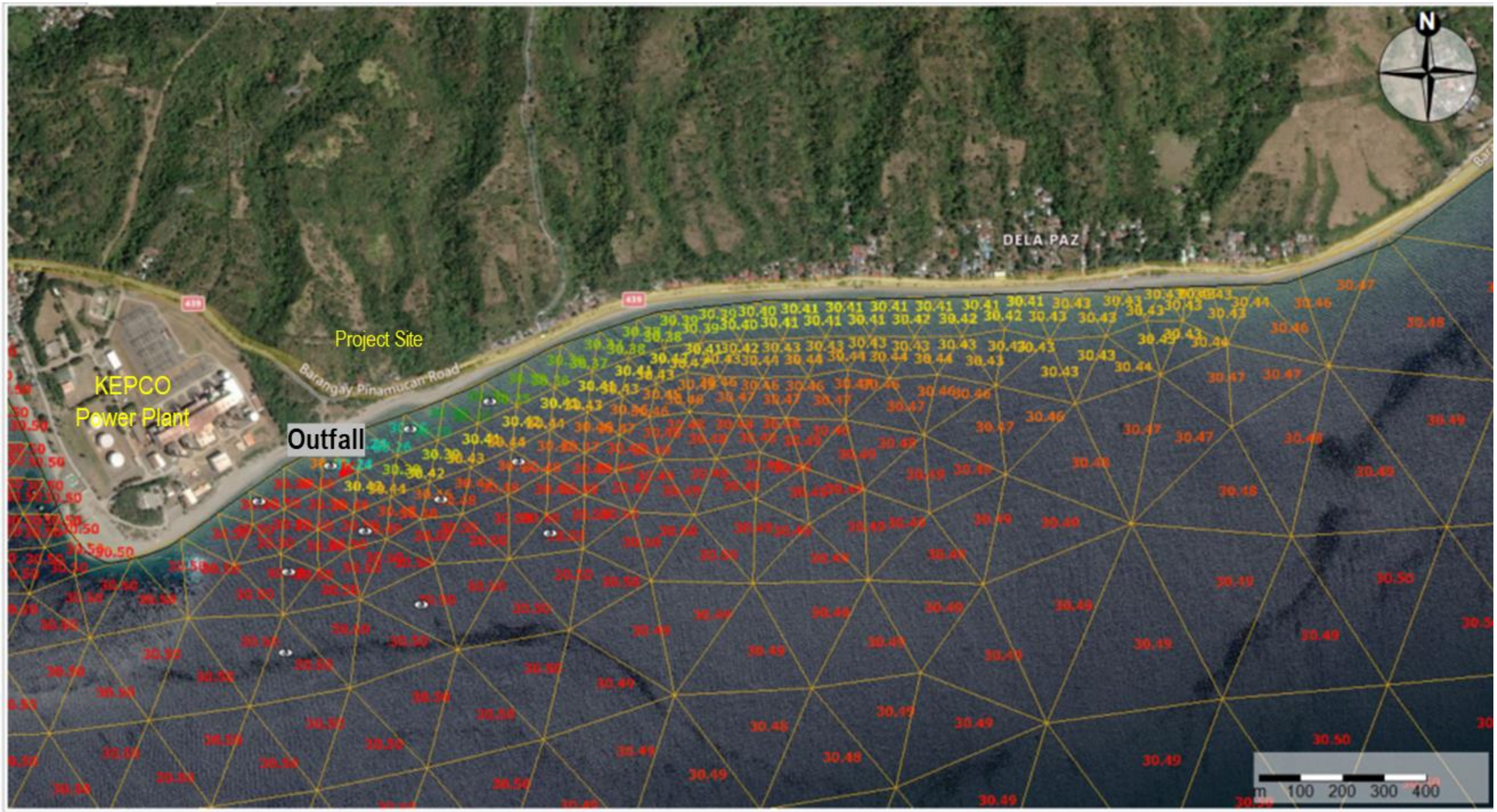


Figure 2-69. Snapshot of simulated water temperature at each computation point/mesh

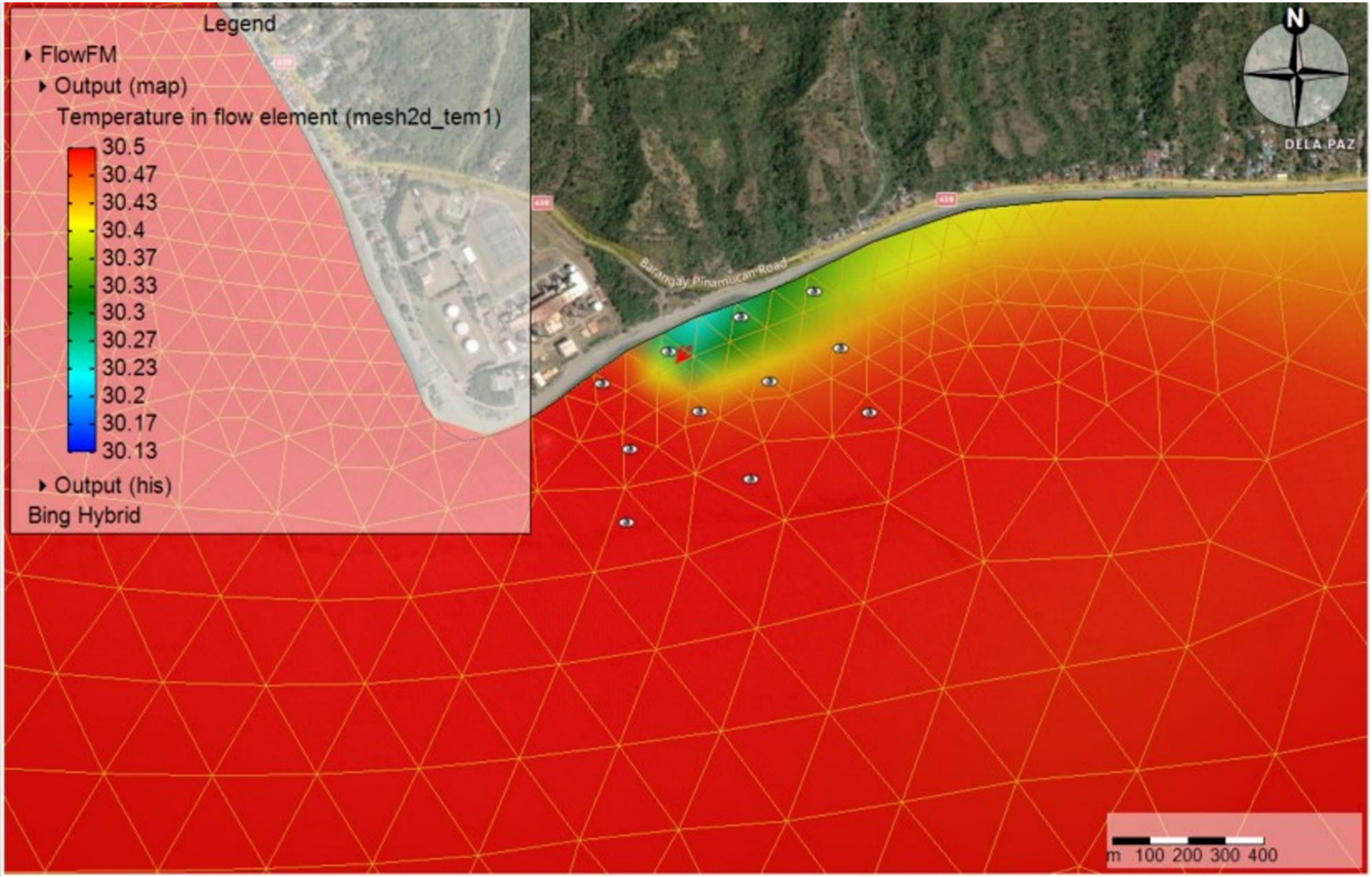


Figure 2-70. Snapshot of simulated water temperature (July-Aug)

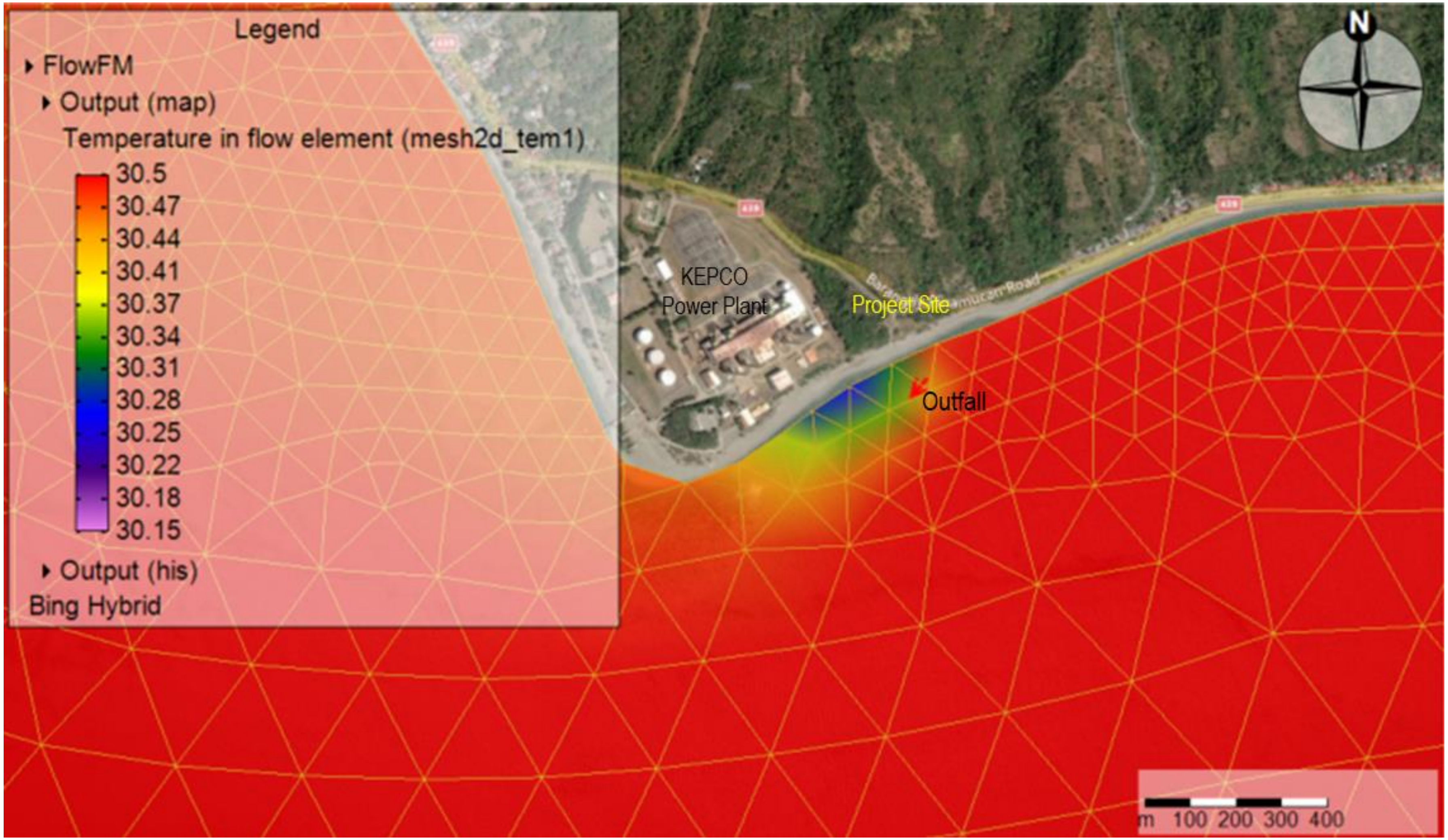


Figure 2-71. Snapshot of simulated water temperature (Jan-Feb)

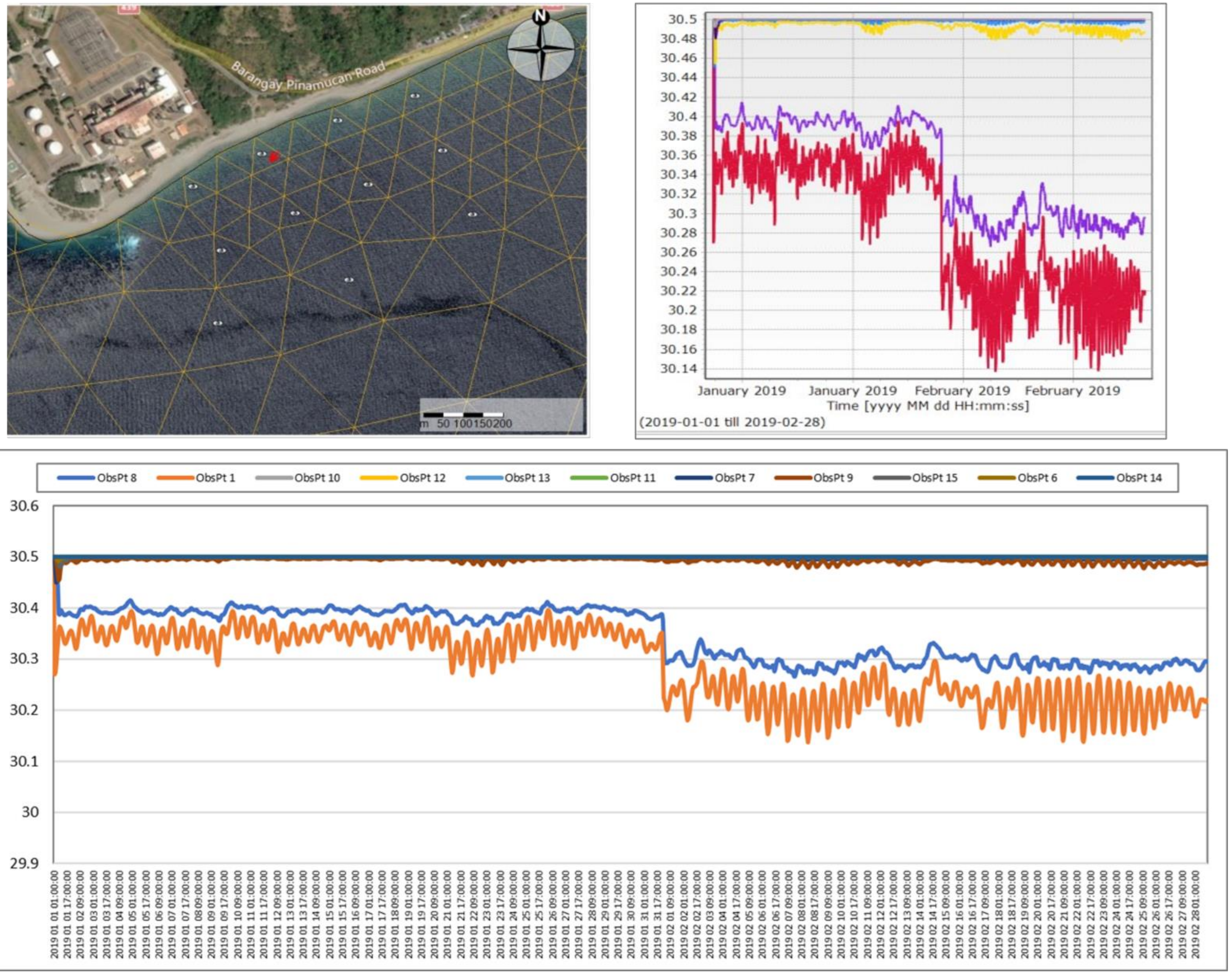


Figure 2-72. Simulated water temperatures at the observation points during northeast monsoon (Jan-Feb)

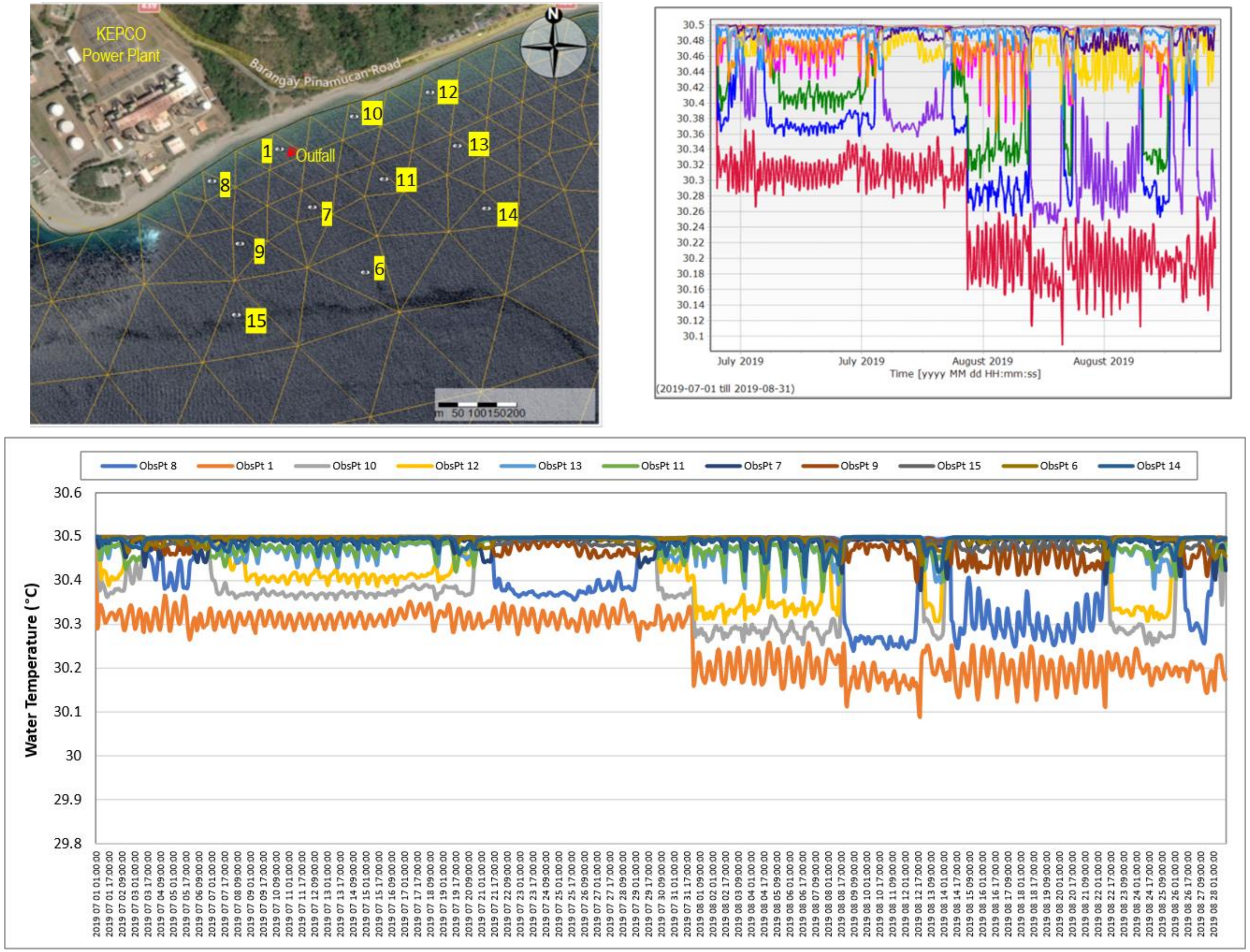


Figure 2-73. Simulated water temperatures at the observation points during southwest monsoon (July-Aug)

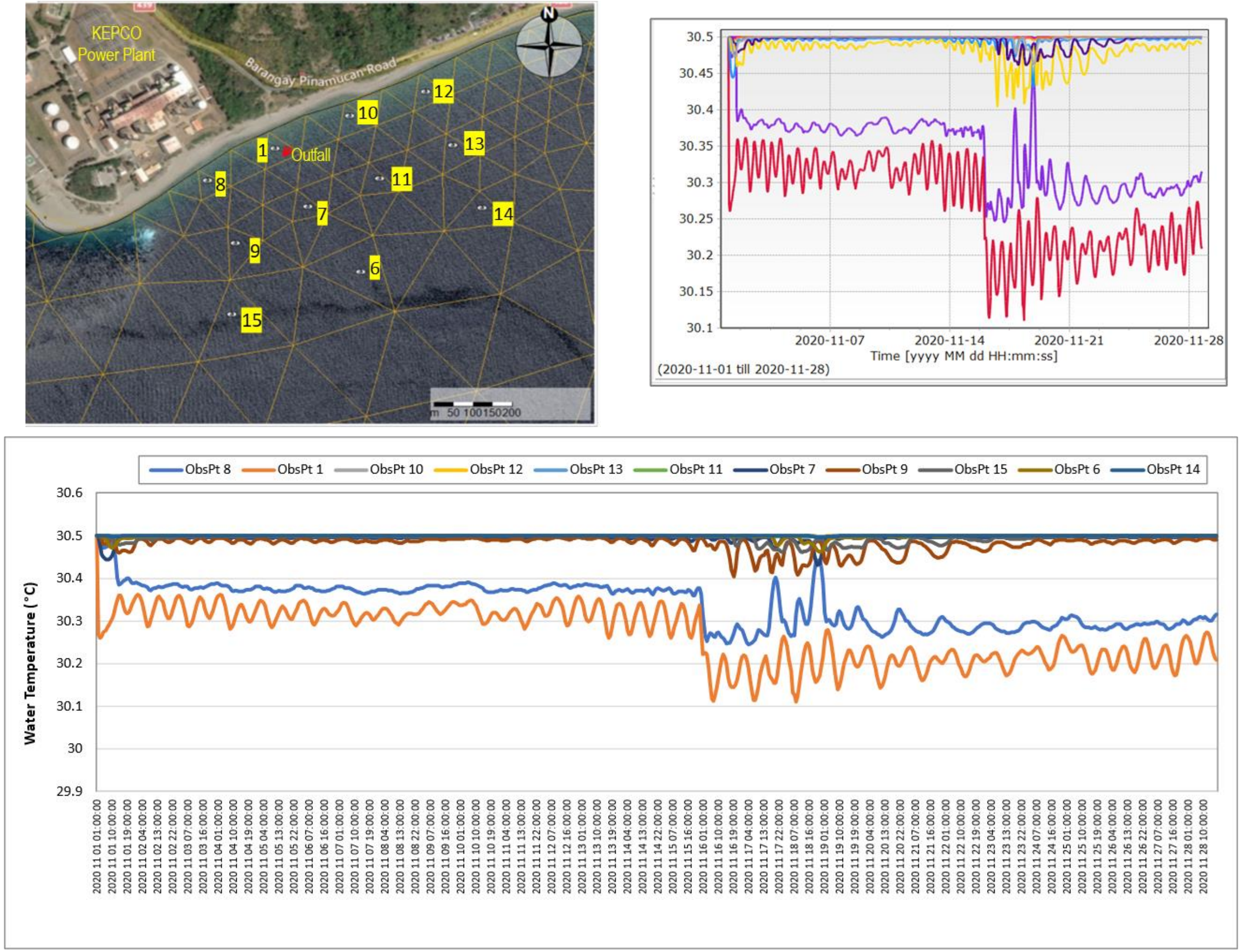


Figure 2-74. Simulated water temperatures at the observation points during transition period (November)

2.2.2.2.4.1 IMPACTS OF STORM SURGE AND SEA LEVEL RISE

2.2.2.2.4.1.1 METHODOLOGY

To assess the hazards of storm surge at the Project site, two (2) general methods were employed:

1. Review and analyses of the following literatures on storm surge assessment in the Philippines and in Batangas City:
   a. 2015 Study on Identification of storm surge vulnerable areas in the Philippines through simulation of Typhoon Yolanda (Haiyan)-induced storm surge levels over historical storm tracks;
   b. 2019 Batangas City Local Climate Change Action Plan (LCCAP): A Convergence of Mitigation and Adaptation
2. Actual storm surge modeling using the Open Source Delft3D FLOW Model. The storm surge model shall be based on 100-year probability of occurrence of the historical wind speed of the strongest typhoon that passed the Philippine Area of Responsibility (PAR) or the highest waves from tsunami that occur in the Philippine coasts. Storm surge risk shall be assessed based on the results of the model.

2.2.2.2.4.1.2 HISTORICAL STORM SURGE AT THE PROJECT SITE

A storm surge is a coastal flood brought about by strong wind as a result of tropical storms. Especially if the site is frequented by storm paths in the Philippines, then the said site may have high risk of storm surge and consequent inundation in the nearby areas. It is caused by strong winds brought by the low pressure at the eye of the storm. The strong winds push sea water, which leads to its accumulation and abnormal increase in water level heading to the shores. A storm surge brings widespread floods which can extend to kilometers from the seashore, depending on the shape and height of the wave. Along with strong waves and forceful winds, a storm surge can destroy and wash away anything in its path. Being a littoral country, the Philippines is one of the countries most susceptible to the danger posted by a storm surge because of its very long coastlines. Areas near the shore are most prone to being hit by a storm surge. People a couple of kilometers away may also be hit depending on the elevation of their area (lowlands are easier to get affected than highlands). A storm surge will have no effect if the shore is steep.

Numerous incidences of destroyed property and loss of lives at different seashores of the country have already been recorded. One of these was Typhoon Undang on November 1984, which brought a far-reaching devastation on the homes and properties of the people living in Basey, Samar. In September 2011, a storm surge once again ravaged the coast of Manila Bay where an enormous wreckage was brought by the force of floods, strong winds, and flush of waves. On November 8, 2013, Typhoon Yolanda (Haiyan) impacted the Philippines with estimated winds of approximately 314 kmh-1 and an associated 5-7 m high storm surge that struck Tacloban City and the surrounding coast of the shallow, funnel-shaped San Pedro Bay.

Section 1.1 present the location and area of the Ilijan LNG Import Facility. **Table 1-1** presents the geographic coordinates of the Project Area. **Figure 1-1** presents the Project Location Map. Based on **Figure 1-1**, the Ilijan LNG Import Facility is located at the shoreline of Brgy. Ilijan, Batangas City. Being located in the shore, the proposed LNG Import Facility is at risk to possible storm surges in the area during passage of tropical typhoons.

Based on the 1912-1975 Historical Storm Surges in the Philippines **(Figure 2-75**), the Project Site experienced a storm surge in 1971. **Figure 2-75** however, did not elaborate how high the storm surge is in 1971 and there's no information also if the 1971 storm surge caused inundation of the nearby low lying areas.

Figure 2-76 on the other hand present the tropical storm paths from 1987-2013. There are strong typhoons with maximum wind speed of more than 119 kmh-1 that passed the coastal area of Batangas City within the shore of the Project site.

From **Figure 2-77** (Tracks of Simulated Tropical Cyclones from 1951-2013), the Project Site is frequently visited by Tropical Cyclones from 1951-2013 which makes the site vulnerable to risk of storm surge and consequent flooding or inundation.

2.2.2.2.4.1.3 PREDICTED STORM SURGE AT THE PROJECT SITE BASED ON 2015 STUDY ON IDENTIFICATION OF STORM SURGE VULNERABLE AREAS IN THE PHILIPPINES THROUGH SIMULATION OF TYPHOON YOLANDA (HAIYAN)-INDUCED STORM SURGE LEVELS OVER HISTORICAL STORM TRACKS

A Study on Identification of storm surge vulnerable areas in the PAR in 2015 conducted by the Nationwide Operational Assessment of Hazards (NOAH) in collaboration with the National Institute of Geological Sciences, University of the Philippines-Diliman and Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) shows that the Project site at the coastal area of Brgy. Ilijan in Batangas City is at risk of 1 to 2 m high storm surge for a wind speed equivalent to the magnitude of Tropical Cyclone Yolanda. The study calculates the maximum probable storm surge height for every coastal locality including the coast of Brgy. Ilijan in Batangas City by running simulations of Yolanda-type conditions but with tracks of tropical cyclones that entered Philippine Area of Responsibility (PAR) from 1948-2013. The study produced a list of the 30 most vulnerable coastal areas that can be used as a basis for choosing priority sites for further studies to implement appropriate site-specific solutions for flood risk management. Another result of the study is the storm tide inundation maps that the local government units can us to develop a risk-sensitive land use plan for identifying appropriate areas to build residential buildings, evacuation sites, and other critical facilities and lifelines. The maps can also be used to develop a disaster response plan and evacuation scheme.

Figure 2-78 presents the maximum storm surge height (m) map of the Philippines as a result of the said study by NOAH. The figure also highlighted the provinces with highest simulated storm surge and population density, i.e., Metro Manila, Iloilo and Leyte. The province of Batangas nor Batangas City where the proposed Ilijan LNG Import Facility Site is to be locate is not among the 30 provinces with a high storm surge level and low elevation coastal zone (LECZ) population density. The predicted maximum storm surge height of provinces with highest simulated storm surge ranges from 2 - 4 m and above while the predicted maximum storm surge at the coastal area of Brgy. Ilijan, Batangas City where the proposed Ilijan LNG Import Facility Project shall be located is only 1 – 2 m.

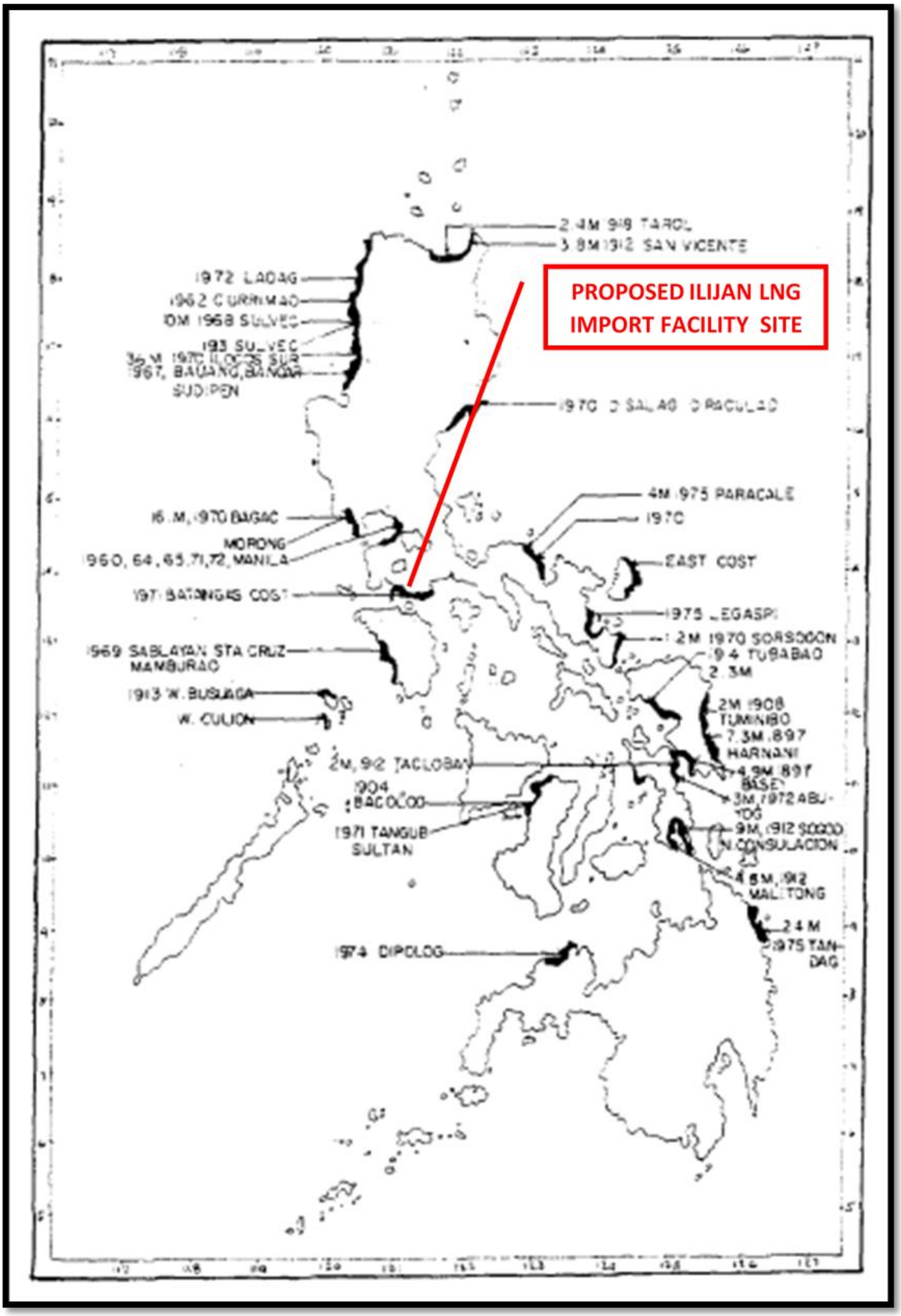
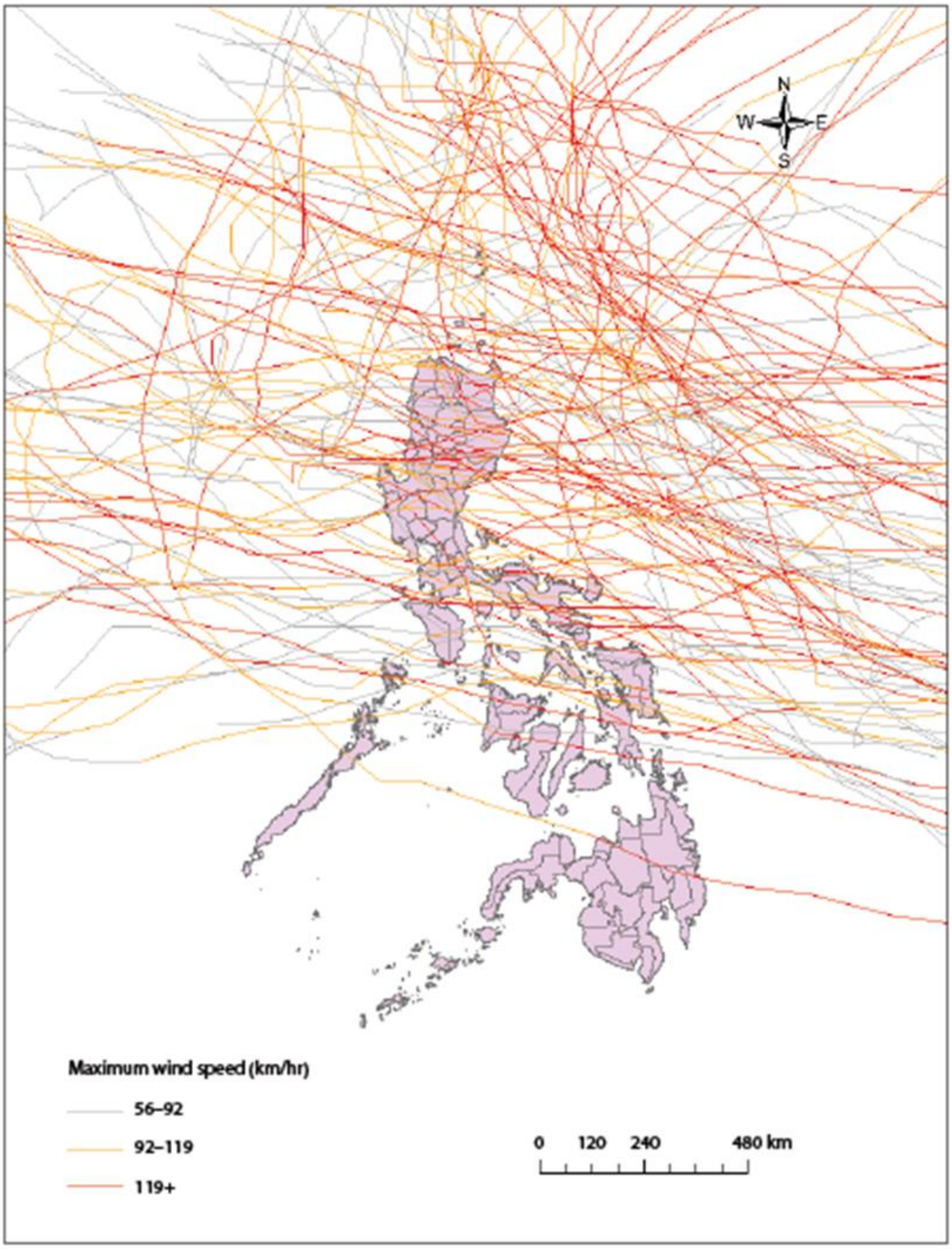


Figure 2-75. Historical Storm Surges in the Philippines (1912-1975). Source: Asian Development Bank



E = east, hr = hour, km = kilometer, N = north, S = south, W = west.
Source: Storm tracks are from Knapp, Kenneth. R., Michael C. Kruk, David H. Levinson, Howard J. Diamond, and Charles J. Neumann. 2010. "The International Best Track Archive for Climate Stewardship (IBTrACS) Unifying Tropical Cyclone Data." *Bulletin of the American Meteorological Society* 91 (3): 363–76.

Figure 2-76. Tropical Storms in the Philippines (1987-2013)

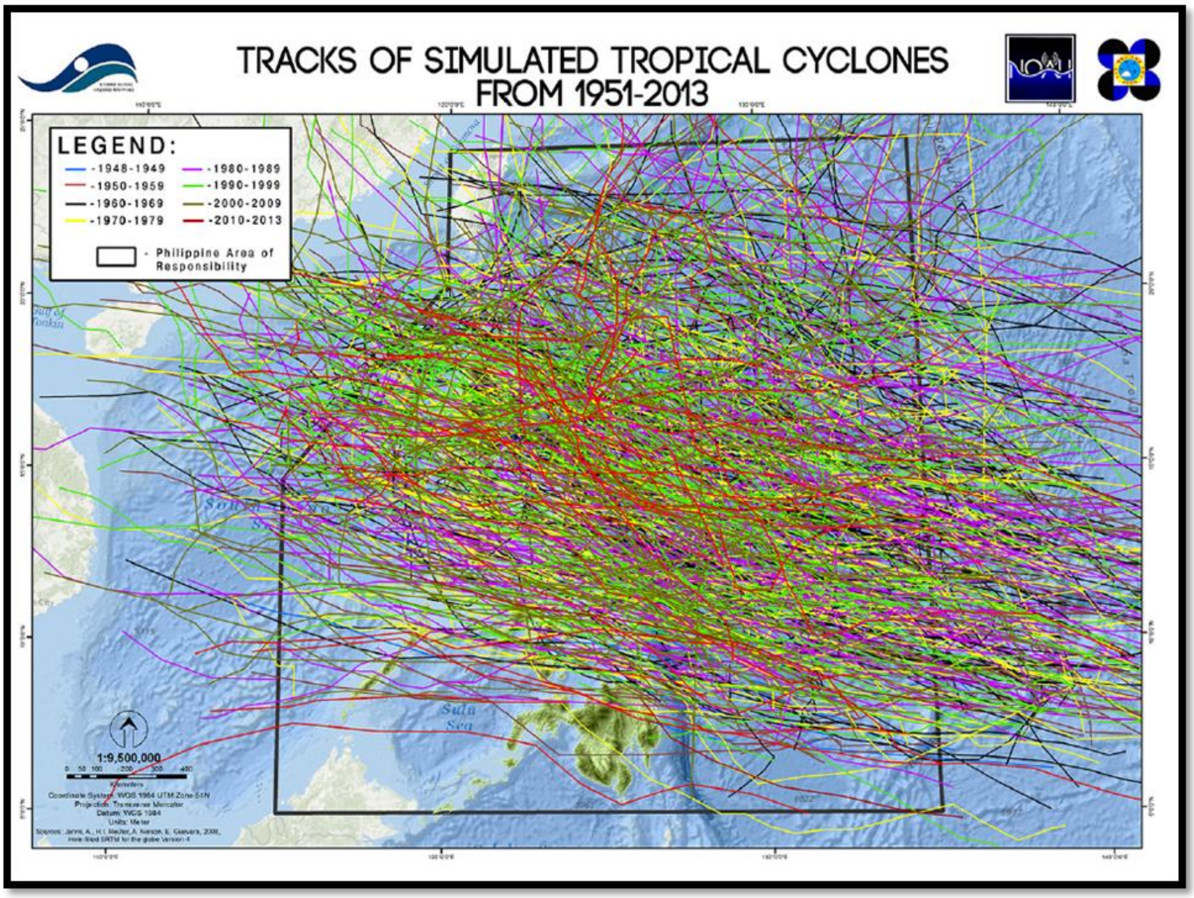


Figure 2-77. Tracks of Simulated Tropical Cyclones from 1951-2013

2.2.2.2.4.1.4 FLOODING VULNERABILITY ASSESSMENT AND PREDICTED STORM SURGE AT THE PROJECT SITE BASED ON THE 2019 BATANGAS CITY LOCAL CLIMATE CHANGE ACTION PLAN (LCCAP): A CONVERGENCE OF MITIGATION AND ADAPTATION

Based on the Batangas City Flooding and Landslide Susceptibility Map (**Figure 2-79**), the coastal area of Brgy. Ilijan is not susceptible to coastal flooding. Only the low-lying barangays including Santa Rita Aplaya, Santa Clara, Cuta, Wawa and Libjo are the most vulnerable to flooding. These barangays can also be severely affected by storm surges. However, after ground truthing, based on the summary of flood hazards assessment and susceptibility in selected Barangays of Batangas City, Coastal Brgys. Wawa and Cuta are at low risks of coastal flooding.

According to the Batangas City LCCAP, based also on the same 2015 NOAH Study in **Section 2.2.2.2.4.1.3**, for Batangas City, The Japan Meteorological Agency Storm Surge Model (JMA Storm Surge Model was used to calculate the storm surge values while FLO-2D was used to map the resulting inundation. For the purposes of the study, Typhoon Glenda (Rammasun) in 2014 was simulated as these had direct impact on Batangas City. A hypothetical typhoon was also simulated using the track of with Typhoon Yolanda's (Haiyan) wind speed and pressure to produce a worst case scenario.

Figure 2-80 and **Figure 2-81** presents the storm surge flow depth and storm surge hazard map for Batangas City, respectively. The model was simulated using Typhoon Glenda's track and Typhoon Yolanda's parameters. In general, the city has low to medium storm surge hazard but high hazard areas can be found very near the coast. The most affected barangays based on the simulation are barangays Santa Rita Aplaya, Sta. Clara, and Wawa. The storm surge hazard reaches the inland portion primarily because of the presence of streams, while high elevation areas are not affected by storm surges. The coastal area of Brgy. Ilijan which is the site of the proposed Ilijan LNG Import Facility has a maximum storm surge depth of 1-1.5 m and is considered at low risk to storm surges.

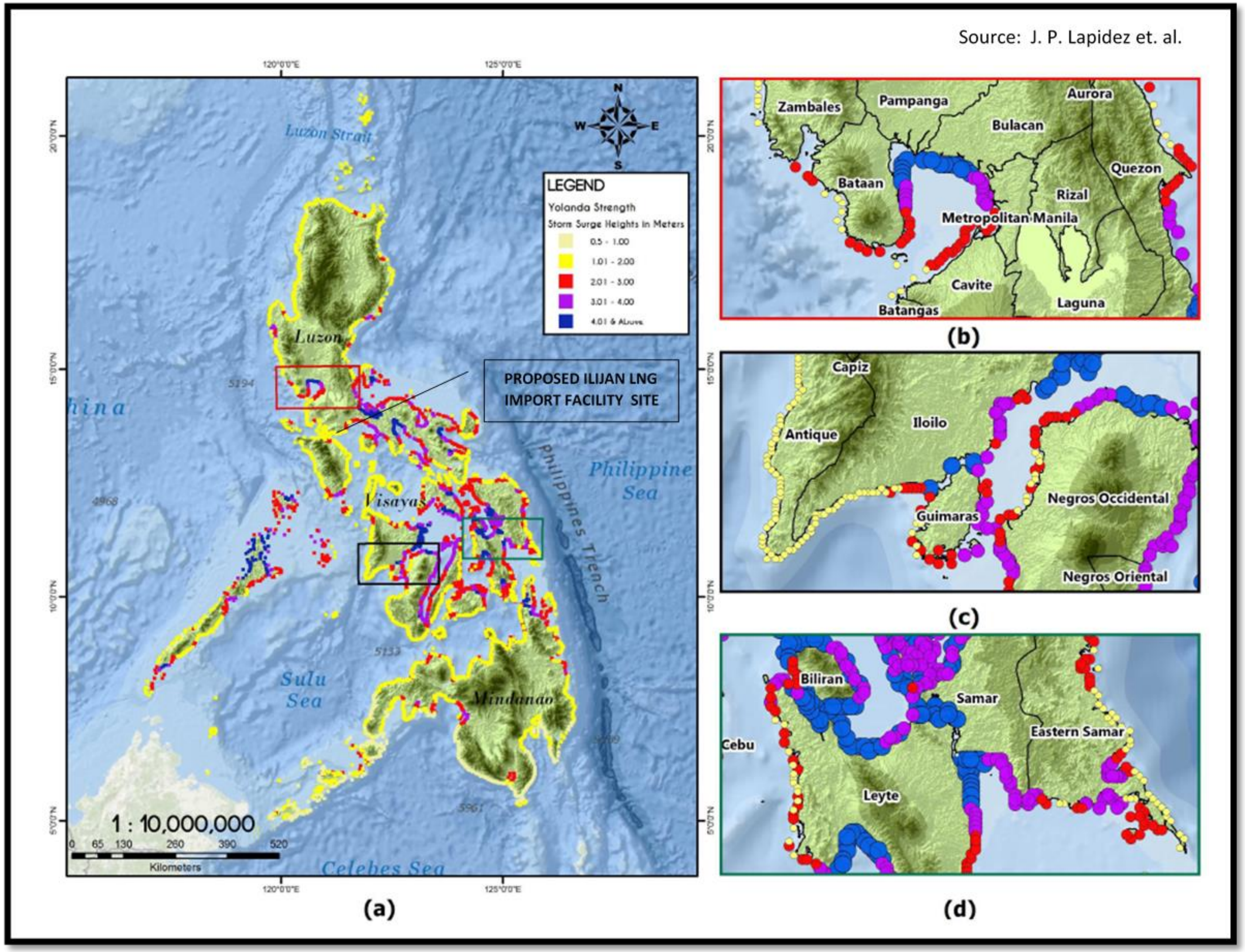


Figure 2-78. Maximum storm surge height (m) map for the (a) Philippines and provinces with highest simulated storm surge and population density, i.e., (b) Metro Manila, (c) Iloilo, and (d) Leyte

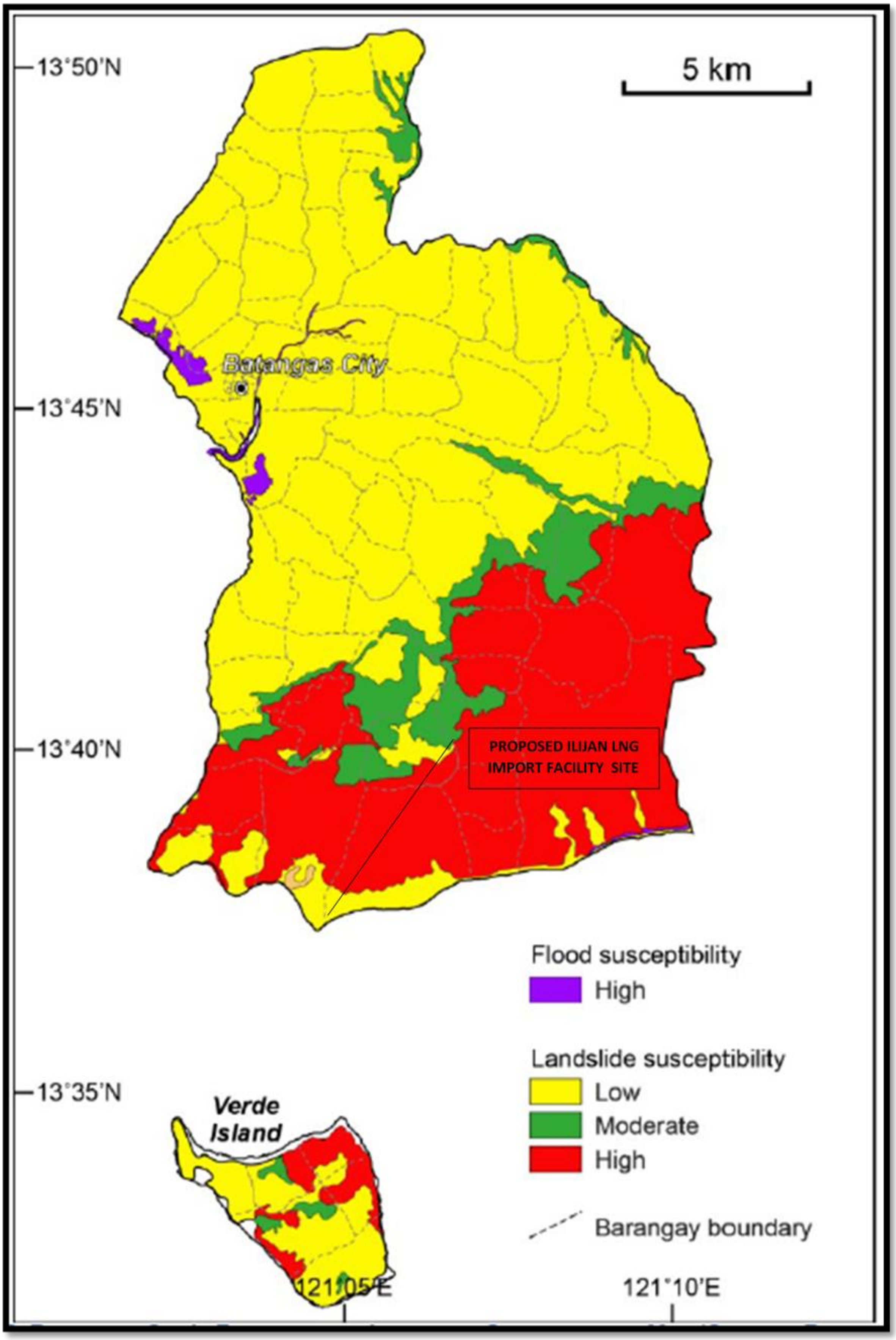


Figure 2-79. Flood Susceptibility Map of Batangas City. Source: Batangas City LCCAP

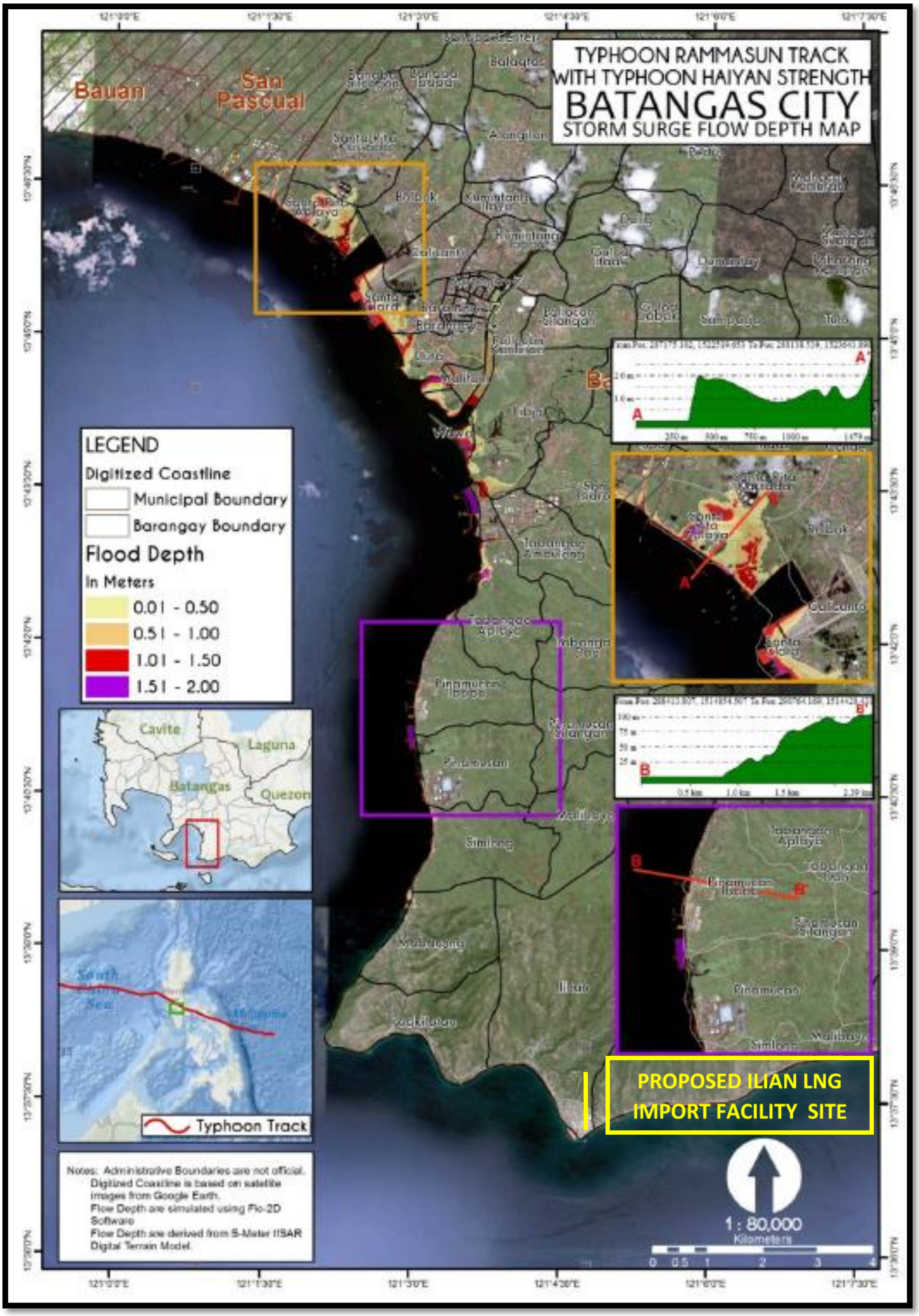


Figure 2-80. Storm Surge Flow Depth Map of Batangas City Simulated Using Typhoon Glenda's (Rammasun) Track and Typhoon Yolanda (Haiyan) Intensity (Source: Batangas City LCCAP)

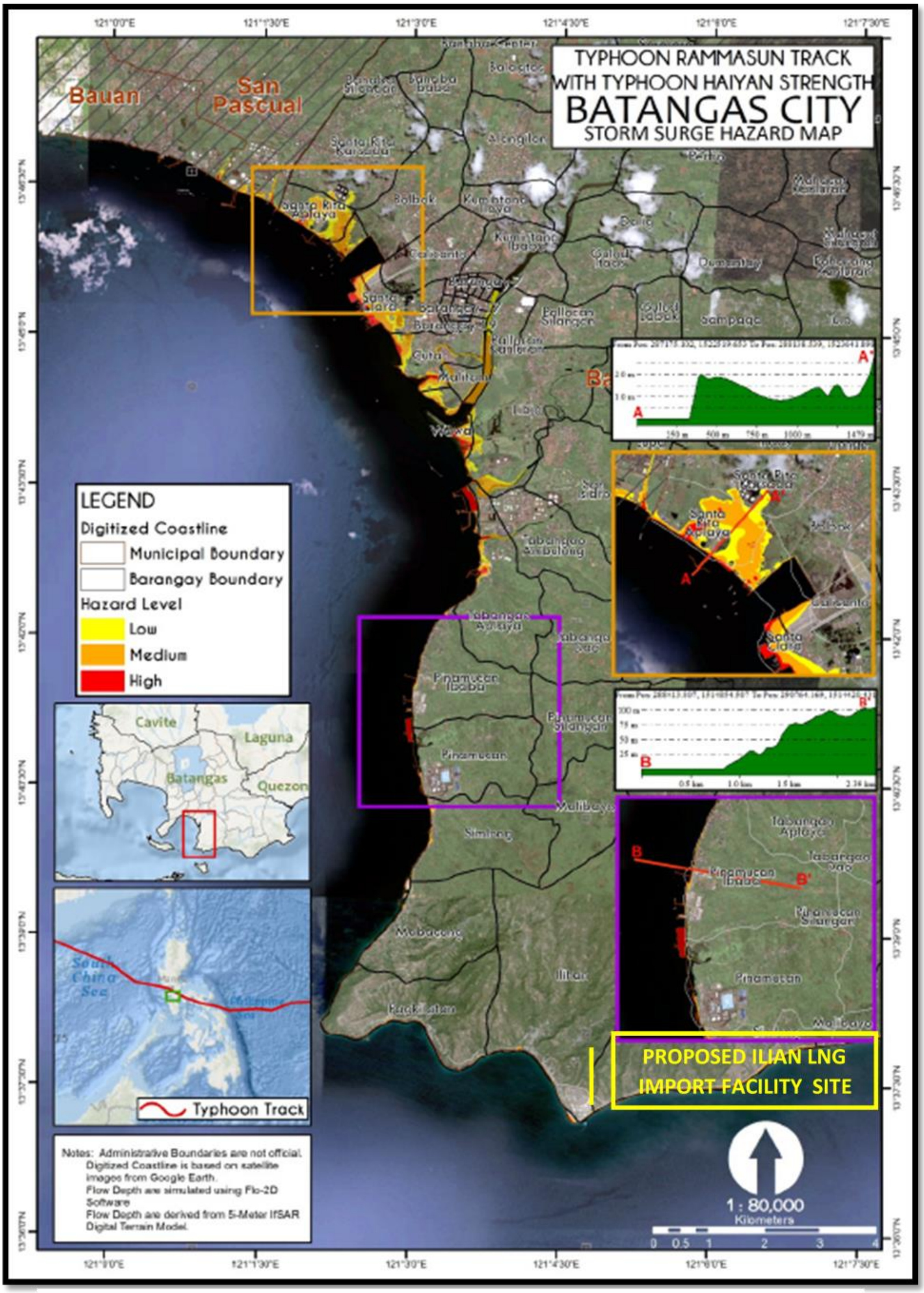


Figure 2-81. Storm Surge Hazard Map of Batangas City Simulated Using Typhoon Glenda's (Rammasun) Track and Typhoon Yolanda (Haiyan) Intensity (Source: Batangas City LCCAP)

2.2.2.2.4.1.5 STORM SURGE SIMULATION USING OPEN SOURCE DELFT3D FLOW MODULE

The storm surge simulation using Open Source Delft3D FLOW Model shall also be done and is on-going. Delft3d is a fully integrated software suite for two-dimensional (2D) and three dimensional (3D) computations for coastal, river, and estuarine areas. It is a robust model for regional and nearshore applications, and the time to set up the model for any event-based forecast for any region is on the order of minutes using the open-source tool Delft Dashboard. Currently, input data are being formatted.

2.2.2.2.4.1.6 ADAPTATION AND MITIGATING MEASURES

From the discussions on the results of storm surge simulations based on the storm track of Glenda and strength of Yolanda, it was or it may be concluded that the proposed project site has a very low risk of being affected by storm surges. The Project Proponent should at least design their facility to withstand the strongest typhoon like that of Yolanda. The Project Proponent as part of their Corporate Social Responsibility (CSR) should collaborate with Batangas City in planning and implementing holistic mitigation and adaptation measures to combat climate change, mitigation and adaptation measures not just for the facilities of the proposed Ilijan LNG Import Facility but also for the whole of Batangas City. Among the adaptation and monitoring measures recommended by LGU Batangas City to abate climate change are: monitoring the integrity of engineering structures along the coast; improve domestic waste disposal to ensure efficient flow of flood waters; and to develop an early warning device/system; and to designate/identify relocation sites for residents.

2.2.3 WATER QUALITY

Presented in this section are the results of the marine water quality baseline sampling conducted on October 20, 2020. A NAMRIA topographic map showing the project location was used for initially identifying the possible locations of water sampling stations which was finalized on site. Based on the project's site development plan, project components will be placed both inland and on the coastal area of Barangay Ilijan. There were no inland waters identified at the project site except for a natural drainage traversing the project area which carries surface runoff from a drainage area. There were also no wells and springs found within the project site. The water quality assessment therefore focused on the marine water within the project area. The sampling map is shown in **Figure 2-82**.

2.2.3.1 METHODOLOGY

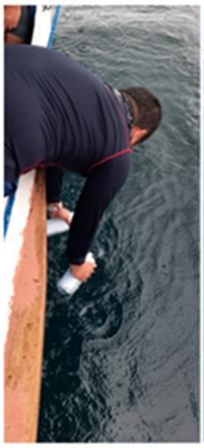
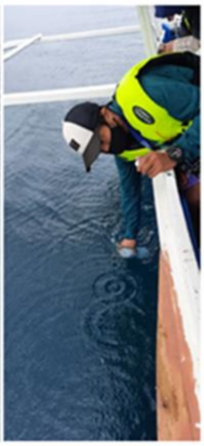
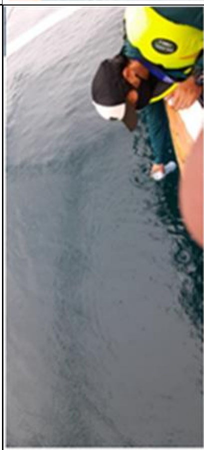
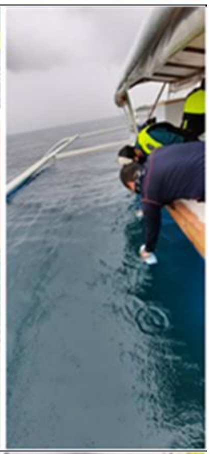
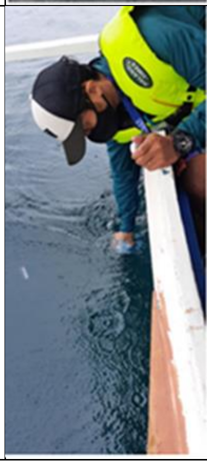
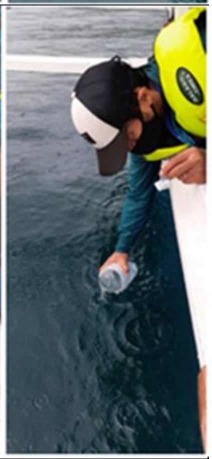
In-situ water analysis and water sampling procedures were done following the guidelines presented in Water Quality Monitoring Manual Volume I: Manual on Ambient Water Quality Monitoring (EMB-DENR 2008). Six (6) grab samples of marine water were taken from strategically located sampling stations within project impact area. Parameters tested in situ were temperature and pH while the following parameters were tested in a DENR accredited laboratory: Color; Dissolve Oxygen (DO); Total Suspended Solids (TSS); oil and grease (O&G); Chemical oxygen demand (COD), Surfactants (MBAS); Phenols; Hexavalent Chromium (Cr6+); Phosphate; Nitrate as Nitrogen (N03-N); arsenic (As); cadmium (Cd); chromium (Cr); lead (Pb), mercury (Hg); Zinc and Fecal Coliform.

The guidelines stipulated in DENR Administrative Order No. 2016-08: Water Quality Guidelines and General Effluent Standards of 2016 were used in the assessment of the status of ambient surface water quality in the study area. Although the coastal waters where the project is proposed to be located is part of the Verde Passage Marine Biodiversity Conservation Corridor, the results of the marine water quality tests were compared to Class SC guidelines based on the intended beneficial use of the marine waters in the area. It should be noted that the project area is identified as a zone for industrial use by the City of Batangas.

Figure 2-82. Marine Water Quality Sampling Map

Table 2-18. Marine Water Quality Sampling Stations

Sample ID	Date & Time of Sampling	Coordinates	Description	Photos
MW1	20 Oct 2020 1120H	13°37'14.45"N 121° 4'54.98"E	Near the proposed seawater intake	
MW2	20 Oct 2020 1100H	13°37'18.57"N 121° 5'4.00"E	Near the outfall of a small natural drainage east of the project site	
MW3	20 Oct 2020 1131H	13°37'10.91"N 121° 4'52.63"E	Near the existing outfall of the adjacent power plant	

Sample ID	Date & Time of Sampling	Coordinates	Description	Photos
MW4	20 Oct 2020 1113H	13°37'14.26"N 121° 5'0.65"E	Jetty area facing inland	 
MW5	20 Oct 2020 1053H	13°37'15.91"N 121° 5'10.22"E	Control station outside the proposed coastal project site eastern side	 
MW6	20 Oct 2020 1107H	13°37'9.69"N 121° 5'1.45"E	Jetty area facing the sea	 

2.2.3.2 RESULTS

Results show that the following parameters – color, O&G, surfactants, phenols, and metals Cr6+, Cd, Cr, Pb, Hg, and Zn – were found to be below their respective method detection limits in all of the marine water samples tested.

In-situ temperature ranged from 30.1 °C to 30.9 °C which were within Class SC WQG range (25-31 °C). Dissolved oxygen in all water samples were at 6 mg/l. Total suspended solids concentration in all samples were within the CLASS SC WQG. TSS found in samples MW3 and MW4 were 1 mg/l while the rest of the samples exhibited TSS levels below method detection limit. Phosphate concentration in samples ranged from 0.02 mg/l to 0.05 mg/l which are all within the Class SC WQG. Nitrate as nitrogen were detected at low concentrations, ranging from 0.01 to

0.04 mg/l, relative to the 10 mg/l WQG. Traces of arsenic were also found in the marine water samples with concentrations ranging from <0.0007 mg/l (MW5) to 0.0042 mg/l (MW6) and were within the Class SC guideline which is at 0.02 mg/l. Arsenic can be naturally found in seawater in concentrations ranging from 0.002 mg/l to 0.004 mg/l. Fecal coliform in marine water sample MW2 was above the 200 MPN/100 ml WQG with value equal to 540 MPN/100 ml. The rest of the marine water samples had fecal coliforms within the Class SC WQG ranging from 7.8 MPN/100 ml to 170 MPN/100 ml.

Significant effluent water quality parameters for this type of project (electric power generation from natural gas) are temperature, pH, COD, TSS, phosphate, chloride, chromium and zinc. These are the suggested minimum parameters to be tested in the effluent samples once the project is operational. In the case of seawater from the heat-exchanger/re-gasification process, COD and chloride need not to be tested in the water to be discharged since the values of COD and chloride are naturally high in seawater.

Table 2-19. Results of water quality analyses for marine waters

Parameters	Sampling Station						WQG (SC)	Units	Method
	MW1	MW2	MW3	MW4	MW5	MW6			
Temperature	30.4	30.4	30.5	30.6	30.1	30.9	25-31	°C	In-situ
Color	<5	<5	<5	<5	<5	<5	75	--	Visual Comparison
Dissolved Oxygen (DO)	6	6	6	6	6	6	5 (min)	mg/L	Iodometric
Chemical Oxygen Demand (COD)	254	197	279	288	209	206	n/a	mg/L	Open Reflux
Total Suspended Solids (TSS)	<1	<1	1	1	<1	<1	80	mg/L	Gravimetric
Oil and Grease	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3	mg/L	Liquid-Liquid, Partition-Gravimetric
Surfactants (MBAS)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	1.5	mg/L	Anionic Surfactants as MBAS
Phenols	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.05	mg/L	Chloroform Extraction
Hexavalent Chromium (Cr^{6+})	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	mg/L	Colorimetric
Phosphate	0.04	0.03	0.03	0.02	0.04	0.05	0.5	mg/L	Stannous Chloride
Nitrate as Nitrogen ($N0_3$--N)	0.01	0.01	0.01	0.04	<0.01	0.01	10	mg/L	Colorimetric, Brucine
Arsenic (As)	0.0016	0.0009	0.0007	0.0008	<0.0007	0.0042	0.02	mg/L	Manual Hydride Generation AAS
Cadmium (Cd)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	mg/L	Direct Air-Acetylene Flame
Chromium (Cr)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	--	mg/L	Direct Air-Acetylene Flame
Lead (Pb)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	mg/L	Direct Air-Acetylene Flame
Mercury (Hg)	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.002	mg/L	Cold Vapor AAS
Zinc (Zn)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.8	mg/L	Direct Air-Acetylene Flame
Thermotolerant (Fecal) Coliform	23	540	170	23	17	7.8	200	MPN/100mL	Multiple Tube Fermentation Technique – Fecal Coliform Procedure

2.2.3.3 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES – WATER QUALITY

2.2.3.3.1 STORMWATER DISCHARGE SYSTEM

Potential project impacts on marine water during construction phase is the increase in TSS due to the generation of contaminated runoff from the construction area. This can be mitigated by enclosing the construction area. Silt traps will be installed along the natural channel present within the area. This is crucial especially during the wet season.

The project will also have a stormwater discharge system consisting of pipes and concrete open ditch channels with cover and/or guard rail on both sides for the plant internal roads. These pipes and channels shall collect runoff water from road surfaces and plant areas and transport it to the main drainage channels.

2.2.3.3.2 SEAWATER FROM THE RE-GASIFYING PROCESS DISCHARGE SYSTEM

Another potential impact change in ambient surface temperature due to the discharge of cool water coming from the heat-exchanger for re-gasification. To mitigate this impact, the discharge system shall discharge the cool water to surface waters in a location that will allow maximum cooling and mixing of the thermal plume to ensure that the change in temperature will not exceed 3 °C. The discharge system shall consider and take reasonable countermeasure on on bubble-formation to prevent the discharge of bubbles to the sea.

2.2.3.3.3 LNG SPILL AND IMPOUNDING PITS

Impounding Pits shall be constructed in case of LNG spills. Areas under LNG piping flanges and unloading arms shall be concrete paved with dike to collect and transport LNG to the impounding pits. Impounding pits shall be made of reinforced concrete with no cover and perlite concrete shall be adopted on surface. The pits shall be kept empty at all times by either providing a sump basin and sump pumps or by other means. LNG spill shall be prevented from flowing down to the storm drainage system by providing splitter boxes in the drains to the impounding pit. Specifically, LNG spills shall be collected from the Process Area, LNG Tank Area and Truck Lorry Area.

2.2.3.3.4 OIL CONTAMINATED WATER DRAINAGE SYSTEM

The project shall have an Oil Contaminated Water Drainage System specifically to prevent potential contamination of surface waters. The oil contaminated water from the BOG/SOG equipment, pump area, transformer, etc., shall be collected by drip pans, curbing or oil sump. The sewers will transport oil contaminated water to the primary wastewater treatment package. Effluent from the primary package shall be directed to a secondary wastewater treatment package to ensure that the effluent comply with the DENR AO 2016-08 Class SC effluent standards prior to discharge to the sea. The design capacity of oil contaminated water shall be based upon the maximum flow of oily water plus storm water under the design rainfall, or the maximum flow of oily water plus fire water, whichever is greater.

2.2.3.3.5 SANITARY WASTEWATER

The project shall install a sewage treatment package to treat sanitary wastewater from toilets in buildings and from the canteen kitchen. Wastewater from food preparation and dishwashing areas in the canteen shall be directed into a grease trap to separate grease before flowing into sanitary sewers. The sanitary wastewater shall be transported through underground piping. Treated wastewater shall be discharged to the sea through the stormwater drainage system following DENR effluent standards for Class SC waters. The sludge shall be treated and disposed according to DENR regulations.

2.2.4 FRESHWATER ECOLOGY

The freshwater river or creek adjacent to the project site was dried up/intermittent during the conduct of study. Therefore, a study on freshwater ecology was not applicable.

2.2.5 MARINE ECOLOGY

2.2.5.1 METHODOLOGY

The 9-hectare *Linseed Field Power Corporation* - Ilijan LNG Terminal and Import Facility are located in Batangas Bay, approximately 9.5km south of Batangas City, Philippines. A floating storage unit with berthing and mooring dolphins will be positioned in coastal waters 300 meters from the land-based facility (**Plate 2-8**). The proposed project is adjacent to existing Ilijan Power Plant and Kepco Ilijan Corporation (**Figure 2-83**).

Figure 2-83. Location of the proposed Linseed Field Power Corporation - Ilijan LNG Terminal Facility and Import Facility in Barangay Ilijan, Batangas City.

Plate 2-8. Coastal area in front of the proposed Ilijan LNG Terminal Import Facility in Barangay Ilijan, Batangas City.

The survey methods employed follow standard coastal resource survey techniques prescribed by English et. al. (1997) and modified in accordance with in-situ conditions employing prescriptions developed though rapid coastal assessment processes evolved in several coastal management projects (e.g. DENR - Coastal Resource Management Project (CRMP) and the BFAR - Fisheries Improved for Sustainable Harvest (FISH) Project.

Assessment of distribution and diversity of primary coastal habitats and benthic resources in the coastal impact area of the proposed LNG Import Facility Project in Barangay Ilijan, Batangas City was conducted by a team of fisheries and marine biologists on 27-28 September 2020 (**Plate 2-9**). The assessment is focused on scientifically documenting the existence and condition of a range of coastal habitats, ecological resources and resource use practices found within a three (3) - kilometer stretch of coastline covering the expanse of coastal waters considered as primary impact area of the proposed project. The objective of the assessment is to account and describe the condition of primary benthic habitats principally corals, seagrass, mangroves, plankton, benthos and reef-associated fish species, its associated fisheries resources, resource use practices and ecological functions that can be potentially disrupted or be subjected to stresses associated with potential anthropogenic environmental issues attributable to the establishment and operation of the LNG facility. By obtaining data on the condition and distribution of resources in the impact area employing consistent survey protocols, susceptible end points and critical benthic habitats can be characterized in their current state and identification of potential causes and pathways of stressors can be defined for implementation of mitigating measures and for future monitoring purposes. The evaluation is therefore broad and far and included recording of coral diversity in a small reef found outside of the project's impact area. Overall, the survey was designed to generate meaningful information that can be the basis for making informed decisions on how to address possible issues emanating from port operations and to recommend appropriate mitigating measures and safety nets that will help in sustaining ecological integrity in the coastal impact area of the project.

Plate 2-9. Marine ecology research team doing baseline assessment in the coastal impact area of the proposed Ilijan LNG Terminal Facility and LNG Import Facility in Barangay Ilijan, Batangas City.

The scope of work of the marine ecology baseline assessment was focused on the conduct of the following surveys (**Figure 2-84**):

- Validate the presence or absence of corals through rapid broad area assessments using repetitive and rigorous manta tow surveys;
- Determine benthic substrate and general benthic morphology in front of the proposed project site through sport dives and systematic snorkelling;
- Determination of distribution and composition and coral cover and associated benthic life forms and abiotic components where they occur;
- Definition of species richness and abundance of reef-associated fish communities in fish visual census survey stations;
- Rapid assessment of species composition, estimation of catch rates of primary target species of fish, and fishing gears employed; describe other fishing effort and fishing practices near the proposed project site through key informant interviews;
- Determination of species, composition, density, and diversity of seagrasses and associated macro-benthic algae if present in the impact area;
- Determination of major macro-invertebrate species of commercial importance for food and trade of local fishers in the sandy beach fronting the project site;
- Survey of plankton and benthos community composition in selected stations.

Extensive characterization of significant coastal habitats present in the primary impact area of the LNG project is designed to give a distinct snapshot of the current condition of the coastal environment and the marine resources present in the area at the time of sampling. The intensive survey stations investigated around the project site offers a definitive pattern of ecological characteristics and attributes which can be utilized as baseline reference for predicting environmental impacts and defining the most suitable mitigation measures. Moreover, the baseline data sets can be used as a reliable benchmark for comparison with data sets obtained in future monitoring activities by the multi-sectoral monitoring team, if the same sampling stations are monitored.

The survey methods employed follow standard coastal resource survey techniques prescribed by English et. al. (1997) and modified in accordance with in-situ conditions employing prescriptions developed though rapid coastal assessment processes evolved in several coastal management projects (e.g. DENR - Coastal Resource Management Project (CRMP) and the BFAR - Fisheries Improved for Sustainable Harvest (FISH) Project.

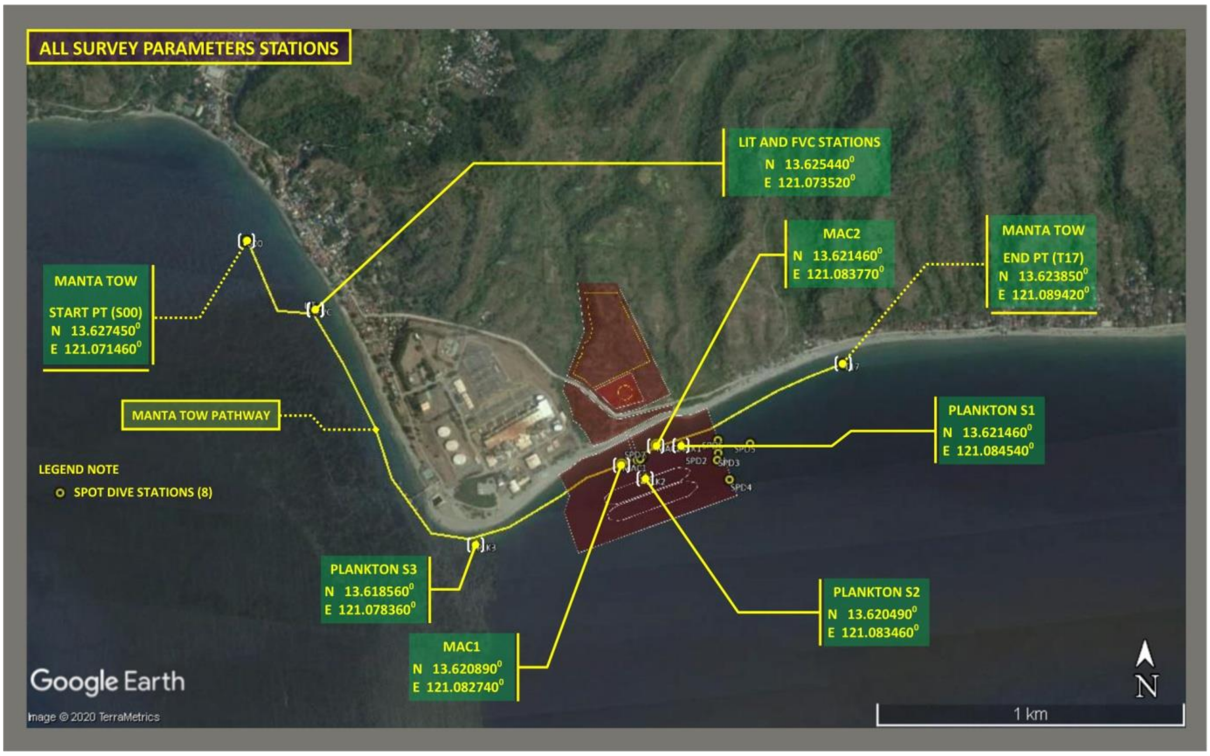


Figure 2-84. Map showing all sampling stations during marine ecology baseline assessment - Linseed Field Power Corporation - Ilijan LNG Terminal and Import Facility Project

2.2.5.1.1 CORALS

Two survey methods were employed to determine spatial distribution and abundance of live coral cover.

2.2.5.1.1.1 MANTA SURVEY METHOD FOR OBSERVATION OF CORAL COVER IN THE REEF FLAT AND GENERAL COASTAL HABITAT CONFIGURATION

Manta Tow surveys (**Plate 2-10**) were conducted in continuous stations in order to determine whether corals or sea grass occur in the benthic environment over a long stretch of seabed across the coastal impact area of the LNG Project. The manta tow stations included coastal waters outside f the impact area. The manta tow method is useful in generating a general profile of benthic resources as it permits observation of the condition, distribution and abundance of benthic habitats in a continuous stretch of the coastal environment. Estimates of percentage distribution of coral reefs and associated benthos observed within the tow stations are recorded in accordance with standard categories to document distribution of coral life forms and the collective picture generated can show a fairly accurate description of the overall state of the coastal area under study. The manta tow surveys also enable the identification of the location of sea grass meadows, if present in the area. In areas where significant coral reefs occur, results from a manta tow survey are used to pinpoint the locations of ideal stations where more detailed underwater coral reef characterization employing line transects are undertaken. A total of seventeen (17) manta tow survey stations were investigated covering a stretch of near shore waters approximately 2.6 kilometers long outside and inside the coastal impact area f the LNG Project in Barangay Ilijan (**Figure 2-85**). The coordinates of the manta tow survey stations are listed in **Table 2-30** in the discussion of results.

Plate 2-10. Manta tow observer being pulled across the coastal impact area (left); scuba diver about to conduct coral line intersect survey (right).

Figure 2-85. Manta tow stations surveyed in coastal waters fronting Linseed Field Power Corporation - Ilijan LNG Terminal and Import Facility project site in Barangay Ilijan, Batangas City during marine ecology baseline assessment; 27-28 September 2020. (Map by Jose Rene Villegas; October 2020).

2.2.5.1.1.2 CORAL LINE INTERCEPT TRANSECT (LIT) FOR DETAILED CORAL ASSESSMENT

Manta tow observations revealed that no patches of coral colonies occur in front of the project site except for isolated colonies of mostly dead corals with algae in deep water. A short reef flat was, however, encountered in manta tow stations 2 and 3 in Sitio Silangan, Ilijan, located around the Ilijan headland about 1.4 km west of the project site. This small reef patch was subjected to more detailed coral survey employing the line intercept transect (LIT) method.

A line-intercept method (English, et. al., 1994) of coral reef assessment is used to more precisely estimate the relative abundance of living and nonliving components in a survey station where more prominent coral reef resources occur. A major advantage of LIT is that it can pinpoint susceptible life forms that can be invariably affected by anthropogenic issues. The survey protocol involved the laying out of 50-meter transects parallel to the shoreline and spatially following the reef crest isobaths. The survey team recorded all observed benthic life forms along the transect line and the survey therefore provides more precise information of percent coral cover as well as species distribution of corals in a given area. The stations and results of the baseline LIT can be the basis for future monitoring as they are repeatable and comparable. The overall characterization of coral life forms are described following standard categorization as shown in **Table 2-20**.

Table 2-20. Criteria for Determining Condition of Coral Reef (Gomez, et. al., 1994)

Category	Condition in terms of live coral cover distribution within the transect
Excellent	76-100% coverage live coral cover
Good	51-75% coverage live coral cover
Fair	26-50% coverage live coral cover
Poor	0-25% coverage live coral cover

The coordinates of the LIT station are listed in **Table 2-21** and depicted in **Figure 2-86**.

Table 2-21. Coordinates of line intercept station for detailed survey of coral diversity and distribution by standard categories in the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020.

WP Code	LATITUDE	LONGITUDE	REMARKS
LIT1 28 Sept 2020	N 13.62544	E 121.07352	Located in shelf in front of resorts in Sitio Silangan, Bgy. Ilijan. Reef crest in 6.5 m of water. About 1.2 km East of project site

Figure 2-86. Map showing location of coral line intercept station for detailed survey of coral diversity and distribution by standard categories in the coastal impact area of the Linseed Field Power Corporation - Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020. (Map prepared by Jose Rene Villegas, October 2020).

2.2.5.1.1.3 SPOT DIVES

The manta tow revealed several rocky outcrops with isolated small colonies of corals growing in the rocks and dead coral boulders near the proposed site of the floating storage unit in the vicinity of Tow number 12 (coordinates N 13.62089; E 121.08274) and in contiguous areas. Since the rocks are few and far between and only a minor portion support dead corals in a deep sandy substrate (8 to 35.1 meters at low tide on 28 September and November 5, 2020), several spot dives was undertaken (on 28 September and November 5) in lieu of the line intercept method which was not feasible due to the wide distances between rocky outcrops. A total of eight (8) spot dives to validate the nature of the rocky outcrops were conducted. The coordinate of the spot dive stations are listed in **Table 2-22** and shown in the location is shown in a map in **Figure 2-87**.

Table 2-22. Coordinates of a spot dive stations for validation of the absence of corals in rocky outcrops South and northwest of the *Linseed Field Power Corporation* Ilijan LNG Terminal and Import Facility project site for the floating facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020 and 4 - 5 November 2020.

WP Code	LATITUDE	LONGITUDE	REMARKS
SD1	N 13.621040	E 121.083210	Located in the floating facility site in shelf with rocks with scanty coral settlers that are far between. LIT transect not feasible. Few coral settlers are growing in rocks with dead coral outcrops. School of triggerfish -12 cm TL
SD2	N 13.62125	E 121.08566	Cluster of rocks located about 200 East of floating facility site; depth at 8 meters (low tide); School of triggerfish -12 cm TL Depth at 14.5m; located East of the floating facility site
SD3	N 13.62104	E 121.08563	About 200 meters from shoreline, East of the floating facility; Depth 21.3m
SD4	N 13.62047	E 121.08600	Located SE of site of floating facility; depth at 35.1m
SD5	N 13.62152	E 121.08662	Located East of site of floating facility; at a distance of about 250 meters; depth at 20.8 m
SD6	N 13.62162	E 121.08565	Located East of the floating facility, about 200 meters; depth at 10 m
SD7	N 13.62107	E 121.08331	Located near site of floating facility; depth at 7 m
SD8	N 13.62113	E 121.08337	Located near site of floating facility; depth at 6.1 m

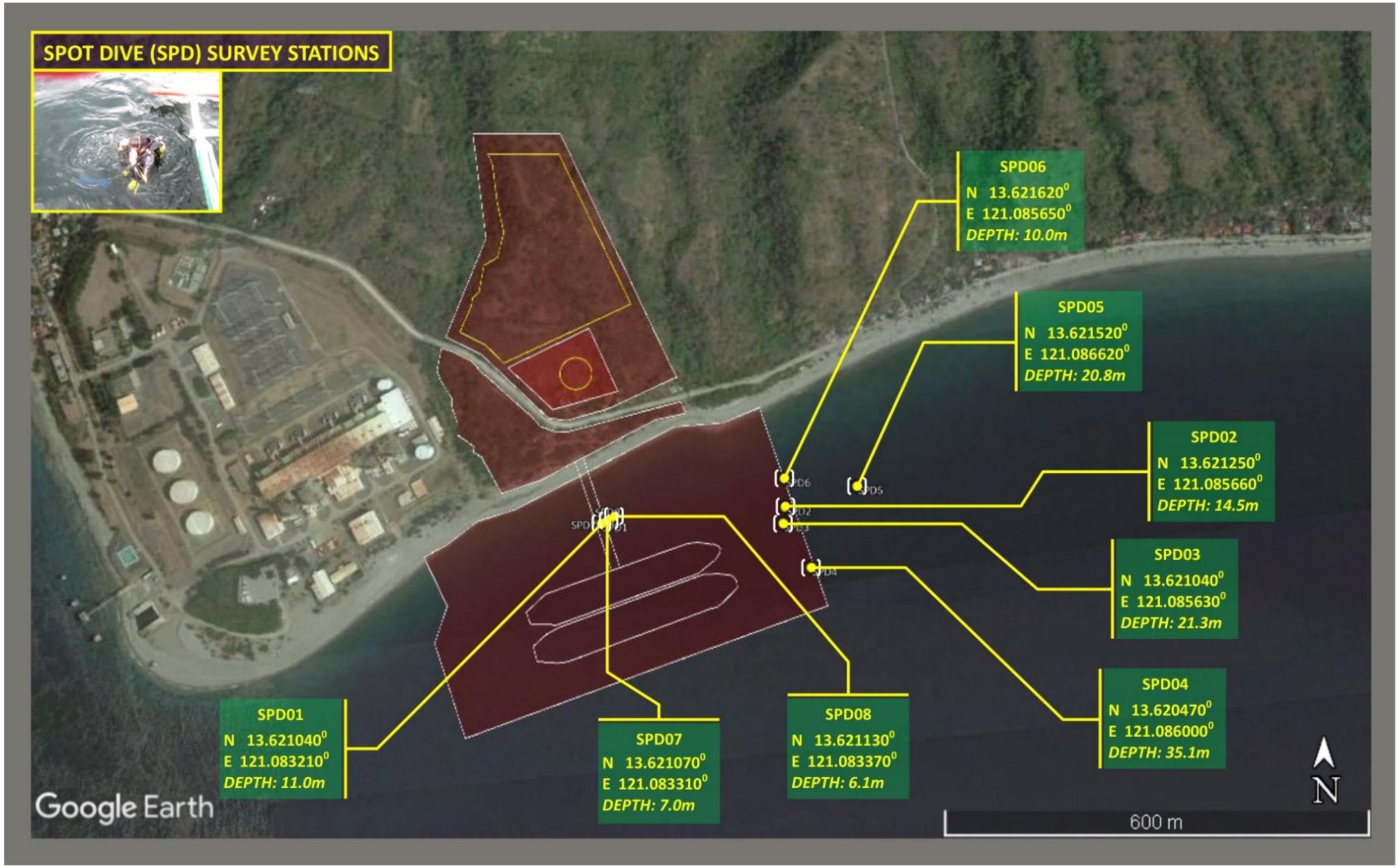


Figure 2-87. Map showing location of spot dive stations for validation of rocky outcrops near the Linseed Field Power Corporation - Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September and 4-5 November 2020. (Map prepared by Jose Rene Villegas, October 2020).

2.2.5.1.2 ASSESSMENT OF REEF-ASSOCIATED FISH ASSEMBLAGES EMPLOYING FISH VISUAL CENSUS (FVC)

Fish species diversity and abundance was catalogued in the coral line intercept survey station employing the standard fish visual census (FVC) method. The conduct of FVC is aimed to document demersal fish species richness and abundance of fish assemblages associated with coral reef habitats. High values for these indicators can indicate the overall ecological condition of a reef area and high species richness is normally associated with robust ecosystem functions. Fish visual census is used to estimate the variety, numbers and sizes of fishes along 500m2 survey belt. FVC surveys document mostly demersal, reef-associated species of fish that normally indicates the robustness of a coral reef ecosystem. In healthy reefs, the fish species diversity may include both commercially important fish (e.g., Groupers, Snappers) and reef-dependent species of fish such as Angelfishes and Butterfly fishes. The estimation of fish abundance in the station surveyed can subsequently be used to extrapolate the average fisheries productivity of the broader coastal area under normal circumstances, especially in view of the fact that demersal fish can supply about 30 percent of total food fish production in a locality. This productivity value is in fact one of the most important merits in protecting coral reefs in the area. Collectively, the results of coral reef assessments and fish visual census are used as reference points for comparative monitoring of changes in spatial distribution and diversity of benthic life forms in periodic environmental impact monitoring. Fish species encountered in the FVC station categorized as target, major or indicator species based on categories recommended in FishBase (2004). Target species are economically important food fish that are normally sought by fishers for trade or for food. In reef areas, such demersal species may include high value groupers (Ephinephalidae), snappers (Lutjanidae), jacks (Carangidae) and some species of surgeons (Acanthuridae). Fish that belong to the major fish category are considered to be ecologically important because they occupy unique niches and sometimes symbiotic relationships in the coral reef ecosystem. Many of these species are represented by members of the damselfishes (Pomacentridae) and wrasses (Labridae). Indicator species are coral-feeders whose presence, variety and abundance in a reef area may give an indication of the robustness and diversity of corals present in the reef. These are mostly comprised of the magnificently-colored butterfly fishes (Chaetodontidae), species of Angelfishes and the lone highlighted species popularly known as Moorish Idol. The FVC station coordinates are shown in**Table 2-23** and displayed in **Figure 2-88** below.

Table 2-23. Coordinates of fish visual census station for documentation of fish species richness and abundance in the coastal impact area of the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020.

WP Code	LATITUDE	LONGITUDE	REMARKS
FVC1 28 Sept 2020	N 13.62544	E 121.07352	Located in shelf in front of resorts in Sitio Silangan, Bgy. Ilijan. Reef crest in 6.5 m of water. About 1.2 km East of project site

Figure 2-88. Map showing location of fish visual census station for survey of fish species richness and abundance in the coastal impact area of the Linseed Field Power Corporation Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020. (Map prepared by Jose Rene Villegas, October 2020).

2.2.5.1.3 ASSESSMENT OF SEAGRASS AND ASSOCIATED MACRO-ALGAE

No seagrass communities were observed in the seventeen manta tow benthic observation pathways along the coast of Barangay Ilijan. No remnants of decaying seagrass blades were seen even as some portions of the shallower benthic environment consisted of sandy substrate.

2.2.5.1.4 SURVEY OF COMMERCIALLY-IMPORTANT MACRO-INVERTEBRATES AND MEIOFAUNA

Few gleaning activities were witnessed in the general vicinity of the Ilijan LNG Facility project site during the marine ecology baseline assessment. Opportunistic sampling of macro-invertebrates in the inter-tidal flat fronting the project site was undertaken, aided by key informant interviews (**Plate 2-11**). Substrate samples were also obtained and subjected to identification of meiofauna. The coordinates of the macro-invertebrate sampling station are shown in **Table 2-24**; the location is shown in **Figure 2-89**.

Plate 2-11. Bivalves, principally of the species *Litoria* sp. (Perwinkle) are harvested in rocks in the western flank of the Ilijan LNG Facility project site in Bgy Ilijan, Batangas City; 27 September 2020.

Table 2-24. Coordinates of macroinvertebrate and meiofauna sampling stations in the coastal impact area of the Linseed Field Power Corporation - Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020.

WP Code	LATITUDE	LONGITUDE	REMARKS
MAC1	N 13.62089	E 121.08274	In sandy-rocky shoreline in front of project site; catch of gleaners documented
MAC2	N 13.62146	E 121.08377	In sandy-rocky shoreline in front of project site; catch of gleaners documented

Figure 2-89. Sampling station for opportunistic collection of commercially-important macro-invertebrates and meiofauna in the coastal impact area of the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020. (Map prepared by Jose Rene Villegas, October 2020)

2.2.5.1.5 PLANKTON COMMUNITIES

Species composition, abundance and density of phytoplankton and zooplankton communities were determined using plankton net vertically lowered and towed from sub-surface depths. Shannon-Weaver Diversity/Evenness Indices and bio-assessment metrics are then derived from the results of the sampling. Identification of phytoplankton species that can enrich to become harmful algal blooms which may potentially cause paralytic shellfish poisoning (PSP) was also undertaken as algal blooms normally indicate hyper-nutrient levels in the sea sometimes triggered by problems of anthropogenic origin. Sampling stations were strategically chosen so that the stations are focused in the vicinity of the Ilijan LNG Facility project site. Three (3) plankton sampling stations were employed during the survey (**Figure 2-90** and **Table 2-25**; **Plate 2-12**).

Table 2-25. Coordinates of plankton sampling stations investigated in the coastal impact area of the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020.

WP Code	LATITUDE	LONGITUDE	REMARKS
PLK1	N 13.62146	E 121.08454	In front of project site; 7.1 m; turbidity: 6.5 m
PLK2	N 13.62049	E 121.08346	In front of project site; 14.8 m; turbidity: 8.2 m
PLK3	N 13.61856	E 121.07836	Depth at 6.4 m; turbidity 6.4 m

Plate 2-12. Phytoplankton and zooplankton community sampling being undertaken in the coastal impact area of the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020.

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Figure 2-90. Location of sampling stations for plankton communities in the coastal impact area of the Linseed Field Power Corporation - Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020. (Map prepared by Jose Rene Villegas, October 2020)

2.2.5.1.6 MANGROVE ASSESSMENT

No mangrove trees were encountered in the survey along the coast of Barangay Ilijan in the primary and secondary impact areas of the Ilijan LNG facility project.

2.2.5.1.7 RAPID FISHERIES APPRAISALS

No actual fishing operations were encountered in the survey area in two days of survey. The rapid fisheries appraisal was undertaken through key informant interviews to determine (i) presence of fishing activities in the study area and dominant fishing gears used, (ii) usual catch composition, (iii) estimated catch rates, and (iv) issues affecting fisheries. Pelagic and demersal fishing operations are undertaken in open waters in the mouth of Batangas Bay, with the latter dominated by hook and line operations in reef shoals deep waters in the mouth of Batangas Bay where tuna and tuna-like species are traditionally caught.

2.2.5.2 RESULTS

2.2.5.2.1 MARINE RESOURCE MAP

The primary project impact area is coastal waters fronting the proposed project site within the coastal jurisdiction of Barangays Ilijan (**Figure 2-90**). No estuaries, coral reefs, mangrove and seagrass beds occur in the project site. The deep coastal water in front of the floating facility is in fact dotted with rocks the turf algae (**Figure 2-90**).

Batangas City, the capital of Batangas Province has a total land area of approximately 27,633.26 hectares and consists of twenty two (22) coastal barangays of which six (6) are island barangays located in Verde Island. Batangas Bay is a semi-enclosed body of water bordered by the mainland municipalities of Bauan, San Pascual, Mabini, Batangas City, Verde Island, and the municipality of Tingloy in Maricaban Island. There are forty-four (44) coastal barangays; twelve in Batangas City, eight in Bauan, twelve in Mabini, three in San Pascual, and nine in Tingloy. The DENR's Memorandum Circular No. 07, Series of 1993, categorizes Batangas Bay as Class SC waters, which classifies it as suitable for commercial uses and artisanal fisheries. In recent years the Bay has been increasingly used for commercial cargo shipping and passenger terminal owing to the improvement of the Batangas City Port complex and increasing passenger transport. Towards its southern flank, coastal waters of Batangas City forms part of the Verde Island Passage, considered part of the so-called "center of the center" of marine biodiversity in the world (Figure 9). Verde Island has two Fish Sanctuaries (in 2013), Pulong Bato (16.28 ha.) and Nalayag Point (14.13 ha.). About ten kilometres south of Batangas City towards its boundary with Lobo municipality lies the Pagkilatan Fishery Reserve (1.79 ha.) and still farther is the Ilijan Fishery Refuge (12.97 ha) which started as a giant clam stock enhancement program initiated by the Local Government. The reserve is about 5 kilometers south of the LNG project site in boundary of Lobo municipality. In recent years, other MPAs have been established in the Verde Island Passage mostly in Lobo, San Juan and Verde Island.

Figure 2-91. Marine Resources Map - only a single patch coral reef which is too far from the project site; and rocks – are found in the coastal sea in front of the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, map prepared by Jose Rene Villegas, October 2020)

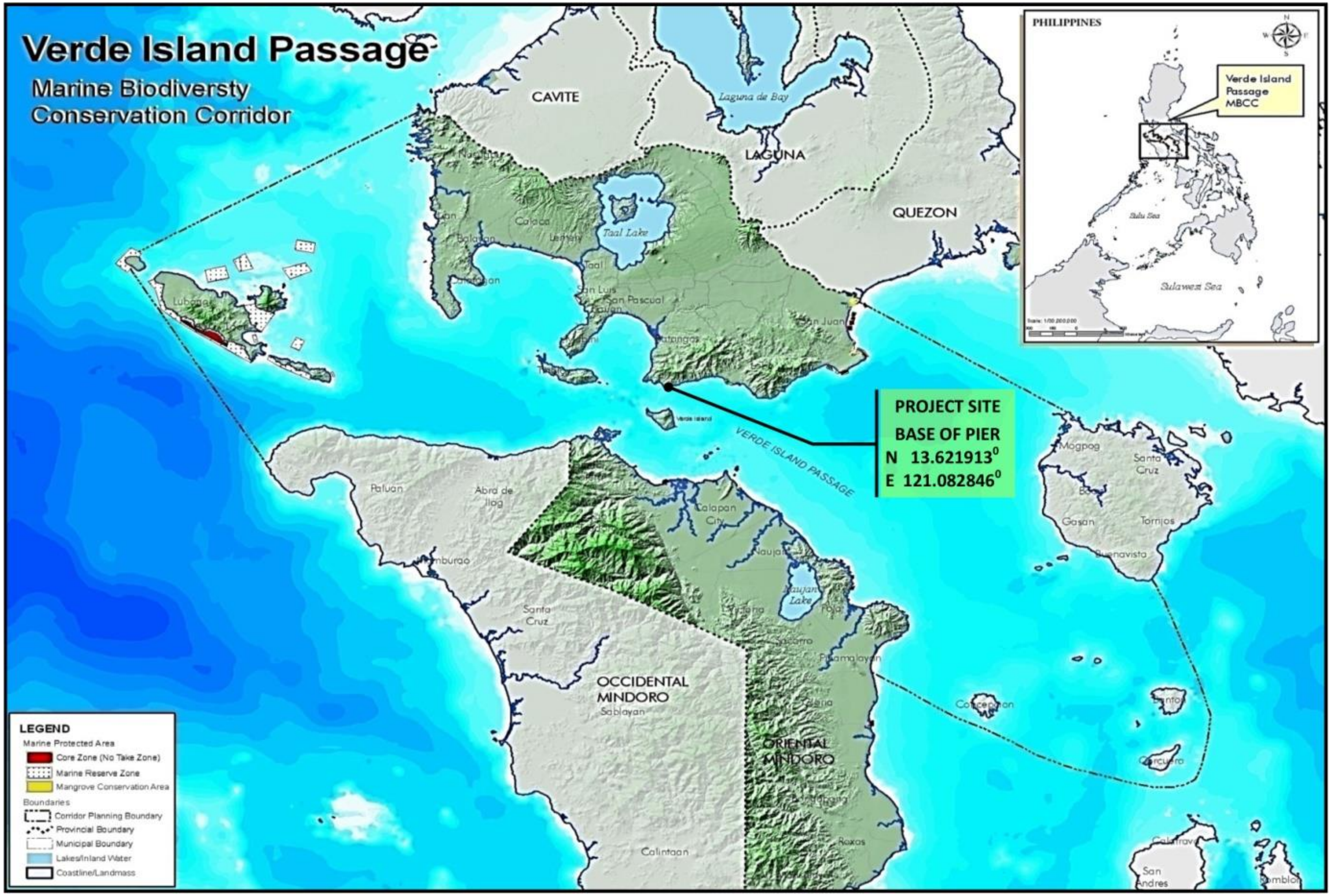


Figure 2-92. The Verde Island Marine Biodiversity Conservation Corridor with the project site shown in arrow.

Coastal habitats of mostly fringing reefs and seagrass meadows exist only in the western, south-western and southern portions of the Batangas Bay, specifically in the Mabini peninsula, Lobo coastal waters, Maricaban and Verde Islands. The Verde Island Passage in particular, has been declared a marine biodiversity conservation corridor, with numerous coastal resource management projects (e.g. through Conservation International, World Wildlife Fund and USAID's Ecofish Project) in the last ten years. The reefs and other coastal habitats in these areas are therefore well documented, and a network of MPAs has been established and entered into the Marine Protected Area Network of the University of the Philippines Marine Science Institute. In contrast, the highly-industrialized enclave of Batangas Bay including the port area and coastal waters going south towards Bgys. Wawa, Malitam, Libjo, Ilijan and Tabangao, has had little resource and habitat assessments due to the alleged absence of corals.

The shelf in Barangay Ilijan is relatively wide but this abruptly slopes to an average of 50 to 100 meters of sandy shelf. However, in front of the project site, the shelf is narrow and drops abruptly in 20 to 50 meters of water. Wind-driven seawater circulation and tidal currents is strong in the eastern region as a short headland pushes currents towards the sandy flats in Barangay Ilijan West. No significant fringing reefs are found in the coastline but a short reef flat exists just before the Kepco pier. Patches of isolated corals occur past the project site but these are few and far between, dominated by dead corals in a wide stretches of sandy shelf. Steep slopes or drop-offs were observed at the offshore edge of the shelf in front of the project site and in the Kepco pier area but no significant coral formations were found in the slopes in the project site, which were primarily dominated by sandy deposits and a scattering of rocks and dead corals (**Plate 2-13**). No mangrove forests and seagrass meadows were seen in the coastal waters surveyed. In two (2) days of surveys and observations few artisanal fishing activities were observed and no fishing boats of small commercial grade were seen in coastal waters fronting the project site except for sport fishers from Manila and other municipalities. The marine ecology baseline assessment eventually established seventeen (17) manta tow survey pathways for characterization of benthic life forms and abiotic components, one (1) line intercept station for detailed coral reef assessments in patches of coral reefs a significant distance west of the project site, one (1) spot dive in front of the project site, three (3) plankton community sampling stations, three (3) macro-benthos survey stations, and two (2) sampling stations for macro-invertebrates of economic value to local fishers. The discussion of survey results and presentation of maps and graphs illustrating the state of the resources are presented in the next sections.

Plate 2-13. Sand, rocks and dead corals dominate most of the coastal shelf in the vicinity of the Ilijan Project site.

2.2.5.2.2 FISHES

2.2.5.2.2.1 RESULTS OF FISH VISUAL CENSUS IN LONE CORAL REEF STATION

No significant demersal fish populations or schools of pelagic fishes were observed during the survey. In the lone line intercept survey station in a reef about 1.4 km from the project site, a total of 415 reef-associated fish individuals were counted across the lone FVC survey station located 1.5 km NW of the project site; with twenty (20) species belonging to eleven (11) family taxa (**Figure 2-93**). Density is 1 individual per square meter. Abundance is relatively low, as well as the number of fish families catalogued in the transect. Fish species richness is represented by seven (7) 'target' species, four (4) 'indicator' species and nine (9) species in the 'other' category. The damselfishes (Pomacentridae) dominated the reef fish community with 343 individuals in six (6) species, altogether representing more than 82% of the fish community in the survey belt. The high fish count for the damselfishes is attributed to the presence of a robust population of the light green-colored Philippine chromis *Chromis scotochiloptera*, numbering 130 individuals, or 31% of the population (**Figure 2-94**). Other damselfishes in the survey were identified as staghorn damsel *Ambigliphidodon curacao,* three-spot damsel *Dascylus trirmaculatus,* yellow chromis *Chromis analis,* scissortail sergeant *Abudefduf sexfaciatus*. The pink anemonefish *Amphiprion penderaion,* which is also included in family Pomacentridae numbered seven (7) individuals.

Four 'indicator' species were recorded – panda butterfly fish *Chaetodon agiergastos,* black-spot butterflyfish *Chaetodon speculum,* big longnose butterflyfish *Forcipiger longirostris* and the *Moorish idol Zanclus cornutus* that numbered four (4) mature individuals); (**Figure 2-93**).

Target fish were represented by six species but most were immature size. These included the lucrative coral trout *Plectropomus sp,* Checkered snapper *Lutjanus decussatus*, the Letrinid emperor *Letrinus harak*, foxface rabbitfish *Siganus vulpinus*, surgeonfish *Acanthurus nubilus*, and the yellow-bared parrtotfish *Scarus dimidiatus (***Table 2-26***;* **Figure 2-93***)*. The normally prolific wrasses (Labridae) were represented by only nine (9) individuals in three (3) species dominated by the halfmoon wrasse *Thalassoma lunare*. Completing the fish community is a school of razorfish (*Aeoliscus strigatus)* and the seldom-encountered banded snake eel *(Elapsopis versicolor).*

Table 2-26. ***Tabulated summary of results of fish visual census for fish species richness and abundance across one FVC station surveyed during marine ecology baseline assessment in the vicinity of the proposed Ilijan LNG Terminal and Import Facility Project in Barangay Ilijan, Batangas City on 28 September 2020; (researcher Benj Francisco).***

Site Name: Ilijan LNG Import Facility Project		Municipality & Province: Sitio Silangan, Barangay Ilijan, Batangas City				
Date: 28 September 2020		Observer: Benjamin S. Francisco				
Time: 1100		Depth(m): 3- 10 meters				
Coordinates	Station No. 1 - Start: N13.62544 E 121.07352 -					
FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**	**LOCAL NAME**	**Station 1**		**Total # of individuals**
				# of Indi	**Size (cm)**	
Acanthuridae	*Acanthurus nubilus*	Bluelined surgeon	Labahita	15	14	15
Chaetodontidae	*Chaetodon adiergastos*	Panda butterflyfish	Paru-paro	4	8	4
Chaetodontidae	*Chaetodon adiergastos*	Panda butterflyfish	Paru-paro	8	15	8
Chaetodontidae	*Chaetodon speculum*	Blackspot butterflyfish	Paru-paro	1	10	1
Chaetodontidae	*Forcipiger longirostris*	Big longnose butterflyfish	Paru-paro	2	10	2
Centriscidae	*Aeoliscus strigatus*	Razorfish	Sundang-sundang	20	6	20
Labridae	*Thalassoma lunare*	Half-moon wrasse	Labayan	4	12	4
Labridae	*Cheilinus inermis*	Cigar wrasse (yellow variation)	Ipospadi	1	30	1
Labridae	*Choerodon zosterophorus*	Dark stripe tuskfish	Ipospadi	4	12	4
Lethrinidae	*Lethrinus harak*	Thumbprint emperor	Katambak/Kanuping	1	25	1
Lutjanidae	*Lutjanus decussatus*	Checkered snapper	Dolesan	1	20	1
Pomacentridae	*Amphiprion penderaion*	Pink anemonefish	Bantay botbot	7	8	7
Pomacentridae	*Chromis analis*	Yellow chromis	Palata	64	6	64
Pomacentridae	*Abudefduf sexfaciatus*	Scissortail sergeant	Palata	12	8	12
Pomacentridae	*Chromis scotochiloptera*	Philippine chromis	Palata	130	8	130
Pomacentridae	*Dascyllus tirmaculatus*	Three-spot damsel	Palata	60	10	60
Pomacentridae	*Ambigliphidodon curacao*	Stag horn damsel	Palata	70	10	70
Scaridae	*Scarus dimidiatus*	Yellow-bared parrotfish	Mul-mol	4	12	4
Serranidae	*Plectropomus sp.*	Coral grouper	Lapu-lapo	1	20	1
Siganidae	*Siganus vulpinus*	Foxface rabbitfish	Tag-bago	2	12	2
Zanclidae	*Zanclus cornutus*	Moorish idol	Saguranding	4	15	4
Total # of individuals per transect (500m²)				415		415
Total number of fish families						11
Total number of target species						7
Total number of indicators						4
Total number of other species						9
Total number of species						20

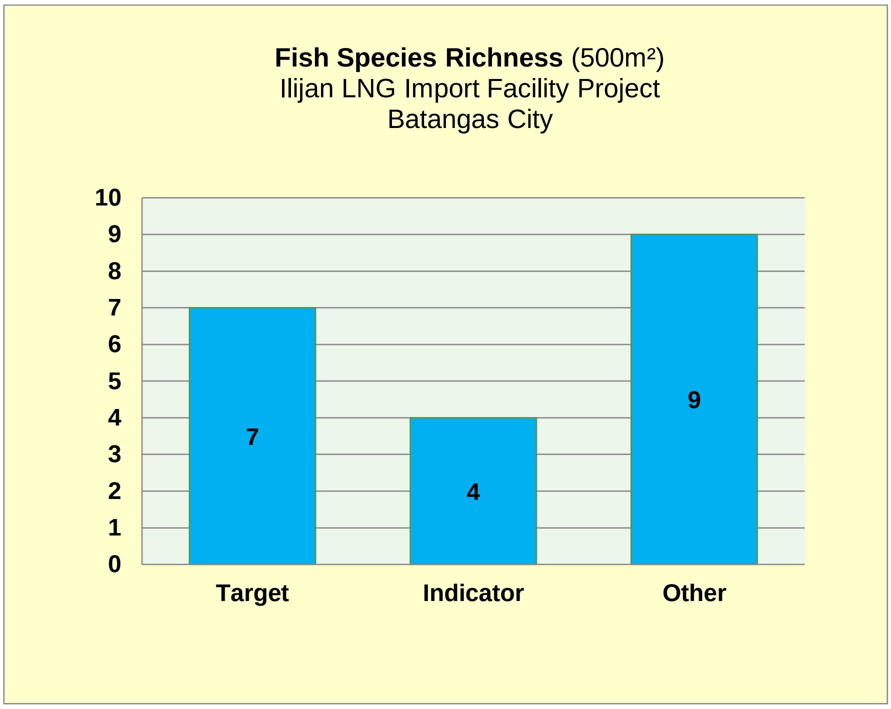


Figure 2-93. Fish species richness by fish category recorded in the fish visual census station surveyed during marine ecology baseline assessment in the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, 27-28 September 2020.

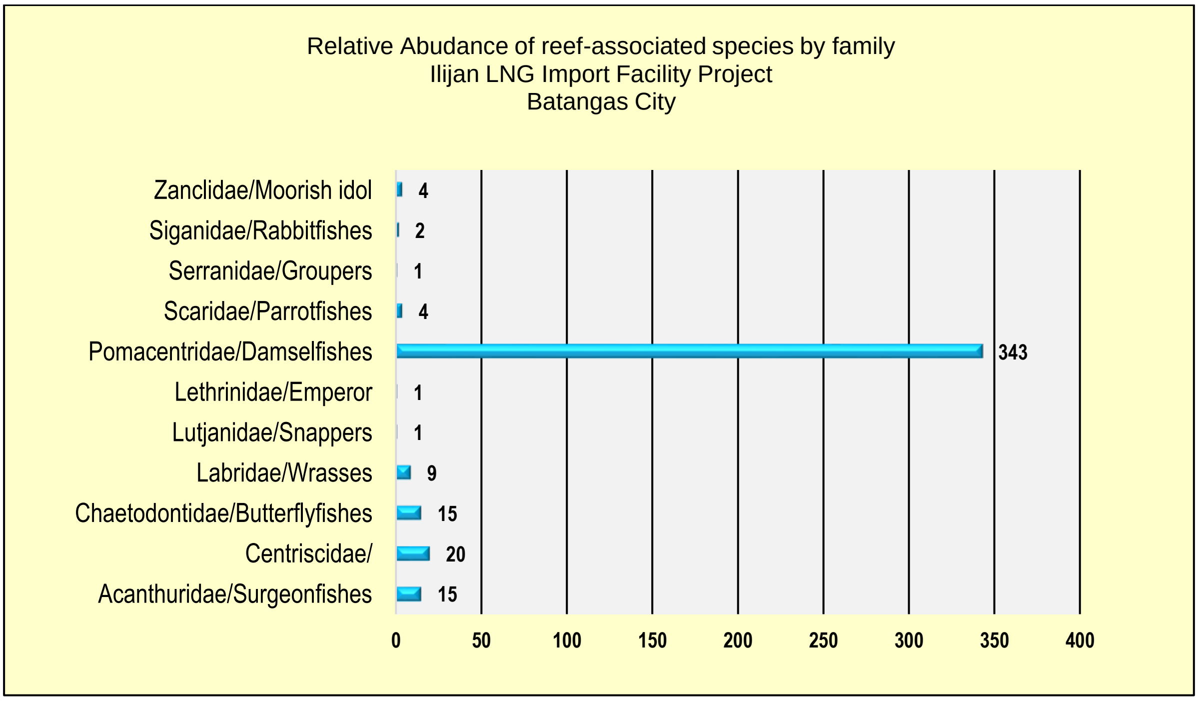


Figure 2-94. Relative abundance of reef-associated fish by family catalogued in an FVC station during marine ecology baseline assessment in the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, 27-28 September 2020.

Fish biomass was computed 3.78 kg/500m2 for fish belonging to the 'other' category, 0.25 kg/500m2 for 'target' fish species, and 0.06 kg/500m2 for indicator species (**Figure 2-95**). The biomass value for target species is low.

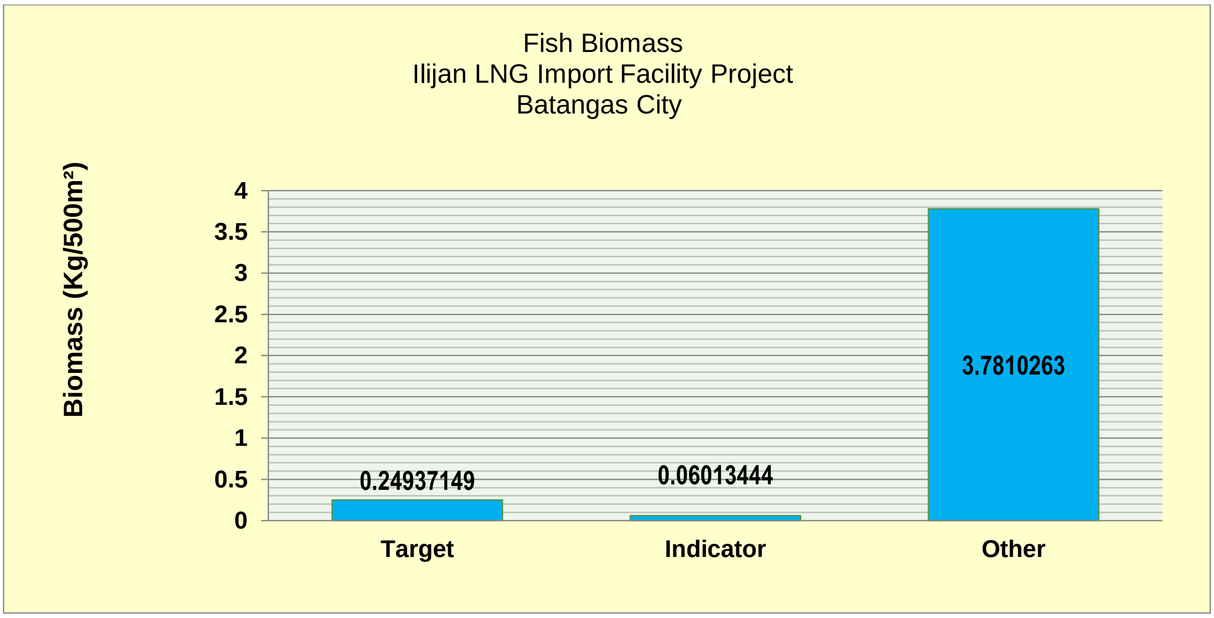


Figure 2-95. Fish biomass/500m^2 meter of FVC survey area recorded in an FVC station during marine ecology baseline assessment in the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, 27-28 September 2020.

On the whole, the overall assessment of the demersal fish profile of the area in front of the project site is low. However, the low abundance and the absence of mature populations of target fish in the reef flat surveyed indicate declining fisheries productivity. This is also vividly manifested in the absence of small recruits of labrids, wrasses and surgeonfishes. The factor that may contribute to this low fisheries profile is the narrowness of the reef and unpronounced deep slope where most mature cryptic fishes prefer to stay and where spawning aggregates normally occur. Anecdotal accounts from fishers in the area also confirm the absence of long-lived demersal fish species in the near shore waters.

A summary of the FVC findings are shown in **Figure 2-96**.

Figure 2-96. Summary of results of fish visual census for fish species richness and abundance across one FVC station surveyed during marine ecology baseline assessment in the vicinity of the proposed Ilijan LNG Terminal and Import Facility Project in Barangay Ilijan, Batangas City on 28 September 2020; (researcher Benj Francisco; map prepared by Jose Rene Villegas, October 2020).

2.2.5.2.2.2 FISHERIES

The rapid fisheries appraisal consisted mainly of key informant interviews with fishers and local government personnel to determine (i) fishing gears used, (ii) catch composition, (iii) catch rates, and popular fishing grounds. No actual fishing operation was encountered in shallow waters in front of the project site and in the vicinity of the resorts. Sports fishing, using fishing rod is being undertaken by visitors in Ilijan in rocky promontories near the project site catching surgeonfishes and wrasses.

Batangas Bay is known for large pelagic fish species during peak migration season. Thus most fishing boats operate in the mouth of Batangas Bay past Verde Island to catch tuna, dorado, tulingan and trevallies in open water using hook and line. The peak fishing season is from October to December in offshore Batangas Bay in the Verde Island Passage and in Balayan Bay. There are about fifty (50) species caught by various gears, with tuna, fusiliers and surgeonfish commonly comprising catch composition (**Table 2-27**). An average of 42 MT of fish is landed per year, with gill nets and hook and line as the primary fishing gears used. In offshore fishing, the gill nets can catch about 20 kg per day consisting mainly of small pelagic during the peak season species while hook and line catches an average of 5kg per day. There are eight species commonly caught, with sardines and fusiliers as the dominant catch. In areas near coral reef ledges, hook and line fishers catch mostly emperors, barracuda, parrotfish and surgeonfish. Shallow water fishing employs gill nets and targets mostly small pelagics like mackerels, siganids and squids. In deeper waters about 2 km from the project site's shoreline, small fishing crafts, unable to travel long distances, operate gill nets, fish pots, hook and line and spear gun to catch siganids, surgeons, and the spangled emperor, among others. Fishing with nets can capture frigate mackerel, and hard-tail scad. The catch rate is low, at less than 2 kg per fisher per day, consisting mostly of juvenile sizes. Fishers declared that productivity of the hook and line fishery for demersal fish is about 2 kg per 4 hours of fishing time.

Table 2-27. Common species of fish caught in Batangas Bay.

Classification	Local Name	English Name	Species Richness
Katsuwomus pelamis	Gulyasan	Yellowfin tuna	1
Caesio, spp. and Pterocaesio spp	Dalagang Bukid	Fusilier	5
Acanthuridae	Labahita	Surgeonfish	6
Epinephelus spp.	Lapu-lapu	Grouper	5
Letrinids	Burak	Emperor	1
Mullidae	Manitis	Mullet	2
Auxis spp.	Tulingan	Frigate mackerel	2
Thunnus spp.	Tambakol	Tuna	3
Scomberomorus spp.	Tanigue	Spanish mackerel	2
Stolephorus spp. larvae/juveniles	Dulong	Anchovy	3
Carangidae	Lagidlid	Trevally	2
Loligo	Pusit	Reef squid	2
Makaira spp.	Blue Marlin	Blue marlin	2
Sigamus spp.	Danggit	Siganid	5
Assorted pelagic species	Galunggong, Talakitok, etc.	mackerels	9
			Total 50

(*Source: Kabang Kalikasan ng Pilipinas Foundation-World Wildlife Fund, (WWF) under its Coastal Resources and Fisheries Conservation project (CRFCP) study is entitled "Assessment of the Marine Municipal Capture Fisheries of Mabini and Tingloy, Batangas).*

There is no stationary fishing gears, set gear or mariculture investments in shallow waters offshore of the project site.

2.2.5.2.3 BENTHOS

Investigations on the presence and species composition of important macro-invertebrates were undertaken in two stations in the tidal flats and rocky promontories in front of the project site where shellfish gleaners were observed (**Figure 2-97**). The purpose of the survey is to determine whether commercially important macro-invertebrate species, especially gastropods and bivalves, are present in significant populations in areas where potential project impacts may occur.

Actual documentation of the catch of gleaners revealed only two dominant gastropods were harvested – the strawberry conch (*Strombus luhuanus*) and perwinkle (*Litoria sp*). Key informants added that few other species are havested in sandy-muddy substrate in the tidal flats fronting several resorts in Sitio Silangan. These included small top shell (*Monodonta labio),* ark shells *(Scapharca globosa),* throughshell *(Mactra sp)* and shore crab *Calappa calappa.* On the other hand, no meiofaunal species were recorded in the sandy substrate samples indicating a dearth in macrobenthos in the surveyed areas.

Plate 2-14. Common macro-invertebrates of commercial value being harvested in the inter-tidal area in front of the proposed Ilijan LNG Terminal and Import Facility Project in Barangay Ilijan, Batangas City surveyed during marine ecology baseline assessment; 28 September 2020.

With few species diversity and widely dispersed distribution, the overall prognosis is few macro-invertebrates of significant value for food and trade are being harvested in the sandy flats and rocky outcrops near the project site in Bgy. Ilijan. Overall, the species diversity and number of macro-invertebrates encountered are deemed unimpressive and the survey results do not reveal a significantly susceptible macro-invertebrate population, especially in the sandy beach of the coastline where the project is proposed to be located. Gleaning for shellfish is also not significant.

Figure 2-97. Location of macro-invertebrates sampled in front of the project site during marine ecology baseline assessment; 28 September 2020.

2.2.5.2.4 PLANKTON

2.2.5.2.4.1 PHYTOPLANKTON

A total of thirty (30) phytoplankton genera belonging to Bacillariophyceae (diatoms), Dinophyceae (dinoflagellates) and Cyanophyceae (blue-green algae) was identified in three sampling stations. Diatoms dominated the phytoplankton community accounting for 37% of the total phytoplankton abundance (**Figure 2-98**). This was followed by cyanobacteria which constituted 36% and dinoflagellates with 26%. Diatoms were the most taxa rich with 20 genera identified (**Figure 2-98**). A solitary filamentous cyanobacterium Trichodesmium, though, was the most abundant species with total density of 31,596 cells/m3 (36.06% of the total composition). Among the dinoflagellates, small armored taxa *Peridnium* spp. was the most abundant with a total density of 18,987 cells/m3 (21.67% of the total composition). For the diatoms, the pennate solitary taxa *Cylindricotheca* spp. was the most abundant taxon with a total density of 7,685 cells/m3 (86.2% of the total composition). These abundant species are harmless and not included in the IOC-UNESCO Reference List of Harmful Microalgae (Moestrup et al 2009). A dinoflagellate identified in this sampling which was included the above-mentioned list was *Dinophysis* spp. *Dinophysis* (*D. caudata*) is a toxic dinoflagellate capable of producing toxin associated with Diarhetic Shellfish Poisoning (DSP) (FAO, 2004). It is a cosmopolitan species with wide distribution and also associated with red tide resulting to mass mortality of fish in countries like Gulf of Thailand and Seto Inland Sea in Japan (Okaichi 1967). In this survey however, it was recorded at low density ranging from 5-19 cells/L (0.07% of the total composition)

Table 2-28. Phytoplankton composition and abundance (cells/m^3) in three sampling station in the proposed Ilijan Import Facility in Ilijan Batangas during the September 2020 sampling.

TAXA	STATIONS			Grand Total	Rel. Abund.
	PH1	PH2	PH3		
Cyanophytes	**9,290**	**18,625**	**3,703**	**31,618**	**36.09**
Lyngbya	22			22	0.02
Trichodesmium	9,268	18,625	3,703	31,596	36.06
Bacillariophytes	**2,578**	**21,657**	**8,488**	**32,723**	**37.35**
Bacillaria	120		97	217	0.25
Chaetoceros			277	277	0.32
Coscinodiscus	1,632	1,447	2,178	5,256	6.00
Cylindrotheca	218	6,539	929	7,685	8.77
Diploneis		2,576		2,576	2.94
Ditylium			111	111	0.13
Fragillaria		396		396	0.45
Gomphonema	44	793		836	0.95
Gyrosigma		594		594	0.68
Licmophora	120			120	0.14
Melosira	185	991		1,176	1.34
Navicula			277	277	0.32
Nitzschia	44	3,765	929	4,737	5.41
Odontella			166	166	0.19
Pinnularia		594	624	1,219	1.39
Pleurosigma	22	2,774	1,831	4,626	5.28
Rhabdonema	54			54	0.06
Rhizosolenia	120	793	513	1,425	1.63
Striatella	22			22	0.02
Surirella		396	555	951	1.09
Dinophytes	**1,131**	**5,152**	**16,990**	**23,273**	**26.56**
Akashiwo	44			44	0.05
Ceratium	392		1,110	1,501	1.71
Dinophysis sp.	131	198		329	0.38
Diplopsalis	44	198	180	422	0.48
Ornithcercus	44			44	0.05
Oxytoxum	141			141	0.16
Peridinium	196	4,755	14,036	18,987	21.67
Prorocentrum	141		1,664	1,806	2.06

TAXA	STATIONS			Grand Total	Rel. Abund.
	PH1	PH2	PH3		
Grand Total	**12,999**	**45,433**	**29,182**	**87,615**	**100**
Richness	**21**	**16**	**17**		
Evenness (J')	**0.40**	**0.72**	**0.67**		
Diversity (H')	**1.22**	**2.00**	**1.91**		

Generally, the mean cell density of the phytoplankton in all stations was 29,205 cells/m^3. The highest total abundance was quantified in station Ph2 with 45,433 cells/m^3 and the most taxa rich station was observed in station Ph1, a station farther from the proposed project area, with 21 (**Figure 2-99**). The lowest phytoplankton abundance was quantified in station Ph1 with 12,999 cells/m3. The computed index of diversity is the not so variable among the sites (0.40–0.72).The computed diversity and evenness values was low (<2).

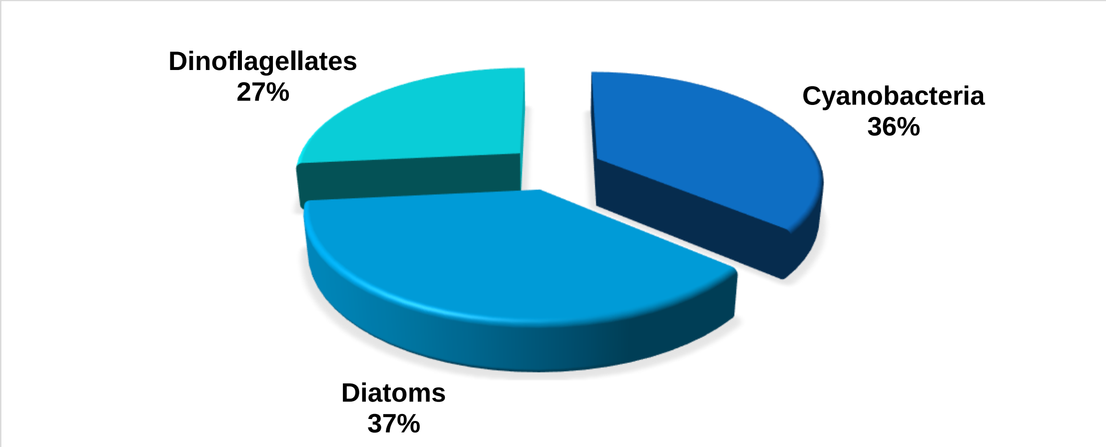


Figure 2-98. Percentage composition major phytoplankton groups in three sampling stations in the proposed Ilijan Import Facility in Ilijan Batangas during the September 2020 sampling.

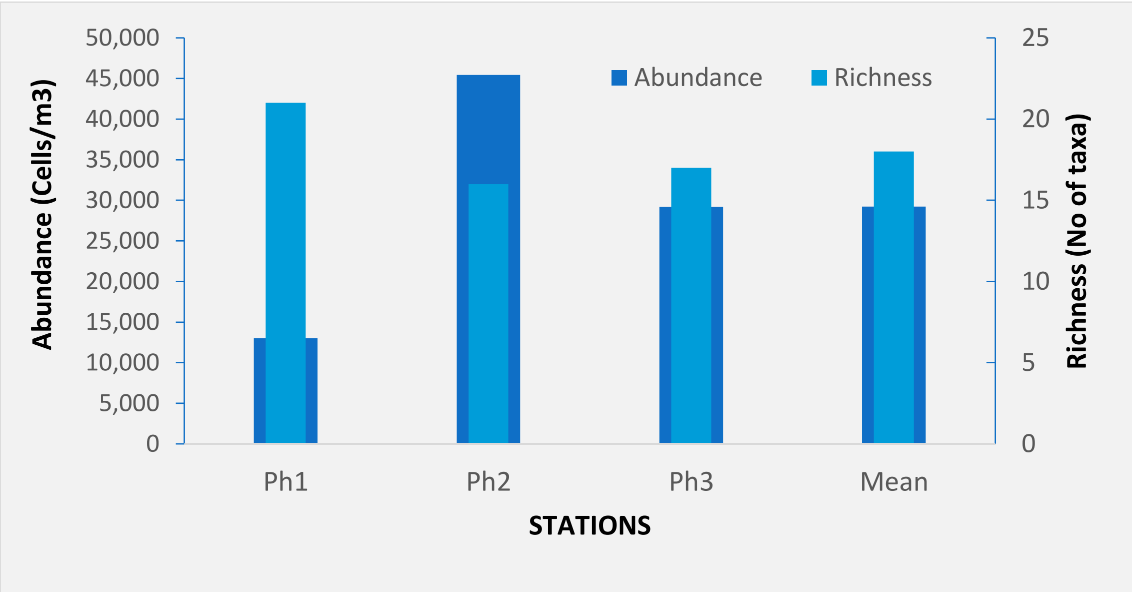


Figure 2-99. Total phytoplankton density and richness in three sampling station in the proposed Ilijan Import Facility in Ilijan Batangas during the September 2020 sampling.

2.2.5.2.4.2 ZOOPLANKTON

A total of fourteen (14) zooplankton groups (adult and larval forms) were identified from the three stations sampled near and within the proposed project. The top five (5) most abundant zooplankton group were copepod nauplius (53%), adult copepods (16%), and radiolarian (15%), ostrocod (3%) and brachyuran zoeae (3%). Other zooplankton taxa constituted 10% of the total zooplankton community. Zooplankton groups observed consisted of adult forms accounting for 40% and larval forms with 60% of the total zooplankton abundance (**Table 2-29**). Adult forms consisted of 9 groups while larval forms had 5 groups recorded during this survey. The large portion of the adult zooplankton is represented by calanoid copepod which comprised 18% and cyclopoid copepod with 12%. For the larval zooplankton forms, radiolarian was the abundant group with total density of 2,287 ind/m^3 (15% of the total composition). Other important groups like bivalve veliger and gastropod veliger only contributed 12% and 0.47% of the total composition, respectively. No fish larvae nor fish eggs were observed during the sampling period. Also, there were no rare or endemic zooplankton species found in the area and majority of the groups are common and cosmopolitan in distribution.

The summary of the composition, distribution, density and abundance of zooplankton community is shown in **Table 2-29**. A total of fourteen (14) zooplankton groups (adult and larval forms) were identified from the three stations sampled near and within the proposed project (**Table 2-29**). The top five (5) most abundant zooplankton group were copepod nauplius (53%), adult copepods (16%), and radiolarian (15%), ostrocod (3%) and brachyuran zoeae (3%) (**Figure 2-100**). Other zooplankton taxa constituted 10% of the total zooplankton community. Zooplankton groups observed consisted of adult forms accounting for 40% and larval forms with 60% of the total zooplankton abundance. Adult forms consisted of 9 groups while larval forms had 5 groups recorded during this survey. The large portion of the adult zooplankton is represented by calanoid copepod which comprised 18% and cyclopoid copepod with 12% (**Figure 2-100**). For the larval zooplankton forms, radiolarian was the abundant group with total density of 2,287 ind/m3 (15% of the total composition). Other important groups like bivalve veliger and gastropod veliger only contributed 12% and 0.47% of the total composition, respectively. No fish larvae nor fish eggs were observed during the sampling period. Also, there were no rare or endemic zooplankton species found in the area and majority of the groups are common and cosmopolitan in distribution. Photomicrograph of common zooplankton groups is shown in **Plate 2-15**.

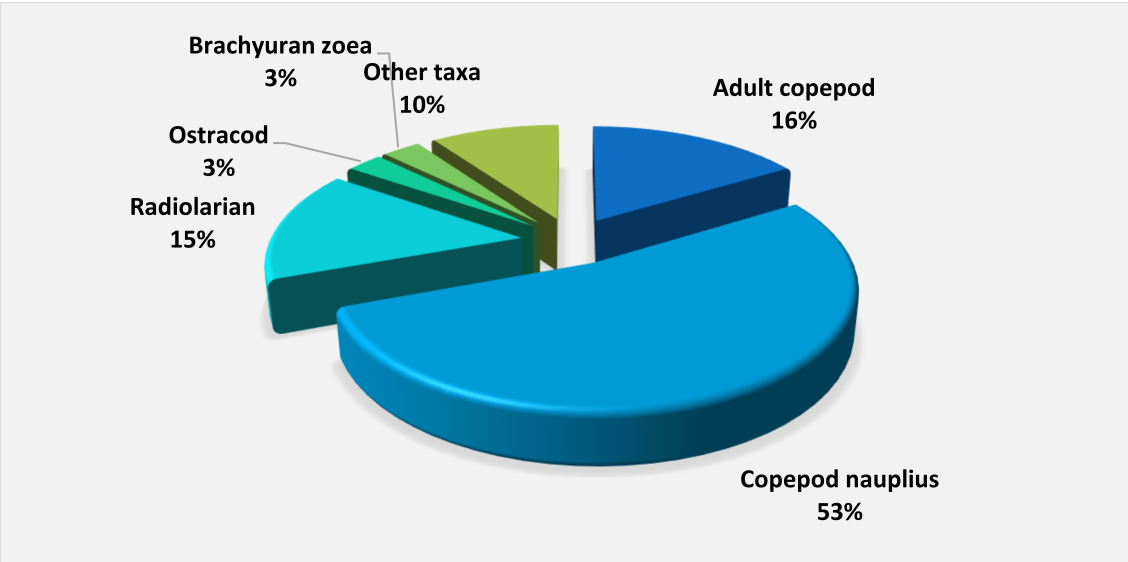


Figure 2-100. Percentage composition of major zooplankton groups in three sampling station in the proposed Ilijan Import Facility in Ilijan Batangas during the September 2020 sampling.

Table 2-29. Zooplankton composition and abundance (Ind/m^3) in three sampling station in the proposed Ilijan Import Facility in Ilijan Batangas during the September 2020 sampling

TAXA	STATIONS			Grand Total	Rel. Abund.
	ZP1	ZP2	ZP3		
Adult forms	**3,851**	**1,028**	**1,184**	**6,063**	**40.20**
Amphipods	261			261	1.73
Copepod calanoid	228	82	466	776	5.15

TAXA	STATIONS			Grand Total	Rel. Abund.
	ZP1	ZP2	ZP3		
Copepod cyclopoid	196	277	136	609	4.04
Copepod harpacticoid	538	212	330	1,081	7.17
Heteropods	98	98		196	1.30
Larvacean	49		136	185	1.23
Mysiids	131	131		261	1.73
Ostracod	179	228		408	2.70
Radiolarian	2,170		117	2,287	15.16
Larval forms	**2,774**	**3,622**	**2,621**	**9,018**	**59.80**
Bivalve veliger		65	194	259	1.72
Brachyuran zoea	179	261		441	2.92
Copepod nauplius	2,529	3,084	2,388	8,001	53.06
Gastropod veliger	33		39	71	0.47
Pluteus	33	212		245	1.62
Grand Total	**6,625**	**4,650**	**3,806**	**15,081**	**100**
Richness	**13**	**10**	**8**		
Evenness (J')	**0.67**	**0.58**	**0.63**		
Diversity (H')	**1.71**	**1.34**	**1.30**		

The mean estimate of abundance was 5,027 individuals/m^3 for all sampling stations recorded during this survey (**Figure 2-101**). Spatially, station ZP1 had the highest zooplankton abundance and the most taxa rich with 6,625 ind/m^3 and thirteen (13) zooplankton groups each identified. The lowest zooplankton abundance and was quantified in station ZP3 with 3,806ind/m^3. It is also the station with the least number of taxa recorded with 8. All diversity measurement were low (<2) with the highest value observed in station ZP1 with 1.71 while the lowest in station ZP3 with 1.30. The computed index of evenness among the three stations was not so variable ranging from 0.58 to 0.67. These computed values are considered low as values above 3.0 indicate that the habitat structure is stable and balanced, while values midway from 1.0 to 2.0 describe a threatened condition. Furthermore, values lower than 1.0 indicates pollution and degradation of habitat structure (Goncalves and Menezes, 2011); however, it should be noted that the diversity index very rarely exceeds a 4.5 value.

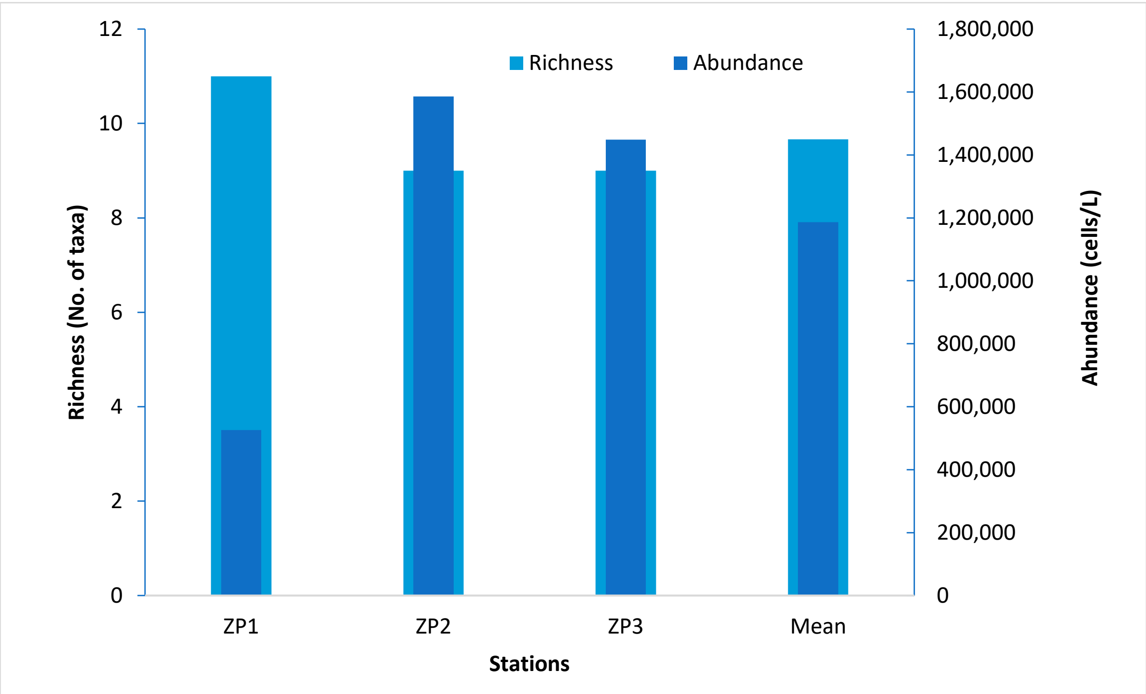


Figure 2-101. Total zooplankton density and richness in three sampling station in the proposed Ilijan Import Facility in Ilijan Batangas during the September 2020 sampling

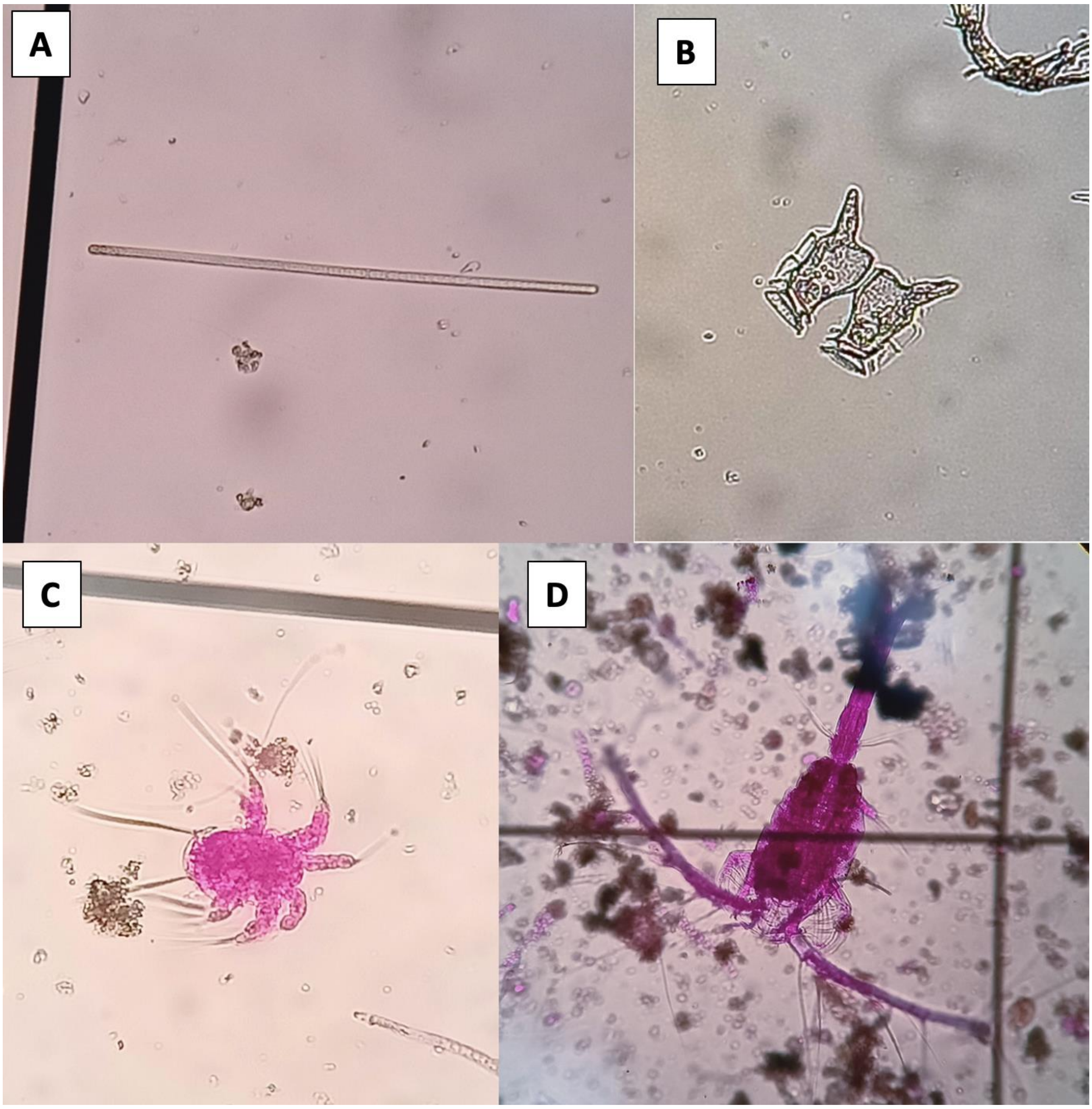


Plate 2-15. Photomicrographs of dominant and important plankton taxa (A) *Trichodesmium* sp. (B) *Dinophysis caudata* (C) *Copepod nauplius* (D) *Calanoid copepod*

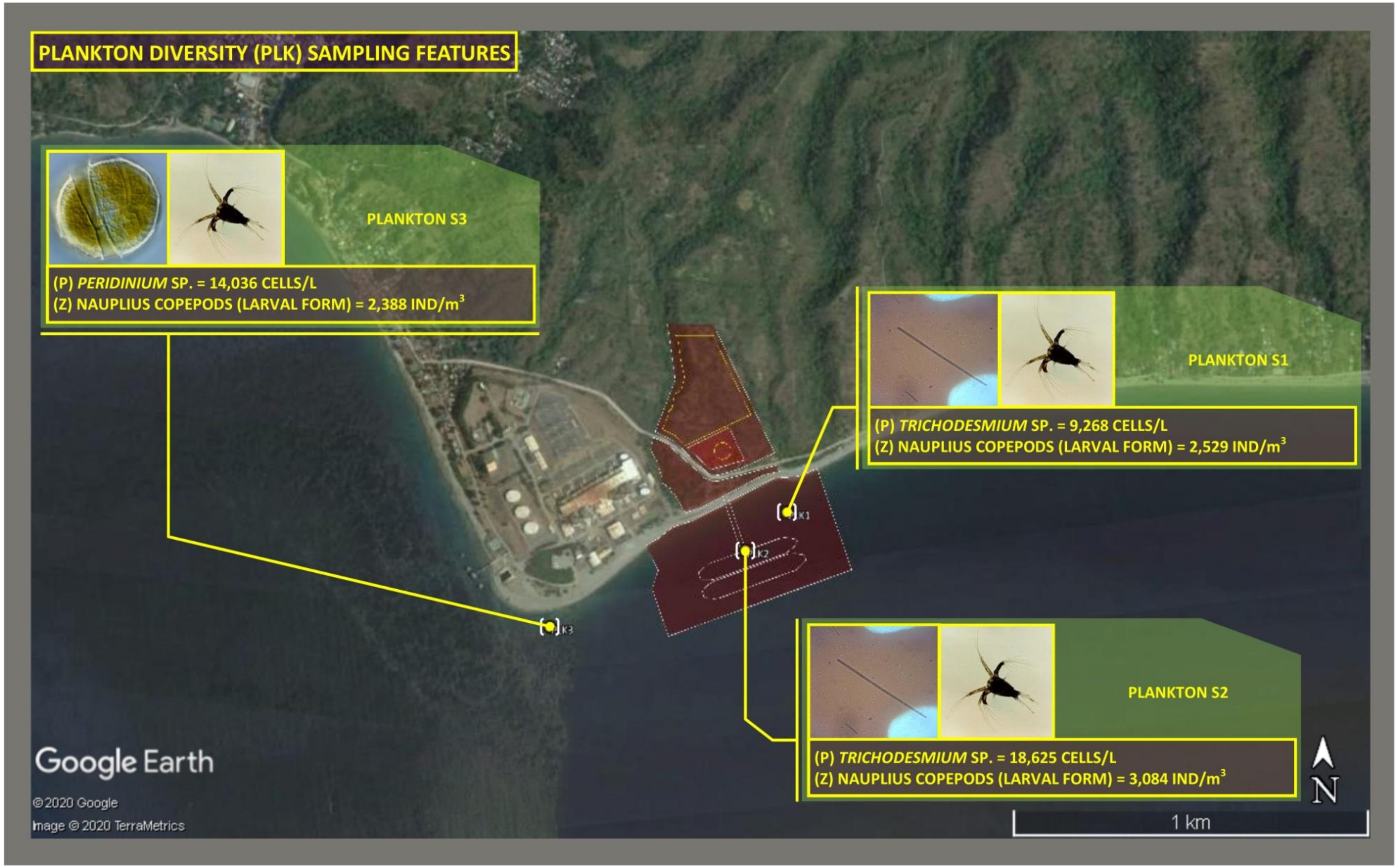


Figure 2-102. Highlights of plankton community assessment during marine ecology baseline assessment in the vicinity of the proposed Ilijan LNG Terminal and Import Facility Project in Barangay Ilijan, Batangas City; (researchers Benj Francisco and Ernie Fontamillas; map prepared by Jose Rene Villegas, October 2020).

2.2.5.2.5 CORAL REEFS

2.2.5.2.5.1 MANTA TOW SURVEYS FOR BENTHIC LIFE FORMS

A total of seventeen (17) manta tow observation stations (**Figure 2-104**) were completed over a linear stretch of 2.6 kilometers. This was supplemented by extensive systematic snorkeling in front of the project site itself where sporadic dead corals were observed.

Out of seventeen (17) manta tow benthic observation pathways, six (6) tows hosted live coral cover ranging from 5% to 60% LHC, ten (10) pathways had dead corals with algae ranging from 10% to 50%, six (6) stations hosted coral rubble, and all seventeen stations were dominated by sandy substrate of 20 to 100% (**Figure 2-104** and **Table 2-30**). Eight (8) stations near the Kepco pier and the project site hosted 80 to 100% sandy substrate, while stations further east revealed dead corals and rocks (**Figure 2-103**).

The live corals were almost exclusively recorded in tows 1 to 5 which were all located in the northwestern coastal shelf of Barangay Ilijan where most resorts and tourist facilities are located. The highest coral cover – 60% LHC of mostly Acropora branching and tabulate corals – was catalogued in station 3 in Sitio Silangan (**Figure 2-103**). This small coral patch is approximately 1.5 km from the LNG facility project site around the Ilijan headland. The shelf with sandy substrate are all situated in front of the Kepco pier and the LNG facility project site except in one station – tow number 12 where 5% live hard corals growing in previously dead coral outcrops were encountered by the survey team. These corals are few and far between and are situated in deep water beneath the proposed berthing site of the floating storage unit. Small coral recruits have actually settled in previously dead coral outcrops and rocks and are not part of a fringing reef which was completely absent in the project site area (**Plate 2-16**). In view of this outcrop where few coral settlers have attached, a spot dive was undertaken in the area. The spot dive confirmed that the corals are few and far between, lodged in rocks and boulders and dead coral outcrops.

Plate 2-16. Isolated coral patches (left) observed in manta tows with a lone patch hosting 60% LHC (right) situated in Sitio Silangan about 1.5 km west of the project site.

Table 2-30. Tabulated summary of results of manta tow surveys for broad coastal benthic profiling in the vicinity of the proposed Ilijan LNG Terminal and Import Facility Project in Barangay Ilijan, Batangas City during marine ecology baseline assessment; 27-28 September 2020.

MANTA TOW RESULTS FOR REEFAND SUBSTRATE COMPOSITION [Southern Coastal Waters of Batangas City, Batangas]								
Site name:		Southern coastal waters of Batangas City across the proposed *Linseed Field Power Corporation* Project site and its immediate vicinities; Batangas City, Batangas						**Survey Team:**
Time / Date:		1328H-1532H / 27September2020						1. Benjamin Francisco 2. Michael Chester Francisco 3. Ernie Fontamillas
Tow Speed:		3.0kmh (ave)						
Visibility:		Turbid waters, some up to 4m visibility						
Weather:		Sunny to Fair						
Wave:		Mild wave action from approx. ± 5cm to ± 10cm wave crests						
Current:		None to mild						
Tide:		Lowering @ 0.19m to 0.10m; as ref from Port Galera Tidal Station (WXTIDE32)						
Water Temp:		Varying from approx. ± 30°C						
Wind:		Beaufort Scale #1						
Cloud Type(s):		Cumulus with some Cirrus Clouds						
Tow Coverage	**Location [DecDeg]**	**LHC**	**SC**	**DC**	**DCA**	**CR**	**S**	**Remarks**
S00	N 13.627450° E 121.071460°	-	-	-	-	-	-	**Start of Tow**
S00-T01	N 13.625389° E 121.072360°	10	0	0	10	0	80	Across resorts; meager isolated coral patch in sandy substrate
T01-T02	N 13.625300° E 121.073450°	40	0	0	30	5	25	Mostly coral recruits in reef patch dominated by tabulate and Acropora branching corals
T02-T03	N 13.623870° E 121.074330°	60	0	0	20	0	20	Mostly coral recruits in isolated reef patch dominated by tabulate and Acropora branching corals
T03-T04	N 13.621920° E 121.075330°	30	0	0	20	0	50	Reef patch begins to be dominated by sandy substrate; coral colonies are widely dispersed
T04-T05	N 13.620480° E 121.075810°	30	0	0	30	10	30	Reef patch dominated by sandy substrate; coral colonies are widely dispersed
T05-T06	N 13.618880° E 121.077000°	0	0	0	0	0	100	Deep water but substrate visible as dominantly sand
T06-T07	N 13.618710° E 121.078140°	0	0	0	0	0	100	Sandy substrate in deep water
T07-T08	N 13.619060° E 121.079340°	0	0	0	0	0	100	Sandy substrate and a few visible rocks

MANTA TOW RESULTS FOR REEFAND SUBSTRATE COMPOSITION [Southern Coastal Waters of Batangas City, Batangas]								
Site name:		Southern coastal waters of Batangas City across the proposed *Linseed Field Power Corporation* Project site and its immediate vicinities; Batangas City, Batangas						**Survey Team:**
Time / Date:		1328H-1532H / 27September2020						1. Benjamin Francisco 2. Michael Chester Francisco 3. Ernie Fontamillas
Tow Speed:		3.0kmh (ave)						
Visibility:		Turbid waters, some up to 4m visibility						
Weather:		Sunny to Fair						
Wave:		Mild wave action from approx. ± 5cm to ± 10cm wave crests						
Current:		None to mild						
Tide:		Lowering @ 0.19m to 0.10m; as ref from Port Galera Tidal Station (WXTIDE32)						
Water Temp:		Varying from approx. ± 30°C						
Wind:		Beaufort Scale #1						
Cloud Type(s):		Cumulus with some Cirrus Clouds						
Tow Coverage	**Location [DecDeg]**	**LHC**	**SC**	**DC**	**DCA**	**CR**	**S**	**Remarks**
T08-T09	N 13.619940° E 121.080840°	0	0	0	0	0	100	Sandy substrate and a few visible rocks
T09-T10	N 13.620500° E 121.081670°	0	0	0	0	0	100	Deep sandy shelf with rocks
T10-T11	N 13.620870° E 121.082700°	0	0	0	0	0	100	Deep sandy shelf with rocks
T11-T12	N 13.621380° E 121.083720°	5	0	0	40	5	50	Patches of corals widely apart with coral rubble; gleaning area at lowest tide
T12-T13	N 13.621920° E 121.085380°	0	0	0	20	0	80	Mostly sand and dead corals with algae; gleaning area
T13-T14	N 13.622580° E 121.086560°	0	0	0	0	0	100	Sandy substrate and a few visible rocks
T14-T15	N 13.623060° E 121.087450°	0	0	0	40	20	40	No live corals seen; mostly DCA and rubble
T15-T16	N 13.623450° E 121.088360°	0	0	0	50	30	20	No live corals seen; mostly DCA and rubble
T16-T17	N 13.623850° E 121.089420°	0	0	0	50	30	20	Stretch of mostly DCA; **End of Tow**
Average Reef and Substrate Composition		**10**	**0**	**0**	**18**	**6**	**66**	

- Tow area coverage are expressed in Decimal Degrees WCS notation in reference toWGS84 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 Iiving 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)**

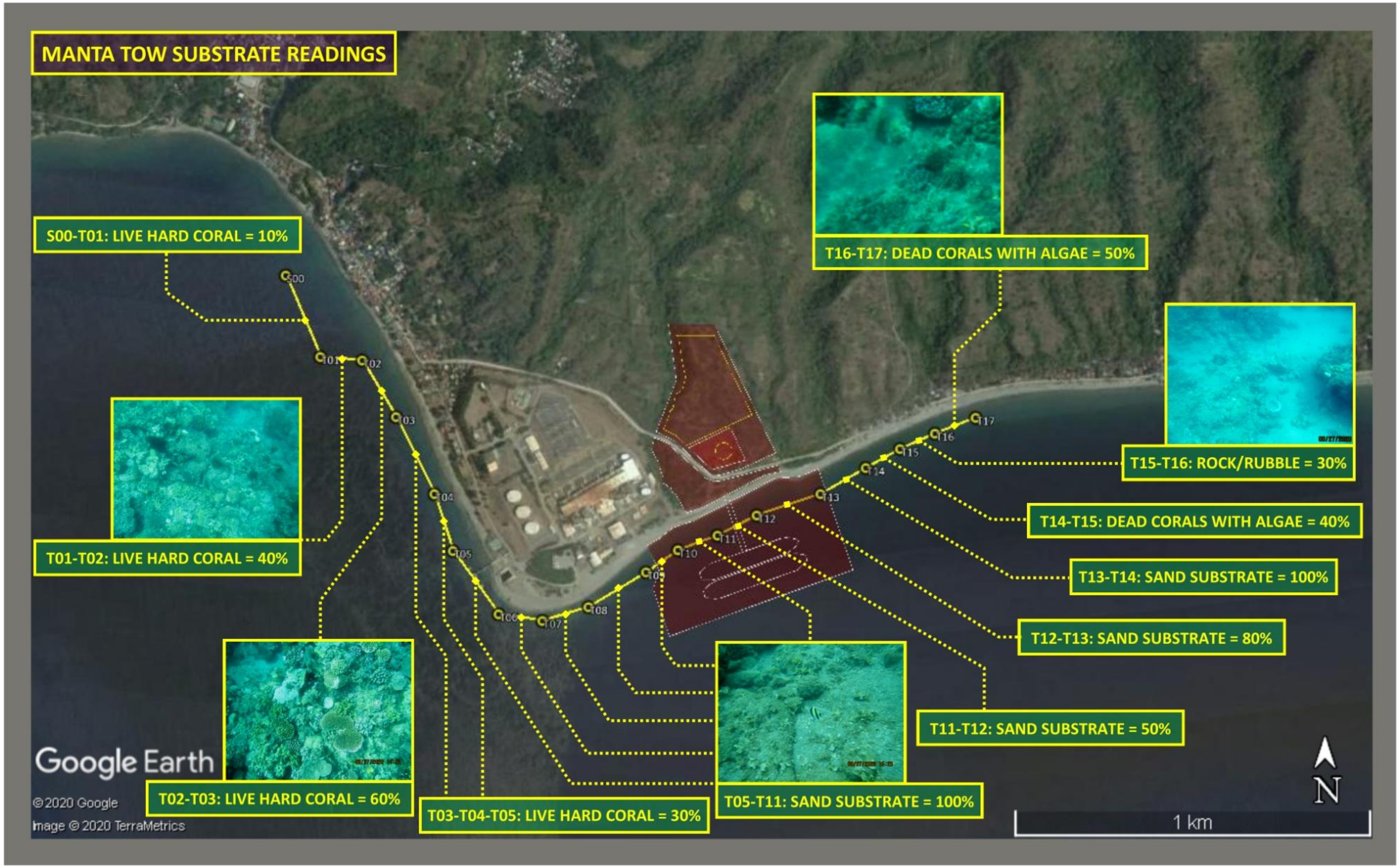


Figure 2-103. Results of manta tow survey in seventeen (17) benthic observations pathways showing areas where live corals were recorded outside the coastal impact area of the Ilijan LNG Terminal and Import Facility in Bgy. Ilijan, Batangas City, during marine ecology baseline assessment on 27-28 September 2020. (Map prepared by Jose Rene Villegas, October 2020)

Across these stations, the average coral cover was catalogued at 10% (=Poor); the high coral cover in one manta tow station was pulled down on average by the rest of the stations which either completely comprised of sandy seabed or poor coral cover in patches interrupted by sandy shelf (**Figure 2-104**). There are no indications of recent and serious coral reef disturbance caused by external factors. No dynamite marks were encountered and neither were there scraping by boat anchors. However, coral bleaching was observed in approximately 10 percent of the live corals (**Plate 2-17**).

Plate 2-17. Sand and rocks encountered in most of the tow stations (left) and bleached tabulate corals in the small coral patch with high coral cover observed outside of the Ilijan LNG Facility project impact area during marine ecology baseline assessment September 27-28 2020.

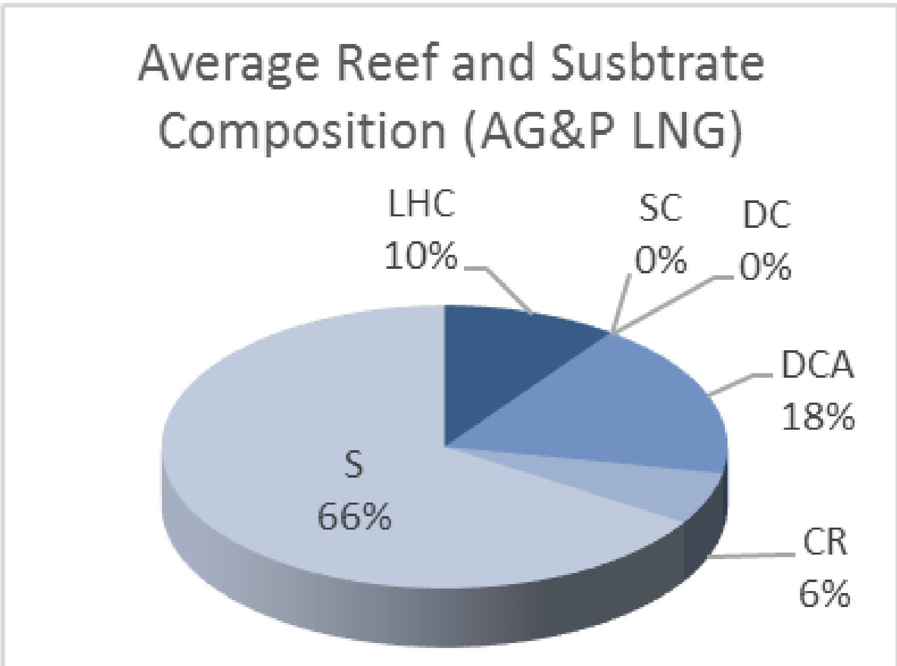
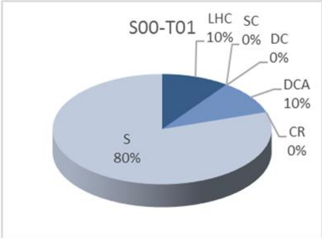
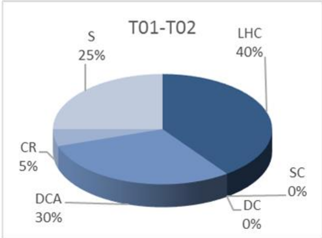


Figure 2-104. Graph summarizing results of seventeen manta tows for coral and benthic substrate profiling during marine ecology baseline assessment in the Ilijan LNG Facility project impact area September 27-28 2020.

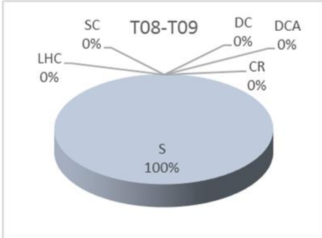
The graphs showing the result of manta tows on a per station basis is shown in **Figure 2-105**.



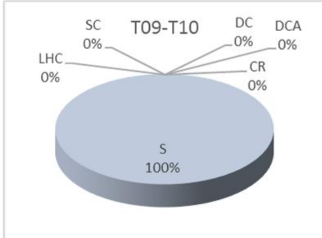
Reef and Substrate Composition for S00-T01



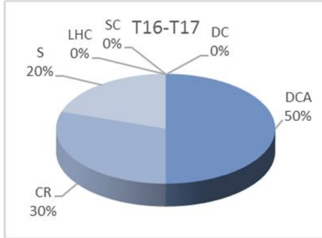
. Reef and Substrate Composition for T01-T02



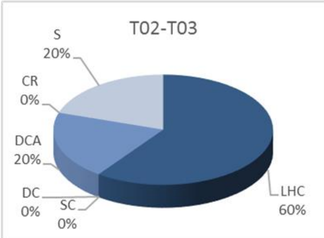
Reef and Substrate Composition for T08-T09



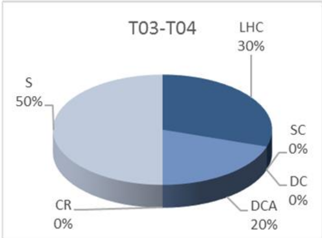
Reef and Substrate Composition for T09-T10



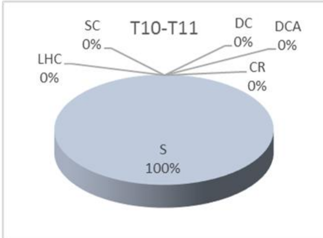
Reef and Substrate Composition for T16-T17



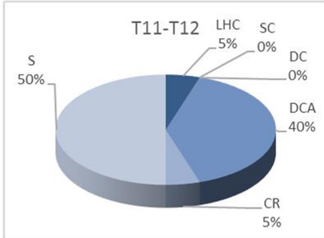
Reef and Substrate Composition for T02-T03



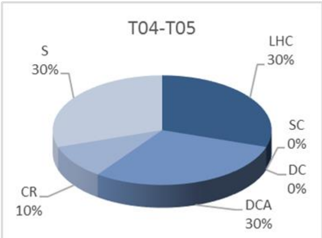
Reef and Substrate Composition for T03-T04



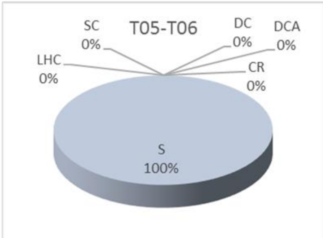
Reef and Substrate Composition for T10-T11



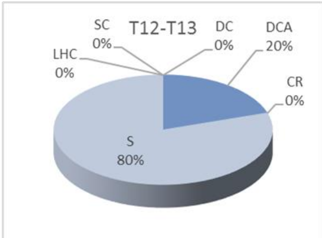
. Reef and Substrate Composition for T11-T12



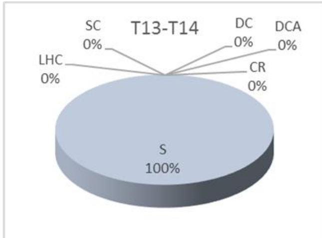
Reef and Substrate Composition for T04-T05



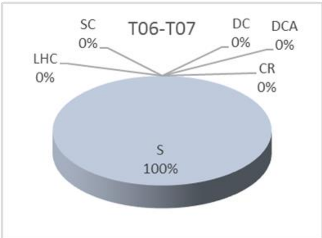
Reef and Substrate Composition for T05-T06



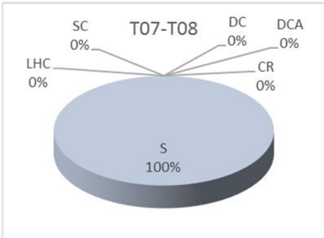
Reef and Substrate Composition for T12-T13



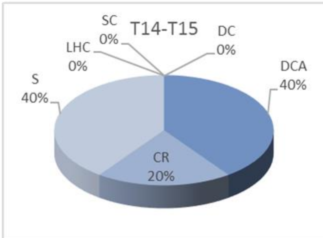
Reef and Substrate Composition for T13-T14



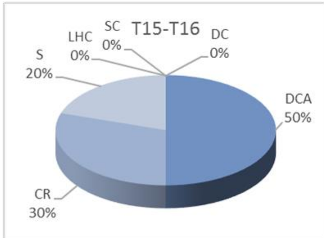
. Reef and Substrate Composition for T06-T07



Reef and Substrate Composition for T07-T08



Reef and Substrate Composition for T14-T15



Reef and Substrate Composition for T15-T16

Figure 2-105. Manta tow results for coral and benthic substrate characterization per station; surveyed during during marine ecology baseline assessment on 27-28 September 2020

2.2.5.2.5.2 RESULTS OF DETAILED CORAL PROFILING IN THE LINE INTERCEPT STATION

Detailed coral assessment in the Line Intercept Transect laid out in a coral patch in Sitio Silangan, Barangay Ilijan recorded an average live hard coral cover (LHC) of 57.2% across the survey corridor. The coral cover is rated as "good" in standard evaluation. It will be recalled that the manta tow reading in this same area is 60% LHC. The highest component in the survey line was actually 'rocky substrate' which was recorded at 20% of the survey area.

Branching and encrusting *Acropora* coral varieties (e.g., *Acropora granulosa; Montipora* spp) dominated the reef, accounting for 23% of live coral distribution combined. Tabulate Acropora (e.g., *Acropora hyacinthus*) and non-Acropora foliose coral species (e.g., *Montipora mactanensis)* were also significant, accounting for 9.20% and 9.0 %, respectively of coral varieties encountered in the transect. Massive *Porites* (*Porites* spp) varieties comprised almost 6%, encrusting non-Acropora varieties consisted of 5.2 (**Table 2-31** and **Figure 2-106** and **Figure 2-107**).

Table 2-31. Average percentage cover of the different coral varieties, other life forms and abiotics across the Line Intercept Transect (LIT) transect station assessed during marine ecology baseline assessment in the *Linseed Field Power Corporation* - Ilijan LNG Facility project impact area September 27-28 2020. (Observers: Ernie P. Fontamillas and Michael Chester V. Francisco).

LIFEFORM CATEGOTES		CODE	AVERAGE PERCENTAGE COVER *(in %)*
Acropora	*Branching*	*ACB*	**11.10**
	Encrusting	*ACE*	**12.00**
	Tabulate	*ACT*	**9.20**
Non-Acropora	*Branching*	*CB*	**3.20**
	Encrusting	*CE*	**5.20**
	Foliose	*CF*	**9.00**
	Massive	*CM*	**5.70**
	Coral Submassive	*CS*	**1.80**
AVERAGE PERCENT LIVE HARD CORAL (LHC) COVER			***57.20 - Good Condition***
Dead Coral		*DC*	**4.80**
Dead Coral with Algae		*DCA*	**3.00**
Other Fauna	*Soft Coral*	*SC*	**2.6**
	Sponge	*SP*	**3.5**
	Sea Anemones	*OT*	**0.40**
	Algal Assemblage	*AA*	**0.40**
Abiotic	*Sand*	*S*	**7.80**
	Rubble	*R*	**0.40**
	Rock	*RCK*	**20.00**

Status Category: Poor = 0 - 24.9; Fair = 25 - 49.9%; Good = 50 - 74.9%; Excellent = 75 - 100% (Gomez et al. 1981)

Dead corals and dead corals with algae was registered at a mean of 7.8 % which is relatively low compared to the live hard coral cover, indicating dense coral cover in the reef crest where the survey line was installed. Sandy substrate was registered at 7.8% and coral rubble at 0.40%. Soft corals and sponge constituted 2.6% and 3.5%, respectively. Coral recruits that consisted mainly of branching *Acropora* and tabulate *Acropora* were witnessed in profuse distribution indicating that the reef is a sink area for coral planulae.

Other coral species observed in the transect line included, among others, *Acropora formosa, Acropora digitifera, Porites lobata, Montipora capricornis*, *Montipora donae, Montipora altasepta, Montipora digita, Porites lutea, Lobophylla sp, Millepora platyphylla, Fungia granulose, Sarchophyton elegans (soft coral);* (**Plate 2-18**).

2.2.5.2.5.3 CONSERVATION STATUS OF CORALS

Acropora granulose, Acropora digitifera, Acropora hyacinthus, Porites lutea, and Porties lobata are listed in the IUCN conservation status as "Near Threatened"; while Montipora mactanensis, and Acropora Indonesia are among those listed as "Vulnerable".

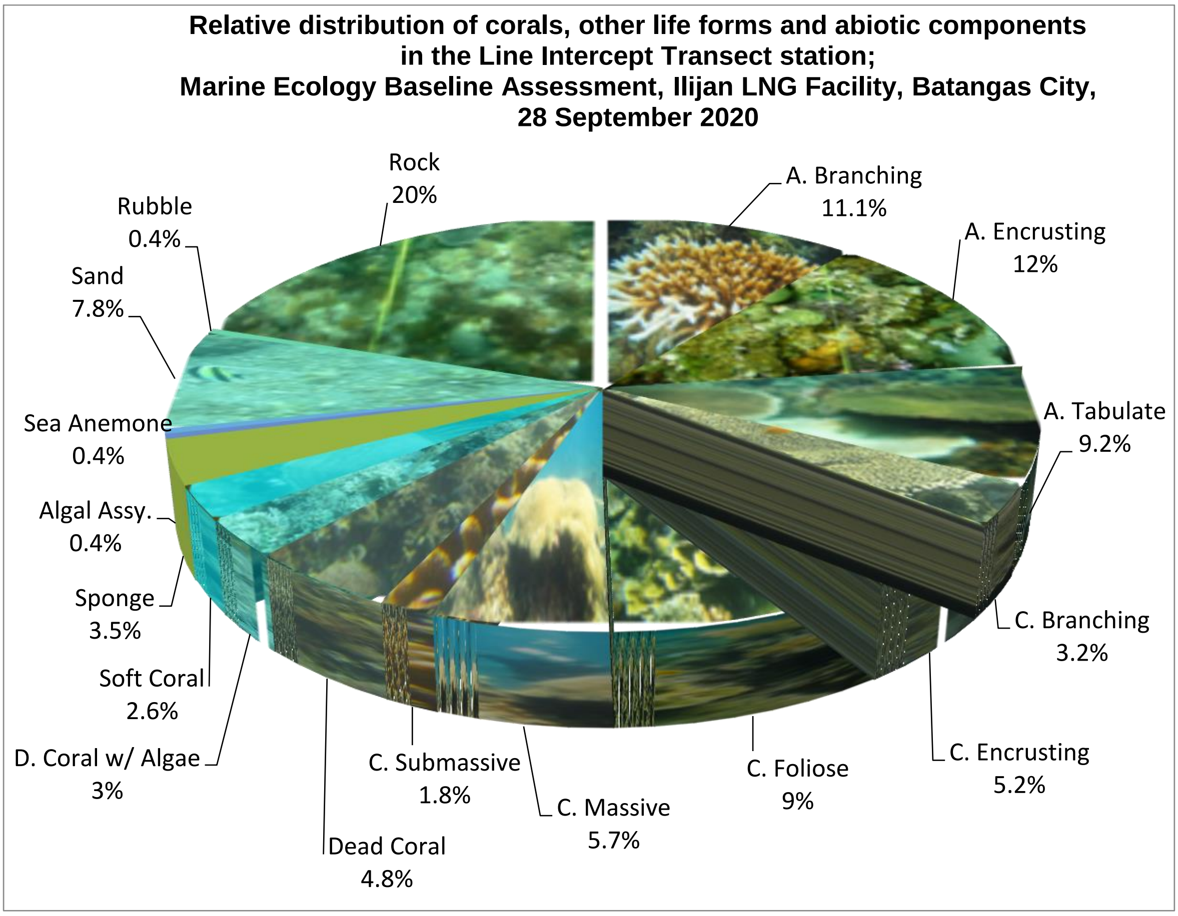


Figure 2-106. Relative distribution of different coral varieties, other life forms and abiotics (in percentages) across the Line Intercept Transect (LIT) transect station assessed during marine ecology baseline assessment in the Ilijan LNG Facility project impact area September 27-28 2020. (Observers: Ernie P. Fontamillas and Michael Chester V. Francisco).

Figure 2-107. Location of corals and summary of results of the LIT survey during marine ecology baseline assessment in the Linseed Field Power Corporation Ilijan LNG Facility project impact area September 27-28 2020. (Observers: Ernie P. Fontamillas and Michael Chester V. Francisco; map prepared by Jose Rene Villegas; October 2020).

Plate 2-18. Corals encountered in the Line Intercept Transect station in Sitio Silangan, Bgy. Ilijan during marine ecology baseline assessment in the coastal impact area of the Ilijan LNG Terminal and Import Facility; 27-28 September 2020. This particular coral patch is outside of the primary impact area of the project.

2.2.5.2.5.4 RESULTS OF SPOT DIVES IN SUBMERGED ROCKS NEAR FLOATING FACILITY PROJECT SITE

A scattering of small rocky outcrops with suspected isolated coral settlers lying in deep water (8 to 31 meters at low tide) in a sandy shelf was recorded in the vicinity of manta tow station number 12. The rocks are located about 100 to 200 meters South and SE of the site for the floating storage facility (**Figure 2-108**). The rocks are located in deep water (measured at 6.5 to 23 meters on 28 Sept 2020 and 8 to 31 m on November 4, 2020) in the central portion of the site where the floating storage facility is proposed to be positioned (**Figure 2-108**). To validate if corals are present in the rocks, eight (8) spot dives were undertaken in five clusters of “rocks” in the area. The largest aggregation consisted of seven major rocky outcrops about 100 meters SE of the site for the floating facility. Underwater observations indicate that the rocky outcrops are all barren with very few, isolated *Porites* and encrusting soft corals in the rocky outcrops (**Plate 2-19**). No significant coral cover was seen in all spot dives, particularly in the largest group of rocks SE of the floating facility. Most of the outcrops consisted of rocks with low relief algal assemblages and dead corals. The seabed is predominantly comprised of sandy substrate. A school of triggerfish (*Balistidae*) and blue demoiselle damsels (*Chrysiptera* sp.) was observed hovering in the rocks and boulders.

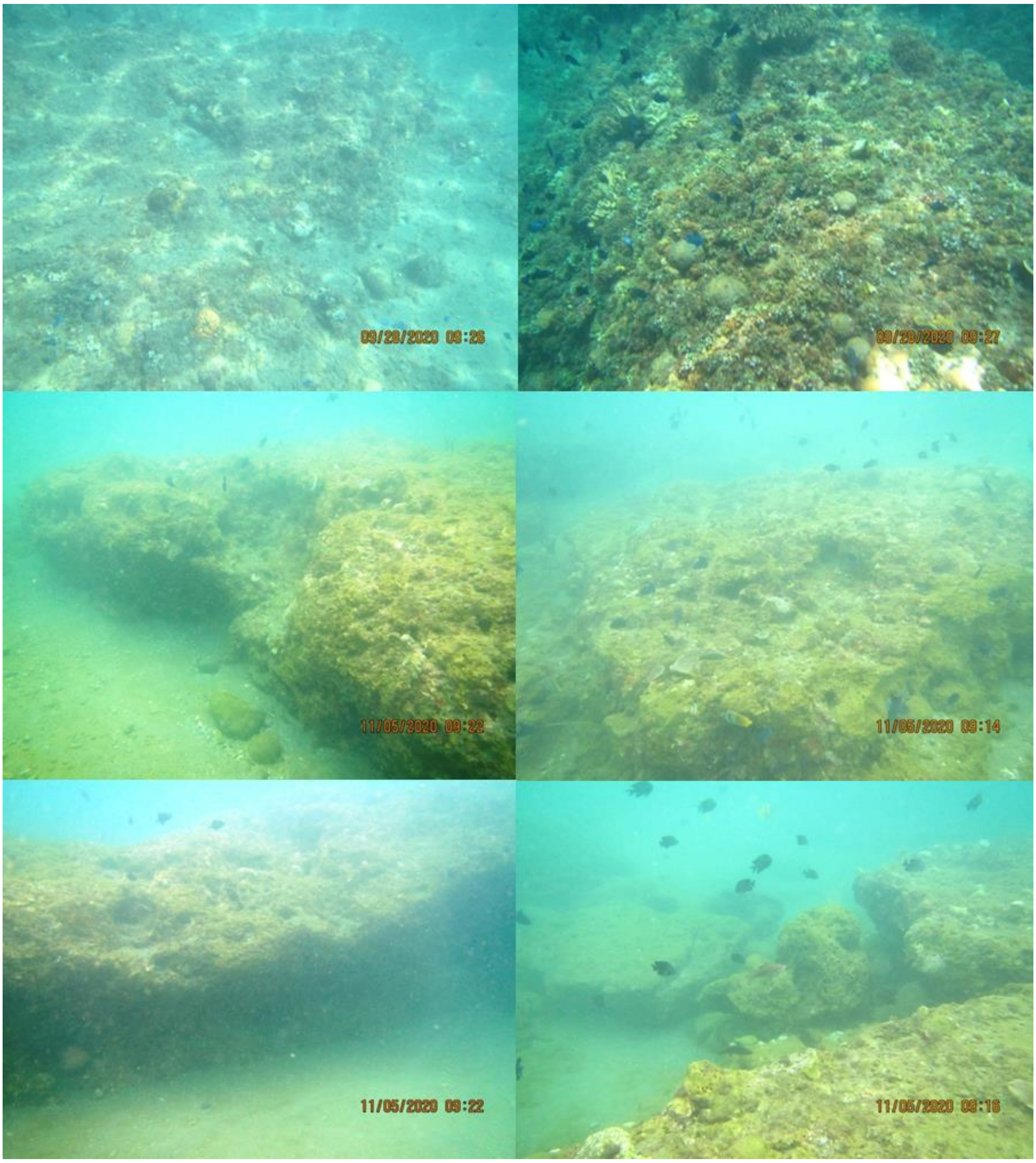


Plate 2-19. A scattering of rocky outcrops with dead corals and algae dominate the seabed in front of the for the floating storage facility; with isolated soft corals consisting of very few young recruits settling in the dead corals and boulders.

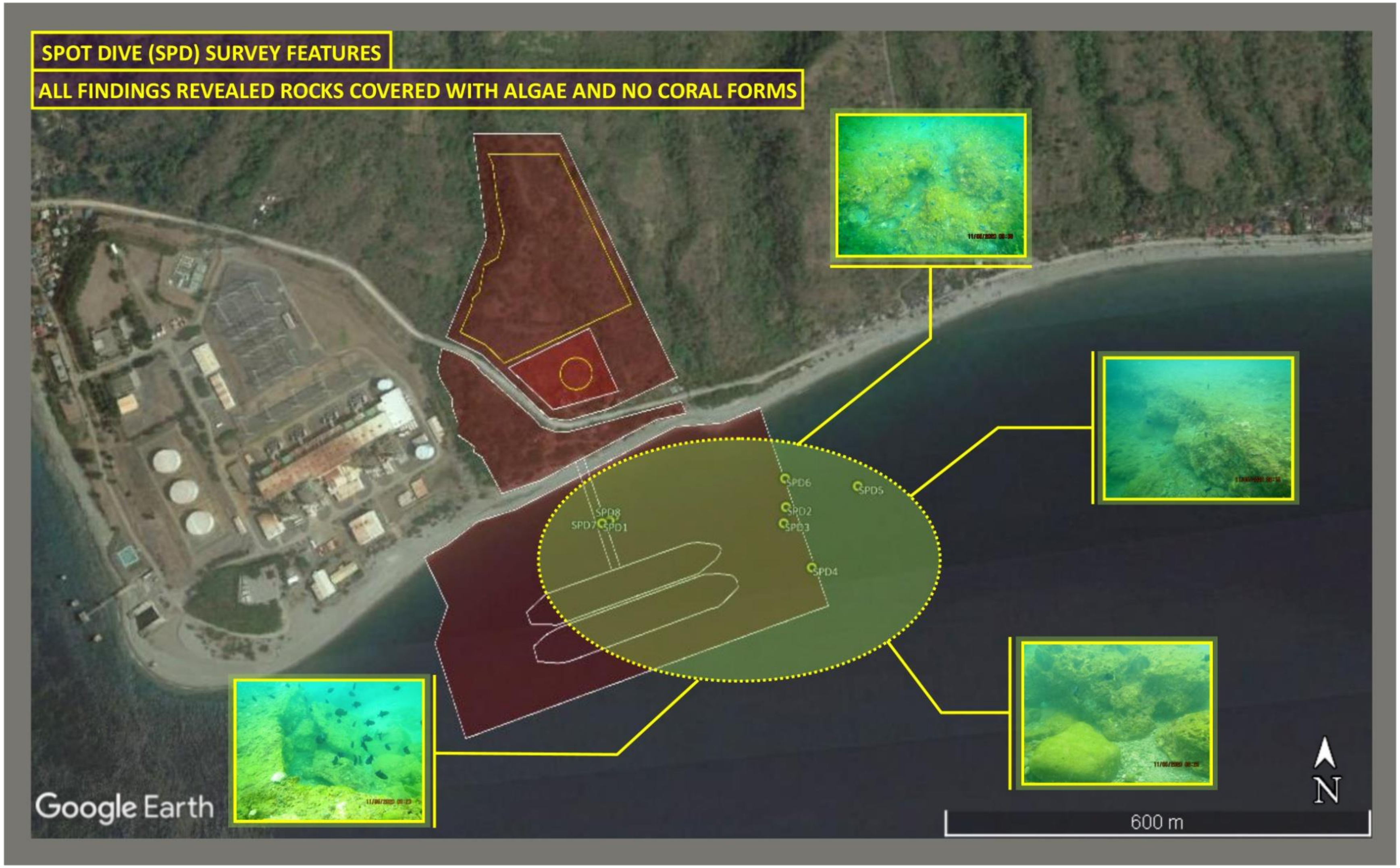


Figure 2-108. Location of rocks and dead coral outcrops with few coral settlers surveyed in a spot dives in front of the project site during marine ecology baseline assessment in the Ilijan LNG Facility project impact area September 27-28 and November 4 to 5, 2020. (Observers: Ernie P. Fontamillas and Michael Chester V. Francisco; map prepared by Jose Rene Villegas; October 2020).

2.2.5.2.6 DEPTH MEASUREMENTS IN SITE OF FLOATING STORAGE FACILITY

Depth of the seabed in the coastal area where s floating storage facility is to be positioned was measured during low tide on 28 September using a portable Hondex depth finder. The readings obtained from 11 random measurement stations show depths ranging from 15 to 54.8 meters in the central portion; while depth near the coastline was measured at 6. 7 meters (**Figure 2-109**).

2.2.5.2.7 ALGAE

Low relief algae were observed in rocky outcrops in front of the site for the project's floating facility. None of the algae observed are ecologically important. The seventeen manta tow surveys did not find any significant colony of macroalgae or seagrass. Two species of macro-algae growing on rocks were, however, encountered in the shallow coastal area where the spot dive was undertaken. These include the *Sargassum* sp. and the red algae *Gracilaria manilensis*. These species grow on rocky substrate or hard sandy substrate which accounts for their sparse distribution in the shallow sea in front of the project site.

2.2.5.2.8 SEAWEEDS

Other than sporadic colonies of *Sargassum crassifolium* (Phaeophyta) growing on rocks and dead corals no significant commercially important seaweed resources were catalogued in the marine survey in the costal impact area of the Project.

2.2.5.2.9 SEAGRASSES

No seagrass communities were observed in the seventeen manta tow benthic observation pathways and eight spot dives in front of the project site along the coast of Barangay Ilijan. No remnants of decaying seagrass blades were seen even as some portions of the shallower benthic environment consisted of sandy substrate.

2.2.5.2.10 MANGROVES

No mangrove trees were encountered in the survey along the coast of Barangay Ilijan in the primary and secondary impact areas of the Ilijan LNG facility project.

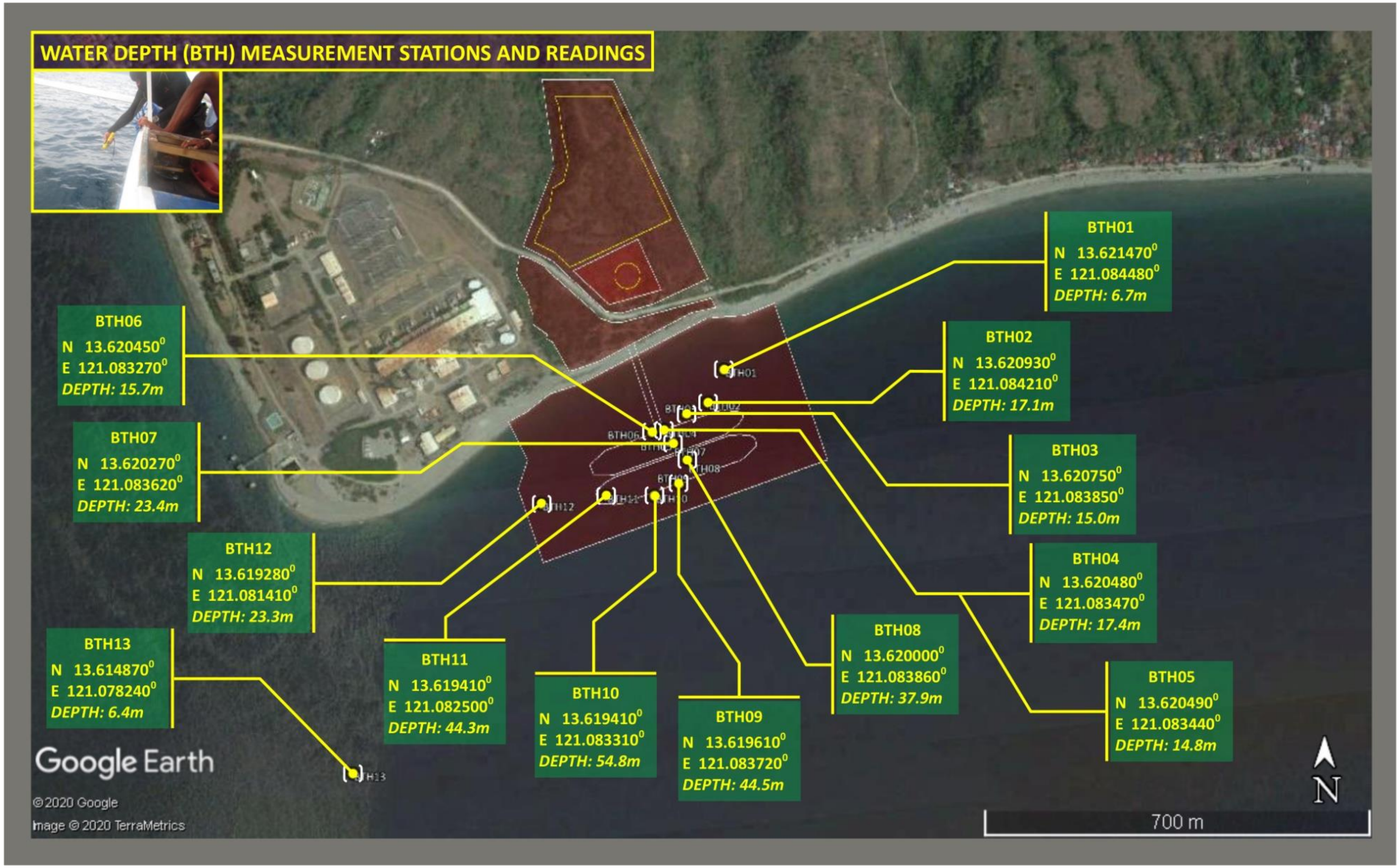


Figure 2-109. Depth of seabed in the area where a floating storage unit is proposed to be positioned measured at low tide on 28 September 2020 during marine ecology baseline assessment in the vicinity of the proposed Ilijan LNG Terminal and Import Facility Project in Barangay Ilijan, Batangas City; (researchers Benj Francisco and Ernie Fontamillas; map prepared by Jose Rene Villegas, October 2020).

2.2.5.2.11 PRESENCE OF POLLUTION INDICATOR SPECIES

Fish - Marine fish species have not been used as indicators of pollution, except where biotoxins are involved (e.g. plankton-filtering fish species in PSP-affected areas). On the contrary, some species of fish have been used as "indicators" of a relatively good coral reef habitat and its ecosystem functions. In the case of the coastal area fronting the project site, at least three (3) species of the butterfly fish *Chaetodontidae* have been recorded in the present survey, as well as another indicator species – the Moorish Idol. These animals are characteristically indicative of a bio-diverse marine environment. The loss of these species over time, on the other hand, is indicative of a degrading benthic ecosystem.

Corals – Corals thrive well in clear waters as their symbiotic relationship with a host alga requires that sustained sunlight penetration for food production is ensured. In this aspect, coral reefs are therefore sensitive to turbid waters that can be brought about by the introduction of sediment plumes. However, there are no corals of significant number of colonies in front of the project site. The corals encountered in Sitio Silangan are 1.5 km from the project site and are unlikely to be impacted by project establishment and operation.

Coral reefs are sensitive to turbid waters that can be brought about by the introduction of sediment plumes. However, there are no corals of significant number of colonies in front of the project site. The corals encountered in Sitio Silangan are 1.5 km from the project site and are unlikely to be impacted by project establishment and operation.

Plankton – No plankton blooms of significant proportion was observed in the survey although the presence of one species with biotoxin potential in case of bloom proportion. *Dinophysis caudata* are associated to produce toxins that cause Diarrheic Shellfish Poisoning (DSP) if ingested by humans through shellfish consumption during algal blooms. In many cases, increased nutrient loading through sediment transport has been observed to be a more likely pathway for occurrence of HABs in coastal areas if the suspended organic matter (OM) causes hyper-nutrient levels and euthrophication. The pollution of coastal waters is believed to stimulate bursts in populations of microscopic and macroscopic algae as various pollution-supplied substances fertilize the water column and bottom substrate and provide the nutrients that trigger algal bloom proportions. Because of this, harmful or toxic algal species become more abundant and more noticeable. Currently, the densities of plankton groups observed in the coastal area within the vicinity of the project site do not indicate proportions that can cause the occurrence of HABs. Nevertheless, constant monitoring of the cell counts of bio-toxin carrying species needs to be undertaken.

2.2.5.2.12 HISTORICAL OCCURRENCES OF RED-TIDE, FISH KILL OR ANY RELATED EVENT

No red tide episodes or fish kills triggered by harmful algal blooms were experienced in the vicinity of the project site in the last ten years.

2.2.5.3 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES – MARINE ECOLOGY

2.2.5.3.1 SEDIMENT PLUMES AND DISTURBANCE TO THE ISOLATED SOFT CORAL COLONIES IN THE AREA OF THE FLOATING FACILITY

There are no significant corals, seagrass and macrobenthic communities in coastal waters fronting the project site. Nevertheless, the overall mitigating strategy is to curtail sediment intrusion in the sea. Furthermore, ships and sea vessels that will dock in the vicinity of the floating storage facility shall be strictly advised not to dispose of any waste water, ballasts, or POL-based liquids in to the seawater. A spill-boom along the port will be installed for added safety measures.

Even as there are no corals in front of the project site, as well as fish habitats, the objective is to reduce, or altogether prevent, sediment invasion to the highest degree possible. Sediment streams from project port activities, if any, earthworks, road construction, or in cases of inadvertent spillage of materials being handled in the land-sea interface that have the potential to intrude into the sea can be prevented first and foremost by ensuring that any plumes or spillages are effectively captured. This will involve the placement of silt curtains and other silt and sediment weirs around the port area, dolphins and infrastructure during construction activities. All activities and structures that can potentially generate loose or fugitive soil and sediments will be subjected to silt curtains and geo-textile sediment filters for effective recovery which will then be disposed of in containment pools inland. During the rainy season, escape of silt will be curtailed especially focusing on potential spill points of terrigenous materials that can end up in coastal waters near the wharf. This will be reinforced by the construction of sediment entrapment screens in drainage canals. Periodic environmental monitoring of TSS will be undertaken and results of monitoring are periodically fed into strategic improvement plans.

Although very few in number, coral settlers in the area of the floating facility can be impaired by the vessel anchoring system and can also be subjected to sediment settlement arising from land-based development works. However it is noted that these corals are few and isolated, and have settled in rocky substrate in deep water where sediments can be readily carried away by currents. Potential oil and marine bilge spillage can also affect these few coral colonies. The robust corals in Sitio Silangan are unlikey to be affected by project development works as they are too far from the project site.

2.2.5.3.2 MACROBENTHOS SUFFOCATION IN CASES OF EXTREME EPISODES OF SEDIMENT INTRUSION

The overall impression from the macroinvertebrate diversity assessment in the survey area is poor as indicated by the low diversity in sampling stations. Nevertheless, coastal and offshore earth moving activities and shoreline fortifications will result to a significant increase in sediment deposition and re-suspension, particularly in the immediate vicinity of the construction site. Alteration of the inter-tidal zone can result to loss of infaunal benthic molluscs. The removal of rocks and stones from the littoral zone will result to loss of populations of perwinkles, some of which are harvested for food. Bivalve veligers in the inter-tidal area of the project site – specifically conch bivalves that were observed in sampling stations, can be susceptible to sediment blanketing particularly during onshore project establishment activities. However, the community of larger conch gastropods can move out to undisturbed areas. Also, it is noted that few other macro-invertebrates were seen in the project site area. Any disturbance to the few benthic stocks of molluscs will be temporary and will have no lasting, far-reaching effects on macro-invertebrate growth and recruitment as shelf is deep and sediment plumes will be readily swept into deeper slopes. Moreover, the macrobenthic community is also known to be resilient as some groups would migrate to less stressful areas, while a few tolerable organisms remain in the affected area; or replenishment of the community will occur with either the existing or new species establishing their population and niches through time. Further, concrete structures in the pier area for the floating facility will, over time, serve as settlement areas for bivalves.

2.2.5.3.3 ACCIDENTAL OIL SPILLS; SHIP BILGE AND BALLAST DISCHARGE

Accidental spillage of oil and grease from project facilities, disposal of ship bilge, as well as spills of materials from ship to port and vice versa can cause seawater pollution that can end up in substrates within the shelf. Such episodes can potentially contaminate benthic invertebrate populations, macrobenthos and fish larvae in the area, even if such communities are few in the area fronting the project site. While these issues are to be strictly controlled so that such will not take place, oil slicks caused by unintentional spills in the project wharf or from shipboard dispensing may remain sequestered in coastal waters and can be dispersed in small blotches towards the direction of tidal movement affecting benthic niches far from the project site and thereafter pollute coral colonies within its pathway, as well as fish nurseries and habitats for sedentary marine animals. On the other hand, the introduction of exotic species in a particular environment can also be caused by the disposal ship ballast water and this will be prevented as a major operational policy of the Project. It is unlikely though that pollution from ballast water can reach the coral reef patch 1.4 km way from the project site as the deep shelf round the Ilijan headland causes strong water circulation forcing tidal water into the deeper portions of the open sea.

An oil and grease containment and waste containment plan will be formulated and enforced in all aspects of project operations. Prohibition of disposal of shipboard wastes will be absolute and a rigid monitoring system around the port complex will be carried out constantly. A bilge and ballast water exchange system will be formulated in accordance with standard IMO protocols and treatment system fitted with oil separators

2.2.5.3.4 THREAT TO EXISTENCE AND/OR LOSS SPECIES OF IMPORTANT LOCAL AND HABITAT

2.2.5.3.4.1 MOVEMENT OF DEMERSAL FISH SPECIES AWAY FROM TRADITIONAL FISHING GROUNDS DUE TO DISTURBANCES AND POTENTIAL MARINE POLLUTION BROUGHT ABOUT BY INCREASED VESSEL MANOEUVRING

Inadvertent oil spills or disposal of shipboard liquid wastes and bilge water can have far reaching, persistent impacts on seawater quality and negatively affect fisheries reproductive morphology, cause decreased reproductive output and shortened larval duration and subsequently, low larval recruitment and survival. Mortality of fish species is not anticipated as the fishes can simply avoid areas of high turbidity, oil spills and contaminated benthic environments. The indirect result will be more costly fishing operations in more distant waters as fishers will be forced to fish further away from the disturbed areas.

2.2.5.3.4.2 POSSIBLE THREATS TO THE PLANKTON COMMUNITY AND THEIR ADAPTABILITY

Sediment suspension in seawater, as well as unforeseen spillage of petroleum-oil-lubricants (POLs) and ballasts, aside from liquid and solid biological and chemical waste materials from sea vessels that are in berth or in regular boat traffic can result to reducing light penetration depth, which again in turn, affect photosynthetic activity by the phytoplankton and reduce the grazing success of zooplankton.

However, it is important to note that these effects are relatively short-term once construction has been completed and measures have then been set to prevent further disturbance during regular operations. Plankton communities are however resilient, and its population could replenish from the relatively abundant plankton community located offshore of the site due to advection as facilitated by water circulation, tidal forcing, and current systems in the water body. There may also be a replacement for niches from displaced plankton with the proliferation of existing tolerant organisms.

2.2.5.3.5 THREAT TO ABUNDANCE, FREQUENCY AND DISTRIBUTION OF SPECIES

2.2.5.3.5.1 SEAWATER TEMPERATURE RISE

Corals have low tolerance limits on warming seawater temperatures and may bleach in seawater temperatures that reach an increase of 3 degrees Celsius or higher. However, the Project is not anticipated to induce climate change issues or contribute to climate-induced seawater temperature rise or saltwater intrusion into the land-sea interface.

2.2.5.3.5.2 DECREASE IN FISH ABUNDANCE DUE TO VESSEL MOVEMENTS

Disturbance arising from heavy vessel movements can discourage fish species from moving into the coastal waters of the project site. However, this will be only temporary in nature and fish stocks will eventually return as benthic habitats improve over time.

2.3 AIR

2.3.1 METEOROLOGY/CLIMATOLOGY

2.3.1.1 CHANGE IN LOCAL MICRO-CLIMATE

2.3.1.1.1 BASELINE METEOROLOGICAL CONDITIONS

2.3.1.1.1.1 CLIMATE

The proposed project site falls under Type 1 Climate based on the Modified Coronas Classification (**Figure 2-110**). This type of climate is characterized by two pronounced seasons, namely: dry and wet season. Dry season occurs from November to April and the wet season during the rest of the year. Regions or areas found along the west of Luzon generally fall under Type 1 Climate.

Figure 2-110. Climate map of the Philippines showing the locations of the project site and PAGASA stations

2.3.1.1.1.2 NORMAL RAINFALL

Table 2-32 to **Table 2-35** show the climatological normals and extremes of the Ambulong PAGASA Station located in Ambulong, Batangas and Calapan PAGASA Station in Calapan, Oriental Mindoro

Figure 2-111 shows the plot of monthly rainfall from three (3) synoptic stations located in Ambulong, Batangas, Calapan, Oriental Mindoro, and Tayabas, Quezon, including rainfall data from MM5. It appears that monthly rainfall trends generally follow the two (2) major seasons in the Philippines, that is lower rainfall during dry season and high rainfall during wet season. Rainfall at PAGASA-Tayabas Station from October to December, however, shows higher rainfall than the other stations as the former is within Type II climate wherein maximum rainfall occurs during the end of the year.

Rainfall at PAGASA-Ambulong and Calapan Stations generally follow the same monthly trend as both stations are located in Type 1 and 2 climates, where Type 2 resembles Type 1 climate. PAGASA-Calapan Station, however, shows higher annual rainfall (2337.1 mm) than PAGASA-Ambulong Station of 1757.0 mm.

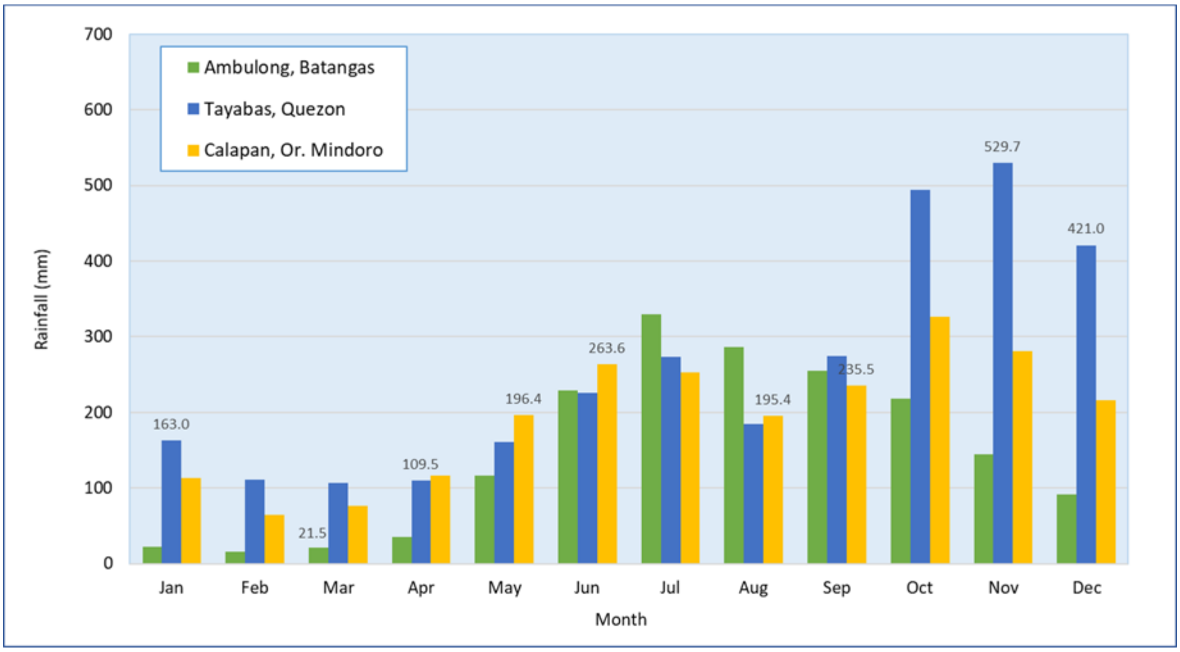


Figure 2-111. Plot of monthly average rainfall and number of rainy days for PAGASA-Ambulong

Table 2-32. Climatological Normals of Ambulong PAGASA Station (1981-2010)

Month	Rainfall		Temperature (°C)						Vapor Pressure (mbar)	%RH	MLSP (mbar)	Wind		Cloud Amt. (okta)	No. of Days	
	Amount (mm)	No. of Rainy Days	Max	Min	Mean	Dry Bulb	Wet Bulb	Dew Pt.				Direction (16pt)	Speed (m/s)		TSTM	LTNG
JAN	22.7	5	30.4	22.2	26.3	25.9	23.1	22.0	26.3	79	1012.7	NE	2	5	0	0
FEB	16.0	3	31.6	22.1	26.9	26.4	23.3	22.1	26.5	77	1012.6	NE	2	4	0	0
MAR	21.5	3	33.2	22.9	28.1	27.7	24.1	22.8	27.5	74	1011.7	NE	2	4	1	1
APR	35.0	4	34.5	23.9	29.2	29.0	25.1	23.8	29.2	73	1010.2	NE	1	4	5	5
MAY	116.6	10	33.9	24.6	29.2	29.1	25.7	24.6	30.7	76	1008.5	NE	1	5	13	14
JUN	228.7	16	32.5	24.6	28.6	28.4	25.6	24.7	30.9	80	1008.3	SW	1	6	15	15
JUL	329.6	19	31.4	24.1	27.8	27.6	25.3	24.5	30.6	83	1008.2	SW	1	6	17	16
AUG	286.9	18	31.0	24.3	27.6	27.5	25.3	24.5	30.7	84	1007.6	SW	2	6	12	12
SEP	255.0	17	31.4	24.1	27.8	27.5	25.3	24.5	30.7	84	1008.5	SW	1	6	14	14
OCT	218.4	15	31.6	23.9	27.7	27.4	25.1	24.3	30.3	83	1009.4	NE	1	6	9	14
NOV	144.7	13	31.4	23.6	27.5	27.1	24.6	23.7	29.2	81	1010.3	NE	2	5	2	6
DEC	92.0	9	30.2	22.8	26.5	26.2	23.6	22.6	27.3	80	1011.8	NE	2	5	0	1
Annual	**1,767.0**	**132**	**31.9**	**23.6**	**27.8**	**27.5**	**24.7**	**23.7**	**29.2**	**80**	**1010.8**	**NE**	**2**	**5**	**88**	**98**

Source: Climate and Agrometeorology Division, PAGASA
Latitude: 13°08'18" N
Longitude: 123°44'00" E
Elevation: 17.0 m

Notes:

VP – Vapor Pressure
mbs – millibar
MSLP – mean sea level pressure
Dir – direction
TSTM – thunderstorm
LTNG – lightning

Table 2-33. Climatological Normals for Calapan, Oriental, Mindoro (1981 to 2010)

Month	Rainfall (mm)	No of rainy days	Temperature(ºC)						VP (mbs)	RH (%)	MSLP (mbs)	Wind (m/s)		Clouds (Okta)	No. of days With	
			Max	Min	Mean	Dry Bulb	Wet Bulb	Dew Pt.				Dir.	Speed		TSTM	LTNG
Jan	112.9	17	29.2	22.1	25.7	25.4	23.4	22.6	27.4	84	1013.1	E	2	6	1	0
Feb	64.7	11	30.1	22.3	26.2	25.8	23.6	22.8	27.6	83	1013.1	E	2	6	0	0
Mar	75.9	10	31.2	23.1	27.2	26.8	24.3	23.4	28.6	81	1012.4	E	2	5	2	1
Apr	116.0	10	32.5	24.1	28.3	28.1	25.7	24.3	30.3	80	1010.9	E	2	5	6	4
May	196.4	13	33.0	24.2	28.6	28.4	25.7	24.8	31.1	81	1009.2	E	2	6	18	12
Jun	263.6	16	32.6	23.9	28.2	28.0	25.7	24.9	31.4	83	1008.5	E	2	6	19	14
Jul	253.0	17	32.0	23.6	27.8	27.5	25.4	24.7	31.0	84	1008.2	NW	1	7	16	12
Aug	195.4	15	32.0	23.7	27.9	27.6	25.5	24.8	31.2	84	1007.8	NW	1	7	12	9
Sept	235.5	16	32.0	23.6	27.8	27.4	25.4	24.7	31.0	85	1008.7	NW	1	7	14	12
Oct	326.5	19	31.5	23.5	27.5	27.2	25.2	24.5	30.7	85	1009.7	E	2	6	14	10
Nov	281.0	19	30.7	23.3	27.0	26.7	24.9	24.2	30.2	86	1010.7	E	2	6	7	4
Dec	216.1	20	29.4	22.5	26.0	25.7	23.9	23.2	28.4	86	1012.3	NE	2	7	2	1
Annual	**2337.1**	**183**	**31.3**	**23.3**	**27.3**	**27.1**	**24.9**	**24.1**	**29.9**	**84**	**1010.4**	**E**	**2**	**6**	**111**	**79**

Source: Climate and Agrometeorology Division, PAGASA

Latitude: 13°24'48" N
Longitude: 121°10'12" E
Elevation: 40.50 m

Notes:

VP – Vapor Pressure
mbs – millibar
MSLP – mean sea level pressure
Dir – direction
TSTM – thunderstorm
LTNG – lightning

Table 2-34. Climatological Extremes in Ambulong Synoptic Station (as of 2019)

MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		HIGHEST WIND (m/s)			SEA LEVEL PRESSURE			
	HIGH	DATE	LOW	DATE	AMT.	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	34.9	01-03-1958	16.0 16.0	01-09-1985 01-24-2014	118.1	01-01-1960	20	ENE	01-29-1989	1022.1	01-30-1998	1004.1	01-05-1999
FEB	37.2	02-28-1985	16.1	02-03-1976	92.7	02-21-2013	24	NE	02-06-1982	1022.2 1022.2	02-01-1962 02-14-2017	1003.7	02-08-1985
MAR	38.0	03-30-1984	16.2	03-03-1963	60.6	03-24-1980	22	ENE	03-10-1989	1021.3	03-30-1958	1002.9	03-27-2001
APR	38.3	04-05-1987	17.5	04-05-1963	57.0	04-23-1996	18	SE	04-25-1989	1019.4	04-04-1998	1001.5	04-06-1994
MAY	38.8	05-15-1921	20.0	05-21-1974	499.2	05-21-1976	41	SW	05-17-1989	1016.2	05-18-2018	987.3	05-17-1989
JUN	38.0	06-14-1983	20.6	06-18-1976	301.5	06-27-1961	40	SW	06-23-1984	1016.2	06-07-1997	987.4	06-29-1964
JUL	36.8 36.8	07-15-1999 07-23-2016	19.2	07-19-2014	218.5	07-13-2010	75	W	07-15-1983	1019.5	07-19-2017	972.1	07-04-2001
AUG	36.7	08-23-1969	19.0	08-31-2015	283.6	08-24-1990	40	NNE	08-12-1987	1015.3	08-23-1999	995.2	08-12-1987
SEP	35.7 35.7	09-14-1984 09-07-2016	19.5	09-04-1991	273.8	09-11-2017	54	SSW	09-09-1982	1015.7	09-05-1953	987.7	09-09-1982
OCT	37.3	10-11-1975	18.9	10-31-1969	183.2	10-28-2000	70	S	10-11-1989	1017.3	10-28-1960	977.4	10-10-1989
NOV	36.5	11-02-1956	18.3 18.3	11-29-1974 11-22-1975	277.2	11-03-1995	45	NE	11-25-1987	1020.0	11-27-2001	978.6	11-03-1995
DEC	35.3	12-25-1962	16.8	12-16-1960	151.9	12-09-1971	54	NE	12-30-1950	1024.2	12-27-2001	996.2	12-05-1993
Annual	38.8	05-15-1921	16.0 16.0	01-09-1985 01-24-2014	499.2	05-21-1976	75	W	07-15-1983	1024.2	12-27-2001	972.1	07-04-2001
Period of Record	**1919-2019**				**1949-2019**		**1950-2019**			**1949-2019**			

Source: Climate and Agrometeorology Division, PAGASA

Coordinates of Ambulong PAGASA Station:

Latitude: 14°05'24.29" N
Longitude: 121°03'18.88" E
Elevation: 11.0 m

Table 2-35. Climatological Extremes in PAGASA-Calapan, Oriental Mindoro (as of 2019)

MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		HIGHEST WIND (m/s)			SEA LEVEL PRESSURE			
	HIGH	DATE	LOW	DATE	AMT.	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	33.5	01-05-1995	17.5	01-03-2002	220.0	01-16-1988	20	NE	01-08-1986	1023.5	01-13-1955	998.7	01-16-1988
FEB	34.0	02-23-1995	16.2	02-08-1916	123.7	02-21-2013	15	NE	02-09-1996	1023.5	02-25-1983	1002.8	02-01-1999
MAR	34.5	03-29-1995	18.4	03-06-1911	180.6	03-14-1991	14	E	03-23-1998	1022.2	03-30-1958	1002.0	03-27-2001
APR	36.5	04-20-1990	16.4	04-02-1972	117.0	04-08-2009	14	WNW	04-14-1992	1019.5	04-01-1958	1002.0	04-21-1956
MAY	37.2	05-27-1912	14.0	05-15-1972	263.0	05-17-1989	30	NW	05-17-1989	1016.5	05-01-1963	985.7	05-12-2007
JUN	37.1	06-19-1912	14.7	06-18-1972	177.6	06-21-2007	23	SE	06-25-1971	1015.3	06-12-1963	986.9	06-29-1964
JUL	36.5	07-07-1987	19.0	07-09-1993	131.4	07-15-2014	36	E	07-10-1983	1017.5	07-28-1987	990.9	07-10-1983
AUG	37.6	08-01-1914	17.6	08-10-1993	140.2	08-09-1993	46	SE	08-12-1987	1016.0	08-25-1988	976.5	08-12-1987
SEP	36.8	09-08-1998	19.4	09-30-1995	197.6	09-30-1995	40	NW	09-27-1978	1016.6	09-01-1978	885.7	09-27-1978
OCT	35.5	10-17-1995	18.4	10-15-1918	266.4	10-28-2005	37	NW	10-10-1989	1018.1	10-28-1960	972.2	10-22-1952
NOV	35.0	11-30-1916	16.2	11-04-1967	277.4	11-11-2008	44	NW	11-25-1987	1021.7	11-30-1989	968.7	11-26-1987
DEC	34.0	12-13-1995	18.0	12-27-2001	228.8	12-09-2011	47	WNW	12-26-2016	1021.3	12-08-1960	893.7	12-12-1993
Annual	37.6	08-01-1914	14.0	05-15-1972	277.4	11-11-2008	47	WNW	12-26-2016	1023.5 1023.5	01-13-1955 02-25-1983	885.7	09-27-1978
Period of Record	1949 - 2019				1919 - 2019		1966 - 2019			1949 - 2019			

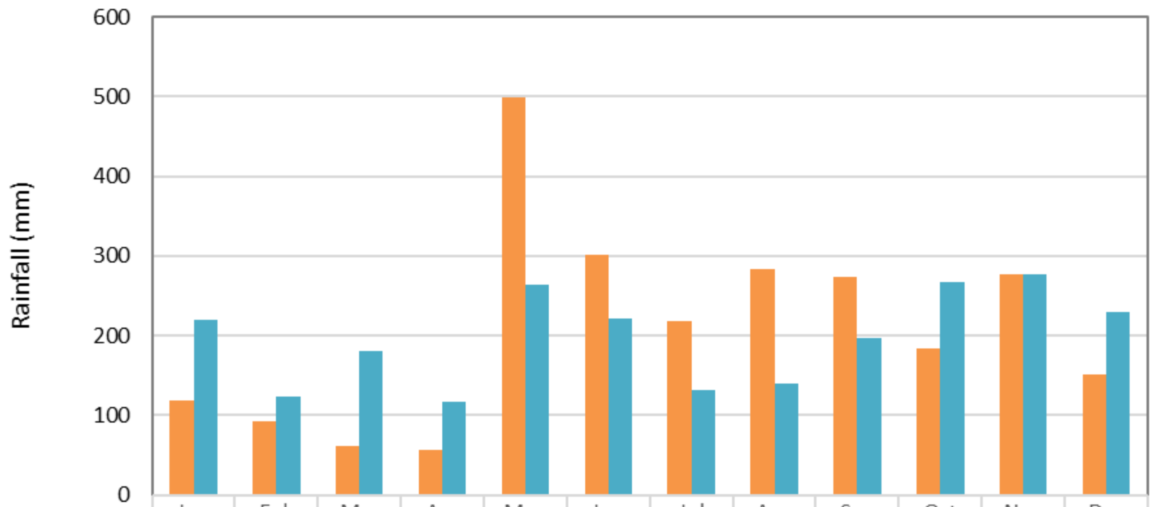
Source: Climate and Agrometeorology Division, PAGASA

Coordinates of Calapan PAGASA Station:

Latitude: 13°24'48" N
Longitude: 121°10'12" E
Elevation: 41 m

2.3.1.1.1.3 EXTREME RECORDED RAINFALL EVENTS

Figure 2-112 shows the highest recorded rainfall at PAGASA-Ambulong and Calapan Stations. The highest recorded rainfall was 499.2 mm on May 21, 1976 followed 301.5 mm on June 27, 1961. The highest rainfall recorded at PAGASA-Calapan Station was 266.4 mm.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ambulong	118.1	92.7	60.6	57.0	499.2	301.5	218.5	283.6	273.8	183.2	277.2	151.9
Calapan	220.0	123.7	180.6	117.0	263.0	221.8	131.4	140.2	197.6	266.4	277.4	228.8

Figure 2-112. Plot of extreme recorded daily rainfall in each month (Source: PAGASA Ambulong and Calapan)

2.3.1.1.1.4 AMBIENT AIR TEMPERATURE

Figure 2-113 shows the plot of monthly average temperatures at PAGASA's Ambulong and Calapan Stations and the project site (MM5 data). It appears that air temperature at PAGASA-Ambulong are generally higher than PAGASA-Calapan as the former is located at lower elevation (11 m) than the latter (41 m). At the project site, the monthly temperatures are generally lower during the dry season and higher during the wet season, although it follows the same trend at PAGASA-Ambulong and Calapan Stations.

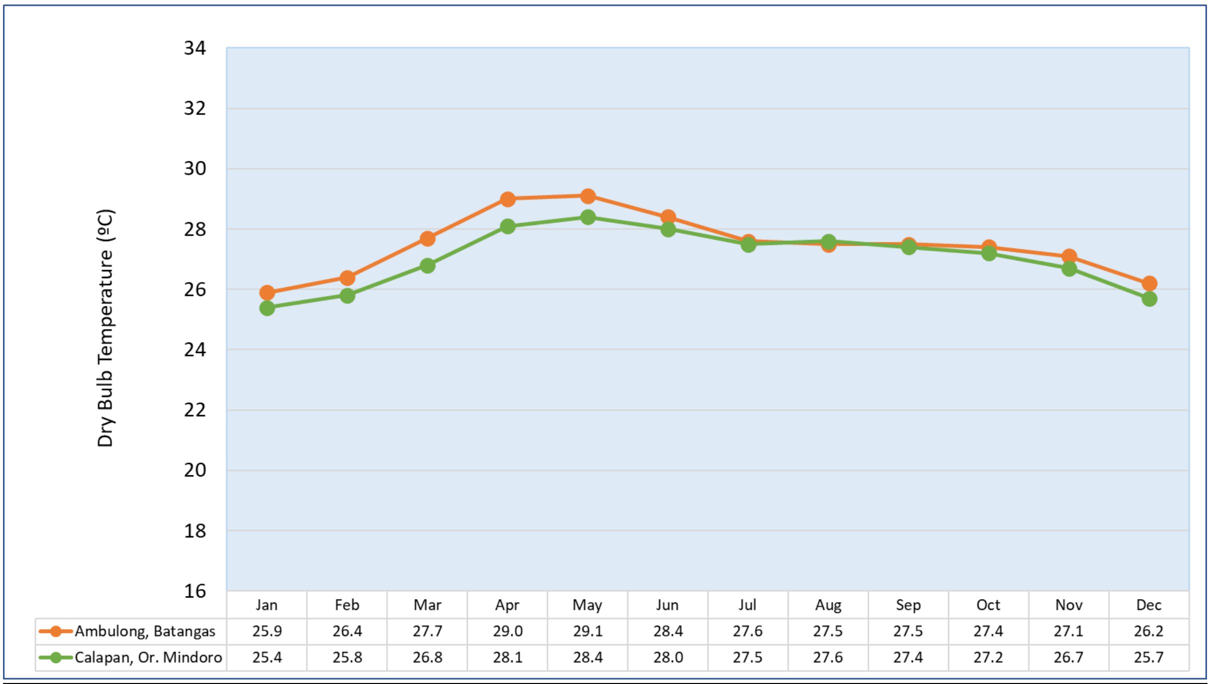
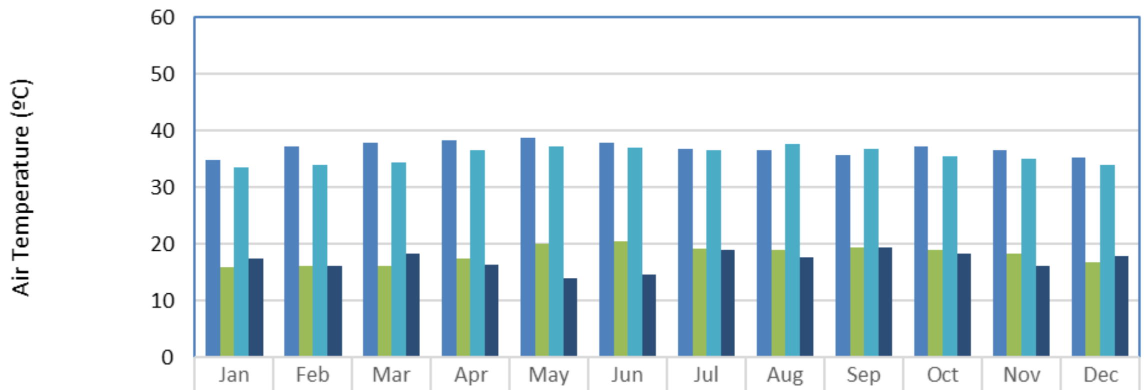


Figure 2-113. Plot of average air temperature and relative humidity for PAGASA-Ambulong and Calapan Stations

2.3.1.1.1.5 EXTREME TEMPERATURE EVENTS

Figure 2-114 shows the plot of the highest and lowest recorded air temperatures in each month of the year. The highest recorded air temperature was at PAGASA-Ambulong Station of 38.8 ºC on May 21, 1974 followed by 38.3 ºC on April 5, 1987 (**Table 2-33**). At PAGASA-Calapan, the highest observed was 37.6 ºC and the second highest was 37.6 ºC. Higher air temperature was observed at PAGASA-Ambulong as it is located in lower elevation than PAGASA-Calapan Station.

The lowest recorded air temperature was 14.0 ºC on May 15, 1972 at PAGASA-Calapan Station and the second lowest at 14.7 ºC also at PAGASA-Calapan. PAGASA-Calapan is located at higher elevation than PAGASA-Ambulong, thus resulting to lower observed air temperature.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High-Ambulong	34.9	37.2	38	38.3	38.8	38	36.8	36.7	35.7	37.3	36.5	35.3
Low-Ambulong	16	16.1	16.2	17.5	20	20.6	19.2	19	19.5	18.9	18.3	16.8
High-Calapan	33.5	34	34.5	36.5	37.2	37.1	36.5	37.6	36.8	35.5	35	34
Low-Calapan	17.5	16.2	18.4	16.4	14.0	14.7	19.0	17.6	19.4	18.4	16.2	18.0

Figure 2-114. Monthly highest and lowest temperatures at PAGASA-Ambulong and Calapan (Period: 1949 to 2019)

2.3.1.1.1.6 LOCAL WIND SPEEDS AND WIND DIRECTIONS

Based on the normal wind directions at the two (2) closest synoptic stations, namely: Ambulong PAGASA Station and Calapan PAGASA Staiton, the prevailing wind flows at the said stations are as follows:

- Ambulong PAGASA Station – northeast winds from October to May and southwest winds from June to September (Table 1); and

- Calapan PAGASA Station - Easterly winds from October to June (except December with northeast winds) and northwest winds from July to September

At the project site, prognostic meteorological data for the period January 1, 2017 to December 31, 2019 were generated by the Lakes Environmental Software (**Plate 2-20**). These data consist of sequential hourly surface and upper air meteorological data, which were also used in the dispersion modelling of air emissions emanating from the proposed project.

The annual wind rose diagram shows that the prevailing winds were from the S-E quadrant, particularly the southwest winds, which accounted to about 20% of the time. Moderate winds (5 to 9 m/s) prevailed in the area followed by light winds (1 to 5 m/s) at 42.5%) (**Figure 2-115**).

During the northeast monsoon season (December to April) in the Philippines, winds at the project site were generally from the east and east-northeast and southeast (**Figure 2-116** and **Figure 2-117**). From June to September, winds from the west and west-southwest prevailed in the area.

In May, which is the transition from northeast to southwest monsoon season in the Philippines, winds from the N-E quadrant started to increase in frequency. The opposite happened in October in which winds from west started to diminish and replaced by persistent winds from the N-E and S-E quadrants.

Lakes Environmental Software — Met Data Services

Surface & Upper Air Met Data
AERMET/AERMOD
Preprocessed from MM5 Data

Nov 10, 2020

Met Data Order Information:

Order #:	MET2017504
Ordered by:	Ronald Pahunang
Company:	RHR Consult Services Inc
Met Data Type:	AERMET-Ready (Surface & Upper Air Data)
Start-End Date:	Jan 01, 2017 - Dec 31, 2019
Latitude:	13.622989 N
Longitude:	121.082522 E
Datum:	WGS 84
UTM Zone:	51
Site Time Zone:	UTC+0800
Closest City & Country:	Ilijan Batangas City - Philippines

Calculated Pseudo Met Station Parameters:

Anemometer Height:	15 m
Station Base Elevation:	46 m
Upper Air Adjustment:	-8 hour(s)

Plate 2-20. General information and location of the prognostic meteorological data

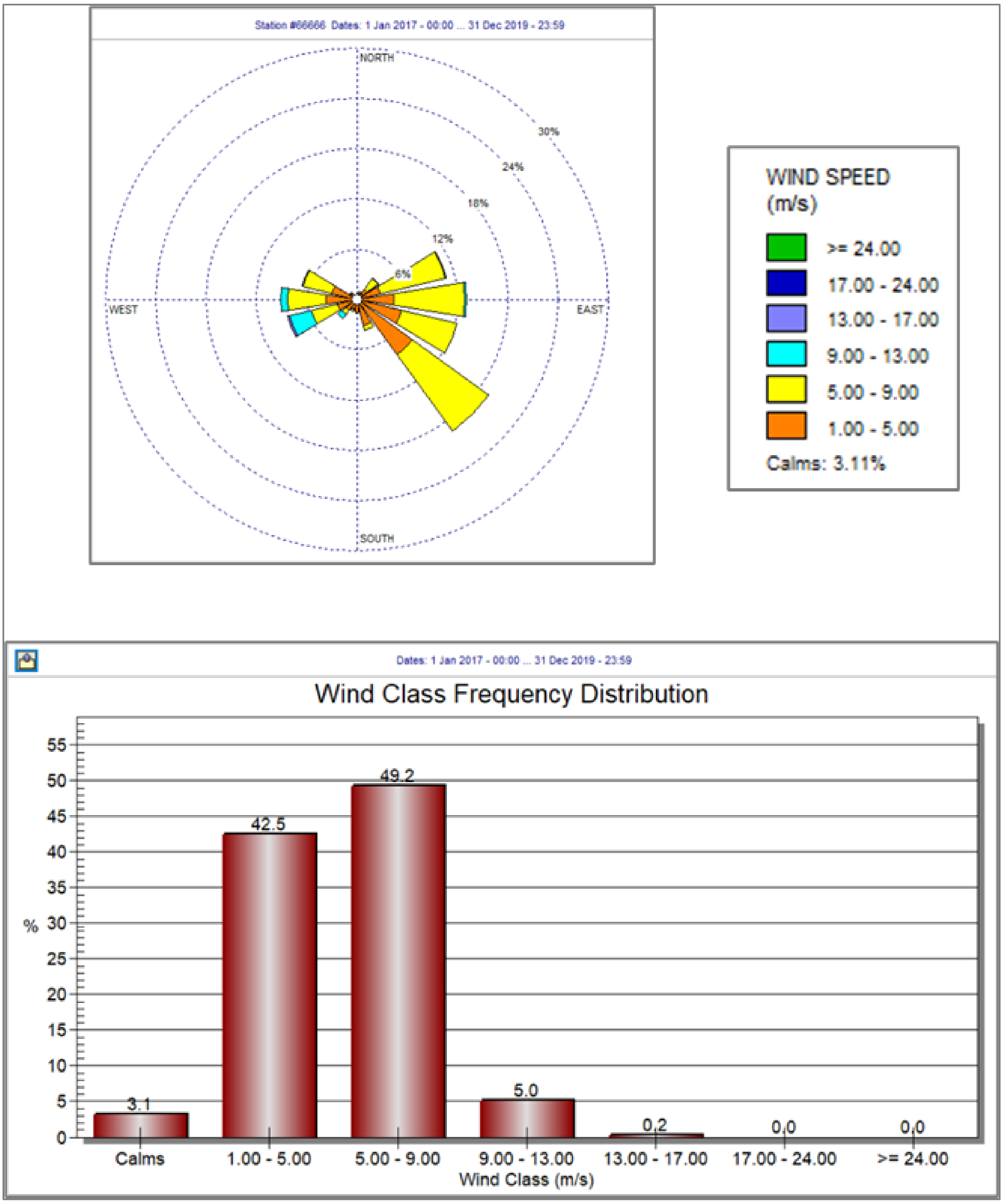


Figure 2-115. Annual wind rose diagrams for the MM5 wind data (2017 to 2019)

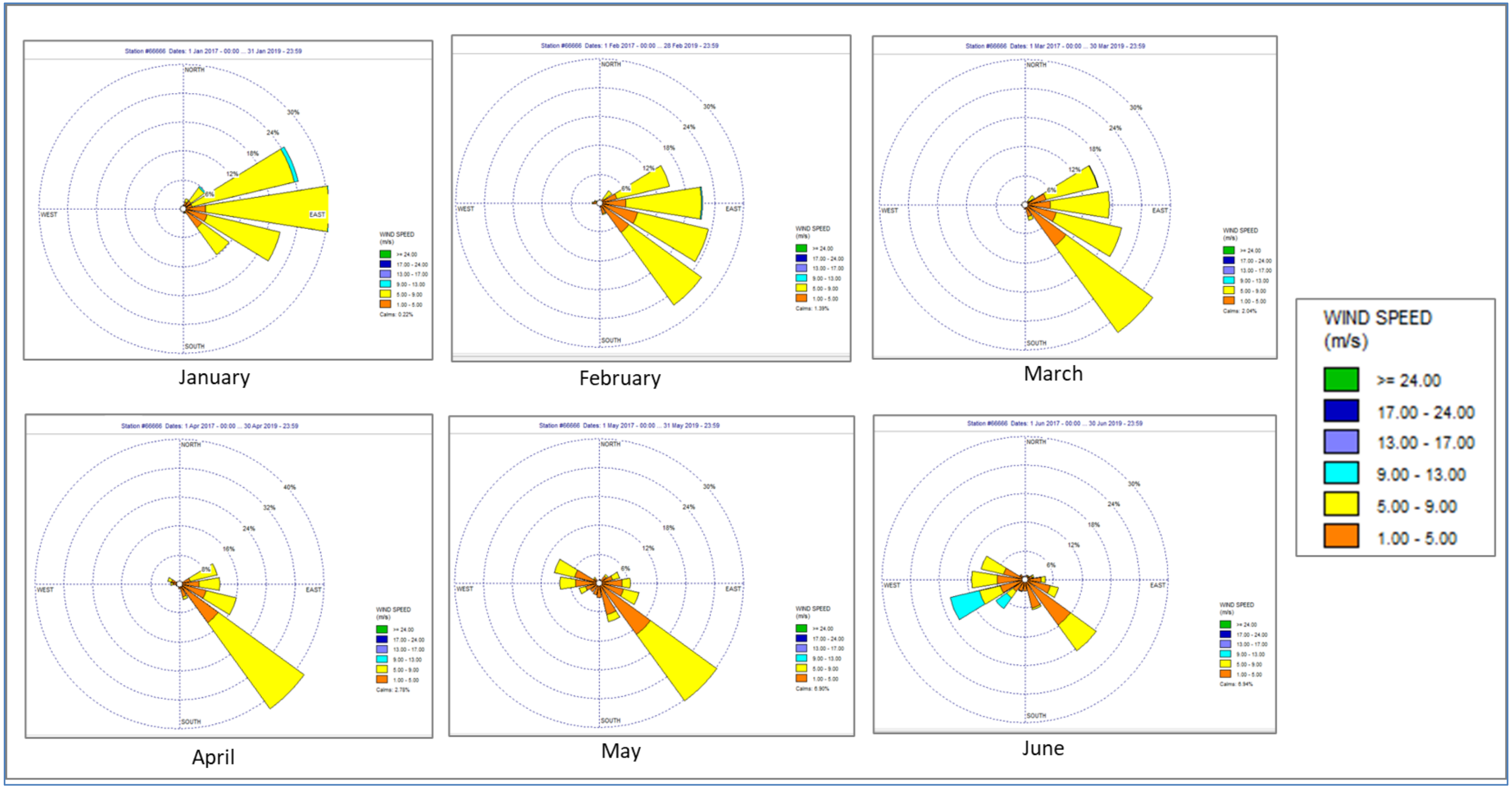


Figure 2-116. Monthly wind roses from January to June (MM5 data from 2017 to 2019)

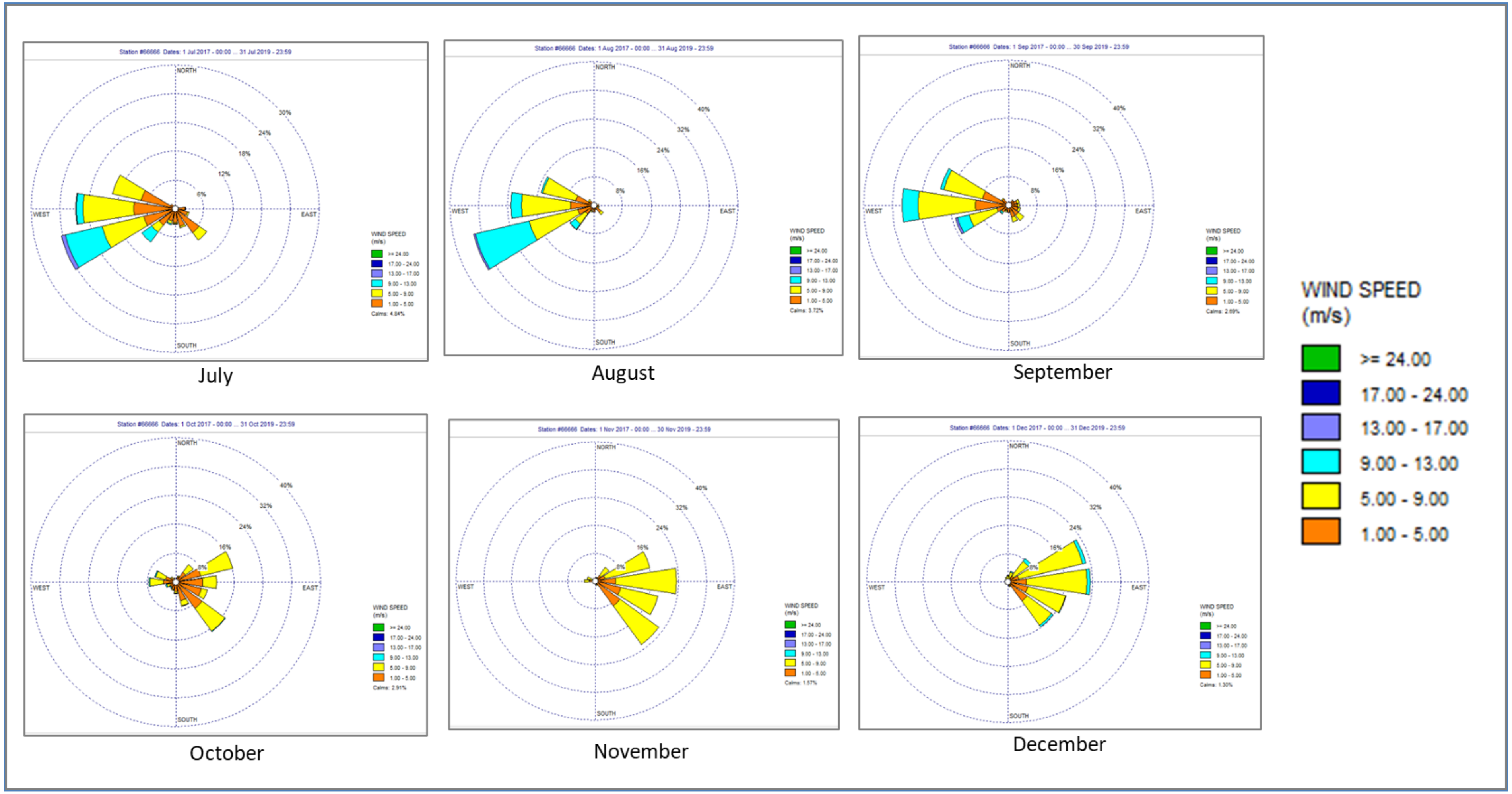


Figure 2-117. Monthly wind roses from January to July to December (MM5 data from 2017 to 2019)

2.3.1.1.1.7 TROPICAL CYCLONES

Table 2-36 shows the classification of tropical cyclones (TCs) based on associated wind intensity. From 1949 to 2019, there were thirty (30) tropical cyclones that crossed the Province of Batangas (**Figure 2-118**).

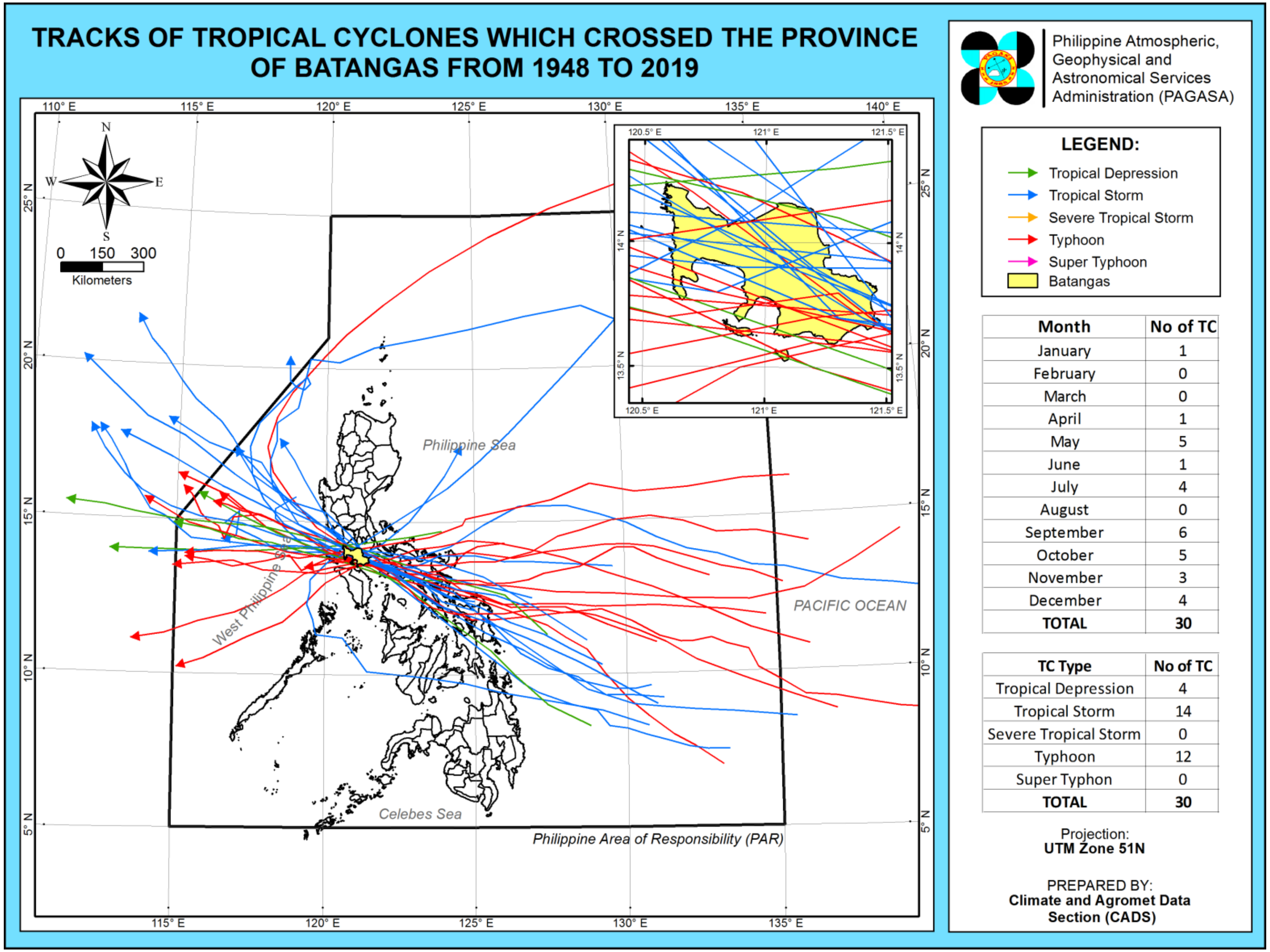
Table 2-36. Categories of Tropical Cyclones (Source: PAGASA)

Type	Sustained Winds (km/h)
Tropical Depression (TD)	<=61
Tropical Storm (TS)	62 to 88
Severe Tropical Storm (STS)	89 to 117
Typhoon (TY)	118 to 220
Super Typhon (STY)	>220

Fourteen (14) of the tropical cyclones were Tropical Storm (TS) and twelve (12) were typhoons. The remaining four (4) TCs were Tropical Depression (TD) (**Figure 2-118** and **Figure 2-119**).

September appears to have the highest TCs with six (6) followed by May and October with five (5) each (**Figure 2-120**). July and December have TCs of four (4) each. The rest of the months have monthly occurrences of 3 and 1 TCs, except February and March with no occurrences of TCs.

The greatest recorded wind speed at Ambulong PAGASA Station was 75 m/s on July 15, 1983 during the passage of Typhoon Vera (named as Typhoon Bebeng in the Philippines). At PAGASA-Calapan Station, the highest recorded wind speed was 46 m/s on August 12, 1987 by Typhoon Betty (or locally known as Typhoon Herming).



Month	No of TC
January	1
February	0
March	0
April	1
May	5
June	1
July	4
August	0
September	6
October	5
November	3
December	4
TOTAL	30

TC Type	No of TC
Tropical Depression	4
Tropical Storm	14
Severe Tropical Storm	0
Typhoon	12
Super Typhoon	0
TOTAL	30

Figure 2-118. Tracks of tropical cyclones which crossed the Province of Batangas from 1948 to 2019 (Source: PAGASA 2020)

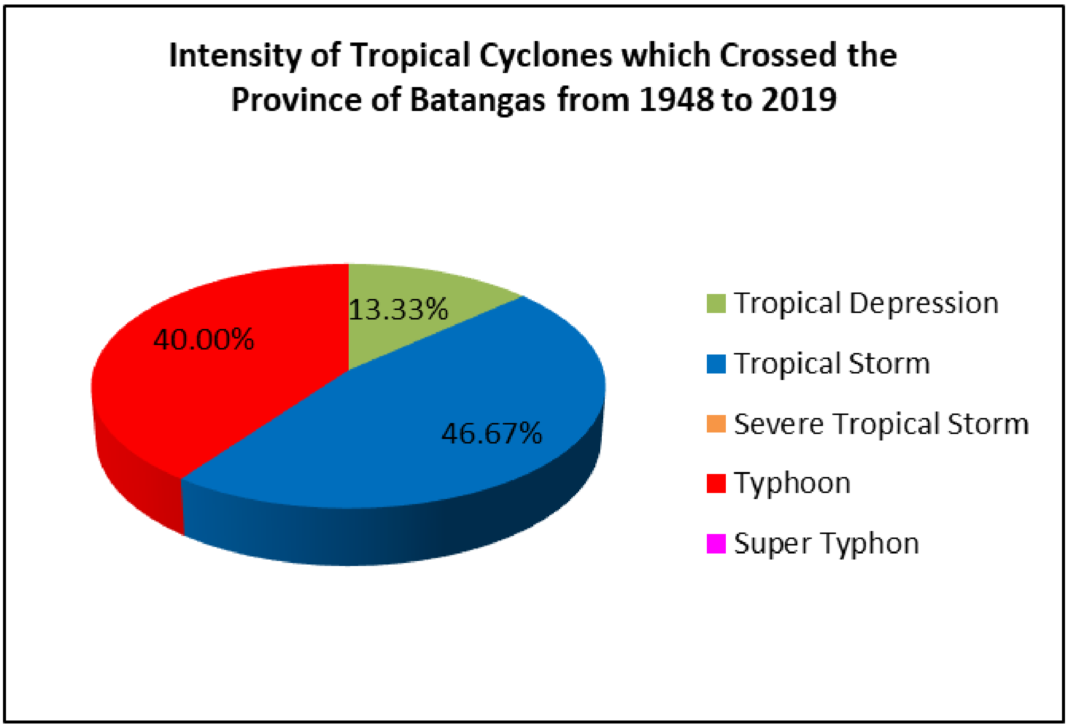


Figure 2-119. Intensity of Tropical Cyclones which Crossed the Province of Batangas from 1948 to 2019 (Source: PAGASA 2020)

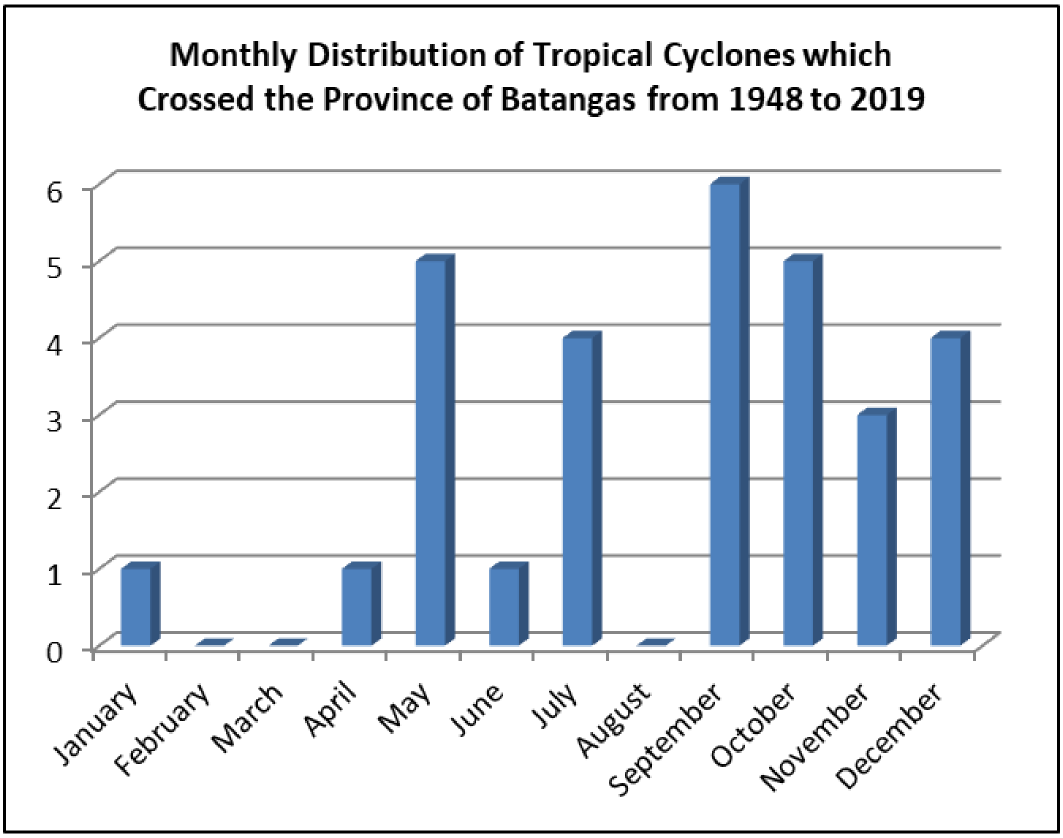
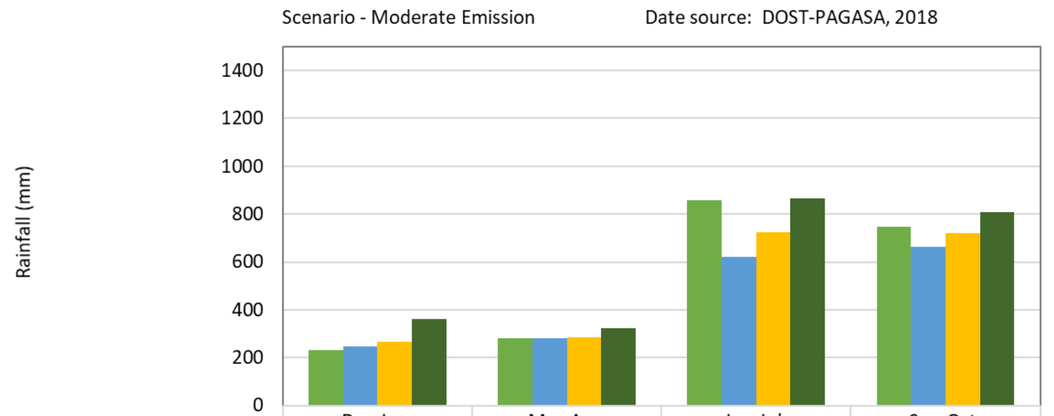


Figure 2-120. Monthly distribution of tropical cyclones which crossed the Province of Batangas from 1948 to 2019 (Source: PAGASA, 2020)

2.3.1.1.2 PROJECTED CLIMATE CHANGES

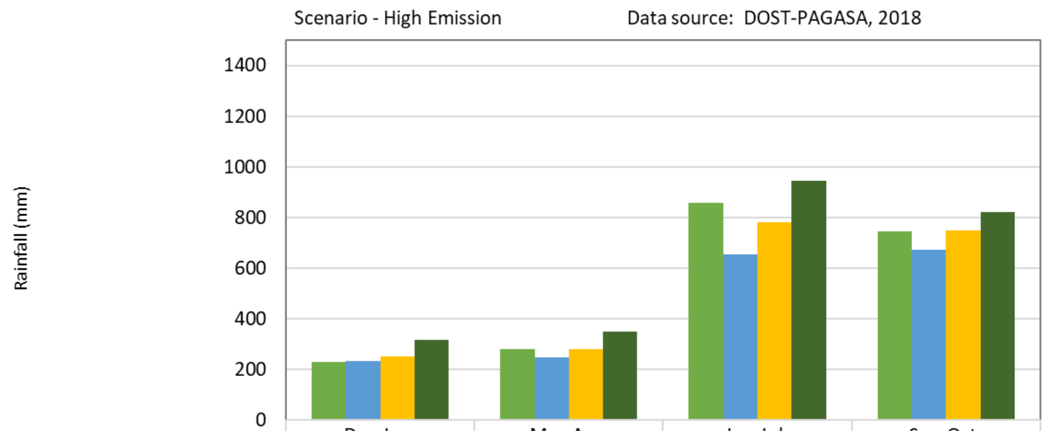
2.3.1.1.2.1 PROJECTED RAINFALL IN 2020 AND 2050

Figure 2-121 and **Figure 2-122** show the projected amount of rainfall in Batangas in 2020 and 2050. Rainfall during dry season in 2020 and 2050 are projected to decrease from the baseline year (1971 to 2000). During wet season, however, rainfall appears to increase in 2020 and 2050. The projected decrease and increase of rainfall in Batangas during dry and wet season, respectively, coincided with the projected trend in the Philippines in 2020.



	Dec-Jan-Feb	Mar-Apr-May	Jun-Jul-Aug	Sep-Oct-Nov
Observed (1971 to 2010)	231.0	280.4	856.5	746.4
Projected (2036 to 2065) - lower bound	248.2	280.1	619.4	661.6
Projected (2036 to 2065) - median	265.5	285.1	726.1	719.7
Projected (2036 to 2065) - Upper bound	360.7	324.8	865.1	807.2

Figure 2-121. Projected change of rainfall in Batangas province in 2020 and 2050



	Dec-Jan-Feb	Mar-Apr-May	Jun-Jul-Aug	Sep-Oct-Nov
Observed (1971 to 2010)	231.0	280.4	856.5	746.4
Projected (2036 to 2065) - lower bound	234.2	248.3	655.6	673.7
Projected (2036 to 2065) - median	249.8	281.8	779.9	749.5
Projected (2036 to 2065) - Upper bound	318.2	350.7	944.0	821.2

Figure 2-122. Projected number of dry days with rainfall greater than 200 mm

2.3.1.1.2.2 PROJECTED TEMPERATURE IN 2020 AND 2050

Figure 2-123 and **Figure 2-124** show the projected air temperatures in Batangas in 2020 and 2050. It shows increasing air temperature from the baseline years (1971 to 2000) to 2020 and 2050, as follows:

As modelled by PAGASA (2011), the worldwide increase of GHG emissions at medium-case scenario triggered regional increase of air temperatures in the Philippines.

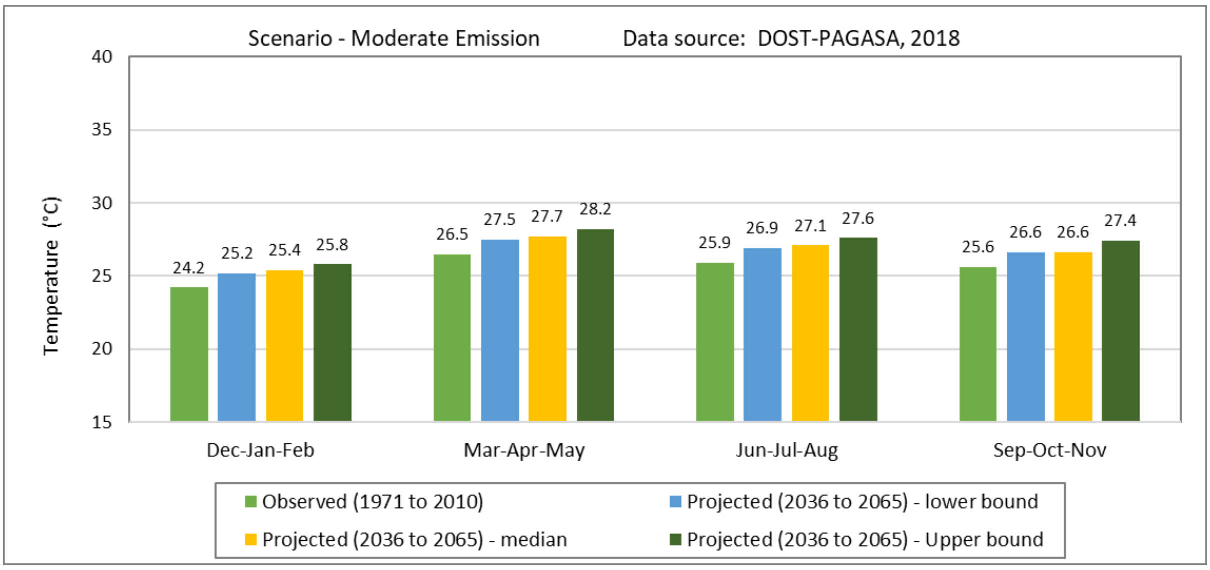


Figure 2-123. Projected change in temperature in 2020 and 2050

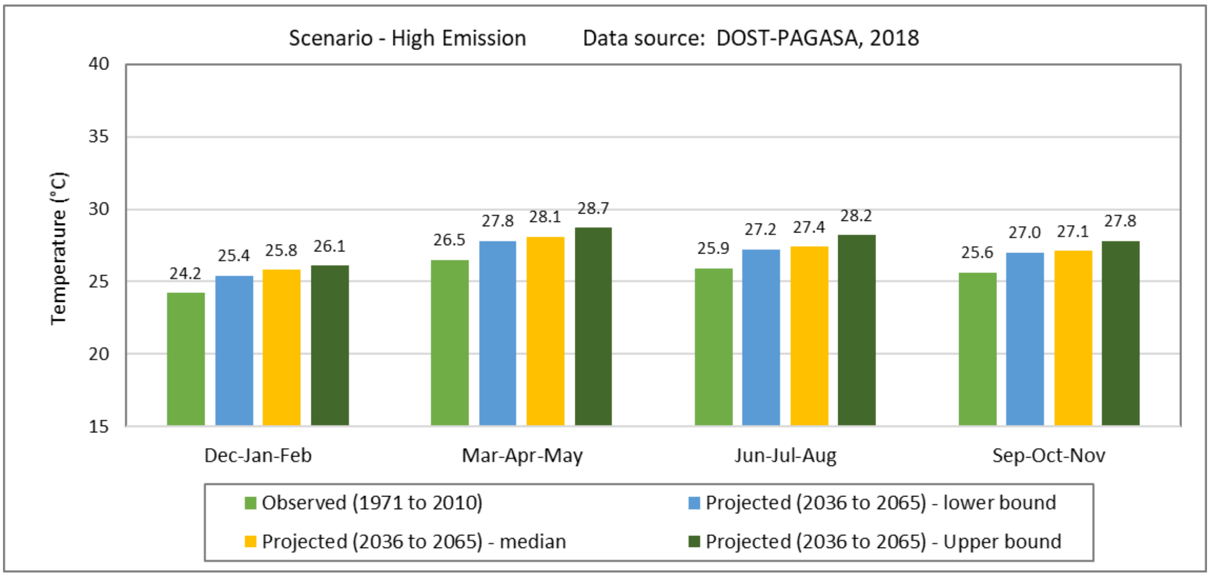


Figure 2-124. Projected change in temperature in 2020 and 2050

2.3.1.1.2.3 PROJECTED CHANGES OF TEMPERATURE IN MICROCLIMATE LEVEL

There could be slight increase of air temperature at the project site and immediate vicinities. The heat generated during operation of the boiler, flare, and other project facilities will increase the existing ambient air temperature including areas that will be cleared for the construction of buildings and other related structures inland. Opened areas that will be directly exposed to solar radiation will gradually release heat directly above the soil resulting to increase in air temperature. .

The following are proposed mitigation measures to lessen or minimize significant increase of ambient air temperature.

1) Limit clearing of vegetation and cutting of trees by utilizing opened areas as possible.

2) Immediate replenishment or replanting of opened space after construction works, i.e., lay down areas, to alleviate increase of air temperature,

3) Plant strips of trees along the property boundaries. This will also prevent or minimize release of fugitive emissions outside the project and could serve as buffer zones.

4) Include in the design of the project site greening/landscaping program that not only enhances the surroundings, but also lessens increase of air temperature by employing greening practices.

2.3.1.1.3 CONTRIBUTION IN TERMS OF GREENHOUSE GASES

2.3.1.1.3.1 GHG EMISSIONS DURING CONSTRUCTION PHASE

2.3.1.1.3.1.1 METHODOLOGY

GHG emissions during construction period were estimated by a) determining the fuel consumption of each equipment based on the engine capacity, average load factor, and the specific fuel consumption, and b) by using the using the GHG Emissions Calculation Tool (Mobile Combustion Version 2.6) with fuel consumption and other related information as inputs.

The GHG Emission Calculation Tool was developed by the Clear Standards, Inc. in collaboration with the World Resources Institute (WRI 2015). The emission factors in this tool come from the following:

- UK Dept. for Environment, Food and Rural Affairs (DEFRA),
- US Environmental Protection Agency (EPA); and
- Intergovernmental Panel on Climate Change's (IPCC) 2006 Guidelines for National Greenhouse Gas Inventories. The tool was developed by Clear Standards Inc. in collaboration with WRI.

2.3.1.1.3.1.2 RESULTS

Table 2-37 shows the summary of the estimated GHG emissions during construction phase based on screenshots of the results of GHG calculations (**Plate 2-21** to **Plate 2-27**). GHG emissions at the construction site (onshore) appear to have the highest projected emissions due to numerous equipment and extended duration of construction works (about 1.5 years) as compared to the fabrication area and offshore site. Fabrication and offshore construction will take about nine (9) months each.

Table 2-37. Estimated GHG emissions during construction period

Location	Estimated GHG Emissions (tons)
Yard equipment (fabrication area)	5090.494
Construction site (onshore)	7720.455
Offshore site	3275.716

Annex G1 to **Annex G3** show the list of equipment and the number and estimated fuel consumption per month.

GREENHOUSE GAS PROTOCOL

Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)	5090.494
Biofuel CO2 Emissions (metric tonnes)	0

Activity Data

The default emission factors are sourced from the US EPA Climate Leaders program or from the UK DEFRA (for air travel only).

Status	Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Vehicle Type (For air transport, see footnote)	Distance Travelled
	Welding Machines	Other	Road	Scope 1	Fuel Use		
	Crawler Crane, 300T	Other	Road	Scope 1	Fuel Use		
	Crawler Crane, 150T	Other	Road	Scope 1	Fuel Use		
	Rough-terrain Crane, 100T	Other	Road	Scope 1	Fuel Use		
	Rough-terrain Crane, 70T	Other	Road	Scope 1	Fuel Use		
	Air Compressor, 750 cfm	Other	Road	Scope 1	Fuel Use		
	Manlift, 272kgs	Other	Road	Scope 1	Fuel Use		
	Rough-terrain Crane, 70T	Other	Road	Scope 1	Fuel Use		
	Rough-terrain crane, 45T	Other	Road	Scope 1	Fuel Use		
	Tractor Truck with HB Trailer, 20T	Other	Road	Scope 1	Fuel Use		
	Forklift, 6T	Other	Road	Scope 1	Fuel Use		
	Boom Truck, 10T	Other	Road	Scope 1	Fuel Use		
	Self Propelled Modular Transporter (S	Other	Road	Scope 1	Fuel Use		

Status	Source Description	Fuel Amount	Unit of Fuel Amount	Error Messages	GHG Emissions: Fossil Fuel CO2 (metric tonnes)	CH4 (kilograms)	N2O (kilograms)	Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
	Welding Machines	141.634	Cubic Meter		379.059			379.059
	Crawler Crane, 300T	110.745	Cubic Meter		296.390			296.390
	Crawler Crane, 150T	79.101	Cubic Meter		211.700			211.700
	Rough-terrain Crane, 100T	55.744	Cubic Meter		149.189			149.189
	Rough-terrain Crane, 70T	653.044	Cubic Meter		1747.759			1747.759
	Air Compressor, 750 cfm	169.452	Cubic Meter		453.509			453.509
	Manlift, 272kgs	6.783	Cubic Meter		18.154			18.154
	Rough-terrain Crane, 70T	73.46741082	Cubic Meter		196.623			196.623
	Rough-terrain crane, 45T	36.87663812	Cubic Meter		98.694			98.694
	Tractor Truck with HB Trailer, 20T	477.9669685	Cubic Meter		1279.196			1279.196
	Forklift, 6T	47.05344678	Cubic Meter		125.930			125.930
	Boom Truck, 10T	26.62424471	Cubic Meter		71.255			71.255
	Self Propelled Modular Transporter (S	23.55294118	Cubic Meter		63.035			63.035

Plate 2-21. Estimated GHG emissions of emission sources at the yard/fabrication site

GREENHOUSE GAS PROTOCOL

Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)	7720.455
Biofuel CO2 Emissions (metric tonnes)	0

Activity Data

The default emission factors are sourced from the US EPA Climate Leaders program or from the UK DEFRA (for air travel only).

Status	Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Vehicle Type (For air transport, see footnote)	Distance Travelled
	Crawler Crane, 300T	Other	Road	Scope 1	Fuel Use		
	Crawler Crane, 150T	Other	Road	Scope 1	Fuel Use		
	Rough-terrain Crane, 100T	Other	Road	Scope 1	Fuel Use		
	Rough-terrain Crane, 70T	Other	Road	Scope 1	Fuel Use		
	Manlift, 272kgs	Other	Road	Scope 1	Fuel Use		
	Welding Machine - Electric Driven	Other	Road	Scope 1	Fuel Use		
	Hydrotest Pump	Other	Road	Scope 1	Fuel Use		
	AIR COMPRESSOR	Other	Road	Scope 1	Fuel Use		
	Generator Set	Other	Road	Scope 1	Fuel Use		
	Oil Free Portable Compressor	Other	Road	Scope 1	Fuel Use		
	Crawler Crane, 150T	Other	Road	Scope 1	Fuel Use		
	Rough-terrain Crane, 70T	Other	Road	Scope 1	Fuel Use		
	Low Bed Trailer, 100T	Other	Road	Scope 1	Fuel Use		
	Forklift	Other	Road	Scope 1	Fuel Use		
	Boom truck	Other	Road	Scope 1	Fuel Use		
	Tractor Truck with HB Trailer	Other	Road	Scope 1	Fuel Use		
	Water Truck 10,000 L	Other	Road	Scope 1	Fuel Use		

Plate 2-22. List of equipment at the construction site (onshore project site)

GREENHOUSE GAS PROTOCOL

Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)	7720.455
Biofuel CO2 Emissions (metric tonnes)	0

Activity Data

The default emission factors are sourced from the US EPA Climate Leaders program or from the UK DEFRA (for air travel only).

Status	Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Vehicle Type (For air transport, see footnote)	Distance Travelled
	Diesel Fuel Truck 6,500 L	Other	Road	Scope 1	Fuel Use		
	Ambulance	Other	Road	Scope 1	Fuel Use		
	Bulldozer (CAT)	Other	Road	Scope 1	Fuel Use		
	Grader	Other	Road	Scope 1	Fuel Use		
	Roller	Other	Road	Scope 1	Fuel Use		
	Water truck	Other	Road	Scope 1	Fuel Use		
	Dumptruck	Other	Road	Scope 1	Fuel Use		
	Backhoe (excavator) (ct 330)	Other	Road	Scope 1	Fuel Use		
	Service truck / Dropsode	Other	Road	Scope 1	Fuel Use		
	Crane	Other	Road	Scope 1	Fuel Use		
	Payloader	Other	Road	Scope 1	Fuel Use		
	Mobile pumpcrete	Other	Road	Scope 1	Fuel Use		
	Tractor Truck with HB Trailer, 20T	Other	Road	Scope 1	Fuel Use		

Plate 2-23. Additional list of equipment at the construction site (onshore project site)

Status	Source Description
	Diesel Fuel Truck 6,500 L
	Ambulance
	Bulldozer (CAT)
	Grader
	Roller
	Water truck
	Dumptruck
	Backhoe (excavator) (ct 330)
	Service truck / Dropsode
	Crane
	Payloader
	Mobile pumpcrete
	Tractor Truck with HB Trailer, 20T

			Error Messages	GHG Emissions			
Fuel Used	Fuel Amount	Unit of Fuel Amount		Fossil Fuel CO2 (metric tonnes)	CH4 (kilograms)	N2O (kilograms)	Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
On-Road Diesel Fuel	88.152064	Cubic Meter		235.924			235.924
On-Road Diesel Fuel	32.57089129	Cubic Meter		87.170			87.170
On-Road Diesel Fuel	49.55000471	Cubic Meter		132.612			132.612
On-Road Diesel Fuel	310.1957346	Cubic Meter		830.185			830.185
On-Road Diesel Fuel	4.94208	Cubic Meter		13.227			13.227
On-Road Diesel Fuel	113.969856	Cubic Meter		305.021			305.021
On-Road Diesel Fuel	7.356808282	Cubic Meter		19.689			19.689
On-Road Diesel Fuel	95.60609882	Cubic Meter		255.873			255.873
On-Road Diesel Fuel	0	Cubic Meter		0			0
On-Road Diesel Fuel	29.97818353	Cubic Meter		80.231			80.231
On-Road Diesel Fuel	50.85820235	Cubic Meter		136.113			136.113
On-Road Diesel Fuel	81.63045647	Cubic Meter		218.470			218.470
On-Road Diesel Fuel	0	Cubic Meter		0			0
On-Road Diesel Fuel	72.92744282	Cubic Meter		195.178			195.178
On-Road Diesel Fuel	33.72781176	Cubic Meter		90.267			90.267
On-Road Diesel Fuel	201	Cubic Meter		536.845			536.845

Plate 2-24. Estimated GHG emissions at the construction site (onshore project site) (set 1)

Water Truck 10,000 L	32.032	Cubic Meter		85.728			
Diesel Fuel Truck 6,500 L	28.26352941	Cubic Meter		75.642			
Ambulance	27.13298824	Cubic Meter		72.617			
Bulldozer (CAT)	341.1004235	Cubic Meter		912.896			
Grader	135.5637308	Cubic Meter		362.813			
Roller	107.4466334	Cubic Meter		287.562			
Water truck	70.4704	Cubic Meter		188.602			
Dumptruck	416.1898918	Cubic Meter		1113.860			
Backhoe (excavator) (ct 330)	381.5350362	Cubic Meter		1021.113			
Service truck / Dropsode	67.83247059	Cubic Meter		181.542			
Crane	92.59670588	Cubic Meter		247.819			
Payloader	12.50055529	Cubic Meter		33.456			
Mobile pumpcrete	12.50055529	Cubic Meter		33.456			
Tractor Truck with HB Trailer, 20T	67.50945882	Cubic Meter		180.677			

Plate 2-25. Estimated GHG emissions at the construction site (onshore project site) (set 2)

GREENHOUSE GAS PROTOCOL

Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)	3275.716
Biofuel CO2 Emissions (metric tonnes)	0

Activity Data

The default emission factors are sourced from the US EPA Climate Leaders program or from the UK DEFRA (for air travel only).

Status	Source Description	Region	Mode of Transport	Scope	Type of Activity Data	Vehicle Type (For air transport, see footnote)	Fuel Amount	Unit of Fuel Amount	Error Messages	GHG Emissions: Fossil Fuel CO2 (metric tonnes)	GHG Emissions: CH4 (kilograms)	GHG Emissions: N2O (kilograms)	GHG Emissions: Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
	Demag 2800 - 600t crawler crane	Other	Water	Scope 1	Fuel Use		162.5072188	Cubic Meter		434.922			434.922
	Crawler Crane with fixed piling leader	Other	Water	Scope 1	Fuel Use		54.16907294	Cubic Meter		144.974			144.974
	1200 hp Tugboat	Other	Water	Scope 1	Fuel Use		268.8588424	Cubic Meter		719.554			719.554
	30T BP Multicat	Other	Water	Scope 1	Fuel Use		388.7672696	Cubic Meter		1040.468			1040.468
	Crew Transfer Vessel 12m	Other	Water	Scope 1	Fuel Use		170.8409224	Cubic Meter		457.226			457.226
	6m Aluminium Work Boat	Other	Water	Scope 1	Fuel Use		23.33436988	Cubic Meter		62.450			62.450
	IHC S-280 Hydrohammer	Other	Water	Scope 1	Fuel Use		120.8387012	Cubic Meter		323.404			323.404
	10,000lb Forklift	Other	Water	Scope 1	Fuel Use		34.017984	Cubic Meter		91.043			91.043
	MF 400 Mescolatore Pan Mixer (400L (	Other	Water	Scope 1	Fuel Use		0.625027765	Cubic Meter		1.673			1.673

Plate 2-26. List of equipment at the offshore project site

Status	Source Description	Fuel Amount	Unit of Fuel Amount	Error Messages	GHG Emissions			
					Fossil Fuel CO2 (metric tonnes)	CH4 (kilograms)	N2O (kilograms)	Total GHG Emissions, exclude Biofuel CO2 (metric tonnes CO2e)
	Demag 2800 - 600t crawler crane	162.5072188	Cubic Meter		434.922			434.922
	Crawler Crane with fixed piling leader	54.16907294	Cubic Meter		144.974			144.974
	1200 hp Tugboat	268.8588424	Cubic Meter		719.554			719.554
	30T BP Multicat	388.7672696	Cubic Meter		1040.468			1040.468
	Crew Transfer Vessel 12m	170.8409224	Cubic Meter		457.226			457.226
	6m Aluminium Work Boat	23.33436988	Cubic Meter		62.450			62.450
	IHC S-280 Hydrohammer	120.8387012	Cubic Meter		323.404			323.404
	10,000lb Forklift	34.017984	Cubic Meter		91.043			91.043
	MF 400 Mescolatore Pan Mixer (400L	0.625027765	Cubic Meter		1.673			1.673

Plate 2-27. Estimated GHG emissions during construction at the offshore project site

2.3.1.1.3.2 GHG EMISSIONS DURING OPERATIONS PHASE

GHG emissions during were estimated based on emissions from the boiler stack and the ground flare, which are considered the significant sources of emissions. The total CO2e emission per year for both the boiler and the flare is 12,743.612 MT/year. Boiler emissions appear to have the higher GHG as this will be operated 24 hours per day while for the ground flare, the estimated maximum flaring is about 10 hours per month**.** **Annex G** presents the emission factors, assumptions, and sample computation.

Table 2-38. Estimated GHG emissions emanating from the boiler and the ground flare

GHG	Boiler (MT/year)	Ground Flare (MT/year)
CO_2	12,673.807	1.397
CH_4	6.802	0.026
N_20	61.574	0.006
CO_2e	12,742.183	1.429
Total CO_2e	**12,743.612**	

Note that other fugitive emission sources of GHG during operation were excluded in the computation as these are considered minimal emissions. This included the diesel generators (firewater pumps, emergency diesel generator), which will be operated only during emergency cases, i.e., fire, fire drills, and electric supply failure. Other emission sources within the LNG facility were considered minimal sources of GHG, as based on publication of the American Petroleum Institute (2015), as

- LNG storage tanks – the gas is fully contained within the outer container of the tank (heavily insulated) and that these tanks are designed as atmospheric tanks in which there is minor difference in pressure between the tank and the atmosphere
- Tank loading – boiled off gases during tank loading will be captured and recirculated within the system
- Piping connections – connections are welded rather than flanged

2.3.1.1.3.3 MITIGATION MEASURES

The construction and operation of the proposed project will contribute to increase of GHG emissions, although in general, this type of project will contribute to large offset of GHG emissions as it processes (liquefied) natural gas, which will be used as fuel for the existing KEPCO power plant. GHG emission due to combustion of natural gas is estimated at 0.545 kg CO2 per Kwh while for coal (average of bituminous, sub-bituminous and lignite) and fuel oil (average of No. 2 and No. 6 oil) are 0.959 and 0.7815 kg CO2 per Kwh, respectively (Source: www.eia.gov). Natural gas power plants therefore reduce GHG emissions by 43.2% and 30.3% if power plants with same capacities using coal and fuel oil will be operated, respectively.

Release of GHG emissions from the project, however, may contribute to climate change to some extent. As the design of the LNG facility is yet to be finalized including the type and number of equipment to be used during construction, accurate information on GHG emissions can only be gathered or monitored during construction and operation periods. Hence, it would be appropriate to conduct extensive GHG emissions monitoring program during construction and operation to determine emissions and to plan for the appropriate measures and reduction.

Reforestation program shall also be implemented to offset GHG emissions arising from the operation of the project, and also alleviate projected increase of air temperature in the future. The reforestation program will be part of the Corporate Social Responsibility (CSR) projects in cooperation with the Local Government Units (LGU) and the Department of Environment and Natural Resources (DENR).

The project's facility shall also be designed to withstand extreme weather events, such as extreme rainfall and winds. As discussed above, the highest recorded wind speeds at two (2) PAGSASA stations nearest the project site (Calapan PAGASA Station and Ambulong PAGASA Station were 75 and 46 m/s). Storm drains, i.e., canals, roof drains, and culverts, shall also be designed to contain expected increase of rainfall and occurrence of extreme rainfall in the future.

Other mitigation measures are as follows.

- Minimize idling time by shutting equipment off when not in use or reducing the time of idling to not more than 3 minutes.
- Use of use heavy equipment and trucks that are fuel efficient and optimize use of vehicles and heavy equipment,
- Optimize lighting at workplaces and access roads
- Maintain all construction equipment in accordance with the manufacturer's specification, and
- Use of compact fluorescent bulbs and reduce consumption of electricity at work areas;

2.3.2 AIR QUALITY AND NOISE

2.3.2.1 AIR QUALITY

2.3.2.1.1 REGULATORY SETTING

The following presents the applicable emission standards, ambient guidelines and standards for the project, including the air dispersion modelling requirement as stipulated in DENR Memorandum Circular 2008-003 (Guidelines for Air Dispersion Modelling);

a) National Emission Standards for Source Specific Air Pollutants (NESSAP) (**Table 2-39**)
b) National Ambient Air Quality Standards (NAAQS) (**Table 2-40**)
c) National Ambient Air Quality Guidelines (NAAQG) (**Table 2-41**)
d) Air Dispersion Modelling Requirements under Section 3 (Increment Consumption), Rule X (New/Modified Sources in Attainment Areas) of DAO 2000-81 (**Plate 2-28**)
e) Air Dispersion modelling guidelines - DENR-EMB issued Memorandum Circular 2008-003 (Guidelines for Air Dispersion Modelling)

Note that the complete standards, guidelines, and regulations are stipulated in the Philippine Clean Air Act (PCAA) and its implementing rules and regulations (IRR).

Table 2-39. NESSAP for primary air pollutants

Pollutant	Concentration (mg/Nm^3)
Sulfur Oxide (SO_X as SO_2)	700
Nitrogen Oxide (NO_x as NO_2)	2000
Particulate Matter (PM)	150
Carbon Monoxide (CO)	500
Other air pollutants	Table 2 of DAO 2000-81

Notes: mg/Nm^3 - milligram per normal cubic meter

Table 2-40. National Ambient Air Quality Standards (NAAQS) of selected air pollutants

Pollutant	Concentration ($\mu g/Nm^3$)	Averaging Time (min)	Reference
Sulfur Dioxide (SO_2)	340	60	Table 3 of DAO 2000-81
Nitrogen Dioxide (NO_2)	260	60	Table 3 of DAO 2000-81
Total Suspended Particulates (TSP)	300	60	Table 3 of DAO 2000-81
Particulate Matter less than 10 microns (PM_{10})	200	60	Table 3 of DAO 2000-81

Notes: 1) $\mu g/Nm^3$ – microgram per normal cubic meter ; 2) NAAQS for CO – not specified

Table 2-41. National Ambient Air Quality Guideline Values (NAAQGV) for TSP, PM_{10}, $PM_{2.5}$, SO_2, NO_2, O_3, and Pb

Pollutants	Short-term Concentration[a]			Long Term Concentration[f]		
	µg/Nm³	ppm	Averaging Time	µg/Nm³	ppm	Averaging Time
Total Suspended Particulates (TSP)[b]	230	-	24 hours	90	-	1 year[g]
Suspended particulates 10 microns or lesser (PM_{10})[bc]	150	-	24 hours	60	-	1 year[g]
Sulfur dioxide (SO_2)[b]	180	0.07	24 hours	80	0.03	1 year
Nitrogen dioxide (NO_2)	150	0.08	24 hours	-	-	-
Other air pollutants	Table 1 of DAO 2000-81					

[a] Maximum limits represented by ninety-eight percentile (98%) values not to exceed more than once a year.
[b] SO_2 and Suspended Particulate matter are sampled once every six days when using the manual methods. A minimum of twelve sampling days per quarter or forty-eight sampling days each year is required for these methods. Daily sampling may be done in the future once continuous analysers are procured and become available.
[c] Provisional limits for PM_{10} until sufficient monitoring data are gathered to base a proper guideline.
[d] As per DAO No. 2013-13: "Establishing the Provisional National Ambient Air Quality Guideline Values for Particulate Matter 2.5 ($PM_{2.5}$)", NAAQGV for $PM_{2.5}$ (24 hours) was upgraded from 75 µg/Nm³ to 50 µg/Nm³ on January 1, 2016.
[e] Evaluation of this guideline is carried out for 24-hour averaging time and averaged over three moving calendar months. The monitored average value for any three months shall not exceed the guideline value.
[f] Arithmetic mean.
[g] Annual geometric mean

Section 3. Increment Consumption

No new source may be constructed or existing source modified if emissions from the proposed source or modification will, based on computer dispersion modeling, result in;

Exceedance of the National Ambient Air Quality Guideline Values; or
An increase in existing ambient air levels above the levels shown below

PM-10, annual arithmetic mean	17 micrograms per cubic meter
PM-10, 24-hr maximum	30 micrograms per cubic meter
Sulfur Dioxide, annual arithmetic mean	20 micrograms per cubic meter
Sulfur Dioxide, 24-hr maximum	91 micrograms per cubic meter
Nitrogen Dioxide, annual arithmetic mean	25 micrograms per cubic meter

In the case of multiple point sources at a single facility, the net emissions from all affected sources shall be included in a single increment analysis.

Plate 2-28. Section 3, Rule X of DAO 2000-81

2.3.2.1.2 BASELINE AIR QUALITY MONITORING

ACES Distribution & Consulting Services, Inc. (ACES) was commissioned by RHR Consulting Services, Inc. (RHR) to conduct ambient air sampling at and in vicinities of the proposed project site. Ambient air sampling was conducted on October 19, 2020 and October 27-31, 2020. **Table 2-42** shows the coordinates, the pollutants sampled and the geographic coordinates of the sampling stations. The locations of the sampling stations are presented in **Figure 2-125**.

Table 2-42. Coordinates, date of sampling, and parameters measured as each sampling station

Station ID	Location	Geographical Coordinates	Sampling Date/Time	Averaging Time (minutes)	Parameters
AQ1	Near Parola	13°37'20"N 121°4'57"E	October 19, 2020/ 1302H-1402H	1 hour/ 30 minutes for metals	• PM_{10}, TSP, SO_2, NO_2, and CO • lead (Pb), mercury (Hg), cadmium (Cd), chromium (Cr) Arsenic (As)

Station ID	Location	Geographical Coordinates	Sampling Date/Time	Averaging Time (minutes)	Parameters
			October 28-29, 2020/ 0943H-0943H	24 hours/ 1 hour for CO	• PM_{10}, TSP, SO_2, NO_2, and CO
AQ2	Near Arko Bridge	13°37'24"N 121°5'11"E	October 19, 2020/ 1146H-1246H	1 hour/ 30 minutes for metals	• PM_{10}, TSP, SO_2, NO_2, and CO • lead (Pb), mercury (Hg), cadmium (Cd), chromium (Cr), arsenic (As)
			October 29-30, 2020/ 0943H-0943H	24 hours/ 1 hour for CO	• PM_{10}, TSP, SO_2, NO_2, and CO
AQ3	Near Crossing	13°37'31"N 121°4'30"E	October 19, 2020/ 1418H-1518H	1 hour/ 30 minutes for metals	• PM_{10}, TSP, SO_2, NO_2, and CO • lead (Pb), mercury (Hg), cadmium (Cd), chromium (Cr) Arsenic (As)
			October 30-31, 2020/ 1002H-1002H	24 hours/ 1 hour for CO	• PM_{10}, TSP, SO_2, NO_2, and CO
AQ4	Brgy. Ilijan	13°38'3"N 121°4'47"E	October 19, 2020/ 1026H-1126H	1 hour/ 30 minutes for metals	• PM_{10}, TSP, SO_2, NO_2, and CO • lead (Pb), mercury (Hg), cadmium (Cd), chromium (Cr) Arsenic (As)
			October 27-28, 2020/ 0904H-0904H	24 hours/ 1 hour for CO	• PM_{10}, TSP, SO_2, NO_2, and CO
AQ5	Brgy. de la Paz	13°38'4"N 121°5'23"E	October 19, 2020/ 0900H-1000H	1 hour/ 30 minutes for metals	• PM_{10}, TSP, SO_2, NO_2, and CO • lead (Pb), mercury (Hg), cadmium (Cd), chromium (Cr) Arsenic (As)

The sampling stations were determined based on the locations of nearest air quality sensitive receptors (AQSR) or residences nearest and around the proposed project site and the prevailing wind flows. The following presents the sampling stations.

- Station A2- nearest residential area east of the proposed project site. This location is downwind when wind flows from the west.
- Station A3 and Station A4 – these stations are located at residential areas and downwind of prevalent southeast and east-southeast and easterly winds.
- Station A5 – located at nearest residential areas northeast of the proposed flare location, and

Further, station A1 aimed to determine the background air quality levels at the proposed project site.

Plate 2-29 to **Plate 2-33** show the geotagged photographs taken during sampling at Stations AQ1 to AQ5.

Figure 2-125. Locations of air quality sampling stations

2.3.2.1.3 METHODS OF AIR SAMPLING AND ANALYSIS

Pollutants monitored were suspended particulates less than or equal to 10 micrometers (or PM_{10}), total suspended particulates (TSP), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2), and ambient air metals. TSP is the fraction sampled with high-volume samplers, approximately particle diameters less than 50 to 100 micrometer (µm) while PM_{10} is particulate matter with 10 µm or less in diameter.

The gaseous air pollutants are SO_2, NO_2 and CO. SO_2 is a colorless gas with strong odor. Short-term exposures to SO_2 can harm the human respiratory system and make breathing difficult. People with asthma, particularly children, are sensitive to these effects of SO_2. (www.epa/gov). SO_2 can also contribute to acid rain and decreases visibility when in reaction with other compounds in the atmosphere.

NO_2 is a reddish-brown gas or yellowish-brown liquid when cooled or compressed (www.pubchem.ncbi). According to the U.S.EPA website, "high concentration of NO_2 can irritate airways in the human respiratory system and exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms

Table 2-43 presents the methods of air sampling and analysis.

Table 2-43. Methods of Ambient Air Sampling and Analysis

Parameters	Methodology / Analysis
Particulate Matter 10 (PM_{10})	High Volume – Gravimetric Method
Total Suspended Particulates (TSP)	High Volume – Gravimetric Method
Sulfur Dioxide (SO_2)	Impinger Bubbler-Pararosaniline Colorimetric Method
Nitrogen Dioxide (NO_2)	Impinger Bubbler – Griess-Saltzman Reaction Method
Particulate lead (Pb)	High Volume – ICP-OES
Mercury (Hg)	High Volume – Manual Cold Vapor AAS
Chromium (Cr)	High Volume – ICP-OES
Cadmium (Cd)	High Volume – ICP-OES
Arsenic (As)	High Volume – ICP-OES

2.3.2.1.3.1 SUSPENDED PARTICULATES

Sampling of TSP and PM_{10} was carried out by using a high-volume sampler with cyclone separator for PM_{10}. Ambient air was drawn through a collecting medium of a pre-weighed glass microfiber filter paper at a controlled flow rate over the specified duration. The filter paper with retained particles was recovered and transported to a DENR-recognized laboratory to determine the amounts of particulates collected.

The concentrations of particulates in ambient air were determined from the ratio of total mass of particulates collected and the total normal volume of air sampled (total volume of air sampled corrected to normal conditions of 25 °C and 760 mm Hg).

2.3.2.1.3.2 GASEOUS AIR POLLUTANTS (SO_2 AND NO_2)

Sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) in the ambient air were sampled by aspirating air at a controlled flow rate over the specified sampling period through glass midget impingers containing absorbing solutions of 0.04 M sodium tetrachloromercurate for SO_2 and an azo dye forming reagent for NO_2. The absorbing solutions were retrieved after sampling and transported to a laboratory for further treatment and analysis.

The amounts of SO_2 and NO_2 were determined thru colorimetric methods using a spectrophotometer. The concentrations of SO_2 and NO_2 in ambient air were determined from the ratio of total mass of particulates collected and the total normal volume of air sampled.

Plate 2-29. Photographs of air sampling equipment at Station AQ1

Plate 2-30. Photographs of air sampling equipment at Station A2

Plate 2-31. Photographs of air sampling equipment at Station A3

Plate 2-32. Photographs of air sampling equipment at Station A4

Plate 2-33. Photographs of air sampling equipment at Station A5

2.3.2.1.4 AIR DISPERSION MODELLING

AERMOD View Version 9.9.9 (Serial # AER0006927) was used to predict or model the dispersed air pollutants arising from the operation of the proposed project (**Plate 2-34**). AERMOD View is Graphical User Interface (GUI) software for U.S.EPA's AERMOD, which was developed by the American Meteorological (AMS/U.S.EPA Regulatory Model Improvement Committee (AERMIC). **Plate 2-34** shows the serial number (AER0006927) of the license AERMOD View Version 9.9.0.

Dispersion modelling involved used of preprocessors to process the terrain (topography), meteorological data and building dimensions (heights and widths), which were consequently used as input data (**Figure 2-126**). The source input parameters included the locations of the proposed stacks, which in this case are the boiler stack and the ground flare. The modelling output were 98th percentile concentration, which were compared with applicable air quality guideline values. The following presents in detail the input data.

- Source input parameters
- Building dimensions and heights
- Receptor coordinates, elevation, and hill height.
- Meteorological data

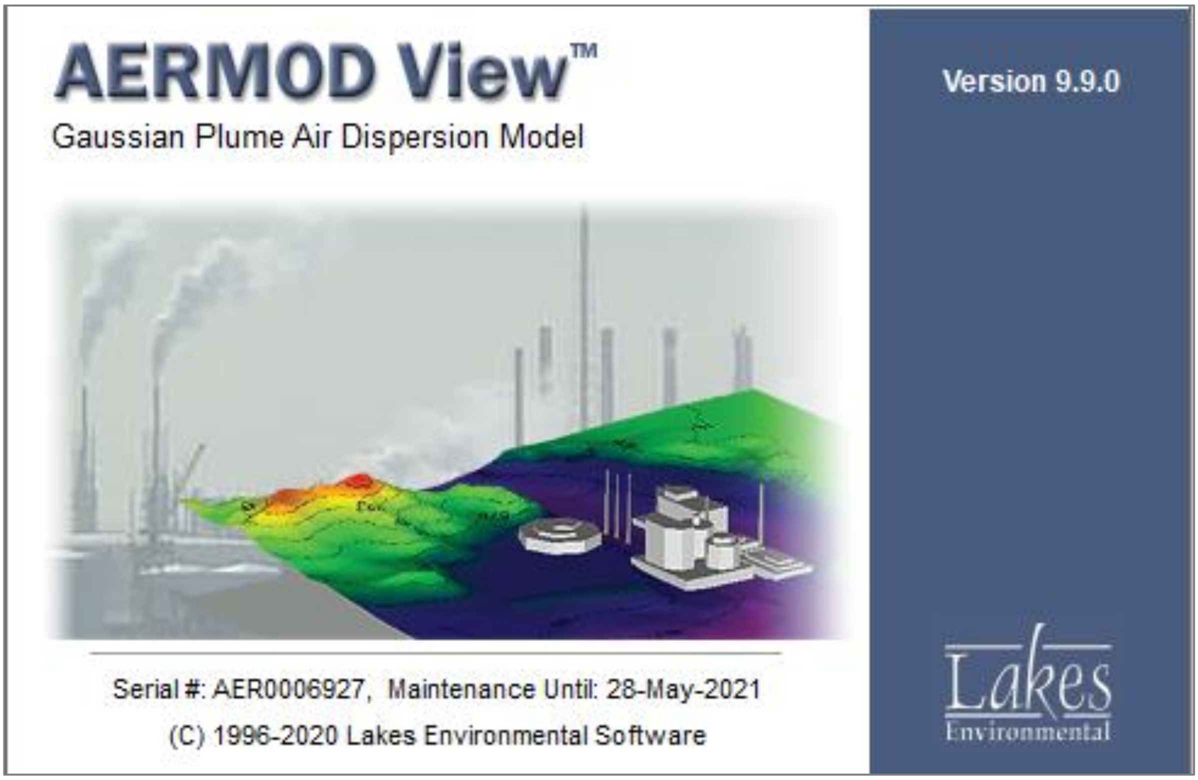


Plate 2-34. Serial number license AERMOD View Air Dispersion Model Version 9.9.0

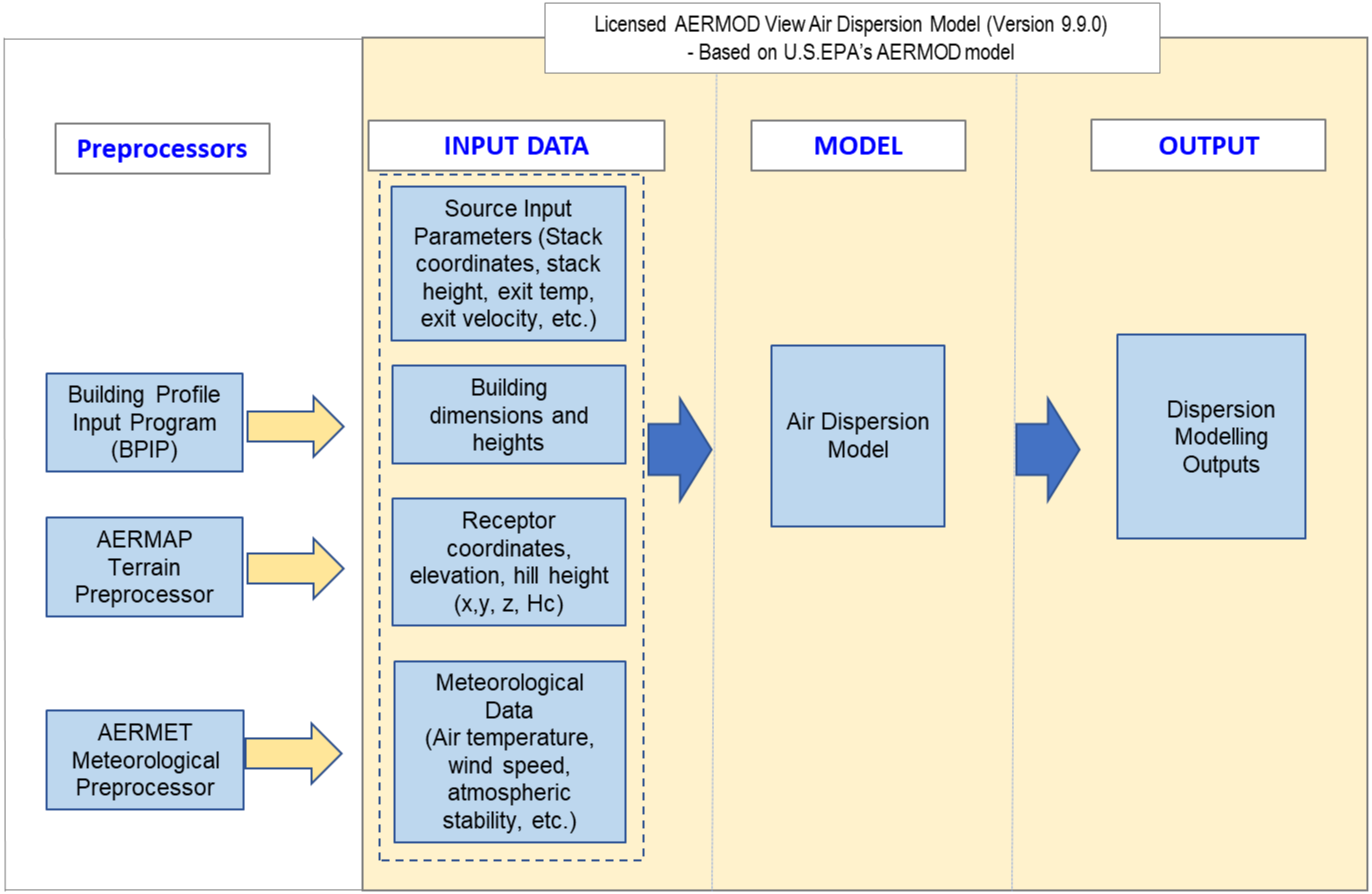


Figure 2-126. Process flow on air dispersion modelling

2.3.2.1.4.1 SOURCE INPUT PARAMETERS

The source input parameters consisted of a) coordinates, base elevation, and heights of the emission source (or stacks) and b) the source emission parameters, such as the emission rates of the air pollutant, stack gas temperature, stack inside diameter, and the stack gas velocity. The emission sources (or stacks) are from emissions of the proposed boiler and the ground flare. **Table 2-44** and **Table 2-45** present the source input parameters for the boiler stack and the ground flare, respectively.

Annex H shows the equations and sample computations.

Table 2-44. Source input parameters for the boiler stack

Parameters	Unit	Boiler Stack	Remarks
Coordinates, base elevation, and heights:			
x-coordinate (WGS84 UTM Zone 51)	m	292505.82	Based on the site development plan (with georeferenced coordinates), which was imported in AERMOD View (**Figure 2-127** and **Figure 2-128**)
y-coordinate (WGS84 UTM Zone 51)	m	1506960.58	Based on the site development plan (with georeferenced coordinates), which was imported in AERMOD View (**Figure 2-127** and **Figure 2-128**)
Base elevation	m	54.41	Elevation was derived using the AERMAP View - terrain preprocessor of AERMOD View (**Figure 2-127** and **Figure 2-128**)
Stack height above base elevation	m	10	Assumed initially at 10 m in height
Design source emission parameters:			
Emission rate of NO_X	g/s	0.43	Computed based on AP-42 emission factors and estimated fuel input (please see **Annex H** on the worksheet calculations)
Emission rate of CO	g/s	0.361	Computed based on AP-42 emission factors and estimated fuel input
Stack exit temperature	ºC	158	Typical exit gas boiler temperature
Stack inside diameter	m	0.4	Computed based on fuel factor for natural gas and the volumetric flow
Gas exit velocity	m/s	17.07	Computed based on fuel factor for natural gas and the volumetric flow

Table 2-45. Source input parameters for the ground flare

Parameters	Unit	Ground flare	Remarks
Coordinates, base elevation, and heights :			
x-coordinate (WGS84 UTM Zone 51)	m	292569.49	Based on the site development plan (with georeferenced coordinates), which was imported in AERMOD View (**Figure 2-127** and **Figure 2-128**)
y-coordinate (WGS84 UTM Zone 51)	m	1507181.18	Based on the site development plan (with georeferenced coordinates), which was imported in AERMOD View (**Figure 2-127** and **Figure 2-128**)
Base elevation	m	67.7	Elevation was derived using the AERMAP View - terrain preprocessor of AERMOD View (**Figure 2-127** and **Figure 2-128**)
Stack height above base elevation	m	9.51 (18.065 m)	Elevation drawing in **Figure 2-129**. Effective flare height is shown in **Plate 2-35**.
Design source emission parameters:			
Emission rate of NO_X	g/s	0.77	Computed based on AP-42 emission factors, flare gas composition and emission rate (Plate 1-8). Please refer **Annex H** on the worksheet calculations)
Emission rate of CO	g/s	4.21	-do-
Flare gas temperature	ºC	999.85	Calculated in AERMOD View

Parameters	Unit	Ground flare	Remarks
Stack inside diameter	m	4.4 (1.759)	Elevation drawing in **Figure 2-129**. Number enclosed in parenthesis is the effective flare diameter. Effective diameter is shown in **Plate 2-35**.
Gas exit velocity	m/s	17.07	

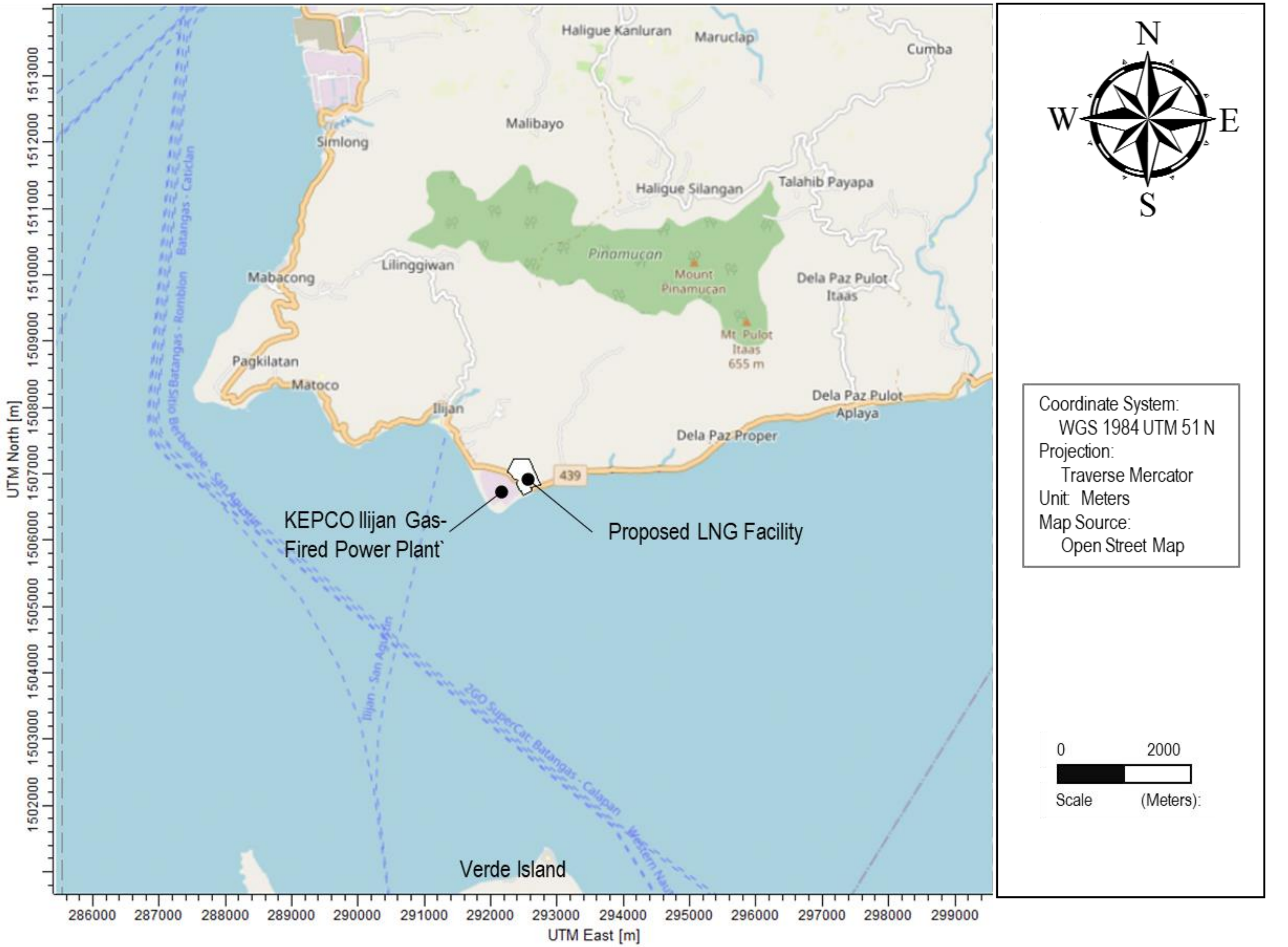


Figure 2-127. Locations of the proposed project site and extent of modelling domain or calculation area

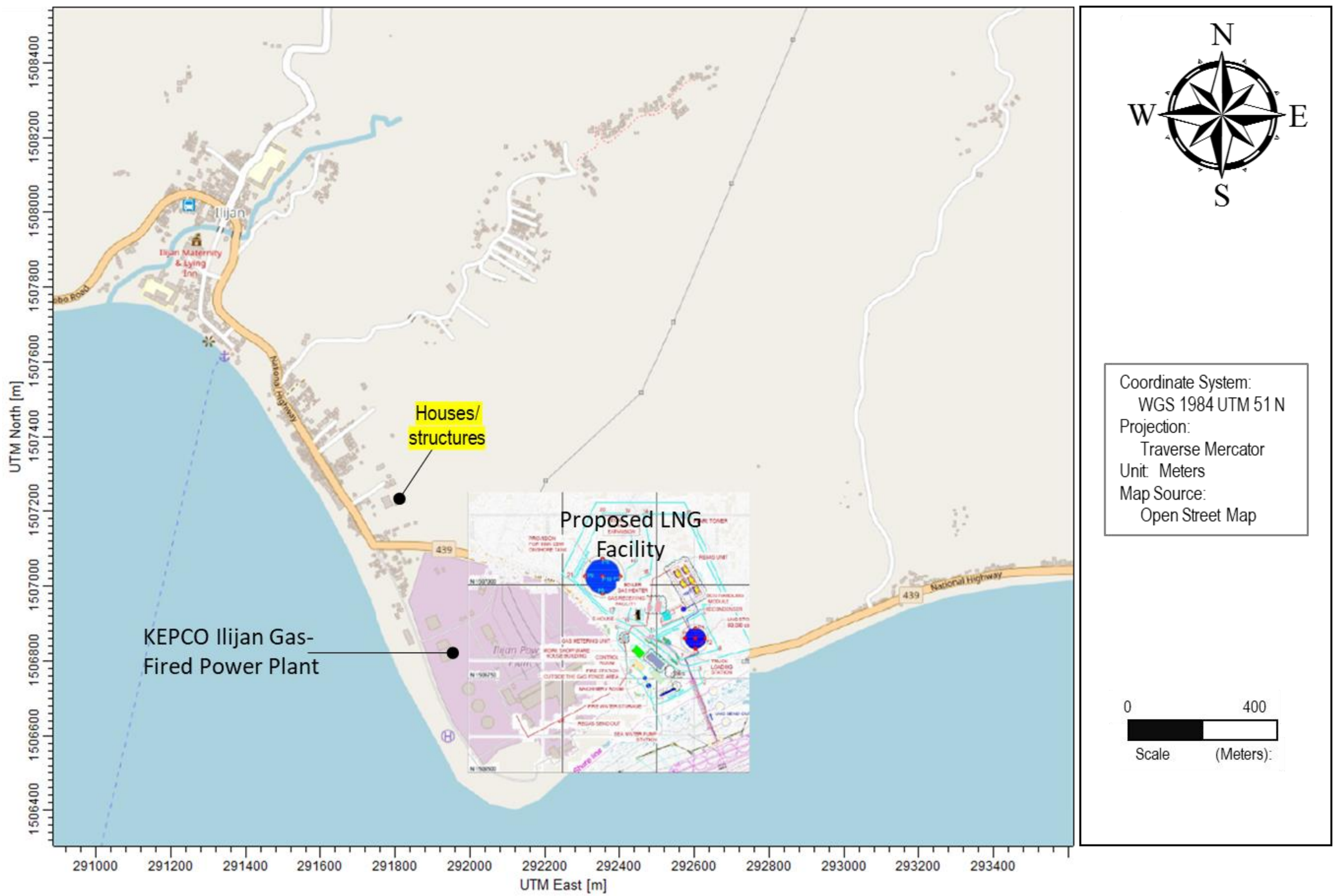


Figure 2-128. Closer view of the project site and residences/households in vicinities of the project area (site devt plan is superimposed in Open Street Map)

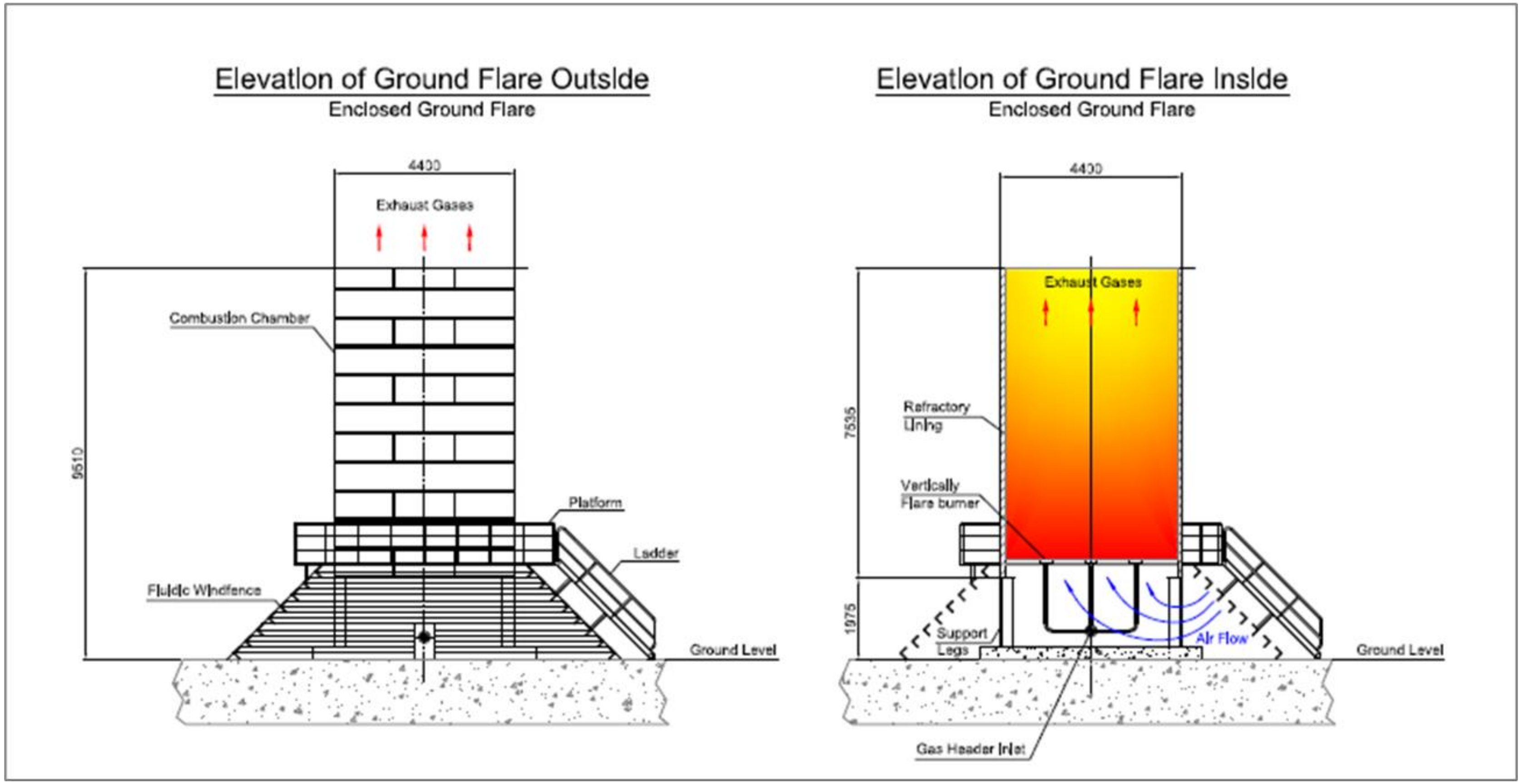
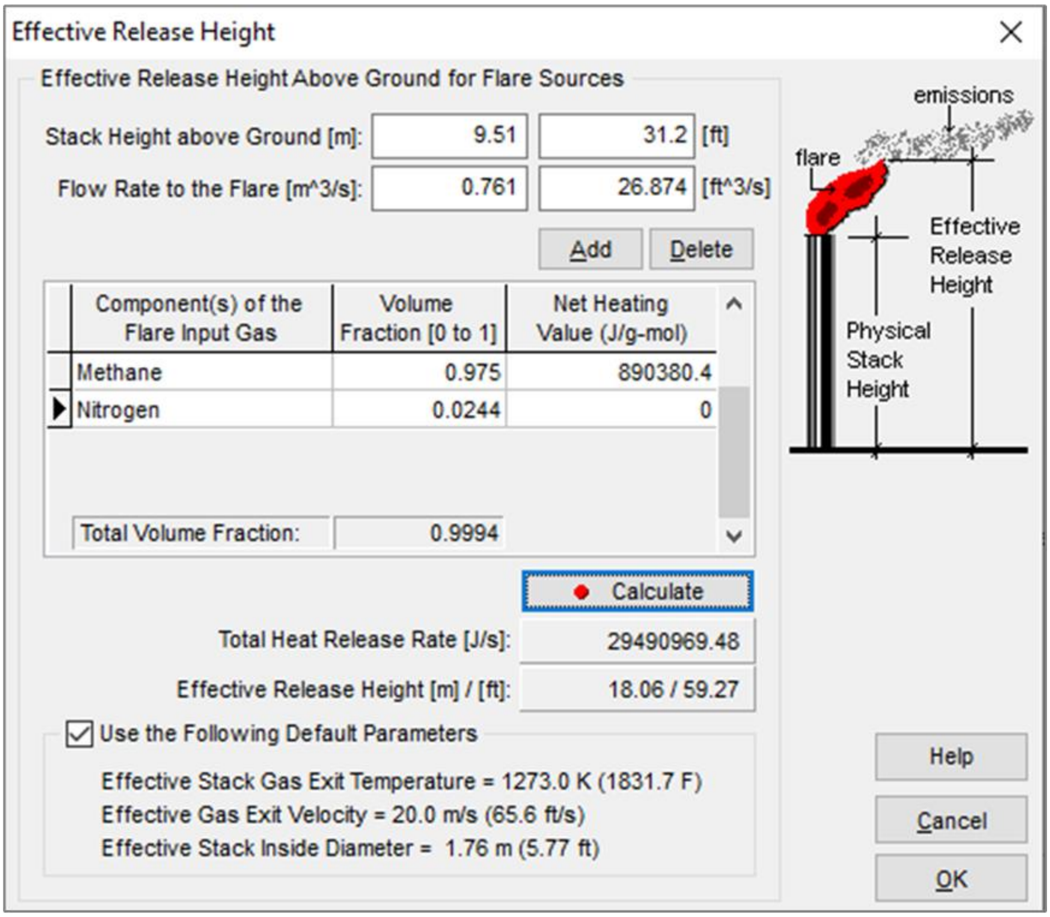


Figure 2-129. Elevations of the proposed ground flare (Source: AG&P)

Flare gas(NG) composition :	
Composition (Mol %)	Volume (%)
Methane	97.55
Ethane	0
Propane	0
Nitrogen	2.44
Isobutane	0
Density Gas (kg/m3)	0.73
Calorific Value (low) (MJ/kg)	49.5
Methane Number	83

a) Flare gas composition (Source: AG&P)



b) Effective release height, exit temperature and inside diameter of the flare

Plate 2-35. Flare gas composition (top) and effective stack parameters (bottom)

2.3.2.1.4.2 BUILDING PROFILE INPUT DATA

As stipulated in DENR MC 2008-003 (Guidelines for Air Dispersion Modelling), building dimensions should be included in the modelling as cavities created at the wake zones of buildings forms low pressure areas, which may form building downwash, a scenario that produces very high ground level concentrations, particularly for shorter stacks.

Building dimensions within the project site were based on the site development plan for the project (**Figure 2-130**), which was imported and extracted in AERMOD View (**Figure 2-131**). **Plate 2-36** shows the building input data, particularly on the name of the buildings, coordinates, elevations, and dimensions).

2.3.2.1.4.3 RECEPTOR INPUT DATA

Figure 2-132 shows the locations of the modelling domain or calculation area and the details of the risk receptors. Modelling domain defines the area in which predicted concentrations (or parameters) are calculated by a model, which in this case are the predicted concentrations of SO_2, NO_2, particulates and CO. The receptors are locations or points in the modelling domain where predicted concentrations are computed.

The modelling domain is rectangular in shape with dimension of 7 km x 7 km (or 7000 m x 7000 m). Within the modelling domain are receptors closely spaced (20 m grid spacing) within 1 km from the centroid of the stacks (boiler and flare stacks). At distances of 1 to 3 km from the stack centroid, the receptor spacing is 100 m, and 200 m from 3 km to 7 km.

Further, discrete Cartesian receptors and plant boundary intermediate receptors were included in the modelling domain, as shown in **Figure 2-133**. The air quality monitoring stations and some households are assigned as discrete Cartesian receptors.

The elevation at each receptor was derived from the SRTM data, as extracted and processed using AERMAP View (**Figure 2-134**). Further, the hill height (Hz) at each receptor was also processed using AERMAP View. Hill height is the height of the terrain surrounding the receptor that will most influence the flow in stable conditions (www.weblakes.com).

The flagpole heights (or heights of the receptors) were 2 m above ground level.

Onsite receptors or receptors within the project boundaries were disabled or excluded in the simulations because these receptors represent locations within the workplace.

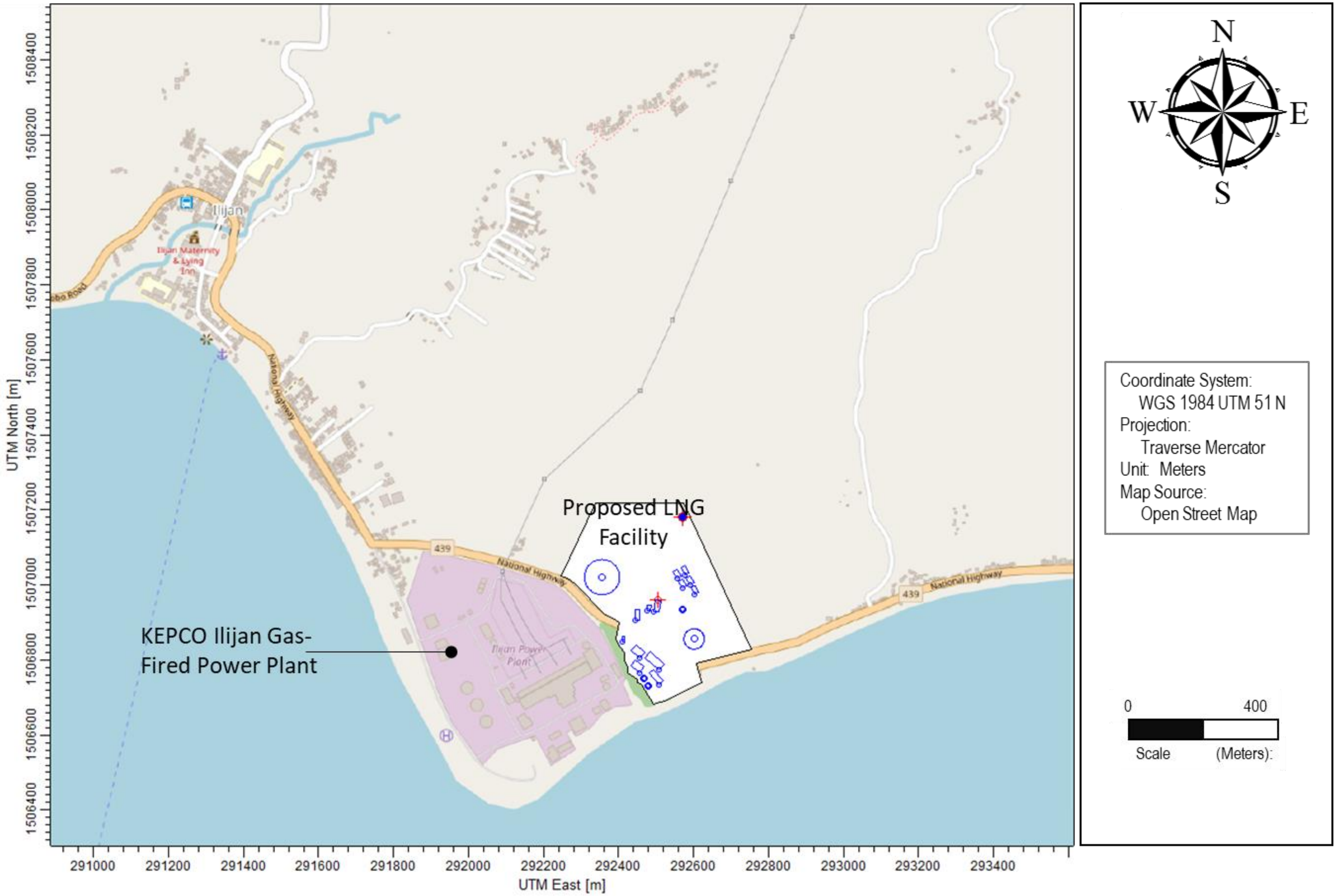


Figure 2-130. Representation of the building tiers and stacks, project site boundaries and households/residences

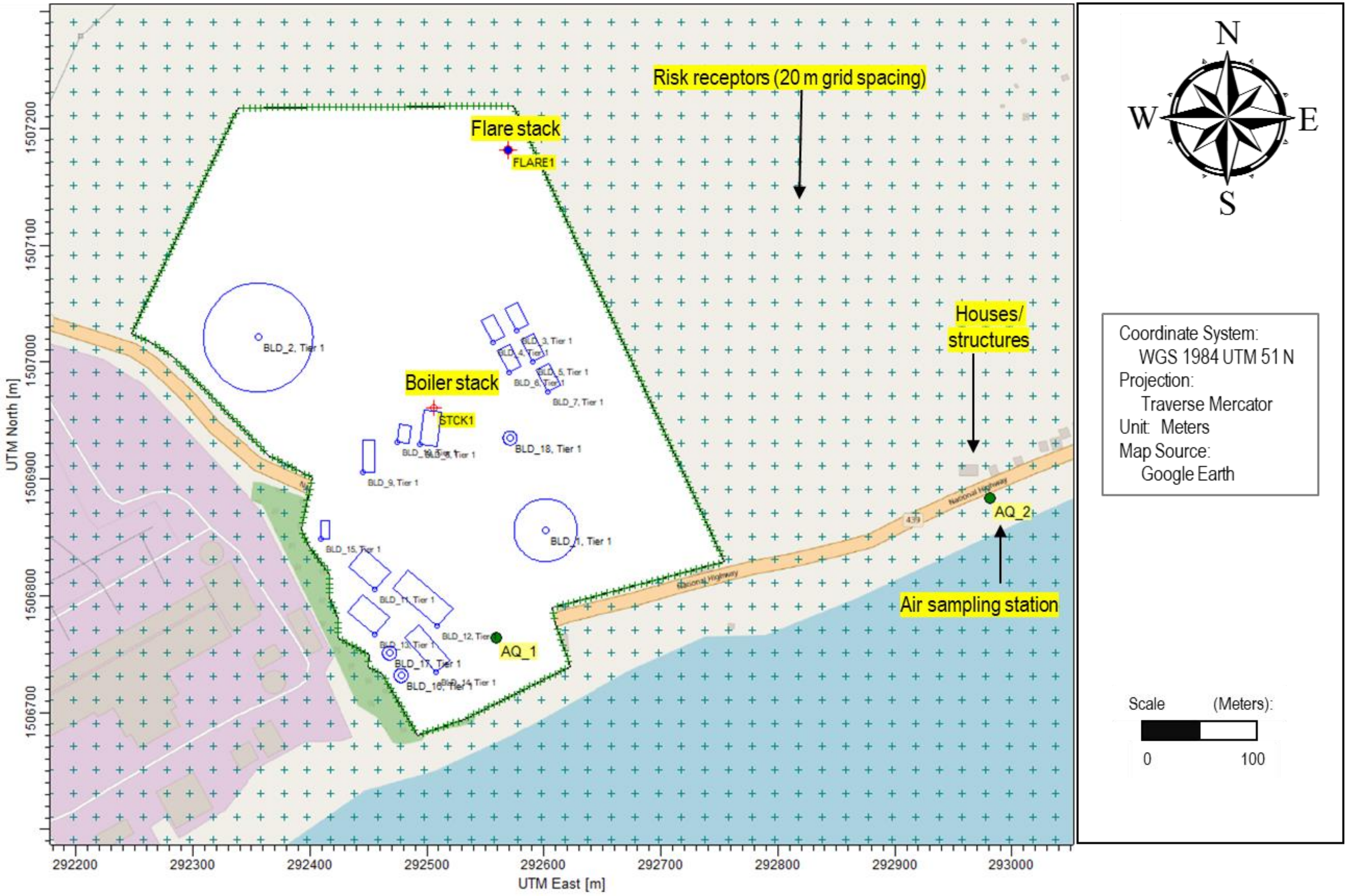


Figure 2-131. Building tiers and receptors

AERMOD View - Building Parameters
MS Excel - Lakes Format

Parameters	Units	Description
ID_Building =	-	Name up to 8 characters with no spaces or "-"
Description =	-	Optional (up to 250 characters)
Tier_Number =	integer	Integer
Base_Elevation =	[m]	Building base elevation above mean sea level (If blank, base elevation will be auto-calculated)
Tier_Height =	[m]	Tier height above ground / height of tank
Diameter =	[m]	Diameter of the tank/building (CIRCULAR Buildings only)
X_Length =	[m]	Building length on X-direction (RECTANGULAR Buildings only)
X_Length =	[m]	Building length on Y-direction (RECTANGULAR Buildings only)
Rotation_Angle =	[deg]	Rotation angle (-360 to +360) (If blank, 0 will be assigned) (RECTANGULAR Buildings only)
Num_Coords =	integer	Number of coordinate pairs (X,Y) for the building corners to follow
X1 =	[m]	X coordinate for corner 1 or for center of tank/building
Y1 =	[m]	Y coordinate for corner 1 or for center of tank/building
X2 =	[m]	X coordinate for corner 2
Y2 =	[m]	Y coordinate for corner 2
X3 =	[m]	X coordinate for corner 3
Y3 =	[m]	Y coordinate for corner 3
X4 =	[m]	X coordinate for corner 4
Y4 =	[m]	Y coordinate for corner 4

...

NOTE: You may keep adding additional coordinate pairs for an POLYGONAL building with more than 4 corners (e.g. X5, Y5, etc)

Notes:

1) CIRCULAR Buildings/Tanks: Specify "Diameter", "Num_Coords=1" and "X1, Y1" coordinates for the center

2) RECTANGULAR Buildings: Specify "X_Length", "Y_Length", "Rotation_Angle", "Num_Coords=1" and "X1, Y1" coordinate

3) POLYGONAL Buildings: Specify "Num_Coords>=4" and all the coordinates for the corners (e.g., X1/Y1, X2/Y2, X3/Y3...

ID_Building	Description	Tier_Numb	Base_Elev	Tier_Height	Diameter	X_Length	Y_Length	Rotation_A	Num_Coord	X1	Y1	X2
			[m]	[m]	[m]	[m]	[m]	(deg)		[m]	[m]	[m]
BLD_1	LNG Tank 1	1	32.6	27.31	54				1	292601.45	1506855.98	
BLD_2	LNG Tank 2	1	49.78	27.31	93.5				1	292355.75	1507021.01	
BLD_3	Regas Unit 1	1	57.88	6		12	21	28.5	1	292576.65	1507026.86	
BLD_4	Regas Unit 2	1	56.79	6		12	21	28.5	1	292556.06	1507016.5	
BLD_5	Regas Unit 3	1	58.5	6		12	21	28.5	1	292590.28	1507000.4	
BLD_6	Regas Unit 4	1	57.17	6		12	21	28.5	1	292570.13	1506991.28	
BLD_7	Regas Unit 5	1	56.37	6		12	21	28.5	1	292603.44	1506974.61	
BLD_8	Boiler house	1	47.61	6		15	30	353.45	1	292494.03	1506929.21	
BLD_9	E-house	1	39.35	6		10	27	0	1	292445.13	1506906.06	
BLD_10	Gas receiving facility	1	47.73	6		10	15	353.16	1	292475.01	1506931.69	
BLD_11	Worshop-warehouse build	1	17.24	6		20	30	48.81	1	292455.76	1506805.14	
BLD_12	Control room	1	16.37	6		20	50	49.09	1	292508.89	1506773.78	
BLD_13	Fire station	1	14.59	6		20	30	50.44	1	292454.96	1506766.37	
BLD_14	Machinery room	1	14.22	6		16	40	41.99	1	292508.17	1506734.29	
BLD_15	Gas metering unit	1	22.05	3		7.5	15	2.2	1	292409.55	1506848.82	
BLD_16	Fire water storage 1	1	13.94	6	12				1	292477.89	1506731.77	
BLD_17	Fire water storage 2	1	14.65	6	12				1	292468.01	1506750.97	
BLD_18	Recondenser	1	53.98	6	12				1	292571.09	1506934.96	

Plate 2-36. Screenshot of building input data

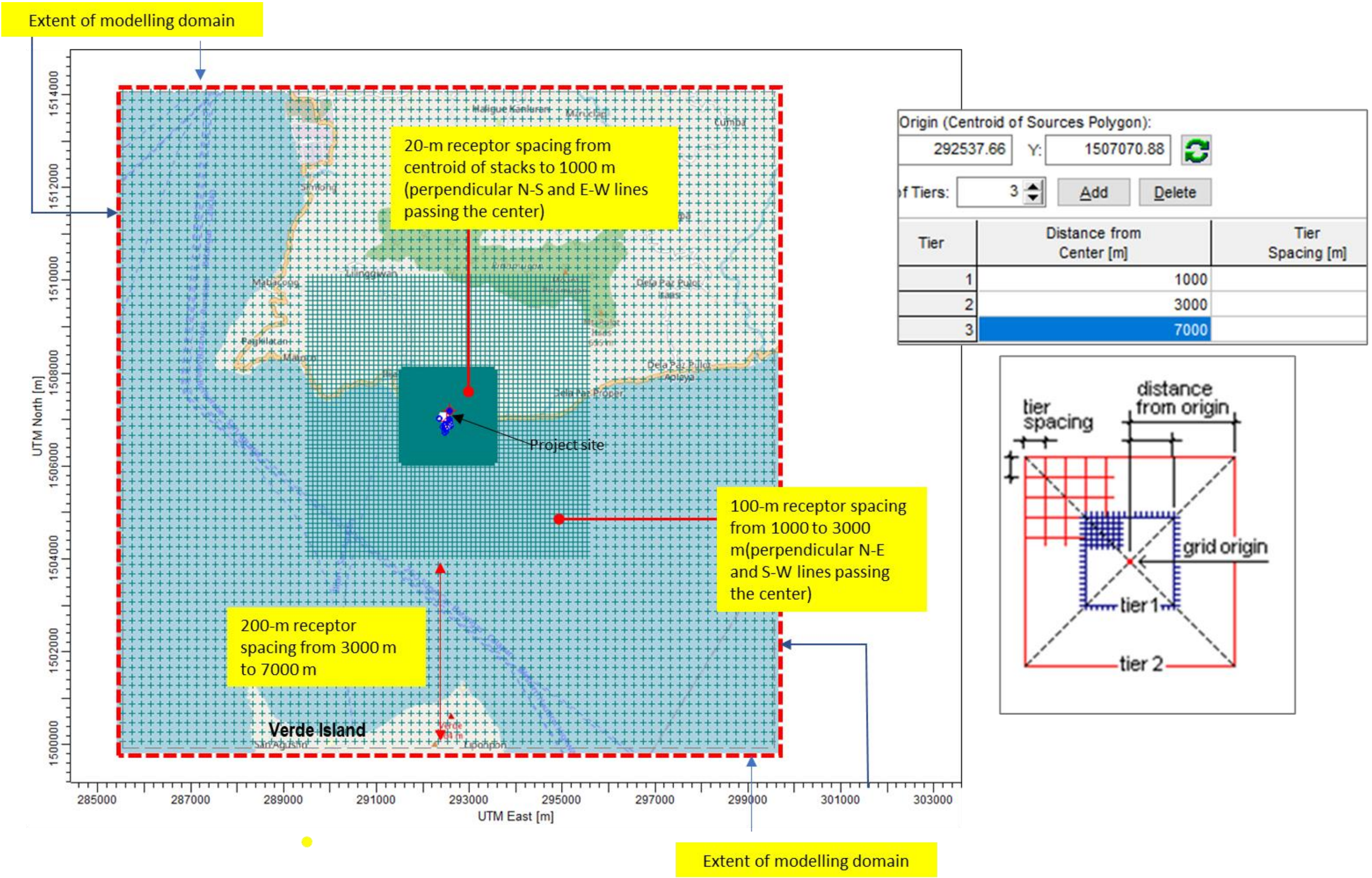


Figure 2-132. Locations of risk receptors (left) and details of the risk receptors (top right and bottom left)

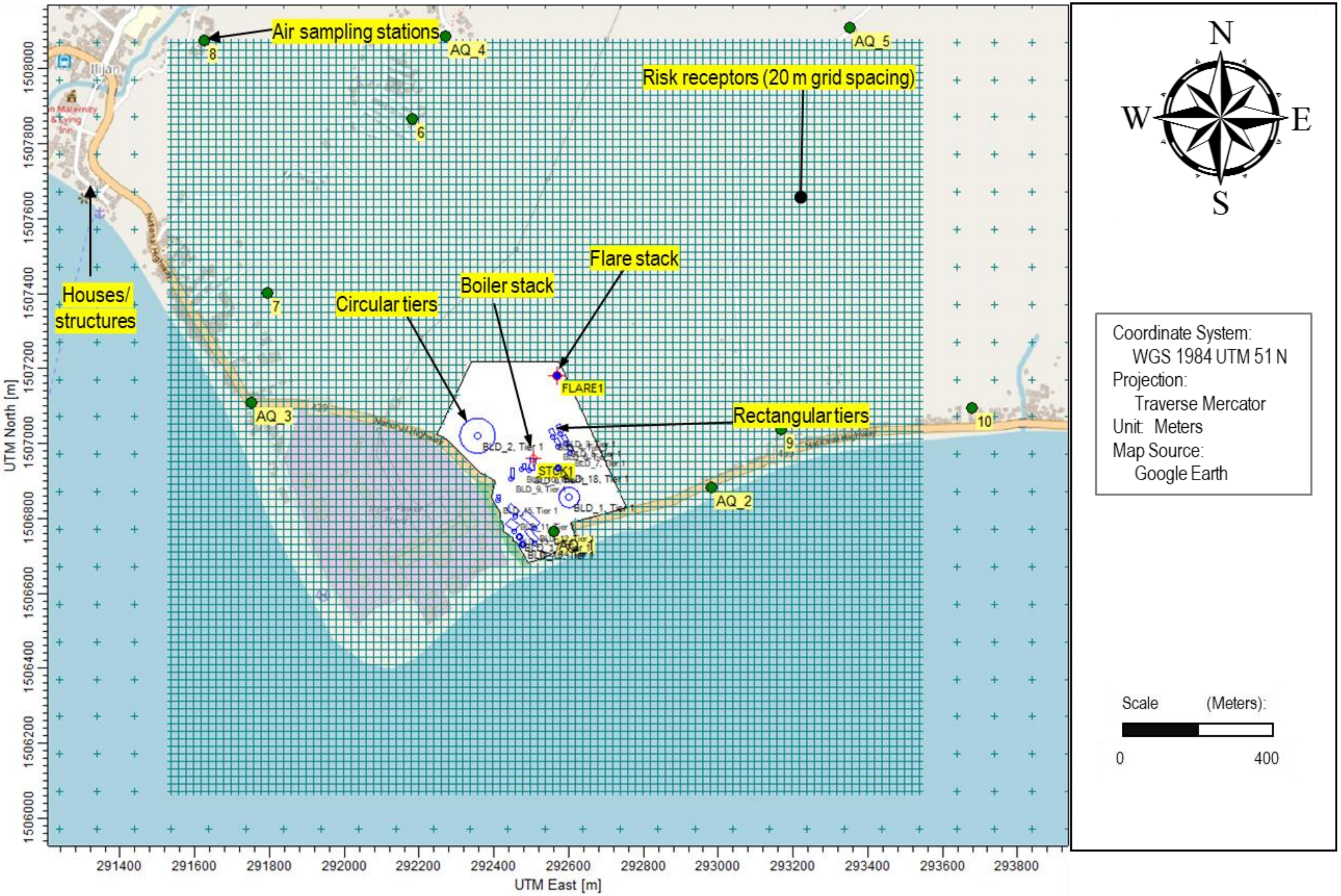


Figure 2-133. Closer view of receptors, households, air sampling stations, building tiers

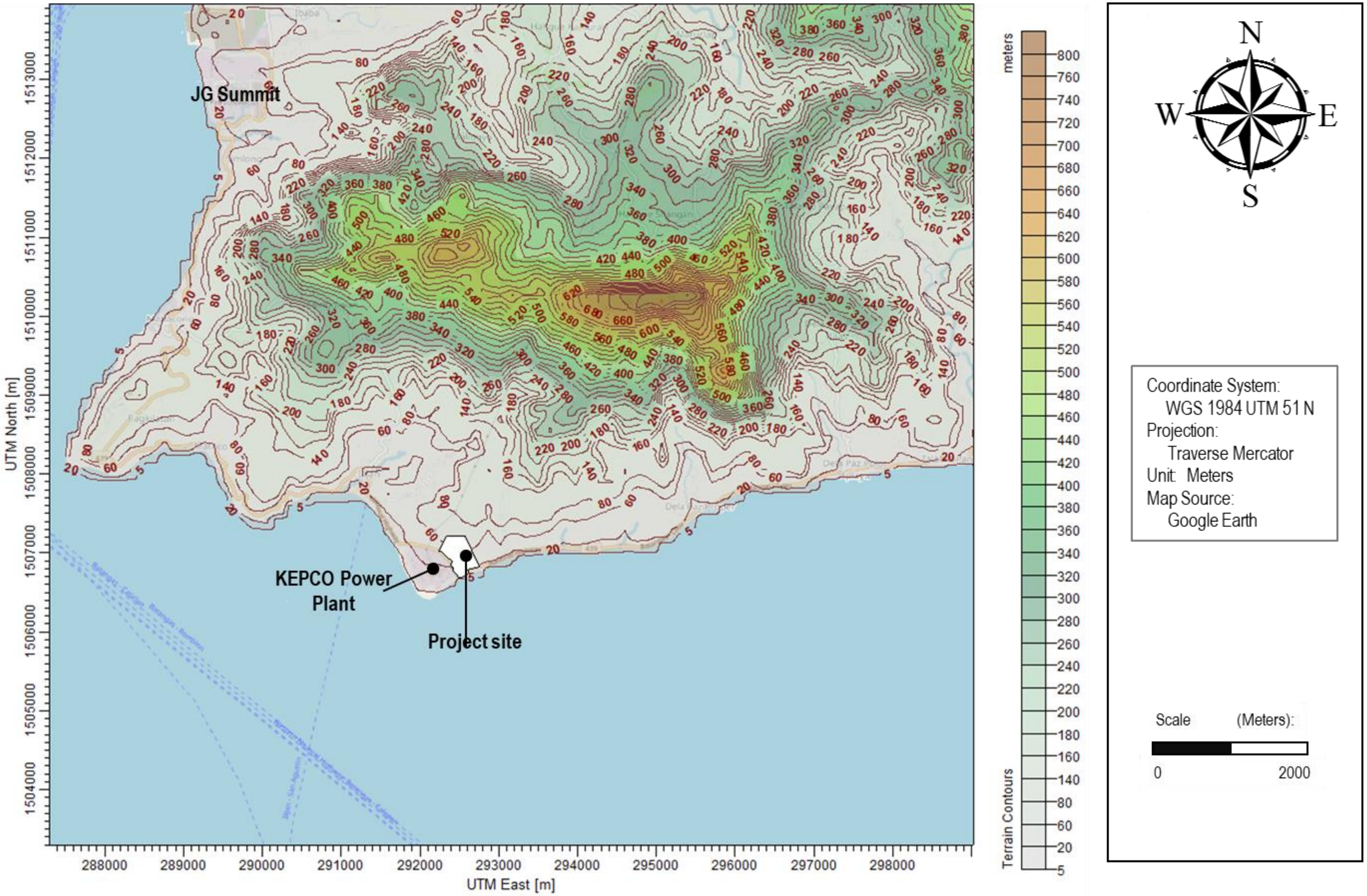


Figure 2-134. Terrain contours

2.3.2.1.4.4 METEOROLOGICAL INPUT DATA

Prognostic meteorological input data were purchased on-line from the website of Lakes Environmental Software, Inc. (or Lakes) with office based in Canada. AERMET View – a meteorological processor, was used to process the data provided by Lakes, which were provided in SAMSON format (*.samson).

Meteorological input data consists of two (2) types of files, namely: surface and profile (or upper air) data. **Plate 2-37** and **Plate 2-38** show the generated profile and surface input data files, respectively.

Met View [Profile Met Data File]

Profile File Name: LNG.PFL

Filter

Year: All Month: All Day: All

Table Graph

	Year	Month	Day	Hour	Measurement Height [m]	1, if this is the last (highest) level for this hour, or 0 otherwise	Direction the wind is blowing from for the current level [degrees]	Wind Speed for the current level [m/s]	Temperature at the current level [C]	Standard deviation of the wind direction fluctuations [degrees]	Standard deviation of the vertical wind speed fluctuations [m/s]
Min.	2017	Jan	1	1	15.0	1	0.0	0.00	21.6	99.0	99.00
Max.	2019	Dec	31	24	15.0	1	360.0	15.90	31.6	99.0	99.00
Graph					☐	☐	☐	☐	☑	☐	☐
1	2017	Jan	1	1	15.0	1	71.0	6.70	26.6	99.0	99.00
2	2017	Jan	1	2	15.0	1	68.0	6.70	26.6	99.0	99.00
3	2017	Jan	1	3	15.0	1	74.0	6.70	26.6	99.0	99.00
4	2017	Jan	1	4	15.0	1	73.0	7.20	26.6	99.0	99.00
5	2017	Jan	1	5	15.0	1	83.0	7.70	26.6	99.0	99.00
6	2017	Jan	1	6	15.0	1	82.0	8.20	26.5	99.0	99.00
7	2017	Jan	1	7	15.0	1	75.0	8.70	26.5	99.0	99.00
8	2017	Jan	1	8	15.0	1	73.0	8.20	26.8	99.0	99.00
9	2017	Jan	1	9	15.0	1	67.0	8.70	27.4	99.0	99.00
10	2017	Jan	1	10	15.0	1	81.0	9.30	27.8	99.0	99.00
11	2017	Jan	1	11	15.0	1	84.0	8.70	28.0	99.0	99.00
12	2017	Jan	1	12	15.0	1	76.0	6.70	27.9	99.0	99.00
13	2017	Jan	1	13	15.0	1	83.0	6.20	28.0	99.0	99.00
14	2017	Jan	1	14	15.0	1	79.0	5.70	27.9	99.0	99.00
15	2017	Jan	1	15	15.0	1	72.0	6.70	27.8	99.0	99.00
16	2017	Jan	1	16	15.0	1	74.0	7.20	27.8	99.0	99.00
17	2017	Jan	1	17	15.0	1	71.0	8.20	27.2	99.0	99.00
18	2017	Jan	1	18	15.0	1	57.0	8.20	26.8	99.0	99.00
19	2017	Jan	1	19	15.0	1	64.0	8.70	26.5	99.0	99.00
20	2017	Jan	1	20	15.0	1	57.0	8.70	26.4	99.0	99.00
21	2017	Jan	1	21	15.0	1	60.0	8.70	26.2	99.0	99.00

Plate 2-37. Profile meteorological input data

Met View [Pre-Processed Surface Met Data File]

File Header Data

Surface File Name: LNG.SFC

Station Latitude: 13.617N — Upper Air Station ID: 00066666 — Onsite Station ID: N/A

Station Longitude: 121.083E — Surface Station ID: 66666 — Version: 19191 CCVR_SUB TEMP_SUB

Filter

Year: All — Month: All — Day: All — Julian Day: All — Show

Data Quality

Calms: 238 [hours] 0.91 [%] — Missing: 10 [hours] 0.04 [%]

Table | Graph

	Year	Month	Day	Julian Day	Hour	Sensible Heat Flux [W/m^2])	Surface Friction Velocity [m/s]	Convective Velocity Scale [m/s]	Vertical Potential Temperature Gradient above PBL	Height of Convectively-Generated Boundary Layer - PBL [m]	Height of Mechanically-Generated Boundary Layer - SBL [m]	Monin-Obukhov Length [m]	Surface Roughness Length [m]	Bowen Ratio	Albedo	Wind Speed - Ws [m/s]	Wind Direction - Wd [degrees]	Reference Height for Ws and Wd [m]	Temperature - temp [K]
Min.	2017	Jan	1	1	1	-999.0	-9.000	-9.000	-9.000	-999.0	-999.0	-99999.0	0.000	0.45	0.10	0.00	0.0	15.0	294.8
Max.	2019	Dec	31	365	24	345.5	2.353	2.757	0.015	2564.0	4000.0	8888.0	1.000	1.62	1.00	15.90	360.0	15.0	304.8
Graph																			
2	2017	Jan	1	1	2	-64.0	0.969	-9.000	-9.000	-999.0	2288.0	1272.3	1.000	1.00	1.00	6.70	68.0	15.0	299.8
3	2017	Jan	1	1	3	-64.0	0.969	-9.000	-9.000	-999.0	2288.0	1272.3	1.000	1.00	1.00	6.70	74.0	15.0	299.8
4	2017	Jan	1	1	4	-64.0	1.045	-9.000	-9.000	-999.0	2555.0	1599.7	1.000	1.00	1.00	7.20	73.0	15.0	299.8
5	2017	Jan	1	1	5	-64.0	1.122	-9.000	-9.000	-999.0	2838.0	1975.8	1.000	1.00	1.00	7.70	83.0	15.0	299.8
6	2017	Jan	1	1	6	-64.0	1.197	-9.000	-9.000	-999.0	3130.0	2404.0	1.000	1.00	1.00	8.20	82.0	15.0	299.6
7	2017	Jan	1	1	7	-64.0	1.273	-9.000	-9.000	-999.0	3430.0	2887.6	1.000	1.00	0.61	8.70	75.0	15.0	299.6
8	2017	Jan	1	1	8	45.4	1.218	-9.000	-9.000	-999.0	3242.0	-3570.8	1.000	1.00	0.24	8.20	73.0	15.0	299.9
9	2017	Jan	1	1	9	120.6	1.301	-9.000	-9.000	-999.0	3543.0	-1635.6	1.000	1.00	0.14	8.70	67.0	15.0	300.5
10	2017	Jan	1	1	10	180.8	1.394	-9.000	-9.000	-999.0	3926.0	-1342.2	1.000	1.00	0.11	9.30	81.0	15.0	300.9
11	2017	Jan	1	1	11	221.9	1.312	-9.000	-9.000	-999.0	3637.0	-911.8	1.000	1.00	0.11	8.70	84.0	15.0	301.1
12	2017	Jan	1	1	12	242.4	1.034	-9.000	-9.000	-999.0	2667.0	-408.5	1.000	1.00	0.10	6.70	76.0	15.0	301.0
13	2017	Jan	1	1	13	234.3	0.964	-9.000	-9.000	-999.0	2301.0	-342.2	1.000	1.00	0.10	6.20	83.0	15.0	301.1
14	2017	Jan	1	1	14	213.9	0.892	-9.000	-9.000	-999.0	2039.0	-297.1	1.000	1.00	0.11	5.70	79.0	15.0	301.0
15	2017	Jan	1	1	15	46.9	1.000	-9.000	-9.000	-999.0	2390.0	-1905.9	1.000	1.00	0.11	6.70	72.0	15.0	300.9
16	2017	Jan	1	1	16	115.7	1.085	-9.000	-9.000	-999.0	2698.0	-986.8	1.000	1.00	0.14	7.20	74.0	15.0	300.9
17	2017	Jan	1	1	17	43.2	1.218	-9.000	-9.000	-999.0	3205.0	-3741.4	1.000	1.00	0.25	8.20	71.0	15.0	300.4
18	2017	Jan	1	1	18	-64.0	1.197	-9.000	-9.000	-999.0	3149.0	2401.5	1.000	1.00	0.64	8.20	57.0	15.0	299.9

Plate 2-38. Surface meteorological input data (Set 1)

2.3.2.1.4.5 BACKGROUND AIR QUALITY

Table 2-46 to **Table 2-49** show the measured background concentrations of air pollutants at the five (5) sampling stations (Station AQ1 to AQ5).

Ambient particulate concentrations (TSP and PM_{10}) were all within the ambient standards and guidelines values of the said air pollutants, including the ambient air metals.

Gaseous air pollutants (SO_2, NO_2, and CO) were also within the respective ambient standards and guideline values.

The existing stationary source adjacent the project site is the KEPCO gas-fired power plant, located west of the proposed project site. JG Summit petrochemical plant is located about 6.3 km northwest of the project site.

Table 2-46. Measured one-hour average concentrations of TSP, PM_{10}, SO_2 and NO_2 on October 19, 2020 (Source: ACES, 2020)

Station	Location	Date / Time of Sampling	TSP	PM10	SO2	NO2	REMARKS
AQ1	Near Parola	October 19, 2020 1302H-1402H	158	50.1	<15.8	8.9	Below NAAQS
AQ2	Near Arko Bridge	October 19, 2020 1146H-1246H	48	41.9	20.2	10.6	Below NAAQS
AQ3	Near Crossing	October 19, 2020 1418H-1518H	103	67.2	<15.8	<7.6	Below NAAQS
AQ4	Brgy. Ilijan	October 19, 2020 1026H-1126H	55	49.4	<15.9	9.3	Below NAAQS
AQ5	Brgy. Dela Paz Itaas	October 19, 2020 0900H-1000H	62	37.4	<15.8	8.9	Below NAAQS
DENR NAAQS for Source Specific Air Pollutants based on 60 minutes averaging time			**300**	**200**	**340**	**260**	

Table 2-47. Measured ambient metals on October 19, 2020 (Source: ACES, 2020)

Station	Location	Date / Time of Sampling	Lead (Pb) µg/Ncm	Mercury (Hg) µg/Ncm	Cadmium (Cd) mg/Ncm	Chromium (Cr) mg/Ncm	Arsenic (As) mg/Ncm	REMARKS
AQ1	Near Parola	October 19, 2020 1302H-1402H	<0.86	<0.17	<0.00017	0.0456	<0.00138	Below NAAQS
AQ2	Near Arko Bridge	October 19, 2020 1146H-1246H	<0.86	<0.17	<0.00017	0.0045	<0.00137	Below NAAQS
AQ3	Near Crossing	October 19, 2020 1418H-1518H	<0.86	<0.17	<0.00017	0.0403	<0.00137	Below NAAQS
AQ4	Brgy. Ilijan	October 19, 2020 1026H-1126H	<0.86	<0.17	<0.00017	0.0311	<0.00138	Below NAAQS
AQ5	Brgy. Dela Paz Itaas	October 19, 2020 0900H-1000H	<0.86	<0.17	<0.00017	0.0318	<0.00138	Below NAAQS
DENR NAAQS for Source Specific Air Pollutants based on 30 minutes averaging time			**1.5**	**N/A**	**0.01**	**N/A**	**0.02**	

Table 2-48. Measured 24-hour average concentrations of TSP, PM_{10}, SO_2 and NO_2 on October 27-31 2020 (Source: ACES, 2020)

Station	Location	Date / Time of Sampling	TSP	PM10	SO2	NO2	REMARKS
AQ1	Near Parola	October 28-29 2020 0925H-0925H	15.5	12.3	7.3	5.6	Below NAAQS
AQ2	Near Arko Bridge	October 29-30, 2020 0943H-0943H	89.5	19	9.6	4.7	Below NAAQS
AQ3	Near Crossing	October 30-31, 2020 1002H-1002H	31.7	19.8	9.9	6.6	Below NAAQS
AQ4	Brgy. Ilijan	October 27-28, 2020 0904H-0904H	14.7	12.2	3.4	4.9	Below NAAQS
DENR NAAQS for Source Specific Air Pollutants based on 24- hour averaging time			**230**	**150**	**180**	**150**	

Table 2-49. Measured ambient concentrations of carbon monoxide (CO) on October 27-31, 2020 (Source: ACES, 2020)

Station	Location	Date / Time	Period	CO (mg/Ncm)	Remarks
AQ1	Near Parola	October 28-29, 2020 0925H-0925H	Morning	9.2	Below NAAQS
			Afternoon	11.5	Below NAAQS
			Nighttime	5.7	Below NAAQS
AQ2	Near Arko Bridge	October 29-30, 2020 0943H-0943H	Morning	3.4	Below NAAQS
			Afternoon	6.9	Below NAAQS
			Nighttime	2.3	Below NAAQS
AQ3	Near Crossing	October 30-31, 2020 1002H-1002H	Morning	9.2	Below NAAQS
			Afternoon	13.7	Below NAAQS
			Nighttime	5.7	Below NAAQS
AQ4	Brgy. Ilijan	October 27-28, 2020 0904H-0904H	Morning	2.3	Below NAAQS
			Afternoon	5.7	Below NAAQS
			Nighttime	3.4	Below NAAQS
DENR NAAQS for Source Specific Air Pollutants based on 1- hour averaging time				**35**	

2.3.2.1.5 IMPACT ASSESSMENT AND MITIGATION MEASURES

2.3.2.1.5.1 PREDICTED DISPERSED AMBIENT AIR CONCENTRATIONS

Figure 2-135 to **Figure 2-139** show the predicted ambient air concentrations of CO and NO_2 at various averaging periods, i.e., 1 hour and 24 hour averaging period. The summary of results are presented in **Table 2-50**.

Results of predicted ambient air concentrations were all within the ambient guideline values set for CO and NO2. The highest predicted concentration is located at complex terrain adjacent the northeast and northwest boundaries of the project.

Results of air dispersion modelling showed that dispersed air emissions from the proposed project arising from the operation of the flare and the boiler stack were within the ambient guideline value set for NO2 and CO.

It is recommended to conduct stack emissions testing for the boiler and updated air dispersion modelling prior to issuance of Permit to Operate for the project. Results of stack emissions testing shall comply with the emission standards stipulated in the PCAA and its IRR (DAO 2000-81). Furthermore, the updated air dispersion modelling shall use the actual stack heights, building dimensions and heights, and results of initial stack testing, such as stack gas exit velocity, emission rates, and stack gas temperature.

Further, it is also recommended to perform ambient air monitoring at locations downwind of the prevailing wind direction where receptors or households are found.

Table 2-50. Summary of modelling results

Pollutant	Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
CO	1-HR		45.32135	ug/m^3	292313.12	1507163.71	62.73	2.00	803.00	9 Nov 2019, 7
NO_2	1-HR		53.98383	ug/m^3	292313.12	1507163.71	62.73	2.00	803.00	9 Nov 2019, 7
CO	8-HR		30.67911	ug/m^3	292737.66	1507230.88	68.24	2.00	803.00	28 Jun 2019, 24
NO_2	24-HR		23.65871	ug/m^3	292313.12	1507163.71	62.73	2.00	803.00	30 Mar 2019, 24
NO_2	ANNUAL		4.52983	ug/m^3	292300.45	1507136.79	59.41	2.00	803.00	

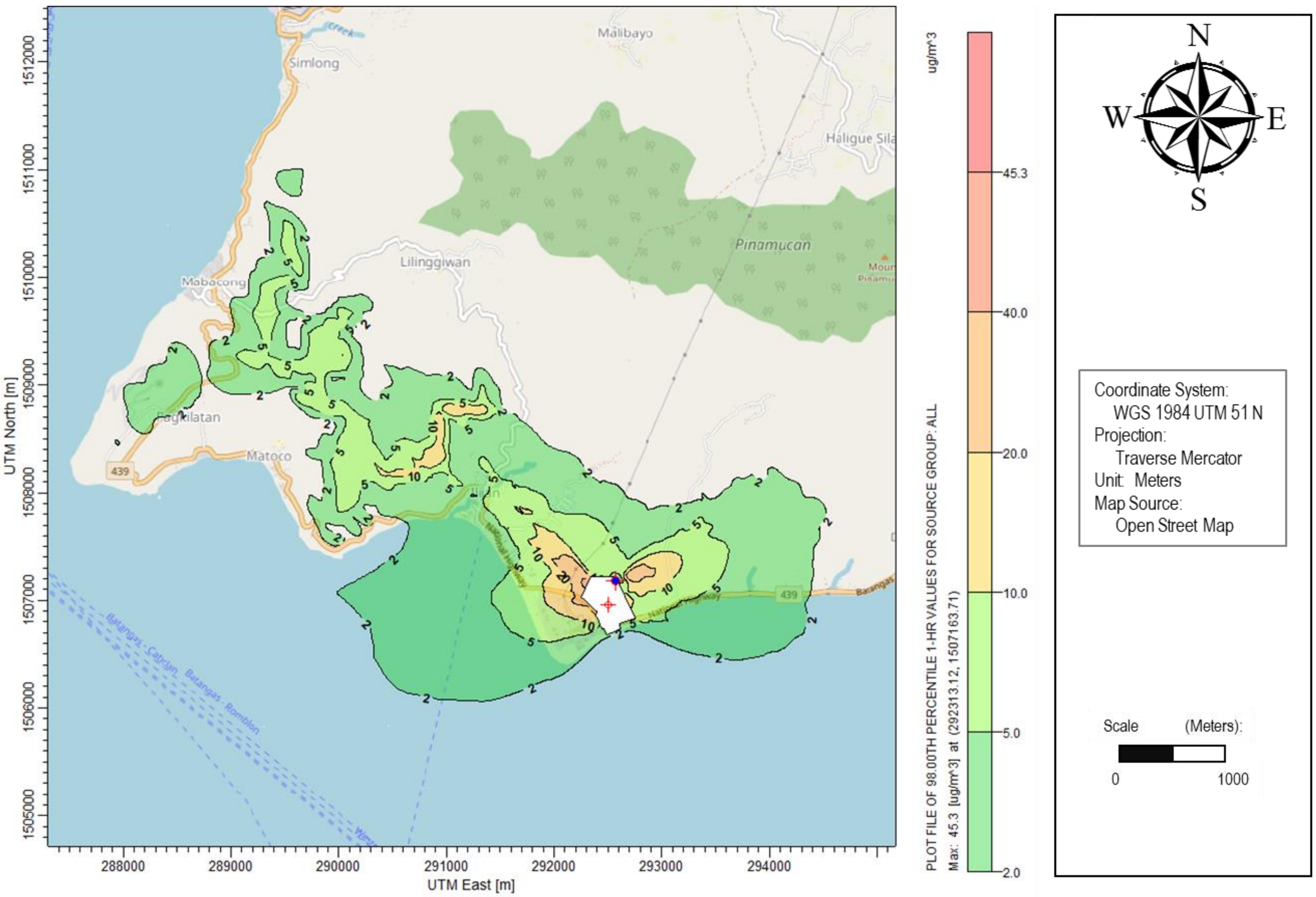


Figure 2-135. Predicted dispersed CO concentrations (1-hour average at 98th percentile)

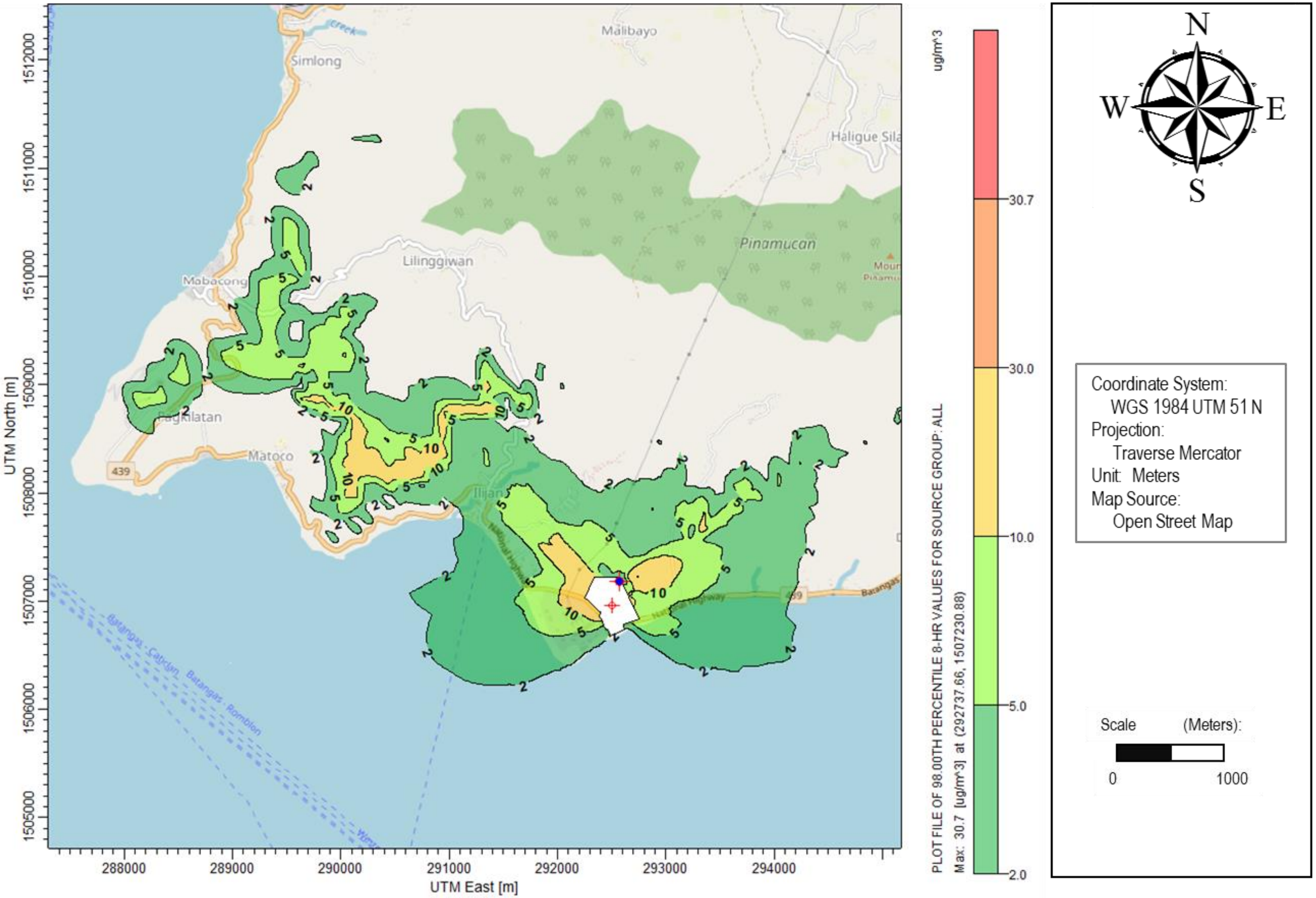


Figure 2-136. Predicted dispersed CO concentrations (8-hour average at 98th percentile)

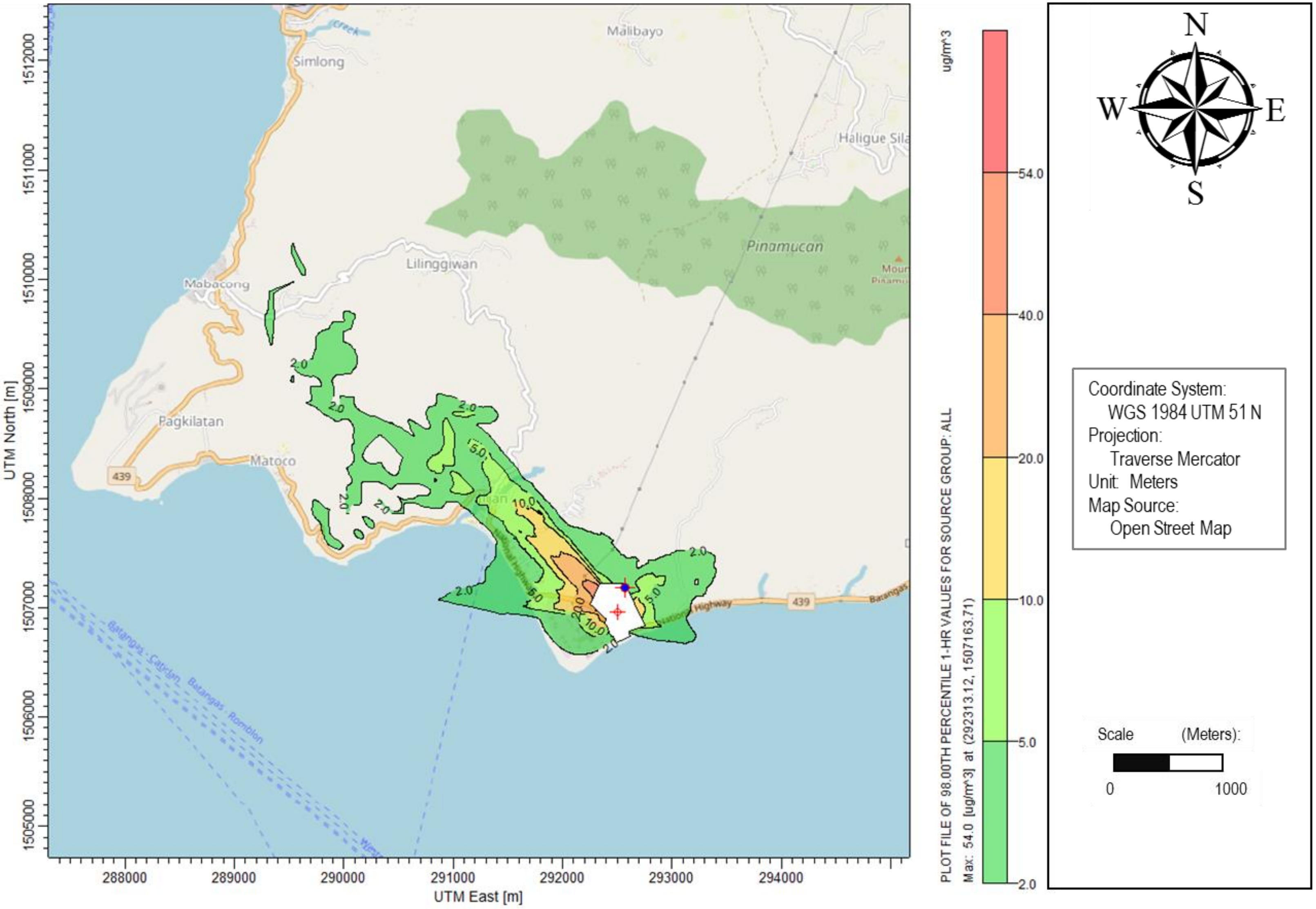


Figure 2-137. Predicted dispersed NO_2 concentrations (1-hour average at 98th percentile)

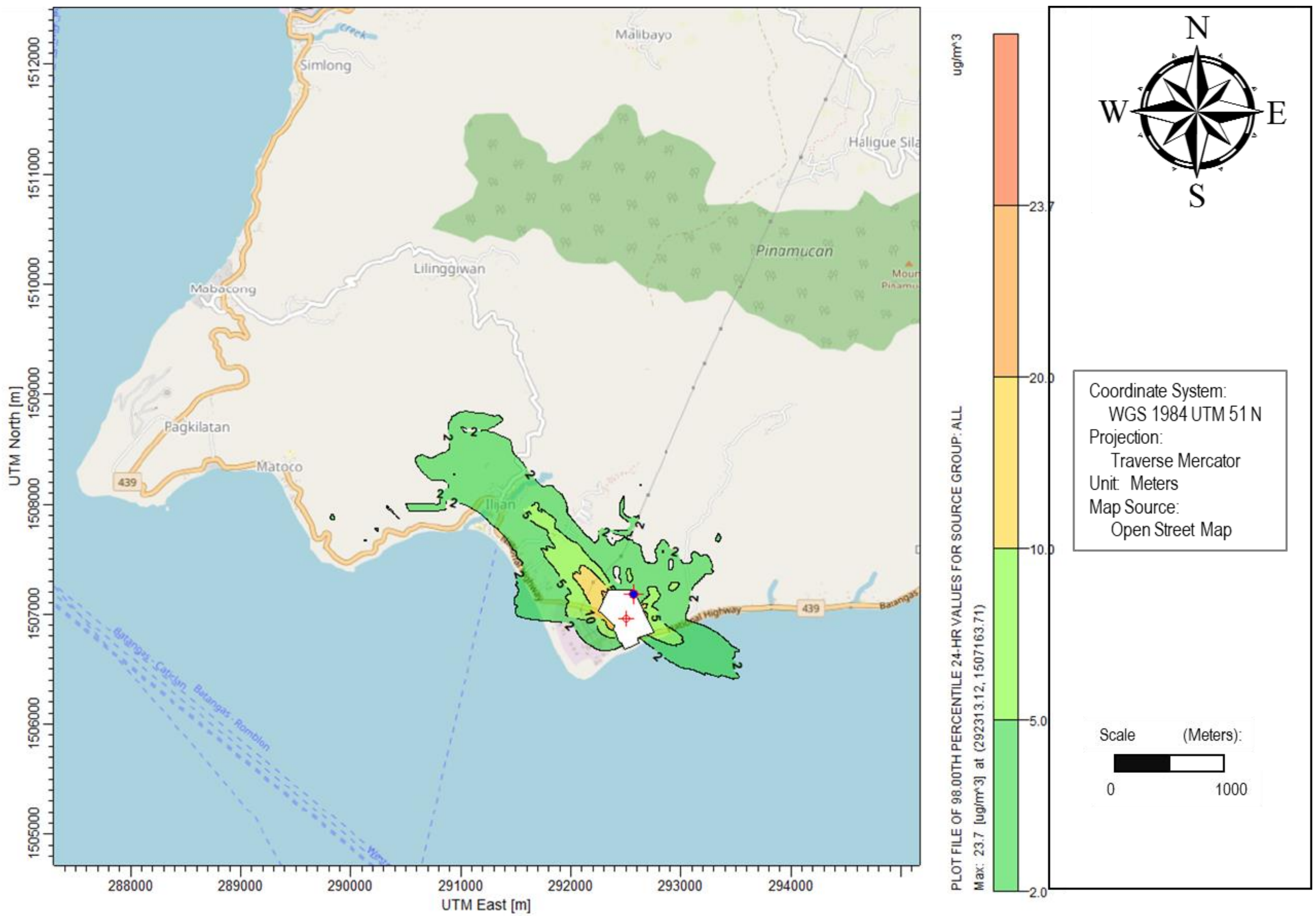


Figure 2-138. Predicted dispersed NO_2 concentrations (24-hour average at 98th percentile)

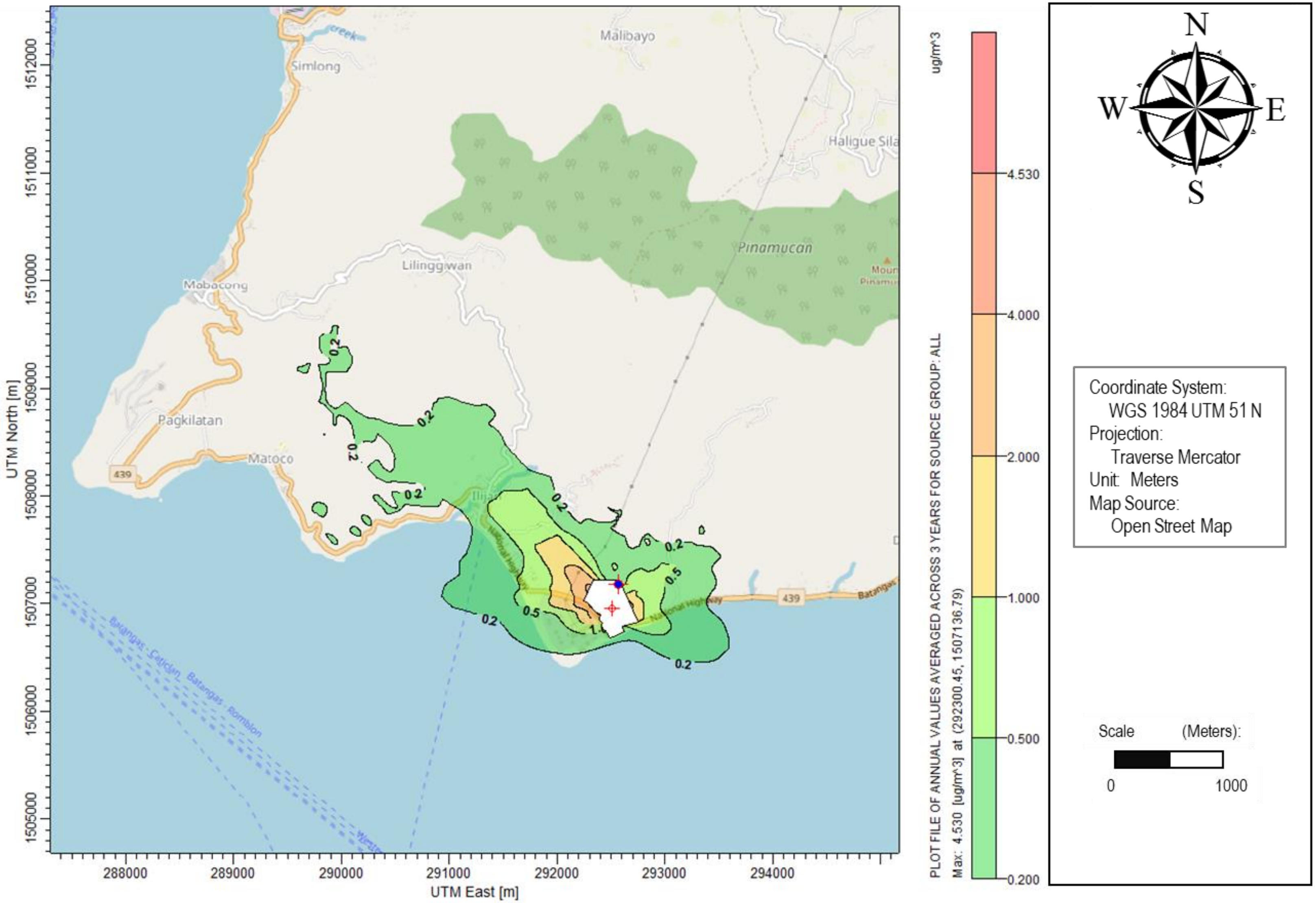


Figure 2-139. Predicted dispersed NO_2 concentrations (annual average)

2.3.2.2 AMBIENT NOISE LEVELS

2.3.2.2.1 METHODOLOGY

Noise assessment involved the determination of background noise levels at the project site and vicinities by conducting sound level monitoring at four (4) locations from October 27-28, 2020 (**Figure 2-140**). Sound level monitoring per noise sampling station was done by manual recording of total of fifty (50) sound levels that appeared in the screen every ten (10) seconds. Noise monitoring was performed by ACES Distribution and Consulting Services, INC (ADCSI).

The following statistical noise levels were then computed.

- Median of 7th highest noise readings;
- Equivalent sound levels (L_{eq});
- Sound levels exceeded 10% of the time (L_{10});
- Sound levels exceeded 90% of the time (L_{90}); and
- Median of sound levels.

The median of 7th highest noise readings was the 4th highest measured sound level at each station.

The equivalent sound levels (L_{eq}) were computed using the following formula

$$L_{eq} = 10\log_{10}\left[\frac{1}{N}\sum_{i=1}^{n} 10^{\frac{Li}{10}}\right]$$

where,

L_{eq} = equivalent noise level,
L_i = instantaneous noise level, and
N = total number of noise data

The L_{10}, L_{90} and L_{50} levels were computed using the statistical functions in MSEXCEL.

The increase in noise levels during construction were estimated using the typical noise levels at certain distances from construction equipment.

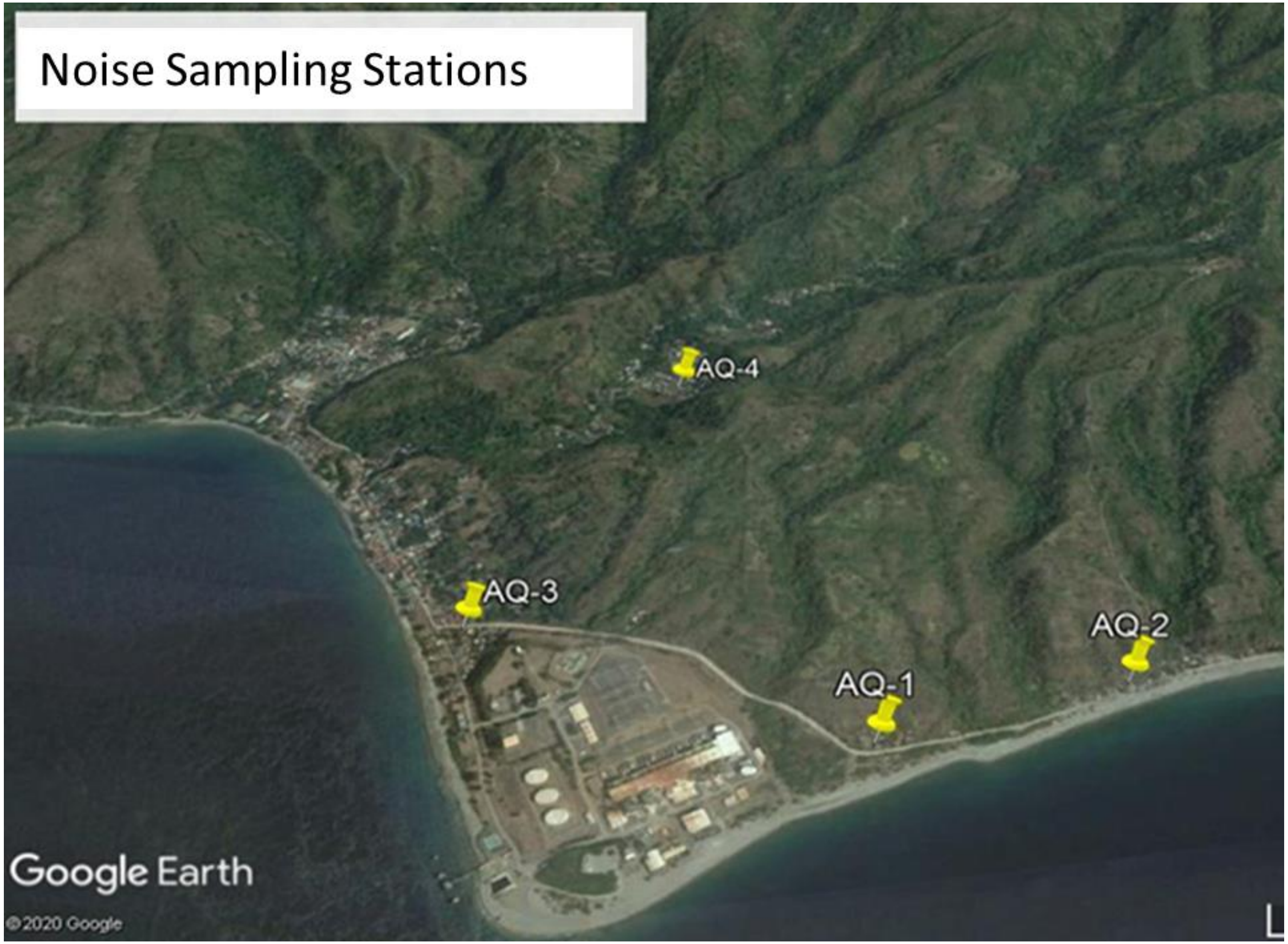


Figure 2-140. Locations of noise sampling stations (Note: same as the air quality sampling stations)

2.3.2.2.2 BACKGROUND NOISE LEVELS

The results of the morning, daytime, evening and night time ambient noise level monitoring are presented in **Table 2-51** while **Table 2-52** show the sources of noise at the time of monitoring.

Table 2-51. Hour Ambient Noise Level Monitoring Results Monitoring Results (dB A)

Station	Location	Date / Time	Period	Noise Level	NPCC Standard	Remarks
N1	Near Parola	October 29, 2020 0716H-0726H	Morning	57.3	55	Slightly Exceeded NPCC Standard
		October 28, 2020 1008H-1018H	Daytime	57.6	60	Below NPCC Standard
		October 28, 2020 1836H-1846H	Evening	53.5	55	Below NPCC Standard
		October 28, 2020 2302H-2312H	Nighttime	43.8	50	Below NPCC Standard
N2	Near Arko Bridge	October 30, 2020 0607H-0617H	Morning	59.1	55	Slightly exceeded NPCC Standard
		October 29, 2020 1004H-1014H	Daytime	62.6	60	Slightly exceeded NPCC Standard
		October 29, 2020 1828H-1838H	Evening	59.7	55	Slightly exceeded NPCC Standard
		October 29, 2020 2242H-2252H	Nighttime	48.6	50	Below NPCC Standard
N3	Near Crossing	October 31, 2020 0723H-0733H	Morning	61.5	55	Slightly exceeded NPCC Standard
		October 30, 2020 1041H-1051H	Daytime	62.8	60	Slightly exceeded NPCC Standard
		October 30, 2020 2003H-2013H	Evening	59.3	55	Slightly exceeded NPCC Standard
		October 30, 2020 2238H-2248H	Nighttime	50.6	50	Slightly exceeded NPCC Standard
N4	Brgy. Ilijan	October 28, 2020 0705H-0715H	Morning	59.4	50	Slightly exceeded NPCC Standard
		October 27, 2020 0931H-0941H	Daytime	59.4	55	Slightly exceeded NPCC Standard
		October 27, 2020 1858H-1908H	Evening	53.7	50	Slightly exceeded NPCC Standard
		October 27, 2020 2303H-2313H	Nighttime	44.2	45	Below NPCC Standard

Note: For areas directly facing a public transportation route, a correction factor is added to the applicabl standard by:

i. +5 dB A (if the area is facing a two-lane road) or

ii. +10 dB A (if the area is facing a four-lane or wider road)

Based on the results presented in **Table 2-51**, noise level at station N1 (Near Parola) were below the NPCC standards at all periods except during morning, while station N2 (Near Arko Bridge) slightly exceeded the standards during morning, daytime and evening and complied during nighttime.

Station N3 (Near Crossing) exceeded its corresponding NPCC standard at all periods. Lastly, station N4 (Brgy. Ilijan) only complied during nighttime while it slightly exceeded the standards during morning, daytime and evening periods. All noise levels were compared based on the NPCC standards for Class A areas. Audible noise levels at all stations mostly came from continuous passing of light to medium-sized vehicles and animal noises.

Table 2-52 shows the primary sources of noise at each station during sampling.

Table 2-52. Primary Sources of Noise

Station	Location	Sources of Noise
N1	Near Parola	Noise came from continuous passing of vehicles and noise from animals near the station.
N2	Near Arko Bridge	Noise came from passing vehicles and animals near the area.
N3	Near Crossing	Noise came from passing vehicles and insects.
N4	Brgy. Ilijan	Noise came from passing motorcycles and animal noises.

2.3.2.2.3 IMPACT ASSESSMENT AND MITIGATION MEASURES

Noise levels during construction period at the project site and vicinities and along access roads are expected to increase due operation of heavy equipment, such as dump trucks, front end loaders, and generators. Typical noise levels of these equipment at 15-m distance are as follows.

- Backhoe – 80 dBA
- Front end loader – 82 dBA
- Dump truck – 84 dBA
- Generator – 82 dBA
- Pick-up truck – 55 dBA
- Concrete pump truck – 82 dBA

To avoid significant increase on the background noise levels during construction, mitigation measures should include installation of effective or appropriate mufflers at tailpipes of mobile equipment and generator sets and strictly impose speed limits at access and barangay roads. If necessary, provide partial or total enclosure of high noise sources, if practicable as possible, and as necessary.

During project operation, noise from the LNG facility is not expected to significantly at residences/households due to wide distance between the power plant and the former (about 500 m).

Mitigation measures, however, should be implemented to reduce noise levels to within ambient noise standard in the event of noise exceedances. This could be done by provision of noise barriers, use of effective silencers of noise emanating from the diesel generating sets, provision of low noise emanating equipment, and other measures when necessary. .

2.4 PEOPLE

The study focuses on the impact areas of the proposed project. Batangas City is considered the indirect impact area based on the social impacts the project may induce. On the other hand, Barangay Ilijan is deemed as direct impact areas where the project components are to be located near. The following sections present the demographic and socio-economic profile of the impact areas as well as the issues/concerns/possible impacts regarding the project and corresponding proposed mitigation/enhancement measures.

2.4.1 METHODOLOGY

Various methods were employed in gathering information on the socio-economic conditions and perceptions of the impact community. The summary and details of these activities/methods presented in the following table and sections, respectively:

Activity	Date	Location/Venue	Participants
1. Requirements prior to Public Scoping*			
a. Focus Group Discussion	03 September 2020	Multi-Purpose Hall of Barangay Ilijan, Batangas City	11 participants
b. IEC Activity	03 September 2020	Multi-Purpose Hall of Barangay Ilijan, Batangas City	17 composed of representatives from different sectors
c. Initial Perception Survey	4-8 September 2020	Barangay Ilijan	48 respondents
2. Public Scoping	30 September 2020 1:30 PM	• Multi-Purpose Hall of Barangay Ilijan, Batangas City • Zoom Meeting	18 participants 11 participants (online)
3. Perception Survey	4-8 September 2020	Barangay Ilijan	98 respondents

***Annex I**

2.4.1.1 REQUIREMENTS PRIOR TO THE PUBLIC SCOPING

In compliance with DAO 2017-15 or the Guidelines on Public Participation under the Philippine Environmental Impact Statement System, Focus Group Discussion (FGD), Information and Education Campaign (IEC) and Initial Perception Survey were conducted as part of the requirements for the Public Scoping.

2.4.1.1.1 FOCUS GROUP DISCUSSION

The Focus Group Discussion (FGD) Activity on the proposed Ilijan LNG Import Facility Project was conducted on September 3, 2020 in the Barangay Hall of Barangay Ilijan, Batangas City. There were a total number of 11 participants present during the FGD.

Two (4) personnel were engaged in conducting the FGD proper.

2.4.1.1.2 IEC ACTIVITY

The IEC activity was attended by three representatives from AG&P, 5 from RHR Consulting Services, and 17 from the barangay sectors on 03 September 2020 in Barangay Ilijan, Batangas City (Direct Impact Area).

The activities included in the IEC were the following:

1. Courtesy Calls and Consultations with:
    a. Barangay Officials; and
    b. Sectoral Representatives
2. Presentation of Project Description;
3. Distribution of Project Information Brochures.

2.4.1.1.3 INITIAL PERCEPTION SURVEY

The perception survey was conducted with a total of 48 respondents from the impact barangay. The Survey Methodology used was Purposive Sampling, wherein the selection of the respondents was based on their representation of the different Sectors in their community. The other respondents randomly selected are residents, albeit ensuring that only one per household is selected, of different genders, and that ages, although limited to adults (18 years old and up) are not of a narrow range.

The venues of the survey are in the barangay hall and residences, stores, and work areas in the impact Barangay of the Project, Barangay Ilijan, Batangas City.

This activity was conducted on September 4-8, 2020, Friday to Tuesday, for a duration of 5 Days.

2.4.1.2 PUBLIC SCOPING

The Public Scoping for the proposed Ilijan LNG Import Facility Project was held on September 30, 2020, 1:00 PM at the Barangay Hall, Barangay Ilijan, Batangas City. A Zoom Meeting was simultaneously conducted to accommodate stakeholders that cannot attend the meeting physically. The Public Scoping was facilitated by representatives from AG&P and RHR Consulting Services, Inc. (EIA Preparer) and was participated by 29 attendees composed of members/heads of the local sectors, Local Government Units and other government agencies that are or will be affected by the project.

The issues and concerns during public scoping were summarized in this Report.

2.4.1.3 REVIEW OF SECONDARY DATA

Socio-demographic and economic data were procured from pertinent documents from respective government institutions such as City and Provincial LGUs, as well as online sources for background information. All sources were exhausted in the study. The latest available documents provided by LGUs and agencies are listed in **Table 2-53.**

Table 2-53. List of References used in the Study

Document	Date	Source	Impact Area Covered	
			Batangas City	Barangay Ilijan
Batangas City Local Climate Change Action Plan (LCCAP): A Convergence of Mitigation and Adaptation	2014-2030	Batangas City CPDO	✓	
Updating/ Revision of the Batangas City Ten Year Comprehensive Development Plan, Land Use Plan, and Zoning Ordinance for CY 2008 – 2018	2018	Batangas City CPDO	✓	
Batangas City Profile	2020	Batangas City CPDO	✓	
Marine Vessel Traffic	2019-2020	Philippine Ports Authority	✓	
Barangay Profile of Ilijan	2018	Barangay LGU		✓
Health Statistical Report of Barangay Ilijan	2017	Barangay LGU		✓
Barangay Annual Investment Plan	2018-2019	Barangay LGU		✓

*CPDO – City Planning and Development Office

2.4.1.4 PERCEPTION SURVEY

In order to determine the sample size, a standard survey will usually have a confidence level of 95% and margin of error of 5%. For this purpose, the assessment assigned a sample size for the host barangay employing a confidence level of 95% and a margin of error of 10%. The assessment used the Slovin's Formula (1960), wherein, a sample size can be determined using the computation below:

$$n = \frac{N}{1 + Ne^2}$$

Where:

n is the sample size
N is the population size
e is the margin of error
1 is a constant value

The formula arrived at *minimum* 94 responses based on 3,059 registered voters in the barangay.

The Survey Methodology used was Purposive Sampling, wherein the selection of the respondents was based on their representation of the different Sectors in their community. The other respondents randomly selected are residents, albeit ensuring that only one per household is selected, of different genders, and that ages, although limited to adults (18 years old and up) are not of a narrow range. A total of 98 respondents were surveyed on 4-8 September 2020.

The venues of the survey is within the impact barangay of the Project, Barangay Ilijan. The number of enumerators who facilitated the Perception Survey were 5 personnel.

2.4.2 RESULTS

2.4.2.1 PUBLIC SCOPING SUMMARY

Overall there were 18 issues, concerns, and recommendations raised by the stakeholders which were answered and acknowledged by AG&P, the proponent's main contractor, and are summarized in the table below.

Table 2-54. Issues and concerns raised during the Public Scoping

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
Physical Public Scoping		
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	Is the LNG in liquid or gas state?	Mr. Levi Alan B. Vitug, AG&P: The LNG is in liquid state that will be regassed in the facility.
Mr. Ronald M. Enriquez, Principal of Pedro S. Tolentino Memorial National High School – Integrated Shool	Why is the Floating Storage needed and why not directly located in the land terminal so it won't affect the seas of Ilijan. These seas are protected. Many fishermen might lose their livelihood due to 200-m shore area. This zone has a lot of marine resources vital to fisherfolk.	Mr. Levi Alan B. Vitug, AG&P: One LNG Carrier can carry 170,000 m3. San Miguel can only receive partial amount of LNG if they depend on a 60,000-m3 tank. The LNG tank takes a long time to install or construct as compared to a Floating Storage Unit. The June 2022 deadline for the company might not be achieved if all facilities will be on land. Mr. Lester B. Dinoy, AG&P: The project will only involve a terminal facility. An LNG production project will be too big and too long to construct. Thus, the FSU is necessary and practical. The AG&P and RHR will conduct a series of studies including the public scoping to gather issues and concerns of the community.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	In the plant processing, it is noticed that seawater will be used for the heating system. If seawater will be used, what will be the temperature of the seawater discharge?	Mr. Levi Alan B. Vitug, AG&P: The temperature of the seawater discharge should be not more than 3°C for the safety of marine life. The EIA study will help the design of the project to determine various EMB standards.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	There was a case where a fisherman, aside from marine life, was sucked by the intake in Ilijan who later died. In	Mr. Levi Alan B. Vitug, AG&P: There will be a 200-meter exclusion zone around the FSU as it is flammable. A seawater pump is also located within

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
	response, the intake of KEPCO was recommended to be fenced as 10-25 meters near its intake could suck in a person. What are your safety measures for this type of accident? The community experienced so far 20 sacks of sucked in small fishes and about 30 seaturtles, 7 of which are dead. Will this type of accidents occur for this type of project?	that zone hence human activities will not be permitted. AG&P will study the design for the project on how marine life will be protected from the onshore facility. Mr. Lester B. Dinoy, AG&P: AG&P will take into consideration the protection of marine life. The contractor who designs the project will follow international standards. These questions were noted and will be addressed.
Barangay Ilijan Councilor Gil Cepillo of Barangay Ilijan LGU	On the process of regasification, it was said that 100% will not have a leak but a tower will burn the leak. It means there is still a possibility of a leak. If gas will burn-off, how destructive will it be to the vegetation, wildlife, and the people?	Mr. Levi Alan B. Vitug, AG&P: The number one imperative for the engineers is that there should be no leak. From a commercial perspective, a leak is a loss in profit. Secondly, natural gas is methane and in any international safety standards, a flare tower is required to burn the leak. Mr. Lester B. Dinoy, AG&P: A large volume of natural gas will still have an impact to the environment. A leak shall be prevented due to the high cost. There will be a very minimal probability of boil off rate. Residues will be pushed to the flare tower to burn. However, the amount to be burned will be very minimal not destructive enough to the environment as it will be monitored by international standards.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	What will be the indicator for the leak outside the plant?	Mr. Lester B. Dinoy, AG&P: In all areas of the plant, multiple censors will be installed as LNG is odorless. Fire stations will be constructed in accordance with international standards. Burning in the flare tower indicates that it is working.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	Are there any residuals from the regasification process that may harm the environment?	Mr. Lester B. Dinoy, AG&P: AG&P is very confident that there will be no residuals. Bought LNG will have certificates that assure the quality of the LNG.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	In your experience, what will be the noise level of the processing plant?	Mr. Lester B. Dinoy, AG&P: In this project, the limit should be no more than 85 decibels, one meter away from the source of the noise. Thresholds will be confirmed during the EIA study. Mr. Jess M. Addawe, RHR: Ambient noise will be studied in the EIA report. This will be compared to DENR standards. Monitoring will also be conducted for the ambient noise during the operation of the project.
Barangay Ilijan Councilor Gil Cepillo of Barangay Ilijan LGU	What are the livelihood programs benefitting the impact barangay or communities from the LNG project?	Mr. Rufino Ocampo, AG&P-COMREL: AG&P, through the COMREL, will closely coordinate with the communities. Concerned barangays or organizations may send a letter to the COMREL regarding their requests. Mr. Henry James P. Botengan, RHR: There will be a series of discussions and consultations with the concerned stakeholders, such as the fisherfolk during which they will be asked for their proposed alternative livelihood or other programs they have in mind.

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
		Mr. Jess M. Addawe, RHR: In terms of ECC requirements, in the EIA study, a Social Development Plan is required by EMB to be formulated based on consultations with the stakeholders. The goal of the SDP is to aid those who will be affected by the project. This is separate from the Corporate Social Responsibility (CSR). The EIA study can be reviewed by the stakeholders and during the Public Hearing, may raise comments regarding the SDP
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	AG&P has submitted a letter request for clearance. It was not yet clear for the Barangay LGU what kind of clearance, if for construction or operation. There is no clear discussion yet on the flow of construction and what are the impacts on the community. Consultations should be made on the traditions and cultures present in the barangay. The Barangay LGU prioritizes safety during the entry of construction workers in Ilijan. Existing issues include unpaid households for resettlement and lack of stockpile area according to the contractor for clearing operations. If the stockpile area is located in the upper parts of the barangay, this may cause landslides. It should be located in a flat and vast area. Communication should be made with the host barangay first.	Mr. Levi Alan B. Vitug, AG&P: AG&P endorsed the contractor to the Barangay LGU for the topographic survey. However, AG&P was not aware on what has transpired during the visit. AG&P will list down the concerns of the LGU and will convey them to the contractor. The contractor cannot apply yet for a permit as SMC Site Development has still no ECC. As per the contractor, a stockpile area was already identified about 10 km away from Ilijan. Regarding the concerns about the households, the project area will not be owned by AG&P but by SMC. Hence, AG&P has no authority to broach the subject on land issues to the communities. On the clearances applied, AG&P received a notice to proceed from the DOE requiring the proponent to deliver a locational zoning clearance that the location of the project is 100% industrial. That is the purpose of the barangay permit being applied by the AG&P. Mr. Lester B. Dinoy, AG&P: AG&P would like to maintain good communication with the barangay. Should there be any issues regarding the contractor, the barangay can notify AG&P. Santa Clara Contractor is being employed both by AG&P and SMC for their Site Development. Hence there will be instances where activities may be confused with.
Video Conference		
Mr. Suzie M. Huelgas, Environmental Specialist, PPA Batangas	Request for a copy of AG&P project plans so the Harbor Master and the Vessel Traffic Manager can also provide their insights in regard the safe navigation in the area. Also, the Engineering Services Manager will need to look on port facilities too. Requesting for a separate discussion with the presence of the Harbor Master and Vessel Traffic Manager.	Mr. Alex Gamboa, AG&P: AG&P will send an advanced copy of project plans to PPA-Batangas. An open dialogue will be conducted separately with the PPA-Batangas.

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
Engr. Januario G. Godoy, City Planning and Development Officer	Will motorists be safe in crossing the Batangas Bay Road within the proposed project area?	Mr. Alex Gamboa, AG&P: Yes, it is very safe. AG&P will provide all the mitigating measures. The NFPA standards for LNG terminals, aside from the local building code make sure that the facility is very safe.
Engr. Januario G. Godoy, City Planning and Development Officer	What is the target date of construction for the project?	Mr. Alex Gamboa, AG&P: We are now currently applying for permits, including ECC, locational clearance, etc from different government agencies. AG&P targets the construction early part of 2021. The target start of operation will be June 2022.
EnP. Raquel Smith C. Ortega - EMB Central Office	Is the project located within the compound of AG&P?	Mr. Alex Gamboa, AG&P: The facility will be located right beside the Ilijan Power Plant. The property is owned by SMC and will be in a lease contract with AG&P. AG&P will only develop the area.
EnP. Raquel Smith C. Ortega - EMB Central Office	Are there no settlers within the project area?	Mr. Alex Gamboa, AG&P: None. It is part of the application for locational clearance that issues present in the area.
Ms. Natividad Efondo (Fisheries Inspection Unit) – BFAR Region IVA	Residues of the processing that may fall on seas may affect marine life. Make sure that during operations, no contamination on the environment, especially on the fisheries.	Mr. Alex Gamboa, AG&P: Specific standards will be complied with to make sure that the environment will not be contaminated. Moreover, details on effluent and the final design may be presented with BFAR before construction.
Engr. Januario G. Godoy, City Planning and Development Officer	Will electricity be cheaper using LNG?	Mr. Alex Gamboa, AG&P: Cannot speak on behalf of the Ilijan power plant, but prices are very competitive as compared to other power providers.
Engr. Julius Caesar G. Pantaleon - Science Research Specialist II (DOE-Luzon Field Office) / Ms. Kristel Charmaine R. Sayson - Science Research Specialist I (DOE-Luzon Field Office)	Requesting for copy of the presentations during Public Scoping.	RHR Consulting Services, Inc.: Noted.

2.4.2.2 REVIEW OF SECONDARY DATA

Secondary data gathered from City and Barangay LGUs and other government agencies are presented in the following sections:

2.4.2.2.1 HISTORY

Batangas City was discovered by Spanish missionaries in 1572. It was founded in 1581 and was named Batangan because of the numerous big logs abounding the Calumpang River during that time. These logs were called "batang" by the natives that settled near the river and called their settlement or barangay "Batangan". This name was modified and became Batangas in 1601. Don Agustin Kasilao was appointed the first gobernadorcillo. Since 1754, the city has been the provincial capital and its administrative center.

Batangas became a city in 1969.

2.4.2.2.2 DEMOGRAPHIC DATA

2.4.2.2.2.1 POPULATION

According to Batangas City CPDO (updated 2020), the total population 349,502. About 217,522 are urban population and 131,980 are rural population. The population growth rate, based on PSA 2015, is 1.46%.

The number of population in Barangay Ilijan is 4,880 with 3,059 registered voters.

2.4.2.2.2.2 NUMBER OF HOUSEHOLDS AND HOUSEHOLD SIZE

Batangas City CPDO (2020) indicates that there are 82,630 total households in the city. About 52,614 of them are urban households and the rest are rural households. The average household size in Batangas City is 4 per members per household.

2.4.2.2.2.3 LAND AREA

The total land area of Batangas City is 28,541.4355 hectares, 79.4% of which is considered as rural.

Barangay Ilijan has a total area of 1,007.32 Hectares categorized as Rural. The barangay's classifications are: Agricultural, Industrial, Residential.

2.4.2.2.2.4 POPULATION DENSITY /GROWTH

Batangas CPDO (2020) estimated a 1,190 persons/km^2 population density in Batangas City.

2.4.2.2.2.5 LITERACY RATE, PROFILE OF EDUCATIONAL ATTAINMENT

Batangas City CPDO reported that simple literacy rate in Batangas City is 99.40%.

2.4.2.2.2.6 CULTURE/LIFESTYLE[12]

The dialect of Tagalog spoken in the province closely resembles the Old Tagalog spoken before the arrival of the Spanish. Hence the Summer Institute of Linguistics called this province the Heartland of the Tagalog Language. A strong presence of the Tagalog culture is clearly visible to the present day.

In the recent years, waves of migration from the Visayas had brought significant number of Visayans to the province. There are also a few who can speak Spanish, since Batangas was an important centre during the colonial period.

Maria Kalaw Katigbak, a Filipino historian, was quoted to call the Batangueños the Super-Tagalogs. One particular custom in the Batangan culture is the so-called MatandasaDugo (lit. older by blood) practice wherein one gives respect not because of age but of consanguinity. During the early times, the custom of having very large families are very common. Thus, it may be expected that the someone's uncle could be of the same age, or even younger than himself. In this case, the older one would call the younger one in an honorary title (such as tiyo or simply kuya if they can no longer establish the relationship), not the other way around. This often draws confusion to those from other provinces who are not accustomed to such practices. This practice exists until today.

Batangueños are very regionalistic. When one learns that a person in the room is also from Batangas, expect them to be together until the end of the event. It is also expected that those in office would favour their fellow Batangueños as long as the rules could allow it. Thus the running joke, the Batangas Mafia came to existence.

They also tend to live in a large extended family. It is but common that a piece of land remains undivided until the family connection becomes to far-off related. Marriages between relatives of the fifth generation is still restrained in the Batangan culture even if Philippine laws allow it.

Most Batangueños are either farmers or fishers who sell their own products in the market. Although most of them have also finished a degree, a lot of the people prefer to not use what they have studied and put up their own small businesses instead. This is perhaps due to the subconscious idea that he who has no land to cultivate or trade to make is a lazy person.

Batangueños are known for being religious, where devotees pay respect in such way that they make rituals, like dances and chants (Luwa) to please them,one of these is the Passion in which it is a common sight to hear these chants during the Lenten season, a religious act still practice today. During the month of May the people of Bauan and Alitagtag celebrate the feast day of the Mahalna Poon ng Sta. Cruz, a ritual dance called the Subli is made to repect to the Poon .In the town of Taal they celebrate the feast day of the Our Lady of Caysasay and San Martin

[12] Lifted from Batangas Province Official Website (http://www.batangas.gov.ph/portal/history/)

de Tours a two day celebration where procession from the shine of the Virgin towards the Pansipit River where the fluvial procession and another procession towards the Basilica are made in honored of the Virgin Mary.Fiestas in other towns usually start in the month of May and last up to the first day of June, usually the plaza near the church becomes the center of attraction.

Since Batangas has long been declared a tourism area by late President Ferdinand Marcos, people from other places could find a very hospitable culture in the Batangueños. They will feed you more than the usual with the food they eat. Actually, these folks would appreciate it greatly if they see that you are trying to be one of them.

Results of the secondary data gathering and actual surveys suggest that there are no indigenous people (IPs) present within and near the project site.

2.4.2.2.2.7 PHYSICAL CULTURAL RESOURCES

Batangas is home to some of the best architectures of the country. Along with Vigan, Ilocos Sur, Batangas has the best preserved colonial architectures. This is very evident when one visits the Municipality of Taal.

Though not as popular as the carving industry of Laguna, Batangas is still famous for the sculptures engraved on the countless furniture that came from their Province. Often, altar tables coming from Batangas was called the friars' choice because of its delicate beauty.

According to Milagros Covarubias-Jamir, another Filipino scholar, the furniture that came from Batangas during the colonial times was comparable to the beautiful furniture from China. The built of the furniture was so exquisite, nails of glues was never used. Still, the Batangueños knew how to maximize the use of hardwoods. As a result, furniture made about a hundred years ago are still found in many old churches and houses even today.

Specific to the project site, the area is considered as an industrial zone by the City Planning and Development Office. Upon reviewing the CLUP and other similar documents, there are no known physical cultural resources that will be affected by the project near the project site.

2.4.2.2.3 BASIC SERVICES

2.4.2.2.3.1 WATER SUPPLY

Sources of water supply in Batangas City are BCWD-Prime Water. Artesian Wells, Developed Springs & 72 Barangay Waterworks Associations.

In Barangay Ilijan, the following table shows the water supply system of households. Majority of the households have access to 3rd Level Water Type or water supplied through water faucets in individual households.

Table 2-55. Water Supply System in Batangas Ilijan, Batangas per number of household

Type/Level	Number of Household with access
1st Level – spring, deep well, etc.	0
2nd Level - water supplied by public water faucets	171
3rd Level - water supplied through water faucets in individual households	777

2.4.2.2.3.2 POWER SUPPLY

Batangas City has three sources of power, namely: MERALCO Franchise, BATELEC II (portions of 3 barangays).

In Barangay Ilijan, the largest power supply distributor is Meralco.

2.4.2.2.3.3 COMMUNICATIONS

Listed below before are communication services/media available in Batangas City:

- Telephone & Fax Services - PLDT, Globe Telecom, Smart Communications
- Mail/Telegraph Services - JRS Express. LBC Express, WWW Express, 2Go Phil. Postal Corp., Abest Express.

- Radio Stations - 99.1 DWAM-FM Spirit FM, 104.7 DWEY-FM Brigada News FM, DWAL-FM 95.9 Radio Totoo Batangas, Air 1FM
- Cable/Television Station - Asian Vision, SMATV, ABS-CBN ch-10, Cignal TV. Dream Cable and Sky Direct
- Cellphones - Globe/Touch Mobile, Smart /Talk&Text, Sun Cellular
- Internet Service Provider - PLDT, Innove Telecom. Sun, Asian Vision, Smart Communication, Inc, Integranet Network Serives.

Barangay Ilijan has portable radio, cellphone, social media as existing means of communication.

2.4.2.2.3.4 EDUCATION FACILITIES

The table below shows the number of schools present in Batangas City.

Table 2-56. Number of Schools in Batangas City

Level of Education	Number of Schools	
	Public	Private
Day Care Center	109	26
Pre-School	84	44
Elementary Level	83	39
Secondary Level	20	25
Junior High School	14	17
Senior High School	2	7
Vocational Level	3	7
Master's Degree Level	1	3
Doctorate	1	2
Law	1	1
Computer Courses	2	9
TOTAL	**320**	**180**

2.4.2.2.3.5 RECREATIONAL FACILITIES / SPORTS FACILITIES

Batangas City offers a variety of recreational facilities: Bowling Alleys, Basketball Courts, Badminton Court, Amusement Centers, Tennis Court. Billard Halls, Movie Houses, Swimming Pools, Cockpit Arenas. Beach Resorts, Target Shooting Range, Bingo Hall and Shopping Malls.

2.4.2.2.3.6 NUMBER OF HEALTH PROVIDERS

The number of health providers in Barangay Ilijan is shown in the following table:

Table 2-57. Number of Health Provider in Barangay Ilijan, Batangas

Health Provider	Number
Doctor	1
Dentist	1
Nurse	2
Midwife	1
Sanitation Inspector	1
Nutritionist	1
Population Program Worker	1
Dental Aide	1
BHW	4
BNS	1
BSPO	1

2.4.2.2.3.7 MORBIDITY AND MORTALITY RATES

The health profile of Barangay Ilijan is presented in the following tables:

Table 2-58. Health Profile in Barangay Ilijan, Batangas in 2017

Health Profile	Number
Total Number of Live Births	60
Total Number of Deaths	26
Total Number of Infant Deaths	0
Total Number of Under Five Deaths	0
Total Number of Maternal Deaths	0
Crude Birth Rate	14.25
Crude Death Rate	6.17

The leading cause of morbidity in Barangay Ilijan as of 2017 is ARI/URI/AURI, mostly affecting females.

Table 2-59. Leading Causes of Morbidity per 1000 population in Barangay Ilijan, Batangas in 2017

Causes	Male	Female	Total	Rate
1. ARI/URTI/AURI	180	232	412	97.84
2. Systemic Viral Infection	53	61	114	27.07
3. Cardio Vascular Disease	11	28	39	9.26
4. Bronchial Asthma	21	9	30	7.12
5. Acute Gastroenteritis	8	6	14	3.32
6. Pulmonary Tuberculosis	8	4	12	2.85
7. Diabetes Mellitus	7	3	10	2.37
8. Animal Bite	4	1	5	1.19
9. Dengue Fever	1	4	5	1.19
10. CVD/ DM	1	2	3	0.71

The leading cause of morbidity under five years old in Barangay Ilijan as of 2017 is still ARI/URI/AURI, mostly affecting males.

Table 2-60. Leading Causes of Under Five Morbidity per 1000 population in Barangay Ilijan, Batangas in 2017

Causes	Male	Female	Total	Rate
1. ARI/URTI/AURI	62	58	120	28.50
2. Systemic Viral Infection	35	36	71	16.86
3. Bronchial Asthma	13	4	17	4.03
4. Impetigo	5	4	9	2.14
5. Acute Gastroenteritis	5	2	7	1.66
6. Dengue Fever	1	4	5	1.19
7. Viral Flue	3	1	4	0.95
8. R/o Pneumonia	0	1	1	0.24
9. Tonsillitis	1	0	1	0.24

The leading cause of mortality under in Barangay Ilijan as of 2017 is Electrolyte Imbalance, mostly affecting females.

Table 2-61. Leading Causes of Mortality per 1000 population in Barangay Ilijan, Batangas in 2017

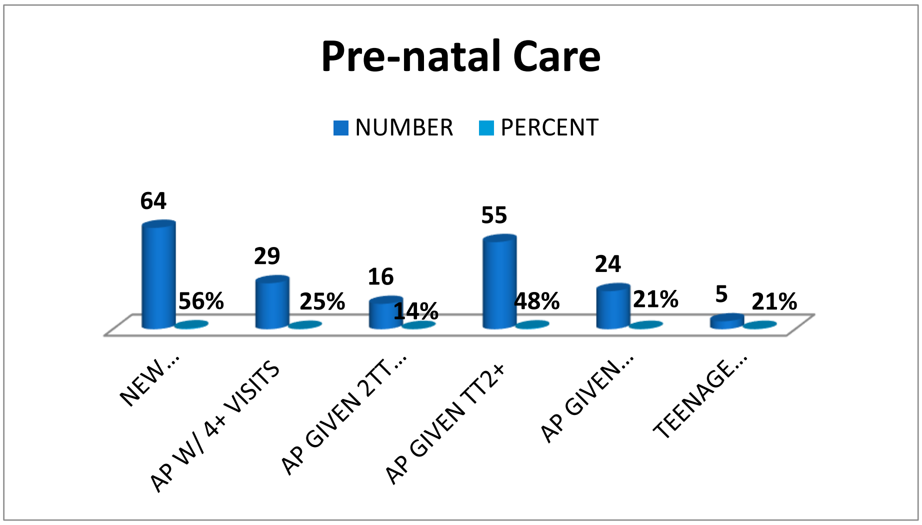
Causes	Male	Female	Total	Rate
1. Electrolyte Imbalance	1	2	3	0.71

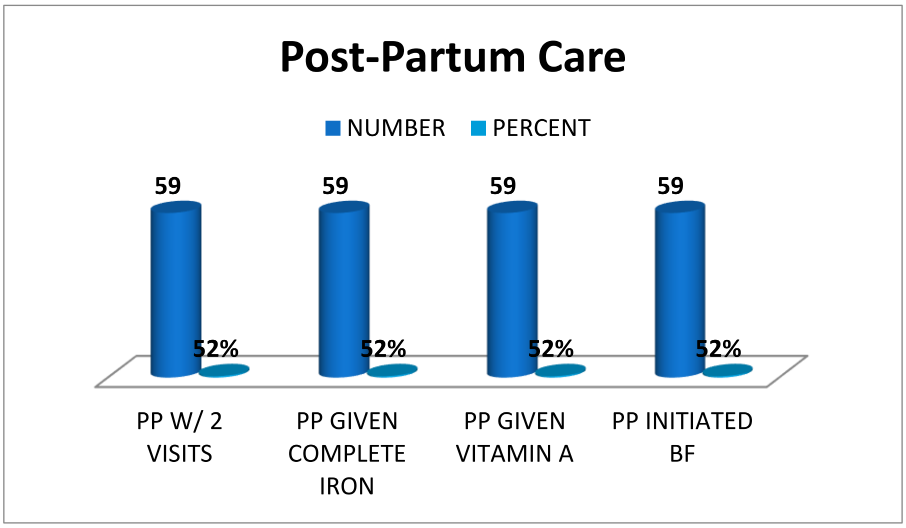
Causes	Male	Female	Total	Rate
2. Acute Myocardial Infraction	2	0	2	0.47
3. Pneumonia	2	0	2	0.47
4. To consider Dementia	1	1	2	0.47
5. Chronic Kidney Disease	0	2	2	0.47
6. Cardiovascular Disease	1	1	2	0.47
7. CAP	1	1	2	0.47
8. Cerebrovascular Disease	0	1	1	0.24
9. Ovarian Cancer	0	1	1	0.24
10. Acute Gastroenteritis	1	0	1	0.24

MATERNAL NEONATAL

AND

CHILD HEALTH NUTRITIONS





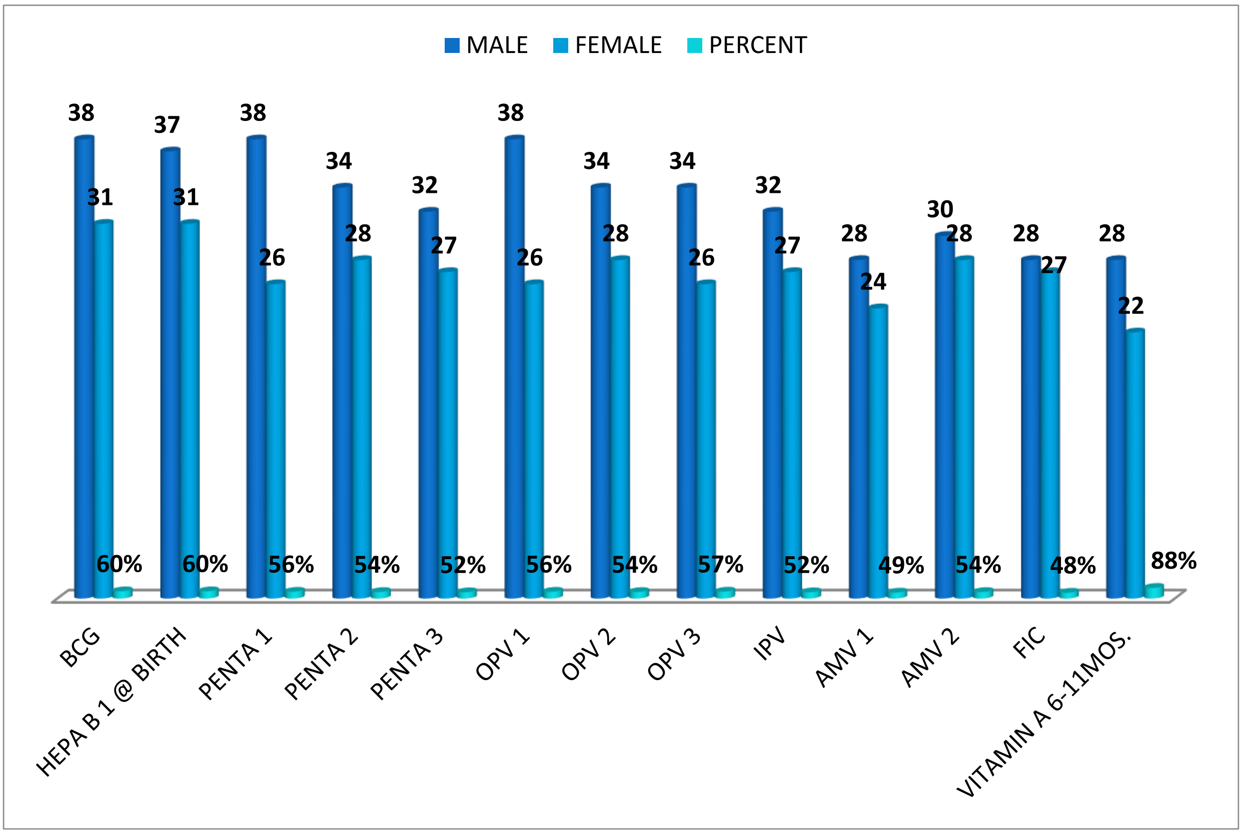
HEALTH STATISTICS

RURAL HEALTH UNIT V

ILIJAN, BATANGAS CITY

CY 2017

NATIONAL IMMUNIZATION PROGRAM



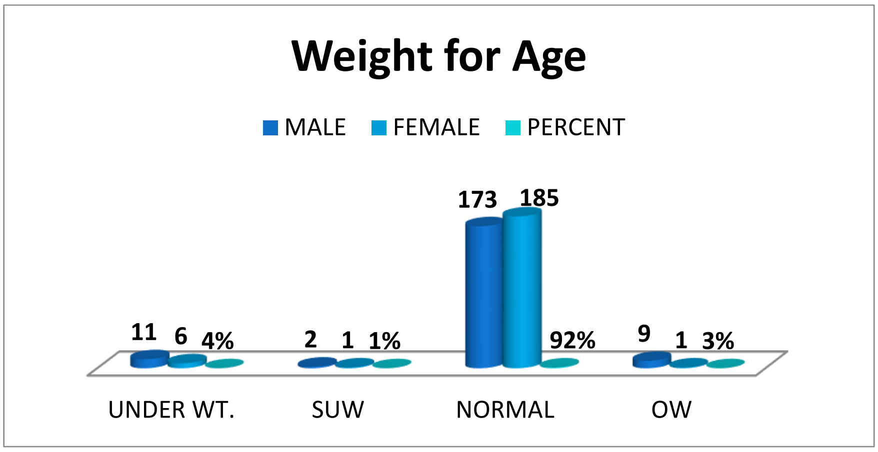
HEALTH STATISTICS

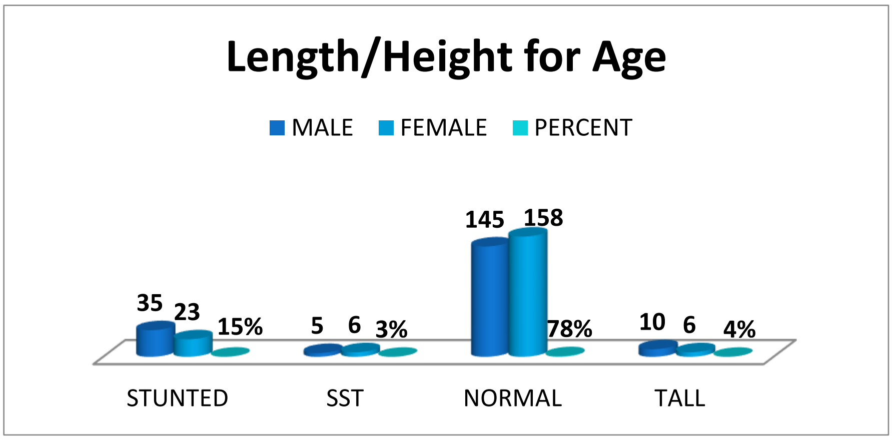
RURAL HEALTH UNIT V

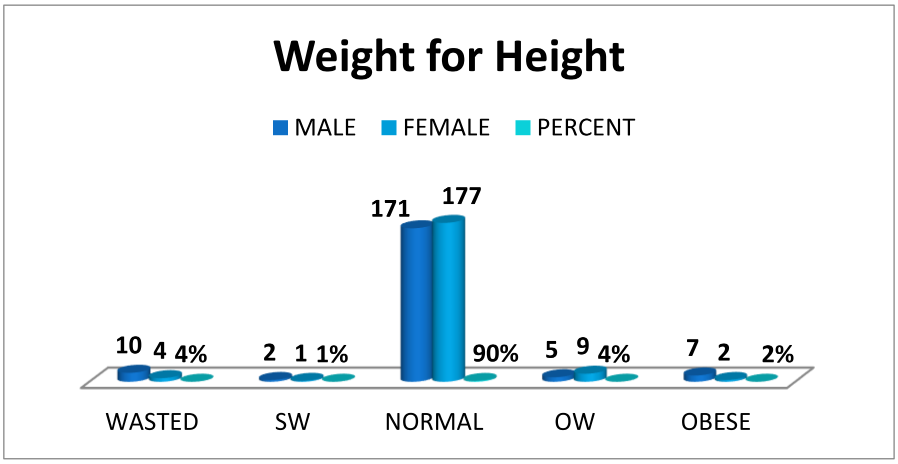
ILIJAN, BATANGAS CITY

CY 2017

NUTRITIONAL HEALTH STATUS







2.4.2.2.3.8 ENVIRONMENTAL HEALTH AND SANITATION PROFILE

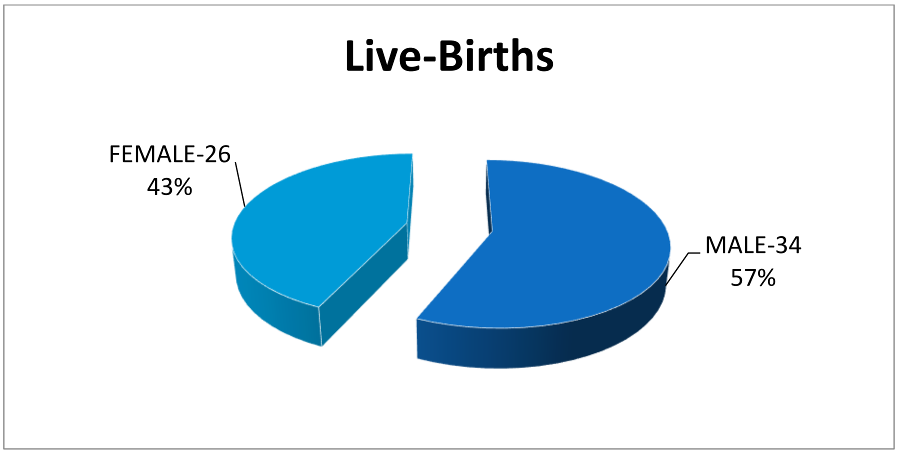
Household with access to improved or safe water supply	948
Level I	171
Level II	0
Level III	777

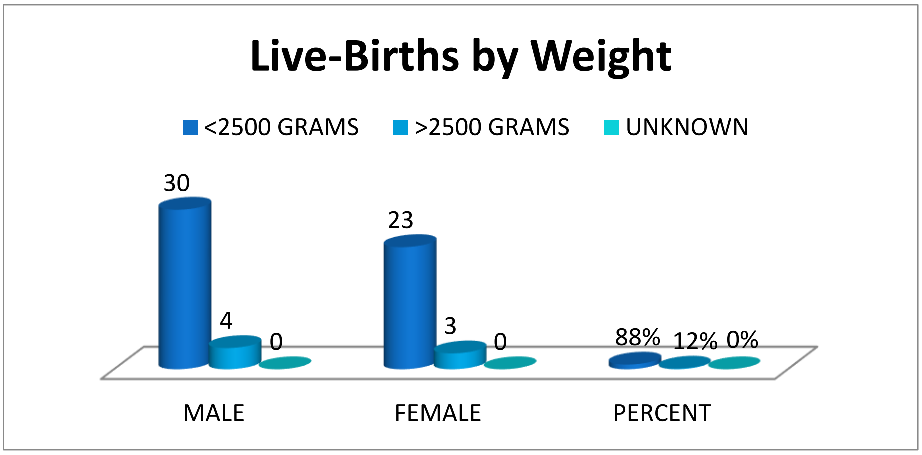
Household with sanitary toilet facilities	1081
Household with satisfactory disposal of solid waste	856
Household with complete basic sanitation facilities	856
Food Establishments	16
Food establishments with sanitary permit	9
Food handlers	22
Food handlers with health certificate	18

DENTAL HEALTH STATUS

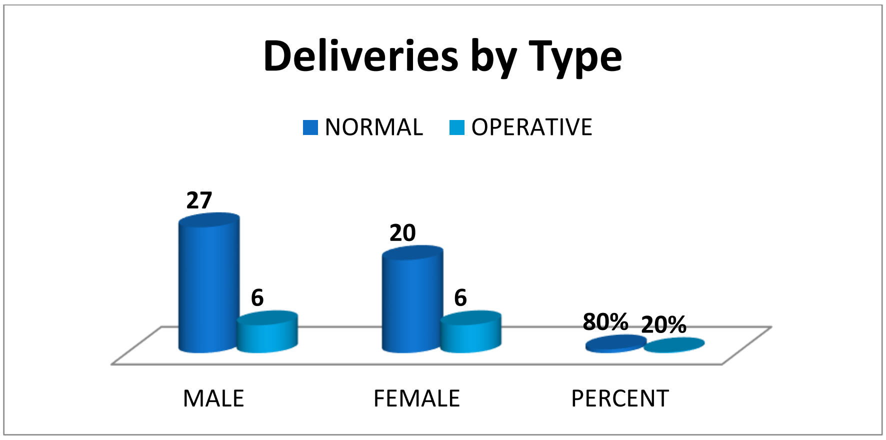
Orally fit child 12-71 mos. Old	6
Child 12-71mos. Provided with BOHC	37
Adolescent & Youth (10-24y/o) given BOHC	222
Pregnant women provided with BOHC	22
Older person 60y/o & above provided w/ BOHC	9

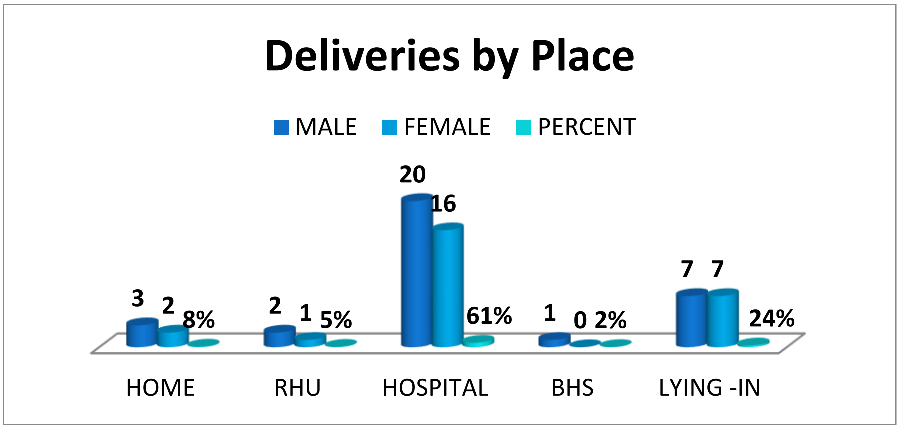
NATALITY I

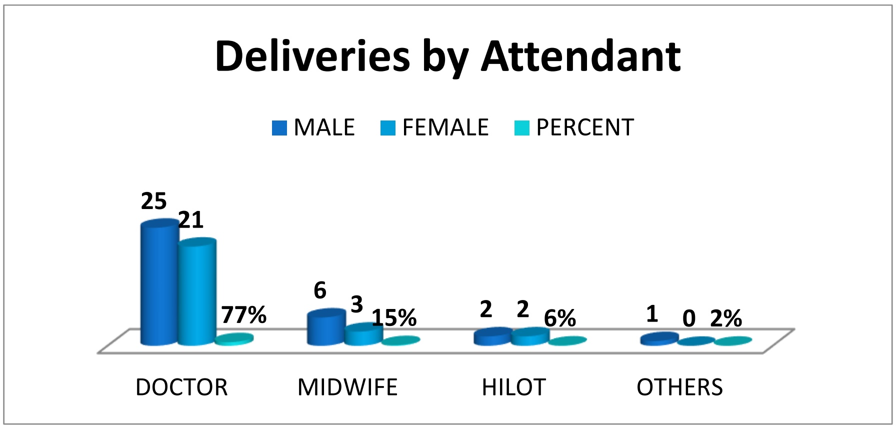


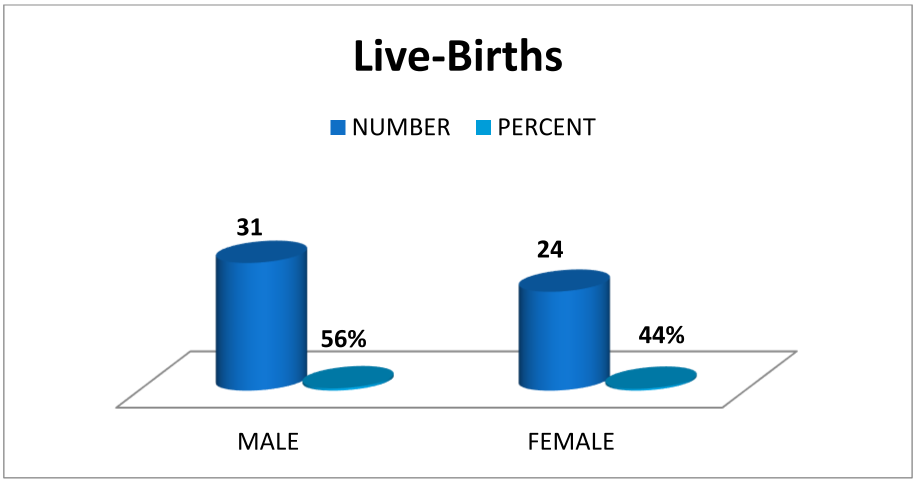

Live-Births by Weight
<2500 GRAMS
>2500 GRAMS
UNKNOWN
30
4
0
23
3
0
88%
12%
0%
MALE
FEMALE
PERCENT

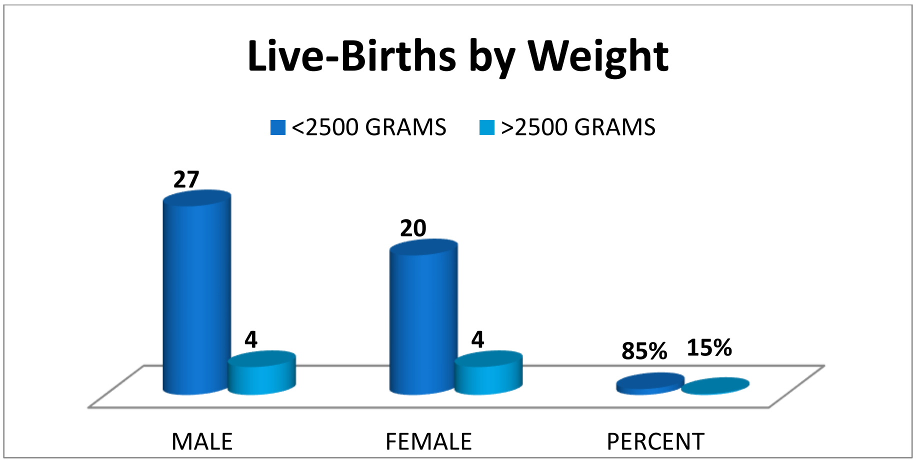
NATALITY II


Deliveries by Type
NORMAL
OPERATIVE
27
6
20
6
80%
20%
MALE
FEMALE
PERCENT

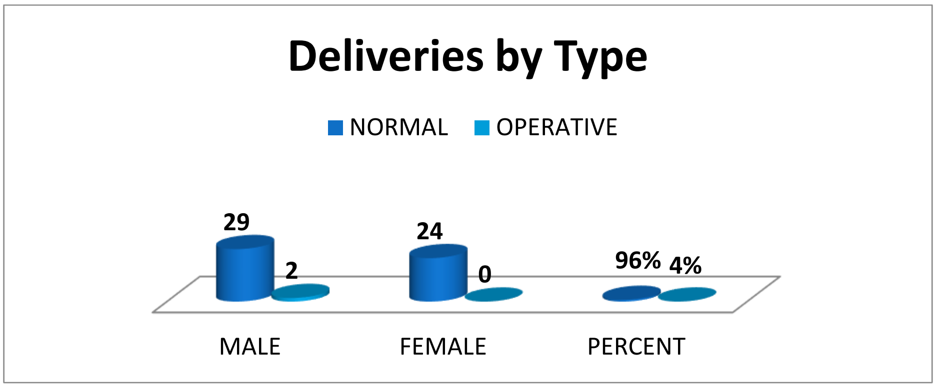

Deliveries by Place
MALE
FEMALE
PERCENT
3
2
8%
2
1
5%
20
16
61%
1
0
2%
7
7
24%
HOME
RHU
HOSPITAL
BHS
LYING -IN

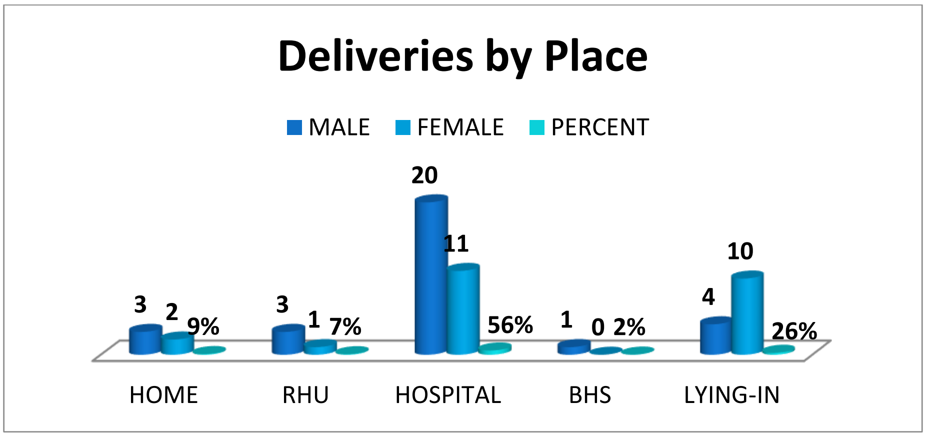

Deliveries by Attendant
MALE
FEMALE
PERCENT
25
21
77%
6
3
15%
2
2
6%
1
0
2%
DOCTOR
MIDWIFE
HILOT
OTHERS

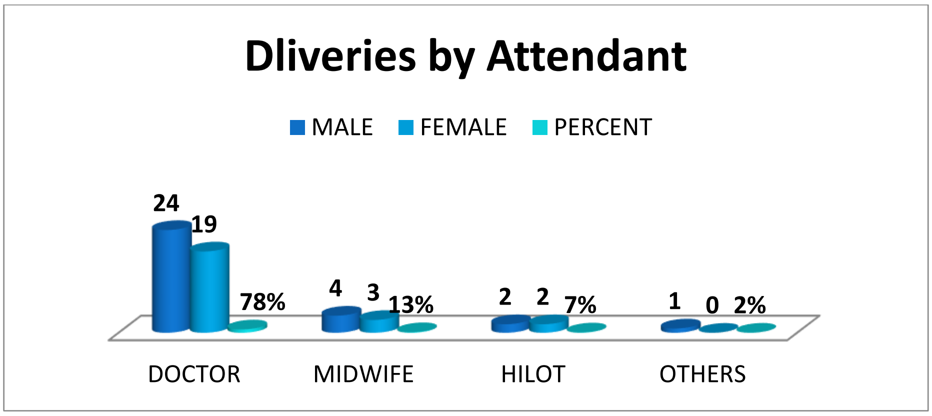

Live-Births
NUMBER
PERCENT
31
56%
24
44%
MALE
FEMALE


Live-Births by Weight
<2500 GRAMS
>2500 GRAMS
27
4
20
4
85%
15%
MALE
FEMALE
PERCENT

NATALITY II







2.4.2.2.4 SOCIO-ECONOMIC DATA

Income Class – First class

Gross Income (2014) – P1, 813,300,725.35

Large Scale Industries:

- Isla Gas Terminals, Inc., Libjo
- Pilipinas Shell Petroleum Corporation, Tabangao Ambulong
- San Miguel Mills Inc., Tabangao Aplaya
- First Philippine Industrial Corporation, Kumintang Ilaya
- Himmel Industries, Pinamican Proper/Ibaba
- J.G. Summit Petrochemical Complex, Simlong
- Asian Terminal Inc., Port of Batangas

- Sta. Rita NatGas Power Plant (1,063 MW), Sta. Rita Karsada/Aplaya
- San Lorenzo NatGas Power Plant (550MW), Sta. Rita Aplaya
- Atlantic, Gulf and Pacific Company of Manila, Inc., Calicanto
- Ilijan NatGas Power Plant (1200MW), Ilijan
- Malampaya On-Shore Gas Plant, Tabangao Ambulong
- PSPC Bitumen Storage, Tabangao Ambulong

2.4.2.2.4.1 MAIN SOURCES OF INCOME

Based on the final results of the CY 2009 Family Income and Expenditure Survey (FIES) by the National Statistics Office, the average income per household is P219,272.00 per annum or P18,273.00 per month while the average expenditure per household is P182,600.00 per annum or P15,217.00 per month based on the current prices.

2.4.2.2.4.2 EMPLOYMENT RATE/ PROFILE

As of April 2003, based on the National Statistics Office latest data, Batangas City has a total labor force participation of 104,520 which were comprised of 90,828 or 86.9% employed and 13,692 or 13.1% not employed.

2.4.2.2.5 TRAFFIC

2.4.2.2.5.1 ROAD NETWORK/ SYSTEMS

As of CY 2014, the total length of all roads in the city is approximately 469.69685 km. comprised of 77.521 km. of national roads, 21.952 km. of city roads and 370.22385 km. of barangay roads.

The inventory showed that the total length of asphalt paved roads is 94.5259 km., concrete paved roads are 308.31902 km. while gravel roads are 35.58038 km and the unpaved road totaled to 31.27155 km. The record indicated that there is an increase in the length of asphalt paved roads as compared to the year 2013 which is 69.26383 kilometers.

The existing means of transportation in Barangay Ilijan are: Jeepney, Tricycle, Bus, Motorcycle.

2.4.2.2.5.2 EXISTING TRANSPORTATION/TRAFFIC SITUATION

All routes from within & outside Batangas City are serviced by ALPS the BUs, Inc., Jam Trans., Supreme Trans. Liner Inc., DLTB Co.. Pong & Oning, N. Dela Rosa Liner, Batangas Star Express, RRCG. Ceres Trans., Inter Bats. Bus, SJ Park Ventures Inc., KL CNG Bus Transport, Gold Star Transit Corp.

PU Jeepneys & Tricycles are operational within the city & suburbs.

On the other hand, RORO ships, fast water crafts and other sea vessels connecting Batangas City, to Calapan City/Puerto Galera. Mindoro Or./Occ., Romblon, Caticlan(Boracay), Malay, Aklan and Iloilo.

2.4.2.2.5.3 MARINE VESSEL TRAFFIC

In 2019, the total of vessels for shipping purposes that use Batangas Port is about 47,427, 96% of which were domestic, about 25,788,883MT total cargo throughput 37% of which were domestic and 8,514,615 total passengers have embarked and disembarked in the port via domestic, foreign ships, and cruises.

Table 2-62. Summary of Shipping, Cargo, and Passengers at Batangas Port. Source: PMO Batangas 2019

PARTICULARS	AT BERTH				AT ANCHORAGE		TOTAL
	Base Port	Terminal Ports	Other Govt Ports	Private Ports	Base Port	Terminal Ports	
A. SHIPPING							
1. Number of vessels	34,336	3,804	2,303	6,048	743	193	47,427
Domestic	33,598	3,804	2,302	4,935	696	177	45,512
Foreign	738	0	1	1,113	47	16	1,915
2. Gross Tonnage	53,258,819	4,668,805	937,097	26,638,742	1,518,631	514,788	87,536,881
Domestic	30,300,298	4,668,805	934,603	6,519,687	770,897	248,737	43,443,026
Foreign	22,958,521	0	2,494	20,119,055	747,734	266,051	44,093,855
3. Net Tonnage	24,799,793	2,996,392	388,165	13,110,225	787,004	260,388	42,341,967
Domestic	15,269,857	2,996,392	386,789	3,823,539	395,568	128,229	23,000,374
Foreign	9,529,936	0	1,376	9,286,686	391,436	132,159	19,341,593
4. Deadweight Tonnage	58,511,931	4,913,072	1,355,251	38,654,072	2,482,269	799,515	106,716,108
Domestic	39,534,159	4,913,072	1,351,148	10,294,530	1,211,763	369,008	57,673,679
Foreign	18,977,772	0	4,103	28,359,542	1,270,506	430,507	49,042,429
5. Length of Vessel (m.)	1,797,137	232,740	94,085	479,247	46,205	14,530	2,663,943
Domestic	1,657,591	232,740	93,995	308,282	39,634	12,417	2,344,660
Foreign	139,545	0	90	170,964	6,572	2,112	319,283
6. Beam of Vessel (m.)	415,418	42,517	15,772	93,234	9,441	2,843	579,225
Domestic	393,498	42,517	15,758	66,231	8,183	2,518	528,706
Foreign	21,920	0	14	27,003	1,258	325	50,520
7. Draft of Vessel (m.)	87,329	13,347	6,347	21,235	2,073	610	130,941
Domestic	81,164	13,347	6,341	13,002	1,742	515	116,112
Foreign	6,164	0	6	8,233	331	94	14,829
8. Down/Idle Time (hrs.)	0	0	173	0	0	0	173
Domestic	0	0	173	0	0	0	173
Foreign	0	0	0	0	0	0	0
9. Waiting Time (hrs.)	14,531	11,071	332	146,853	0	0	172,788
Domestic	5,370	11,071	332	124,133	0	0	140,906
Foreign	9,162	0	0	22,720	0	0	31,882
10. Service Time (hrs.)	187,805	70,969	35,020	429,655	262,149	52,488	1,038,086
Domestic	176,744	70,969	34,859	365,801	258,267	45,038	951,678
Foreign	11,062	0	161	63,853	3,882	7,451	86,409
11. Net Service Time (hrs.)	187,805	70,969	34,846	429,655	262,149	52,488	1,037,913
Domestic	176,744	70,969	34,685	365,801	258,267	45,038	951,504
Foreign	11,062	0	161	63,853	3,882	7,451	86,409
12. Total Dwell Time in Port (hrs.)	202,337	82,040	35,352	576,508	262,149	52,488	1,210,874
Domestic	182,113	82,040	35,191	489,934	258,267	45,038	1,092,584
Foreign	20,223	0	161	86,573	3,882	7,451	118,291

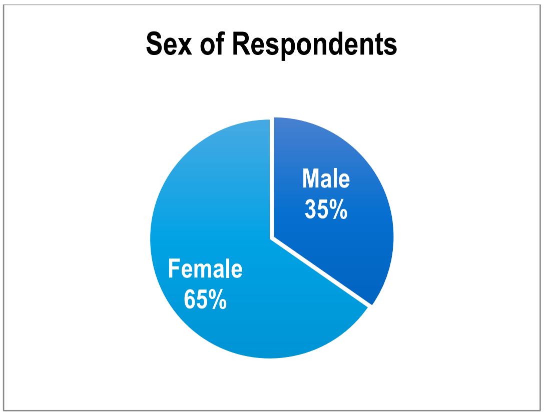
PARTICULARS		A T B E R T H				AT ANCHORAGE		TOTAL
		Base Port	Terminal Ports	Other Govt Ports	Private Ports	Base Port	Terminal Ports	
B . CARGO AND PASSENGER								
1. Total Cargo Throughput (m.t.)		2,495,559	605,956	65,742	21,899,647	317,983	403,996	25,788,883
a. Domestic		785,311	605,956	61,942	7,726,615	148,519	177,850	9,506,193
Inbound		158,062	515,730	49,242	4,378,631	32,621	27,677	5,161,962
Breakbulk		12,270	306,222	27,992	91,377	179	210	438,251
Liquid Bulk		3,149	206,983	8,345	875,243	32,442	2,560	1,128,722
Dry Bulk		29,697	2,525	12,904	3,370,799	0	24,906	3,440,832
Containerized		112,946	0	0	41,211	0	0	154,157
Transit Cargo		0	0	0	0	0	0	0
Transhipment		0	0	0	0	0	0	0
Outbound		627,249	90,226	12,701	3,347,985	115,898	150,173	4,344,231
Breakbulk		335,981	84,948	8,605	165,960	3,551	18,540	617,585
Liquid Bulk		4,381	5,278	0	2,582,052	90,344	0	2,682,054
Dry Bulk		0	0	4,095	437,289	22,003	131,633	595,021
Containerized Cargo		286,887	0	0	162,684	0	0	449,571
Transit Cargo		0	0	0	0	0	0	0
Transhipment		0	0	0	0	0	0	0
b. Foreign		1,710,248	0	3,800	14,173,032	169,464	226,146	16,282,690
Import		1,418,050	0	3,800	13,201,226	166,464	226,146	15,015,686
Breakbulk		317,696	0	3,800	836,296	1,900	19,506	1,179,198
Liquid Bulk		0	0	0	8,359,067	100,454	0	8,459,521
Dry Bulk		0	0	0	4,005,863	64,110	206,640	4,276,613
Containerized Cargo		1,100,354	0	0	0	0	0	1,100,354
Transit Cargo		0	0	0	0	0	0	0
Transhipment		0	0	0	0	0	0	0
Export		292,198	0	0	971,806	3,000	0	1,267,004
Breakbulk		306	0	0	10,058	0	0	10,363
Liquid Bulk		0	0	0	952,671	3,000	0	955,671
Dry Bulk		0	0	0	9,077	0	0	9,077
Containerized Cargo		291,893	0	0	0	0	0	291,893
Transit Cargo		0	0	0	0	0	0	0
Transhipment		0	0	0	0	0	0	0
2. Total Passengers		7,302,247	854,537	356,119	0	0	1,712	8,514,615
Domestic	**Disembarked**	3,890,497	394,992	156,860	0	0	856	4,443,205
a. Domestic		3,890,497	394,992	156,860	0	0	0	4,442,349
b. Foreign		0	0	0	0	0	0	0
c. Cruise Ships		0	0	0	0	0	856	856
Foreign	**Embarked**	3,411,750	459,545	199,259	0	0	856	4,071,410

PARTICULARS	A T B E R T H				AT ANCHORAGE		TOTAL
	Base Port	Terminal Ports	Other Govt Ports	Private Ports	Base Port	Terminal Ports	
a. Domestic	3,411,750	459,545	199,259	0	0	0	4,070,554
b. Foreign	0	0	0	0	0	0	0
c. Cruise Ships	0	0	0	0	0	856	856

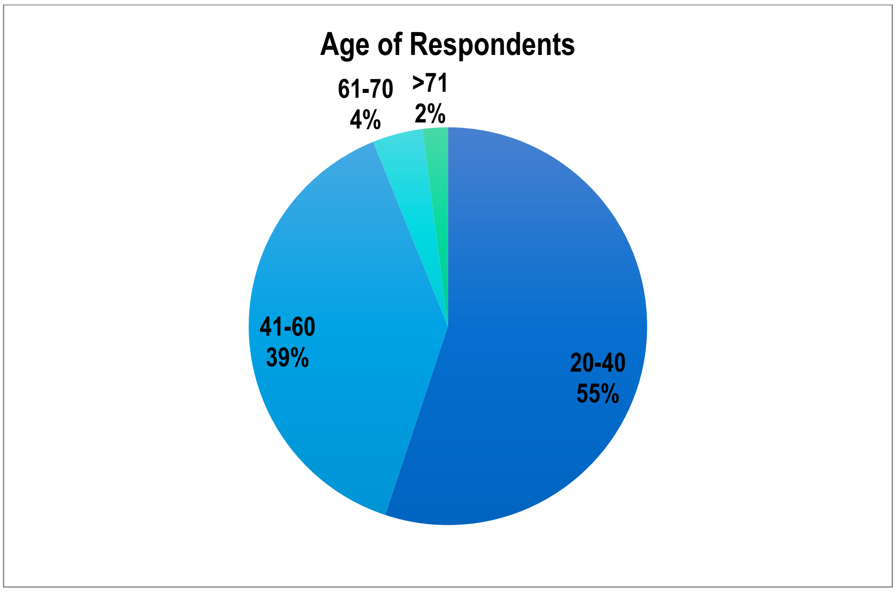
2.4.2.3 PERCEPTION SURVEY

2.4.2.3.1 DEMOGRAPHIC PROFILE OF RESPONDENTS

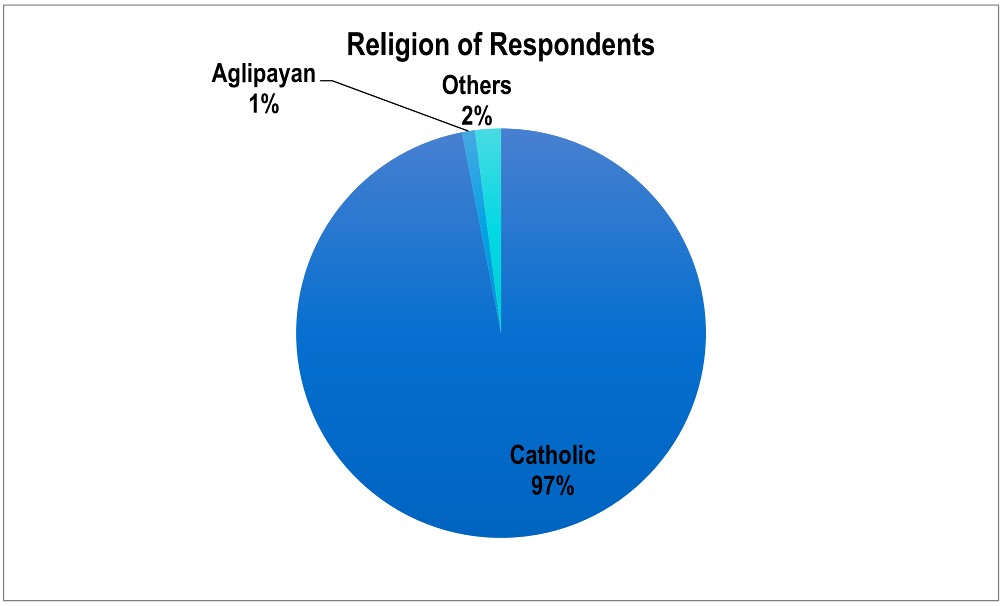
Sex: Respondents are composed of 65% female and 35% male.



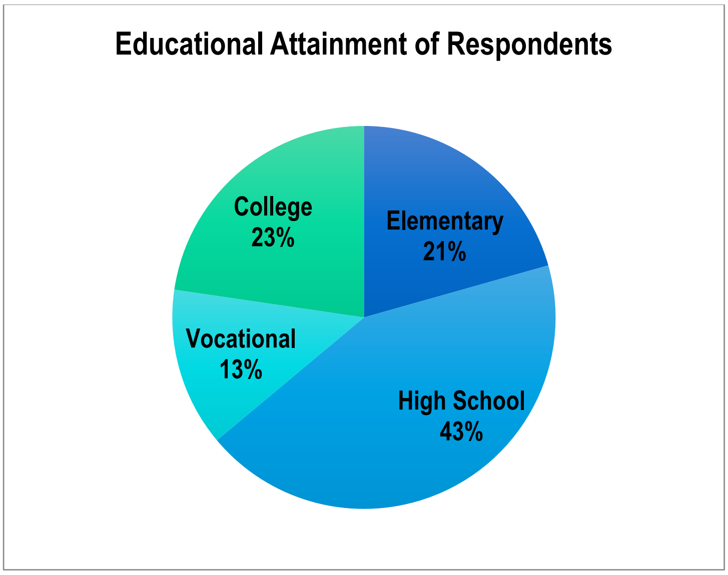
Age: 55% of the respondents are 20-40 years old.



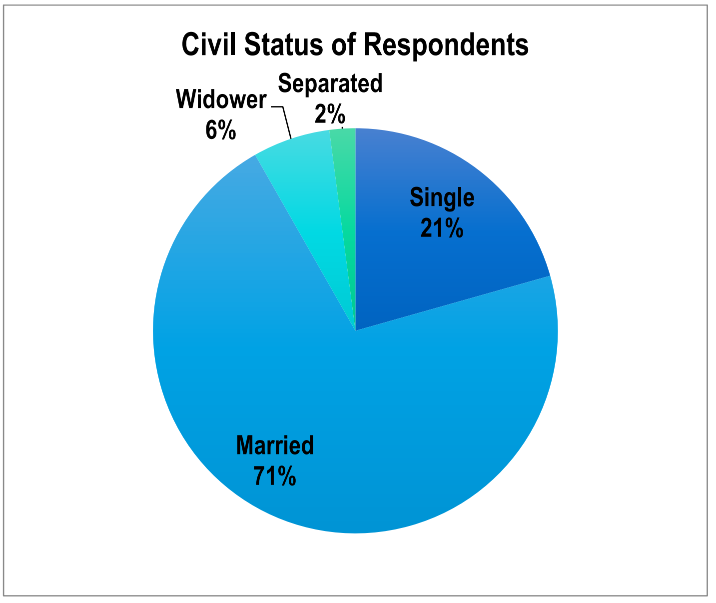
Religious affiliation: 97% of the respondents are Roman Catholic. The rest indicated Aglipayan and Others as their religious affiliation.



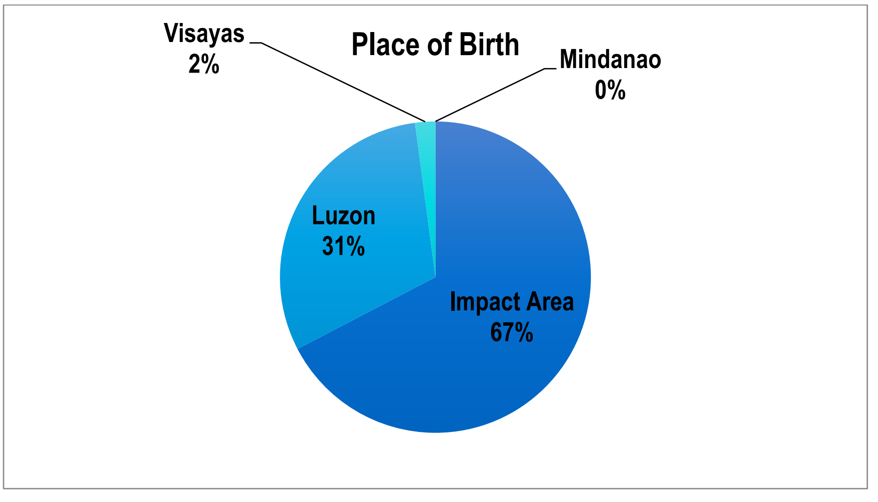
Educational Attainment: 43% of the respondents have finished highschool while 21% finished elementary.

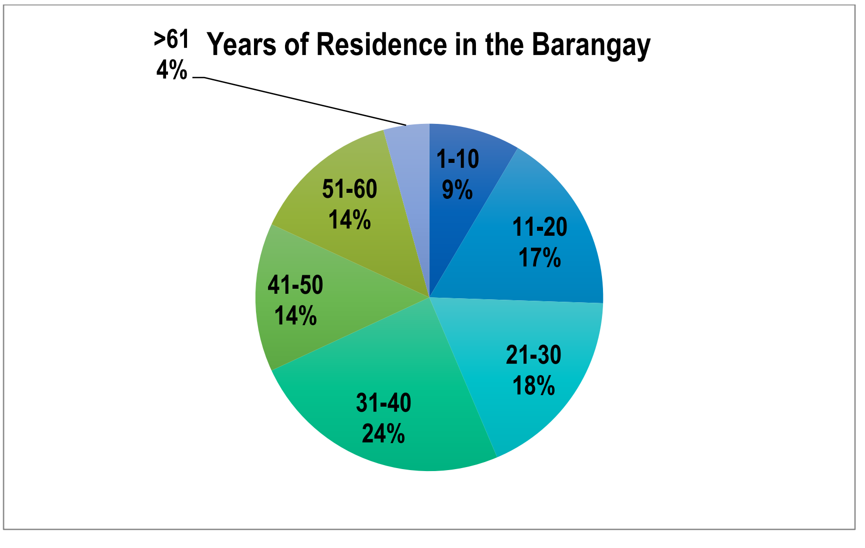


Civil Status: 71% of the respondents are married.

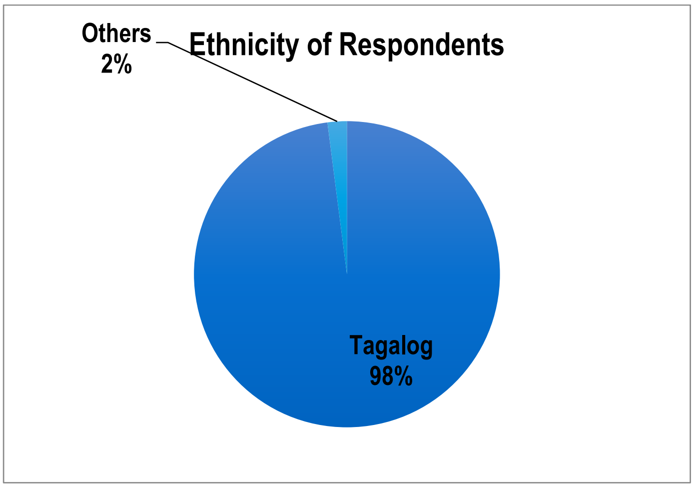


Place of birth: About 67% of the participants were born in Barangay Ilijan, the impact barangay, the rest came from other provinces in Luzon (31%) and Visayas (2%). 24% of the respondents has been living in the barangay for 31-40 years now.



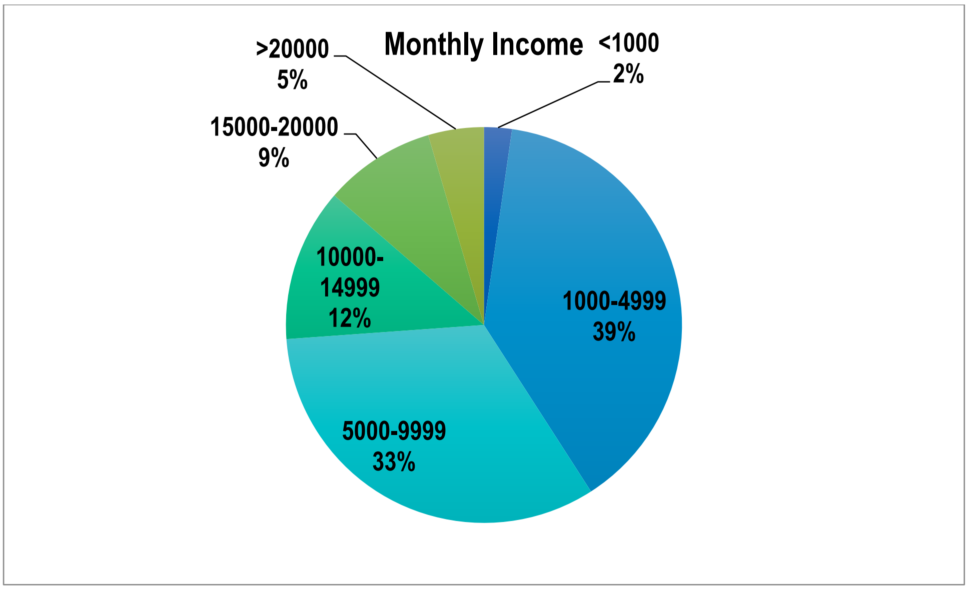


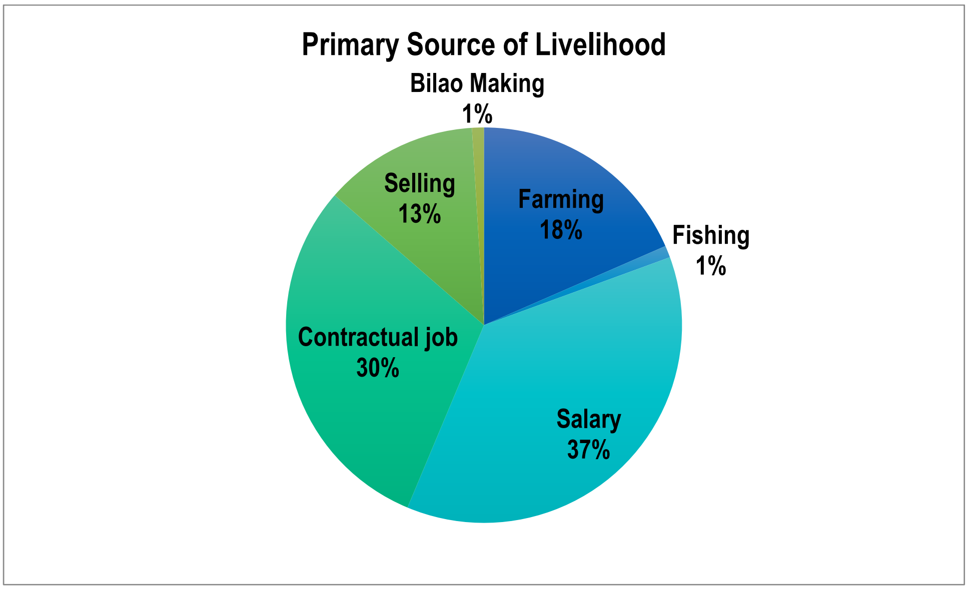
Ethnicity: 98% percent of the respondents are tagalog. There are no indigenous people / groups in the barangay.



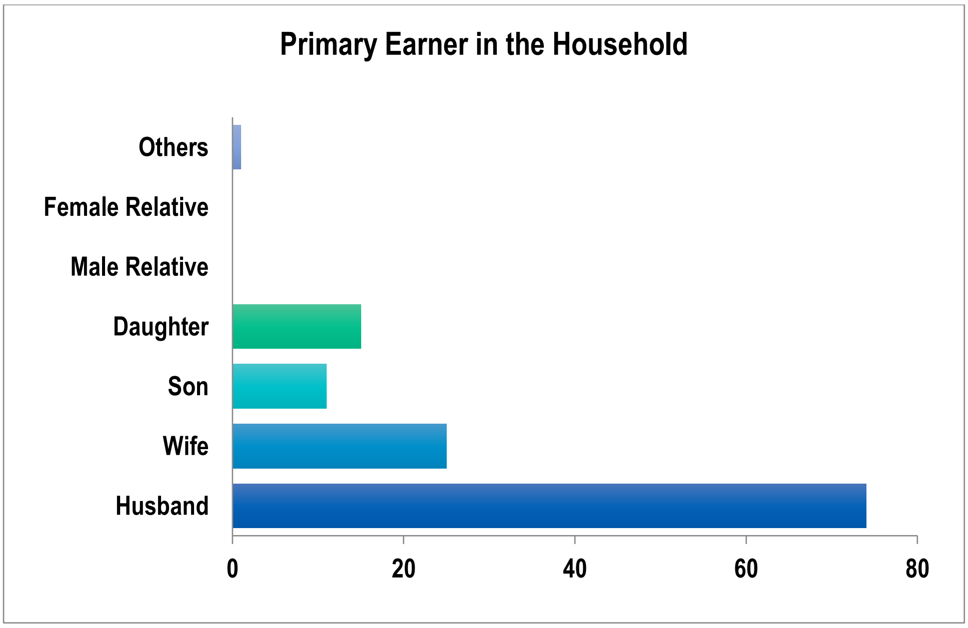
2.4.2.3.2 SOCIO-ECONOMIC PROFILE OF THE RESPONDENTS

Monthly Income: 39% of the respondents has monthly income of 1,000 to 4,999. Most of the respondents has salary (37%) as the main source of income, followed by contractual job (30%), farming (18%), selling (13%) and bilao making (1%).

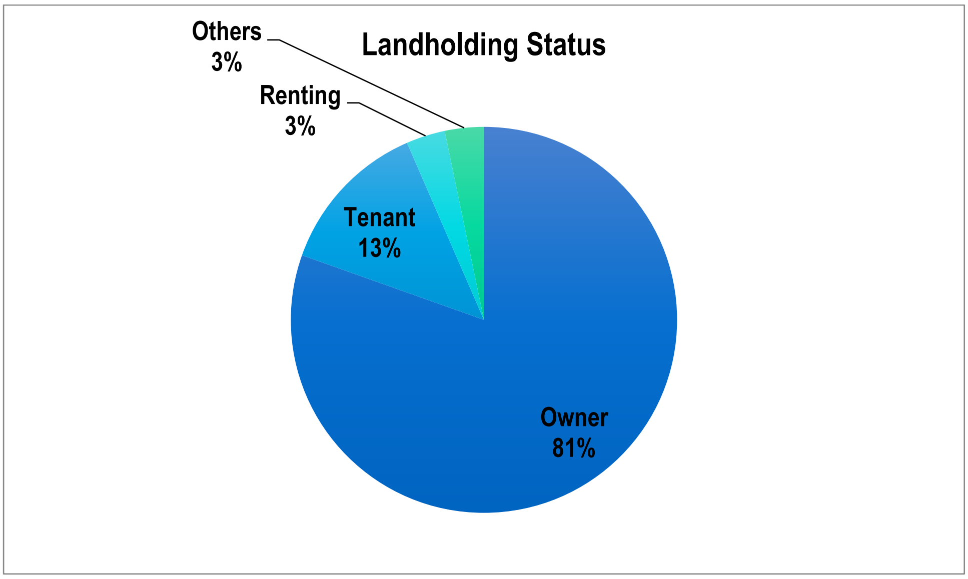




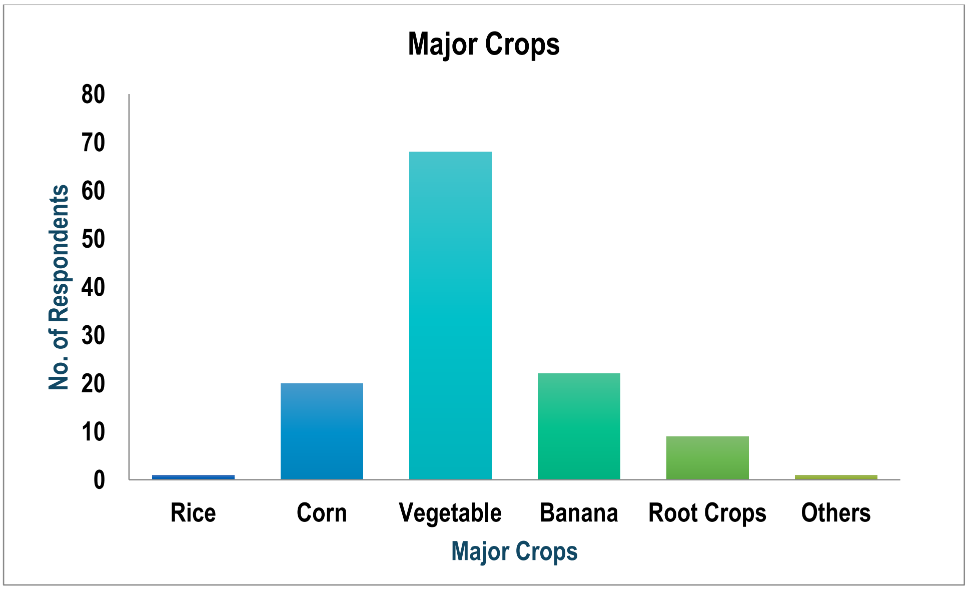
Primary Earner in the Household: Most households depend on the husband for the livelihood/source of income, followed by the wife, daughter and son.



Landholding Status: 81% of the respondents own their lot/house where they currently live in. followed by 13% tenants, 3% renting, and other (3%).

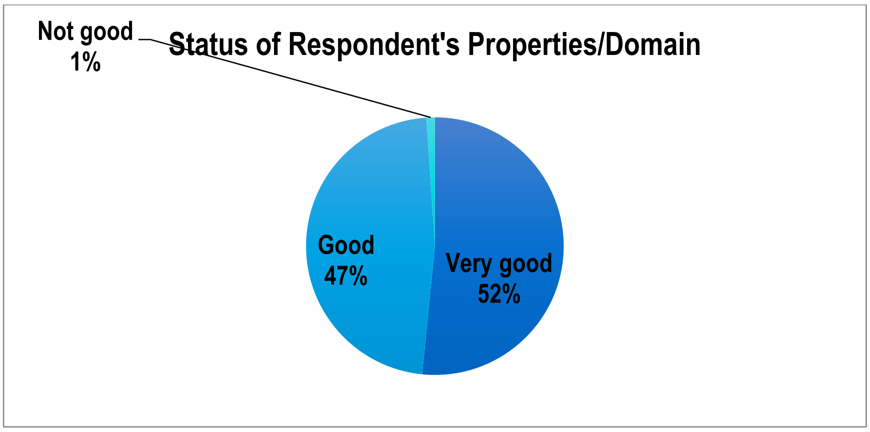


Major Crops: Most of the crops of the respondents are vegetable planted on their backyards.

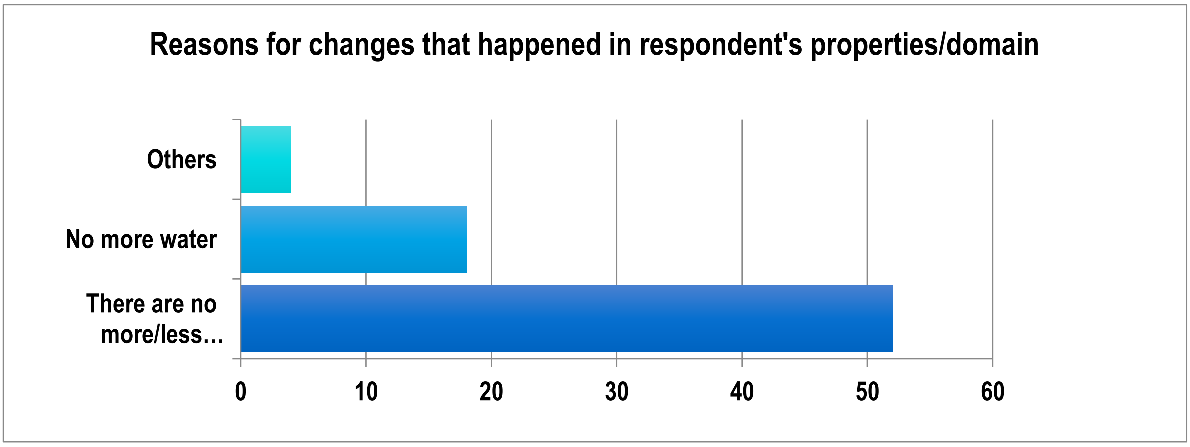


2.4.2.3.3 ENVIRONMENTAL HEALTH AND SANITATION PROFILE OF THE RESPONDENTS

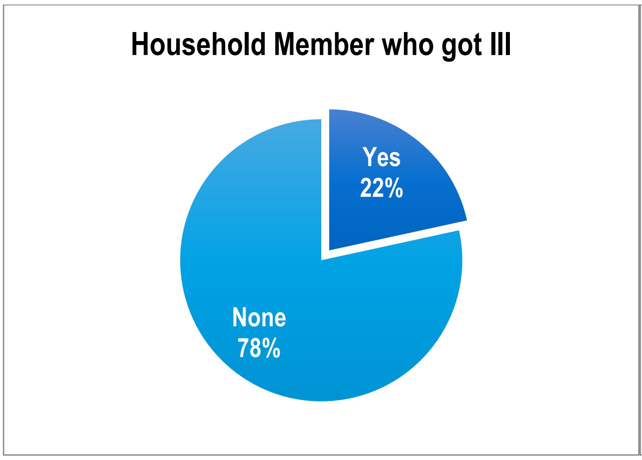
Status of Domain: Status 52% of the respondents stated that their properties/domain are very good. 47% stated that their area is good, and 1% is not good.

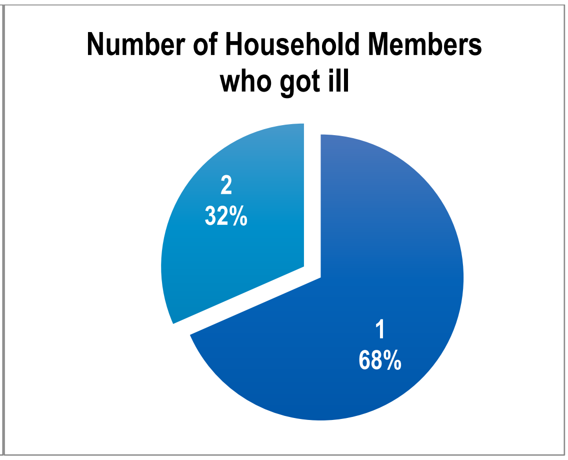


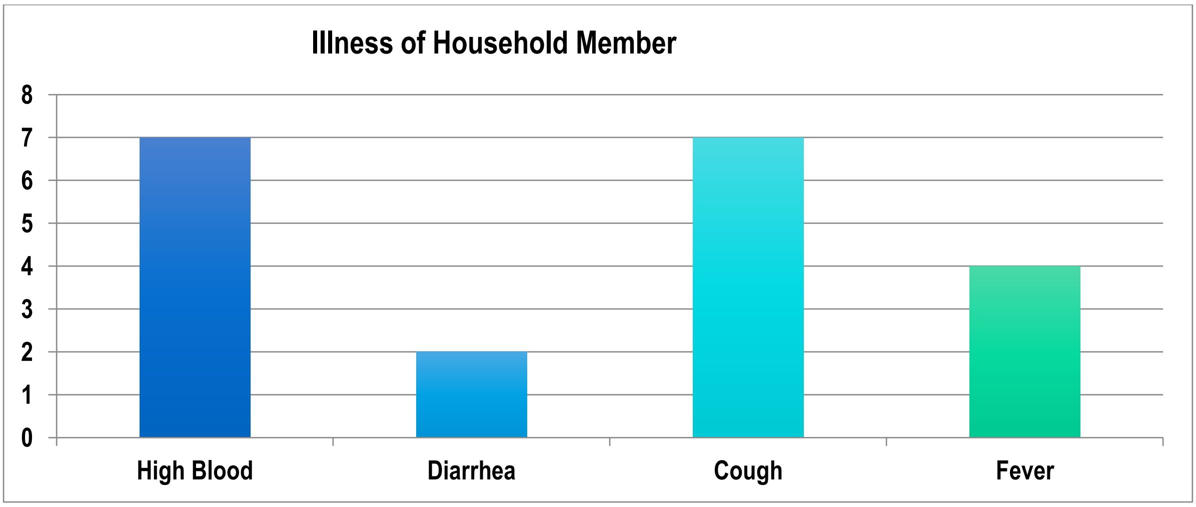
More than 50 respondents stated that causes of change in their properties / domain are there were fewer trees seen as compared before. Eighteen (18) respondents also noted that water supply in their domain is also affected over the years.

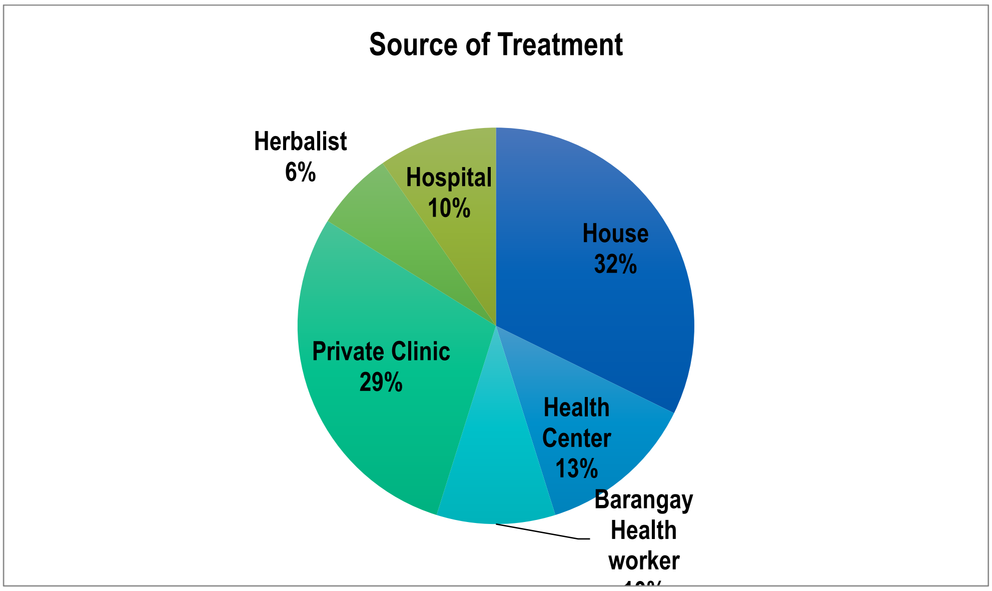


Diseases: About 78% of the respondents has household member who got ill. Among them, 68% has only 1 member who got ill. Highblood and cough are the most usual illness encountered by the respondents which are treated mostly at their own home.

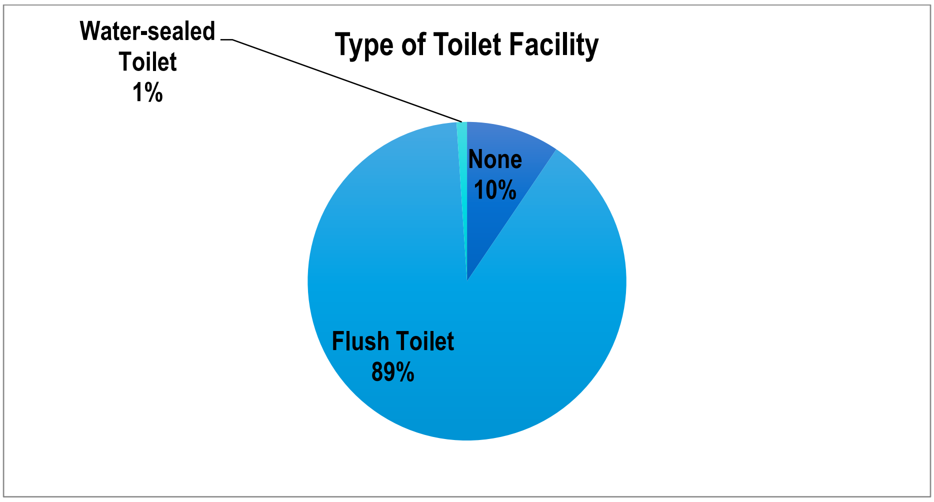




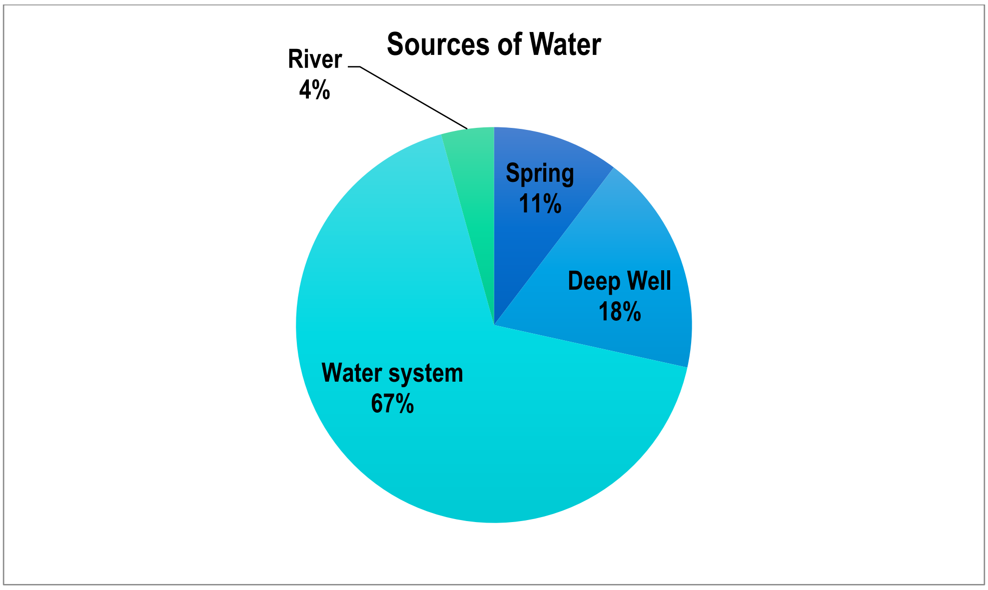




Toilet facility: About 89% of the respondents have flush toilet in their home.

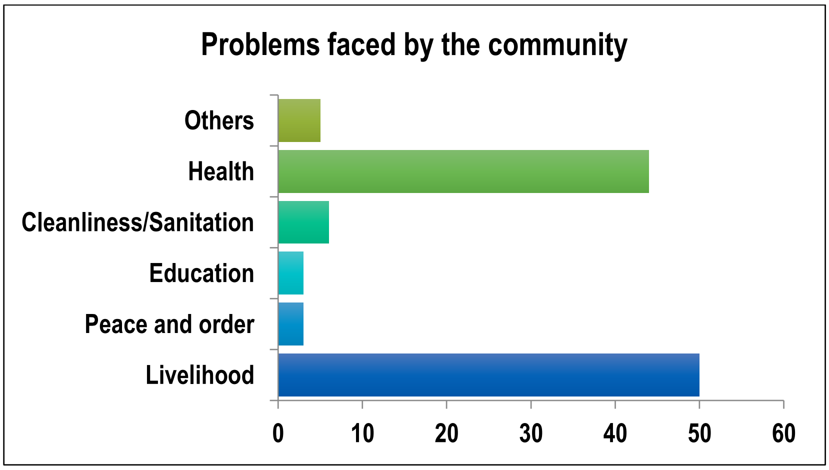


Water supply: 67% of the respondents have an installed water system in their household.

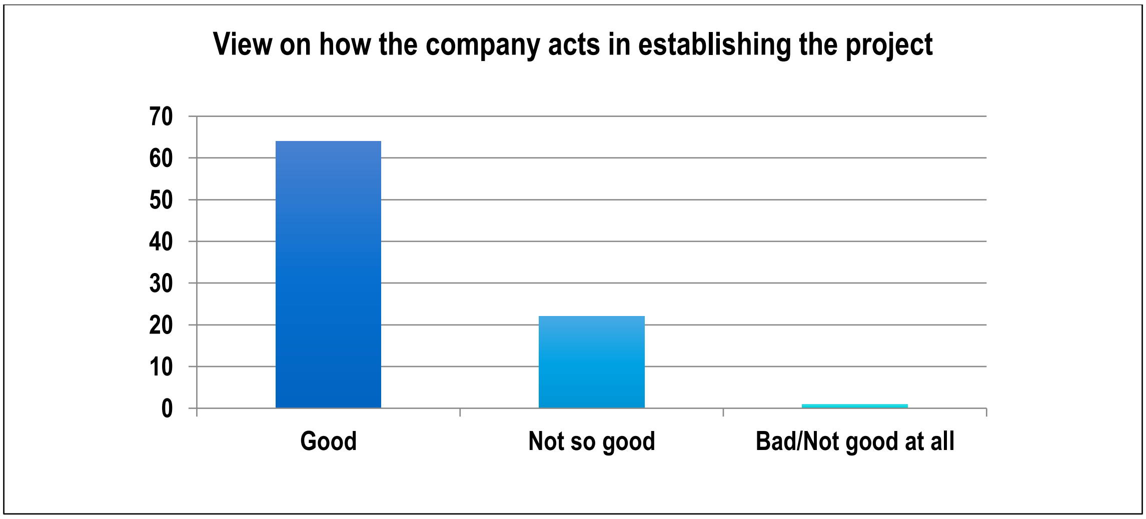


2.4.2.3.4 PERCEPTION ON THE PROJECT

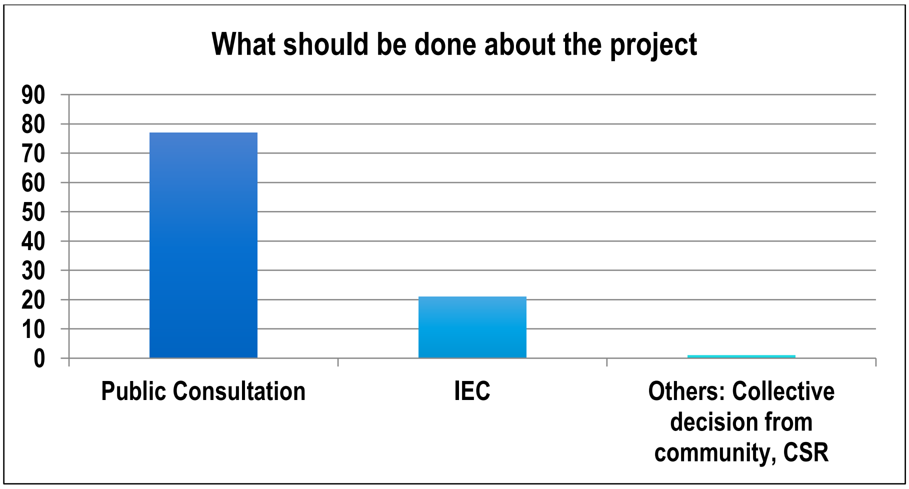
Problems faced by the community: Most of the respondents stated that livelihood is the number one problem they are facing in the barangay.



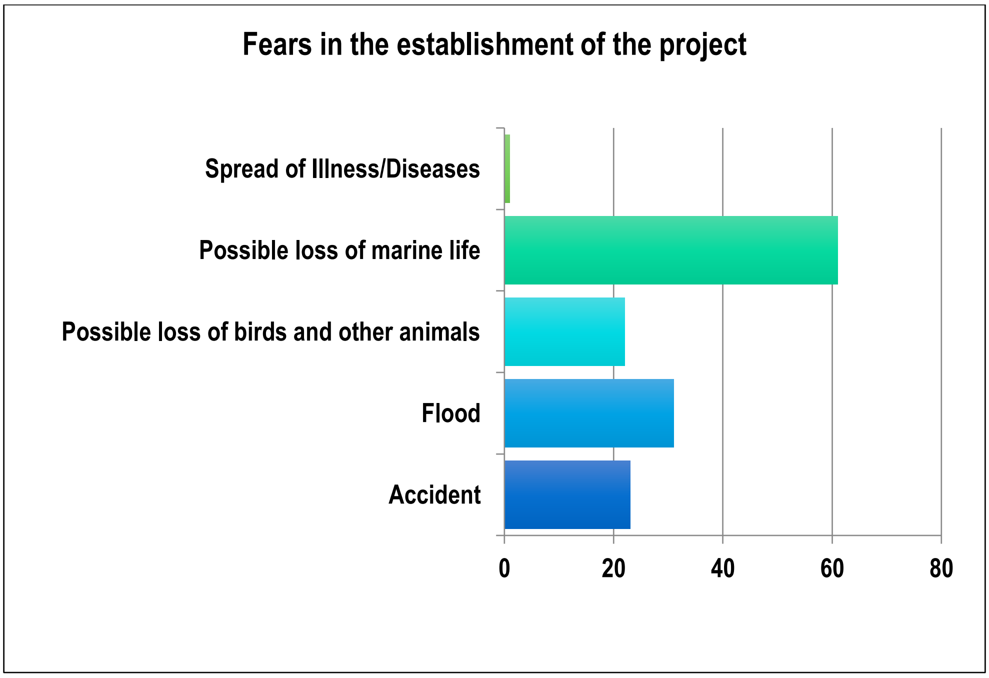
View on how the company acts in establishing the project: The respondents perceived that the company is “good” in establishing the project.



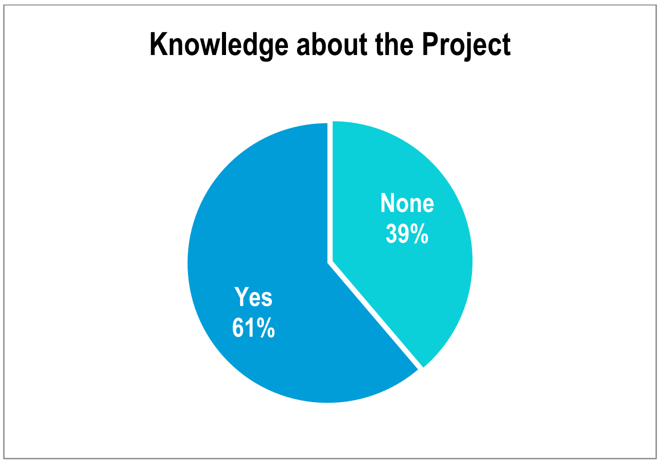
Suggestions about the project: The respondents suggested Public Consultation, IECs, collective decision from the community, and CSR activities be implemented for the project.

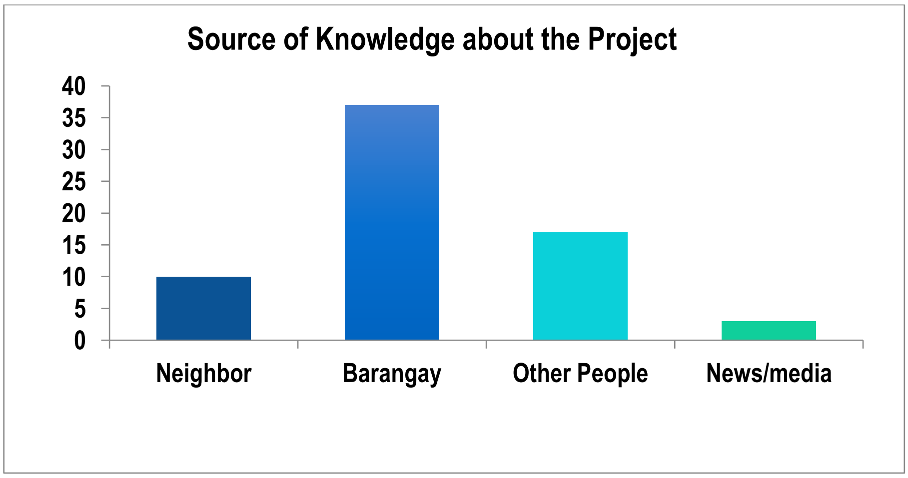


Fears in the establishment of the project: The respondents noted that the project might bring possible loss of marine life, flood, accident, loss wildlife, and spread of diseases.

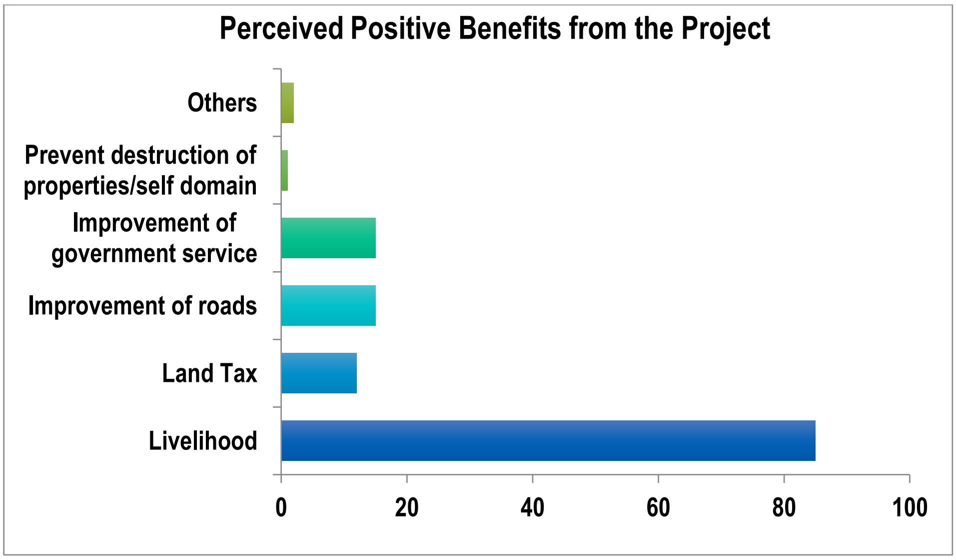


Knowledge about the project: 61% of the respondents have knowledge about the project before the perception survey. Their main source of information is the barangay.

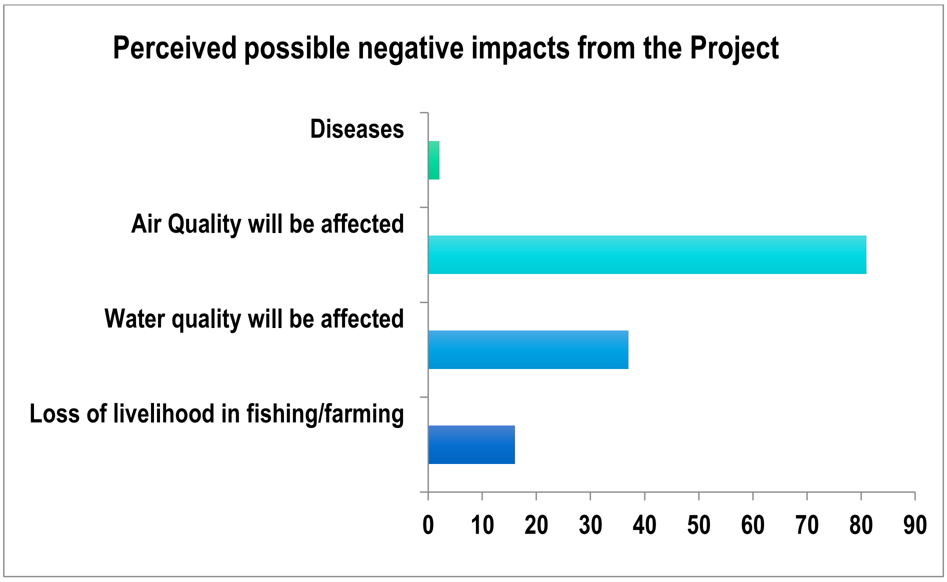




Perceived Positive Benefits from the Project: Livelihood opportunities is the most perceived benefits from the project according to the respondents.



Perceived Negative Benefits from the Project: Impact to air quality is the most perceived benefit from the project according to the respondents.



2.4.3 IMPACTS AND MITIGATION AND/OR ENHANCEMENT MEASURES – PEOPLE

2.4.3.1 IN-MIGRATION

The proposed project will provide jobs during the construction up to the operation stage and will open employment opportunities to the unemployed sector of Batangas City comprising 13.1% of the labor force.

This will also limit in-migration in the area since the labor force is available from the host city.

2.4.3.2 CULTURE/LIFESTYLE CHANGE

Based on the review of secondary data, there is no identified indigenous cultural communities and site of cultural or historical significance within the project impact area. Likewise, there are no recreation and public areas (i.e. parks and sports facilities) near or within the proposed location that may be affected or removed by project activities.

In terms of lifestyle, Batangas City has been known for the considerable change from 1946 to 1981 as a major agriculture center to a rapidly developing major urban center, and from 1981 up to the present as a major urban commercial center and industrial center.

2.4.3.3 IMPACTS ON PHYSICAL CULTURAL RESOURCES

Potential Destruction, mishandling of Archaeological chance finds/ Workers lack of understanding and care to protect the environment and archaeological/ historical sites and cultural monuments.

1. Include the following specific requirement in bid and contract documents:

   a. Withholding of payment or penalty clauses, to ensure contractor's implementation of environmental and archaeological mitigation measures;
   b. Employment of a designated Environmental Specialist and a designated Archaeologist to oversee environmental and archaeological issues and mitigation; and
   c. Provision of environmental and archaeological orientation/workshop.

2. Environment Protection, Health and Safety Orientation Plan

   a. The purpose of this sub-plan is to document the approach of the general contractor (GC), Subcontractors (SCs), and their workers in the implementation of a training program for construction workers in relation to environmental, archaeological, and occupational health and Safety issues.
   b. Orientation rationale. The implementation of the EMP will require the involvement of all construction personnel. The nature of the EMP is such that personnel at all levels have a degree of responsibility in relation to environmental, archaeological, and occupational health and safety issues and the implementation of measures contained in the EMP. As such, orientation for all personnel in relation to environmental and archaeological issues and the implementation of the EMP will be critical to ensuring the effectiveness of the EMP
   c. Orientation objective. The objective is to raise and enhance the awareness of the construction workforce in relation relevant legislation and policy issues: a. General environmental awareness, including rules and regulations to be followed on archaeological, historical, cultural sites, construction site and in the construction camps

Physical Cultural Resources Plan

i. The purpose of this sub-plan is to document the approach of the proponent and contractors and their workers to protect identified archaeological, historical, and cultural sites and monuments and to manage any physical cultural resources that are encountered during the construction works.
ii. The plan should comply with procedures set by the NHCP.
iii. For archaeological chance, find the procedures set by NHCP shall be followed.

In the event of archaeological chance finds:

i. Inform at once the respective institutions governing such matters, specifically the National Historical Commission of the Philippines (NHCP).
ii. Obtain necessary approvals for construction in areas where archaeological finds have been identified, and follow the archaeological chance-find procedures of the NHCP.
iv. Fix borders of archaeological sites to be excavated for preservation and/or investigated.
v. Incorporate archaeological excavations in construction schedule.
vi. To avoid potential adverse impacts to historic and cultural resources, the Contractor shall:
   (a) Protect sites of known archaeological, historic and cultural resources by the placement of suitable fencing and barriers.
   (b) Construction camps shall be located 500 meters away from cultural resources.
   (c) Adhere to accepted NHCP practice and all applicable historic and cultural preservation requirements of the NHCP.
   (d) In the event of unanticipated discoveries of cultural or historic artifacts (movable or immovable) in the course of the work, the Contractor shall take all necessary measures to protect the findings and shall notify the Engineer and the NHCP. If continuation of the work would endanger the finding, work shall be suspended until a solution for preservation of the artifacts is agreed upon

2.4.3.4 THREAT TO DELIVERY OF BASIC SERVICES /RESOURCE COMPETITION

The project will utilize freshwater from the desalination unit as a secondary source for all the utility station such as Jetty, BOG Compressor Area, fire water pond/tanks, etc. while the required potable water for the terminal office buildings will be 5 cbm/hr maximum mainly from the Batangas Water District.

The proponent will impose water conservation measures to its workers and employees through IEC.

2.4.3.5 THREAT TO PUBLIC HEALTH AND SAFETY

As discussed in **Section 2.3.2.1,** the predicted ambient air concentrations were all within the ambient guideline values set for CO and NO2 during its operation.

Use of PPE during construction and operation should be strictly adhered to. Moreover, strict compliance to safety systems, HSE policies, among others, shall be implemented.

2.4.3.6 GENERATION OF LOCAL BENEFITS FROM THE PROJECT

The benefits of the project will include items from the existing SDP containing the recommended programs and projects that the different sectors themselves identified.

The Social Development Plan prepared for this project considered the articulated wishes of the community and Local Government of Batangas, their concerns and issues concerning the environment, health and vulnerable groups and the measures to address them as recommended in the EIS. Focus will be on the mitigating measures to abate the possible negative impacts of the project and enhance the positive impacts. At its best scenario, the plan should interface with the existing social development programs initiated by the community of Ilijan and that of the City of Batangas.

2.4.3.7 TRAFFIC CONGESTION

2.4.3.7.1 LAND TRAFFIC

It is inevitable that there will be an increase in vehicular traffic. Such situation will pose risks to the residents living along the periphery of the road and school children crossing the streets.

However, this increase is to be expected to be minimal during construction and operation phase to cause traffic congestion. The proponent will strictly comply with traffic rules and implement speed limits to ensure the safety of the potentially affected communities.

2.4.3.7.2 SEA TRAFFIC

Batangas Port is the second biggest port next to Manila port. Cargo shipments and passenger's vessels dock at the port, making it one of the busiest ports in the country. Aside from Batangas Port, there are also other small ports in Batangas which cater to smaller vessels and private (JG Summit, Chevron, ChemOil, Shell, etc.) and government ports (Bauan, San Juan and Balayan District) which provide maritime services to their respective industries. The number of registered fishing vessels that dock within the port is 0.39% of the total number of vessels. It still excludes the number small fishing vessels that dock near the ports or near the shore.

Both phases of the project will utilize vessels to deliver materials into the project site that could impact the Verde Island Passage. During construction, the project will utilize marine vessels such as barges and shuttle vessels to transport the prefabricated key components from the manufacturing area to the project site which is estimated to be 20-25 kilometers in between. During operations, vessels will transport the LNG to the import terminal. The proponent will comply with the Philippine Coast Guard (PCG)'s traffic separation scheme (TSS) established for the Verde Island Passage under Memorandum Circular 04-03 (Routing System at Verde Island Passage).

Relative to the proposed project, there will be no direct adverse effect on the current traffic scheme along the area, given that the data from PPA will be utilized for scheduling of LNG delivery to Ilijan. But the unidentified number of small-scale fishing vessels in the area might be affected due to the arrival of LNG barge.

The following are the recommendations:

1. Implement a monitoring system regarding the shipping schedules of the LNG barge, to avoid congestion in the Western Nautical highway
2. Coordinate with other existing ports to formulate a comprehensive plan in regards to marine traffic to avoid naval traffic issues
3. Organize IEC programs regarding the shipping schedules in the area for the small scale fisherfolk (restrictions during the shipping, etc)
4. Provide alternative livelihood programs to the affected fisherfolk with coordination with LGUs and POs

CHAPTER 3 ENVIRONMENTAL MANAGEMENT PLAN

This section provides the Project's Impact Management Plan (IMP), which serves as the action plan for implementing the mitigating and enhancement principles, practices and measures aimed at minimizing and/or eliminating the potential impacts of the proposed Project to the surrounding environment.

The identified environmental impacts and corresponding proposed preventive, mitigation and/or enhancement measures for each environmental component during the Project's pre-construction, construction, operation and abandonment phases are detailed in **Table 3-1**.

Table 3-1. Impact Management Plan

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
I. Pre-construction Phase						
Completion of requisite MOAs, endorsements, and clearances/ permits	Socio-economic	Social Acceptance and Support for the project	▫ IEC on Project to inform, respective institutions, agencies, offices, bodies and organizations for providing their respective endorsements and/or clearances ▫ MOAs with respective bodies	Linseed	Php 50,000	Non-commencement of construction until full compliance and completion of required endorsements and clearances
Integrate air quality mitigation measures in the design and secure permits related to air quality	Air Quality	Social Acceptance and Support for the project with regards to air quality	▫ Prepare detailed air quality mitigation plan on the mitigation measures to be undertaken during construction of the project ▫ Conduct air dispersion modelling using the final design plans of the proposed project and submit to DENR-EMB for review and approval prior to the commissioning and operation of the processing plant. The modelling report shall include in detail the final site development plan, locations of emission sources, detailed discussion of process flow and emissions, computed emission rates, stack gas concentrations in comparison with the NESSAP, and other relevant information ▫ Secure Permit to Operate air pollution control source from DENR EMB prior to the commissioning and operation of the processing plant	Proponent Contractor	Included in project cost	Air quality mitigation plan, detailed engineering design plans, permit to operate air pollution source and control installation
II. Construction Phase						
i. Site Development, Piling and Foundation Works *Initial activities for construction stage includes surveying, setting up of temporary roads, clearing and grubbing, excavation, backfilling, and compaction, piling, and foundation works.* *Foundations of the following facilities will be established:* • Jetty • Flare	Marine Water Quality	(-) Generation of silted runoff resulting to increase in TSS of the receiving water body (marine surface water)	▫ Enclose the construction area within the 9-hectare project area and MLA area ▫ Installation of silt traps along the existing natural channel	Linseed/ Contractor	Part of Construction Cost	Contractor Agreement IMP and Monitoring Plan
	Marine Ecology - Corals	(-) Sediment intrusion into coral reef that can cause coral polyp suffocation; (-) Potential loss of fish habitat and spawning areas;	▫ There are few corals in the deep rocky formations underneath the proposed area for floating storage facility and are unlikely to be significantly affected.	Linseed/ Contractor Project management team and marine consultants	Part of Construction Cost	Contractor Agreement IMP and Monitoring Plan
	Marine Ecology - Fish population	(-) Noise pollution can be carried way beyond the construction area - Altered fish population structure as some species will seek to evade areas of noise generation; loss of fisheries productivity.	▫ Containment of all construction activities within the construction site/project area (9-hectare onshore and MLA area) to avoid sediment deposition in the coastal shelf;	Linseed/ Contractor Project	Part of Construction Cost	Contractor Agreement IMP and Monitoring Plan

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
• RegasTainers • Truck-Loading Bays • LNG Storage Tanks • Seawater System • Buildings: E-house, Workshop, • Warehouse, Fire Station, Gas • Metering, Control Building, Machinery • Room • Gas Boiler/Furnace Skid • Gas Receiving Metering System • Utilities			▫ Placement of silt curtains and geo-textile around the port area and other construction sites; ▫ Containment of spillage of soil filling materials;	management team		
	Marine Ecology	(-) Potential sediment intrusion in coastal waters can lead to: ▫ Increased seawater turbidity and decrease in photosynthesis, affecting fish and plankton grazing ▫ Loss of bivalve veligers and other benthos; ▫ Disturbance to plankton community and grazing of fish;	▫ The most modern sediment curtailment measures and engineering designs will be adopted by the project to address all waste discharges from the wharf and port site and inland facilities. Diversion canals will be built, silt curtains and geo-textile traps and filters will be installed and other entrapment mechanisms will be adopted in order to prevent sediments and silt from spilling into coastal waters.	Project management team	Part of Construction Cost	Contractor Agreement IMP and Monitoring Plan
	Air Quality Noise	*Increase in background air quality levels* (-) Heavy equipment during construction will be the main source of emissions to air. *Transient vehicles (i.e., trucks, service vehicles) of proponent and contractors at residential areas and other sensitive receptors* (-) Increase in background air and noise levels (-) Possible nuisance to residents and other receptors along access roads	▫ Include in the contractor's contract the air quality mitigation plan. Compliance requirements and possible penalties should be specified in the contracts in the event of non-compliance by contractors and sub-contractors as regard to air quality emissions ▫ Strictly impose speed limits in the project area, along residential areas and other sensitive receptors ▫ Regular wet suppression or water spraying during dry weather condition ▫ Grading to be phase in with hauling activities to reduce cumulative increase of fugitive dusts Phasing with hauling ▫ Provide trucks with appropriate cover, such as solid sliding cover on top of trucks or tarp that completely covers the whole transported material ▫ During wet season, provide wheel washing facilities for vehicles leaving the project site going to residences. The wheel washing facility should be used to remove muds at the tires of trucks and heavy equipment, ▫ Regular maintenance of trucks to reduce or maintain tailpipe emissions ▫ Regular maintenance of access roads, particularly at areas with residences and other sensitive receptors ▫ Provision of effective noise mufflers of all project vehicles	Linseed/ Contractor	Part of Construction Cost	MOA with the contractor
ii. Daily construction activities	Land	Increase in Solid and Hazardous waste	▫ The proponent will implement waste segregation, a collection of scrap and recyclable materials that can be sold, and	Linseed/ Contractor	Part of construction cost	Solid waste management plan

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
			composting of biodegradable wastes in accordance with the Batangas City LGU requirements and the Ecological Solid Waste Management Act of 2000 or RA 9003. ▫ Workers must be briefed in seminars/workshops about proper waste management in and outside the project site. Placards/posters may also be posted on work areas as constant reminders for the workers. ▫ Implement RA 6969 through proper segregation and storage of hazardous waste ▫ Tapping DENR accredited waste transporter to dispose of hazardous waste			Contractor MOA
	Geology	The project area is composed of both onshore and offshore areas. Site grading of the onshore area will involve mostly cutting of slopes and backfilling, thus a change in surface landform/geomorphology/topography/terrain and slope is expected.	▫ If ever there is a need for some areas to be backfilled, the backfill materials shall be compacted to the required density. If soft soil materials or undesirable clayey deposit will be encountered in areas where heavy structures are to be constructed or where heavy equipment will be installed, the soft or undesirable materials have to be excavated and replaced by engineered backfill. ▫ If some cavities will be encountered within the reef limestone during the site preparation, the cavities have to be filled with suitable materials. If necessary, grouting may be done to improve the soil condition.	Linseed/ Contractor	Part of construction cost	Contractor Agreement
	Terrestrial Flora	▫ Vegetation removal and loss of habitat ▫ Threat to existence and/ or loss of important local species ▫ Threat to abundance, frequency and distribution of important species	▫ Replacement planting with preference to indigenous species found in the area and in accordance to DMO 2012-02 ▫ Monitor replacement planting to ensure growth and survival	Linseed/ Contractor	Part of the Project Cost	Project development budget, Contractor's contract
	Terrestrial Ecology – Fauna	▫ Loss of habitat and displacement ▫ Reduction in the abundance, frequency and distribution of fauna species due to pollution effects (i.e. noise, vibration, light pollution, traffic) ▫ Habitat fragmentation	▫ Avoidance and minimization of the extent of clearing ▫ Replacement of trees cut in accordance to DMO 2012-02 ▫ Enrichment planting/tree planting within and adjacent the project site ▫ Implement no hunting/poaching policy ▫ Conduct CEPA programs in relation to biodiversity protection and conservation	Linseed/ Contractor	Part of the Project Cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
			▫ Establish, maintain and enhance buffer areas ▫ Regular maintenance of vehicles and heavy equipment ▫ Install temporary barriers/walls, mufflers and/or luminaires to manage noise and light pollution ▫ Implement speed limits and establish fixed routes for vehicles and heavy equipment ▫ Allow fauna species to cross over or pass through the project area unharmed ▫ Enrichment planting along project boundaries parallel to the gully.			
	Noise Quality	(-) Noise levels during construction period at the project site and vicinities and along access roads are expected to increase due operation of heavy equipment, such as dump trucks, front end loaders, and generators. Typical noise levels of these equipment at 15-m distance are as follows. ▫ Backhoe – 80 dBA ▫ Front end loader – 82 dBA ▫ Dump truck – 84 dBA ▫ Generator – 82 dBA ▫ Pick-up truck – 55 dBA ▫ Concrete pump truck – 82 dBA	▫ To avoid significant increase on the background noise levels during construction, mitigation measures should include installation of effective or appropriate mufflers at tailpipes of mobile equipment and generator sets and strictly impose speed limits at access and barangay roads. If necessary, provide partial or total enclosure of high noise sources, if practicable as possible, and as necessary.	Linseed/ Contractor	Part of construction cost	Project development budget, Contractor's contract
	Air Quality	(-) Increase of GHG emissions from construction equipment	▫ Prepare and implement GHG emissions monitoring program in accordance with the GHG Protocol developed by the World Resources Institute (WRI) and the World Business Council on Sustainable Development (WBCSD). ▫ Support to reforestation and coastal management programs of the LGU	Linseed/ Contractor	Part of construction cost	Project development budget, Contractor's contract
	People	(-) Occupational safety and health hazards	▫ Provision of PPE's including safety vests and harness for laborers involved in the construction ▫ Conduct of safety seminars, training and proper orientation to construction workers ▫ Strict implementation of HSE program as well emergency response plan	Linseed/ Contractor	Part of construction cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
	People	(+) Increased employment opportunities	▫ The proponent shall give priority hiring to locals whose skills and experience match the project's specific needs. A local hiring scheme will be established in close coordination with the concerned barangay Local Government Units (LGUs). In general, the proponent will provide a list of anticipated job requirements with corresponding qualifications to the concerned barangay LGUs. These potential opportunities will be promoted by the barangay LGUs in their respective jurisdictions and potential applicants will be forwarded to the proponent, for further review and evaluation by the Human Resources Office. ▫ Consultations shall be made with the LGUs and host communities to finalize a scheme for hiring residents from host communities. Qualified local residents will be given priority in hiring. For technical positions not available in the host communities, the proponent reserves the option to source its manpower requirements elsewhere. Compensation terms and the process of hiring will comply and adhere with existing labor laws, rules, and regulations ▫ The project shall be fully compliant with the General Labor Standards of the Department of Labor & Employment across the yard, offices, and project site in Ilijan. There will be in-house technical training customized for project requirements across welding, pipe fitting, rigging, scaffolding, and electrical & instrumentation disciplines. Two-day client-specific refresher training will be conducted before deploying personnel to site.	Linseed/ Contractor	Part of construction cost	Project development budget, Contractor's contract
	People	(-) Loss of livelihood and income source for fisher folks previously mooring in or passing through the coastal area of the project site (including the proposed	▫ Just Compensation and relocation package to be provided to the affected stakeholders ▫ Provision and development of alternative livelihood through conduct of trainings in coordination with government agencies, e.g. TESDA, BFAR, DOST, etc.	Proponent	Part of construction cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
			▫ Development of fishery and fishery based livelihood program through implementation of the Social Development Plan of the project			
Operation						
i. Transport of LNG	Marine Ecology	*Increased vessel traffic, human activities and maintenance works in the wharf area leading to:* (-) Disturbance to small-scale fishing operations; (-) Inadvertent introduction of exotic species through disposal of ballast water; can cause alteration of the marine species trophic level; potential loss of key prey.	▫ Effective IEC are imparted to local fishers targeting to avoid any displacement of fishing activities. Any substantiated loss of income from fishing due to project activities will be compensated. Lost permanent gears such as fish pots will be replaced. The project will study the viability of establishing fish aggregating devices to support fishing. ▫ Clear and forceful policy on management of ballast water discharge supported by monitoring schemes ▫ Oil and grease recovery and accident prevention plan will be adopted; ▫ There are no coral colonies in the floating storage facility docks or in coastal waters where ship maneuvering is projected to occur ▫ Policy of no shipboard waste disposal will be rigidly enforced. ▫ A disaster risk reduction and mitigation program will be adopted. ▫ A vessel anchoring system will be imposed.	Project management team and marine consultants	P 500,000.00	Project development budget, Contractor's contract
	People	Possible collision with other ships	▫ The proponent will comply with the Philippine Coast Guard (PCG)'s traffic separation scheme (TSS) established for the Verde Island Passage under Memorandum Circular 04-03 (Routing System at Verde Island Passage).	Linseed/ Contractor	Part of the operation cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
	People	Safety during natural hazards	▫ Assembly areas shall be provided for emergency situations. These areas should be located so that when an emergency is identified the operating personnel can go to the identified assembly area and be in a safe area. This will allow supervisory personnel to account for the operating personnel, where practicable, the orientation of the unit or installation, with respect to wind direction, shall aim to avoid smoke or gas impairment of escape, muster and evacuation areas. The areas shall be identified with a large sign and shall be provided with a sheltered telephone. ▫ The whole facility is equipped with Public Address and General Emergency Alarm System (PA and GEA System) which will be used during emergencies.	Linseed/ Contractor	Part of the operation cost	Project development budget, Contractor's contract
ii. FSU unloading (berthing and mooring)	Water Quality	Water quality degradation from bilge and ballast water	▫ Bilge and ballast pumps are installed in the engine room compartment. Bilge and ballast pipe manifold with individual valves was used for easy operation during filling and draining activities. It is also located in the engine room. Oily water separator was used to filter to oily water sediments at the engine room bilge and other compartments before discharging outside the ship's hull. ▫ For the vessel being used as an FSU, the ballast water management system, has been designed and manufactured to meet IMO regulations. The Purimar system comprises of two unit operations: mechanical filtration and disinfection (electrolysis based chlorine). In the first stage particles, sediment and lager organisms are removed. In the second stage a chlorine compound is generated through electrolysis of sea water and is injected into the filtered ballast to disinfect any smaller sized organisms and bacteria. At deballasting a neutralising unit is used to reduce the total residual oxidant concentration of the ballast water to be discharged.	Linseed/ Contractor	Part of the operation cost	Project development budget, Contractor's contract
	Water Quality Marine Ecology	(-) Domestic wastewater generated from FSU	▫ The vessel being used as FSU is fitted IMO approved sewage treatment plant:	Linseed/ Contractor	Part of the operation cost	Project development

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
			▪ Sewage System in use: Hamworthy Super Trident ST-4A ▪ Treatment 3010L/day (max 50 Persons 60 L/day) ▪ Effluent Quality BOD <40ppm, SS <50ppm, Coliform Below 200/100ml ▫ Being an approved treatment plant, treated waste can be discharged directly to sea but will be collected on schedule basis and processed by 3rd party.			budget, Contractor's contract
	Air Quality	(-) Emissions from the ship's funnel in Port, either from Boilers or Diesel Generators produce Nitrogen oxides (NOx), Sulfur oxides (SOx) and particulate matter (PM). Through chemical reactions in the air, NOx and SOx are converted into very small airborne particles, nitrite and sulphate aerosols. Both NOx and SOx are combustion products that are emitted into the environment in the form of smoke; these are the two main pollutants.	▫ FSU fully complies with the international regulations in regards to emissions. ▫ Inspections will be performed by Port State and other Bodies ▫ Regular maintenance of the engines and boilers including its ancillary equipment to ensure adherence to emissions limits. ▫ Use Lower Sulphur Fuels and Selective Catalytic Reduction (SCR) ▫ Monitoring devices to be used: ▪ Marine Emission Monitoring Analyser capable of reporting the SO2:CO2 ratio as required by IMO's. ▪ Infra-red gas analyser Continuous Emission Monitoring System (CEMS) ▪ Scrubber Monitors/analysers ▪ Measuring unit to capture NOx(g) to power production kWh ▪ Smoke density indicators will be used which alert the operator to combustion issues, so can be rectified quickly	Linseed/ Contractor	Part of the operation cost	Project development budget, Contractor's contract
iii. Transport of LNG through pipes	Marine Water Quality	(-) Degradation of marine water quality due to LNG spill	▫ Concrete lining of LNG piping flanges and unloading arms to collect and transport LNG to impounding pits that shall also be constructed to temporarily store LNG spills	Linseed/ Contractor	Part of the operation cost	Project development budget, Contractor's contract
iv. Regasification of LNG using seawater	Marine Water Quality	(-) Thermal Pollution due to the release of cool water to the sea	▫ Installation of the discharge outlet in a location that will allow maximum mixing of the thermal plume to ensure the change (drop) in temperature will not exceed 3 °C ▫ Implement effective countermeasure on bubble-formation to prevent discharge of bubbles to the sea	Linseed/ Contractor	Part of the operation cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
vii. Daily operations - Domestic activities - Operation of land and floating facility - Daily use of equipment/ machineries	Land	(-) Solid waste generation Solid wastes that will be generated by the Projects consist of: • Household waste consisting of compostable waste materials from food and recyclable or residual materials such as plastics, wrappers, crates or boxes for food supply of workers and/or employees • Debris and other materials removed from construction activities such as spoils or excavated materials • Industrial solid wastes, such as damaged vehicle and equipment parts, etc. • Hazardous wastes such as used batteries, light bulbs, etc.	▫ Establishment of a Materials Recovery Facility within the project site. Solid wastes, except compostable and dirty residual wastes, will be sorted and temporarily stored in the MRF. Disposal of these wastes will be handed to the governing LGU regularly on a monthly basis or at shorter frequency as necessary. Compostable and dirty residual solid wastes will be collected and disposed daily also through the LGU in order to avoid vermin infestation. ▫ The design of the project shall adopt the principles and practice of waste minimization and reduction/elimination of the production of waste wherever practicable. Any waste produced shall be segregated to allow for recycling or safe storage and disposal. ▫ Non-hazardous solid wastes will be classified and sorted as compostable, recyclable, and residual. Hazardous solid wastes will be classified based on Republic Act 6969 or the Toxic Substances and Nuclear Wasted Control Act of 1990.	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Terrestrial Flora	Threat to abundance, frequency and distribution of important species	▫ Replacement planting with preference to indigenous species found in the area and in accordance to DMO 2012-02 ▫ Monitor replacement planting to ensure growth and survival	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Terrestrial Ecology - Fauna	Pollution effects on species (light pollution, traffic) Habitat fragmentation	▫ Maintain and enhance buffer areas ▫ Use luminaires that direct light to designated areas that requires lighting and avoid dispersion of lights to surrounding areas. ▫ Implement speed limits and establish fixed routes for vehicles ▫ Allow fauna species to cross over or pass through the project site unharmed ▫ Enrichment planting along project boundaries parallel to the gully. ▫ Conduct CEPA programs in relation to biodiversity protection and conservation	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
Cont'n vii. Daily operations - Domestic activities - Operation of land and floating facility - Daily use of equipment/ machineries	Hydrology Marine Ecology	(-) Water resources competition *The primary water supplier of the terminal is under Batangas City Water District. The required potable water for the terminal office buildings will be 5 cbm/hr maximum.*	▫ The freshwater will be supplied by desalination unit as secondary source for all the utility station such as Jetty, BOG Compressor Area, fire water pond/tanks, etc.	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Marine Water Quality Marine Ecology	(-) Contamination of marine surface water due to the stormwater discharge coming from the plant area	▫ Installation of a stormwater discharge system consisting of pipes and concrete open ditch channels with provisions to prevent silt, oil and grease and other contaminants from being transported to the sea (e.g. silt traps, oil water separators)	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Marine Water Quality Marine Ecology	(-) Oil contamination of marine surface water	▫ Provision of drip pans, curbing or oil sumps to collect oil-contaminated water ▫ Installation of Oil-contaminated Water Drainage System with sufficient capacity	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Marine Water Quality Marine Ecology	(-) Degradation of marine water quality from sewage	▫ Sanitary wastewater from toilets in buildings and from the kitchen in the canteen shall be collected to septic. The sanitary wastewater shall be transported in underground piping. ▫ Wastewater from dishwashing areas in the canteen shall be directed into a grease trap to separate grease before flowing into sanitary sewers.	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Marine Ecology	(-) Accidental oil and lubricant spills; oil pollution in the inter-tidal zone; (-) Slicks may reach coral reefs leading to loss of species and associated demersal fish (in primary and secondary impact areas).	▫ Implementation of accidental oil spill and ship bilge water treatment and recovery plan.	Project management team	Part of operation cost	Project development budget, Contractor's contract
	Marine Ecology	*Increased human inhabitation of the port complex area can induce potential increase in domestic wastes that leads to:* (-) Marine pollution can be triggered if fugitive domestic wastewaters reach coastal sea leading to loss of fish and invertebrate habitats and nutrient loading in shallow waters. Biotoxin (PSP) in shellfish	▫ Waste management in all aspects of project operation will be implemented forcefully. ▫ Human traffic in inter-tidal area will be restricted and managed to ensure very little disturbance to natural processes. ▫ Conduct of regular plankton community monitoring focusing on presence and density of HAB-causing organisms will be monitored periodically in collaboration with the BFAR; ▫ All drainage water shall be filtered through a series of filtering devices.	Project management team	P 250,000.00	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
Cont'n vii. Daily operations - Domestic activities - Operation of land and floating facility - Daily use of equipment/ machineries		populations can happen together with health hazards to consumers.	▫ Collaboration with the City Government of Batangas to enable adoption of clean practices and domestic wastewater management.			
	Marine Ecology	*Alteration of inter-tidal zone contiguous to the wharf/port complex if structures to further accommodate human and cargo access by sea leading to:* (-) Disruption to benthic and in-faunal population of mollusks in the inter-tidal zone; (-) Loss of commercially important macro invertebrate/bivalve stocks	▫ No additional permanent structures shall be set in areas contiguous to the port, in the wharf itself or inter-tidal areas near the port complex. ▫ Alterations in the wharf area will be kept to the minimum and on-going investigations to monitor any alteration of coastal habitats will be undertaken in order to adopt control measures. All temporary structures will be removed immediately. ▫ Shellfish populations will be monitored for potential enhancement of stocks especially in identified breeding grounds; ▫ Bivalve spawning and nursery areas near the project site will be identified and cordoned as closed to intensive worker movement			
	Air Quality	(-) Increase of air pollutants (mainly SOX, NOX, CO, and PM) from the exhaust stacks during operation, thus increasing ambient air quality (-) During diesel engines intermittent operation (ca. 350KVA EDG nearby the E-house, Firewater pumps of ca. 500BHP each nearby the shoreline for water intake), CO2 may be released in intermittent cases.	▫ Use of stack height in accordance with the Good Engineering Practice (GEP) stack height. Pollutants dispersed at lower stacks tend to be forced at the surface or ground resulting to very high pollutant concentrations. This is due to presence of cavities or wakes around buildings. ▫ Use of diesel fuel for diesel engine generators with low sulfur content and subsequently, lower SOX emissions compliance with SOX emission standard set at 700 mg/Nm3 ▫ Use of diesel engines compliant with NOX emission standards set at 2000 mg/Nm3. ▫ Regular maintenance of the diesel engines (i.e., change oil and filter change) to reduce particulate and carbon emissions ▫ Conduct stack emissions monitoring in accordance with the requirements of DENR-EMB	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract
	Ambient noise	(-) Increase in noise level During project operation, noise from the LNG facility is not expected to significantly at residences/households	▫ Provision of effective noise mufflers of all project vehicles ▫ Strictly implement speed limits in access road in vicinity of residences	Linseed/ Contractor	Part of operation cost	Project development budget, Contractor's contract

Project Phase/ Environmental Aspect	Environmental Component Likely to be Affected	Potential impact (+/-)	Options for Prevention, Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangement
		due to wide distance between the power plant and the former (about 500 m).	▫ Provide noise mitigation measures, i..e, barriers, noise enclosures, should noise levels from sources (e.g., pumps) exceeded ambient standards			
Cont'n vii. Daily operations - Domestic activities - Operation of land and floating facility - Daily use of equipment/ machineries	People	(-) Occupational safety and health hazards	▫ Provision of PPE's including safety vests and harness for laborers involved in the construction ▫ Conduct of safety seminars, training and proper orientation to construction workers ▫ Implementation of HSE program as well emergency response plan	Proponent	Part of operation cost	Project development budget, Contractor's contract
	People	(+) Employment opportunities	▫ Prioritization of locals for hiring ▫ Conduct of IEC regarding policy on local prioritization in hiring manpower, contractors, and suppliers ▫ Provision of Capacity Building and Skills Training Program	Proponent	Part of operation cost	Project development budget, Contractor's contract
	People	(-) Loss of livelihood and income source for fisher folks previously mooring in the coastal area w/in the vicinity	▫ Just Compensation and relocation package ▫ Provision and development of alternative livelihood ▫ Development of fishery and fishery based livelihood program	Proponent	Part of operation cost	Project development budget, Contractor's contract
IV. Decommissioning Phase						
Removal of project facilities	Terrestrial Ecology	Proliferation of invasive species on opened areas	▫ Rehabilitation of disturbed areas through revegetation (i.e., indigenous tree planting, cover crops planting) ▫ Avoid use and deliberate introduction of invasive species	Proponent	Part of the Project Cost	Project development budget, Contractor's contract

Legend:

+/- Positive or negative impact

CHAPTER 4 ENVIRONMENTAL RISK ASSESSMENT (ERA) & EMERGENCY RESPONSE POLICY AND GUIDELINES

4.1 ENVIRONMENTAL RISK ASSESSMENT (ERA)

4.1.1 INTRODUCTION

4.1.1.1 BACKGROUND

This Environmental Risk Assessment (ERA) was prepared for the proposed Ilijan LNG Import Facility Project of Linseed Field Power Corp. (LFPC). The project will be located in Barangay Ilijan, Batangas City, Batangas and cover an approximate area of nine (9) hectares. It will be adjacent to the existing Ilijan Power Plant and Kepco Ilijan Corporation and will primarily supply the natural gas requirements of the latter.

This ERA was undertaken in compliance with the scoping agreement between the EMB and LFPC.

4.1.1.2 OBJECTIVE OF THE ERA

This ERA aims to identify and characterize the hazards associated with the project. The project's hazard footprints will be estimated based on worst-case accident scenario analysis. Planned safety barriers and accident prevention measures will be identified, as well as the Proponent's Emergency Response Plan (ERP). Based on the hazard analysis, worst-case scenario analysis, planned safety measures and ERP to be implemented, further risk management measures may be recommended.

4.1.1.3 SCOPE AND LIMITATION OF THE ERA

The various physical, chemical and natural hazards associated with the project were analyzed. This ERA focused on safety risks, "which are characterized by low probability, high consequence, accidental nature and acute effects" in compliance with the *Procedural Guidelines for Scoping of Environmental Risk Assessment*, Annex 2-7e of the Revised Procedural Manual of DAO 03-30) (EMB-EIAMD, 2007). It took into consideration the PAGASA-predicted climate scenarios. It undertook the simulation of several worst-case accident scenarios for fire/explosion involving LNG and natural gas. Hazards that were analyzed in this ERA were fire and explosion arising from the storage and handling of LNG and natural gas.

The scope of this ERA included the following aspects:

1. Hazards identification;
2. Risk screening activity that considered all substances that will be used, handled, or stored at the project site;
3. Hazard footprint estimation based on site conditions, chemico-physical properties of hazardous substances and meteorological data;
5. Use of accident scenarios and valid hazard endpoints in modeling postulated accident consequences;
6. Application of appropriate modeling tools in hazard footprint analysis; and
7. Generation of consequence hazard footprint maps.

4.1.1.4 ERA FRAMEWORK

4.1.1.4.1 THE ERA PROCESS

ERA, as defined in the *Procedural Manual for DAO 2003-30*, is "the use of universally accepted and scientific methods to assess the risks associated with a project. It focuses on determining the probability of occurrence of accidents and their magnitude (e.g., failure of containment or exposure to hazardous materials or situations.)". Risk is defined as a measure of potential human injury/ death, economic loss, or environmental damage in terms of the probability of the loss, injury/death or damage occurring and the magnitude of the loss, injury/ death or damage if it occurs. Risk involves two measurable parameters: consequence and probability. Risk refers to qualitative or quantitative measure of hazards associated with the proposed Ilijan LNG Import Facility Project. It is the integrated result of the calculated consequence of a postulated accident scenario and the calculated probability or frequency of occurrence of postulated events.

4.1.1.4.2 THE ERA FRAMEWORK

The general framework of this ERA is illustrated in **Figure 4-1**.

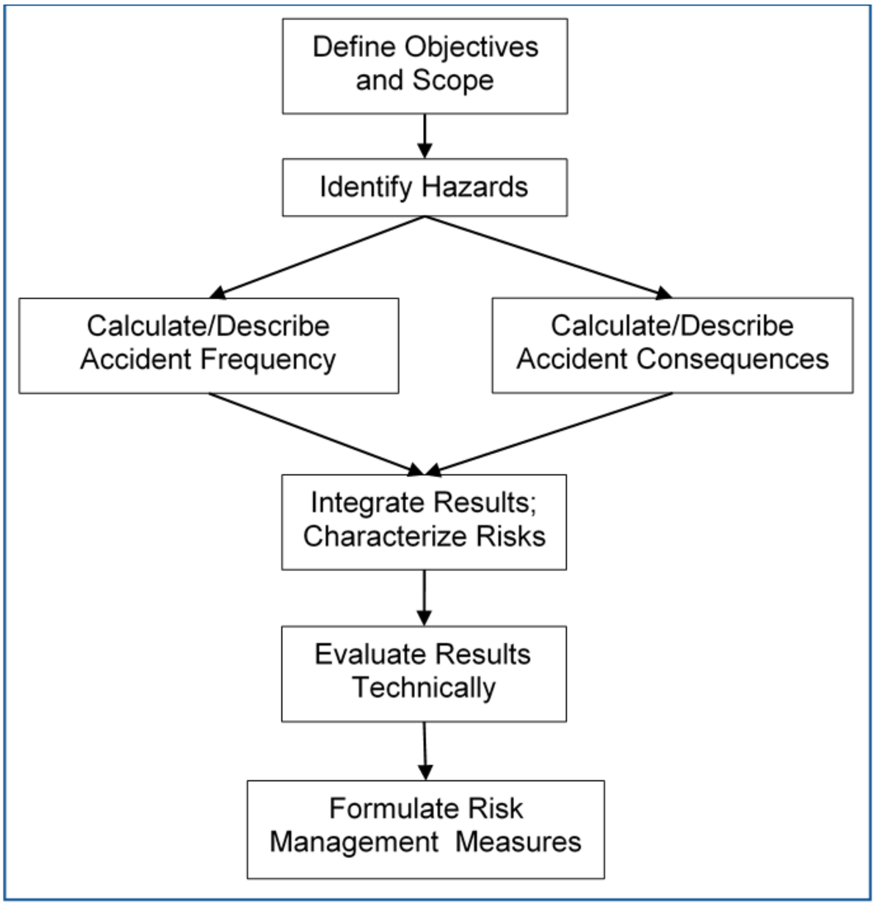


Figure 4-1. The Risk Assessment Process

4.1.1.5 METHODOLOGY

4.1.1.5.1 HAZARD IDENTIFICATION

This ERA process involved the identification of the various hazardous processes, activities and substances associated with the project. Focus of hazard identification was the substances' flammability, explosive potential and potential for toxicity. Risk screening that included all substances to be used, handled and stored at the project site was conducted. The potential of each substance to pose hazards to the environment, the public and the facility was analyzed based on a thorough review of its intrinsic physical, chemical and hazard characteristics. Risk screening was done according to the process and criteria described in the *Revised Procedural Manual of DAO 2003-30: Guidelines for the Conduct of Environmental Risk Assessment*, particularly *Annex 2-7e*. The risk screening procedure enabled the identification of substances that should be included in the quantitative aspect of the risk assessment.

4.1.1.5.2 CONSEQUENCE ANALYSIS

Based on a postulated worst-case accident scenario, quantitative calculation or estimation of unwanted consequences, effects, impacts or outcomes of potential major hazard incidents in the facility were undertaken. Major hazard incidents involve hazardous activities or substances that have impacts in terms of death, injury or evacuation of people, damage to property or lasting harm to the environment. Hazardous substance that was included in the consequence analysis was liquefied natural gas (LNG) and natural gas.

Calculation of accident consequences was done through measurement of hazard distances to specified endpoints or levels of concern of accident impacts. Maps of hazard footprints were generated to demonstrate the extent of postulated accident consequences. Estimated hazard radii were used to generate footprints of the fatality or injury zones on a population map of the area.

The postulated accident scenarios did not consider the effects of planned mitigation measures, which presumably would be rendered ineffective. The endpoints of concern were the acute effects in terms of fatality and injuries to people.

4.1.1.5.3 CALCULATION OF MAXIMUM DISTANCES TO IMPACT CRITERIA

Explosion accidents. Distances to at least four levels of concern of blast overpressures were measured for explosion accidents. The overpressure level of concern is a threshold level of pressure above which certain hazards may result. The blast overpressure endpoints and their relevance are listed in **Table 4-1**. Vapor cloud fire of flash fire impact criteria are shown in **Table 4-2**.

Table 4-1. Blast Overpressure Endpoints and their Relevance

Explosion Overpressure (psi)	Expected Damage/Relevance[13]
1.0	Possible serious injury due to flying glass and missiles; Probability of injury is 10%; Fatality not expected; Partial demolition of houses; Usually used as the threshold overpressure value for regulatory purposes by USEPA; Used to delineate the maximum Injury Zone.
3.0	20% chance of fatality to a person in a building
5.0	Nearly complete destruction of houses; Threshold of eardrum damage; 50% chance of fatality for a person in a building and 15% chance of fatality for a person in the open.

Table 4-2. Vapor Cloud Fire Endpoints and their Relevance

LNG Vapor Cloud Concentration		Expected Damage/Relevance[14]
60% LFL	30,000 ppm	Flammable vapor cloud concentration that could give rise to occurrence of flame pockets
100% LFL	50,000 ppm	Vapor cloud concentration equivalent to the Lower Flammable Limit (50,000 ppm) for LNG; 100% fatality is assumed for persons engulfed within the flash fire delineated by 100% LFL

Fire Accidents. For fires, maximum downwind distances to specified thermal radiation levels of concern were calculated. The thermal radiation level of concern is a threshold level of thermal radiation, the level above which a hazard may occur. Three thermal radiation endpoints were used in the consequence analysis for fire hazards. These endpoints are described in **Table 4-3**.

Table 4-3. Levels of Concern for Thermal Radiation Effects of Fires

Thermal Radiation Dose (kW/m^2)	Expected Damage/Relevance
5	People will feel pain after 13 seconds and receive second-degree burns after 40 seconds. Used to define the injury zone.
12.5	Used to define the 7% fatality zone after 20 seconds of exposure for persons not protected by clothing or shelter
35	Used to define the 100% fatality zone after 20 seconds of exposure for persons regardless of protection of clothing or shelter; This thermal radiation dose could burn clothing and houses

4.1.1.5.4 ESTIMATION OF THE MAGNITUDE OF ACCIDENT CONSEQUENCES

[13] "Guidelines for Hazard Analysis." Advisory Paper No. 6, Department of Planning. Sydney, Australia.
[14] "Guidelines for Hazard Analysis." Advisory Paper No. 6, Department of Planning. Sydney, Australia.

The number of potential fatalities and injured persons were the endpoints of concern in estimating the magnitude of accident consequences. The potential number of injured or fatalities were graphically demonstrated by generating hazard footprints (injury zone and fatality zone) on Google Earth® map.

4.1.2 ERA SCOPING AND RISK SCREENING OF HAZARDOUS SUBSTANCES

Scoping and risk screening procedures were undertaken to determine the level of environmental risk assessment to be undertaken. The criteria and process used in risk screening was based on *Annex 2-7e* (*Guidelines for the Conduct of Environmental Risk Assessment)* of the *Revised Procedural Manual of DAO 2003-30*.

According to *Annex 2-7e of the RPM of DAO 2003-30* conduct of an ERA is required if a proposed project will use, handle, transport, or store substances that are explosive, flammable, oxidizing, or toxic. The project would require an ERA as it involves the use of flammable substances. These hazardous substances are listed in **Table 4-4** below.

Table 4-4. Risk Screening of Hazardous Substances to be Used and Stored at the Project Site

Substance	Hazard Classification (as screened)	Max. Inventory of the Substance (MT)	DENR Level 1 Threshold Inventory[1] (MT)	DENR Level 2 Threshold Inventory[2] (MT)	"q/Q" value for Level 2
1. LNG	Extremely flammable	76,110 (assume s.g. = 0.43)	10	50	1,522
2. Diesel	Flammable substance	Minimal	5,000	50,000	No data

The level of ERA coverage is defined by the type of hazardous substance and the expected maximum inventory of this substance to be stored or handled at the project site at any one time. The levels of ERA coverage are as follows (*Annex 2-7e of the RPM of DAO 2003-30*):

- Level 2 – for facilities that will use, manufacture, process or store hazardous materials in excess of **Level 2** threshold inventory shall be required to conduct a Quantitative Risk Assessment (QRA) and prepare an Emergency/Contingency Plan based on the results of the QRA;

- Level 1 – for facilities that will use, manufacture, process or store hazardous materials in excess of **Level 1** threshold inventory shall be required to prepare an Emergency/Contingency Plan based on the worst-case scenario. The Plan shall be based on a Hazard Analysis study; and

- Risk screening level – specific facilities or the use of certain processes shall require the conduct of a risk screening study even if the projected or estimated inventory does not reach the threshold levels.

Table 4-4 shows the maximum amount of the identified hazardous substances that may be stored at the project site at any one time, their hazard classification, the corresponding DENR Threshold Inventory Levels (Level 1 and Level 2) and the "q/Q" value for each substance. The maximum amount of LNG to be stored exceeds the DENR level 2 Threshold Inventory for extremely flammable substances, which is 50 MT. The diesel to be stored is expected to be only minimal. Based on the amount of LNG to be stored, the project would require the conduct of a Quantitative Risk Assessment (QRA) as shown in **Figure 4-2**.

A QRA that is based on final engineering design and on actual operating conditions would be essential in the operation of the project. As such, it was agreed during the Technical Scoping Meeting that the Environmental Risk Assessment (ERA) will not encompass the QRA but would rather focus on Hazard identification (HAZID), computation of hazard distances based on Worst-case Accident Scenario (WCAS) analysis, and identification/formulation of Emergency Response Plan (ERP). The QRA will be done post-ECC based on final engineering design.

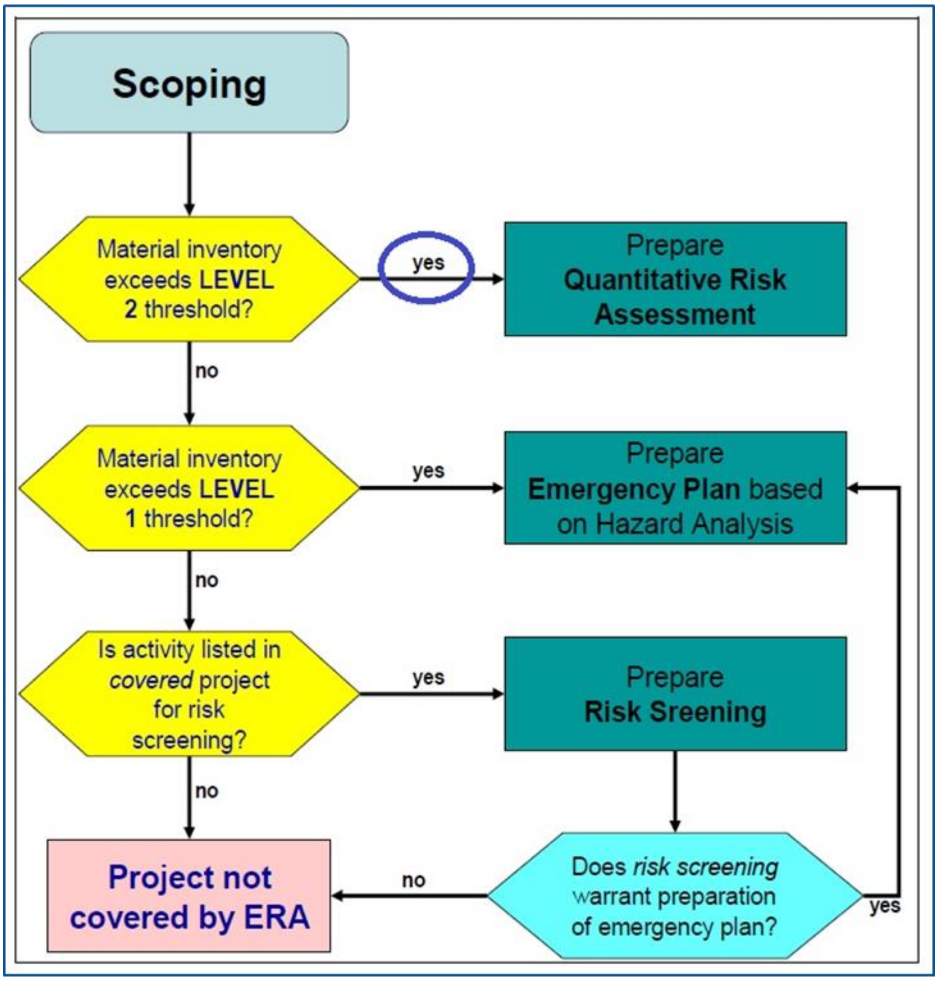


Figure 4-2. Result of ERA Scoping for the Ilijan LNG Import Facility Project

4.1.3 HAZARDS IDENTIFICATION

4.1.3.1 HAZARDOUS INVENTORIES

4.1.3.1.1 LIQUID NATURAL GAS (LNG) AND NATURAL GAS (NG)

LNG is a clean fuel with very few contaminants. **Table 4-5** presents the composition and quality specifications of LNG that will be delivered at the site.

Table 4-5. Natural Gas Composition and Quality Specifications at Ilijan Site Boundary Delivery Point

Composition	
Component	**% Composition**
Carbon Dioxide (CO_2)	3.77
Nitrogen (N_2)	0.74
Methane (C1)	90.52
Ethane (C2)	2.76
Propane (C3)	1.21
Iso-butane (iC4)	0.27
N-butane (nC4)	0.37
Iso -pentane (iC5)	0.12
N-pentane (nC5)	0.08
Hexane (C6)	0.01
C7+	0.12
Quality Specifications	
Water Dewpoint	≤ 273 K @ 4.5 MPa absolute
Hydrocarbon dewpoint	≤ 288 K @ pressure up to and including 4.5 MPa absolute

Composition	
Component	**% Composition**
Total Sulfur	≤ 35 ppm as Hydrogen Sulphide
WOBBE Index	59.6 MJ/kg to 68.4 MJ/kg @ 288.15 K and 0.1015 MPa. Does not vary by more than ±5% in any thirty day period and by more than ±2% during any gas turbine start-up
Gross Calorific Value (GCV) or High Heating Value (HHV)	48.0 MJ/kg to 53.2 MJ/kg at 288.15 K and 0.1013 MPa
Temperature	288 K to 338 K
Pressure	4.5 MPa absolute to 5.0 MPa absolute

If LNG or NG is released to the atmosphere, a flammable gas cloud would form that could potentially cause flash fire and/or vapor cloud explosion (VCE) with delayed ignition. If LNG spills to the ground or into the water, a pool fire could occur if it gets ignited. Jet fire or spray fire results with the release and immediate ignition of natural gas with significant momentum in a particular direction.

4.1.3.1.2 GLYCOL

Glycol has zero reactivity rating and is considered not flammable or combustible, but can pose a fire hazard at elevated temperatures above its flash point (NFPA flammability rating = 1) and if it contacts a very hot surface. The flash point of glycol is expected to range from 190 to 200°C. Glycol used in the regasification of LNG is expected to be at a temperature of 25°C, which is well below the glycol flash point. Under this condition, glycol is not considered as major fire and explosion hazard.

4.1.3.1.3 DIESEL

Diesel is combustible and flammable with a flash point at 52°C and auto-ignition temperature at 254 to 285°C. Diesel is expected to be stored onshore as fuel for fire water pumps and emergency diesel generators (EDG) and will be at ambient pressure and temperature, well below its flash point and therefore is not considered as flammable.

4.1.3.2 HAZARDS IDENTIFICATION

4.1.3.2.1 LOSS OF CONTAINMENT (LOC), FIRE AND EXPLOSION HAZARDS

The fire and explosion hazards associated with the project are listed in **Table 4-6**. These hazards result to loss of containment (LOC) releasing LNG/NG, which has the potential to cause fire and explosion if and when ignition sources are present. Release of LNG can also result to embrittlement of structures and subsequently, LOC. Escalation of fire due to failure of firewater system and supply of diesel to firewater pumps are hazards that lead to escalation of fire when it happens. Failure of the nitrogen system, which may lead to potential air ingress into the LNG tank, can also result to fire/explosion.

LOC of containment of glycol water is not expected to result to fire but can result to environmental pollution.

Potential consequences of these hazards are:

- Injury to personnel or at the extreme case fatality;
- Damage to infrastructure and equipment;
- Shutdown of operation and loss of production; and
- Loss of reputation.

It should be noted that natural hazards, security hazards and ship collision (as discussed in subsequent sections) can also result to LOC and potential fire/explosion.

Table 4-6. Project Hazards Register: Fire and Explosion Hazards

SN	Hazard Category	Hazardous Event Description	Potential Consequence
1			Ignition of LOC leading to fire/ explosion

SN	Hazard Category	Hazardous Event Description	Potential Consequence
	Failure of flammables/chemical storage	LNG release from LNGC, FSU and/or buffer LNG tank	Cryogenic effect on structure (embrittlement of steel) leading damage to LNGC/ FSU/ Regasification Terminal
			Cold burns to personnel
		Release of paint/ grease/ chemicals and lube oil	Fire (normally small fire that can escalate if not immediately controlled)
			Environmental pollution
		Leakage from storage tank of diesel for firewater pumps and generators	Uncontrolled leakage leading to environmental incident and potential fire
2	Release of LNG inventory (in process)	Transfer hose failure (LNGC and FSU)	Ignition of LNG release leading to fire/ explosion
			Cryogenic effect on structure (embrittlement of steel) resulting to potential damage to LNGC/ FSU
			Cold burns to personnel
		Transfer failure during truck loading	Ignition of LNG release leading to fire/ explosion
			Cryogenic effect on structure (embrittlement of steel) resulting to potential damage to LNGC/ FSU
			Cold burns to personnel
		LNG pipeline failure	Ignition of LOC leading to fire/ explosion
			Cryogenic effect on structure (embrittlement of steel) resulting to potential damage to LNGC/ FSU
			Cold burns to personnel
3	Release of NG inventory (in process)	NG pipeline failure	Ignition of NG release resulting to fire/ explosion
		BOG pipeline/ compressor failure	Ignition of NG released resulting to fire/ explosion
		Regasification unit failure	Ignition of NG released resulting to fire/ explosion
4	Failure of glycol system	Release of glycol-water	Environmental pollution
			Fire (Will only occur at elevated temperatures above its flash point, which is very unlikely)
5	Overfilling of FSU and buffer LNG tank	Overfilling FSU/ buffer LNG tank leading to liquid in vapor lines	Material damage leading to LOC and potential explosion
6	Ignition sources	Instrumentation, electrical equipment	Ignition of a LOC leading to fire/ explosion
		Engines including diesel and gas generators	Ignition of a LOC leading to fire/ explosion
		Static	Ignition of a LOC leading to fire/ explosion
		Hot works	Ignition of a LOC leading to fire/ explosion
		Lightning	Ignition of a LOC leading to fire/ explosion
7	Startup/Shutdown	Thermal shock	Mechanical damage/ equipment failure and LOC leading to potential fire/ explosion
8	Pressure	Overpressure	Overpressure leading to LOC, potential fire/ explosion
		High pressure system – gas system	Overpressure leading to LOC, potential fire/ explosion
		Surge caused by quick closing valves on loading arms	Overpressure leading to equipment damage
9	Corrosion	External/ Internal corrosion of equipment, structures, pipelines, etc.	LOC leading to potential fire/ explosion

SN	Hazard Category	Hazardous Event Description	Potential Consequence
10	Temperature	Low temperature exposure due to failure of regasification system by fouling, loss of heating medium (glycol-water), excess demand	LNG contact with downstream system causing brittle failure of piping/ equipment leading to LOC, potential fire/ explosion
		LNG release on FSU from high pressure systems, mechanical failure, fatigue, etc.	Potential brittle fracture, causing failure leading to LOC and potential fire/ explosion
11	Failure of inerting (Nitrogen) gas system	Nitrogen release	Potential asphyxiation but very low probability
		Loss of inerting (nitrogen) gas	Loss of nitrogen/inerting gas to LNG tank leading to potential air ingress, flammable mixture, fire/ explosion
12	Failure of Firewater System	Insufficient firefighting system (water/inerting)	Escalation of a fire event
13	Failure of Diesel Fuel/ Fuel Oil System	Loss of diesel to firewater pump or generator	Escalation of a fire event
14	Heavy lifting requirements	Crane transfer activities and lifting of provisions from jetty to FSU	Potential dropped/ swinging object leading to equipment damage and potential LOC

The following control measures listed below will be implemented to reduce the fire and explosion hazards and resulting risks to low levels.

Planned Controls

The following built-in safeguards to prevent the spill/release of LNG/NG to atmosphere, will be implemented as part of the project:

1) High pressure alarms – To alert the operator.
2) Very high-pressure alarms and associated emergency shutdown (ESD) – Shutting down of systems to prevent rapid over pressurization.
3) Safety relief valves on liquid and vapor lines – To prevent damage to piping systems.
4) Gas detection system – To alert the operator of any leak in the system, which initiates an ESD if gas concentration exceeds alarms limits in certain areas. The barrier spaces/ void spaces are continuously monitored.
5) Emergency release coupling (ERC), consistent with dry-break philosophies, will be present on each of the LNG transfer hoses to minimize the quantity of LNG spill in case the hose parts or in case of activation of ESD 2.
6) All ERC's are designed and approved to ensure containment even under a full flow release.
7) ERC should be designed utilizing two (2) valves, one upstream and one downstream of the coupling.
8) Emergency release system (ERS) must be capable of operating and releasing the transfer hoses in case of ship black out and non-availability of ship-provided services.
9) In all cases, ESD 1 and ESD 2 must be interlocked such that ESD 2 is not possible without activating ESD 1, Step by step activation process.
10) In case of a ship breaking away the ERS should automatically operate and release the transfer lines before the maximum operating limits of hoses / arms are breached. Surge pressure should be within acceptable limits.
11) There must be a restraint system fitted, which will control the rate of fall of these transfer hoses after disconnection to prevent any damage to the vessel or to the integrity of the transfer hoses.
12) The system should ensure no sparking takes place and the released hoses do not contact any metal structure of the vessel.
13) ESD system – Manual or automatic to prevent release of LNG vapor or liquid to atmosphere.

14) High Level alarms in cargo tanks /buffer LNG tank – To alert the operator and in case of 99% or 99.5% initiate ESD.
15) Water spray system (IMO Spray / Deluge system) – Ready in case of fire.
16) Water curtain system – To protect the hull from thermal shock in case of LNG spill.
17) The spill tray under the manifold is designed to withstand the cryogenic temperature of LNG Liquid and the contents are designed to be drained overboard via a dedicated drainpipe.
18) Double hull vessels to prevent damage to the cargo tanks in case of collision or grounding.

Procedural Controls

1) Establish safe parameters before planning the ship to ship (STS) operation in terms of maximum tank pressures.

2) Internal transfer of cargo should not be carried out on FSU during the berthing operation and if at all absolutely necessary then a full risk assessment must be carried out and shared with the LNGC.

3) ESD System is tested after connection of the transfer hoses. ERC system is tested.

4) STS checklists to be followed and all terms must be complied with

5) Cargo hoses and connections to be pressure tested to at least 1 bar higher than the normal working pressure. Maximum manifold pressures and cargo load rate to be agreed in the JPO (Joint Plan Operation) to prevent over pressurization of the cargo transfer hoses.

6) Maintaining an efficient cargo watch, deck and Central Control Room (CCR) to be continuously manned by suitably qualified personnel.

7) Agree on the weather parameters to stop transfer, disconnect the hoses and depart.

8) Standby Tug (Guard tug) is present to assist in case required.

To mitigate fire/ explosion the following safeguards will be implemented:

Planned Controls

To extinguish any gas fires the primary method is to isolate the leak. The residual fires can then be extinguished with appropriate medium. LNG fires produce very high heat energy which is radiated outwards.

1) High pressure alarms – To alert the operator.

2) Very high-pressure alarms and associated ESD – Shutting down of systems to prevent rapid over pressurization.

3) Gas detection system – To alert operator of any leak in the system and it initiates the ESD if gas concentration exceeds alarms limits in certain areas.

4) ESD system – Fusible plugs – In case of fire they will trigger ESD system.

5) Water spray system (IMO Spray / Deluge system) – It will cover essential areas of the vessel with sea water to protect the system from heat damage due to radiation.

6) Fixed firefighting system – DCP hoses and monitors are located on the FSU and LNGC for extinguishing any gas related fires.

7) Noven/ CO_2 firefighting systems are present for Motor Room/ Compressor Room and Engine Room.

8) Fire detection system – Flame sensors and heat sensors are present on both LNGC and FSU for early detection of any fire/ smoke and trigger an alarm and shutdown.

Procedural Controls

1) Firefighting systems on both vessels must be fully operational and serviced as per manufacturers' requirement and tested as per vessels planned maintenance system.
2) ESD System is tested after connection of the transfer hoses. ERC system is tested.
3) STS checklists to be followed and all terms must be complied with.
4) Maintaining an efficient cargo watch, deck and CCR to be continuously manned by suitably qualified personnel who are well rested before their watch.
5) Rig the fire hoses on deck, DCP monitors to be ready to be operated remotely Portable extinguishers are kept forward and aft of manifold.
6) No Smoking regulations are enforced.
7) Stop cargo transfer operations if thunderstorms/ lightning occurs in the vicinity.
8) Stand by tug (Guard tug) should have adequate firefighting equipment, DCP system is highly preferred.
9) Before connection and disconnecting of the cargo transfer hoses, they must be properly purged with nitrogen till the HC concentration reduces below 1.5% HC volume.

4.1.3.2.2 NATURAL HAZARDS

The occurrence of natural hazards such as typhoons and earthquakes have been considered in the design of the facility. However, these natural hazards when they occur, depending on their magnitude, can result to potential structural and mechanical damages to the LNGC, FSU, onshore LNG buffer tank, jetty, gasification units, pipelines and other equipment. These damages can potentially result to LOC and subsequently to fire/explosion in the presence of an ignition source. **Table 4-7** lists the natural hazards at the project site.

Potential consequences of these hazards are:

- Injury to personnel or at the extreme case fatality;
- Damage to infrastructure and equipment including the extreme possibility of sinking/grounding of LNGC/SRU;
- Oil pollution if the bunker oil tank failure occurs as a result of damage to LNGC;
- Shutdown of operation and loss of production; and
- Loss of reputation.

Table 4-7. Project Hazards Register: Natural Hazards

SN	Hazard Category	Hazardous Event Description	Potential Consequence
1	Extreme Weather	Typhoons/ Strong wind/ Heavy rains	Structural/ Mechanical damage to LNGC /FSU/ jetty/ Regasification Terminal leading to potential LOC (LNG/NG), fire/ explosion
			Collision between LNGC/ FSU/ jetty resulting to damage that leads to LOC (LNG and bunker oil), fire/ explosion
			Grounding/ Sinking of LNGC/ FSU
2	Lightning	Lightning strike	Damage to control systems and equipment in LNGC/ FSU/ and Regasification Terminal
			Ignition of a LOC leading to fire/ explosion
3	Seismic Activity	Earthquake	Structural/Mechanical damage to facilities leading to LOC, fire/ explosion
		Tsunami/ Big waves	Structural/Mechanical damage of LNGC/ FSU/ jetty leading to potential LOC, fire/ explosion
			Grounding/ Sinking of LNGC/ FSU/ jetty
4	Sediment Buildup	Sediment buildup beneath the FSU	Damage to FSU hull

SN	Hazard Category	Hazardous Event Description	Potential Consequence
5	Subsidence	Subsidence due to settlement	Overstressing of pipework leading to LOC and potential fire

An earthquake can occur without any warning so there is no preventive action, which can be taken.

In case of typhoons and storm surge, adequate warning is available. It is prudent to unberth the FSU and let it sail out to sea till the typhoon passes the port area.

Planned Controls

1) Port meteorological observatory to provide adequate warning if any tsunami / storm surge / typhoon is expected.

2) Vessels hard arms/ flexible hoses have an envelope of safety (about 2 meters for hard arms and 4 meters for flexible hoses) so minor earthquake and aftershocks can be absorbed without the risk of failure.

3) ESD systems will activate in case this safety envelope is breached and the arms/ hoses will be disconnected.

4) Some jetties are designed with emergency hooks for mooring ropes, which can be released remotely.

Procedural Controls

1) Follow the shipboard contingency plan for the corresponding emergency.

2) Stop all transfer operations and prepare to depart.

3) Main engines should be ready in short notice.

4) Standby tug can be called to assist in maintaining position if required.

5) FFE is in constant readiness to deal with any other emergencies, which may arise (i.e. fire and LNG/NG release).

6) BOG management should be ready for use.

4.1.3.2.3 COLLISION OF LNGC AND FSU

In addition to extreme weather (see **Table 4-7**), aberrations in tug boat operation, mooring, loss of power/steering and human error during berthing and departure of the LNGC can result to collision between the LNGC and FSU/jetty (refer to **Table 4-8**). Depending on the severity of the collision the damage can result to LOC (LNG and/or bunker oil).

Potential consequences of these hazards are:

- Injury to personnel or at the extreme case fatality;
- Damage LNGC/FSU/jetty including the extreme possibility of sinking of LNGC/FSU;
- Oil pollution if the bunker oil tank failure occurs as a result of collision;
- Shutdown of operation and loss of production; and
- Loss of reputation.

Table 4-8. Project Hazards Register – Hazards Resulting to LNGC and FSU Collision

SN	Hazard Category	Hazardous Event Description	Potential Consequence
1	Tug boat operation failure	Low impact collision due to failure of one or more	Low impact collision resulting to structural damage to LNGC, FSU/ jetty

SN	Hazard Category	Hazardous Event Description	Potential Consequence
		tugs (i.e. approach of LNGC to FSU is disrupted due to the failure of one or more tugs)	
		Man overboard	Personnel injury/ fatality
2	LNGC Power Failure	Loss of power/ steering/ engine malfunction – uncontrolled approach	Collision between LNGC/ FSU /jetty resulting to damage that leads to potential LOC (LNG and bunker oil), fire/ explosion
			Grounding of LNGC/ FSU
3	Failure of Mooring	Line/ hook/ dolphins failure	Over tensioning in ropes and mooring lines leading to personnel injury
			Loss of mooring leading to collision between LNGC and FSU and potential LOC (LNG and bunker oil), fire/explosion
			Excessive LGNC/ FSU movement
4	Improper LNGC berthing and departure	Human error in maneuvering the LNGC during berthing and departure	Collision between during berthing and departure of the LNGC resulting to damage to LNGC and FSU and potential LOC (LNG and bunker oil)

The following control measures will be implemented to reduce the risk of collision to low level.

Planned Controls

1) Qualified pilot and/or mooring master is mandatory for berthing and unberthing operations.
2) Both vessels will be equipped with radars system/ Electronic Chart Display and Information System (ECDIS) to warn them of any risk of collision with other vessels.
3) Speed sensors to warn the pilot/ mooring master if the approach needs to be slowed down.
4) Adequate fenders to be placed as per ship to ship compatibility. Secondary fenders to be positioned correctly.
5) Sufficient number of adequately powered tug boats to be used for berthing and unberthing operations.
6) Primary and secondary communications established. Complete communications failure is an abort criterion.

Procedural Controls

1) Mooring master and pilot exchange should be thorough, entire operation plan to be sent to the vessels in advance for the master to be familiar with the contents and be aware what to expect.
2) Navigation warning (safety message) broadcast by vessel traffic service (VTS)/ Port. Pilot to be aware of traffic movements.
3) Day time and night signals displayed to indicate restricted in ability to maneuver. Tugs to control movement of vessels.
4) Ship to Ship (STS) checklists to be followed and all terms must be complied with.
5) Pre and post operation steering checks to be completed as per SOLAS (Safety of Life at Sea), Astern test prior to arrival.
6) Berthing vessel to be maneuvered under standby conditions with full redundancy.
7) Vessels to be provided with accurate and up to date weather forecast. Weather to be actively monitored by both vessels. And weather parameters as laid down are strictly adhered to.

8) Maintaining an efficient bridge watch by qualified navigating officers and crew who are well rested before watch.
9) Sufficient personnel manning the engine room for standby conditions.
10) Speed to be limited as per vessel force/fender calculations. Pilot/ Master to monitor this to maintain 0.15 kts, but in any case, not to exceed 0.3 kts.
11) Port must have guidelines to regulate traffic whenever the LNGC is in the port area. Maintain an exclusion zone around the LNGC. Escort tug to accompany the vessel from Pilot boarding till berth and also from berth to Pilot disembarking position.
12) Joint Plan Operation (JPO) to state maximum approach speed for LNGC when it is vicinity of FSU.
13) Maximum angle of approach must be agreed upon.
14) It would be highly recommended that the Pilot and Master are trained in the port specific simulator. Environment limits agreed must be simulated in the simulator to study the best way to conduct the maneuver.

4.1.3.2.4 TERRORIST ATTACK/ SABOTAGE

Deliberate acts of sabotage or a terrorist attack can occur at any stages or operation. Likelihood of such attacks will vary according to the location and current threat levels to the port.

In case of a terrorist attack/ sabotage the impact on the facilities can be devastating and can lead to the following consequences:

- LNG/NG release to the environment resulting to fire/ explosion;
- Oil spill due to breach in the hull (bunker tanks);
- Personnel injury/ fatality; and
- Damage to business and loss of reputation.

Planned Controls

1) Both vessels will be equipped with radars/ AIS (Automatic Identification System) to identify vessels in vicinity.
2) CCTV cameras located at strategic locations on vessels and terminals.
3) Intelligence reports obtained by the Company Security Officer (CSO)/ Port Facility Security Officer (PFSO) through the national law enforcement agency.
4) Physical barriers/ razor wire barricade around the terminal to block access from land.
5) No photographs of the facility are allowed to be taken.
6) Ships and terminal equipped with firefighting equipment (FFE) to deal with secondary emergencies which can arise after a terrorist attack.

Procedural Controls

1) Guard boats/ police boats escorting the LNGC during her movements and enforcing clear zone around the vessels.
2) International Ship and Port Facility Security (ISPS)) Code is implemented on both vessels and the terminal facility. Both vessels are maintaining watch on waters surrounding the vessel.
3) If the threat assessment warrants, then armed gun boats should be used for patrol and escort.
4) Shipboard contingency plans to be followed to tackle any emergency arising from any attack.
5) No unauthorized personnel allowed to be on board vessels or the terminal
6) Declaration of Security signed, and all operating procedures agreed.
7) Inform terminal in advance of any crew change/ stores expected during the stay.

4.1.3.2.5 SERIOUS OCCUPATIONAL SAFETY INCIDENTS (PERSONAL INJURY)

Personal Injury is a risk which can occur during any stage of the operation. Operation may suffer delays due to requirement to get reliefs at the last minute. The following control measures will be implemented to eliminate/minimized occupational safety hazards.

Planned Controls

1) Company SMS procedures will be followed, consistent with the requirements laid down in the ISM Code and Code of safe working practices.
2) Operating companies of both LNGC and FSU will have ISO 18001 Certification.
3) Minimum PPE standards to be stated in the Company's SMS and also any additional PPE requirements. Personnel being transferred must always wear a floatation device.
4) Personnel transfer baskets must be certified and tested as per regulations.
5) Crane used for personnel transfer must be certified for that operation.
6) Both vessels and terminal will have personnel trained in administering First Aid to the casualty when required.
7) Vessels and terminal must be equipped with first aid equipment's including AED (automated external defibrillator) and oxygen resuscitator.
8) Both vessels will have equipment required to transfer the personnel to shore using cranes/ stretcher for sending to further treatment

Procedural Controls

1) Permit to work system to followed for personnel transfer between vessels using the certified ships crane.
2) Personnel in connecting and disconnecting cargo transfer hoses must be properly trained for the operation. LNGC crew to assist them only if required. Tool box talk (TBT) to be carried out prior each operation.
3) No hot work or enclosed space entry to be carried out during the STS operation.
4) Personnel working on the manifold must be wearing appropriate PPE (e.g. visor and goggles).
5) Both vessels and terminal must be manned by adequately trained and certified personnel.
6) The Port facility must have a suitable health care facility and have an agreement with any advanced health care facility in the vicinity where the casualty can be transferred without delay.
7) Immigration authorities must clear the arrival formalities immediately on arrival every time. This will ensure that in case of any accident the casualty can be transferred ashore with minimum delay.
8) Work/ rest hour's requirements for all crew and officers must be complied with.
9) An appropriate drill should be held within 24 hours and in any case not more than 7 days before commencing STS transfer operation (applicable for LNGC).
10) The JPO must have clear instructions on actions to be taken in case of any emergencies and the personnel involved in the operation must be familiar with the plan so injury can be minimized while dealing with the emergencies. The Emergency Plan must include the following scenarios:
    - Vessel collision during mooring/ unmooring maneuver;
    - Cargo spill;
    - Flammable LNG/NG release;
    - Fire/ explosion;
    - Mooring failure;
    - Emergency unmooring; and
    - Emergency on own vessel or other vessel involved in operations.

4.1.3.2.6 ACCIDENTAL OIL SPILL

The risk of oil pollution is moderate during berthing and unberthing of vessels. This may occur as a result of collision and bunker tank failure. Controls to prevent collision can be referred to address that risk.

The FSU or LNGC may be undertaking an internal bunker transfer of gas oil during her stay at berth during which time there is a risk of oil pollution.

If the terminal provides bunkers to the FSU and LNGC then risk of pollution during that period is high.

Oil pollution incidents have a high adverse impact on both vessels in terms of cleanup cost, damage to reputation and delays.

The following control measures are to be implemented to eliminate/minimize oil pollution:

Planned Controls

1) All deck scuppers are plugged before berthing operations.
2) Shipboard Oil Pollution Emergency Plan (SOPEP) approved by the flag state is present on both vessels and all personnel are trained and aware of the requirements.
3) Clean up equipment is kept ready on deck for ships where the hydraulic system is in use for cargo systems or mooring systems.
4) Vessels planned maintenance system covers the routine inspection and pressure testing of all oil pipelines and associated machinery.
5) If bunkers are being provided at the berth, then it must only be carried out either before or after LNG transfer operation.
6) The port facility must have rapid deployment kits ready to be used in case of any oil pollution incidents.

Procedural Controls

1) Deck watch is maintained with sufficient number of trained personnel and must keep constant watch over the waters surrounding the ship.
2) In case of draining rainwater, the surface is checked for any oil traces and the water drained after confirmation from shore. Absorbent pads can be used to filter out even minor traces of oil.
3) Mooring winch save all trays and bunker tank save all trays are plugged.
4) No internal bunker transfer shall be carried out during the STS operation.
5) A floating oil boom can be rigged around the vessel during their stay alongside by the guard tug.
6) Contact details for local contacts for oil pollution incidents must be mentioned in the JPO and posted in CCR / Bridge.
7) In case bunkers are being provided to the LNGC then the terminal must develop a SOPEP and distribute the same to the FSU and LNGC before arrival. All precautions as mentioned in the Company's bunkering checklist and Terminal SOPEP must be complied with.

4.1.3.3 CREDIBLE HAZARD CONSEQUENCE

4.1.3.3.1 JET FIRE

A jet fire occurs following the ignition and combustion of pressurized flammable fluid continuously released from a pipe or orifice, which burns close to its release plane. The high heat intensity poses a hazard to personnel and causes damage to unprotected equipment due to direct flame impingement, causing it to fail within several minutes. Jet flames dissipate thermal radiation, away from the flame's visible boundaries and transmit heat energy that could be hazardous to life and property.

4.1.3.3.2 POOL FIRE

The released flammable material which is a liquid stored below its normal boiling point, will collect in a pool. The geometry of the pool will be dictated by the surroundings. If the liquid is stored under pressure above its normal boiling point, then a fraction of the liquid will flash into vapor and the remaining portion will form a pool in the vicinity of the release point. Once sustained combustion is achieved, liquid fires quickly reach steady state burning. The heat release rate is a function of the liquid surface area exposed to air. An unconfined spill will tend to have thin fuel depth (typically less than 5 mm) which will result in slower burning rates. A confined spill is limited by the boundaries (e.g. a dyke area) and the depth of the resulting pool is greater than that for an unconfined spill. Pool fires are less directional and so may affect a larger area although it is mostly influenced by wind conditions. They will also cause structural failure of equipment although the time taken is longer than jet fires.

4.1.3.3.3 VAPOR CLOUD DISPERSION / FLASH FIRE

Flash Fire occurs when a vapor cloud of flammable material burns. The cloud is typically ignited on the edge and burns towards the release point. The duration of flash fire is very short (seconds), but it may continue as Jet fire if the release continues. The overpressures generated by the combustion are not considered significant in terms of damage potential to persons, equipment or structures. The major hazard from flash fire is direct flame impingement. Typically, the burn zone is defined as the area the vapor cloud covers out to the LFL. Even where the concentration may be above the UFL, turbulent induced combustion mixes the material with air and results in flash fire.

4.1.4 RISK ANALYSIS

As specified in the Technical Scoping Agreement, risk analysis will be limited to the delineation of hazard distances and areas using worst-case scenario analysis, as Quantitative Risk Assessment (QRA) will be undertaken once the final engineering design is already approved. As such, a consequence analysis of identified event scenarios was undertaken.

The consequence analysis focused on worst-case accident scenarios involving the release of LNG or natural gas from the FSU storage tanks, from the LNG onshore buffer tank (OBT), and from the natural gas pipeline going to the power plant. LNG was modelled as methane since the substance contains 90.52% methane based on the LNG specifications provided for the project.

4.1.4.1 EVENT SCENARIOS

Loss of LNG containment leading to hazardous event outcomes such as pool fires, jet fires, vapor cloud fire and vapor cloud explosion were analyzed. Hazard footprints were calculated and mapped. The particular scenarios selected are shown in **Table 4-5**. All scenarios assumed full-bore rupture of discharge lines from the LNG tanks and full-bore rupture of natural gas pipeline to the powerplant. Two meteorological conditions were assumed: atmospheric stability Class F (moderately stable) with wind speed of 2 meter per second (mps) and atmospheric stability Class D (neutral) with wind speed of 5 mps.

Table 4-9. Description of selected event scenarios

Unit/Scenario/Scenario Designation	Hole Diameter (cm)	Hole Area (cm^2)	Scenario Description
A. LNG Storage Tanks in FSU	30	707	Full-bore rupture of LNG discharge line from FSU tank leading to LNG loss of containment. Pool fire (PF), vapor cloud flash fire (VCF), or vapor cloud explosion (VCE) results with ignition.
1. FSU-D5-PF	30	707	Pool fire resulting from full-bore discharge line rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
2. FSU-D5-VCF	30	707	VCF resulting from full-bore discharge line rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
3. FSU-D5-VCE	30	707	VCE resulting from full-bore discharge line rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
4. FSU-F2-PF	30	707	Pool fire resulting from full-bore discharge line rupture under F2 (moderately stable, 5 mps wind) atmospheric conditions.

Unit/Scenario/Scenario Designation	Hole Diameter (cm)	Hole Area (cm^2)	Scenario Description
5. FSU-F2-VCF	30	707	VCF resulting from full-bore discharge line rupture under F2 (moderately stable, 5 mps wind) atmospheric conditions.
6. FSU-F2-VCE	30	707	VCE resulting from full-bore discharge line rupture under F2 (moderately stable, 5 mps wind) atmospheric conditions.
B. Onshore LNG Buffer Tank (OBT)	25.4	507	Full-bore rupture of OBT LNG discharge line leading to LNG loss of containment. Pool fire (PF), vapor cloud flash fire (VCF), or vapor cloud explosion (VCE) results with ignition.
1. OBT-D5-PF	25.4	507	Pool fire resulting from OBT full-bore discharge line rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
2. OBT-D5-VCF	25.4	507	VCF resulting from OBT full-bore discharge line rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
3. OBT-D5-VCE	25.4	507	VCE resulting from OBT full-bore discharge line rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
4. OBT-F2-PF	25.4	507	Pool fire resulting from OBT full-bore discharge line rupture under F2 (moderately stable, 5 mps wind) atmospheric conditions.
5. OBT-F2-VCF	25.4	507	VCF resulting from OBT full-bore discharge line rupture under F2 (moderately stable, 5 mps wind) atmospheric conditions.
6. OBT-F2-VCE	25.4	507	VCE resulting from OBT full-bore discharge line rupture under F2 (moderately stable, 5 mps wind) atmospheric conditions.
C. Natural Gas Pipeline (NGP) to Power Plant	15	177	Full-bore rupture of NGP pipeline leading to LNG loss of containment. Jet fire (JF), vapor cloud flash fire (VCF), or vapor cloud explosion (VCE) results with ignition.
1. NGP-D5-JF	15	177	Jet fire (JF) resulting from NGP full-bore e rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
2. NGP-D5-VCF	15	177	VCF resulting from NGP full-bore e rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
3. NGP-D5-VCE	15	177	VCE resulting from NGP full-bore e rupture under D5 (neutral stability, 5 mps wind) atmospheric conditions.
4. NGP-F2-JF	15	177	Jet fire resulting from NGP full-bore e rupture under F2 (moderately stable, 2 mps wind) atmospheric conditions.
5. NGP-F2-VCF	15	177	VCF resulting from NGP full-bore rupture under F2 (moderately stable, 2 mps wind) atmospheric conditions.
6. NGP-F2-VCE	15	177	VCE resulting from NGP full-bore rupture under F2 (moderately stable, 2 mps wind) atmospheric conditions.

4.1.4.2 CALCULATION OF HAZARD DISTANCES

Four outcomes of loss of LNG containment were analyzed. These were jet fires, pool fires, vapour cloud fire (VCF) and vapour cloud explosion (VCF). The hazardous event impact criteria or endpoints used are shown in **Table 4-1**, **Table 4-2** and **Table 4-3** in **Section 4.1.1.5** (Methodology).

4.1.4.3 MODELING TOOL

ALOHA®5.4.7 (Areal Locations of Hazardous Atmospheres), software developed by USEPA and NOAA was used to come up with distances and footprints of various accident scenarios involving the release of LNG and natural gas from storage and in the pipeline. LNG was modelled as liquefied methane, as the substance contains at least 90.52% methane as indicated in the gas specifications for the project.

The Areal Locations of Hazardous Atmospheres (ALOHA) is an atmospheric dispersion modeling software jointly developed by USEPA and NOAA that is used for evaluating releases of hazardous chemicals. Originally developed to estimate how a toxic cloud might disperse after an accidental chemical release, the present version of ALOHA can model threats from chemical releases that could result in fires or explosions. It can model the following key hazards related to chemical releases that result in toxic gas dispersions, fires, and/or explosions. These key hazards are toxicity, flammability, thermal radiation (heat), and overpressure (explosion blast force). The model can calculate the rate of release for chemicals from tanks, puddles, and gas pipelines. It can model many release scenarios including toxic gas clouds, BLEVEs, jet fires, vapor cloud explosions, and pool fires. Its scenario-specific output, includes threat zone plots, threat at specific locations, and source strength graphs.

4.1.4.4 WEATHER DATA

Two (2) atmospheric stability classes and wind conditions that are prevalent at the project site were used in modeling. The weather stability class and wind speed combinations that were used in the study are shown in **Table 4-10**. Data from PAGASA were used in modeling, unless specified otherwise. The wind speed of 2.0 mps was used to represent the low wind speed condition. Ambient temperature was assumed as 30°C.

Table 4-10. Atmospheric stability classes and wind speeds used in modeling

Designation	Atmospheric Stability Class	Wind speed (mps)	Description
D5	D	5	Neutral stability condition- moderate wind speed
F2	F	2	Moderately stable condition-low wind speed

4.1.4.5 LOSS OF CONTAINMENT AND FACILITY CONDITIONS

Table 4-11 shows the assumptions on conditions surrounding the LNG loss of containment (LoC).

Table 4-11. Assumptions on Facility Conditions

Item	Description/ Value
A. LNG Storage Tanks on FSU	
Volume capacity per tank (m^3)	27,400
Number of tanks	5 sets
Max inventory of LNG that can be contained in the FSU	137,000 m^3
Type of tank	Spherical, double-walled (IMO Type B, MOSS)
Contents of tank	LNG
Max. Operating pressure (barg)	0.12
Storage temperature (°C)	-162
Tank diameter (m)	40
LNG discharge pipe diameter (cm)	30
B. LNG Onshore Buffer Tank	
Volume capacity per tank (m^3)	40,000
Number of tanks	1
Max inventory of LNG that can be contained in the buffer tank (m^3)	40,000
Type of tank	Single-containment, aboveground, cryogenic, cylindrical, bunded (110% of tank capacity)
Contents of tank	LNG
Tank design pressure (barg)	0.25

Item	Description/ Value
Storage temperature (ºC)	-162
Tank diameter (m)	40.0
Tank height (m)	42.3
Nominal diameter of output pipeline (m)	0.254
Pool Fire Diameter (m)	80
C. Natural Gas Pipeline to Power Plant	
Operating pressure (barg)	65
Operating temperature (ºC)	60
Pipeline nominal diameter (cm)	15

4.1.4.6 RESULTS OF CONSEQUENCE MODELLING

4.1.4.6.1 CALCULATION OF DISTANCES TO IMPACT CRITERIA

Using the ALOHA 5.4.7® software, the outcomes of postulated LNG releases were quantified in terms of distances and footprints to specified impact criteria or hazard endpoints. The derived distances were used to map the injury and fatality zones of event scenarios. **Table 4-12** shows the amount of LNG released from the hole specified, the amount burned (for pool fire and jet fire scenarios), the pool diameter formed on the water surface, the maximum flame length (for pool and jet fires), and the release or burn duration. ALOHA® limited the release duration to a maximum of 60 minutes.

Table 4-12. Amount of LNG released/burned, resulting pool diameter, flame length and burn duration

Scenario Designation	Hole Diameter (cm)	LNG Amount Released (kg)	LNG Amount Burned (kg)	Pool diameter (m)	Max. Flame length (m)	Release/Burn Duration (min)
A. LNG Storage in FSU						
1. FSU-D5-PF	30	801,244	801,244	64	78	60
2. FSU-D5-VCF	30	801,244	-	54	-	60
3. FSU-D5-VCE	30	801,244	-	54	-	60
4. FSU-F2-PF	30	801,244	801,244	64	78	60
5. FSU-F2-VCF	30	801,244	-	55	-	60
6. FSU-F2-VCE	30	801,244	-	55	-	60
B. Onshore LNG Buffer Tank (OBT)						
1. OBT-D5-PF	25.4	1,120,760	1,120,760	76	84	60
2. OBT-D5-VCF	25.4	672,595	-	80	-	60
3. OBT-D5-VCE	25.4	672,595	-	80	-	60
4. OBT-F2-PF	25.4	1,120,760	1,120,760	76	87	60
5. OBT-F2-VCF	25.4	588,063	-	80	-	60
6. OBT-F2-VCE	25.4	588,063	-	80	-	60
C. Natural Gas Pipeline (NGP) to Power Plant						
1. NGP-D5-JF	15	336,527	336,527	-	16	60
2. NGP-D5-VCF	15	336,527	-	-	-	60
3. NGP-D5-VCE	15	336,527	-	-	-	60
4. NGP-F2-JF	15	336,527	336,527	-	16	60
5. NGP-F2-VCF	15	336,527	-	-	-	60
6. NGP-F2-VCE	15	336,527	-	-	-	60

Table 4-13 below shows the calculations for the distances to the various consequence impact criteria. The relevance of each impact criteria is described in **Table 4-1** to **Table 4-3** in **Section 4.1.1.5** (Methodology).

Table 4-13. Maximum distances to consequence impact criteria

Scenario Designation	Distance to LoC (m)							
	Vapor Cloud Concentration for VCF		Thermal Radiation for PF/JF (kW/m^2)			Explosion Overpressure for VCE (psi)		
	0.6LFL	1.0 LFL	5	12.5	35	1	3.0	5
A. LNG Storage Tanks in FSU								
1. FSU-D5-VCF/PF or JF/ VCE	353	198	226	144	81	NE	NE	NE
2. FSU-F2-VCF/PF or JF/VCE	178	123	226	144	81	NE	NE	NE
B. Onshore LNG Buffer Tank (OBT)								
1. OBT-D5- VCF/PF or JF/VCE	409	301	265	170	98	260	NE	NE
2. OBT-F2- VCF/PF or JF/VCE	219	130	265	170	97	NE	NE	NE
C. Natural Gas Pipeline (NGP) to Power Plant								
1. NGP-D5- VCF/PF or JF/VCE	205	141	78	51	30	NE	NE	NE
2. NGP-F2- VCF/PF or JF/VCE	206	139	78	50	30	NE	NE	NE
Legends: NE – not exceeded								

4.1.4.6.2 FOOTPRINTS OF ACCIDENT CONSEQUENCES

Accident consequences of concern are in terms of fatality or injury to people. The potential areas of injury or fatality as a result of the postulated worst-case accident scenarios were plotted as footprints on Google map of the project site. Hazard footprints, as generated by ALOHA® were plotted on maps of the area using the software MARPLOT®.

Footprints of the hazard zones are in shown in **Figure 4-3** to **Figure 4-9**.

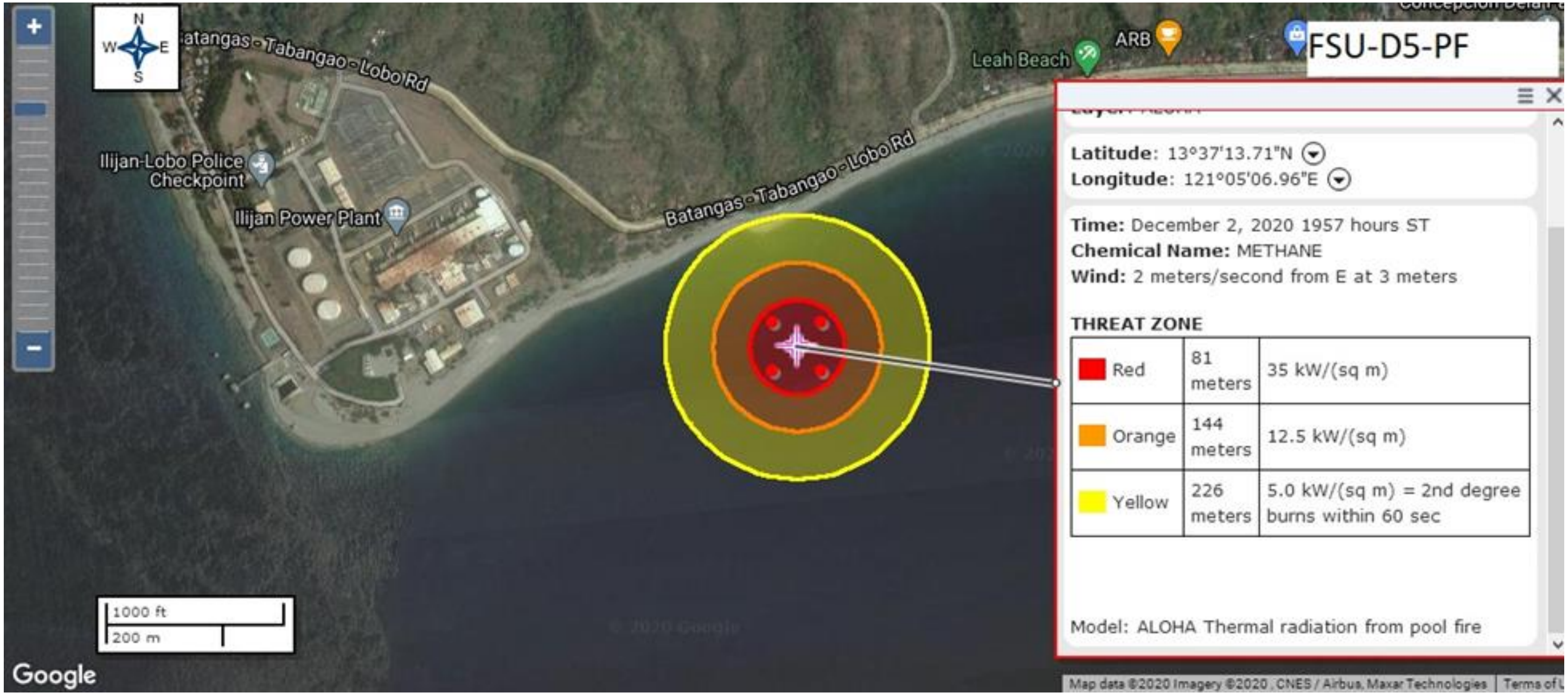


Figure 4-3. Hazard Footprint of LNG LoC at FSU leading to Pool Fire

Figure 4-4. Hazard Footprint of LNG LoC at FSU leading to Vapor Cloud Fire

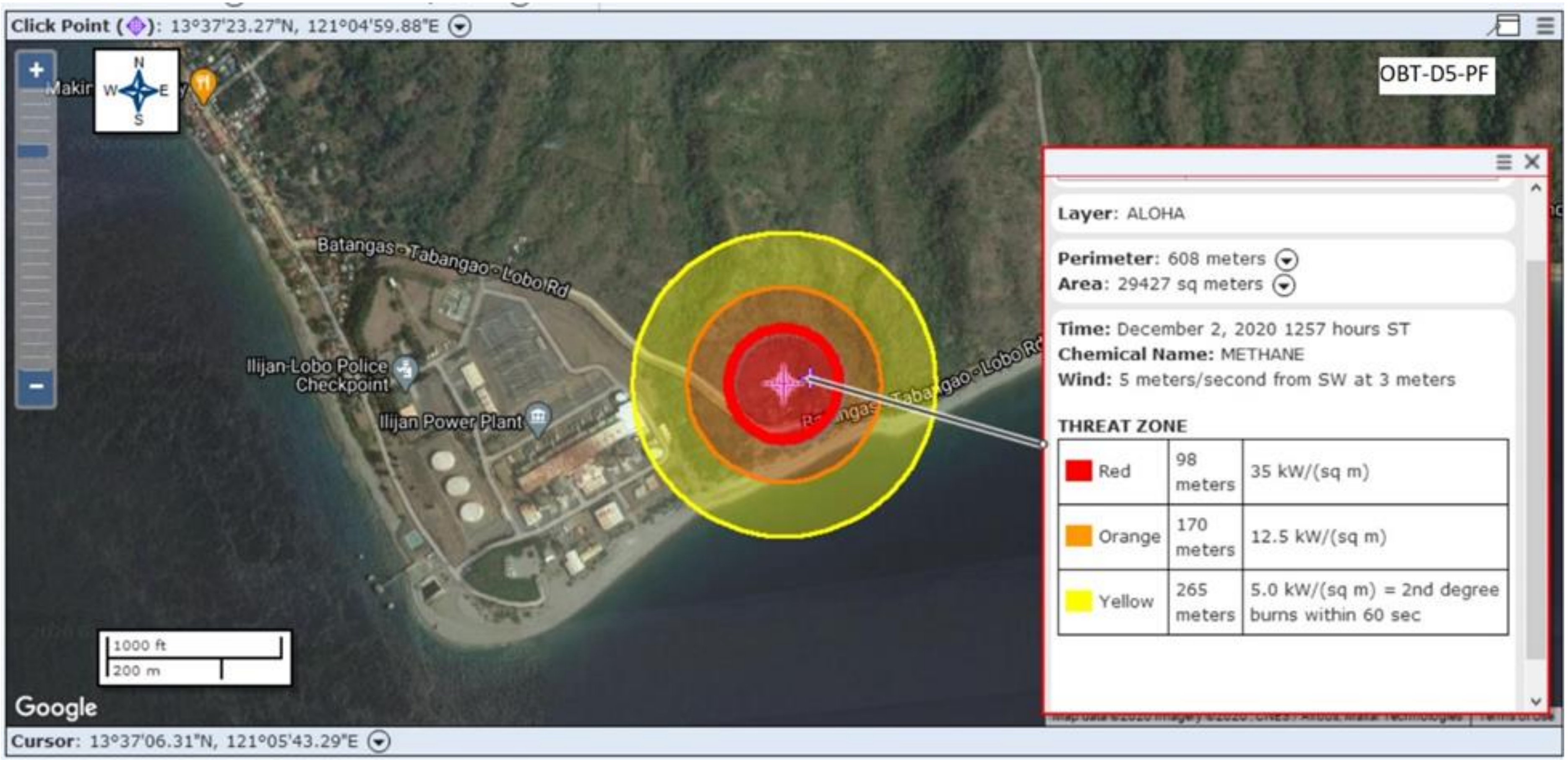


Figure 4-5. Hazard Footprint of LNG LoC at OBT Leading to Pool Fire

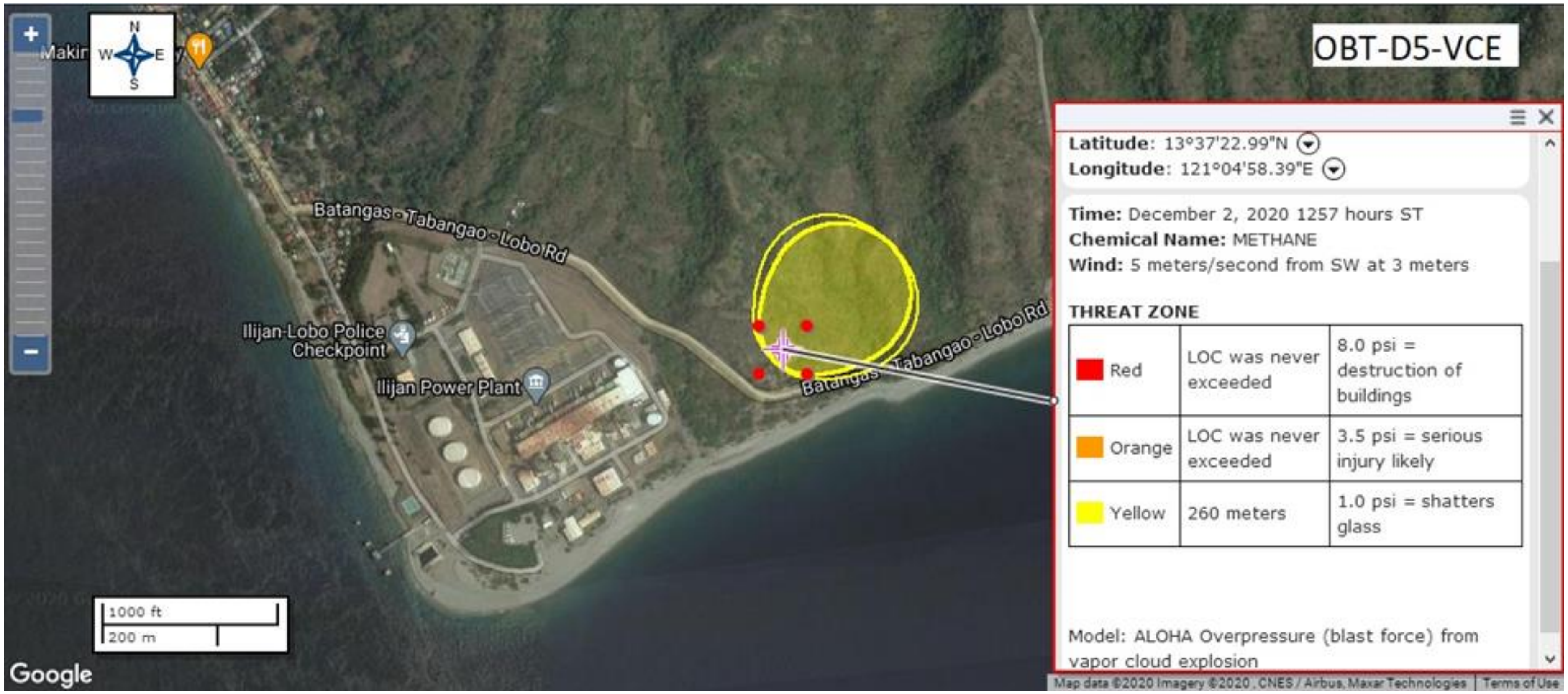


Figure 4-6. Hazard Footprint of LNG LoC at OBT Leading to VCE

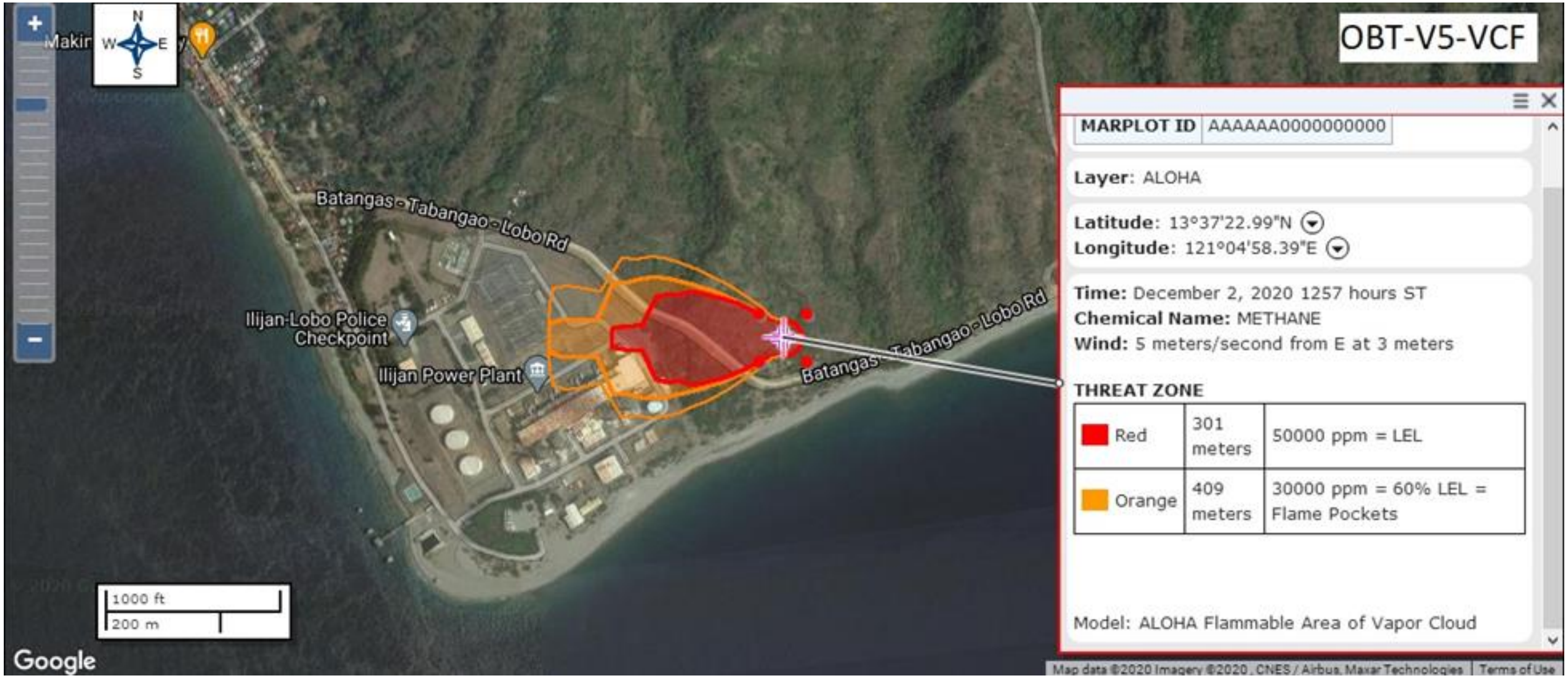


Figure 4-7. Hazard Footprint of LNG LoC at OBT Leading to VCF

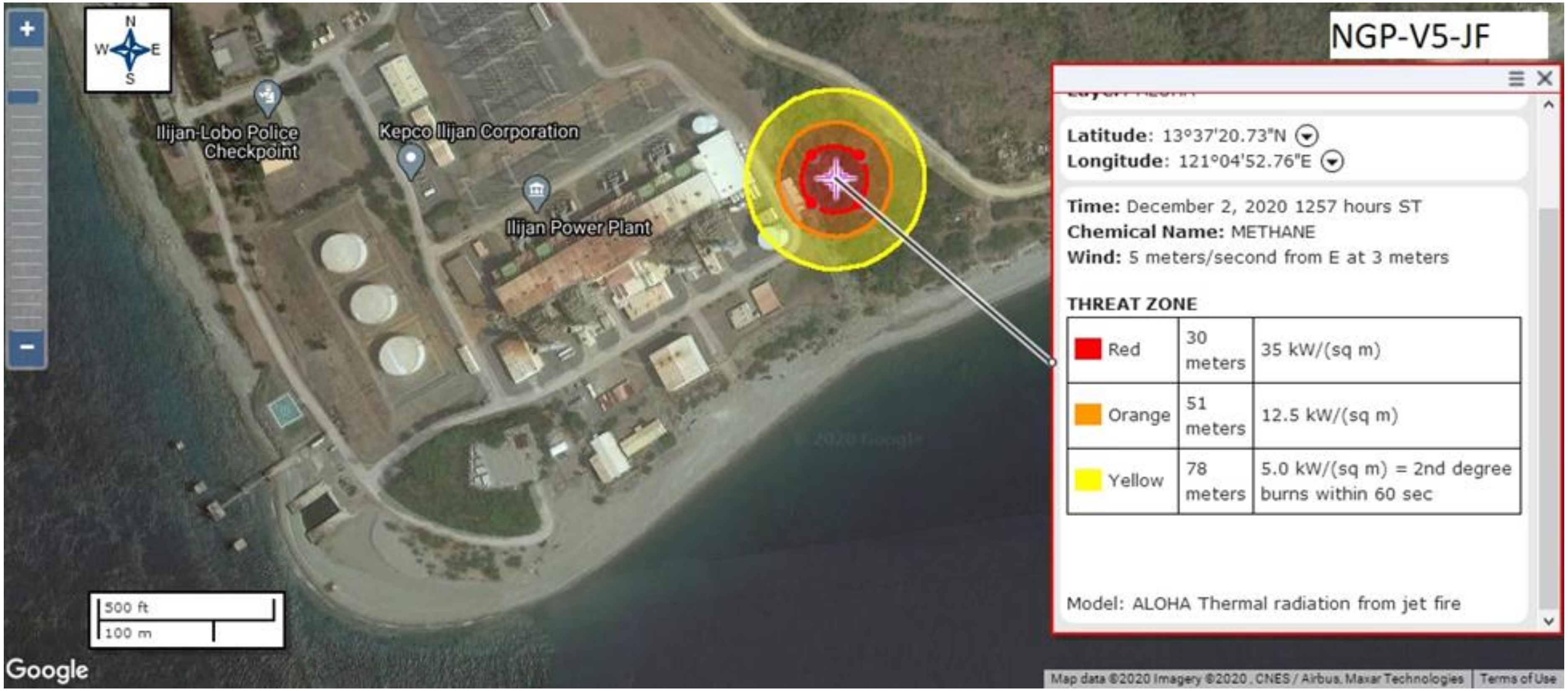


Figure 4-8. Hazard Footprint of LNG LoC at NGP Leading to Jet Fire

Figure 4-9. Hazard Footprint of LNG LoC at NGP Leading to VCF

4.1.4.6.3 SUMMARY OF CONSEQUENCE ANALYSIS

Consequence modeling of LNG/ NG loss of containment at various areas of operation at the LNG terminal showed the risk of fire and explosion accident scenarios that included the propagation of pool fires, jet fires, vapor cloud fire (VCF) and vapor cloud explosion (refer to **Table 4-9**). The hazard radii from fatal doses of thermal radiation (12.5 to 35 kW/m^2) from pool fires and jet fire ranged from 30m to 170m. Vapor cloud fires (VCF) reached distances ranging from 178m to 409m for 0.6LFL (pocket fires) and from 123m to 301m for 100%LFL. VCF occurring at the OBT had the longest reach at 409m for 0.6LFL and 301m for 100%LFL. The event outcome of vapor cloud explosion (VCE) was mostly not reached. It only occurred at the OBT at the lowest impact criteria of 1.0 psi (10% serious injuries due to flying broken glass and missiles) corresponding to a radius of 260m.

At the FSU. At the FSU, pool fire thermal radiation dose of 35 kW/m^2 (100% fatality) reached a radius of 81m (refer to **Figure 4-2**). The thermal dose of 12.5 kW/m^2 (7% fatality) at FSU reached a radius of 144m, while the zone of serious burns (5 kW/m^2) had a radius of 226m. All hazard radii from pool fire at FSU are mostly limited offshore. Hazard footprints from VCF arising from 100%LFL reached distances of 123m to 198m. Impact criteria from VCE were not reached.

At the OBT. The postulated accident scenarios at the OBT exhibited the worst consequences compared to other areas in the study. Fatal thermal radiation from pool fire had the longest radii at 98m for 35 kW/m^2 (100% fatality) and 170m for 12.5 kW/m^2 (7% fatality). 100%LFL of VCF reached 301m. VCE was also shown to be possible at 1.0 psi (possible 10% serious injuries) corresponding to a hazard distance of 260m.

Natural Gas Pipeline to Power Plant. Fatal thermal radiation from jet fire reached a radius of 30m for 35 kW/m^2 and 51m for 12.5 kW/m^2. 100% LFL for VCF had hazard distances ranging from 139m to 141m. Hazard impact criteria for VCE were not reached.

4.2 EMERGENCY RESPONSE PLAN

4.2.1 ESD AND SAFETY SYSTEMS

4.2.1.1 FIRE EMERGENCY SHUT DOWN (ESD) SYSTEM

The alarms initiated by the detection systems perform some automatic fire protection actions via the Safety Control System (SCS) to the ESD system (refer to the ESD Philosophy document).

The SCS interface system also gives to the operator detailed information on areas involved in the hazardous event, type of hazard, concentration of gas, where in the area (if applicable), detector or loop involved, status of fire water pumps, status of protection systems, status of HVAC equipment involved (fans, dampers,.), wind force and direction, temperature and relative humidity, system faults, reduced safety in the fire zones.

The alarms initiated by the detection systems perform some automatic fire protection actions via the SCS to the ESD system (refer to the ESD Philosophy document).

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4.2.1.2 SAFETY SYSTEM

4.2.1.3 DETECTORS FOR EACH TARGET

The monitoring and control system for the safety assurance in THE TERMINAL includes;

- PCS (Process Control System)
- ESD (Emergency Shutdown System)
- F&G (Fire and Gas Detection) System and Spill Detection System (FSGDS)

The PCS is provided to ensure the monitoring and control of process and utilities equipment, as well as their interlocking and tripping by process conditions. Automated plant procedures will free up the Operators, allowing them to monitor Plant conditions, and concentrate on areas requiring corrective action.

The ESD and FSGDS are collectively called as Safety Control System (SCS). SCS used to automatically prevent the occurrence of any physical situation which could potentially cause loss, damage or undesirable effects on personnel, environment, plant equipment, production, raw material and property. It:

- rapidly and reliably detects an LNG spillage, a leakage of flammable gas, a fire condition or any other specific incident (information about fire, LNG spillage and leakage of gas are collected through the "Fire, Spill and Gas Detection System";
- performs monitoring of active protection systems, sequential functions and activation of alarms (with alarm filtering to allow proper Operator response) and of some automatic fire protection actions;
- initiates emergency shut-down actions for returning the LNG Terminal areas to a safe condition as required.

F&G and spill detection System would be the main monitoring for the terminal. The F&G system will perform the following functions;

- F&G system would rapidly and reliably detect a fire condition, LNG leakage (cold detection), or gas cloud.
- F&G system would monitor critical process and protection systems and activate alarms to PCS, which is monitored by the operators.
- F&G system would activate automatically the specified safety actions and manipulation of valves in order to minimize process hazardous condition and prevent escalation of potentially hazardous situations.
- Area Isolation and emergency shutdown shall be initiated manually by ESD system, because its malfunction has a significant impact on gas send-out or LNG unloading, etc.

Seismic acceleration monitoring shall be provided, giving signals to automatically initiate the plant shutdown in the case of a high seismic event.

4.2.1.4 BERTHING/UNLOADING OPERATIONS MONITORING AND CONTROL SYSTEMS

Since berthing and unloading operations represent potential credible risks, the following systems/provisions are provided for the safety of both the Terminal and LNG Carrier (LNGC):

For the berthing operations:

- Environmental conditions:

  All environmental conditions, like wind, tide and waves will be available from the meteorological station located at Batangas City. The critical information required for the berthing operations such as wind direction and speed shall be measured continuously by a meteorological station. This information will be transmitted in real time to the operator and to the pilot, on board of the carrier.

- Communication System:

  Communication facilities are provided between ship and shore, consisting of electronic data (and telephone) links plus a VHF radio system.

For the unloading operations:

In addition to the above described facilities (Environmental conditions, MMS, communication).

Emergency Release System on Unloading Arms:

A Powered Emergency Release Coupler (PERC) with Double Ball Valves (DBV) is included in the unloading/loading arms.

Position Monitoring System (PMS):

A Position Monitoring system is provided to monitor the condition of unloading/loading arms, in relation to their ultimate reach and alert the operator of the need to take corrective actions.

4.2.1.5 FLARING SYSTEM AND RELIEF VALVES

The Terminal is designed to the philosophy of "minimum venting and flaring" with the following principles:

- In normal operation no gas is flared.
- Thermal relief valve or vent discharges are collected in a drain vessel itself connected, via the boil-off gas header, to the LNG tanks vapor space.
- Under upset conditions, due to the hazardous flammable properties of LNG and Natural Gas, most emergency process gas releases from pressure relief valves are collected in a gaseous effluent system which is connected to a central elevated flare stack, except discharges from LNG tank safety valves for excessive vapor rate production conditions (in case of roll-over, significant fall in barometric pressure, abnormal heat input, etc.), and jetty KO drum which are released to atmosphere at a safe location.
- The flare capacity is determined by the greatest release between the pressure safety valve of the re-condenser and the boil-off rate corresponding to an unloading operation without boiloff compressor or return gas blower.

4.2.1.6 CONTROL OF STRATIFICATION AND ROLLOVER RISK

The rollover phenomenon, which produces an excessive rate of vapour evolution, may occur if different sources of LNG are allowed to stratify in the LNG storage tanks.

To prevent stratification well before rollover occur the following equipment and facilities are provided:

- Top and bottom feed nozzles on the LNG tanks.
- LNG density/temperature measurement in the LNG tanks.
- The possibility to circulate LNG via LP pump recirculation, and on-line monitoring of LNG properties during unloading.

However, for additional safety, the pressure relief valves on the LNG tanks are sized to release the maximum vapor volume, which could be generated in case of rollover.

4.2.1.7 CCTV (CLOSED CIRCUIT TELEVISION CAMERAS) MONITORING

Remote operated cameras shall be installed for viewing all events which could occur in hazardous and unmanned areas.

Under abnormal circumstances the operator has the ability to use these CCTV systems to analyze the situation.

Cameras shall be provided for visual surveillance of process and critical areas and to detect suspicious motions within critical areas in accordance with a security plan.

The critical areas are: the jetty head, the penetrations on each tank roof, the compressor area, the high pressure pumps area, the vaporiser area, the flare stack, the metering area and the utilities.

The system is generally considered as a priority load and is connected to an UPS system.

4.2.2 F&G DETECTION

Comparing with the LNG leakage, gas leakage tends to occur at anywhere in the process area, thus from the early detecting concept, there should be gas detectors installed at appropriate and strategic locations all over the LNG Regasification terminal.

These gas detectors will be connected to and will inform the gas detection alarm to the Fire and Gas Detection (F&G) System.

Possible hazards and their mode of detection is shown below.

No.	Hazard	Detection System
1	Possibility of smoldering fire inside building such as the initial stages of a fire involving cardboard or electric wires.	Smoke detectors
2	Evolution of high levels of hydrogen during over charging and reverse charging operation at Battery Room	Hydrogen gas (H_2) detectors
3	Possibility of fire in Electrical and instrument room panels	High Sensitivity Smoke Detection System
4	Smoke and fire detected by human beings	Manual Alarm call points
5	Air Intake System	Smoke Detectors
6	Emergency Diesel Generator	Heat Detector for Engine Enclosure
7	Gas reducing and Gas compressors stations	Natural Gas detector
8	Hypo chlorination room	Hydrogen gas(H_2) detector

4.2.3 FIRE PROTECTION SYSTEMS (ACTIVE AND PASSIVE)

4.2.3.1 STEEL STRUCTURE PROTECTION AGAINST FIRE

Steel structures main elements, equipment and/or important parts of equipment, of which the failure could involve additional hazard in case of a pool fire, shall be protected, when located within a “fire-hazard zone” (FHZ).

Fireproofing shall be decided for the Terminal as per API 2218 and OISD – STD-164.

Fire Hazard zone extent will be 9.1 m horizontal and 12.2 vertical as per OISD-114.

The protection level for structures shall be 1 ½ hours according to the UL 1709 test.

In case of Pipe rack fireproofing:

- When a pipe rack is within a fire exposed envelope, fireproofing should be used for all vertical and fire horizontal supports up to and including the first level.
- If a pipe rack carried piping that has a diameter greater than 6 inches at levels above the first horizontal beam or large hydrocarbon pumps are installed beneath the rack, fireproofing should be considered up to and including the level that is nearest to a 30-foot (9.1 meter) elevation.

The means of fireproofing are well described in section 7.3 of API 2218. There is a preference for light weight vermiculite concrete or light weight cementitious fireproofing for cost reasons. Where fireproofing needs to be removed for maintenance, endothermic wrap shall be preferred.

Concrete in general has proven to be highly resistant to fire and is therefore the prime choice for structures.

Emergency shutdown valve should be located outside the Fireproofing Zone.

4.2.3.2 FIRE FIGHTING FACILITIES

The terminal would comprise the following firefighting systems and facilities:

- Large capacity fresh water reservoir;
- Fire water loop, which is usually filled with fresh water;
- Dry chemical powder system for relief valve manifold and Jetty for loading/unloading arm;
- Water spray system;
- Water curtain system;
- High expansion foam generator system;
- Water sprinkler system only for rooms provided in warehouse and workshop;
- Hydrant and mobile extinguisher in the building;
- Outdoor hydrant and monitor; and
- Fire fighting vehicle.

Fresh water will be used as the firefighting water via fire water loop. The loop would be usually filled and pressurized with fresh water so that the water from the loop could be used immediately as needed.

The firefighting facilities design will be based on the philosophy to maximize the use of installed equipment to allow the LNG Regasification Terminal operators to be an effective first line of defense.

4.2.4 HAZARDOUS AREA CLASSIFICATION

The Classification of STF (slip, trip and fall) areas shall be carried out in accordance with API 505.

The resulting hazardous areas shall be shown on layout drawings, clearly showing the following Zone definitions, as appropriate: Zone 0. In which an explosive gas mixture is continuously present, or present for long periods.

- Zone 1: In which an explosive gas-air mixture is likely to occur in normal operation.
- Zone 2: In which an explosive gas-air mixture is not likely to occur in normal operation and if it occurs will exist only for a short time.

4.2.5 OCCUPATIONAL HEALTH/ PERSONNEL SAFETY

4.2.5.1 PERSONAL PROTECTION

Suitable personnel PPE shall be provided for day to day operation and non-routine activity.

Induction training will be required for site personnel prior to performing tasks and work activities or entering site areas in which PPE is required.

Safety signs shall be provided warning of hazards and the need for protective equipment throughout the facilities. The signs shall be clear, easy to understand and consistent throughout the facility.

4.2.5.2 ESCAPE ROUTES

Safe, direct and unobstructed exits, access, and escape routes shall be provided from all normally manned areas of the site to temporary refuge, muster areas and embarkation or evacuation points.

4.2.5.3 MUSTER AREAS

Easily accessible muster areas shall be clearly defined on the site. All muster areas shall be suitably sized to enable efficient accounting of personnel. Areas shall be suitably arranged to enable movement of stretchers. Muster areas shall be provided with suitable protection and facilities, including lighting and communications, for use in identified accidental events.

4.2.5.4 FIXED LADDERS

Fixed ladders should have equal rises in successive flights wherever practicable.

Access points to the head of ladders from platforms and walkways should be protected by self-closing gates or chains. No part of the ladder should project onto the passageway.

Where the ladder climbing height exceeds 9m, rest platforms should be provided at 6m intervals.

Protective cages shall be provided for all ladders wherever personnel could fall a distance of 2.3m or more or come into contact with dangerous equipment.

4.2.5.5 EMERGENCY LIGHTING

All manned areas on the unit or installation shall be equipped with emergency lighting, which is supplied from the emergency source of power. The illumination level shall be sufficient to ensure that necessary emergency response actions, including reading of signs and layouts, can take place efficiently.

Escape routes, access routes and exit points shall be marked and illuminated so they are readily identifiable in an emergency.

4.2.6 CONTAINMENT SYSTEMS

4.2.6.1 SPILLAGE COLLECTION, INCLUDING PAVING IN HAZARDOUS AREA

Restricting the extent of a potential leak is achieved by:

- limiting the volume of the possible accidental spills; and
- containing these spills within defined collecting areas, such as parts of the rainwater drainage network or in dedicated impoundment pits, to prevent their spreading to other areas of the LNG Regasification Terminal and to minimize the vapor cloud dispersion.

Spill collecting areas are designed to contain LNG that could be released in case of equipment or system failure. Such accidental LNG spillage is more likely to occur at operating process equipment and valve nests rather than from piping itself.

The LNG spill containment is generally achieved by a specific drainage system. This drainage system shall be built with sloped concrete surfaces beneath the LNG containing equipment and main valve nests with collecting trenches directing the spillage away from equipment or piping into a separate area.

The LNG containment sumps shall be as small as possible consistent with the requirement of providing sufficient volume to contain a potential spill at critical location.

Impoundment basin calculation sheet is attached with the document as Attachment-I. In general, the goals of the spill collection systems are to prevent:

- spread of cryogenic liquid from the immediate spill area to other PLANT areas or areas outside the LNG Regasification Terminal;
- flammable vapor concentrations from process equipment spills from spreading outside the LNG Regasification Terminal boundary; and
- ignition of any LNG or gas under uncontrolled conditions.

If ignition of accidentally released gas or liquid occurs despite safety precautions, the spill collection areas shall serve to minimize the fire size to;

- reduce heat fluxes to the surroundings;
- localize the need for fire protection; and
- minimize the size of fire protection equipment required for fire control.

Provision is taken to properly remove rainwater whilst LNG spill will be contained in the collecting systems by gravity drainage or pumps. If there is a spill of LNG into this collection system it will automatically seal and prevent pump or drain operation.

Each collection sump is provided with a cold detection probe.

4.2.7 ACCESS AND ESCAPE ROUTES

4.2.7.1 DIRECT ACCESSIBILITY TO VALVES AND EQUIPMENT

This is achieved by providing in the TERMINAL all the required safe accesses, paths, staircases (ladders) and platforms.

As a minimum two (2) escape ways are provided in all possible cases, except for platforms shorter than six (6) meters in length. Where practical, platforms will be connected to allow Operator circulation, avoiding single access situations where frequent access is expected.

The road system shall be developed to provide a direct access for the fire fighting trucks and other emergency response vehicles.

Accessibility and escape routes & ways shall be verified at different steps during the design reviews.

The roads in (or around) process areas shall be concrete surfaced to allow circulation during heat radiation.

4.2.8 PLANT AND PERSONNEL SAFETY

4.2.8.1 ORGANIZATION AND PREPARATION FOR OPERATIONAL SAFETY CONTROL

The organization for operational safety control shall be established to secure full-time safety in the LNG Regasification Terminal. For this organization, it is important to clarify the roles and responsibilities of all personnel.

The organization and preparation for plant operation shall include:

- Personnel training;
- Development of Plant Operations, Maintenance and Inspection procedures;
- Development of Safety, Emergency and Security Procedures, which integrate the overall JPL
- Emergency Procedures and International Ship and Port facilities Security (ISPS) where relevant

4.2.8.2 TRAINING

Every person related to the LNG Regasification Terminal operation shall receive the appropriate training and be familiar with the risks involved in the tasks to be performed. At the time of introducing hydrocarbons all remaining staff shall be familiar with the properties of LNG and be aware of all operational, emergency and safety procedures in place.

- The training will include:
- Theoretical courses;
- On the job training of key peoples in an operating LNG terminal;
- On the job training during pre-commissioning and commissioning;
- Emergency response training; and
- Confined entry training.

Re-training should be undertaken at regular intervals and all records of these training shall be kept as the action stipulated in the emergency procedures would not be realized without repetitive training and drill. The periodical training and drill without advanced notice would be helpful for each personnel to be familiar with the emergency activities.

4.2.8.3 DEVELOPMENT OF TERMINAL OPERATING PROCEDURES

The Operation and Maintenance Manuals, prepared by the CONTRACTOR, on basis of supplier documentation, shall then be developed by the Operator into procedures and instructions.

4.2.8.4 DEVELOPMENT OF TERMINAL SAFETY PROCEDURES

LNG Regasification Terminal safety procedures are prepared to cover aspects as:

- Safe working practice;
- Personnel safety objectives;
- Alarm, emergency and evacuation situations;
- Access to hazardous and restricted areas;
- The application of "Permit to Work" procedures (welding, cutting, burning, etc.);
- Rules for safe maintenance works;
- Appropriate safety protective equipment to be worn (safety helmets, gloves, goggles, ear defenders and overalls), breathing apparatus where applicable;
- Road traffic & ship regulations;
- Main access roads to be kept clear at any time for fire appliances;
- Firefighting duties (operation of hydrants, monitors, extinguishers, sprinkler systems, etc.;
- Smoking restrictions;
- Mobile phone, matches and equivalent materials restrictions;
- Commissioning safety procedures;
- Housekeeping rules to keep the Terminal clean and tidy; and
- Overall Batangas City area Emergency Response Procedures and communication with the Batangas City Authorities.

These procedures shall be integrated in the Safety Management System for the LNG Regasification Terminal.

4.2.9 SAFETY SIGNS

The provision of safety signs is an important feature of personnel safety. Safety signs shall be pictorial as far as practicable.

Every building and area of the facility shall be provided with sufficient exits to permit the prompt escape of personnel. Exits shall be arranged to provide free and unobstructed egress from all parts of every building, structure, section or area at all times. Diverse escape routes shall be provided for high occupancy areas to ensure safe escape in event of one route is blocked.

Safety Signs and Notices are intended to alert or draw attention towards objects and situation, which effect or could affect health, safety & integrity of workers or worksite. It shall be provided as required throughout the plant area. Graphic signs shall be prominently displayed to identify locations of safety, firefighting and survival equipment.

Safety signs and notice shall conform to all performance aspects meet the requirements of BS 5378 and BS 5499.

4.2.10 SECURITY RISK MANAGEMENT

4.2.10.1 SECURITY STRATEGIES TO MANAGE RISK

Risk avoidance is applying safeguards that eliminate or reduce the remaining uncontrolled risks for the vulnerability. Risk avoidance can be achieved through training and education, and implementing technical security controls and safeguards. It can also be achieved through the use of policies. Risk avoidance identifies as many threats or vulnerabilities as possible and implement strategies to mitigate those threats, reducing the impact of an attack.

Risk transference is the shifting of the risk to other areas or to outside entities. The overall goal is to allow someone else accept the risk. When looking at ways to transfer risk, it would evaluate things such as services. Many services can be outsourced such as application services and IT services. An outside organization may be able to offer an experience in a certain area to your organization that you simply cannot fill. Hiring an outside organization is transferring the risk to them for that development.

Risk mitigation is reducing the impact should the vulnerability be exploited. With risk mitigation it is the expectation that it is not a matter of if something happens, it is a matter of when. And when something does happen you want to have policies and procedures in place to mitigate that. These risk mitigation strategies include disaster recovery plans, incident response plans and business continuity plans.

Risk acceptance understands the consequences and accepts the risk without control or mitigation. There will always be risk. It is impossible to eliminate risk, so therefore there needs to be analysis of these things. This is achieved by determining the level of risk to the information. There is need to evaluate the probability of an attack versus the likelihood that that vulnerability will be exploited. Another way risk can be analyzed for risk acceptance is through evaluating the controls that are in place and ensuring that there are strong justifications for risk.

4.2.10.2 PROTECTIVE SECURITY MEASURES

4.2.10.2.1 DETER

Dissuade adversaries from conducting an attack by making each element within the boundary line appear too physically/technically difficult to overcome without likelihood of detection/ failure/ capture.

<u>Examples</u>

- Install a security rated fence and commensurately rated portals around the site, which combined with appropriate signs emphasizes the strength of the security measures. The number of portals should be kept to an absolute minimum.
- Introduce random, visible security patrols around the site.
- Utilize signage on a sacrificial fence line highlighting the use of CCTV cameras and security lighting.

4.2.10.2.2 DETECT

1. To identify suspicious behavior at the perimeter boundary.
2. To identify unauthorized intrusions across the boundary line.

3. To raise an alarm and initiate further investigation.
4. Verify all perimeter intrusion alerts.
5. Initiate an appropriate response to a threat or attack as early as possible.
6. Enable verification of attack force size/threat/direction of travel to the responding security team.

Examples

- Install a perimeter intrusion detection system and CCTV camera system capable of detecting and tracking an intrusion at all times of the day and night.
- Use fixed and pan-tilt-zoom cameras along with lighting to detect an intruder and track their direction of travel once inside the perimeter.

4.2.10.2.2.1 DELAY

1. Maximizing the time taken for an attack to breach the perimeter once detection has taken place.
2. Prevent an attack from breaching the perimeter.

Examples

- Install an approved security barrier and portal which maximizes delay.
- Install approved hostile vehicle mitigation measures around the perimeter.

4.2.10.2.3 MITIGATE

1. Use of perimeter protection measures to minimize the impact of an attack whilst considering the potential of the security equipment to add to the effects of an attack.
2. Maximize the protection provided at access points at the perimeter.

Examples

- Consider the materials perimeter protective measures are constructed from (e.g. glass) to ensure materials selected minimize additional injury (e.g. laminated glass).
- Locate screening facilities in areas where the effects of an attack will be contained and limited.

4.2.10.2.4 RESPONSE

1. Determine what responses are required at the perimeter for the range of threats that the site faces and ensure measures are tied into response.
2. Where appropriate, exercise response plans involving all relevant internal and external stakeholders.
3. Consider the ability of a response force to access an incident, including where the incident has affected access points.

Examples

- Use of perimeter detection system to determine an attack is taking place and its location, and the use of standard operating procedures to deploy an internal security team to investigate.
- Incident response plans which include the use of multiple entry points to a range of incidents.
- Close coordination with the Law Enforcement Units, AFP and the Philippine Coast Guard to assess the suitability of the waterway for LNG marine traffic.
- LGUs plays an important role in the LNG Terminal Project.

4.3 SUMMARY AND RECOMMENDATIONS

This Environmental Risk Assessment (ERA) was prepared for the proposed Ilijan LNG Import Facility Project of Linseed Field Power Corp. (LFPC). It was undertaken in compliance with the scoping agreement between the EMB and LFPC and was intended to identify and characterize the hazards and risks associated with the project; present the planned safety features, philosophy and plans of the facility; and recommend measures to further strengthen the project's management of risks.

As stipulated in the Technical Scoping Agreement with EMB, this Environmental Risk Assessment will be mainly qualitative in nature. The quantitative aspect will mainly deal with the delineation of hazard distances and areas using worst-case scenario analysis. The Quantitative Risk Assessment (QRA) will be separately undertaken based on the final engineering design.

Hazards associated with the Project are fire/explosion from storage, regassification and distribution of LNG and natural gas. As a cryogenic substance, loss of containment of LNG can lead to embrittlement and eventual failure of structures and serious injuries to exposed persons. LNG vapors are extremely flammable such that LoC's may lead to pool fires, jet fires, vapor cloud fires or explosion. Natural hazards such as earthquakes, strong winds, extreme weather events (typhoons, torrential rains), storm surge, flooding and subsidence can contribute to LNG LoC's that can increase the probabilities of hazardous outcomes of fires and explosion events. Other contributory factors to loss of containment are ship collision, ship grounding, mechanical impacts, terroristic attacks and human errors. Other hazardous substances that may contribute to risks from fire and/or toxicity are diesel and glycol, the effects of which are minimal. Occupational health and safety hazards include cryogenic impacts and asphyxiation from exposure to LNG, slips, fall from heights, mechanical impacts from objects, crushing injuries, and fall into water and drowning. Toxicity effects may also result from exposure to trace toxic components of LNG, diesel and glycol.

Consequence analysis based on worst-case accident considerations was undertaken to assess the fire and explosion hazards of LNG and natural gas on the project site. Consequence modeling of LNG/ NG loss of containment at various areas of operation at the LNG terminal showed the risk of fire and explosion accident scenarios that included the propagation of pool fires, jet fires, vapor cloud fire (VCF) and vapor cloud explosion. The hazard radii from fatal doses of thermal radiation (12.5 to 35 kW/m2) from pool fires and jet fire ranged from 30m to 170m. Vapor cloud fires (VCF) reached distances ranging from 178m to 409m for 0.6LFL (pocket fires) and from 123m to 301m for 100%LFL. VCF occurring at the LNG Onshore Buffer Tank (OBT) had the longest reach at 409m for 0.6LFL and 301m for 100%LFL. The event outcome of vapor cloud explosion (VCE) was mostly not reached. It only occurred at the OBT at the lowest impact criteria of 1.0 psi (10% serious injuries due to flying broken glass and missiles) corresponding to a radius of 260m. The postulated accident scenarios at the OBT exhibited the worst consequences compared to other areas in the study.

Given the risks associated with the proposed Ilijan LNG Import Facility Project, the Proponent has integrated safety features in the design of facilities and plans to install the needed safety facilities, instrumentation and organization. Safety features include Fire Emergency Shut Down and Safety System, Fire and Gas Detection (F&G) System, Fire Protection Systems (Active and Passive), Hazardous Area Classification System, Occupational Health/ Personnel Safety Protocols, Spill Containment Systems, Security Risk Management Plan, and the Plant and Personnel Safety Plan.

The following are some recommendations to further enhance management of environmental risks at the proposed Ilijan LNG Import Facility Project:

- Daily site visit and inspection of the facility by the Health & Safety Officer;
- Monthly internal audit of Terminal Operations;
- Annual safety audit of the Terminal Facility by a Third-Party Safety Auditor;
- Conduct of QRA and HAZOP based on final engineering design of the facility;
- Certification for ISO 45001 (International Standards for Occupational Health and Safety Management);
- Review and finalization of an Oil Spill Contingency Plan; and
- Review and finalization of the Emergency Response Plan based on Health and Safety Philosophy and final engineering design

CHAPTER 5 SOCIAL DEVELOPMENT PLAN AND IEC FRAMEWORK

5.1 SOCIAL DEVELOPMENT PLAN

Indicative social development planning is necessary for formulating programs and strategies that would mitigate the major impacts of the project. This would guide the proponent in preventing/mitigating and/or enhancing a project's adverse and positive impacts on people's livelihood, health and environment.

Social development plan (SDP) aims to assess and identify the basic needs of the communities which will be affected by the project. SDP should be patterned in the Municipal and Barangay Development Plans of the host communities and in accordance with the mandated Corporate Social Responsibility. It aims to establish a strong relationship between the Project Proponent, community institutions, and stakeholders towards the goal of achieving an improved quality of life of the residents of the host localities.

The issues that were raised during the public scoping were considered and addressed in the formulation of SDP. Moreover, issues obtained from perception survey were also included. These are the following:

- Impacts on marine life and livelihood
- Temperature of the seawater discharge
- Safety regarding the inlet
- Possible leak of gas from the terminal
- Increase in noise level
- Livelihood programs for the impact communities
- Spread of illness/diseases
- Possible loss of wildlife
- Flooding
- Accidents

Table 5-1. Social Development Plan

CONCERN	Responsible Community Member/Beneficiary	Government Agency/Non-Government Agency and Services (Indicative Specific Services)	Proponent	Indicative Timeline	Source of Fund
1. Gender Responsive • Livelihood/Employment and Credit Facilities *Men* - Skills development for project employment - Training and workshop on Efficient Fishing Methods *Women, Youth and Elderly* - Livelihood trainings for skill development	• Barangay Kagawad for livelihood • Qualified identified workers within the area who will be affected by the project. • BFARMC President and qualified identified affected fisher folks. • Qualified identified affected residents in the vicinity of the project area	• LGU City Planning Officer • CSWD ○ Pro-poor Livelihood programs • CAO ○ Workshop on efficient fishing methods	Community Relations Officer	• Pre-construction • Construction • Operation	LGU-IRA/ PROPONENT
2. Health and Safety • Health & Safety Training for employees • Lung health-related programs for employees and community - Provision of clinic, medicine, and health worker	• Barangay Kagawad for Health ▪ Barangay Health Workers ▪ Barangay Nutrition scholars • Barangays affected by the project • Project employees	• City Health Officer ○ Maternal Care and Child Health Care - Prenatal, Intranatal, Postnatal - Child birth in health centers or hospitals ○ Malnutrition - Supplemental feeding • Batangas City DRRMC	PROPONENT Community Relations Officer	• Pre-construction • Construction • Operation	LGU-IRA/ PROPONENT
3. Education and Recreation • Assistance for development of school facilities • Provision of scholarship to qualified students	• Barangay Kagawad for Education • Barangay Elementary/ Primary School Principal	• CPDO & ME of the City • DEPED of the City • Barangay Elementary Schools - Sports and Recreation Program	PROPONENT Community Relations Officer	• Pre-construction • Construction • Operation	LGU-IRA/ PROPONENT
4. Environment and Sanitation	• Barangay Kagawad for Environment	• CAO/ENRO of the City • CHO of the City - Implement the Ecological Solid Waste Management (RA 9003) - Implement Clean & Green for Barangay buffer zones - Implementation of Health & Sanitation Program - Solid Waste Management Program - Set-up community based health program in project affected areas; regular monitoring and consultation on medical services.	PROPONENT Community Relations Officer and Pollution Control Officer	• Pre-construction • Construction • Operation	LGU-IRA/ PROPONENT

CONCERN	Responsible Community Member/Beneficiary	Government Agency/Non-Government Agency and Services (Indicative Specific Services)	Proponent	Indicative Timeline	Source of Fund
5. Peace and order • Entry of migrant workers • Conflict of project workers and the community	• Barangay Kagawad for Peace and Order • Barangay Tanods	• PNP of the City ○ Provision of equipment and facilities as aid in keeping order in the community	PROPONENT Chief Security Officer	• Pre-construction • Construction • Operation	LGU-IRA/ PROPONENT
6. Spiritual	• Barangay Assigned Catholic Priest, Pastor of different denomination	• Parish Priest and Pastor ○ Spiritual Development Programs to the company and community ○ Provision of materials and facilities for spiritual programs	PROPONENT Community Relations Officer	• Pre-construction • Construction • Operation	PROPONENT
7. Impact on Fishing and Livelihood	• Fisher folks within the area • Qualified identified workers within the area who will be affected by the project. • Qualified identified beneficiaries in the vicinity of the project area that might be adversely affected. • BFARMC President and qualified identified affected fisher folks.	• OCVAS • BFAR • CAO ○ Provision of offshore and in water structures in designated areas to assist in the facilitation of marine growth. Examples of structures are artificial reefs and corals, floating rigs with lights, etc. ○ Designation of possible regulated docking areas catering to fishing vessels ○ Resource, Financial or material assistance for the provision of larger fishing vessels (such as trawlers) capable of further distances to accommodate organized fishing expeditions in further areas where more fish abounds ○ Training for fishing and fishing related skills development including fish processing, marketing, etc	PROPONENT Community Relations Officer	• Pre-construction • Construction • Operation	PROPONENT
8. Disaster Risk Reduction/Climate Change Adaptation	• Barangay Kagawad for Environment • Barangays and communities around the project area	• CDRRMC • Barangay Kagawad for Envi • Disaster Risk Management Plan ○ IEC on Disaster Risk Management ○ Seminars/training for communities and plant workers on Disaster Risk Preparedness and Mitigation	PROPONENT Community Relations Officer	• Pre-construction • Construction • Operation	PROPONENT

CONCERN	Responsible Community Member/Beneficiary	Government Agency/Non-Government Agency and Services (Indicative Specific Services)	Proponent	Indicative Timeline	Source of Fund
		○ Provision of equipment and aid in response and recovery of affected communities			

Linseed Field Power Corporation has no previous Corporate Social Responsibility Projects/Programs but is open for such activities during operations in accordance with the needs of the host barangay and in support to the Social Development Programs of the project.

5.2 IEC FRAMEWORK

A comprehensive and intensive Information Education Communication (IEC) Campaign to better inform and educate the communities and the general public as to the objective, necessity and benefits of the project, as well as the processes involved for the construction and operation of the project. These shall be done thru distribution and posting of written materials such as brochures, newsletters, media statements and articles, bulletins and posters, and online presence. Also as well as non-written types such as fora, symposia, community discussions and hearings, audio visual presentations (such as powerpoint and DVD), radio and TV programs and/or guestings, etc. The IEC materials and activities will also serve as a venue for continuous dialogue, feedback and check and balance mechanism for the parties involved.

Table 5-2. Indicative Information, Education and Communication (IEC) Plan

Target Sector identified as needing project IEC	Major topics of concern in relation to project	Strategy/ Methods	Information Medium	Indicative Timeline/ Frequency	Cost Estimate
Different sectors, organizations and resource users in the project affected barangays (i.e. education and health sectors; women's, youth, senior citizen and fishermen organizations, City and Barangay LGUs)	• Project description • EIA process • EIS findings	Group methods (Meetings, Focused Group Discussions)	• Invitation letters • Multi-sectoral cluster meetings • Audio-visual presentation • Illustrative primer about the project	Prior to project implementation	Php 50,000 per activity
Agencies and offices covering the area and marine vessel traffic and navigation, such as the PPA, the Philippine Coast Guard, Batangas Bay Coordinating Office, and others.	Sea Lane Navigation and Traffic Plan	Group methods (Meetings, Consultations, Presentations, and Audio-Visual Materials)	• Invitation letters • Partnership meetings • Audio-visual presentation	Prior to project implementation	Php 50,000 per activity
Different sectors, organizations and resource users in the project affected barangays (i.e. education and health sectors; women's, youth, senior citizen and fishermen organizations, City and Barangay LGUs)	Project impact and mitigating measures	Group methods (Meetings, Focused Group Discussions)	• Invitation letters • Partnership meetings • Focus group discussions	• Before project construction • Regular consultation during project operation	Php 50,000 per activity
• City Government of Batangas • Barangay Officials of Ilijan	Project benefits	Group method (Meetings, Focused Group Discussions, Public Meetings)	• Invitation letters • Partnership meetings • Focus group discussions	• Before project construction • Regular consultation during project operation	Php 50,000 per activity
• City Government of Batangas • Barangay Officials of Ilijan	City/ barangay requirement (i.e. clearances) of workers and employees	Group methods (Meetings, Focused Group Discussions) Multi-media	• Newspaper publication • Radio broadcast • Posters/ Flyers Meetings with LGU	At least two to three months before construction	
• Community	• Road safety during construction period • Blasting activity	Safety Precautions Visibility Advanced notice Consultation with barangay stakeholders	• Signage • Postings on barangay • Community billboards • Mobile audio announcements	• Throughout construction period	Php 50,000 per activity
• Fisher folks	• Performance against ECC conditions and EMP during construction period • Actual impacts during construction period and control measures implemented • Closure access for safety and exclusion zones	Group methods (Meetings, Focused Group Discussions) Signage	• Multi-sectoral cluster meetings (e.g. MMT meeting) • Meetings with fisherfolks association • Individual letters • Multi-sectoral cluster meeting (e.g. MMT meetings) • Local radio broadcast	• Regular/as needed during construction and operation period • During unloading activities	Php 50,000 per activity

Target Sector identified as needing project IEC	Major topics of concern in relation to project	Strategy/ Methods	Information Medium	Indicative Timeline/ Frequency	Cost Estimate
			• Announcement in barangay LGU • Visual presentation, posters, and pamplets		
• Members of Multi-Partite Monitoring Team	• Increase resiliency of the community to disasters and climate change	Group methods (Meetings, Focused Group Discussions)	• Multi-sectoral cluster meetings	Regular MMT meeting during construction	Php 50,000 per activity

CHAPTER 6 ENVIRONMENTAL COMPLIANCE MONITORING

As required under DENR Memorandum Circular 2010-14 and the Revised Procedural Manual for DAO 2003-30, the following section presents the environmental compliance monitoring plan for the project to monitor the identified key environmental impacts of the Project. This monitoring plan includes “Environmental Quality Performance Level” (EQPL) values, which are threshold/limit levels identified for each critical parameter associated with the identified significant project impacts. The limit level shall be the regulated threshold of pollutant (standard that must not be exceeded) while the action level is set lower than the limit level wherein management measures must be implemented so as not to reach the regulated threshold.

The following mechanisms and monitoring schemes are discussed in the succeeding subsections:

- Self-monitoring plan;
- Multi-sectoral Monitoring Framework; and
- Environmental Guarantee and Monitoring Fund/ Contingent Liability and Rehabilitation Fund Commitments

6.1 SELF-MONITORING PLAN

The proponent will undertake regular self-monitoring for parameters indicated in **Table 6-1**. A quarterly environmental monitoring report in the form of the Self-Monitoring Report (SMR) will be prepared by the proponent and submitted to the DENR-EMB accordingly.

Table 6-1. Self-Monitoring Plan

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
Construction Phase													
Land	Terrestrial Flora	Naturally growing/ planted species outside of the direct impact area: Abundance and Frequency Diversity Indices	Transect and Quadrat method	Semi-annual	Transects	PCO, MMT, Contractor	300,000	10% reduction in the abundance of total plant species recorded from the baseline data	25% reduction in the abundance of total plant species recorded from the baseline data	40% reduction in the abundance of total plant species recorded from the baseline data	Coordination with Barangay Officials/ DENR -off-set planting of indigenous species that can be found in the area in the designated tree planting site of the barangay	Coordination with Municipal ENRO/DENR - off-set planting of indigenous species that can be found in the area in the designated tree planting site of the municipality.	Coordination and assessment with DENR - off-set planting of indigenous species that can be found in the area in the designated tree planting site of the Enhanced National Greening Program (ENGP)
Water Quality	Marine Water Quality (Ambient)	DO, pH, Temperature, TSS, O&G	In-situ measurement using hand-held water quality tester Grab sampling and laboratory analysis	Monthly	MW1, MW2, MW3, MW4, MW5, MW6	PCO / Contractor	PHP 25,000/ station	▫ pH 6.8-7.0 or pH 8.0-8.2 ▫ Temp 25.6-26°C or Temp 28-29 °C ▫ DO 5.3-5.4 mg/l ▫ TSS 50-64mg/l ▫ O&G 2.0-2.1 mg/l	▫ pH 6.6-6.8 or pH 8.3-8.4 ▫ Temp 25.2-25.5 °C or Temp 29-30°C ▫ DO 5.1-5.2 mg/l ▫ TSS 65-75mg/l ▫ O&G 2.2-2.5mg/l	▫ pH=6.5 or pH=8.5 ▫ Temp=25°C or Temp=31°C ▫ DO=5mg/l min ▫ TSS=80mg/l ▫ O&G=3mg/l	Investigate the source and identify possible pollutant sources	▫ Investigate the source ▫ If the problem is within the construction area, conduct adjustments/ appropriate corrective action at identified pollutant source ▫ Reconduct sampling / water quality monitoring	▫ Temporarily stop activities contributing to the pollutant load ▫ Evaluate existing mitigation measures for possible need for additional mitigation measures ▫ If the source is not related to the project, inform MMT regarding possible source for the group's investigation and coordination with LGU
Air Quality	Occasional increase of fugitive and gaseous emission	Ambient TSP, PM_{10}, SO_2, and NO_2	▫ TSP and PM10– High volume/gravimetric ▫ SO_2 – Pararosaline	Monthly during construction period	Project boundary, nearest residences, and downwind of prevailing wind flows	Project proponent/ contractor	PhP 100,000 per month	≥75% of ambient standard. EQPL (Alert Mininum in μg/Nm^3) ▫ NO2 = 195 ▫ TSP = 225 ▫ PM10 = 150	≥ 90% of ambient standard. EQPL (Action minimum in μg/Nm^3) ▫ NO2 = 234 ▫ TSP = 270 ▫ PM10 = 180	NAAQS (in μg/Nm$^{3)}$ ▫ NO_2 = 260 ▫ TSP = 300 ▫ PM_{10} = 200 ▫ SO^2=340	▫ Monitor levels and determine prevailing wind flows and other meteorological condition ▫ Identify possible sources of high	▫ Check for complaints from residence ▫ Implement mitigation measures to reduce fugitive emissions during	▫ Suspend construction related work that causes exceedance with ambient levels (e.g., TSP) and implement

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
			▫ NO_2- Griess Saltzman Method					▫ SO2 =255	▫ SO2 =306		ambient concentrations	construction (e.g., water spraying) ▫ Inform management in case the proposed project is the possible source of high ambient levels based on meteorological condition	corrective measure (e.g., water spraying)
Testing and commissioning	Occasional release of gaseous emissions at the boiler stack	Stack emissions of CO, NO_X, PM, SO_X, and metals by accredited third-party stack testers	▫ NOX- U.S.EPA Methods 1 through 4 and Method 7 ▫ CO - U.S.EPA Method 3 or 10 ▫ PM – Methods 1 to 5 ▫ Metals r – USEPA Methods 1 through 5 or 29	At least once during commissioning period	Boiler stack	Project proponent/Accredited third-party stack samplers / Contractor	PhP 150,000	≥75% of NESSAP Values. EQPL (Alert Mininum in mg/Nm³) SO_X =525 NO_X = 375 PM = 112.5	≥90% of NESSAP Values. EQPL (Action Minimum in mg/Nm³) SO_X =630 NO_X = 450 PM = 135 CO = 450	NESSAP Values (in mg/Nm³) SO_X =700 NO_X = 500 PM = 150 CO = 500	▫ Monitor levels ▫ Check stack data with plant operating conditions (i.e., gas flow rates)	▫ Check air intake combustion system ▫ Supplier to correct high levels, as necessary.	▫ Suppliers/ vendor to evaluate system performance and to determine cause of exceedances (if any)
Noise	Increase of noise levels	Ambient noise level	▫ Sound level meter	Monthly or as frequent when necessary	Nearby settlements	HSE / Contractor	HSE	45 dBA	50dBA	Ambient: 55dBA (daytime) If construction is 24 hrs, 50 (evening/ morning) 45 (nighttime)	▫ Check background noise levels	▫ Continue monitoring noise levels ▫ Inform community prior to construction activities that produce very high noise levels (e.g., pile driving) ▫ Conduct noise assessment to mitigate noise	▫ Implement noise attenuation measures, if necessary

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
												source that contribute to higher noise levels	
People	Acceptability of the project to the community	Perception of the Community regarding the site development and construction process of the project	Coordination with the Community	Quarterly	Community	CRO / Envi Department / Contractor	Part of the Cost for the IEC	Negative verbal feedback on the ongoing activities	Formal complaint lodged against the ongoing activity	Multiple complaints by the community lodged in various forms or/and	▫ Investigate/ Inspect and Address the subject of negative feedback. ▫ Coordinate with the Brgy LGU and MMT.	▫ Determine and address the root cause. ▫ Conduct consultation with the Municipal LGU, MMT and EMB Regional	▫ Conduct consultation with concerned and relevant stakeholders in the community. ▫ Release an official statement for general consumption and employees.
	Workers	Health and safety of workers	Review of health and safety records of company Incident reports	Annual	Project site	Community Relations Officer / PCO / Contractor	Part of the construction cost	Negative verbal feedback of worker	Formal complaint lodged by worker	Multiple complaints lodged by workers	▫ Proponent to investigate the subject of negative feedback ▫ Coordinate with Contractor and MMT.	▫ Investigate cause of complaint, determine and address the root cause. ▫ Coordinate with contractor and MMT.	▫ Release official statement for general consumption and employees. ▫ Coordinate with contractor and MMT.
	Labor and Wage issues	Wage Rate, Benefits, and Schedule of Payment Other worker's rights related issues	HR Management	Monthly	Project Area/Office	CRO / Envi Department / Contractor	Part of the construction cost	Negative Verbal Feedback	Complaints lodged by employees	Multiple complaints by the workers lodged in various forms and agencies, or/and captured by media	Investigate/ inspect and Address the subject of negative feedback.	▫ Facilitate dialogue with concerned parties. ▫ Formulate program and timetable to address the issues raised in agreement with the concerned parties	▫ Dialogue with concerned parties and with 3rd party agency/ institution involvement, ie DOLE, BLR, churches that are neutral yet competent and conducive with conflict resolution. ▫ Formulate program and timetable to

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
													address the issues raised in agreement with the concerned parties
	Social Development and Management Plan	Projects initiated by the Proponent under the approved SDP	Community Coordination, social engagements	Quarterly	Host barangay	Community Relations Officer / Contractor	Part of the SDP Cost	Negative verbal feedback of community	Formal complaint lodged by the community	Multiple complaints by the community	▫ Proponent to investigate the subject of negative feedback. ▫ Coordinate with barangay LGU and MMT.	▫ Investigate cause of complaint, determine and address the root cause. ▫ Coordinate with barangay LGU and MMT.	▫ Conduct consultation with concerned members of the community. Release official statement. ▫ Coordinate with barangay LGU and MMT.
	Information, Education, and Communication	Implementation of IEC activities	Community Coordination, social engagements	Quarterly	Host barangay	Community Relations Officer / Contractor	Part of the IEC Cost	Negative verbal feed back to the Proponent	Formal complaint lodged by the community	Multiple complaints by the community captured by local media organizations	▫ Proponent to investigate the subject of negative feedback. ▫ Coordinate with barangay LGU and MMT.	▫ Investigate cause of complaint, determine and address the root cause. ▫ Coordinate with barangay LGU and MMT.	▫ Conduct consultation with concerned members of the community. ▫ Release official statement. ▫ Coordinate with barangay LGU and MMT.
	Unauthorized Prohibition (may either be setting up of physical barriers or prohibition of security personnel) of Access to Public Areas	Security Prohibition Practices	Community Grievance / Complaints Registry	Monthly	Project Area and Adjacent Vicinity	CRO / Envi Department / Constractor	Part of the construction cost	Negative Verbal feedbacks on Security prohibition	Formal Complaint lodged	Incidence of confrontation between project security personnel	▫ Investigate/inspect and Address the subject of negative feedback. ▫ Coordinate with the Brgy LGU and MMT to validate feedback. ▫ Conduct IEC on Protocols, Rules, Regulations and other dynamics re-	▫ Determine and address the root cause. ▫ Coordinate with the Municipal LGU, MMT and EMB Regional Office to validate complaints and determine causes, and formulate corrective actions.	▫ Conduct consultation with concerned and relevant stakeholders in the community. ▫ Release an official statement for general consumption and employees. ▫ Coordinate with MMT and EMB Central Office to discuss and

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
											access and prohibition issues and security measures ▫ Investigate/ inspect and Address the subject of negative feedback.		implement corrective actions.
	Marine Traffic	No. of vessels affected by the project in terms of cost, fuel, personnel, and other time affected aspects	Records	Quarterly	Manila Harbor Area	CRO/ Envi Department / External Liaison or equivalent/ Contractor	Minimal Cost	_% of affected vessels	_% of affected vessels	_% of affected vessels	▫ Coordinate with the pertinent agencies and MMT to validate feedback. ▫ Conduct IEC on Protocols, Rules, Regulations and other dynamics on the Sea Lane Navigation and Traffic Plan ▫ Investigate/ inspect and Address the subject of negative feedback.	▫ Determine and address the root cause. ▫ Coordinate with the pertinent agencies, MMT and EMB Regional Office to validate complaints and determine causes, and formulate corrective actions.	▫ Conduct consultation with concerned and relevant stakeholders ▫ Coordinate with MMT, pertinent agencies and EMB Central Office to discuss and implement corrective actions.
	Emission and Water Contamination Health Issues	Respiratory And Digestive System Ailments of Worker s and People in the Community	Health records	Quarterly	Project Area	CRO/ Envi Department/ Contractor	Minimal Cost	Reported/ recorded incidences of minor ailments/ illness	Formal Complaints lodged. Rapid Increase in reported/ recorded Incidences of minor ailments/ illnesses	Rapid Increase in Reported/ recorded incidences of grave ailments/ illnesses necessitating intensive treatments , or resulting in death	▫ Investigate the possible source of the subject of complaints attributed to the project. ▫ Address the root cause if investigation confirms source is from the project	▫ Conduct intensive Project-wide inspection and address root cause if upon inspection the source is confirmed to be from the project. ▫ Provide for compensation	▫ Decrease the level of operation/ aspects of operation commensurate to addressing the problem (fixing the equipment, materials, etc). ▫ Release Statement on

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
											Provide for compensation if confirmed source of ailment is from the project	of affected individuals if confirmed source of ailment is from the project ▫ Provision of personal protective equipment (PPE) to at-risk personnel and individuals	the Issue. ▫ Assist/facilitate medical care/ response to those affected. ▫ Provide for compensation of affected individuals if confirmed source of ailment is from the project
Operation Phase													
Water Quality / Air Quality / Solid waste	Daily operation maintenance	Spillage and disposal of wastes	Visual checks of spillage around tanks, pipelines among others Regular checks for improper/unauthorized release of bilge water (including wastewater, tanker washings, and oily slop) coming from ships (both company owned or service providers) including improver solid waste disposal	Daily	Project site and carriers	PCO / contractor	Minimal cost	▫ Minimal spillage /leaks ▫ Pieces of litter within the project site	▫ Visible and spillage / leaks ▫ Piles of litter / garbage	▫ Complaints of workers/ communities ▫ Presence of odor ▫ Change in ambient water and air quality values	IEC among employees and contractors regarding trash management and flyers and notices on site regarding proper disposal	Same as Alert plus reprimand or disciplinary action for those who don't comply and clean up	Continuation of Alert and Action plus dialogues to address complaints and actions moving forward
Water Quality	Marine Water Quality (Ambient)	DO, pH, Temperature, Color	In-situ measurement using hand-	Monthly	MW1, MW2, MW3, MW4, MW5, MW6	PCO	PHP 120,000/ station	▫ pH 6.8-7.0 or pH 8.0-8.2	▫ pH 6.6-6.8 or pH 8.3-8.4 ▫ Temp 25.2-25.5 °C or	▫ pH=6.5 or pH=8.5	Investigate the source and identify possible pollutant sources	▫ Investigate the source ▫ If the problem is within the	▫ Temporarily stop activities contributing to

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
		TSS, O&G, Nitrate, Phosphate, Surfactants, Phenols, Fecal Coliform, As, Cr^{6+}, Cd, Pb, Hg, Zn	held water quality tester Grab sampling and laboratory analysis					▫ Temp 25.6-26°C or Temp 28-29 °C ▫ DO 5.3-5.4 mg/l ▫ TSS 64-71mg/l ▫ O&G 2.4-2.6 mg/l ▫ Color 60-66 TCU ▫ Nitrate 8-8.99 mg/l ▫ Phosphate 0.40-0.44 mg/l ▫ Surfactants 1.2-1.34 mg/l ▫ Phenols 0.040-0.044 mg/l ▫ Fecal Coliform 160-179 MPN/100 ▫ As= 0.0160-0.0179 mg/l ▫ Cd = 0.003 mg/l ▫ Cr^{6+}= 0.03 mg/l ▫ Pb= 0.03 mg/l ▫ Hg 0.0016-0.0017 mg/l	Temp 29-30°C ▫ DO 5.1-5.2 mg/l ▫ TSS 72-79 mg/l ▫ O&G 2.7-2.9 mg/l ▫ Color 67-74 TCU ▫ Nitrate 9-9.99 mg/l ▫ Phosphate 0.45-0.49 mg/l ▫ Surfactants 1.35-1.49 mg/l ▫ Phenols 0.045-0.049 mg/l ▫ Fecal Coliform 180-199 MPN/100 ▫ As= 0.0180-0.0199 mg/l ▫ Cd= 0.004 mg/l ▫ Cr^{6+}= 0.04 mg/l ▫ Pb= 0.04 mg/l ▫ Hg 0.0018-0.0019 mg/l	▫ Temp=25°C or Temp=31°C ▫ DO=5 mg/l min ▫ TSS=80 mg/l ▫ O&G=3 mg/l ▫ Color=75 TCU ▫ Nitrate=10 mg/l ▫ Phosphate=0.5 mg/l ▫ Surfactants= 1.5 mg/l ▫ Phenols= 0.05 mg/l ▫ Fecal Coliform= 200 MPN/100 ml ▫ As= 0.02 mg/l ▫ Cd=0.005 mg/l ▫ Cr^{6+}= 0.05 mg/l ▫ Pb= 0.05 mg/l ▫ Hg= 0.002 mg/l		construction area, conduct adjustments/ appropriate corrective action at identified pollutant source ▫ Reconduct sampling / water quality monitoring	the pollutant load ▫ Evaluate existing mitigation measures for possible need for additional mitigation measures ▫ If the source is not related to the project, inform MMT regarding possible source for the group's investigation and coordination with LGU
Water Quality	Effluent from Storm Drainage System, Sewage Treatment Package	pH, Temperature, Color TSS, O&G, Nitrate, Phosphate, Surfactants, Phenols, COD Fecal Coliform, As, Cr^{6+}, Cd, Pb, Hg, Zn	In-situ measurement using hand-held water quality tester Grab sampling and laboratory analysis	Monthly	Storm Drainage System Outlet	PCO	PHP 120,000/ station	▫ pH 6.5-6.8 or pH 8.2-8.5 ▫ Temp +/- 2.4°C ▫ TSS 80-89mg/l ▫ O&G 8-8.9 mg/l ▫ Color 120-134 TCU ▫ Nitrate 16-17.99 mg/l ▫ Phosphate 0.80-0.89 mg/l	▫ pH 6.1-6.4 or pH 8.6-8.9 ▫ Temp +/- 2.7 °C ▫ TSS 90-99 mg/l ▫ O&G 9-9.9 mg/l ▫ Color 135-149 TCU ▫ Nitrate 18-19.99 mg/l ▫ Phosphate 0.90-0.99 mg/l	▫ pH=6.0 or pH=9.0 ▫ Temp+/- 3 °C ▫ TSS=100 mg/l ▫ O&G=10 mg/l ▫ Color=150 TCU ▫ Nitrate=20 mg/l ▫ Phosphate=1 mg/l	Investigate the source and identify possible pollutant sources	▫ Investigate the source ▫ If the problem is within the construction area, conduct adjustments/ appropriate corrective action at identified pollutant source ▫ Reconduct sampling /	▫ Temporarily stop activities contributing to the pollutant load ▫ Evaluate existing mitigation measures for possible need for additional mitigation measures

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
			Methods	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
								▫ Surfactants 12-13.49 mg/l ▫ Phenols 0.40 - 0. 44 mg/l ▫ Fecal Coliform 320-359 MPN/100 ▫ As= 0.0320-0.0359 mg/l ▫ Cd = 0.008 mg/l ▫ Cr^{6+}= 0.08 mg/l ▫ Pb= 0.08 mg/l ▫ Hg 0.0032-0.0035 mg/l ▫ COD 160-179 mg/l	▫ Surfactants 13.50-14.99 mg/l ▫ Phenols 0.45 - 0.49 mg/l ▫ Fecal Coliform 360-399 MPN/100 ▫ As= 0.0360-0.0399 mg/l ▫ Cd= 0.009 mg/l ▫ Cr^{6+}= 0.09 mg/l ▫ Pb= 0.09 mg/l ▫ Hg 0.0036-0.0039 mg/l ▫ COD 180-199 mg/l	▫ Surfactants= 15 mg/l ▫ Phenols= 0.5 mg/l ▫ Fecal Coliform= 400 MPN/100 ml ▫ As= 0.04 mg/l ▫ Cd=0.01 mg/l ▫ Cr^{6+}= 0.1 mg/l ▫ Pb= 0.1 mg/l ▫ Hg= 0.004 mg/l ▫ COD=200 mg/l		water quality monitoring	▫ If the source is not related to the project, inform MMT regarding possible source for the group's investigation and coordination with LGU
Water Quality	Effluent / Discharge water from Re-gasification	DO, pH, Temperature, Color TSS, O&G, Nitrate, Phosphate, Surfactants, Phenols, Fecal Coliform, As, Cr^{6+}, Cd, Pb, Hg, Zn	In-situ measurement using hand-held water quality tester Grab sampling and laboratory analysis	Monthly	Re-gasification System Discharge outlet	PCO		▫ pH 6.5-6.8 or pH 8.2-8.5 ▫ Temp +/- 2.4°C ▫ TSS 80-89mg/l ▫ O&G 8-8.9 mg/l ▫ Color 120-134 TCU ▫ Nitrate 16-17.99 mg/l ▫ Phosphate 0.80-0.89 mg/l ▫ Surfactants 12-13.49 mg/l ▫ Phenols 0.40 - 0. 44 mg/l ▫ Fecal Coliform 320-359 MPN/100 ▫ As= 0.0320-0.0359 mg/l ▫ Cd = 0.008 mg/l ▫ Cr^{6+}= 0.08 mg/l	▫ pH 6.1-6.4 or pH 8.6-8.9 ▫ Temp +/- 2.7 °C ▫ TSS 90-99 mg/l ▫ O&G 9-9.9 mg/l ▫ Color 135-149 TCU ▫ Nitrate 18-19.99 mg/l ▫ Phosphate 0.90-0.99 mg/l ▫ Surfactants 13.50-14.99 mg/l ▫ Phenols 0.45 - 0.49 mg/l ▫ Fecal Coliform 360-399 MPN/100 ▫ As= 0.0360-0.0399 mg/l ▫ Cd= 0.009 mg/l	▫ pH=6.0 or pH=9.0 ▫ Temp+/- 3 °C ▫ TSS=100 mg/l ▫ O&G=10 mg/l ▫ Color=150 TCU ▫ Nitrate=20 mg/l ▫ Phosphate=1 mg/l ▫ Surfactants= 15 mg/l ▫ Phenols= 0.5 mg/l ▫ Fecal Coliform= 400 MPN/100 ml ▫ As= 0.04 mg/l ▫ Cd=0.01 mg/l ▫ Cr^{6+}= 0.1 mg/l ▫ Pb= 0.1 mg/l	Investigate the source and identify possible pollutant sources	▫ Investigate the source ▫ If the problem is within the construction area, conduct adjustments/ appropriate corrective action at identified pollutant source ▫ Reconduct sampling / water quality monitoring	▫ Temporarily stop activities contributing to the pollutant load ▫ Evaluate existing mitigation measures for possible need for additional mitigation measures ▫ If the source is not related to the project, inform MMT regarding possible source for the group's investigation and coordination with LGU

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
			Methods	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
								▫ Pb= 0.08 mg/l ▫ Hg 0.0032-0.0035 mg/l	▫ Cr^{6+}= 0.09 mg/l ▫ Pb= 0.09 mg/l ▫ Hg 0.0036-0.0039 mg/l	▫ Hg= 0.004 mg/l			
Air Quality	Continuous release of gaseous emissions at the boiler stack and ground flare	Stack emissions of CO, NO_X, PM, SO_X, by accredited third-party stack testers	▫ NOX- U.S.EPA Methods 1 through 4 and Method 7 ▫ CO - U.S.EPA Method 3 or 10 ▫ PM – Methods 1 to 5	Annual	Boiler stack	Project proponent/Accredited third-party stack samplers	PhP 150,000 per year r	≥75% of NESSAP Values. EQPL (Alert Minimum in mg/Nm³) SO_X =525 NO_X = 375 PM = 112.5 CO = 375	≥90% of NESSAP Values. EQPL (Action Minimum in mg/Nm³) SO_X =630 NO_X = 450 PM = 135 CO = 450	NESSAP Values (in mg/Nm³) SO_X =700 NO_X = 500 PM = 150 CO = 500	▫ Monitor levels	▫ Check stack data with plant operating conditions (e.g., gas flow and fuel inputs, etc.)	▫ Implement corrective measures to reduce levels to within NESSAP values
		Ambient TSP, PM_{10}, SO_2, and NO_2	▫ TSP and PM10 – High volume/gravimetric ▫ SO2 – Pararosaline ▫ NO2- Griess Saltzman Method	Quarterly or as frequent as necessary	Project boundary, nearest residences, and downwind of prevailing wind flows	Project proponent/contractor	PhP 80,000 per quarter	≥75% of ambient standard. EQPL (Alert Mininum in µg/Nm³) ● NO_2 = 195 ● CO = 26.3 ● TSP = 225 ● PM_{10} = 150 ● SO_2 =255 (Note: As there is no ambient standard for ambient nickel, recommended that EQPL to be established post-ECC)	≥ 90% of ambient standard. EQPL (Action minimum in µg/Nm³) ● NO_2 = 234 ● CO = 31.5 ● TSP = 270 ● PM_{10} = 180 ● SO2 =306	NAAQS (in µg/Nm³) ● NO_2 = 260 ● CO = 35 ● TSP = 300 ● PM10 = 200 ● SO2=340	▫ Monitor levels and determine prevailing wind flows and other meteorological condition ▫ Identify possible sources of high ambient concentrations	▫ Check for complaints from residence ▫ Inform management in case the proposed project is the possible source of high ambient levels based on meteorological condition	▫ Implement corrective measures to reduce levels to within NAAQS
Operation of LNG facility	Increase of noise levels	Workplace noise level and Work hour exposure	Sound level meter	Monthly or as frequent when necessary	Workplaces	Proponent/HSE	None	Work place: TLV: 85 dBA for 4 hours exposure	Work place: TLV: 85 dBA for 6 hours exposure	Work place: TLV: 85 dBA for 8 hours exposure or >85 dBA, regardless of time	▫ Check noise sources in workplaces	▫ Hearing protection mandatory ▫	▫ Strict implementation of hearing protective equipment y ▫ Minimize exposure by shifting duties

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
		Ambient noise level	Sound level meter	Monthly or as frequent when necessary	Nearby residential areas	Proponent/HSE	HSE/Part of air monitoring cost	45 dBA	50dBA	▫ Ambient: 55dBA (daytime) ▫ Morning/ evening-50 dBA ▫ Nighttime – 45 dBA	▫ Check background noise levels	▫ Continue monitoring noise levels ▫ Check background noise levels ▫ Conduct noise assessment to mitigate noise source that contribute to higher noise levels	▫ Implement noise attenuation measures, if necessary
People	Acceptability of the project to the community	Perception of the Community regarding the site development and construction process of the project	Coordination with the Community	Quarterly	Community	CRO / Envi Department	Part of the Cost for the IEC	Negative verbal feedback on the ongoing activities	Formal complaint lodged against the ongoing activity	Multiple complaints by the community lodged in various forms or/and	▫ Investigate/ Inspect and Address the subject of negative feedback. ▫ Coordinate with the Brgy LGU and MMT.	▫ Determine and address the root cause. ▫ Conduct consultation with the Municipal LGU, MMT and EMB Regional	▫ Conduct consultation with concerned and relevant stakeholders in the community. ▫ Release an official statement for general consumption and employees.
	Workers	Health and safety of workers	Review of health and safety records of company Incident reports	Annual	Project site	Community Relations Officer / PCO	Part of the construction cost	Negative verbal feedback of worker	Formal complaint lodged by worker	Multiple complaints lodged by workers	▫ Proponent to investigate the subject of negative feedback. ▫ Coordinate with Contractor and MMT.	▫ Investigate cause of complaint, determine and address the root cause. ▫ Coordinate with contractor and MMT.	▫ Release official statement for general consumption and employees. ▫ Coordinate with contractor and MMT.
	Labor and Wage issues	Wage Rate, Benefits, and Schedule of Payment Other worker's rights related issues	HR Management	Monthly	Project Area/Office	CRO / Envi Department	Part of the construction cost	Negative Verbal Feedback	Complaints lodged by employees	Multiple complaints by the workers lodged in various forms and agencies, or/and captured by media	▫ Investigate/ inspect and Address the subject of negative feedback.	▫ Facilitate dialogue with concerned parties. ▫ Formulate program and timetable to address the issues raised in agreement	▫ Dialogue with concerned parties and with 3rd party agency/ institution involvement, ie DOLE, BLR, churches that

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Methods	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
												with the concerned parties	are neutral yet competent and conducive with conflict resolution. ▫ Formulate program and timetable to address the issues raised in agreement with the concerned parties
	Social Development and Management Plan	Projects initiated by the Proponent under the approved SDP	Community Coordination, social engagements	Quarterly	Host barangay	Community Relations Officer	Part of the SDP Cost	Negative verbal feedback of community	Formal complaint lodged by the community	Multiple complaints by the community	▫ Proponent to investigate the subject of negative feedback. ▫ Coordinate with barangay LGU and MMT.	▫ Investigate cause of complaint, determine and address the root cause. ▫ Coordinate with barangay LGU and MMT.	▫ Conduct consultation with concerned members of the community. Release official statement. ▫ Coordinate with barangay LGU and MMT.
	Information, Education, and Communication	Implementation of IEC activities	Community Coordination, social engagements	Quarterly	Host barangay	Community Relations Officer	Part of the IEC Cost	Negative verbal feed back to the Proponent	Formal complaint lodged by the community	Multiple complaints by the community captured by local media organizations	▫ Proponent to investigate the subject of negative feedback. ▫ Coordinate with barangay LGU and MMT.	▫ Investigate cause of complaint, determine and address the root cause. ▫ Coordinate with barangay LGU and MMT.	▫ Conduct consultation with concerned members of the community. ▫ Release official statement. ▫ Coordinate with barangay LGU and MMT.
	Unauthorized Prohibition (may either be setting up of physical barriers or prohibition of security personnel) of Access to	Security Prohibition Practices	Community Grievance / Complaints Registry	Monthly	Project Area and Adjacent Vicinity	CRO / Envi Department	Part of the construction cost	Negative Verbal feedbacks on Security prohibition	Formal Complaint lodged	Incidence of confrontation between project security personnel	▫ Investigate/inspect and Address the subject of negative feedback. ▫ Coordinate with the Brgy LGU and MMT to validate	▫ Determine and address the root cause. ▫ Coordinate with the Municipal LGU, MMT and EMB Regional Office to validate complaints and determine	▫ Conduct consultation with concerned and relevant stakeholders in the community. ▫ Release an official statement for general

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
			Methods	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
	Public Areas										feedback. ▫ Conduct IEC on Protocols, Rules, Regulations and other dynamics re-access and prohibition issues and security measures ▫ Investigate/ inspect and Address the subject of negative feedback.	causes, and formulate corrective actions.	consumption and employees. ▫ Coordinate with MMT and EMB Central Office to discuss and implement corrective actions.
	Marine Traffic	No. of vessels affected by the project in terms of cost, fuel, personnel, and other time affected aspects	Records	Quarterly	Manila Harbor Area	CRO/ Envi Department / External Liaison or equivalent	Minimal Cost	_% of affected vessels	_% of affected vessels	_% of affected vessels	▫ Coordinate with the pertinent agencies and MMT to validate feedback. ▫ Conduct IEC on Protocols, Rules, Regulations and other dynamics on the Sea Lane Navigation and Traffic Plan ▫ Investigate/ inspect and Address the subject of negative feedback.	▫ Determine and address the root cause. ▫ Coordinate with the pertinent agencies, MMT and EMB Regional Office to validate complaints and determine causes, and formulate corrective actions.	▫ Conduct consultation with concerned and relevant stakeholders ▫ Coordinate with MMT, pertinent agencies and EMB Central Office to discuss and implement corrective actions.
	Emission and Water Contamination Health Issues	Respiratory And Digestive System Ailments of Worker s and People in the Community	Health records	Quarterly	Project Area	CRO/ Envi Department	Minimal Cost	Reported/ recorded incidences of minor ailments/ illness	Formal Complaints lodged. Rapid Increase in reported/	Rapid Increase in Reported/ recorded incidences of grave ailments/ illnesses	▫ Investigate the possible source of the subject of complaints attributed to the project.	▫ Conduct intensive Project-wide inspection and address root cause if upon	▫ Decrease the level of operation/ aspects of operation commensurate

Module	Environmental Sector	Parameters to be monitored	Sampling and Measurement			Lead Person / Office	Annual Estimated Cost	EQPL Management Scheme					
			Methods	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
									recorded Incidences of minor ailments/ illnesses	necessitating intensive treatments , or resulting in death	▫ Address the root cause if investigation confirms source is from the project ▫ Provide for compensation if confirmed source of ailment is from the project	inspection the source is confirmed to be from the project. ▫ Provide for compensation of affected individuals if confirmed source of ailment is from the project ▫ Provision of personal protective equipment (PPE) to at-risk personnel and individuals	to addressing the problem (fixing the equipment, materials, etc). ▫ Release Statement on the Issue. ▫ Assist/facilitate medical care/ response to those affected. ▫ Provide for compensation of affected individuals if confirmed source of ailment is from the project

6.2 MULTI-SECTORAL MONITORING FRAMEWORK

A Multipartite Monitoring Team (MMT) will be formed immediately after the issuance of the ECC to undertake monitoring of compliance with the ECC conditions, the EMP, and applicable laws, rules and regulation. The proponent will provide the budget for the MMT monitoring activities in accordance with the approved Work and Financial Plan.

As stipulated in DAO 2003-30, a MMT will be organized to regularly monitor the activities stipulated in the approved EMP, and conditions set in the ECC. Further, in accordance with DAO 2017-15 or the guidelines on public participation under the Philippine EIS System, the MMT for this project shall be composed of a maximum of ten (10) members to include the following:

- City Environment and Natural Resources Officer (City ENRO) of Batangas City
- Philippine Ports Authority Representative
- Philippine Coast Guard Representative
- Department of Energy Representative
- City Health Unit (CHU) Chief
- Barangay Captain of Barangay Ilijan
- 1 Representative from LGU-accredited local NGOs (related to the Project's activities)
- Maximum of 2 representatives from locally recognized community leaders who represent vulnerable sectors including women, senior citizens, urban poor, and academe

The general roles and responsibilities of the MMT chairperson and members are presented in the following table:

Table 6-2. MMT Composition

MMT Member	MMT Role	Responsibilities / Activities
City ENRO	Chairperson	• Team leadership to ensure that the Proponent's compliance with the ECC is monitored. • Strengthening of monitoring, analytical, and reporting capabilities of the Team. • Resolution of any conflicts and issues within the Team. • Management of the Monitoring Trust Fund. • Reporting of MMT activities and accomplishments • Reporting of ECC accomplishment through the MMT Compliance and Validation Report
Philippine Coast Guard Representative Philippine Ports Authority Department of Energy Representative	Member	• Participation in actual monitoring activities, and review and verification of monitoring reports • Concur with the compliance monitoring and verification reports • Advice to MMT of any issues and recommendations concerning the project
City Health Unit (CHU) Chief Barangay Captain of Barangay Ilijan Representative from LGU-accredited local NGOs (related to the Project's activities) Representatives from locally recognized community leaders who represent vulnerable sectors including women, senior citizens, and academe	Member	• Participation in actual monitoring activities • Provision of information to the MMT about the environmental and socio-economic conditions as well as issues, problems, and suggestions of the stakeholders • Preparation and review of MMT reports • Provision of information on policies, plans, and programs of the IPs, NGOs, POs particularly to affected areas of the Project • Advice to MMT of any complaints, issues, and recommendations concerning the project

6.3 ENVIRONMENTAL GUARANTEE AND MONITORING FUND COMMITMENT

6.3.1 ENVIRONMENTAL MONITORING FUND

The proponent will open an account for the Environmental Monitoring Fund of the PROJECT for the exclusive use of the monitoring activities. The amount shall correspond to the expenses incurred by the MMT for the period such as cost of transportation, board and lodging, MMT meetings, sampling, shipment/transport of samples, documentation (photos, videos, etc.) including preparation and distribution of monitoring reports, laboratory analysis, lease/rental of monitoring equipment, hiring of outside experts/subcontracting of a monitoring work to a neutral party, training of the MMT, public information campaign/dissemination and other such activities relating to the operation of the MMT.

6.3.2 ENVIRONMENTAL GUARANTEE FUND

An environmental guarantee fund (EGF) will be established in accordance with the guidelines of the DAO 2003–30 through a MOA with EMB Regional Office and the proponent.

Generally, EGF has two major components, as follows:

- The Trust Fund amounting to Five Million Pesos (Php 5,000,000) will be established to compensate aggrieved parties for any 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 Environmental Guarantee Cash Fund amounting to One Million Pesos (Php 1,000,000) will be used for immediate rehabilitation and compensation of affected communities in case of damage or accidents. This can also be utilized for community-based environmental programs and information campaign. The Environmental Guarantee Cash Fund will also be used to cover the operational costs of the EGF Committee, in line with the Project’s MMT Manual of Operations that will be approved prior to project implementation

6.3.3 EMF AND EGF ADMINISTRATION AND MANAGEMENT

The EMF will be managed and administered by the MMT Executive Committee of the Project. The disbursement of the EMF will be carried out according to the annual monitoring work and financial plan submitted by the MMT, which will be reviewed and concurred with by the Proponent and approved by EMB.

An EGF Committee will be formed to manage, control, and operate the EGF in accordance with the agreed internal procedures established regarding the mechanisms for fund disbursement, processing, validation, accounting and documentation. The committee will be composed of the MMT Officers, with the EMB Regional Director as the Chairperson.

CHAPTER 7 DECOMMISSIONING / ABANDONMENT / REHABILITATION POLICY

After the economic life of the project, it will be assessed if it is still capable to continue commercial operation or not. The main objective of the A/D/RP is to create a safe environment of the area within the terminal and the host community once the project ceased its operation. The import terminal operation cessation should take into consideration the following general objectives:

- To rehabilitate and re-vegetate all the disturbed areas affected by operations, building infrastructures and marine structures;
- To mitigate on-site and off-site impact on marine water quality and coral reefs; and
- To conduct comprehensive monitoring and evaluation.

To prepare the abandonment/decommissioning plan based on the general objectives stated above, the following factors should be emphasized:

- The review of the previous Environmental Impact Assessment will provide the information regarding the state of the environment and the community before the introduction of the project;
- An assessment of the actual impacts generated by the project and the various environmental management measures that were implemented, and those still on the process of implementation; and
- The aspirations and expectations of the stakeholders at the time the decision is made.

CHAPTER 8 INSTITUTIONAL PLAN FOR ENVIRONMENTAL MANAGEMENT PLAN IMPLEMENTATION

The Proponent shall adopt a system for continued monitoring to determine whether the environmental management programs are achieving their objectives and to ensure that procedures are in place to minimize negative impacts from occurring. The guiding principles in the implementation of the management programs are the following:

- Commitment to comply with all environmental regulations and legislations;
- Implementation of pollution prevention and control systems;
- Monitoring and assessment of environmental performance;
- Conservation of resources through judicious use and reuse;
- Commitment of all personnel working for and on its behalf through awareness and training on environmental issues and concerns of the project operations;
- Demonstrated environmental performance through continual improvement; and
- Involvement of all relevant stakeholders in addressing sustainable development issues.

Figure 8-1 is the preliminary organizational structure for the operation of the project.

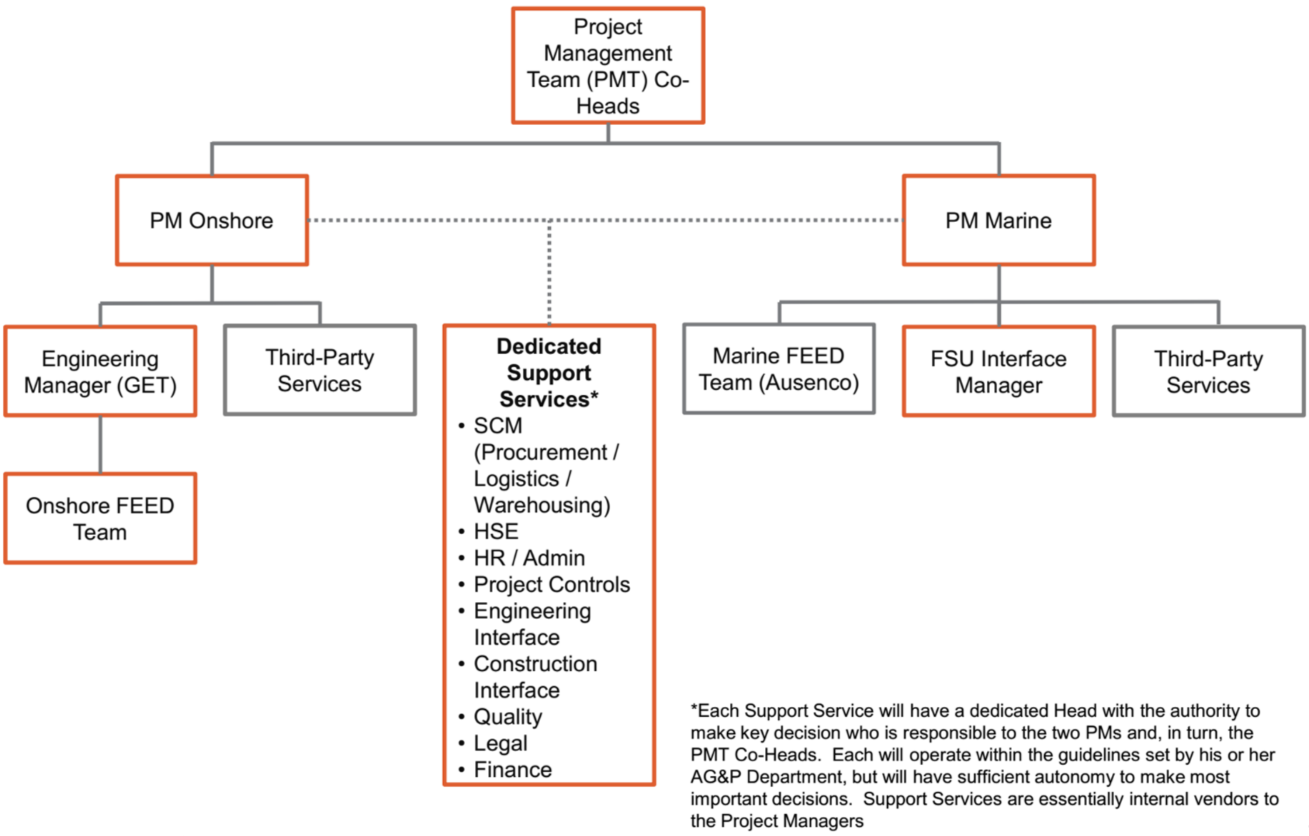

Figure 8-1. Ilijan LNG Terminal Preliminary Organization Chart

ANNEX

A – Proof of Authority

B – SEC

C – Proof of compatibility

D – Sworn Statement Proponent

E – Sworn Statement Preparer

F – PEMAPS

G – Meteorology Attachments

H – Air Quality Attachments

I – People Module Attachments

ANNEX A

PROOF OF AUTHORITY OVER THE PROJECT SITE

OWNER'S COPY

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03805** Property Identification No. : **132-09-0052-117-01**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : J-6
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 116-04 South : ALN 04 (ROAD)
East : ALN 02 West : CREEK

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys : MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	64.00 sqm.	Industrial	32,000.00	25%	8,000.00
		Total :	32,000.00	Total :	**8,000.00**

TOTAL ASSESSED VALUE : EIGHT THOUSAND PESOS (Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-01580 Prev. Assessed Value : P 230.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290681 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS

OWNER'S COPY

OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03806** Property Identification No. : **132-09-0052-117-02**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City
Tel. No. :
Administrator / Beneficial User :
TIN :
Address :
Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) (Barangay / District) (City / Province)

OCT / TCT / CLOA No. :
Survey No. :
Date Issued :
Lot No. : J-1
Cadastral Lot No. : 16169 PT.
Block No. :

BOUNDARIES

North : ALN 116-04
South : SW : ALN 03
East : ALN 07
West : ALN 01

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :

No. of Storeys

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	2,040.00 sqm.	Industrial	1,020,000.00	25%	255,000.00
		Total :	1,020,000.00	Total :	**255,000.00**

TOTAL ASSESSED VALUE : TWO HUNDRED FIFTY FIVE THOUSAND PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-01584 Prev. Assessed Value : P 3,590.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290684 (02/07/2019)

Prepared by : Ophelia Amul De Castro
Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

OWNER'S COPY

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03807** Property Identification No. : **132-09-0052-117-05**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN

Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :

Administrator / Beneficial User : TIN:

Address : Tel. No. :

Location of Property : ILIJAN BATANGAS CITY

(Number & Street) (Barangay / District) (City / Province)

OCT / TCT / CLOA No. : Survey No. :

Date Issued : Lot No. : J-4

Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 04 (ROAD) South : ALN 16

East : ALN 06 West : CREEK

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :

No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	209.00 sqm.	Industrial	104,500.00	25%	26,130.00
		Total :	104,500.00	Total :	**26,130.00**

TOTAL ASSESSED VALUE : TWENTY SIX THOUSAND ONE HUNDRED THIRTY PESOS

(Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-01582 Prev. Assessed Value : P 740.00

Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290682 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OWNER'S COPY

OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03808** Property Identification No. : **132-09-0052-117-06**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
Address : #28 Liberty Avenue, Cubao, Quezon City
Tel. No. :
Administrator / Beneficial User :
TIN :
Address :
Tel. No. :

Location of Property : ILIJAN BATANGAS CITY
(Number & Street) *(Barangay / District)* *(City / Province)*

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : J-3
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : NE : ALN 03 South : ALN 15, 16
East : ALN 14 West : ALN 05

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	2,808.00 sqm.	Industrial	1,404,000.00	25%	351,000.00
		Total :	1,404,000.00	Total :	**351,000.00**

TOTAL ASSESSED VALUE : THREE HUNDRED FIFTY ONE THOUSAND PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-01585 Prev. Assessed Value : P 4,940.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290685 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS **OWNER'S COPY**

OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03809** Property Identification No. : **132-09-0052-117-07**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.

Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :

Administrator / Beneficial User : TIN:

Address : Tel. No. :

Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :

Date Issued : Lot No. :

Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 116-04, 116-05 South : ALN 12, 13

East : ALN 08 West : ALN 02

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	3,750.00 sqm.	Industrial	1,875,000.00	25%	468,750.00
		Total :	1,875,000.00	Total :	**468,750.00**

TOTAL ASSESSED VALUE : FOUR HUNDRED SIXTY EIGHT THOUSAND SEVEN HUNDRED FIFTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02710 Prev. Assessed Value : P 14,550.00

Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290715 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OWNER'S COPY
OFFICE OF THE CITY ASSESSOR
TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03810** Property Identification No. : **132-09-0052-117-08**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) (Barangay / District) (City / Province)
OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. :
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES
North : ALN 116-05 South : SW : ALN 20
East : ALN 09 West : ALN 07, 12

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	3,995.00 sqm.	Industrial	1,997,500.00	25%	499,380.00
		Total :	1,997,500.00	Total :	**499,380.00**

TOTAL ASSESSED VALUE : FOUR HUNDRED NINETY NINE THOUSAND THREE HUNDRED EIGHTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : 2020
Qtr. Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor Approved Date

This declaration cancels TD No. 0052-02064 Prev. Assessed Value : P 7,270.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290689 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
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OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03811** Property Identification No. : **132-09-0052-117-09**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City
Tel. No. :
Administrator / Beneficial User :
TIN :
Address :
Tel. No. :
Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. :
Survey No. :
Date Issued :
Lot No. :
Cadastral Lot No. : 16169 PT.
Block No. :

BOUNDARIES

North : ALN 116-05
South : ALN 20
East : ALN 10
West : ALN 08

KIND OF PROPERTY ASSESSED

[X] LAND   BUILDING (No. of Storeys :)   MACHINERY   OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	3,995.00 sqm.	Industrial	1,997,500.00	25%	499,380.00
		Total :	1,997,500.00	Total :	**499,380.00**

TOTAL ASSESSED VALUE : FOUR HUNDRED NINETY NINE THOUSAND THREE HUNDRED EIGHTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. Year 2020

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02787 Prev. Assessed Value : P 14,540.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290718 (02/07/2019)

Prepared by : Ophelia Anul De Castro
Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

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CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR
TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION
Tax Dec. No. : **0052-03812** Property Identification No. : **132-09-0052-117-10**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) *(Barangay / District)* *(City / Province)*

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : E-1
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES
North : ALN 116-05, 116-06 South : ALN 23, 24
East : ALN 36 West : ALN 09, 23

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	10,147.00 sqm.	Industrial	5,073,500.00	25%	1,268,380.00
		Total :	5,073,500.00	Total :	**1,268,380.00**

TOTAL ASSESSED VALUE : ONE MILLION TWO HUNDRED SIXTY EIGHT THOUSAND THREE HUNDRED EIGHTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor *Approved Date*

This declaration cancels TD No. 0052-00986 Prev. Assessed Value : P 18,470.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290677 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

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CITY GOVERNMENT OF BATANGAS
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OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03813** Property Identification No. : **132-09-0052-117-12**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN:
Address : Tel. No. :
Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : C-3
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 07 South : SW : ALN 13
East : ALN 08 West :

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING (No. of Storeys :) MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	582.00 sqm.	Industrial	291,000.00	25%	72,750.00
		Total :	291,000.00	Total :	**72,750.00**

TOTAL ASSESSED VALUE : SEVENTY TWO THOUSAND SEVEN HUNDRED FIFTY PESOS (Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-00654 Prev. Assessed Value : P 1,060.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290670 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

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CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03814** Property Identification No. : **132-09-0052-117-14**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)
OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : C-1
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : NE : ALN 13 South : ALN 18
East : West : ALN 06, 15

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys : MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	1,046.00 sqm.	Industrial	523,000.00	25%	130,750.00
		Total :	523,000.00	Total :	**130,750.00**

TOTAL ASSESSED VALUE : ONE HUNDRED THIRTY THOUSAND SEVEN HUNDRED FIFTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02709 Prev. Assessed Value : P 12,250.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290714 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

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CITY GOVERNMENT OF BATANGAS
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OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03815** Property Identification No. : **132-09-0052-117-15**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :

Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :

Administrator / Beneficial User : TIN :

Address : Tel. No. :

Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :

Date Issued : Lot No. :

Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 06 South : ALN 17

East : ALN 14, 18 West : ALN 16

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys : MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	2,177.00 sqm.	Industrial	1,088,500.00	25%	272,130.00
		Total :	1,088,500.00	**Total :**	**272,130.00**

TOTAL ASSESSED VALUE : TWO HUNDRED SEVENTY TWO THOUSAND ONE HUNDRED THIRTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02786 Prev. Assessed Value : P 7,660.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290717 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03816** Property Identification No. : **132-09-0052-117-16**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN:
Address : Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) *(Barangay / District)* *(City / Province)*
OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. :
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 06 South : ALN 17
East : ALN 15 West : CREEK

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	2,177.00 sqm.	Industrial	1,088,500.00	25%	272,130.00
		Total :	1,088,500.00	Total :	**272,130.00**

TOTAL ASSESSED VALUE : TWO HUNDRED SEVENTY TWO THOUSAND ONE HUNDRED THIRTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02063 Prev. Assessed Value : P 3,830.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290688 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

OWNER'S COPY

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03817** Property Identification No. : **132-09-0052-117-17**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN

Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :

Administrator / Beneficial User : TIN :

Address : Tel. No. :

Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :

Date Issued : Lot No. : L-1

Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 15, 16 South : SW : CREEK

East : ALN 18, 28, 29 West :

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys : MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	1,164.00 sqm.	Industrial	582,000.00	25%	145,500.00
		Total :	582,000.00	Total :	145,500.00

TOTAL ASSESSED VALUE : ONE HUNDRED FORTY FIVE THOUSAND FIVE HUNDRED PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02644 Prev. Assessed Value : P 4,240.00

Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION

1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290713 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03818** Property Identification No. : **132-09-0052-117-18**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN:
Address : Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) *(Barangay / District)* *(City / Province)*

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : A-2
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 14, 19 South : ALN 28
East : ALN 21 West : ALN 15, 17

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	2,964.00 sqm.	Industrial	1,482,000.00	25%	370,500.00
		Total :	1,482,000.00	Total :	**370,500.00**

TOTAL ASSESSED VALUE : THREE HUNDRED SEVENTY THOUSAND FIVE HUNDRED PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : 2020
Qtr. Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor *Approved Date*

This declaration cancels TD No. 0052-00620 Prev. Assessed Value : P 5,220.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290669 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

OWNER'S COPY

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03819** Property Identification No. : **132-09-0052-117-21**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. :
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 20 South : ALN 27
East : ALN 22 West : ALN 18

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys : MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	131.50 sqm.	Industrial	65,750.00	25%	16,440.00
		Total :	65,750.00	Total :	16,440.00

TOTAL ASSESSED VALUE : SIXTEEN THOUSAND FOUR HUNDRED FORTY PESOS (Amount in Words)

[X] TAXABLE [ ] EXEMPT

Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02065 Prev. Assessed Value : P 990.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290690 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OWNER'S COPY

OFFICE OF THE CITY ASSESSOR
TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03820** Property Identification No. : **132-09-0052-117-29**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) (Barangay / District) (City / Province)

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : A-4
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 28 South : NORTH PASS
East : ALN 30 West : ALN 17

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	3,896.00 sqm.	Industrial	1,948,000.00	25%	487,000.00
		Total :	1,948,000.00	Total :	**487,000.00**

TOTAL ASSESSED VALUE : FOUR HUNDRED EIGHTY SEVEN THOUSAND PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor Approved Date

This declaration cancels TD No. 0052-00619 Prev. Assessed Value : P 6,860.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290668 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OWNER'S COPY

OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03821** Property Identification No. : **132-09-0052-117-30**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :

Location of Property : ILIJAN BATANGAS CITY
(Number & Street) *(Barangay / District)* *(City / Province)*

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. :
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES

North : ALN 27 South : NORTH PASS
East : ALN 31 West : ALN 29

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	1,493.00 sqm.	Industrial	746,500.00	25%	186,630.00
		Total :	746,500.00	Total :	**186,630.00**

TOTAL ASSESSED VALUE : ONE HUNDRED EIGHTY SIX THOUSAND SIX HUNDRED THIRTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : 2020
Qtr. Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor *Approved Date*

This declaration cancels TD No. 0052-02066 Prev. Assessed Value : P 2,720.00
Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290691 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR
TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03822** Property Identification No. : **132-09-0052-117-34**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. : E-3 PT.
Cadastral Lot No. : 16169 PT. Block No. :

BOUNDARIES
North : ALN 33 South : NORTH PASS
East : ALN 35 West : ALN 31

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	1,017.00 sqm.	Industrial	508,500.00	25%	127,130.00
		Total :	508,500.00	Total :	**127,130.00**

TOTAL ASSESSED VALUE : ONE HUNDRED TWENTY SEVEN THOUSAND ONE HUNDRED THIRTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor Approved Date

This declaration cancels TD No. 0052-02753 Prev. Assessed Value : P 3,700.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290716 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

OWNER'S COPY

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR
TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03802** Property Identification No. : **132-09-0052-116-04**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : *(Number & Street)* ILIJAN *(Barangay / District)* BATANGAS CITY *(City / Province)*
OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. :
Cadastral Lot No. : 16170 PT. Block No. :

BOUNDARIES
North : ALN 02 South : ALN 117-01, 02, 07
East : ALN 05 West : CREEK

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys : MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	20,814.00 sqm.	Industrial	10,407,000.00	25%	2,601,750.00
		Total :	10,407,000.00	Total :	**2,601,750.00**

TOTAL ASSESSED VALUE : TWO MILLION SIX HUNDRED ONE THOUSAND SEVEN HUNDRED FIFTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02393 Prev. Assessed Value : P 56,080.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290706 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS **OWNER'S COPY**
OFFICE OF THE CITY ASSESSOR
TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03803** Property Identification No. : **132-09-0052-116-05**

Owner : ILIJAN PRIMELINE HOLDINGS, INC. TIN :
Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :
Administrator / Beneficial User : TIN :
Address : Tel. No. :
Location of Property : ILIJAN BATANGAS CITY
(Number & Street) *(Barangay / District)* *(City / Province)*
OCT / TCT / CLOA No. : Survey No. :
Date Issued : Lot No. :
Cadastral Lot No. : 16170 PT. Block No. :

BOUNDARIES
North : ALN 03 South : ALN 117-07, 08, 09, 10
East : ALN 06 West : ALN 04

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING MACHINERY OTHERS :
No. of Storeys :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	20,813.00 sqm.	Industrial	10,406,500.00	25%	2,601,630.00
		Total :	10,406,500.00	Total :	**2,601,630.00**

TOTAL ASSESSED VALUE : TWO MILLION SIX HUNDRED ONE THOUSAND SIX HUNDRED THIRTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : 2020
Qtr. Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING 10/15/2019
City Assessor *Approved Date*

This declaration cancels TD No. 0052-02394 Prev. Assessed Value : P 54,280.00
Previous Owner : *** SAME NAME ***

MEMORANDA :
RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290707 (02/07/2019)

Prepared by : Ophelia Amul De Castro *Printed by : Ophelia*

Note : This declaration is for real property taxation purposes only and the valuation indicated herein are based on the Schedule of Unit Market Values prepared for the purpose and duly enacted into an Ordinance by the Sangguniang Panlungsod under ORDINANCE No. 20 series of 2013 dated December 9, 2013. It does not and cannot by itself alone confer any ownership or legal title to the property.

Republic of the Philippines
CITY GOVERNMENT OF BATANGAS
OFFICE OF THE CITY ASSESSOR

TAX DECLARATION OF REAL PROPERTY

Property Update : (RC) RECLASSIFICATION

Tax Dec. No. : **0052-03804** Property Identification No. : **132-09-0052-116-06**

Owner : ILIJAN PRIMELINE HOLDINGS, INC.

Address : #28 Liberty Avenue, Cubao, Quezon City Tel. No. :

Administrator / Beneficial User : TIN :

Address : Tel. No. :

Location of Property : (Number & Street) ILIJAN (Barangay / District) BATANGAS CITY (City / Province)

OCT / TCT / CLOA No. : Survey No. :

Date Issued : Lot No. :

Cadastral Lot No. : 16170 PT. Block No. :

BOUNDARIES

North : ALN 03 South : ALN 117-10, 36, 37

East : CREEK West : ALN 05

KIND OF PROPERTY ASSESSED

[X] LAND BUILDING No. of Storeys MACHINERY OTHERS :

Brief Description :

Classification	Area	Actual Use	Market Value	Assessment Level	Assessed Value
INDUSTRIAL	20,813.00 sqm.	Industrial	10,406,500.00	25%	2,601,630.00
		Total :	10,406,500.00	Total :	**2,601,630.00**

TOTAL ASSESSED VALUE : TWO MILLION SIX HUNDRED ONE THOUSAND SIX HUNDRED THIRTY PESOS
(Amount in Words)

[X] TAXABLE [ ] EXEMPT Effectivity of Assessment/Reassessment : Qtr. 2020 Year

APPROVED BY:

GUADALUPE JUDY A. TUMAMBING
City Assessor

10/15/2019
Approved Date

This declaration cancels TD No. 0052-02392 Prev. Assessed Value : P 56,830.00

Previous Owner : *** SAME NAME ***

MEMORANDA :

RECLASSIFICATION
1. Request letter
2. CPDO (Zoning) Certification
3. Realty tax OR# 2290705 (02/07/2019)

Prepared by : Ophelia Amul De Castro Printed by : Ophelia

ANNEX B

SEC REGISTRATION

REPUBLIC OF THE PHILIPPINES
SECURITIES AND EXCHANGE COMMISSION
PICC Secretariat Bldg., PICC Complex
Pasay City, Metro Manila

COMPANY REG NO. CS201909821

CERTIFICATE OF INCORPORATION

KNOW ALL PERSONS BY THESE PRESENTS:

This is to certify that the Articles of Incorporation and By Laws of:

Linseed Field Power Corporation

were duly approved by the Commission on this date upon the issuance of this Certificate of Incorporation and By Laws in accordance with the Revised Corporation Code of the Philippines (Republic Act No. 11232), and copies of said Articles and By Laws are hereto attached.

This Certificate grants juridical personality to the corporation but does not authorize it to issue, sell or offer for sale to the public, securities such as but not limited to, shares of stock, investment contracts, debt instruments and virtual currencies without a prior Registration Statement approved by the Securities and Exchange Commission; nor to undertake business activities requiring a Secondary License from this Commission such as but not limited to acting as: broker or dealer in securities, government securities eligible dealer (GSED), investment adviser of an investment company, close-end or open-end investment company, investment house, transfer agent, commodity/ financial futures exchange/broker/merchant, financing/lending company, and time shares/club shares/ membership certificate issuers or selling agents thereof; nor to operate a fiat money to virtual currency exchange. Neither does this Certificate constitute a permit to undertake activities for which other government agencies require a license or permit.

As a registered corporation, it shall submit annually to this Commission the reports indicated at the back of this Certificate.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of this Commission to be affixed to this Certificate at PICC Secretariat Bldg., PICC Complex Pasay City, Metro Manila, Philippines, this day of 18, June, Twenty Nineteen.

For SEC use only
D35100(PSIC as reserved)

CERTIFIED TRUE COPY

JERRICK M. LIM
Corporate Secretary
14 October 2020

GERARDO F. DEL ROSARIO
Director
Company Registration and Monitoring Department

MAY 31 2019

ARTICLES OF INCORPORATION

OF

LINSEED FIELD POWER CORPORATION

KNOW ALL MEN BY THESE PRESENTS:

We, all of whom are of legal age and are citizens and residents of the Republic of the Philippines, have this day voluntarily associated ourselves together for the purpose of forming a corporation under the laws of the Republic of the Philippines.

AND WE HEREBY CERTIFY:

FIRST: The name of the Corporation shall be:

LINSEED FIELD POWER CORPORATION

SECOND: The purposes for which the Corporation is formed are:

Primary Purpose

To engage in the business of exploration, development, generation, supply, distribution, utilization and commercialization of all forms of energy resources; to enter into all kinds of contracts for the exploration, development, generation, supply, distribution, utilization, commercialization and transmission of all forms of energy resources to include buying, selling, marketing and distribution at wholesale and retail of electricity and energy products insofar as may be permitted by law.

Secondary Purposes

1. To purchase, acquire, own, lease, except financial leasing, sell, and convey real properties such as lands, buildings, factories, and warehouses and machineries, equipment and other personal properties as may be necessary or incidental to the conduct of the corporate business, and to pay in cash, shares of its capital stock, debentures and other evidence of indebtedness, or other securities, as may be deemed expedient, for any business or property acquired by the corporation.

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JERRICK M. LIM
Corporate Secretary
14 October 2020

2. To borrow or raise money from not more than nineteen (19) lenders, including its shareholders, for the conduct of the business of the Corporation, and to draw, make, accept, endorse, execute, and issue promissory notes, drafts, bills of exchange, warrants, bonds, debentures and other negotiable and non-negotiable instruments and evidence of indebtedness, and to secure the payment thereof and of any interest thereon by mortgage upon, or pledge of, or grant of a security interest in, or conveyance or assignment in trust for, or lien upon the whole or any part of the property of the Corporation, whether at the time owned or thereafter acquired, and to sell pledge or otherwise dispose of such bonds, debentures or other obligations of the Corporation for corporate purposes.

3. To invest and re-invest the money and property of the Corporation in such manner considered wise or expedient for the advancement of its interests.

4. To aid in any manner any corporation, association, or trust estate, domestic or foreign, or any firm or individual, any shares of stock in which or any bonds, debentures, notes, securities, evidence of indebtedness, contracts, or obligations of which are held by or for this Corporation, directly or indirectly or through other corporations or otherwise.

5. To acquire the goodwill, rights, assets, and property, and to undertake or assume the whole or any part of the obligations or liabilities, of any person, partnership, association or corporation, and to pay therefor in cash, stocks, or bonds of the Corporation or otherwise.

6. To enter into any lawful arrangement for the sharing of profits, union of interest, reciprocal concession, or cooperation with any person, partnership, association, corporation, or government or authority, domestic or foreign, in the carrying on of any business or transaction deemed necessary, convenient, or incidental to carrying out any of the purposes of the Corporation.

7. To acquire or obtain from any government or authority, national, provincial, municipal, or otherwise, or any person, partnership, association or corporation, such charters, contracts, franchises, privileges, exemptions, licenses, and concessions required for the conduct of any of the purposes of the Corporation.

8. To establish and operate one or more branch offices or agencies and to carry on any or all of its operations and business, including the right to hold, purchase, or

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JERRICK M. LIM
Corporate Secretary
14 October 2020

otherwise acquire, lease, mortgage, pledge and convey or otherwise deal in and with real and personal property anywhere in the Philippines.

9. To do or cause to be done any one or more of the acts and things herein set forth as its purposes, within or without the Philippines, and to do everything necessary, desirable, or incidental to the accomplishment of the purposes or the exercise of any one or more of the powers herein enumerated, or which shall at any time appear conducive to or expedient for the protection or benefit of the Corporation.

THIRD: The principal office of the Corporation shall be located at Suite 2402 Discovery Center, 25 ADB Avenue, Ortigas Center, Barangay San Antonio, Pasig City 1605.

FOURTH: The Corporation shall have perpetual existence.

FIFTH: The names, nationalities and residences of the incorporators are as follows:

Name	Nationality	Residence
HERBERT B. HERNANE	Filipino	Block 29 Lot 5 J. Luna Street, New Capitol Estates-I, Batasan Hills, Quezon City 1126
JOSE CONSTANTINO C. MILITANTE III	Filipino	South Building, Flair Towers, Reliance corner Pines Streets, Mandaluyong City
ROSELA M. BENTILLO	Filipino	41 San Miguel Street, Gulod, Novaliches, Quezon City
KATHERINE EVE. D. CEBANICO	Filipino	041 Quezon Street, Libis Binangonan, Rizal
MADELAINE M. GUERRERO	Filipino	37 B-13 L-32 Yellow Wood St., Estate Village II, Molino III, bacoor Cavite

SIXTH: The Corporation shall have five (5) directors who are also the incorporators, and who are to serve until their successors are elected and qualified as provided by the by-laws.

SEVENTH: The authorized capital stock of the Corporation is Five Million Pesos (₱5,000,000.00), Philippine Currency, divided into Fifty Thousand (50,000) shares with a par value of One Hundred Pesos (₱100.00) per share.

EIGTH: The following persons have subscribed to and paid for the number of shares and the amount of capital stock indicated opposite their respective names:

Name	Nationality	No. of Shares	Amount Subscribed	Amount Paid
HERBERT B. HERNANE	Filipino	14,996	₱1,499,600.00	₱1,499,600.00

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JERRICK M. LIM
Corporate Secretary
14 October 2020

JOSE CONSTANTINO C. MILITANTE III	Filipino	1	100.00	100.00
ROSELA M. BENTILLO	Filipino	1	100.00	100.00
KATHERINE EVE. D. CEBANICO	Filipino	1	100.00	100.00
MADELAINE M. GUERRERO	Filipino	1	100.00	100.00
TOTAL		15,000	₱1,500,000.00	₱1,500,000.00

NINTH: No issuance or transfer of shares of stock of the Corporation which will reduce the stock ownership of Filipino citizens to less than the percentage of the outstanding capital stock required by law to be owned by Filipino citizens shall be allowed or permitted to be recorded in the books of the Corporation. This restriction shall be printed or indicated in all the certificates of stock to be issued by the Corporation.

TENTH: JOSE CONSTANTINO C. MILITANTE III has been appointed by the subscribers as the Treasurer-in-Trust of the Corporation to act as such until his successor is duly elected and shall have qualified in accordance with the By-Laws. As Treasurer-in-Trust, he has been authorized to receive for the Corporation and to issue in its name receipts for all subscriptions paid in by the subscribers.

ELEVENTH: The Corporation manifests its willingness to change its corporate name in the event another person, firm or entity has acquired a prior right to use the said firm name by virtue of registration with other government agencies or its name is identical or deceptively or confusingly similar to that of any existing corporation or to any other name already protected by law or is patently deceptive confusing or contrary to existing laws.

IN WITNESS WHEREOF, we have set our hands this ______________ in Pasig City.

HERBERT B. HERNANE
TIN: 276-065-914

JOSE CONSTANTINO C. MILITANTE III
TIN: 295-936-460

ROSELA M. BENTILLO
TIN: 229-932-168

KATHERINE EVE D. CEBANICO
TIN: 291-129-501

MADELAINE M. GUERRERO
TIN: 423-817-268

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JERRICK M. LIM
Corporate Secretary
14 October 2020

REPUBLIC OF THE PHILIPPINES)
PASIG CITY) S.S.

ACKNOWLEDGMENT

BEFORE ME, a Notary Public, this 29 MAR 2019 in Pasig City, personally appeared the following:

Name	Competent Evidence Of Identity
HERBERT B. HERNANE	TIN: 276-065-914
JOSE CONSTANTINO C. MILITANTE III	TIN: 295-936-460
ROSELA M. BENTILLO	TIN: 229-932-168
KATHERINE EVE. D. CEBANICO	TIN: 291-129-501
MADELAINE M. GUERRERO	TIN: 423-817-268

known to me to be the same persons who executed the foregoing Articles of Incorporation consisting of five (5) pages, including this page on which the Acknowledgment is written, and they acknowledged to me that the same is their free and voluntary act and deed.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal on the date and place stated above.

Doc. No. 66;
Page No. 15;
Book No. I;
Series of 2019.

IAN DENIS U. CANOY
Notary Public for the Cities of Pasig, San Juan
And Municipality of Pateros
Commission until 31 December 2020
2404 Discovery Center 25 ADB Ave., Ortigas Center Pasig City
APPT. No. 143 (2019-2020) – Roll No.70912
PTR No. 5229899; 01-10-2019; Pasig City
IBP No. 064830; 01-08-2019; RSM

CERTIFIED TRUE COPY

JERRICK M. LIM
Corporate Secretary
14 October 2020

ANNEX C

PROOF OF COMPATIBILITY WITH EXISTING LAND USE

Republic of the Philippines
Batangas City
City Planning and Development Office
City Hall Complex, P. Burgos Street, Batangas City 4200
Tel. Nos. (043) 723-1832 (*telefax*) • 773-6100 loc. 2134 & 2136 (*CPDC*) • 2137 (ACPDC) • 2135 & 2818 (*Admin. Division*) • 2138 (*Zoning Division*)
email add: cpdobatangascity@yahoo.com

December 07, 2020

Mr. HERBERT HERNANE
President, LINSEED FIELD POWER CORPORATION
Suite 2402 Discovery Center
25 ADB Avenue, Pasig City
Metro Manila

Dear Mr. Hernane:

This refers to your letter to the Honorable City Mayor Beverley Rose A. Dimacuha of Batangas City requesting for the issuance of Locational/Zoning Clearance for the proposed Ilijan LNG Import Facility to be located in Barangay Ilijan, Batangas City.

Please be informed that based on the approved Batangas City Zoning Ordinance, the site for the abovecited project, which is approximately fifteen (15) hectares is within the designated Eco-Tourism Development Zone (ETDZ) and Agro-Forestry Zone (AFZ) wherein the proposed project is not a conforming use, since it is classified as heavy industrial project.

However, based on the new CLUP 2019-2028 and the City Integrated Zoning Ordinance CY 2019 which is now subject for final approval of the Sangguniang Panlalawigan, the area is classified as Industrial -3 Zone (I-3) and Forest Zone Multiple Use Sub Zone (FMUSZ) .

In view thereof, Locational/Zoning Clearance can be issued only for the abovementioned project upon the final approval of the Sangguniang Panlalawigan and other requirements for its effectivity have been complied with.

Please find attached the list of requirements for your immediate reference and attachment to the application for a Locational Clearance/ Certificate of Zoning Compliance.

Very truly yours,

JANUARIO B. GODOY, CE, EnP.
City Planning and Development Coordinator

Noted By:

BEVERLEY ROSE A. DIMACUHA
City Mayor

Republic of the Philippines
Batangas City
City Planning and Development Office
City Hall Complex, P. Burgos Street, Batangas City 4200
Tel. Nos.: (043) 723-1832 (*telefax*) / 773-6100 loc. 2090 & 2092 (*CPDC*) /
2093 (*ACPDC*) / 2091 (*Admin. Division*) / 2094 (*Zoning Division*)
email add: cpdobatangascity@yahoo.com

CERTIFICATION

TO WHOM IT MAY CONCERN:

This is to certify that the hereunder listed parcels of land located at Barangay Ilijan, Batangas City with their respective owners, lot numbers, Tax Dec No.and lot areas, are within the designated "**AGRO – FORESTRY ZONE (AFZ) based on the Batangas City Zoning Ordinance 2015 approved by the City Mayor and Sangguniang Panlungsod under City Ordinance No. 1 Series of 2015 on March 2, 2015 and Sangguniang Panlalawigan Resolution No. 287 dated September 16, 2015.**

Name of Owner	Tax Dec. No.	Lot No.	Area (Sq. m.)
1. Ilijan Primeline Holdings Inc.	0052 – 03805	16169 pt.	64.00
2. Ilijan Primeline Holdings Inc.	0052 – 03806	161669 pt.	2, 040
3. Ilijan Primeline Holdings Inc.	0052 - 03807	16169 pt.	209
4. Ilijan Primeline Holdings Inc.	0052 - 03808	16169 pt.	2, 808
5. Ilijan Primeline Holdings Inc.	0052 - 03809	16169 pt.	3, 750
6. Ilijan Primeline Holdings Inc.	0052 - 03810	16169 pt.	3, 995
7. Ilijan Primeline Holdings Inc.	0052 - 03811	16169 pt.	3, 995
8. Ilijan Primeline Holdings Inc.	0052 - 03812	16169 pt.	10, 147
9. Ilijan Primeline Holdings Inc.	0052 - 03813	16169 pt.	582
10. Ilijan Primeline Holdings Inc.	0052 - 03814	16169 pt.	1, 046
11. Ilijan Primeline Holdings Inc.	0052 - 03815	16169 pt.	2, 177
12. Ilijan Primeline Holdings Inc.	0052 - 03816	16169 pt.	2, 177
13. Ilijan Primeline Holdings Inc.	0052 - 03817	16169 pt.	1, 164

14. Ilijan Primeline Holdings Inc.	**0052 - 03818**	**16169 pt.**	**2, 964**
15. Ilijan Primeline Holdings Inc.	**0052 - 03819**	**16169 pt.**	**131.50**
16. Ilijan Primeline Holdings Inc.	**0052 - 03820**	**16169 pt.**	**3, 896**
17. Ilijan Primeline Holdings Inc.	**0052 - 03821**	**16169 pt.**	**1, 493**
18. Ilijan Primeline Holdings Inc.	**0052 - 03822**	**16169 pt.**	**1, 017**
19. Ilijan Primeline Holdings Inc.	**0052 - 03802**	**16170 pt.**	**20, 814**
20. Ilijan Primeline Holdings Inc.	**0052 - 03803**	**16170 pt.**	**20, 813**
21. Ilijan Primeline Holdings Inc.	**0052 - 03804**	**16170 pt.**	**20, 813**
22. Ilijan Primeline Holdings Inc.	**0052 - 03790**	**16180 pt.**	**10, 362**
23. Ilijan Primeline Holdings Inc.	**0052 - 03793**	**16373 pt.**	**12, 713**
24. Ilijan Primeline Holdings Inc.	**0052 - 03795**	**16373 pt.**	**12, 715**
			Total: 141, 885. 50

This certification shall not be construed as zoning/locational clearance.

Issued this 3rd day of September, 2020 in Batangas City upon the request of Mr. Lester Abando for whatever legal purpose it may serve her.

JANUARIO B. GODOY
City Planning and Development Coordinator

O.R No. 3753093
Date Issued 09-03-2020
Amount: P 200.00

CITY PLANNING & DEVELOPMENT OFFICE
ZONING DIVISION
RELEASED
BY:
DATE: 9-21-2020 TIME: 1:50pm
BATANGAS CITY

Republic of the Philippines
Batangas City
City Planning and Development Office
City Hall Complex, P. Burgos Street, Batangas City 4200
Tel. Nos.: (043) 723-1832 (*telefax*) / 773-6100 loc. 2090 & 2092 (*CPDC*) / 2093 (*ACPDC*) / 2091 (*Admin. Division*) / 2094 (*Zoning Division*)
email add: cpdobatangascity@yahoo.com

CERTIFICATION

TO WHOM IT MAY CONCERN:

This is to certify that the hereunder listed parcels of land located at Barangay Ilijan, Batangas City with their respective owners, tax declaration numbers, lot numbers, and lot areas, are within the designated "**AGRO – FORESTRY ZONE (AFZ) based on the Batangas City Zoning Ordinance 2015 approved by the City Mayor and Sangguniang Panlungsod under City Ordinance No. 1 Series of 2015 on March 2, 2015 and Sangguniang Panlalawigan Resolution No. 287 dated September 16, 2015.**

Name of Owner	Tax Dec. No.	Lot No.	Area (Sq. m.)
1. Ilijan Primeline Holdings Inc.	0052 – 03798	16175 pt.	378.00
2. Ilijan Primeline Holdings Inc.	0052 - 03794	16737 pt.	12,714.000
3. Ilijan Primeline Holdings Inc.	0052 – 03834	16373 pt.	12,713.00
4. Ilijan Primeline Holdings Inc.	0052 – 03796	16421 pt.	1,847.00
5. Ilijan Primeline Holdings Inc.	0052 - 03797	16421 pt.	5,521.00
			Total: 33,173.00

This certification shall not be construed as zoning/locational clearance.

Issued this 21st day of September, 2020 in Batangas City upon the request of Mr. Lester Abando of San Mariano, San Pascual, Batangas for whatever legal purpose it may serve him.

JANUARIO B. GODOY
City Planning and Development Coordinator

O.R No.: 3758927
Date Issued: 09-21-2020
Amount: P 200.00

CITY PLANNING & DEVELOPMENT OFFICE
ZONING DIVISION
RELEASED
BY:
DATE: 9-21-2020 TIME: 3:45pm
BATANGAS CITY

ANNEX D

SWORN ACCOUNTABILITY OF THE PROPONENT

SWORN STATEMENT OF ACCOUNTABILITY OF THE PROPONENT

This is to certify that all the information and commitments in this ENVIRONMENTAL IMPACT STATEMENT (EIS) for the Ilijan LNG Import Facility Project 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 judgment. Should I/we learn of any information, which would make this EIS inaccurate, I shall immediately bring the said information to the attention of DENR-EMB.

I hereby certify that no DENR-EMB personnel were directly involved in the preparation of EIS other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 Revised Procedural Manual.

I hereby bind myself to answer any penalty that may be imposed arising from any misrepresentation or failure to state material information in this EIS.

In witness whereof, I hereby set my hand this ______________ day of DEC 02 2020 at PASIG CITY.

ATTY. HERBERT B. HERNANE
President
Linseed Field Power Corporation

SUBSCRIBED AND SWORN TO before me this 2nd day of December 2020 at Pasig City, affiant exhibiting his Tax Identification Number 276-065-914.

Doc. No. 03
Page No. 2
Book No. II
Series of 2020.

ALAN DAVID M. ORQUINAZA
Notary Public for the Cities of Pasig, San Juan
And Municipality of Pateros
Commission until 31 December 2021
2404 Discovery Center 25 ADB Ave., Ortigas Center Pasig City
APPT. No. 174 (2020-2021)-Roll No. 73735
PTR No. 6535463; 01-18-2020;Pasig City
IBP No. 104578; 01-09-2020;Makati
MCLE Compliance-N/A (Admitted to the Bar in 2019)

ANNEX E

SWORN ACCOUNTABILITY OF THE PREPARER

SWORN STATEMENT OF ACCOUNTABILITY OF PREPARERS

This is to certify that all information in this ENVIRONMENTAL IMPACT STATEMENT (EIS) for the **ILIJAN LNG IMPORT FACILITY PROJECT** of *Linseed Field Power Corporation* 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 judgment. Should we learn any information which would make this EIS inaccurate, we shall immediately bring the said information to the attention of the DENR-EMB.

We hereby certify that no DENR-EMB personnel were directly involved in the preparation of this EIS other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 Revised Procedural Manual.

We hereby bind ourselves jointly and solidarily to answer any penalty that may be imposed arising from any misinterpretation or failure to state material information in this EIS.

In witness thereof, we hereby set our hands this JAN 04 2021 at CITY OF MARIKINA.

Name	Registration Number	Field of Expertise	Signature
Mr. Henry James P. Botengan	IPCO-063	Project Management, Social Impact Assessment	
Mr. Restituto G. Taganas		Team Leader	
Engr. Ronald R. Pahunang	IPCO-173	Air and Noise Quality, Hydrodynamic Modelling	
Ms. Thelma D. Dela Cruz, MOH	IPCO-387	Environmental Risk Assessment	
Engr. Catherine L. Addawe	IPCO-055	Water Quality	
Ma. Luisa P. Martinez, Ph.D.	IPCO-133	Storm Surge Modelling	
Mr. Benjamin S. Francisco	IPCO-038	Marine Ecology	
Mr. Arnel Mendoza		Geology	
For. Armando V. Gillado Jr.	IPCO-312	Terrestrial Flora	
Mr. Russel D. Baniqued	IPCO-157	Terrestrial Fauna	
For. Kristine Ann P. Gillado	IPCO-282	EIA Integration	

JAN 04 2021

SUBSCRIBED AND SWORN TO before me this ____ day of _____ 2020, affiants exhibiting their identification information, as follows:

Name	Government Issued ID	Expiry Date/Place Issued
Mr. Henry James P. Botengan	D14-99-098361	5/31/2023 LTO SM North
Mr. Restituto G. Taganas		
Engr. Ronald R. Pahunang		
Ms. Thelma D. Dela Cruz, MOH	DL: N01-08-010968	05-28-2024 / Q.C.
Engr. Catherine L. Addawe		
Ma. Luisa P. Martinez, Ph.D.	Drivers License	N02-98-368270
Mr. Benjamin S. Francisco	Drivers License	02-08-2022 ; QC
Mr. Arnel Mendoza	PRC 0000567	10-26-2022 Manila
For. Armando V. Gillado Jr.	948/260/B	02-13-2030 / SAN PABLO CITY
Mr. Russel D. Baniqued		
For. Kristine Ann P. Gillado	PASSPORT EC7947296	06-JUN-21 / DFA NCR

ATTY. MOSES ELEAZAR B. PUA
NOTARY PUBLIC
UNTIL DECEMBER 31, 2021
APPOINTMENT ... (2020-2021)
PTR No. ...; 1-10-20...; Marikina
IBP No. ...; 1-10-2020; Rizal
Roll No. 62..37
MCLE Compliance No. VI-0027311
CU01A Alicante Tower ... Condominiums
... Avenue,
Barangay Sto. Niño, Marikina City

Doc No. 435
Page No. 88
Book No. 100
Series of 2021

ANNEX F

PEMAPS

PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS) QUESTIONNAIRE

Project Name	:	Ilijan LNG Import Facility Terminal
Project Location	:	Barangay Ilijan, Batangas City, Batangas
Proponent	:	Linseed Field Power Corporation
Pollution Control Officer	:	Atty. Herbert B. Hernane President
Tel. No./Fax No./Email	:	
Project Type	:	Import Facility
Project Status	:	Pre-construction

I. PROJECT CONSIDERATIONS

Size and Type
Size based on number of employees
Specify number of employees: 1,800

Type
ECP x
Non-ECP but in ECA ____
Non-ECP and Non-ECA ____

Waste Generation and Management
Enumerate Waste Type and Specify Quantity of Wastes generated in your facility. (Identify /Enumerate)

Category	Waste	Type		Quantity
		Hazardous	Non-Hazardous	
Air	Dust		x	
Liquid	Oil		x	
	Domestic Waste Water		x	
Solid	Domestic Wastes Construction Debris		x	

Pollution Control System (PCS)
Enumerate PCS or Waste Management Method Used in your facility. (Identify /Enumerate)

Category	PCS/Waste Management Method Used	Remarks
Air	Water Spraying	
	Impose speed limits within the project site and along access roads.	
Liquid	Septic tank	
Solid		

II. PATHWAYS

Prevailing wind towards barrio or city? (mark the corresponding point) Yes __ No __

Rainfall (impacts surface & groundwater pathways)
Average annual net rainfall:
Specify amount: 1906.8MM

Maximum 24-hour rainfall:
Specify amount: ____

Terrain (select one and mark) Flat _x_ Steep __

Is the facility located in a flood-prone area? (select one and mark) Yes ___ No _x_

Ground Water

Depth of groundwater table (meter) (select one and mark)

0 to less than 3	______
3 to 10	______
Greater than 10	x

III. RECEIVING MEDIA/RECEPTORS

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	x

Receiving Surface Water Body

Distance to receiving surface water: (select one and mark)

0 to less than 0.5 km	x
0.5 to 1 km	______
Greater than 1 km	______

Size of population using receiving surface water

Specify number: >3,000

Fresh Water

Classification of fresh water (select one and mark)

AA	______
A	______
B	______
C	______
D	______

Size of fresh water body

Specify size: NA

Economic value of water use (may select more than one of the criteria below)

Drinking	______
Domestic	______
Recreational	______
Fishery	______
Industrial	______
Agricultural	______

Salt water

Classification of salt water (select one and mark)

SA	______
SB	______
SC	x
SD	______

Economic value of water use (may select more than one of the criteria below)

Fishery	______
Tourist zone or park	______
Recreational	______
Industrial	x

Ground Water

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	x

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	x

Groundwater use within the nearest well

(may select more than one of the criteria below)

Drinking	
Industrial	x
Agricultural	

Land

Indicate current/actual land uses within 0.5 km radius:

(may select more than one of the criteria below)

Residential	
Commercial/Institutional	
Industrial	x
Agricultural/Recreational	
Protected Area	

Potential/proposed land uses within 0.5 km

(may select more than one of the criteria below)

Residential	
Commercial/Institutional	
Industrial	x
Agricultural/Recreational	x
Protected Area	

Number of affected Environmentally Critical Areas within 1 km:

Specify number:	0

Distance to nearest ECA (select one and mark)

0 to less than 0.5km	
0.5 to 1 km	
Greater than 1 km	x

IV. ENVIRONMENTAL PERFORMANCE

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							

Number of Valid Complaints
Citizen and NGOs
Specify number: ____________
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 Prioritization Scheme (PEMAPS) Questionnaire** of **Bamboo Plantation Project** located at Municipalities of Aguilar, Dasol, Infanta, Bugallon, Mangatarem in the Province of Pangasinan are 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 my hand this _________ day of ____________________ at _______________________.

____
CS First Green AID Inc.
President

SUBSCRIBED AND SWORN to before me this ________________________ day of ________________________ 2020 at ________________________. Affiant exhibiting to me his government issued identification no. ____________________ issued at __________________ on ____________________.

Doc. No. _______________
Page No. _______________
Book No. _______________
Series of 2020

PROJECT ENVIRONMENTAL MONITORING AND AUDIT PRIORITIZATION SCHEME (PEMAPS)

ACCOUNTABILITY STATEMENT OF PROJECT PROPONENT

This is to certify that all information in the submitted **Project Environmental Monitoring and Audit Prioritization Scheme (PEMAPS) Questionnaire** of **Ilijan LNG Import Facility Project** located at Barangay Ilijan, Batangas City, Batangas are 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 my hand this ________ day of DEC 02 2020 at PASIG CITY.

ATTY. HERBERT B. HERNANE
President
Linseed Field Power Corporation

SUBSCRIBED AND SWORN to before me this 2nd day of December 2020 at Pasig City. Affiant exhibiting to me his Tax Identification No. 276-065-914.

Doc. No. 04
Page No. 2
Book No. 4
Series of 2020

ALAN DAVID M. ORQUINAZA
Notary Public for the Cities of Pasig, San Juan
And Municipality of Pateros
Commission until 31 December 2021
2404 Discovery Center 25 ADB Ave., Ortigas Center Pasig City
APPT. No. 174 (2020-2021)-Roll No. 73735
PTR No. 6535463; 01-18-2020;Pasig City
IBP No. 104578; 01-09-2020;Makati
MCLE Compliance-N/A (Admitted ...)

ANNEX G

METEOROLOGY ATTACHMENTS

ANNEX G-1- YARD EQUIPMENT (FABRICATION SITE)

Resources	Engine Power (Kw)	Average Load Factor	Fuel Consumption (liter/hr) (per unit)	Equipment Month (total units)	2020 Sep	Oct	Nov	Dec	Jan		Feb		Mar		Apr
					1	2	3	4	5		6		7		8
Yard Equipment															
Welding Machines	12	0.21	0.652	1,044	-	-	-								
Crawler Crane, 300T	272	0.43	30.272	16											
Crawler Crane, 150T	201	0.43	22.370	17											
Rough-terrain Crane, 100T	195	0.59	29.778	9											
Rough-terrain Crane, 70T	257	0.59	39.245	80	-	-	-								
Air Compressor, 750 cfm	244	0.43	27.156	30											
Manlift, 272kgs	6	0.5	0.776	42											
Rough-terrain Crane, 70T	257	0.59	39.245	9											
Rough-terrain Crane, 45T	129	0.59	19.699	9											
Tractor Truck with HB Trailer, 20T	209	0.59	31.916	72											
Forklift, 6T	82.3	0.59	12.568	18											
Boom Truck, 10T	157	0.35	14.222	9											
Self Propelled Modular Transporter (SPMT)	175	0.5	22.647	5											

	2021 May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
	9		10		11		12		13		14		15		16		17		18	
			99	13431	119	16144	119	16144	119	16144	119	16144	119	16144	119	16144	119	16144	112	15194
			1	6296.6	2	12593	2	12593	2	12593	2	12593	2	12593	2	12593	2	12593	1	6296.6
			1	4653	2	9306	2	9306	2	9306	2	9306	2	9306	2	9306	2	9306	2	9306
			1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8
			8	65304	9	73467	9	73467	9	73467	9	73467	9	73467	9	73467	9	73467	9	73467
			2	11297	2	11297	4	22594	4	22594	4	22594	4	22594	4	22594	4	22594	2	11297
			3	484.52	5	807.53	5	807.53	5	807.53	5	807.53	5	807.53	5	807.53	5	807.53	4	646.02
			1	8163	1	8163	1	8163	1	8163	1	8163	1	8163	1	8163	1	8163	1	8163
			1	4097.4	1	4097.4	1	4097.4	1	4097.4	1	4097.4	1	4097.4	1	4097.4	1	4097.4	1	4097.4
			8	53107	8	53107	8	53107	8	53107	8	53107	8	53107	8	53107	8	53107	8	53107
			2	5228.2	2	5228.2	2	5228.2	2	5228.2	2	5228.2	2	5228.2	2	5228.2	2	5228.2	2	5228.2
			1	2958.2	1	2958.2	1	2958.2	1	2958.2	1	2958.2	1	2958.2	1	2958.2	1	2958.2	1	2958.2
				0		0		0		0	1	4710.6	1	4710.6	1	4710.6	1	4710.6	1	4710.6

2022														
Mar		Apr		May		Jun		Jul		Aug		TOTAL (liters)	Total (m^3)	Remarks
19		20		21		22		23		24				
												141,634.20	141.63	SMP Yard Fabrication / Modularization
												100,745.22	100.75	SMP Yard Fabrication / Modularization
												79,100.74	79.10	SMP Yard Fabrication / Modularization
												55,743.76	55.74	SMP Yard Fabrication / Modularization
												653,043.65	653.04	SMP Yard Fabrication / Modularization
												169,451.97	169.45	SMP Yard Fabrication / Modularization
												6,783.25	6.78	SMP Yard Fabrication / Modularization
												73,467.41	73.47	YARD - HANDLING AND LOGISTICS SUPPORT
												36,876.64	36.88	YARD - HANDLING AND LOGISTICS SUPPORT
												477,966.97	477.97	YARD - HANDLING AND LOGISTICS SUPPORT
												47,053.45	47.05	YARD - HANDLING AND LOGISTICS SUPPORT
												26,624.24	26.62	YARD - HANDLING AND LOGISTICS SUPPORT
												23,552.94	23.55	YARD - HANDLING AND LOGISTICS SUPPORT
												TOTAL=	**1,892.04**	

Annex A2- Site Equipment

Resources	Engine Power (Kw)	Average Load Factor	Fuel Consumption (liter/hr) (per unit)	Equipment Month (total units)	2020 Sep	Oct	Nov	Dec	Jan		Feb		Mar		Apr		May	
Crawler Crane, 300T	272	0.43	30.272	14														
Crawler Crane, 150T	201	0.43	22.370	7														
Rough-terrain Crane, 100T	195	0.59	29.778	8														
Rough-terrain Crane, 70T	257	0.59	39.245	38														
Manlift, 272kgs	6	0.34	0.528	45														
Welding Machine - Electric Driven	17	0.21	0.924	593														
Hydrotest Pump	22.7	0.43	2.526	12														
AIR COMPRESSOR	295	0.43	32.832	12														
Generator Set		0.43																
Oil Free Portable Compressor	185	0.43	20.589	7														
Crawler Crane, 150T	201	0.47	24.451	10														
Rough-terrain Crane, 70T	257	0.59	39.245	10														
Forklift	82	0.59	12.522	28														
Boom truck	179	0.35	16.215	10														
Tractor Truck with HB Trailer	162	0.5	20.965	46														
Water Truck 10,000 L	170	0.35	15.400	10														
Diesel Fuel Truck 6,500 L	150	0.35	13.588	10														
Ambulance	120	0.35	10.871	12														
Bulldozer (CAT)	264	0.6	40.998	40					4	34110	4	34110	4	34110	4	34110	4	34110
Grader	194	0.59	29.625	22					2	12324	2	12324	2	12324	2	12324	2	12324
Roller	162	0.56	23.480	22					2	9767.9	2	9767.9	2	9767.9	2	9767.9	2	9767.9
Water truck	170	0.35	15.400	22					2	6406.4	2	6406.4	2	6406.4	2	6406.4	2	6406.4
Dumptruck	251	0.35	22.738	88					8	37835	8	37835	8	37835	8	37835	8	37835
Backhoe (excavator) (ct 330)	273	0.59	41.689	44					4	34685	4	34685	4	34685	4	34685	4	34685
Service truck / Dropsode	150	0.35	13.588	24					2	5652.7	2	5652.7	2	5652.7	2	5652.7	2	5652.7
Crane	400	0.43	44.518	10					1	9259.7	1	9259.7	1	9259.7	1	9259.7	1	9259.7
Payloader	273	0.6	5.008	12					1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7
Mobile pumpcrete	45	0.43	5.008	12					1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7
Tractor Truck with HB Trailer, 20T	209	0.5	27.047	12					1	5625.8	1	5625.8	1	5625.8	1	5625.8	1	5625.8

Annex A2- Site Equipment (cont.)

2021																		
Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar
0	0	0	0	1	6296.6	2	12593	2	12593	2	12593	2	12593	2	12593	1	6296.6	1
0	0	0	0	0	0	1	4653	1	4653	1	4653	1	4653	1	4653	1	4653	1
0	0	0	0	0	0	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1	6193.8	1
0	0	0	0	1	8163	5	40815	5	40815	5	40815	5	40815	5	40815	6	48978	4
0	0	0	0	3	329.47	6	658.94	6	658.94	6	658.94	6	658.94	6	658.94	6	658.94	3
0	0	3	576.58	18	3459.5	53	10186	81	15568	81	15568	85	16336	85	16336	83	15952	61
0	0	0	0	0	0	0	0	0	0	2	1051	2	1051	2	1051	2	1051	2
0	0	0	0	0	0	0	0	0	0	2	13658	2	13658	2	13658	2	13658	2
0	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	3
0	0	0	0	0	0	0	0	0	0	0	0	1	4282.6	1	4282.6	1	4282.6	1
0	0	1	5085.8	1	5085.8	1	5085.8	1	5085.8	1	5085.8	1	5085.8	1	5085.8	1	5085.8	1
0	0	1	8163	1	8163	1	8163	1	8163	1	8163	1	8163	1	8163	1	8163	1
0	0	2	5209.1	2	5209.1	3	7813.7	3	7813.7	3	7813.7	3	7813.7	3	7813.7	3	7813.7	2
0	0	0	0	1	3372.8	1	3372.8	1	3372.8	1	3372.8	1	3372.8	1	3372.8	1	3372.8	1
0	0	3	13082	3	13082	5	21803	5	21803	5	21803	5	21803	5	21803	5	21803	4
0	0	1	3203.2	1	3203.2	1	3203.2	1	3203.2	1	3203.2	1	3203.2	1	3203.2	1	3203.2	1
0	0	1	2826.4	1	2826.4	1	2826.4	1	2826.4	1	2826.4	1	2826.4	1	2826.4	1	2826.4	1
0	0	1	2261.1	1	2261.1	1	2261.1	1	2261.1	1	2261.1	1	2261.1	1	2261.1	1	2261.1	1
4	34110	4	34110	4	34110	4	34110	4	34110		0		0					
2	12324	2	12324	2	12324	2	12324	2	12324	1	6162	1	6162					
2	9767.9	2	9767.9	2	9767.9	2	9767.9	2	9767.9	1	4883.9	1	4883.9					
2	6406.4	2	6406.4	2	6406.4	2	6406.4	2	6406.4	1	3203.2	1	3203.2					
8	37835	8	37835	8	37835	8	37835	8	37835	4	18918	4	18918					
4	34685	4	34685	4	34685	4	34685	4	34685	2	17343	2	17343					
2	5652.7	2	5652.7	2	5652.7	2	5652.7	2	5652.7	2	5652.7	2	5652.7					
1	9259.7	1	9259.7	1	9259.7	1	9259.7	1	9259.7		0		0					
1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7					
1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7	1	1041.7					
1	5625.8	1	5625.8	1	5625.8	1	5625.8	1	5625.8	1	5625.8	1	5625.8					

Annex A2- Site Equipment (cont.)

	2022											
Apr		May		Jun		Jul		Aug		TOTAL (liters)	Total (m^3)	Remarks
1	6296.6		0		0					88,152.06	88.15	SMP Site Assembly
	0		0		0					32,570.89	32.57	SMP Site Assembly
1	6193.8		0		0					49,550.00	49.55	SMP Site Assembly
2	16326		0		0					310,195.73	310.20	SMP Site Assembly
3	329.47		0		0					4,942.08	4.94	SMP Site Assembly
40	7687.7	3	576.58		0					113,969.86	113.97	SMP Site Assembly
2	1051	2	1051		0					7,356.81	7.36	SMP Site Assembly
2	13658	2	13658		0					95,606.10	95.61	SMP Site Assembly
3	0	3	0	1	0					-	-	SMP Site Assembly
1	4282.6	1	4282.6	1	4282.6					29,978.18	29.98	SMP Site Assembly
										-	-	
1	5085.8		0		0					50,858.20	50.86	SMP - HANDLING AND LOGISTICS SUPPORT
1	8163		0		0					81,630.46	81.63	SMP - HANDLING AND LOGISTICS SUPPORT
2	5209.1	1	2604.6	1	2604.6					72,927.44	72.93	SMP - HANDLING AND LOGISTICS SUPPORT
1	3372.8	1	3372.8		0					33,727.81	33.73	SMP - HANDLING AND LOGISTICS SUPPORT
4	17443	1	4360.7	1	4360.7					200,590.31	200.59	SMP - HANDLING AND LOGISTICS SUPPORT
1	3203.2		0		0					32,032.00	32.03	SMP - HANDLING AND LOGISTICS SUPPORT
1	2826.4		0		0					28,263.53	28.26	SMP - HANDLING AND LOGISTICS SUPPORT
1	2261.1	1	2261.1	1	2261.1					27,132.99	27.13	SMP - HANDLING AND LOGISTICS SUPPORT
										341,100.42	341.10	Civil Works
										135,563.73	135.56	Civil Works
										107,446.63	107.45	Civil Works
										70,470.40	70.47	Civil Works
										416,189.89	416.19	Civil Works
										381,535.04	381.54	Civil Works
										67,832.47	67.83	Civil Works
										92,596.71	92.60	Civil Works
										12,500.56	12.50	Civil Works
										12,500.56	12.50	Civil Works
										67,509.46	67.51	Civil Works
										TOTAL	**2,964.73**	

Annex A3- Offshore

Resources	Engine Power (Kw)	Average Load Factor	Fuel Consumption (liter/hr) (per unit)	Equipment Month (total units)	2020														
					Sep	Oct	Nov	Dec	Jan		Feb		Mar		Apr		May	
OFFSHORE																		
Demag 2800 - 600t crawler crane	390	0.43	43.405	18														
Crawler Crane with fixed piling leader	390	0.43	43.405	6														
1200 hp Tugboat	895	0.31	71.811	18														
30T BP Multicat	1866	0.43	207.675	9														
Crew Transfer Vessel 12m	820	0.43	91.261	9														
6m Aluminium Work Boat	112	0.43	12.465	9														
IHC S-280 Hydrohammer	435	0.43	48.413	12														
10,000lb Forklift	119	0.59	18.172	9														
MF 400 Mescolatore Pan Mixer (400L capacity)	3	0.43	0.334	9														

Resources	2021																			
	Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb		Mar	
OFFSHORE																				
Demag 2800 - 600t crawler crane					2	18056	2	18056	2	18056	2	18056	2	18056	2	18056	2	18056	2	18056
Crawler Crane with fixed piling leader					1	9028.2	1	9028.2	1	9028.2	1	9028.2	1	9028.2	1	9028.2		0		0
1200 hp Tugboat					2	29873	2	29873	2	29873	2	29873	2	29873	2	29873	2	29873	2	29873
30T BP Multicat					1	43196	1	43196	1	43196	1	43196	1	43196	1	43196	1	43196	1	43196
Crew Transfer Vessel 12m					1	18982	1	18982	1	18982	1	18982	1	18982	1	18982	1	18982	1	18982
6m Aluminium Work Boat					1	2592.7	1	2592.7	1	2592.7	1	2592.7	1	2592.7	1	2592.7	1	2592.7	1	2592.7
IHC S-280 Hydrohammer					2	20140	2	20140	2	20140	2	20140	2	20140	2	20140		0		0
10,000lb Forklift					1	3779.8	1	3779.8	1	3779.8	1	3779.8	1	3779.8	1	3779.8	1	3779.8	1	3779.8
MF 400 Mescolatore Pan Mixer (400L capacity)					1	69.448	1	69.448	1	69.448	1	69.448	1	69.448	1	69.448	1	69.448	1	69.448

Annex A3- cont.

2022												
Apr		May		Jun		Jul		Aug		TOTAL (liters)	Total (m^3)	Remarks
										TOTAL	2,964.73	
										-		
2	18056									162,507.22	162.51	OFFSHORE WORKS
	0									54,169.07	54.17	OFFSHORE WORKS
2	29873									268,858.84	268.86	OFFSHORE WORKS
1	43196									388,767.27	388.77	OFFSHORE WORKS
1	18982									170,840.92	170.84	OFFSHORE WORKS
1	2592.7									23,334.37	23.33	OFFSHORE WORKS
	0									120,838.70	120.84	OFFSHORE WORKS
1	3779.8									34,017.98	34.02	OFFSHORE WORKS
1	69.448									625.03	0.63	OFFSHORE WORKS
										TOTAL	1,223.96	

ANNEX G. EMISSION FACTORS AND SPREADSHEET IN ESTIMATED GHG EMISSIONS DURING OPERATION

ANNEX B-1 (Boiler)

Steam output =	15	tons per hour
boiler hp =	965.217391	boiler hp
Boiler HP=	33475	Btu/hr
	32.31065	**MMBtu/hr**
HHV (average)	992.200374	Btu/scf

GHG	Factor (lb/10^6	kg/hr	hrs/day	days per year	MT per year	GHG Potential	CO2e (MT/Y)
CO2	120,000.00	1,760.251	24	300	12673.807	1	12,673.807
CH4	2.30	0.034	24	300	0.243	28	6.802
N20	2.20	0.032	24	300	0.232	265	61.574
						TOTAL	**12,742.183**

CO2 (kg/hr) = 120,000 lb/10^6 scf * 32.3106 MMBtu/hr /(2.2* 992.200 Btu/scf)

TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION[a]

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
CO_2[b]	120,000	A
Lead	0.0005	D
N_2O (Uncontrolled)	2.2	E
N_2O (Controlled-low-NO_X burner)	0.64	E
PM (Total)[c]	7.6	D
PM (Condensable)[c]	5.7	D
PM (Filterable)[c]	1.9	B
SO_2[d]	0.6	A
TOC	11	B
Methane	2.3	B
VOC	5.5	C

ANNEX G-2 (Flare)

GHG emissions (other countries):											
		Emission factor (Gg/10^6 m^3)	g/m^3	BOG Flow (m^3/hr)	CO2 (g/hr)	Max 10 hrs/month	CO2 (tons/month)	12 months	GHG Potential	**CO2e tons per year**
0.00425	CO2 =	0.00425	4.25	2,739.73	11,643.84	10	0.1164	12	1	**1.397**
0.00000285	CH4=	0.00000285	0.00285	2,739.73	7.81	10	0.0001	12	28	**0.026**
0.000000064	N20=	0.000000064	0.000064	2,739.73	0.18	10	0.0000	12	265	**0.006**
									TOTAL	**1.429**
									TOTAL	12,743.612

Note Emission factor – average values in Table 11 (Other countries – sour gas) of the American Petroleum Institute (API) (2015): LNG Operations: Consistent Methodology for Estimating GHG Emissions

ANNEX H

AIR QUALITY ATTACHMENTS

ANNEX H. BOILER STACK AND GROUND FLARE EMISSIONS CALCULATIONS

Boiler stack gas calculation

Steam output =	15	tons per hour	
boiler hp =	965.2173913	boiler hp	
1 Boiler HP=	33475	Btu/hr	
	32.31065217	**MMBtu/hr**	
Fuel factor, dry basis	dscf/MMBtu	8,710.00	From Preferred and Alternative
Heat input (Hin)	MMBtu/hr	32.311	Million British thermal units (Btu/) per hour
Q =	dscfm	4,690.43	Dry standad cubic feet per minute
			MMBtu = 10^6 Btu
Diameter (inches)=	Inches	16	inches
Diameter (m)=	m	**0.4065**	m
Area =	m^2	0.129783555	m^2
Volumetric flow	m3/s	2.22	
Velocity =		**17.07**	
Emission factor (NOX) =	**100**	**lb/10^6 scf**	
HHV=	941.2177456	Btu/scf	(See separate worksheet)
EF (NOX) =	**1.546**	**kg/hr**	
EF (NOX) =	**0.430**	**g/s**	
Emission factor (CO)=	**84**	**lb/10^6 scf**	
HHV=	941.2177456	Btu/scf	
EF (CO)	**1.299**	**kg/hr**	
EF (CO)	**0.361**	**g/s**	

Flare calculation

	HHV (min)	**48**	**MJ/kg**			
		0.001	MMBth	=	1.055	MJ
		0.73	kg/m^3	Density of natural gas		
		1	MMBtu	=	1000000	Btu
	HHV (min)	0.0009	MM Btu			
	HHV (min)	**941.2177**	**Btu/scf**			
	HHV (max)	**53.2**	**MJ/kg**			
	HHV (max)	0.0010	MM Btu			
	HHV (max)	**1043.1830**	**Btu/scf**			
Flare BOG:						
		2000	kg/hr			
		2739.73	m^3/hr			
		96,678.22	ft^3/hr			
		0.761	m^3/sec			
	Emissions (lb/hr) = flare gas vol (scf/hr) x LHV (Btu/scf) x (1 MMBtu/10^6) * EF (lb/MMBtu)					
	EF of CO=	**0.37**	**lb/10^6 Btu**			
	CO Emission factor =	33.617694	lb/hr			
	CO Emission factor =	**4.21**	g/s			
	EF of Nitrogen Oxides =	**0.068**	**lb/10^6 Btu**			
	NOX Emission factor =	6.178387	lb/hr			
	NOX Emission factor =	**0.77**	g/s			
	diameter =	4.4	m			
	Area =	15.21	m^2			
	V=	0.05	m/s			

ANNEX I

PEOPLE MODULE ATTACHMENTS

OCTOBER 2020

PUBLIC SCOPING REPORT (PSR)

ILIJAN LNG IMPORT FACILITY PROJECT

30 SEPTEMBER 2020
BARANGAY ILIJAN, BATANGAS CITY

AG&P

RHR CONSULTING SERVICES, INC.

1 INTRODUCTION

1.1 The Purpose of Activity

The Public Scoping for the proposed Ilijan LNG Import Facility Project of Atlantic Gulf & Pacific Company of Manila, Inc. (AG&P) was held on September 30, 2020, 1:00 PM at the Barangay Hall, Barangay Ilijan, Batangas City. A Zoom Meeting was simultaneously conducted to accommodate stakeholders that cannot attend the meeting physically. The Public Scoping was facilitated by representatives from AG&P and RHR Consulting Services, Inc. (EIA Preparer) and was participated by 29 attendees composed of members/heads of the local sectors, Local Government Units and other government agencies that are or will be affected by the project. The Public Scoping event aims the following:

- Identification of the most significant issues related to the proposed project;
- Identification of possible impacts of the project; and
- Perception of affected residents and Local Government Units on the project.

In a Public Scoping, it is necessary to present and discuss the EIA Process and the description of the Project in order to inform all stakeholders with the ongoing processes and activities. Such inclusion establishes transparency in the EIA process and provides more avenues for inclusion and engagement from the stakeholders. It is to be noted that the identified issues will come from the comments, issues, opinions, and suggestions raised by the audience of the Public Scoping or the stakeholders.

On this note, representation of all pertinent individuals and organizations is very critical to assure that all concerns regarding the project will be covered. Thus, the list of stakeholders is composed of representatives of various sectors of the impact barangay – Barangay Ilijan, and LGUs/agencies potentially affected by the project.

During the program, the stakeholders were given ample time to voice out their concerns, comments, and suggestions regarding the project and all of which were addressed by the proponent and representatives from DENR-EMB. These issues were also noted and listed as can be seen in the "issues and concerns raised" part of this report. Aside from this, the event was purposely held at a venue that is near the site and affected areas for the convenience of the identified stakeholders.

1.2 Preparation for Public Scoping

With the current restrictions related to the COVID-19 pandemic and in line with EMB Memorandum Circular 2020-30 (*Interim Guidelines on Public Participation on the Implementation of the Philippine Environmental Impact Statement System During the State of National Public Health Emergency*), as well as DENR Administrative Order 2017-15 (Guidelines on Public Participation under the Philippine Environmental Impact Statement [EIS] System), the public scoping for the Ilijan LNG Import Facility Project was conducted through video conference (Option 1).

Earlier IEC activities suggested difficulties of internet connection in the area that could hamper discussions especially from the impact barangay sectors. In order to ensure participation and adequate sectoral representation, a physical Public Scoping was implemented inside the Barangay Hall of

Barangay Ilijan, Batangas City (Option 2). Invitees for Option 2 were limited to one representative per sector.

Public Scoping invitation letters (**Annex C**) duly signed by the EMB Director were distributed to various stakeholders – through email and hard copies (in coordination with the Barangay LGU). Attached to the invitation letters were COVID-19 Protocols/Guidelines of Barangay Ilijan should they opt to physically attend the event (**Annex D**). Additional stakeholder group representatives were also invited in coordination with the Barangay LGU.

A Notice of Public Scoping was posted on the EMB Central Office Website (www.eia.emb.gov.ph) on September 19, 2020.

1.3 Representation of Stakeholders

Table 1 shows the stakeholders invited during the Public Scoping based on Section 5 of DAO 2017-15. In order to impose less physical contact amid the pandemic, invitation letters were sent via email to stakeholder representatives or coordinated through the Barangay LGU.

Table 1. List of Stakeholders invited to the Public Scoping

Stakeholder Group	Representative	Barangay Address
Barangay Ilijan LGU/Ilijan Barangay Development Council	Barangay Captain Gilbert B. Cepillo and Constituents	Barangay Hall, Barangay Ilijan, Batangas City, Batangas
Pedro S. Tolentino Memorial National High School	Mr. Ronald M. Enriquez, Principal	Barangay Ilijan, Batangas City, Batangas
Sangguniang Kabataan	Mr. Aristotle R. Cepillo, Sangguniang Kabataan Chairperson	Barangay Ilijan, Batangas City, Batangas
Ilijan Multi-Purpose Cooperative	Ms. Bangie Cepillo, Chairperson	Barangay Ilijan, Batangas City, Batangas
Bantay Dagat	Mr. Pepito A. Bool, Representative	Barangay Ilijan, Batangas City, Batangas
Fisherfolk	Mr. Nanding G. Daquis, President	Barangay Ilijan, Batangas City, Batangas
Ilijan Elementary School	Ms. Elma C. Concepcion, Principal	Barangay Ilijan, Batangas City, Batangas
Women's Association	Ms. Victoria Desserie T. Alejo, President	Barangay Ilijan, Batangas City, Batangas
PMSS/Church	Ms. Violeta P. Aguila	Barangay Ilijan, Batangas City, Batangas
BOD Tricycle Driver Association	Mr. Timothy Rigor S. Cruzat, Representative	Barangay Ilijan, Batangas City, Batangas
Church	Ms. Joyce Silang, Representative	Barangay Ilijan, Batangas City, Batangas
Health Center	Ms. Maxima D. Bayeta, Midwife II	Barangay Ilijan, Batangas City, Batangas
Batangas City Planning and Development Office	Engr. Januario G. Godoy, City Planning and Development Officer	P. Burgos Street, Brgy. Poblacion 17 Batangas City, Batangas
Batangas City Veterinarian & Agricultural Services Office	Dr. Macario B. Hornilla, OIC City Veterinarian	P. Burgos Street, Brgy. Poblacion 17 Batangas City, Batangas
Batangas City Government	Hon. Beverley Rose A. Dimacuha	P. Burgos Street, Brgy. Poblacion 17 Batangas City, Batangas

Stakeholder Group	Representative	Barangay Address
Port Management Office - Batangas	Mr. Joselito O. Sinocruz, Port Manager	Batangas Port Access Rd, Batangas
DENR-CENRO Lipa	For. Januel R. Peras, CENR Officer	Brgy. Marawoy, Lipa City
Batangas Office of the Provincial Agriculturist	Mr. Pablito A. Balantac, Provincial Agriculturist	Provincial Capitol Building, Batangas City, Batangas
Batangas Provincial Planning and Development Office	EnP Benjamin I. Bausas, Provincial Planning and Development Coordinator	Provincial Capitol Building, Batangas City, Batangas
Batangas Provincial Government	Hon. Dodo I. Mandanas, Governor	Provincial Capitol Building, Batangas City, Batangas
Bureau of Fisheries and Aquatic Resources – Region IVA (CALABARZON)	Dir. Sammy A. Malvas, Director	Purok 3 Brgy. Bambang, Los Baños, Laguna
PENRO Batangas	For. Noel M. Recillo, OIC PENRO, Batangas	4915 Solomon Road, Sitio Hospital, Brgy. Kumintang Ibaba, Batangas City
Biodiversity Management Bureau	For. Ricardo L. Calderon, Director	Ninoy Aquino Parks and Wildlife Center, 1100 Diliman Quezon City, Philippines
Department of Energy - Luzon Field Office	Mr. Renante M. Sevilla, Director	2nd & 3rd Floor PSJ Building Mac Arthur Highway, Nancayasan, Urdaneta City, Pangasinan
Batangas Provincial Environment and Natural Resources Office	Mr. Luis A. Awitan, Provincial Environment and Natural Resources Officer	Provincial Capitol Building, Batangas City, Batangas
Philippine Coast Guard	Commandant George Jr. V. Ursabia, Commandant	139 25th Street Port Area, Manila

There were 29 representatives from various stakeholder groups who attended the Public Scoping Activity, 62% of which were Barangay Ilijan stakeholders (See **Table 2** for participants who attended physically and **Table 3** during Zoom Meeting).

Table 2. Community stakeholders who attended the public scoping at Barangay Hall, Ilijan, Batangas City

Community Stakeholders	Number of attendees
Barangay LGU / Ilijan Barangay Development Council	7
Ilijan Health Center	1
Women's Association	1
Fisherfolks	1
Ilijan TODA (Tricycle Drivers' Association)	1
Lilinggiwan Elementary School	1
Ilijan Elementary School	1
Pedro S. Tolentino Memorial National High School	1
Ilijan Multi-Purpose Cooperative	1
Parish Ministry on Social Services	1
Parish Church	1
Bantay Dagat	1
Total	**18**

Table 3. Other stakeholders attended the public scoping via Online Platform – Zoom Meeting

Other Stakeholders	Number of attendees
Batangas City Planning and Development Office	2
Batangas Provincial Planning and Development Office	1
Department of Energy – Luzon Field Office	1
Philippine Ports Authority - Batangas	1
Philippine Coast Guard - MEPCOM	2
Bureau of Fisheries and Aquatic Resources – Region IVA	1
NPSCS	1
EMB	2
TOTAL	**11**

Four (4) members of AG&P and 3 from RHR Consulting Services, Inc. were present in Barangay Ilijan to cater the questions and clarifications of the participants. For the online Public Scoping, three from AG&P and four from RHR Consulting Services, Inc. were present.

2 NARRATIVE SUMMARY OF PUBLIC SCOPING ACTIVITY

The Public Scoping of the proposed Ilijan LNG Import Facility Project was held at the Conference Hall/Room of Barangay Ilijan, Barangas City, Batangas Province. The program started at 1:30 PM. In attendance were 29 representatives of various sectors and/or organizations.

Date	Time	No. of Participants	Venue
30 September 2020	1:30 PM	18	Barangay Hall of Ilijan, Batangas City
30 September 2020	1:30 PM	11	Meeting ID: 886 0419 7060 Passcode: 236872

The program commenced with an announcement from Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU at 1:30 PM. Barangay Councilor Gil Cepillo led the invocation for the program. Barangay Chairman Gilbert B. Cepillo greeted and welcomed the participants in the venue and the video conference. EMB Case Handler Engr. George Silvederio, through Zoom Meeting, presented the EIA Process and Next Steps.

The presentation on the EIA Process was interrupted due to the loss of internet connection in Barangay Ilijan. As the connection cannot be restored, it was agreed upon by the EMB officials, proponent, and the preparer that both venues will proceed independently. In Barangay Ilijan, Mr. Levi Alan B. Vitug, Corporate Planning Manager of AG&P, presented the Project Description while Mr. Alex Gamboa, Senior Vice President - Business Development presented the same through video conference for the online participants.

Filipino was the primary dialect used during the activity and complementing this was English as the secondary language used. Visual presentations were utilized to aid in the presentations and discussions. There were no negative incidences and the general atmosphere throughout the activity was cordial and warm. Snacks and lunch were served after the public scoping activity.

The open forum and Public Scoping program officially ended at 3:33 PM.

Table 4. Program of the Public Scoping

Program of Activities	Person Responsible
Registration	Proponent/Preparer
Opening Prayer	Barangay Ilijan Councilor Gil Cepillo
National Anthem	Barangay Ilijan Secretary Felipe Concepcion
Welcome Remarks	Barangay Ilijan Chairman Gilbert B. Cepillo
Introduction of Participants	Mr. Jess M. Addawe, EIA Preparer
Presentation of EIA Process	Engr. George Silvederio, EMB-CO
Presentation of Project Description	Mr. Levi Alan B. Vitug, AG&P (Barangay Ilijan) Mr. Alex Gamboa, AG&P (Video Conference)
Open Forum and Raising of Issues and Concerns	Mr. Levi Alan B. Vitug, AG&P (Barangay Ilijan) Mr. Alex Gamboa, AG&P (Video Conference)
Synthesis and Integration/ Summary of Issues and Agreements on Scoping, and Next Steps in the EIA Process	Engr. George Silvederio, EMB-CO
Closing Remarks	Mr. Levi Alan B. Vitug, AG&P (Barangay Ilijan)

3 ISSUES AND CONCERNS RAISED

Overall there were 18 issues, concerns, and recommendations raised by the stakeholders which were answered and acknowledged by the proponent and are summarized in the table below.

Table 5. Issues and concerns raised during the Open Forum

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
Physical Public Scoping		
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	Is the LNG in liquid or gas state?	Mr. Levi Alan B. Vitug, AG&P: The LNG is in liquid state that will be regassed in the facility.
Mr. Ronald M. Enriquez, Principal of Pedro S. Tolentino Memorial National High School – Integrated Shool	Why is the Floating Storage needed and why not directly located in the land terminal so it won't affect the seas of Ilijan. These seas are protected. Many fishermen might lose their livelihood due to 200-m shore area. This zone has a lot of marine resources vital to fisherfolk.	Mr. Levi Alan B. Vitug, AG&P: One LNG Carrier can carry 170,000 m3. San Miguel can only receive partial amount of LNG if they depend on a 60,000-m3 tank. The LNG tank takes a long time to install or construct as compared to a Floating Storage Unit. The June 2022 deadline for the company might not be achieved if all facilities will be on land. Mr. Lester B. Dinoy, AG&P: The project will only involve a terminal facility. An LNG production project will be too big and too long to construct. Thus, the FSU is necessary and practical. The AG&P and RHR will conduct a series of studies including the public scoping to gather issues and concerns of the community.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	In the plant processing, it is noticed that seawater will be used for the heating system. If seawater will be used, what will be the temperature of the seawater discharge?	Mr. Levi Alan B. Vitug, AG&P: The temperature of the seawater discharge should be not more than 3°C for the safety of marine life. The EIA study will help the design of the project to determine various EMB standards.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	There was a case where a fisherman, aside from marine life, was sucked by the intake in Ilijan who later died. In response, the intake of KEPCO was recommended to be fenced as 10-25 meters near its intake could suck in a person. What are your safety measures for this type of accident?	Mr. Levi Alan B. Vitug, AG&P: There will be a 200-meter exclusion zone around the FSU as it is flammable. A seawater pump is also located within that zone hence human activities will not be permitted. AG&P will study the design for the project on how marine life will be protected from the onshore facility. Mr. Lester B. Dinoy, AG&P:

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
	The community experienced so far 20 sacks of sucked in small fishes and about 30 seaturtles, 7 of which are dead. Will this type of accidents occur for this type of project?	AG&P will take into consideration the protection of marine life. The contractor who designs the project will follow international standards. These questions were noted and will be addressed.
Barangay Ilijan Councilor Gil Cepillo of Barangay Ilijan LGU	On the process of regasification, it was said that 100% will not have a leak but a tower will burn the leak. It means there is still a possibility of a leak. If gas will burn-off, how destructive will it be to the vegetation, wildlife, and the people?	Mr. Levi Alan B. Vitug, AG&P: The number one imperative for the engineers is that there should be no leak. From a commercial perspective, a leak is a loss in profit. Secondly, natural gas is methane and in any international safety standards, a flare tower is required to burn the leak. Mr. Lester B. Dinoy, AG&P: A large volume of natural gas will still have an impact to the environment. A leak shall be prevented due to the high cost. There will be a very minimal probability of boil off rate. Residues will be pushed to the flare tower to burn. However, the amount to be burned will be very minimal not destructive enough to the environment as it will be monitored by international standards.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	What will be the indicator for the leak outside the plant?	Mr. Lester B. Dinoy, AG&P: In all areas of the plant, multiple censors will be installed as LNG is odorless. Fire stations will be constructed in accordance with international standards. Burning in the flare tower indicates that it is working.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	Are there any residuals from the regasification process that may harm the environment?	Mr. Lester B. Dinoy, AG&P: AG&P is very confident that there will be no residuals. Bought LNG will have certificates that assure the quality of the LNG.
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	In your experience, what will be the noise level of the processing plant?	Mr. Lester B. Dinoy, AG&P: In this project, the limit should be no more than 85 decibels, one meter away from the source of the noise. Thresholds will be confirmed during the EIA study. Mr. Jess M. Addawe, RHR:

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
		Ambient noise will be studied in the EIA report. This will be compared to DENR standards. Monitoring will also be conducted for the ambient noise during the operation of the project.
Barangay Ilijan Councilor Gil Cepillo of Barangay Ilijan LGU	What are the livelihood programs benefitting the impact barangay or communities from the LNG project?	Mr. Rufino Ocampo, AG&P-COMREL: AG&P, through the COMREL, will closely coordinate with the communities. Concerned barangays or organizations may send a letter to the COMREL regarding their requests. Mr. Henry James P. Botengan, RHR: There will be a series of discussions and consultations with the concerned stakeholders, such as the fisherfolk during which they will be asked for their proposed alternative livelihood or other programs they have in mind. Mr. Jess M. Addawe, RHR: In terms of ECC requirements, in the EIA study, a Social Development Plan is required by EMB to be formulated based on consultations with the stakeholders. The goal of the SDP is to aid those who will be affected by the project. This is separate from the Corporate Social Responsibility (CSR). The EIA study can be reviewed by the stakeholders and during the Public Hearing, may raise comments regarding the SDP
Barangay Secretary Felipe M. Concepcion Jr. of Barangay Ilijan LGU	AG&P has submitted a letter request for clearance. It was not yet clear for the Barangay LGU what kind of clearance, if for construction or operation. There is no clear discussion yet on the flow of construction and what are the impacts on the community. Consultations should be made on the traditions and cultures present in the barangay. The Barangay LGU prioritizes	Mr. Levi Alan B. Vitug, AG&P: AG&P endorsed the contractor to the Barangay LGU for the topographic survey. However, AG&P was not aware on what has transpired during the visit. AG&P will list down the concerns of the LGU and will convey them to the contractor. The contractor cannot apply yet for a permit as SMC Site Development has still no ECC. As per the contractor, a stockpile area was already identified about 10 km away from Ilijan.

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
	safety during the entry of construction workers in Ilijan. Existing issues include unpaid households for resettlement and lack of stockpile area according to the contractor for clearing operations. If the stockpile area is located in the upper parts of the barangay, this may cause landslides. It should be located in a flat and vast area. Communication should be made with the host barangay first.	Regarding the concerns about the households, the project area will not be owned by AG&P but by SMC. Hence, AG&P has no authority to broach the subject on land issues to the communities. On the clearances applied, AG&P received a notice to proceed from the DOE requiring the proponent to deliver a locational zoning clearance that the location of the project is 100% industrial. That is the purpose of the barangay permit being applied by the AG&P. Mr. Lester B. Dinoy, AG&P: AG&P would like to maintain good communication with the barangay. Should there be any issues regarding the contractor, the barangay can notify AG&P. Santa Clara Contractor is being employed both by AG&P and SMC for their Site Development. Hence there will be instances where activities may be confused with.
Video Conference		
Mr. Suzie M. Huelgas, Environmental Specialist, PPA Batangas	Request for a copy of AG&P project plans so the Harbor Master and the Vessel Traffic Manager can also provide their insights in regard the safe navigation in the area. Also, the Engineering Services Manager will need to look on port facilities too. Requesting for a separate discussion with the presence of the Harbor Master and Vessel Traffic Manager.	Mr. Alex Gamboa, AG&P: AG&P will send an advanced copy of project plans to PPA-Batangas. An open dialogue will be conducted separately with the PPA-Batangas.

NAME - AGENCY/BRGY./ POSITION	ISSUES/CONCERNS	RESPONSE
Engr. Januario G. Godoy, City Planning and Development Officer	Will motorists be safe in crossing the Batangas Bay Road within the proposed project area?	Mr. Alex Gamboa, AG&P: Yes, it is very safe. AG&P will provide all the mitigating measures. The NFPA standards for LNG terminals, aside from the local building code make sure that the facility is very safe.
Engr. Januario G. Godoy, City Planning and Development Officer	What is the target date of construction for the project?	Mr. Alex Gamboa, AG&P: We are now currently applying for permits, including ECC, locational clearance, etc from different government agencies. AG&P targets the construction early part of 2021. The target start of operation will be June 2022.
EnP. Raquel Smith C. Ortega - EMB Central Office	Is the project located within the compound of AG&P?	Mr. Alex Gamboa, AG&P: The facility will be located right beside the Ilijan Power Plant. The property is owned by SMC and will be in a lease contract with AG&P. AG&P will only develop the area.
EnP. Raquel Smith C. Ortega - EMB Central Office	Are there no settlers within the project area?	Mr. Alex Gamboa, AG&P: None. It is part of the application for locational clearance that issues present in the area.
Ms. Natividad Efondo (Fisheries Inspection Unit) – BFAR Region IVA	Residues of the processing that may fall on seas may affect marine life. Make sure that during operations, no contamination on the environment, especially on the fisheries.	Mr. Alex Gamboa, AG&P: Specific standards will be complied with to make sure that the environment will not be contaminated. Moreover, details on effluent and the final design may be presented with BFAR before construction.
Engr. Januario G. Godoy, City Planning and Development Officer	Will electricity be cheaper using LNG?	Mr. Alex Gamboa, AG&P: Cannot speak on behalf of the Ilijan power plant, but prices are very competitive as compared to other power providers.
Engr. Julius Caesar G. Pantaleon - Science Research Specialist II (DOE-Luzon Field Office) / Ms. Kristel Charmaine R. Sayson - Science Research Specialist I (DOE-Luzon Field Office)	Requesting for copy of the presentations during Public Scoping.	RHR Consulting Services, Inc.: Noted.

4 PROPOSED DESIGN OF PUBLIC PARTICIPATION

4.1 Review of Secondary Information

All secondary data from the concerned LGUs and other relevant agencies will be collected to accurately assess the issues raised by stakeholders, as well as to provide a background on the socio-economic situation of the stakeholder communities. This shall include, but will not be limited to the following:

- Barangay Profiles
- Barangay Profile and Survey;
- Barangay Socio-economic and Health Profile
- Barangay Development Plan
- National Statistics Office
- Comprehensive Land Use Plans
- Provincial Physical Framework Plan
- Ecological Profile
- Other pertinent documents

4.2 Perception Survey

A perception survey will be conducted to determine the stakeholder's awareness and perception of the project. The survey will involve questions about the respondents' demographic profile, socio-economic profile, perception of the current state of the environment, knowledge about the project, and perceived opportunities, issues, and concerns about the project. The sample of the survey will be determined based on the technical scoping requirement. The focus will be given to stakeholders directly affected by the project.

ANNEXES

ANNEX A – PHOTO DOCUMENTATION

ANNEX B – ATTENDANCE SHEET

ANNEX C – RECEIVED INVITATION LETTERS

ANNEX D – COVID PROTOCOLS FOR THE PUBLIC SCOPING ATTENDEES

ANNEX E – PRESENTATION MATERIALS

ANNEX A

Photo Documentation prior and during the Public Scoping

PUBLIC SCOPING AT BARANGAY ILIJAN, BATANGAS CITY

Figure 1. Tarpaulin posting for the Public Scoping

Figure 2. Registration of Participants

Figure 3. Invocation and singing of the National Anthem

Figure 4. Opening Remarks by Barangay Captain Gilbert Cepillo

Figure 5. EIA processes being discussed by Engr. Silvederio via Video Conference

Figure 6. Mr. Levi Alan B. Vitug of AG&P discussing the Project Description

Figure 7. Stakeholder representatives raising their issues and concerns during Open Forum

PUBLIC SCOPING THROUGH VIDEO CONFERENCE

Figure 8. EIA processes being discussed by Engr. Silvederio via Video Conference

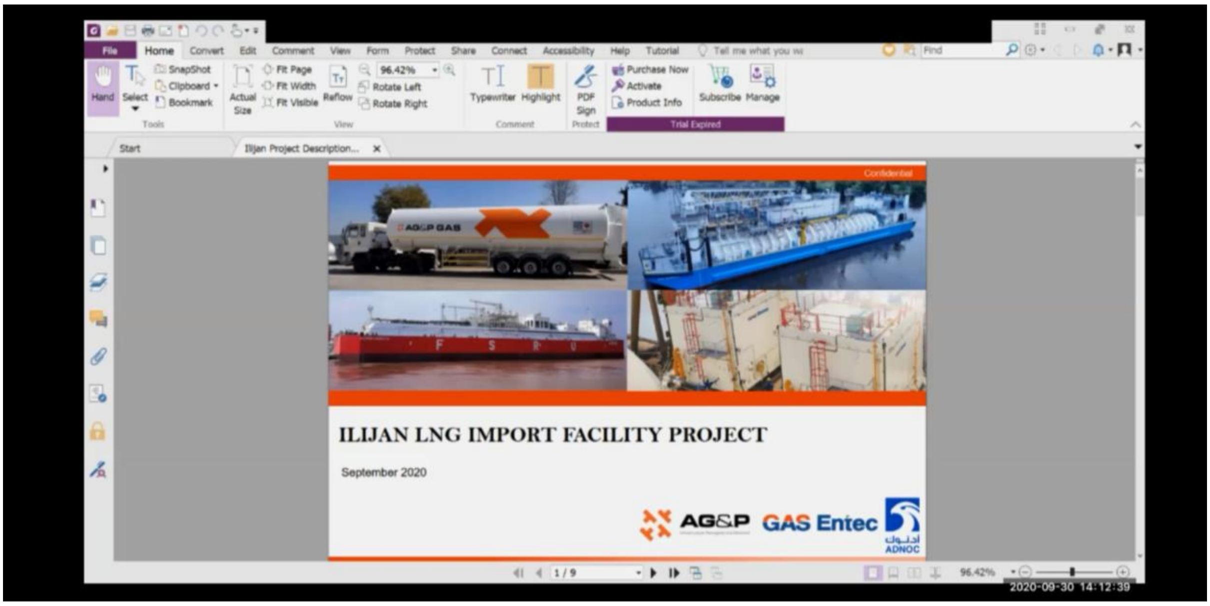


Figure 9. Presentation of Project Description by Mr. Alex Gamboa of AG&P

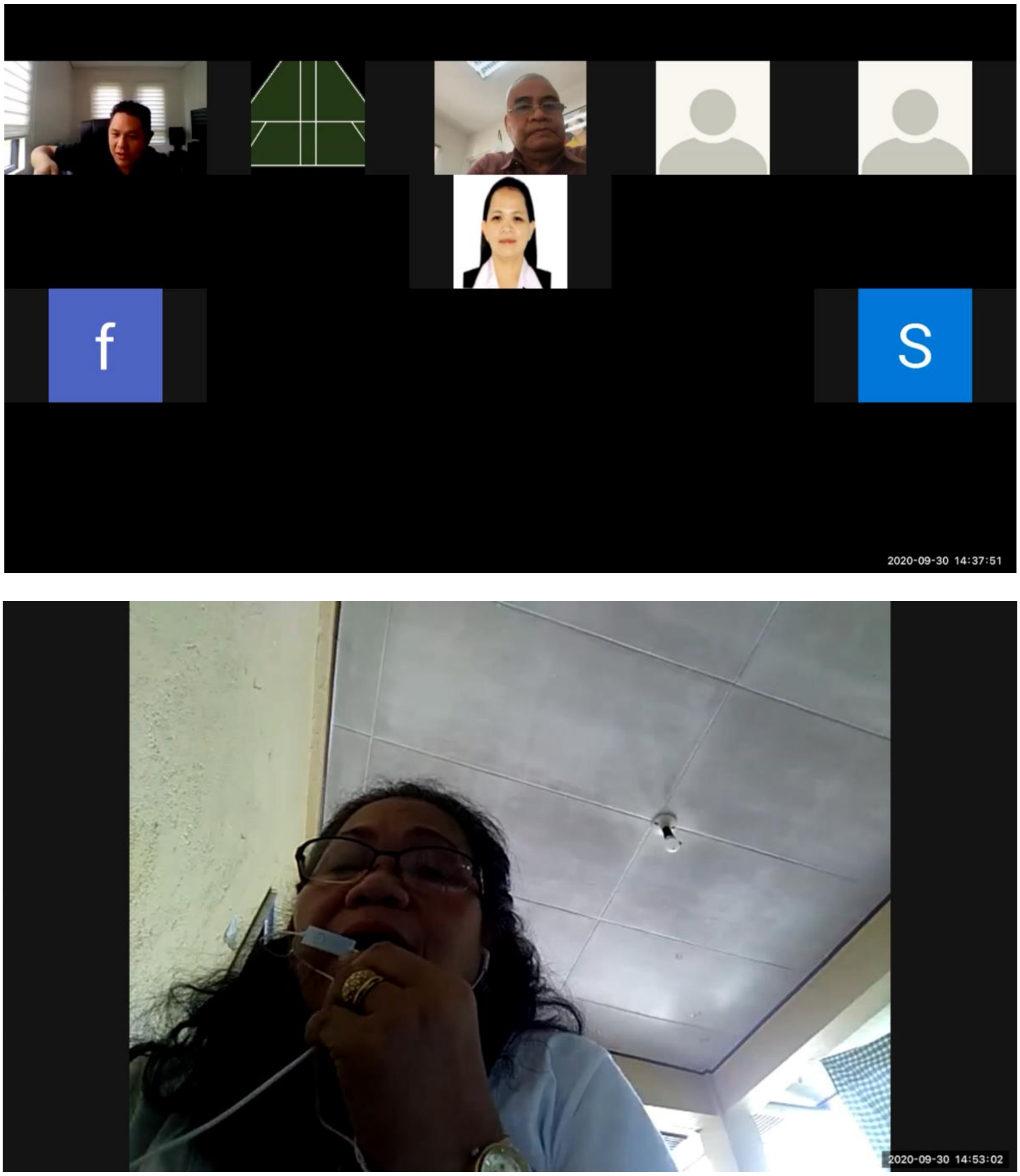


Figure 10.Open Forum via Video Conference

ANNEX B

Attendance Sheet

PUBLIC SCOPING FOR THE PROPOSED ILIJAN LNG IMPORT FACILITY PROJECT
Barangay Hall of Ilijan, Batangas City, Batangas Province
30 September 2020, 1:00 PM

NAME / PANGALAN	ADDRESS / TIRAHAN	ORGANIZATION / ORGANISASYON	SIGNATURE / LAGDA
1. Victoria Desserie T. Alejo	Ilijan Batangas City	WOMEN'S PRESIDENT	
2. Sabina M. Amparo	Liliñgiwan, Ilijan Batangas City	Liliñgiwan Elem. School	
3. RONALD M. ENRIQUEZ	H. BAYANAN - PSJNHS	DepEd	
4. Bangie B. Cupillo	Silangan 2 Ilijan, Bats. City	ILIJAN MULTIPURPOSE COOP - BOD	
5. Visitacion P. Aguila	Hulong Bayanan	Parish Ministry on Social Services	
6. CHITO PERADILLA	HULONG SILANGAN	ILIJAN TODA	
7. ELMA C. CONCEPCION	Hulong Bayanan, Ilijan Bats. City	Ilijan Elem. School - DepEd	
8. NANDING G. DAQUIS	SILANGAN 2 ILIJAN, BATS. CITY	FISHERFOLKS / CHAIRMAN	
9. Maxima D. Bayeta	Liliñgiwan, Ilijan Bats. City	Ilijan Health Center / CHO Midwife II	
10. Joyce Silang	Silangan 2, Ilijan, Batangas City	Parish Church Secretary	
11 RODRIGO A. CELIS	BRGY. ILIJAN BATS. CITY	BRGY. COUNCILOR	
12. RUFINO M ACUÑA	BRGY ILIJAN BATS CITY	BRGY CONCILOR	
13. RENE F. DELA ROCA	BRGY ILIJAN BATS CITY	~~HEPE~~ OF TANOD	
14. LANIE BOOL	ILIJAN. B.C.	BRGY. TREASURER	

PUBLIC SCOPING FOR THE PROPOSED ILIJAN LNG IMPORT FACILITY PROJECT
Barangay Hall of Ilijan, Batangas City, Batangas Province
30 September 2020, 1:00 PM

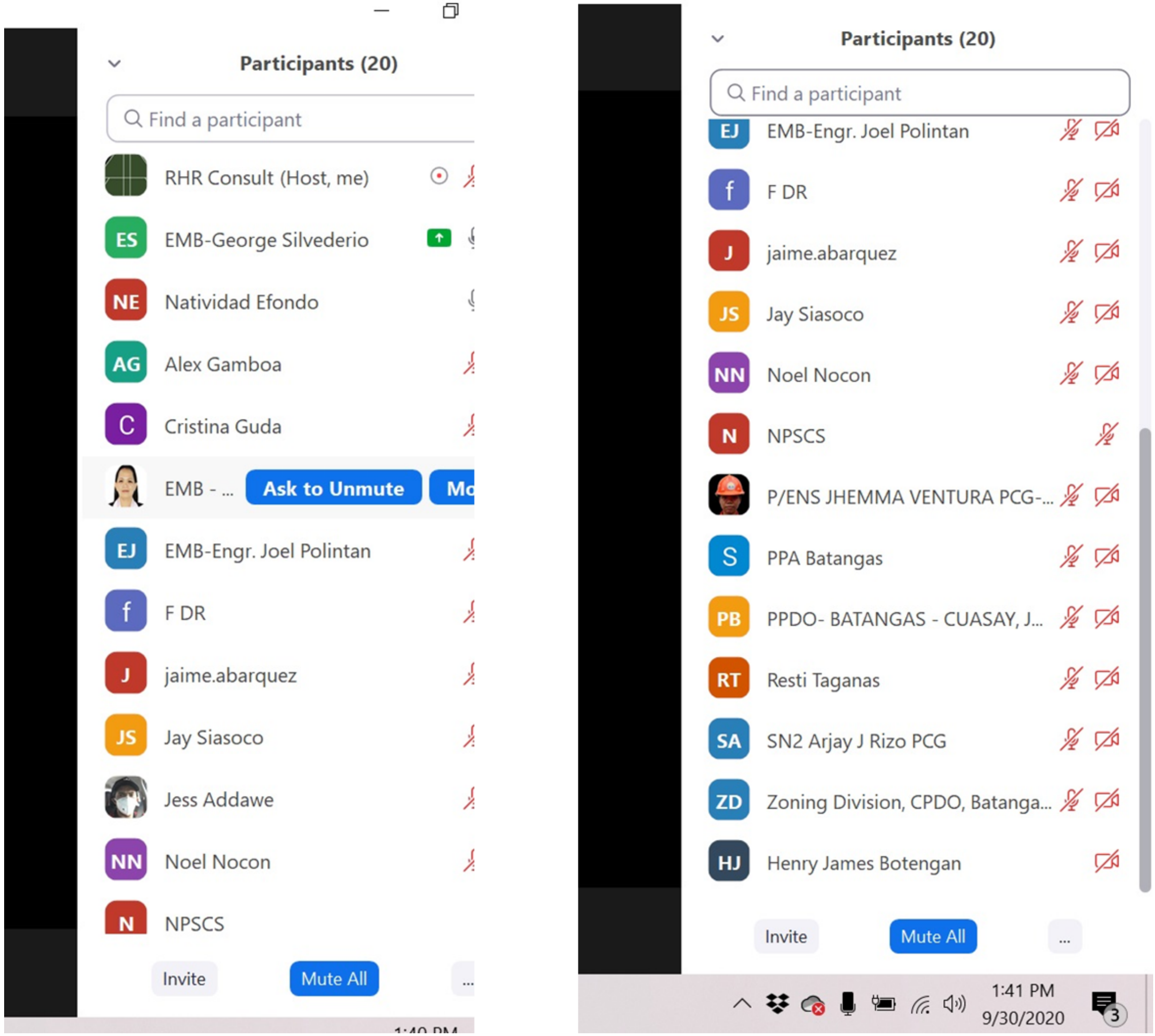
NAME / PANGALAN	ADDRESS / TIRAHAN	ORGANIZATION / ORGANISASYON	SIGNATURE / LAGDA
PEPITO A. BOOL	ILIJAN, BATANGAS CITY	Kumatatawan / Bantay Dagat	[signature]

PUBLIC SCOPING FOR THE PROPOSED ILIJAN LNG IMPORT FACILITY PROJECT
Barangay Hall of Ilijan, Batangas City, Batangas Province
30 September 2020, 1:00 PM

NAME / PANGALAN	ADDRESS / TIRAHAN	ORGANIZATION / ORGANISASYON	SIGNATURE / LAGDA
DIOSDADO C AGUILA	ILIJAN	KONSEHAL	
GIL B. CEPILLO	ILIJAN	COUNCILOR	
Gilbert R. Cepillo	ILIJAN	Brgy- Captain	

PUBLIC SCOPING FOR THE PROPOSED ILIJAN LNG IMPORT FACILITY PROJECT
Barangay Hall of Ilijan, Batangas City, Batangas Province
30 September 2020, 1:00 PM

NAME / PANGALAN	ADDRESS / TIRAHAN	ORGANIZATION / ORGANISASYON	SIGNATURE / LAGDA
RUFINO "Didi" OCAMPO	SAN ROQUE, BAUAN, BATANGAS	AG&P - BHFY	
DOC JUN CUETO	LIBJO BATANGAS CITY	AG&P BHFY	
LEVI VITUG	FILINVEST, ALABANG, MUNTINLUPA	AG&P	
LESTER DINOY	FILINVES, ALABANG MUNTINLUPA	AG&P	
Kristine Ann Gillado	LOS BAÑOS, LAGUNA	RHR consulting	



Screenshots of Attendees via Video Conference

Video Conference Chat Log showing Names and Agencies of Participants

12:31:43 From RHR Consult : Good Afternoon. Please state your name, office, and designation. This is for the attendance. Thank you very much.
12:32:17 From RHR Consult : Example: Jori P. Lentijas - RHR Consult Services, Inc. - EIA Preparer
13:31:25 From RHR Consult to EMB-George Silvederio(Privately) : Sir ikaw facilitator tama ba?
13:31:47 From EMB-George Silvederio to RHR Consult(Privately) : No maam. Proponent driven po yung public scoping.
13:31:59 From EMB-George Silvederio to RHR Consult(Privately) : Sa EIA process at sa next steps lang po yung EMB
13:32:03 From RHR Consult to EMB-George Silvederio(Privately) : okay sir
13:32:06 From EMB-George Silvederio to RHR Consult(Privately) : THank you
13:33:31 From EMB - EnP. Raquel Ortega : hindi po marinig yung kay Sir Henry
13:34:28 From EMB - EnP. Raquel Ortega : lapit nalang po siguro yung nagsasalita sa computer ni Sir Henry
13:37:29 From RHR Consult : Good Afternoon. Please state your name, office, and designation. This is for the attendance. Thank you very much.
Example: Jori P. Lentijas - RHR Consult Services, Inc. - EIA Preparer

13:42:09 From RHR Consult : Good Afternoon. Please state your name, office, and designation. This is for the attendance. Thank you very much.
Example: Jori P. Lentijas - RHR Consult Services, Inc. - EIA Preparer

13:48:25 From EMB - EnP. Raquel Ortega : Kindly inform po yun nasa site, hindi coordinated yung mic sa online viewer
13:48:46 From EMB - EnP. Raquel Ortega : cannot be Sir Jess, choppy ka po
13:58:07 From EMB - EnP. Raquel Ortega to RHR Consult(Privately) : Sir If I may, ilang po yung nasa site?
14:00:39 From EMB - EnP. Raquel Ortega to RHR Consult(Privately) : After joining or starting a meeting, click “Join Audio by Computer” to connect your computer's speaker and microphone to the Zoom Meeting. If using your computer's speaker and microphone is your preferred audio method, check the option "Automatically join audio by computer when joining a meeting".
14:04:38 From EMB-George Silvederio to RHR Consult(Privately) : For those who are attending the Public Scoping online, you may chat your issues and concerns for this project.
14:04:41 From EMB - EnP. Raquel Ortega to RHR Consult(Privately) : sorry, wala pala po kayo sa site
14:05:23 From EMB-George Silvederio : For those who are attending the Public Scoping online, you may chat your issues and concerns for this project on this chatbox. Thank you.
14:06:51 From EMB - EnP. Raquel Ortega : George, kindly share here the Project Description the for information and reference of the participants. especially those from Batangas
14:08:30 From RHR Consult to Alex Gamboa(Privately) : hello po
14:08:37 From RHR Consult to Alex Gamboa(Privately) : sir Alex? or Mam?
14:09:02 From RHR Consult to Alex Gamboa(Privately) : sinned ko po sa email ang PD presentation
14:11:00 From Alex Gamboa to RHR Consult(Privately) : Let's go

Video Conference Chat Log showing Names and Agencies of Participants

14:35:58 From RHR Consult : Sir / Madam from PPA, wala pong naririnig dito. If you have questions po, itype na lang po natin sa group chat dito sa zoom
14:36:17 From PPA Batangas : We would like to request for a copy of your project plans so our Harbor Master and the Vessel Traffic Manager can also provide their insights in regard the safe navigation in the area
14:37:17 From PPA Batangas : Also, the Engineering Services Manager will need to look on your port facilities too.
14:37:17 From Zoning Division, CPDO, Batangas City : safe po ba ang mga motorista kapag dadaan sa batangas bay road na pinag gitnaan ng project site
14:38:00 From Zoning Division, CPDO, Batangas City : opo
14:39:24 From Zoning Division, CPDO, Batangas City : Salamat po
14:52:25 From Zoning Division, CPDO, Batangas City : mas mumura po ba ang kuryente using LNG
14:52:57 From EMB - EnP. Raquel Ortega : hindi po marinig Maam
14:56:10 From RHR Consult : Ms. Natividad Efondo, pwede po bang itype ninyo ang question ninyo, para mabasa ng iba pang participants na hindi makarinig dahil mahina ang dating ng audio po ninyo. Salamat po =)
14:59:09 From Zoning Division, CPDO, Batangas City : okay po Salamat po
15:00:06 From PPDO- BATANGAS - CUASAY, JO ANNE L. : Provincial Planning and Development Office po ang PPDO
15:01:14 From RHR Consult : Good Afternoon. Please state your name, office, and designation. This is for the attendance. Thank you very much.
Example: Jori P. Lentijas - RHR Consult Services, Inc. - EIA Preparer

15:01:52 From Alex Gamboa to RHR Consult(Privately) : Alex P. Gamboa, AG&P Manila, Senior Vice President for Business Development
15:02:22 From Zoning Division, CPDO, Batangas City : Delia M. Licarte/Michelle A. Festijo - Zoning Division CPDO Batangas City
15:03:04 From F DR : Francis Del Rosario - RHR - EIA Preparer
15:04:26 From EMB-George Silvederio : Engr. George Silvederio - EMB Central Office
15:04:30 From DOE- LFO : Pwede po humimgi ng copy ng mga presentations po?
15:04:42 From PPDO- BATANGAS - CUASAY, JO ANNE L. : Jo Anne L. Cuasay, PPDO Batangas - Project Evaluation Officer II
15:04:43 From EMB - EnP. Raquel Ortega : EnP. Raquel Smith C. Ortega - EMB Central Office
15:05:00 From PPA Batangas : Mr. Suzie M. Huelgas, Environmental Specialist, PPA Batangas,
15:05:14 From Cristina Guda : Cristina Guda - AG&P, Asst Vice President - Organization Development and Community Relations
15:05:31 From DOE- LFO : Noted sir
15:06:00 From Noel Nocon : Noel N. Nocon
15:06:18 From jaime.abarquez : Jaime Abarquez - AG&P Engineering
15:06:31 From Noel Nocon : Noel N. Nocon; Vice President for Health, Safety and Environment; AG&P
15:07:25 From P/ENS JHEMMA VENTURA PCG-MEPCOM : Good afternoon Sir/Maam.
15:07:28 From DOE- LFO : Engr. Julius Caesar G. Pantaleon - Science Research Specialist II (DOE-Luzon Field Office) and Ms. Kristel Charmaine R. Sayson - Science Research Specialist I (DOE-Luzon Field Office)
15:08:09 From DOE- LFO : Thank you po

Video Conference Chat Log showing Names and Agencies of Participants

15:09:12 From P/ENS JHEMMA VENTURA PCG-MEPCOM : P/ENS JHEMMA N VENTURA PCG-MEPCOM and SN2 Arjay J Rizo PCG- MEPFORCE STL both po kami from Philippine Coast Guard.
15:12:10 From RHR Consult : Ms. Natividad Efondo, pwede po bang itype ninyo ang question ninyo, para mabasa ng iba pang participants na hindi makarinig dahil mahina ang dating ng audio po ninyo. Salamat po =)

15:28:21 From RHR Consult to NPSCS(Privately) : hello, Ma'am/Sir?
15:28:35 From RHR Consult to NPSCS(Privately) : May I know your names and position, and from what office po?

ANNEX C

Sent and Received Invitation Letters

Gmail

RHR Consulting <lng.rhrconsulting@gmail.com>

Public Scoping for the Ilijan LNG Import Facility Project

4 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 5:45 PM
To: ipeconmag@yahoo.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

As per our consultation visit with your office, we are also providing you with copies of the invitation letters for the other sectors in the Batangas Ilijan, so that they may also be informed and coordinated with, via your good office.

Please acknowledge receipt of this email.

For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

13 attachments

Invitation to Public Scoping_Cepillo, Gilbert_Barangay Captain.pdf
351K

Invitation to Public Scoping_Concepcion, Felipe_Brgy. Ilijan.pdf
351K

Invitation to Public Scoping_Cruzat, Tim_Tricycle Driver Assn.pdf
351K

Invitation to Public Scoping_Cepillo, Banguie_IMPC.pdf
351K

Invitation to Public Scoping_Concepcion, Elma_Ilijan Elem School.pdf
351K

Invitation to Public Scoping_Daquis, Nanding, Fisherfolk.pdf
351K

Invitation to Public Scoping_Enriquez, Ronald_Integrated School.pdf
351K

Invitation to Public Scoping_Silang, Joyce_Church.pdf

351K

- **Invitation to Public Scoping_Aguila, Violeta_PMSS.pdf**
  351K
- **Invitation to Public Scoping__Alejo, Victoria_Womens.pdf**
  351K
- **Invitation to Public Scoping_Bayeta, Maxima_Health Center.pdf**
  351K
- **Invitation to Public Scoping_Bool, Pepito_Bantay Dagat.pdf**
  351K
- **Invitation to Public Scoping_Cepillo, Aristotle_Sangguniang Kabataan.pdf**
  351K

Felipe Jr. Concepcion <ipeconmag@yahoo.com> Mon, Sep 21, 2020 at 8:47 PM
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Sir gud pm po narecieved ko na po ang invitation nyo regarding sa schedule ng public scoping sa September 30, 2020 at 1pm at naprint ko narin po for distribution na lang po ngayong week nagdagdag nalang po ako ng ilang participant

On Monday, 21 September 2020, 05:45:18 pm GMT+8, RHR Consulting <lng.rhrconsulting@gmail.com> wrote:

Good Day!

Attached herewith is the invitation letter for the conduct of Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

As per our consultation visit with your office, we are also providing you with copies of the invitation letters for the other sectors in the Batangas Ilijan, so that they may also be informed and coordinated with, via your good office.

Please acknowledge receipt of this email.

For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 8:49 PM
To: "Felipe Jr. Concepcion" <ipeconmag@yahoo.com>

Copy Sir. Thank you very much!

On Mon, Sep 21, 2020, 8:47 PM Felipe Jr. Concepcion, <ipeconmag@yahoo.com> wrote:

> Sir gud pm po narecieved ko na po ang invitation nyo regarding sa schedule ng public scoping sa September 30, 2020 at 1pm at naprint ko narin po for distribution na lang po ngayong week nagdagdag nalang po ako ng ilang participant

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Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 8:49 PM
To: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

---------- Forwarded message ---------
From: **Felipe Jr. Concepcion** <ipeconmag@yahoo.com>
Date: Mon, Sep 21, 2020, 8:47 PM
Subject: Re: Public Scoping for the Ilijan LNG Import Facility Project
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Sir gud pm po narecieved ko na po ang invitation nyo regarding sa schedule ng public scoping sa September 30, 2020 at 1pm at naprint ko narin po for distribution na lang po ngayong week nagdagdag nalang po ako ng ilang participant

On Monday, 21 September 2020, 05:45:18 pm GMT+8, RHR Consulting <lng.rhrconsulting@gmail.com> wrote:

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Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

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EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project RHR Consulting <lng.rhrconsulting@gmail.com>

2 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 28, 2020 at 2:06 PM
To: laawitan@yahoo.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>, francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of **Public Scoping for the proposed Ilijan LNG Import Facility Project** of **AG&P.**

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

Please acknowledge receipt of this email.

For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Awitan_Batangas Province ENRO.pdf
332K

RHR Consulting <lng.rhrconsulting@gmail.com> Tue, Sep 29, 2020 at 3:25 PM
To: laawitan@yahoo.com

Good day!

May we confirm if you received our invitation letter for the Public Scoping for the proposed Ilijan LNG Import Facility Project located in Barangay Ilijan, Batangas City, Batangas.

Kindly acknowledge receipt of this email.

Thank you very much!
[Quoted text hidden]

Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project

4 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 5:59 PM
To: info.bfar4a@gmail.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

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EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Malvas, Sammy_BFAR R4A.pdf
458K

RHR Consulting <lng.rhrconsulting@gmail.com> Fri, Sep 25, 2020 at 3:31 PM
To: natiefondo@gmail.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>

Good day Ma'am Natie,

Please see attached invitation letter for BFAR Region IVA for your perusal. Should you have any questions, please contact me, Kristine Gillado via this email or the mobile number used to contact you earlier.

Thank you very much!

Best regards,

Kristine
[Quoted text hidden]

Invitation to Public Scoping_Malvas, Sammy_BFAR R4A.pdf
458K

Natividad Efondo <natiefondo@gmail.com> Fri, Sep 25, 2020 at 4:17 PM
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Dear Ma'am,
Good day, recieved and acknowledged with thanks your letter of invitation.
Best regards,
Natividad B. Efondo
Senior Aquaculturist/
Regional Fish Inspector
[Quoted text hidden]

RHR Consulting <lng.rhrconsulting@gmail.com> Fri, Sep 25, 2020 at 4:21 PM
To: George Silvederio <george_silvederio@emb.gov.ph>, francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

[Quoted text hidden]

Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project

4 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 4:52 PM
To: info@batangascity.gov.ph
Cc: George Silvederio <george_silvederio@emb.gov.ph>, cpdobatangascity@yahoo.com
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

Please acknowledge receipt of this email.

For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Dimacuha, Beverly_City Mayor.pdf
351K

RHR Consulting <lng.rhrconsulting@gmail.com> Fri, Sep 25, 2020 at 9:10 AM
To: cmo@batangascity.gov.ph
Cc: George Silvederio <george_silvederio@emb.gov.ph>, info@batangascity.gov.ph
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

[Quoted text hidden]

Invitation to Public Scoping_Dimacuha, Beverly_City Mayor.pdf
351K

City Mayor's Office <cmo@batangascity.gov.ph> Mon, Sep 28, 2020 at 8:45 AM
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Acknowledging receipt of your email
We would appreciate an acknowledgement of this email. For any other concerns or queries, please do not hesitate to email or call me at this number (043) 7232930.

Kind Regards,

Alfa Rabanes
City Mayor's Office

[Quoted text hidden]

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 28, 2020 at 10:03 AM
To: George Silvederio <george_silvederio@emb.gov.ph>

[Quoted text hidden]

Gmail

RHR Consulting <lng.rhrconsulting@gmail.com>

Public Scoping for the Ilijan LNG Import Facility Project

3 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 28, 2020 at 1:49 PM
To: renante.sevilla@doe.gov.ph
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Bcc: Henry James Botengan <jimmy_miagao@yahoo.com>, francis del rosario <rosariodelfrancis199@gmail.com>

Good Day!

Attached herewith is the invitation letter for the conduct of **Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.**

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

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EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Sevilla, RM_DOE Luzon.pdf
333K

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 28, 2020 at 2:27 PM
To: lfo@doe.gov.ph
Cc: George Silvederio <george_silvederio@emb.gov.ph>

[Quoted text hidden]

Invitation to Public Scoping_Sevilla, RM_DOE Luzon.pdf
333K

DOE LFO <lfo@doe.gov.ph> Mon, Sep 28, 2020 at 2:29 PM
To: RHR Consulting <lng.rhrconsulting@gmail.com>
Cc: George Silvederio <george_silvederio@emb.gov.ph>

Dear Ms. Gillado,

Acknowledging receipt of your email.

Thank you.

[Quoted text hidden]

--

DEPARTMENT OF ENERGY
LUZON FIELD OFFICE
2nd & 3rd Flr. PSJ Bldg., MacArthur Highway,
Brgy. Nancayasan, Urdaneta City, Pangasinan
Telefax No. : (075) 656 0114 loc. 570
Telephone No.: (075) 653 0233 loc. 572

Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project

3 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 6:03 PM
To: batspiocapitol@yahoo.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>, planning batangas <planning_batangas@yahoo.com>
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

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Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Mandanas, Dodo_Governor.pdf
351K

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 28, 2020 at 3:25 PM
To: governorhim@gmail.com

[Quoted text hidden]

Invitation to Public Scoping_Mandanas, Dodo_Governor.pdf
351K

RHR Consulting <lng.rhrconsulting@gmail.com> Tue, Sep 29, 2020 at 3:24 PM
To: governorhim@gmail.com

Good day!

May we confirm if you received our invitation letter for the Public Scoping for the proposed Ilijan LNG Import Facility Project located in Barangay Ilijan, Batangas City, Batangas.

Kindly acknowledge receipt of this email.

Thank you very much!

[Quoted text hidden]

Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project

4 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 4:57 PM
To: cpdobatangascity@yahoo.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>, godoy_sonny@yahoo.com, info@batangascity.gov.ph
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

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Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

As per our consultation visit with your office last September 9, 2020, we are also providing you with copies of the invitation letters for the other offices in the Batangas City LGU, so that they may also be informed and coordinated with, via your good office.

Please do reply to this e-mail so we can confirm your participation.

For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

---

3 attachments

Invitation to Public Scoping_Godoy, Januario_CPDO.pdf
351K

Invitation to Public Scoping_Hornilla, Macario_OCVAS.pdf
351K

Invitation to Public Scoping_Dimacuha, Beverly_City Mayor.pdf
351K

RHR Consulting <lng.rhrconsulting@gmail.com> Fri, Sep 25, 2020 at 9:23 AM
To: ocvasbatangas@yahoo.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>, francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good day Ma'am/Sir:

As per our telecon earlier, please see attached invitation letter for the Public Scoping for the Ilijan LNG Import Terminal Project for your office.

Thank you very much and regards,

Kristine Ann Gillado
RHR Consulting Services, Inc.
[Quoted text hidden]

Invitation to Public Scoping_Hornilla, Macario_OCVAS.pdf
351K

OCVAS cityveterinarian <ocvasbatangas@yahoo.com> Fri, Sep 25, 2020 at 10:29 AM
Reply-To: OCVAS cityveterinarian <ocvasbatangas@yahoo.com>
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Received! God Bless...

[Quoted text hidden]

RHR Consulting <lng.rhrconsulting@gmail.com> Fri, Sep 25, 2020 at 11:30 AM
To: George Silvederio <george_silvederio@emb.gov.ph>

[Quoted text hidden]

Gmail RHR Consulting <lng.rhrconsulting@gmail.com>

Public Scoping for the Ilijan LNG Import Facility Project

3 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 5:27 PM
To: pao_batangas@yahoo.com
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

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Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Balantac, Pablito_Provincial Agriculturist.pdf
351K

RHR Consulting <lng.rhrconsulting@gmail.com> Tue, Sep 29, 2020 at 3:23 PM
To: pao_batangas@yahoo.com

Good day!

May we confirm if you received our invitation letter for the Public Scoping for the proposed Ilijan LNG Import Facility Project located in Barangay Ilijan, Batangas City, Batangas.

Kindly acknowledge receipt of this email.

Thank you very much!
[Quoted text hidden]

Invitation to Public Scoping_Balantac, Pablito_Provincial Agriculturist.pdf
351K

no-reply@yahoo-inc <pao_batangas@yahoo.com> Tue, Sep 29, 2020 at 4:11 PM

To: RHR Consulting <lng.rhrconsulting@gmail.com>

Received. Thank you.

[Quoted text hidden]

RHR Consulting <lng.rhrconsulting@gmail.com>

Public Scoping for the Ilijan LNG Import Facility Project

3 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 28, 2020 at 1:57 PM
To: flag.office@yahoo.com, cpcg@coastguard.gov.ph
Cc: George Silvederio <george_silvederio@emb.gov.ph>, francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of **Public Scoping for the proposed Ilijan LNG Import Facility Project** of **AG&P.**

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Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

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For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

EMB Central Office: (02) 8920-2240 to 41.

Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Commandant_PCG.pdf
332K

Commandant, Philippine Coast Guard <cpcg@coastguard.gov.ph> Tue, Sep 29, 2020 at 3:19 PM
Reply-To: cpcg@coastguard.gov.ph
To: RHR Consulting <lng.rhrconsulting@gmail.com>

This is to acknowledge receipt of your email. Thank you!

[Quoted text hidden]

--
Office of the Commandant
National Headquarters Philippine Coast Guard
139 25th Street, Port Area 1018 Manila
Tel no. 527-8481 loc 6001, 6002
www.coastguard.gov.ph

RHR Consulting <lng.rhrconsulting@gmail.com> Tue, Sep 29, 2020 at 3:21 PM
To: cpcg@coastguard.gov.ph

Thank you!

[Quoted text hidden]

Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project

2 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 6:07 PM
To: josinocruz@ppa.com.ph
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

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Preparer:
Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Sinocruz, Joselito_PMO Batangas.pdf
351K

Joselito O. Sinocruz <josinocruz@ppa.com.ph> Sat, Sep 26, 2020 at 6:00 AM
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Good day!

Acknowledging receipt.

Thank you.

Get Outlook for Android

From: RHR Consulting <lng.rhrconsulting@gmail.com>
Sent: Monday, September 21, 2020 6:07:18 PM
To: Joselito O. Sinocruz <josinocruz@ppa.com.ph>
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Subject: Public Scoping for the Ilijan LNG Import Facility Project

[Quoted text hidden]

PPA Disclaimer: This email and any files transmitted with it are confidential and intended solely for the use of the individual to whom they are addressed. If you have received this email in error or mistake please notify administrator@ppa.com.ph. You should not disseminate, distribute or copy this email and delete this email from your system. If you are not the intended recepient you are notified that disclosing, copying, distributing or taking any action in reliance on the contents of this information is strictly prohibited.

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Gmail **RHR Consulting <lng.rhrconsulting@gmail.com>**

Public Scoping for the Ilijan LNG Import Facility Project

4 messages

RHR Consulting <lng.rhrconsulting@gmail.com> Mon, Sep 21, 2020 at 5:26 PM
To: planning batangas <planning_batangas@yahoo.com>
Cc: George Silvederio <george_silvederio@emb.gov.ph>
Bcc: francis del rosario <rosariodelfrancis199@gmail.com>, Henry James Botengan <jimmy_miagao@yahoo.com>

Good Day!

Attached herewith is the invitation letter for the conduct of Public Scoping for the proposed Ilijan LNG Import Facility Project of AG&P.

Date: September 30, 2020
Time: 1:00 PM (Registration Starts at 12:00 NN)
Venue: Barangay Hall, Barangay Ilijan, Batangas City

Please acknowledge receipt of this email.

For any further inquiries, clarifications, comments, and suggestions, please do not hesitate to contact us via:

Email address: lng.rhrconsulting@gmail.com / info.rhrconsult@gmail.com
Contact number: Landline (Manila) 02 798 0020
Mobile Number: 09169261033

Best regards,

Kristine Ann Gillado
Lead TA/Coordinator
RHR Consulting Services Inc.

Invitation to Public Scoping_Bausas, Benjamin_PPDO.pdf
351K

RHR Consulting <lng.rhrconsulting@gmail.com> Tue, Sep 29, 2020 at 3:12 PM
To: planning batangas <planning_batangas@yahoo.com>

[Quoted text hidden]

Invitation to Public Scoping_Bausas, Benjamin_PPDO.pdf
351K

planning batangas <planning_batangas@yahoo.com> Tue, Sep 29, 2020 at 3:20 PM
Reply-To: planning batangas <planning_batangas@yahoo.com>
To: RHR Consulting <lng.rhrconsulting@gmail.com>

Good day. Acknowledging receipt of email.

Please acknowledge. Thank you!

Provincial Planning and Development Office
Provincial Capitol,Capitol Site, Kumintang Ibaba, Batangas City
(043) 722-2359 / 786-0568 / 702-2752

[Quoted text hidden]

RHR Consulting <lng.rhrconsulting@gmail.com> Tue, Sep 29, 2020 at 3:21 PM
To: planning batangas <planning_batangas@yahoo.com>

Thank you!
[Quoted text hidden]

ANNEX D

COVID-19 Protocol for the Public Scoping

COVID-19 PRECAUTIONARY MEASURES GUIDELINES

Public Scoping Activity – AG&P LNG FACILITY PROJECT
September 30, 2020 Wednesday 1:00 PM
Ilijan Barangay Hall, Barangay Ilijan, Batangas City

Barangay Ilijan LGU adheres to the COVID-19 Precautionary Measures Guidelines as prescribed by the Batangas City and Provincial LGU:

For those who would be attending the Public Scoping activity physically at the venue, it is best to submit names of those attending the on-site physical Public Scoping at least 3 days prior to the date set for the activity, so that the designated barangay unit may anticipate and prepare in advance the necessary arrangements for the expected number of arrivals.

During the Public Scoping activity, participants shall be required to:

- wear face mask at all times
- wear face shield at all times
- observe physical social distancing of 6 feet or 2 meters apart

Participants coming from outside of the Barangay are advised to proceed directly to the Barangay Hall Compound, and bring with them their Medical Certificate or Rapid Test Results or COVID-19 Swab Test results not exceeding 7 days from the date of release of the results or medical documents prior to their entry into the Barangay Area.

Furthermore, all participants are encouraged to arrive at least an hour earlier, to comply with the procedures for entry into the venue as follows:

- Body Temperature Check
- Review of Medical Documents
- Filling out of Contact Tracing Forms/Logbook

The above-mentioned protocols shall be strictly enforced and non-compliance may result in the denial of entry into the venue. This is to ensure minimal risk of exposure to infection from COVID-19 to the participants of the activity, as well as guests and residents of the Barangay.

ANNEX E

Presentation Materials

Confidential

ILIJAN LNG IMPORT FACILITY PROJECT

September 2020

AG&P
Infrastructure Reimagined and Delivered

GAS Entec

أدنوك
ADNOC

Introduction to Proposed LNG Terminal to Service SMC Global Power in Batangas

AG&P LNG Terminals & Logistics (AG&P) proposes to develop an integrated LNG import terminal for SMC Global Power (SMCGPH) located in Batangas, intended to service the nearby Ilijan Power Plant as well as future SMCGPH projects

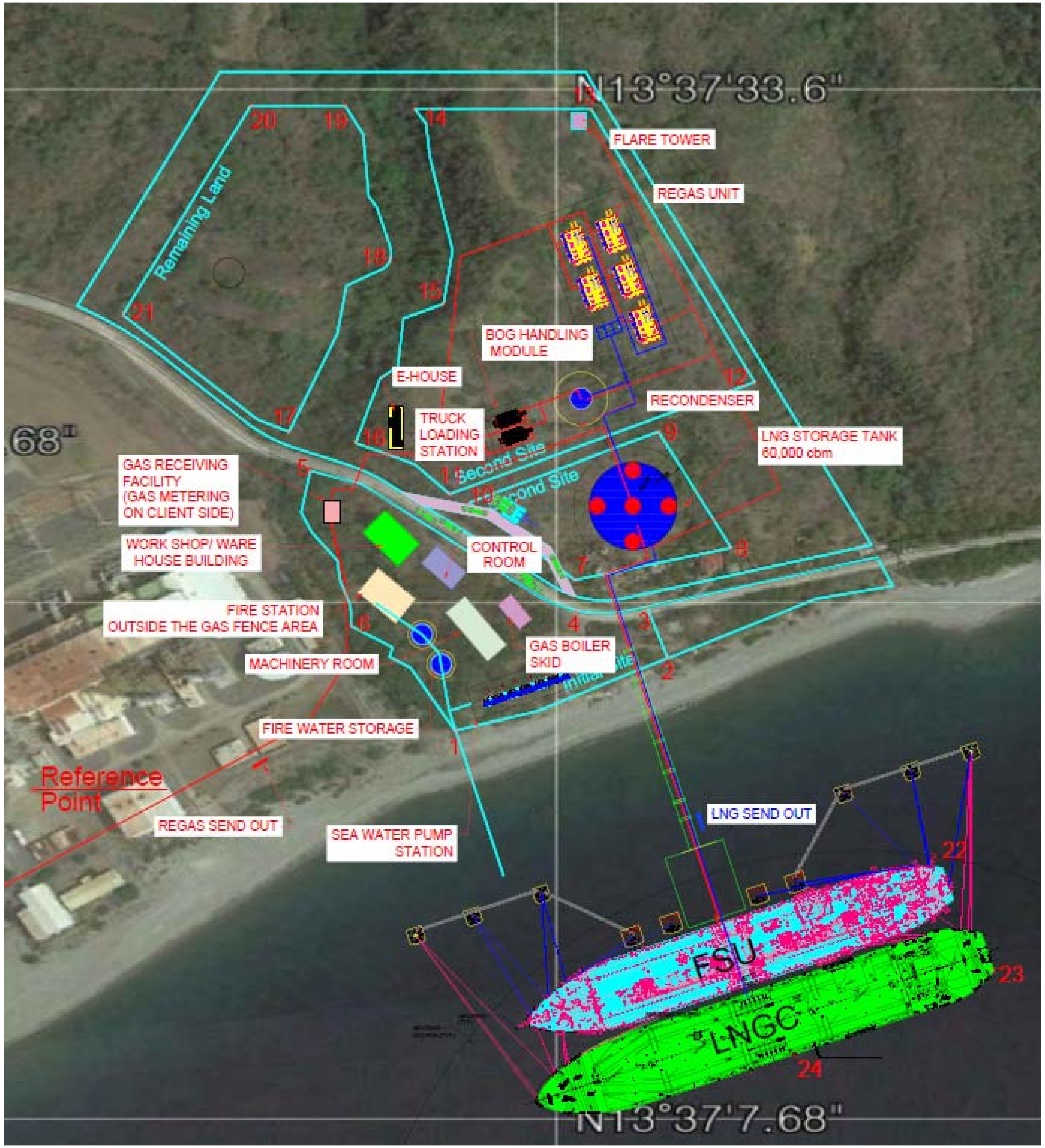
- Given the timelines / requirements associated with this Project, the Terminal shall first be designed to utilize onshore regasification, buffer storage, utilities and balance of plant, supplemented with a Floating Storage Unit ("FSU")
  - AG&P expects the key components of this configuration to be ready for commissioning by **June 2022 (**with four months buffer), with onshore storage following thereafter

Storage	• **Total storage capacity of ~197,000 cbm**
	  • **137,000 cbm floating storage (primary)**
	  • **60,000 cbm onshore storage (buffer)**
	• **Sufficient storage capacity to take full LNG cargo loads**

Regasification Capacity	• 420 mmscfd through AG&P's proprietary regasification modules • Sufficient for ~3.0 MTPA of regasified LNG

AG&P

LNG Terminal Layout



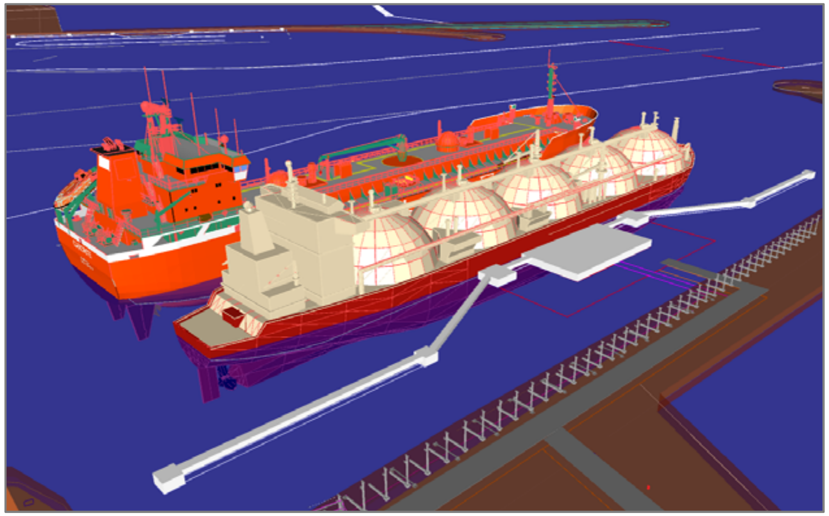
*Assumes no diversion of current road

Location Map

AG&P

Floating Storage Unit (FSU)

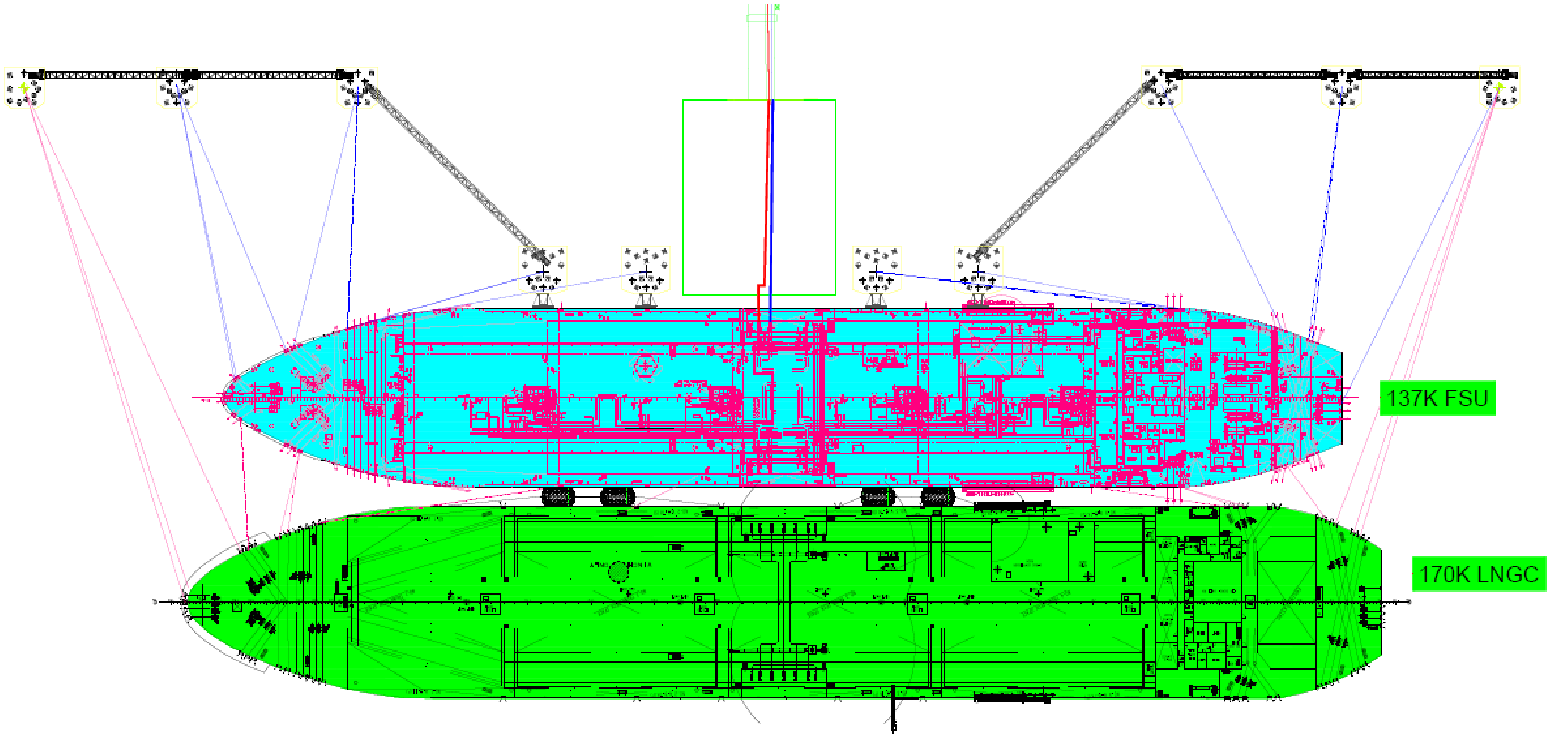
- **AG&P has already identified the LNG Carrier (LNG/C) Ish (owned by ADNOC Logistics and Services) as a suitable vessel to be utilized as a FSU for the import facility**
- **AG&P is chartering a similar vessel from ADNOC for its Karaikal LNG import terminal, and can reapply engineering design / work for the straightforward conversion, which is slated for ~4 months**



LNG/C ISH Vessel Particulars

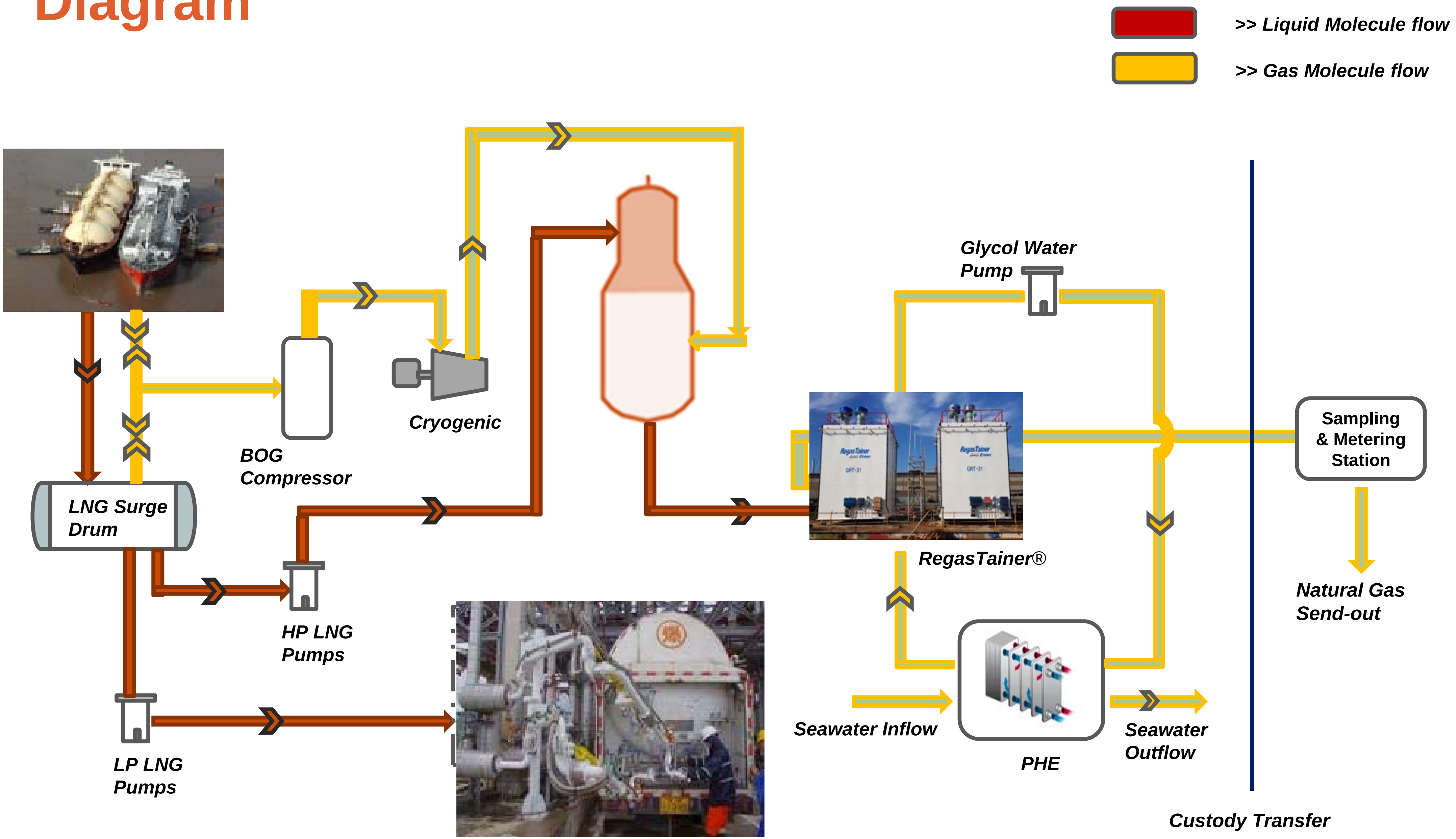
Item	Details
Ship name	ISH
Builder and yard	MHI Nagasaki
Hull no.	MHI 12067
Year built	Keel Laid : 26/03/94 Delivered : 10/11/95
Port of registry and flag	Monrovia / Liberia
IMO number	9035864
Length overall	293 m
Length between perpendiculars	280 m
Breadth moulded	45.75 m
Depth moulded	25.5 m
Draught at summer freeboard (extreme)	11.27 m
Height overall — keel to highest fixed point	66.70 m
Gross tonnage (international)	110,895 tons

FSU Mooring and Berthing Platform



The FSU will be compatible to take LNG from any visiting LNGC (of up to 170k cbm) via ship-to-ship transfer

FSU + Onshore Regas - Process Block Flow Diagram



Components of FSU + Onshore Regas Solution

Designs for key components of LNG terminal can be reapplied from other AG&P / GAS Entec projects, thus reducing time / cost to execute

Key Components of Solution – Designs Reapplied from Previous AG&P LNG Terminals

FSU	**137,000 cbm** LNG/C Ish from ADNOC, to be chartered and used as an FSU, located ~220 meters from shore
Jetty and Mooring	Jetty / mooring designs reapplied from our expertise from other LNG import terminals: • 4 berthing dolphins • 6 mooring dolphins • LNG unloading arms
RegasTainers®	Total regasification capacity of **420 mmscfd** • 5 x 84 mmscfd RegasTainers®

Onshore Storage and Utilities

Buffer LNG Tank	**1 x 60,000 cbm** buffer storage tank, equivalent to 7 days' storage
Utilities	Flaring, plant air, instrument air and nitrogen generation, seawater intake and outfall system, and fire fighting system in accordance to international safety standards

Optional Facilities

Truck Loading Facilities	2 truck loading facilities to allow for LNG-by-truck to 3rd party customers

AGP International Holdings Pte Ltd
8 Marina View,
#13-02A Asia Square Tower 1
Singapore 018960

AG&P

ANG PROSESO NG

ENVIRONMENTAL IMPACT ASSESSMENT

Base sa PD 1586 at IRR "DENR –EMB DAO 2003 -30"

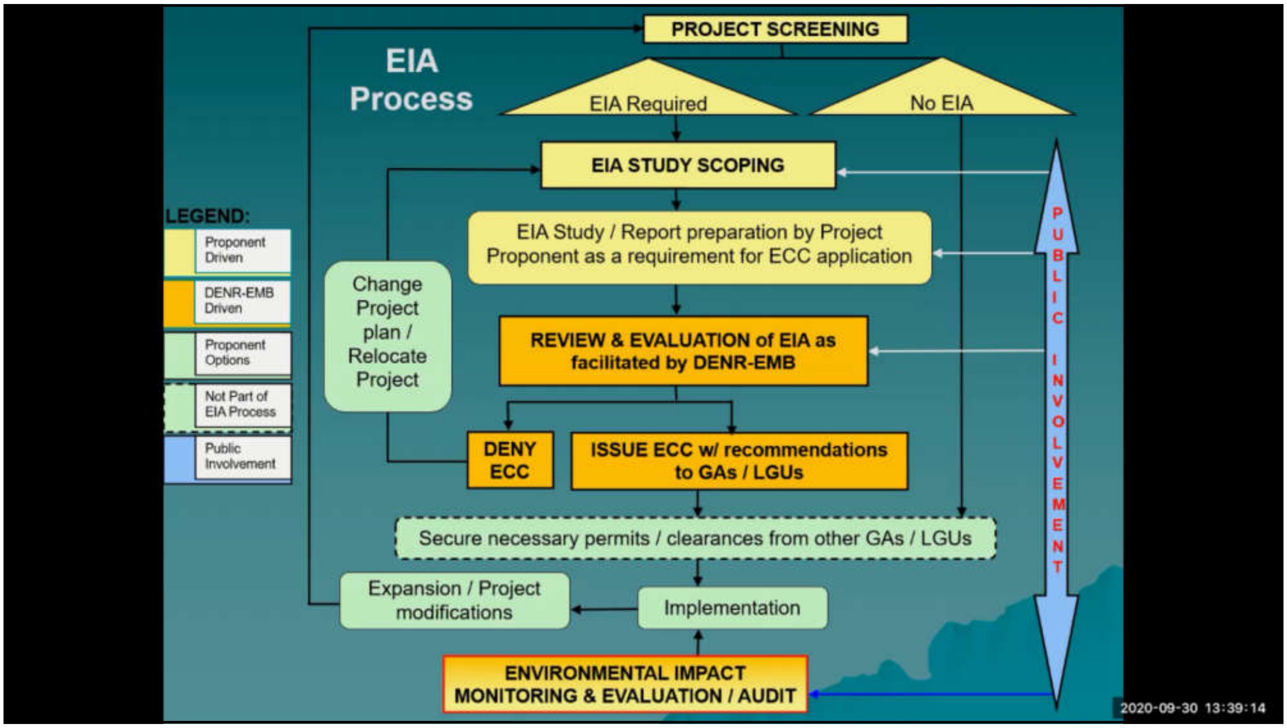
2020-09-30 13:37:48

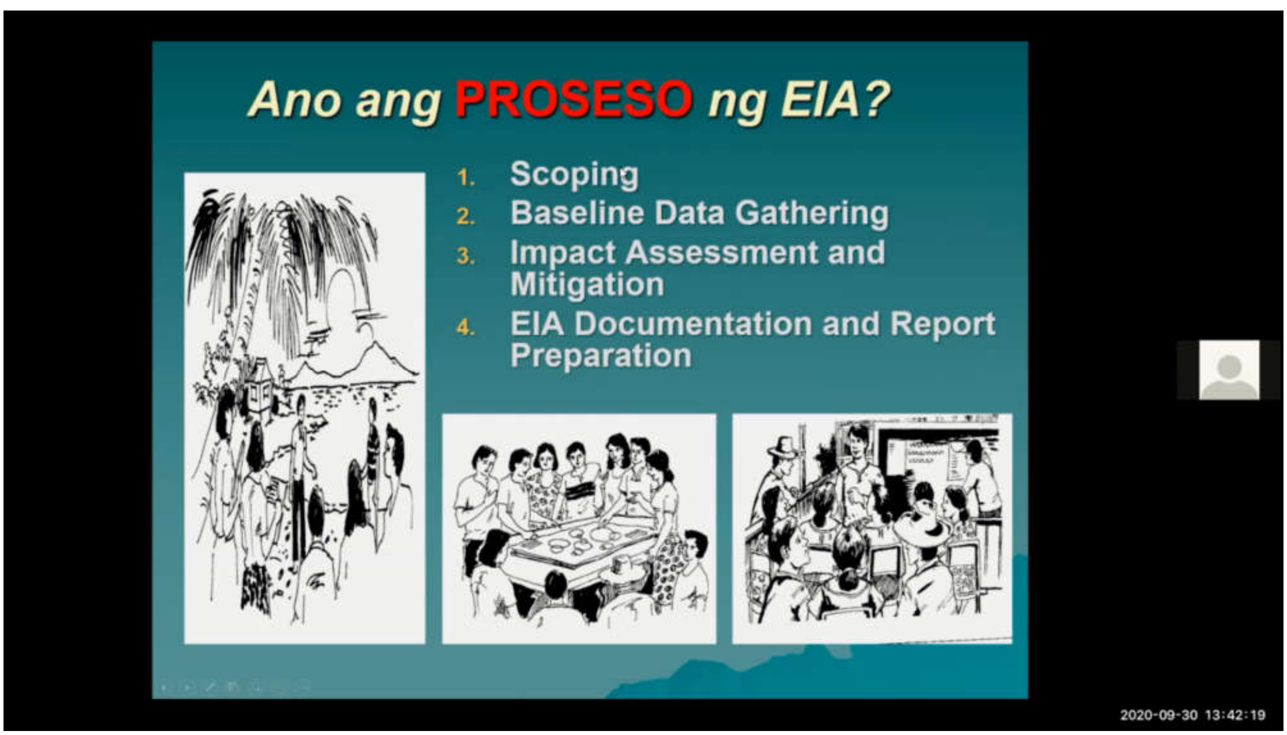
LEGAL FRAMEWORK THE PHILIPPINE EIA SYSTEM

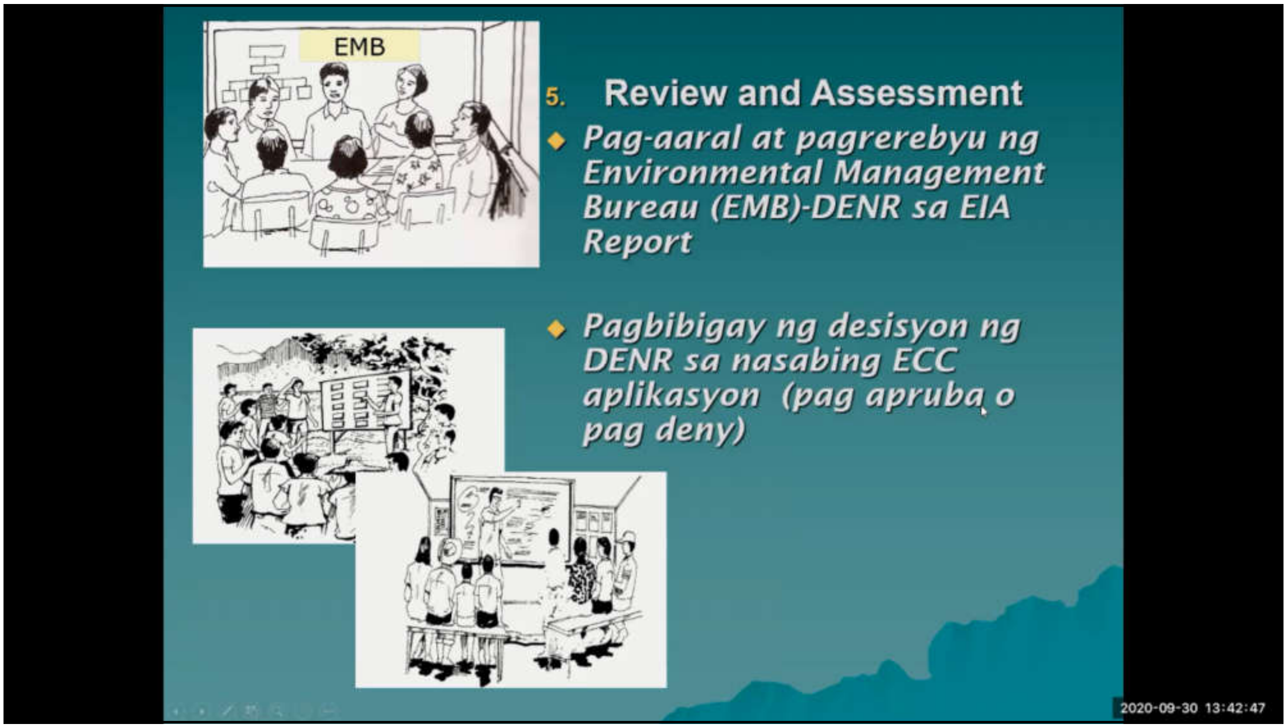
PD 1586

"Establishing an Environmental Impact Statement (EIS) System including other environmental management related measures and for other purposes"

2020-09-30 13:38:58


EIA Process
PROJECT SCREENING
EIA Required
No EIA
EIA STUDY SCOPING
LEGEND:
Proponent Driven
DENR-EMB Driven
Proponent Options
Not Part of EIA Process
Public Involvement
EIA Study / Report preparation by Project Proponent as a requirement for ECC application
Change Project plan / Relocate Project
REVIEW & EVALUATION of EIA as facilitated by DENR-EMB
DENY ECC
ISSUE ECC w/ recommendations to GAs / LGUs
PUBLIC INVOLVEMENT
Secure necessary permits / clearances from other GAs / LGUs
Expansion / Project modifications
Implementation
ENVIRONMENTAL IMPACT MONITORING & EVALUATION / AUDIT
2020-09-30 13:39:14


Ano ang PROSESO ng EIA?
1. Scoping
2. Baseline Data Gathering
3. Impact Assessment and Mitigation
4. EIA Documentation and Report Preparation
2020-09-30 13:42:19


EMB
5. Review and Assessment
Pag-aaral at pagrerebyu ng Environmental Management Bureau (EMB)-DENR sa EIA Report
Pagbibigay ng desisyon ng DENR sa nasabing ECC aplikasyon (pag apruba o pag deny)
2020-09-30 13:42:47


SALAMAT PO!!!
2020-09-30 13:42:49