CEMPHIL CEMENT GRINDING PROJECT EIS

EXECUTIVE SUMMARY

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1. EXECUTIVE SUMMARY

1. Project Fact Sheet

Name of Project:	Cemphil Cement Grinding Project
Nature of Project:	Non-metallic Mineral Processing
Name of Proponent:	Cemphil, Inc.
Project Location:	Barangay Bay-Ang, Ajuy, Iloilo, Panay Island
Address of Proponent	86 Commission Civil St. Jaro, Iloilo City, Iloilo, Panay Island
Project Size	1,200,000 metric tons (mt) ground cement annually, broken down to: Phase 1: 600,000 mt/year Phase 2: Additional 600,000 mt/year Private land area: 6.1051 hectares Construction footprint: 4.5 has. FLA applied area: 0.97 hectares Wharf construction footprint: 3,069 m2 0.31 has. **Total Project Area applied for ECC: 7.0751 hectares** Marine buffer zone 3.515 has. (fifty meters coastal perimeter of Plant)
Project Components	Jetty Port /Wharf on Piles with rock-fill causeway with cross-current culverts Two (2) Closed Bucket Conveyor Systems Raw Material Storage/Stockpile Sheds Cement Grinding Plant and Packing Equipment
Environmental Control and Enhancement Measures	Particulate bag filters with total capacity of 177,520 m^3/hr capacity. 1 main drainage trench,12 silt traps & settling ponds. Holding capacity 8,085 m^3. 7 units oil and water separators, each at least 5 m^3 capacity Stabilization of sloping land through benching, retaining walls and revegetation Biogas digester for sanitary waste treatment Mangrove reforestation Marine buffer zone
Project Activities	**Phase 1 Stage 1 Construction:** Land preparation, Slope stabilization, Material Storage Facilities, Drainage & surface water management system, Jetty-port and conveyor system construction Phase 1 Stage 2 Construction: Construction of 600,000 MTPY Cement Grinding Facilities (Grinding mill house, Grinding facilities Cement Silo 2 units Pack house and packing equipment Administrative Office and laboratory, Machine shop Equipment erection & commissioning: 10 months **Phase 2:** Additional cement grinding equipment Additional Crushers and 2 x 1,000 MT silos **Project does not include quarry nor clinker production.**
Authority Over Land /Sea	Land Titles DENR-Received application for Miscellaneous Lease Agreement
Responsible Officer and Contact Person	Stephen Pol Buenconsejo, President admin@cemphil.com
EIA Preparer	Teodora H. Salvador, EnP. Envitech Environmental Management Consultancy Services

	5 Joshua St. Filinvest Heights, Bagong Silangan, Quezon City 1119 (02) 961-6600; 0916 708-9835 in partnership with Environmental Professionals and Associates (EPA) Engr. Cesar S. Siador, Jr., Environmental Quality Management Specialist Unit 1-C-12, Bahay Caridad, Bayani St. Brgy Doña Imelda, Quezon City +639202377070

2. Process Documentation

2.1. EIA Team

The study team is mostly comprised of experts with interdisciplinary experience in environmental impact assessment, and academically prepared new consultant members awaiting the DENR-EIAMD schedule for Consultant registration (Table 1 the EIA Study Team).

Table 1 The EIA Study Team

EIA team member	Field of expertise / Module
Teodora Haresco-Salvador	Team Leader, Environmental Planning, Land Use Assessment and Social Module
Alan Salvador	Water Quality, Hydrogeology and Hydrology
Nazario Sabello	Air Quality
Katherine Escalona-Sanchez	Marine Ecology
Victor Valderrama	Terrestrial Floral Survey
Wencelito Hintural	Terrestrial Floral Survey
Beatrix Labrador Borja	Environmental Planning, EIA Consolidator
Cesar S. Siador, Jr.	Peer Reviewer

2.2.EIA Study Process and Schedule

The EIA process in Figure 1 followed the procedure outlined in DENR DAO 2017-15. The EIA studies took six (6) months and report preparation took two (2) months.

2.3.Environmental Impact Study Area

The environmental impact study area is presented in Figure 1.5. The direct impact area is the six (6) hectare zone (6. 1051 has.) within the Cemphil Plant site which will undergo landform modification to create flat areas suitable for industrial activity; the indirect impact areas are the Area Sensitive Receptors (ASR) identified through the dispersion model which may experience changes in air quality. The changes in ambient fine particulates (Table 2.3.11) under controlled condition are expected to be well within the National Ambient Air Quality Standards. Based on hydrodynamic model analysis to determine the project impact on marine environment, the project as designed, is expected to generate insignificant impact to the marine ecosystem (pages 2.2.8 to 2.2.31). Increases in ambient particulates from earthworks during construction are more localized, easily controlled with water sprinkling, and is time-bound and reversible. The main environmental impact of a cement grinding plant occurs during operation: due to ambient particulate emissions which come from raw material transport, stockpiling, grinding and cement packing. The peak emissions fall will within the premises of the processing plant where particulates readily drop, hindered by the barrier posed by Mt. Bay-ang at the northeaster perimeter of the Plant.

No.	ACTIVITY	2019								2020												2021			
		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb	Mar	Apr.	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	Site Scoping																								
2	IEC																								
3	Public Scoping																								
4	Technical Scoping																								
5	Baseline Data Collection																								
6	Technical Scoping																								
7	Environmental Impact Assessment																								
8	Environmental Management Plan and Social Development Plan																								
9	EIS Document Preparation																								
10	EIA Review																								
11	Additional Information																								
12	Public Hearing																								
13	ECC drafting																								
14	ECC approval																								

Figure 1 EIA Process and Activity Schedule

Table 2 Environmental Impact Study Area & Methodology

Module		Methodology	Area	Date	Project Impact
THE LAND	Land Use	Interview of LGU Key Staff Review of draft Comprehensive Municipal Land Use Plan of Ajuy Aerial reconnaissance of Project site by Drone Analysis and interpretation of aerial and satellite imagery for soil cover Site observation/validation Interview of Sanggunian Bayan	Ajuy Municipality, Barangay Bay-ang and Six (6) hectares project site	May 14-16, 2019 May 20 to 31, 2019 May 15 -16, 2019 June 2 to 18, 2019 July 5, 2019 July 8, 2019	Direct Impact on 6 has.
	Topography	NAMRIA topographic maps 1:50,000 Topographic survey Site observation GIS mapping and analysis Assessment of Proponent's Site Development Plan Soil Loss Estimation using modified Universal Soil Loss Equation	Project site and adjacent lands	May 20 to 31, 2019 May 1 to 31, 2019 May 15 -16, 2019 June 1 to 30, 2019 June 1 to January 15, 2020 November 1 to 15, 2019	Direct Impact on 6 has.
	Geology and Geomorphology	Gathering/Review of secondary data from Mines and GeoSciences Bureau Soil investigation thru drilling Site observation	Project site and environs	June 1 to 15, 2019 June 1 to 30, 2019 July 5, 2019	No impact
	Natural Hazards	Gathering/Review of secondary data from PhilVolcs, PAGASA, READY Project	Ajuy Municipality	July 1 to 30, 2019	Indirect Impact

Module		Methodology	Area	Date	Project Impact
		Ethnographic survey		July 5 to 8, 2019	
	Pedology	Site observation Review of "Soils of the Province of Iloilo" Report by the Bureau of Soils and Water Management	Project site and environs	July 5 to 8, 2019 December 1 to 15, 2019	Direct Impact on six has.
	Terrestrial Biology	Floral survey using quadrat sampling Faunal survey using transect walk, mist net and traps	Project site	May 14-16, 2019 May 14-16, 2019	Direct Impact on 6 has.
THE WATER	Hydrology and Hydrogeology	Key Informant Interview Review of land use and site observations Secondary data review – Groundwater Resource Assessment Report for Ajuy Municipality by Mines and GeoSciences Bureau Water balance study	Barangay Bay-ang	July 5 to 8, 2019 May 14-16, 2019 December 1 to 15, 2019 January 1 to 15, 2020	Direct Impact on ground water resources but no Impact on local population on resource use competition
	Water Quality	Site observation/interviews Sampling and laboratory analysis	Surface waters surrounding the Project Area	May 14-16, 2019 July 8, 2019 December 23, 2019	Direct impact
	Marine Ecology	Review and use of secondary data from Municipal Coastal Resources Management Plan Site observations, key informant interview, manta tow, spot dives Survey of corals, seagrass, benthos, fish	Marine environment surrounding the Project Area	May 16-31, 2019	Indirect Impact

Module		Methodology	Area	Date	Project Impact
			(Canal Bay, Bay-ang Bay)	July 5 to 8, 2019	
THE AIR	Meteorology	Use of secondary data from PAGASA	Ajuy Municipality	May 16 to 21, 2019	Direct Impact
	Air Quality	Key Informant Interviews (Barangay Leaders, Educators, MPDO, MENRO) 24-hr sampling for TSP in Purok 4 and 1, Bay-ang and Emission inventory Air Pollutants Dispersion Modelling -Tier 4 (AERMOD)	Barangay Bay-ang and Municipality of Ajuy Six (6) km radius of Project covering Barangay Luca, Pedada and Bay-ang of Ajuy and Barangay Tabuk, Barotac Viejo	May 14-16, 2019 July 5-7, 2019 December 17, 2019 November 26 to December 23, 2019	Direct Impact: within Plant fence line Indirect impact: Puroks 4,5 and 6 of Barangay Bay-ang. Portions of Barangay Pedada
THE PEOPLE	Socio-economic Profile Public Perception Survey	Focus Group Discussions Key Informant Interview, Focus Group Discussions Review and use of secondary data from Municipal Comprehensive Land Use Plan, Coastal Resource Management Plan	Municipality of Ajuy Barangay Captains, Women leaders, Fishermen, Educators	May 14-16, 2019 July 5 to 8, 2019 July 1 to October 31, 2019	Indirect Impact receptors
		Household Survey Micro Community Development Planning	Informal settlers within Cemphil Plant site	July 5 to 8, 2019 Oct. 25, 2019 January 10, 2020	Direct impact receptors

2.4. Description of Key EIA Methodologies

Both primary and secondary data were utilized in the assessment of project impacts. Primary data were obtained through on-site investigation and field sampling and surveys, while secondary data were collected from Cemphil Inc. and from related government agencies/institutions. The summary of the methodologies employed during the EIA process is enumerated in Table 2.

2.5. Public Participation

Public participation was obtained by way of Key Informant Interviews, Focus Group Discussions (FGDs), a survey of (informal) households within the project site, and conduct of Public Scoping. The documentation of IEC activities and Public Scoping are annexed to project reports earlier submitted to EMB as part of the preparation for the EIA activities. The summary of questions, issues, and concerns raised during the IEC activities and Public Scoping are in Annex C.

2.6. Summary of Key Issues and Concerns Raised During Public Scoping

Table 3 Summary of Key Issues and Concerns

EIA Module	Issues/Suggestions Raised by Stakeholder	Suggestion Sector or Representative Who Raised the Issue	How Issue is addressed by the Project /Mitigating Measures
1. Land	Where to dispose Project's solid waste	Ms. Precy Santamina, BHW, Purok 7, Bay-ang	The Project will import pre-processed raw materials and will have no waste raw materials. It will implement the "Zero Waste" policy.
2. Water	Pollution of local residents' potable water supply	Noel Cantancio, Resident of Purok 6	Project has no by-product that will pollute local drinking water sources.
3. Air	Air pollution may cause health issues.	Noel Cantancio, Resident of Purok 6	CEMPHIL will provide appropriate medicines and other health services for Barangay Bay-ang and the other potential impact receptor Barangays by Official Request.

EIA Module	Issues/Suggestions Raised by Stakeholder	Suggestion Sector or Representative Who Raised the Issue	How Issue is addressed by the Project /Mitigating Measures
	Cement Plants such as those operating in Iligan City, are required to have anti-air pollution devices. Local people can help control air pollution by planting of more trees. Factories provide income to residents, generate tax revenues and other economic benefits.	Prof. Basinang, DEP-ED District Supervisor, Bay-ang	CEMPHIL project design includes numerous air pollution control installations (APCI) to meet the requirements of the Philippine Clean Air Act. A Multipartite Monitoring Team will help enforce compliance to laws.
4. People	What will happen to the displaced households residing in the Project site.	Roger Claro (project affected persons)-Brgy Bay-ang	The residents in Lot 23 will be resettled in the NHA project in Barangay Luca, near Bay-ang and the sea. Cemphil will provide Php 50,000 livelihood assistance per family. Yes, housing is free.
	Relocation site should be established near the present residential site, and the sea. Will the relocation housing be for free?	Noli Laraga, Brgy Bay-ang	
	There are available private lands that can be used as relocation site within Brgy Bay-ang.	Ex-Kagawad Leonidas Barabona Jr., Brgy Bay-ang	The asking price for available land exceeds available budget.
	Can we request for a 6-classroom building?	Ms. Janet Academia, Principal, BTMES, Bay-ang	When the Project is operational, CEMPHIL will make it a priority.
	The project seems to be beneficial to the local people. However, what if there are negative impacts that may occur, such as health effects due to air pollution.	Marlin Calera, Brgy Culasi.	Severe negative health impact is not expected from Project. [There will be a] Multipartite Monitoring Team (MMT) that will act on complaints.

EIA Module	Issues/Suggestions Raised by Stakeholder	Suggestion Sector or Representative Who Raised the Issue	How Issue is addressed by the Project /Mitigating Measures
	Is it possible to fish in the Project vicinity?	Noli Laraga, Purok 6,	The area is under "No Take Zone" per Municipal Ordinance.
5. Biodiversity	Protection of marine fisheries resources of Bay-Ang, under the present proposal and future expansion.	Kagawad Villaret, Brgy Culasi	The project will protect and create additional habitat for shellfish. There is no plan to expand toward the sea.
	Monitoring of adverse effect by Project to marine resources	Sandra Tupas-Dilag, Brgy. Santiago, Barotac Viejo	There will be annual marine ecosystem monitoring by a marine biologist, and results will be reported to the MMT.

3. Alternatives Considered

Cemphil Inc. considered several options in the process of defining this proposed Project. The alternatives considered pertaining to project technology and process, site selection, and resource utilization is summarized in Table 4.

Table 4 Summary of Alternatives Considered

Alternative	Main Environmental Impact/s	Evaluation/Decision
Technology and Process: Cement production including clinkering	Heightened pollutive air emissions	Not favored due to perceived longer ECC processing period, potentially more issues with the government and the people regarding pollution complaints
Site selection Ajuy is selected due to:	Availability of sufficiently deep harbor near established sea transport routes Declared LGU support to ECC and other permitting processes Better controlled dust dispersion	Ajuy is preferred over the initially identified site in Barotac Viejo due to important coral formations within the identified pier site. The project site is in the southeastern foothill of Mt Bay-ang which provides a topographic barrier shielding much of the nearby populated areas from the potential source of increased ambient dust.

Alternative	Main Environmental Impact/s	Evaluation/Decision
Resources	Reduction of use of natural materials where possible Reduction of ground water extraction volume	The use of alternative raw materials, e.g. waste iron slag from foundries, bottom ash from coal-fired power plants, and rainwater harvesting, will reduce production and operating costs, and environmental impacts.
	Quarry of limestone from Panay Island will open a green land and generate associated environmental concerns	Not favored due to perceived longer ECC processing period, potentially more issues with the government and the people regarding pollution complaints
"No Project" Scenario	No changes to existing air quality; No opportunity for Government savings in assisting informal settlers in CEMPHIL land; Lost opportunity to generate 100 regular jobs in Ajuy; Lost opportunity for economic opportunities and tax revenue generation from the Project; CEMPHIL will not benefit from pump-priming/infrastructure development program of the Government; No centerpiece/attraction for investments for the Ajuy Industrial Development Zone; The idle grasslands will remain in its current condition unless a more feasible land use other than agriculture is introduced; The site may remain to have a high erosion potential for a long time.	Not an attractive option as no one wins. CEMPHIL will lose several millions invested in Project preparation while endeavoring to comply with the government's requirements.

4. Summary of Baseline Characterization

4.1.Geography, Geology, Topography and Slope

Ajuy is a coastal Municipality on the southeastern coast of Panay Island (see Figure 1.3). The Project site in Barangay Bay-ang is located is on a small headland jutting out almost 5 kilometers at its farthest point, from the Ajuy mainland. It is underlain by Odiongan volcanic rocks, hornblende andesite, porphyritic andesite, dacite porphyry, and tuff occurring as flows, plugs, and dikes. The area is an ophiolite, a section of the Earth's oceanic crust with an underlying upper mantle that has been uplifted and exposed above sea level. The project area has a natural slope of roughly 12%, flattish near the coast, and rising toward elevation 55.06masl, the highest elevation. The area is located on the foothills of Mt. Bay-ang, which provides a natural shield against dust dispersion to populated areas.

4.2. Pedology

The soil in the Project site is Barotac loam, rolling phase. It is slightly reddish with moderate and medium granular structure and moderately friable up to depths of 0 to 30cm. This soil series is a residual soil developed from basalts overlaid on shales. The soil is medium grained with excellent to excessive external drainage and fair to good internal drainage. It has medium-to-high soil erosion potential, low natural fertility, low productivity, and deficient in available Phosphorus. Stones are abundant, with sizes ranging from 10, 20 to 50 cm.

4.3.Terrestrial Biology

4.3.1. Flora

The Project soil cover are mostly brush and shrub, estimated on 57,302 m2 or 5.73 hectares (92.5%). A few coconut and mango trees dot the land. The general vegetation cover falls within FMB classification as “other wooded land” with open canopy (DMC 2005-005). The tree cover is less than 10%. And a total of 63 tree individuals and 17 tree species under 10 families exist in the project site; 5 understory species under 5 families were found. The dominant tree species is *Strobilus asper* (14 individuals) followed by *Ficus pseudopalma* (12 individuals). Majority (88.89 %) of the trees in the project site are young, with a 0 to 20.32 cm DBH class. All observed species in the sampling plots, except for the following, have not yet been assessed for the IUCN Red List, but are in the Catalogue of Life: *Artocarpus blancoi, Swietenia macrophylla, Vitex parviflora, Alstonia macrophylla, Alstonia scholaris, Cassia fistula, Saccharum spontaneum,* and *Mangifera indica. M. indica* has deficient data. The endemic *A. blancoi, S. macrophylla and V. parviflora* are categorized as Vulnerable. The remaining observed tree species are categorized as Least Concern, and they are either stable or unknown.

4.3.2. Fauna

From the established 2-kilometer transect, a total of 293 individuals belonging to 25 species of avifauna representing 19 families was observed. The most dominant family based on the number of species observed is family Columbidae or the dove/pigeon group with three represented species. At the species level, bird assessment revealed that the most dominant species on the site were White-breasted Woodswallow with 62 individuals. Co-dominant species were White-breasted Woodswallow (*Artamus leucorynchus, Linn.*), and Philippine Pied Fantail (*Rhipidura nigritorquis, Vigors*). Such a

degree of dominance could be attributed to the land-use and availability of forage materials because the area is generally open shrubland.

4.4.Hydrology, Hydrogeology and Water Resources

Barangay Bay-ang directly drains towards the sea. It is separated by the watershed divide starting from the highest point in Barangay Bay-ang. The rest of Ajuy municipality drains toward the Iloilo river basin. Ajuy is sited in a portion of Panay Island with constrained groundwater resources (MGB 2013). The watershed catchment area hosting the project site is approximately 49.3135 has. Barangay Bay-ang is served by one private and one communal well, however, the Project site itself has no well. There is no seasonal creek within the CEMPHIL property.

4.4.1. Water Quality

Baseline water quality meets Class SB: suitable for fishery production as shellfish and fish production and contact recreation in terms of Total Suspended Solids (TSS). Oil and Grease and Chemical Oxygen Demand (COD) however, falls within Class SC, possibly because of the wastewater discharged from micro fish processing enterprises in the area and or from motorized fishing vessels. There are no major industries in Bay-ang. Lead, Cadmium, Chromium and Iron Oxides are within the limit set by DAO 20016-08. At the time of site sampling, the natural drainage structure (creek) near the Plant was dry, thus no water sample was obtained for analysis.

4.4.2. Freshwater Ecology

There is no perennial surface water body within, near, or traversing the Plant site.

4.4.3. Oceanography

The oceanic current surrounding the jetty port is non-uniform with some of the water in the southwest part of the studied domain (680m x 400m encompassing the port area), forming a gyre in a clockwise direction. Northeast of the domain, the current flows towards the southwest direction. Current velocities in the studied domain, range from 0.001 – 0.007 m/s. The baseline current magnitude is very weak in the area closest to the site with velocities ranging from 0.001 - 0.002 m/s. The average direction of the current near the site is outward, going towards Guimaras strait.

4.4.4. Marine Ecology

Barangay Bay-ang, Ajuy has diverse coral communities with average to good condition. Patches of unconsolidated sub-massive to massive fringing reefs are also present at depths of about 1 to 10-meters, 60 to 75 meters from the shoreline bordering the Plant on its western side, within the Canal Bay. The proposed pier location is east of the cement grinding plant; it is underlain by sand and coral rubble.

Diatoms make up the majority of the plankton community in the area. Dinoflagellate, which can cause harmful algal bloom (HAB), is also present on the site. While the concentration does not merit a declaration of a HAB, favorable conditions such as temperature, concentrated nutrient availability, and hydrodynamic flows that concentrate cells may result in a HAB event in the future.

The microcrustacean copepod dominates the water column of Pedada Bay, indicating an abundance of secondary producers in the area. Decapod zoea (crabs) and scallops are also present.

Damselfishes dominate the fish assemblage. This indicates a well-functioning ecosystem that can support bigger species. However, an estimated area of 364 hectares of Pedada and Bay-ang coastal waters is classified as a "No Take Zone" area, which means all types of fishing activities or any activities that involve harvesting, gathering, and culture leading to harvesting are restricted.

4.5. Meteorology, Climatology and Air Quality

4.5.1. Climate

The climate in the area belongs to Type III of the Modified Coronas classification, with an annual rainfall of 2,043.3 mm. It has no pronounced maximum rain period and dry season, but the heaviest rainfall occurs in October (304.9 mm) and least in March (63.7 mm). The greatest daily rainfall recorded was 370.2 mm from January of 1916. On the other hand, the recorded average temperature in the area is 27.8 °C, while the average annual percentage of humidity in Ajuy is 83%. On average, December is the most humid and April is the least humid month.

The average annual wind speed is three (3) meters per second. The wind is most often from the northeast for five (5) months (November to March), while the wind is from the east for two (2) months (April to May), from the south for four (4) months (June to September), and from the north in October. The average annual mean sea-level pressure is 1,010 millibars (mbs).

An average of four (4) typhoons or 20% of the typhoons in the Philippine Area of Responsibility (PAR) pass the Panay Island, and fewer actually made landfall in Panay, with one (1) typhoon making landfall per year as the average. Meanwhile, a storm surge has reached up to 4.5 meters masl.

4.5.2. Air Quality

There are no major industrial sources of air pollution within Ajuy. The Total Suspended Particulates and Fine Particulate concentrations are within Class A Residential Area, ranging from 25 to 40 µg/Ncm at the potential impact receptor in Sitio Nipa and in Purok 4, near the Barangay Hall. It is well below the standard NAAQS limit of 230. The potential sources of SO_2 are the few tricycles serving the area, while the potential sources of NO_2 are the few diesel-fueled private jeeps and motor vehicles of the residents of Bay-ang.

4.5.3. Noise

Bay-ang is a rural Barangay and its surrounding land use is agriculture. No sources of industrial noise are present in the area. Noise level sampling in July 2019 reveals baseline noise level between 42 dbA (nighttime) to 52 dbA during daytime, within the residential noise category.

4.6. Socioeconomic and Cultural Environment

Ajuy is a second-class municipality in the Province of Iloilo with a population of 52,268 as of the 2015 Population Census. The projected Ajuy population by 2019 is 56,659 based on the past average

annual growth rate of 2.1%. The Bay-ang population of 2,780 persons in 2015 accounts for 5% of the municipal population. The average annual barangay population growth rate was 1.2% from 2010 to 2015, while the population density in Ajuy is three (3) persons per hectare and eight (8) in Bay-ang.

The important sources of livelihood are agriculture and fishery in Ajuy, and fishing in Bay-ang. Ajuy ranks third in having the widest fishing grounds in Northern Iloilo with approximately 74.83 kilometers of coastline which provides the main protein source in the diet of 60% of its population and provides regular livelihoods.

The direct Project impact population is twenty-four (24) informal settler-families in Sitio Punta Daku, with a total of 128 persons, living in a clustered low density, built-up area covering with an estimated 4,634 m^2 or 0.46-hectare housing footprint. Of these, seventy five percent (75%) live within Lot 23 where the Plant will be constructed. Even as the 25% of households in Punta Daku is outside of the limits of Lot 23, these households are still considered part of the direct impact population due to the social inter-support structure they share with the other eighteen (18) families from relations by affinity or consanguinity.

As mentioned, fishing is the primary source of living of these families from which they earn an average daily family income of Php 364.00.

The majority of the direct impact population attained high school level education, two (2) are college graduates, two (2) have reached college level, and nine (9) have received livelihood trainings under programs of the Department of Agriculture, TESDA and/or NGOs in Iloilo. Fifteen (15) have skills that are useful for Project construction and operation (carpentry, masonry, electrician, mechanic, vehicle driver, welder, others).

5. Summary of Main Impacts and Residual Effects

Table 5 Summary of Main Impacts and Target EMP Performance

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
Pre-Construction Phase			
Area preparation	Displacement of 24 Informal Settler-families from Cemphil project site	• Resettlement to formal NHA Housing Project. • Transportation assistance • Provision of livelihood assistance	100% of Project-affected Families (PAFs) are resettled and provided with PhP 50,000 livelihood assistance per household
Project preparation	No environmental impact. However, preparations to secure environmental compliance are implemented during this phase.	• Incorporation of provisions to comply with environmental management requirement and ECC conditions are included in the specifications in the Invitation to Bid for equipment design and supply, facility design, site development plan, civil works construction, and other incidental contracts.	Project equipment, facilities and civil works are designed and built to meet 100% of environmental impact mitigation requirements
Construction Phase			
Site preparation: – Heavy equipment mobilization – vegetation removal – earthworks Land development. Facility construction.	Habitat disturbance, fauna displacement	• Gradual vegetation removal to give fauna ample opportunity to escape. • Minimize vegetation removal as much as possible • Habitat restoration by establishment of nursery to receive viable removed vegetation and	100% trees in project area are inventoried and tree cutting permit is secured, leading to terrestrial habitat replacement 100% of area not required for industrial activities are regreened.

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
Equipment erection and installation		preservation of removed topsoil. • Prepare replacement planting materials in nursery in advance, for stability before out-planting, for habitat restoration / site regreening • Preferably use indigenous flora species in regreening	Replacement of 100% of affected trees through replanting of 50 trees per planted tree species and 100 per naturally growing tree species.
	Solid waste generation: Construction waste Domestic waste	• Carefully plan concrete delivery for zero waste. • Carefully manage concrete pouring to avoid spills. • Immediately clean-up cement spill while wet. • Waste minimization, waste segregation, material recovery and recycling • Use of 5000 metric tons surplus excavated soil for backfill of separate Bay-ang Coastal Road Project • Provide for at least 200m^2 stockyard area to properly sort &store recyclable materials for easy & safe retrieval of recyclers • Consider blending of selected shredded plastic to mortar for non-load- bearing panels, walling etc. in	Zero littering of construction waste 98% of construction waste are properly stockpiled for easy haul-out 100% of recyclable / recoverable materials are segregated and disposed through accredited /registered material recovery agents 100% of residual waste are hauled out weekly 100% of biodegradable domestic waste are properly composted 100% of excavated materials are used for construction backfill

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		accordance with DPWH guidelines. • Biodegradable materials (paper, carton, fiber) will be shredded and composted.	
	Kitchen waste	• Provide for portable biodegradable kitchen waste receptacles for vegetable wastes which go to the compost pit. Total estimated daily vegetable waste is 1.6 tons. • Separation, safe containment and handling of estimated max. 228 kilos food waste per meal as livestock feed amelioration, grown for Project kitchen. • "Expired" food waste and other kitchen waste will be properly composted	100% of raw kitchen and expired food waste are collected and contained separately, hauled and properly composted daily. 100% of food waste are handled safely and quickly dispatched to partner livestock producer cooperative
	Hazardous waste generation	• Segregate hazardous waste (busted light bulbs, spent batteries, clinic waste, broken equipment with electronic components) • Provide safe and sealed containers for each waste type • Place placards with the symbol representing the hazard classification of the waste per (DAO 2004-36)	100% of hazardous waste are properly handled, contained and hauled out in compliance with DAO 29-92

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		• Store hazardous waste in safe, dry, and well-ventilated shed if not hauled out immediately. • Haul out of hazardous waste by accredited TSD agent.	
	Wastewater generation Kitchen wastewater Septic waste	• Provide for 9m3 kitchen grease trap that discharges to a dug-out ground infiltration basin at least 50m2 x 0.3 meters • Schedule the construction of Plant septic tank ahead so it serves the construction personnel, or • Provide for at least 30m3 septic tank with 165m2 leaching area at least 3 meters from bunkhouse & 45 meters from water supply, for sanitation facilities of construction workers.	100% of hazardous waste are properly contained and disposed in proper manner 100% of kitchen wastewater is passed through a grease separator before discharge to a dug-out open bottom receiving pond 100% of septic waste are processed in appropriate septic tank
	Potential soil contamination	• Do not allow discharge of waste concrete in Plant site. • Prevention of oil and lube spill through regular engine maintenance, proper handling and storage of fuels, oil and lubricants. • Use of DOE-compliant fuel and	Soil contamination observed in project site less than 2 square meter2 total affected surface area, with depth not more than 2cm.

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		lubricant containers and dispensers. • Equipment maintenance only in authorized designated area with oil collection sump.	
	Resource use competition	• Use of pre-mixed concrete delivered and injected by fitted cement mixer trucks • Use delivered water supply from permitted water service provider • Secure NWRB permit to operate project well • Construct all facility roof and downspout connected to drainage /reservoir to harvest rainfall • Build drainage/rainfall collection system with 8,035 m3 capacity	Zero (0) complaint regarding water resource use competition from local community Zero (0) ground water extraction unless permitted by NWRB
	Marine water pollution Increased marine water turbidity Increased oil and grease sources	• Install silt control measures (perimeter cut-off channel, adequate settling ponds) before implementing earthworks • Course storm drainage discharge to sea through a 3-basin series settling pond. • Schedule major earth works and slope stabilization during dry season, if possible.	Concentrations of total suspended solids in marine receiving waters, specifically 50meters distance from coral communities should be <70 mg/L., 75% of the time Concentrations of hydrocarbons in project water quality monitoring stations

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		• Implement "cut-haul-lay-and-tamp" method for earthworks • Ensure slope stability and provision of run-off channel during slope excavation. • Immediately plant open spaces including open bench faces right after construction • Prohibit washing of cement trucks at site • Equipment maintenance only in authorized designated area with oil collection sump.	should be < 5.0 mg/L., 75% of the time
	Exceeding ambient dust	• Water sprinkling along haul roads and active construction areas at least 2x a day in dry season, at rate of 5 liters per square meter unpaved road • Require contractor to maintain particulate filters in exhaust of diesel-fed heavy equipment • Set project vehicle speed limit to 30kph • Construct tire wash in Plant for incoming and outgoing vehicles • IEC for community participation in dust suppression • Lobby with Local and National Government to implement access road support to Ajuy economic zone	Zero (0) road accident involving Project equipment and personnel. Ambient road dust ≤ 300 µg/Ncm in 1 hr. sampling Materialization of access road to Ajuy economic zone within five (5) years of Project start-up

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
	Exceeding, disturbing noise	• Limit construction work between 6:00am to 6:00pm • Schedule heavy equipment operation between 7:00am to 6:00 pm • Plan the operation of noisy equipment use outside of 1:00 pm to 4:00 pm • Plan the work as to avoid proximate simultaneous operation of more than two (2) noisy equipment • Advise / remind operators of noisy vehicles for regular maintenance.	Noise level from Project activities perceived in residential areas nearest to project site (in Purok 6, 3 and 4) are within the following noise limit for residential areas: Period dB(A) Morning 50 Daytime 55 Evening 50 Nighttime 45
	Unmitigated greenhouse gas emissions	• Carbon offsetting through reforestation of 10 hectares mangrove areas annually over 25 years and maintenance for another 25 years with at least 85% survival rate.	Redemption of 100% of carbon footprint
	Road safety risks	• Provide road safety signages along haul roads, 1 signage per kilometer in both directions • Provide traffic aides at school gates during 7:00 to 9:00, 11:00 to 14:00 HH and 16:00 to 18:00. • Provide capped traffic mirror/s in narrow, highly populated road	Zero (0) accidents involving project-associated vehicles

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		sections with blind curves. • Require contract heavy equipment to comply with LTO regulation on visibility of markings for large vehicles. • Avoid or minimize scheduling the use of Barangay roads by heavy equipment during high during peak population traffic hours (7am to 9am, 11am to 1pm, 5 to 6pm)	
Jetty port construction	Marine water pollution: Increased marine water turbidity Increased oil and grease sources	• Installation of silt curtain and oil boom around active jetty port construction area, as necessary	Concentrations of total suspended solids at 50meters distance with current toward coral communities should be <70 mg/L. Concentrations of oil and grease in water quality monitoring stations should be < 5.0 mg/L.
	Marine habitat disturbance; wildlife species displacement; threat to abundance, frequency and distribution of important species	• Use of natural rocks and stones to create rough surfaces on causeway and retaining walls from -1 to +2 mean lower low water (MLLW) to recreate habitat for shellfish. • Construction of six (6) concrete anchor blocks for the pier facility	At least 5000 m2 new rocky surfaces at causeway

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
Project construction (processing plant and jetty port)	Generation of employment and Competition for limited employment opportunities	• Post job opportunities and required qualifications in highly visible places (Barangay and Municipal Halls) • Preferential hiring for local labor • Implement On-The-Job training programs for under-privileged undergraduate youth • Comply with DOLE regulations regarding wages, occupational safety, and contract workers' benefits • Requirements for semi-skilled, skilled and engineers will first be posted in Ajuy	100% of labor requirement is sourced from Ajuy. 100% of DOLE regulations regarding wages and benefits are complied.
	Health and safety hazards to workers	• Construction Contract to include provision for DOLE requirements for occupational health and safety • Conduct of workers' safety orientation • Weekly safety meetings • Construction Contract to include provision for DOLE requirements for occupational health and safety • Daily safety checks for all operating equipment, suspended structures (scaffolding), electrical connections, oil	Zero (0) fatal injuries to workers Less than 10% of man-hours lost due to accidents

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		storage and spills, passages, work areas • Daily checking of correct stockpiling of materials and wastes	
	Generation of benefits to the Community	• Organization, training, and capacitation of the local Labor Service and Producers' Cooperative to provide services and supplies for the Project. • Promotion of school-based development of nurseries for high quality planting materials for food, herbal medicine, forest trees and mangrove cultivars	At least two (2) viable people's cooperatives, established to support Project requirements for employee cafeteria, cleaning materials, etc., becoming viable on 7th year of operation
	Uncontrolled in-migration and proliferation of informal settlers	• Require Municipal Certificate of 3-year residency, for employment • Involve Project Cooperatives to report to the LGU any transient/migrant/ informal vendors/ peddlers / settlers within Bay-ang and Pedada.	Zero (0) new informal settlements within 1 km radius of project site. Zero (0) number of non-resident labor workers
Operations Phase			
Finish Grinding of Cement, Packing and Dispatch	Reduced soil erosion potential	• Continuing plantation and maintenance of vegetation in the Plant • Intensification of planting deep and widely rooting shrubs and bushes eroding areas, if any	Reduction of project area soil erosion from existing 14.77 tons to 7.71 tons annually starting Year 6 onwards,

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
	Change in soil quality and soil fertility	• Re-soiling of open/vacant areas with compost-enriched topsoil • Include nitrogen-fixing shrubs and tree species in Plant revegetation • Soil amelioration using project compost	Soil amelioration quality meets DA PNS/BAFS 183:2016
	Habitat disturbance; wildlife species displacement; threat to abundance, frequency and distribution of important species	• Company policy to prohibit predation or harm to wildlife. • IEC to workers for protection of disturbed animals by assisting to habitat shelter and safety.	100% Project compliance to Republic Act No. 9147, Philippine Wildlife Act
	Solid waste management	• Proper composting of biodegradable waste • Provision of separate waste bins for biodegradable, recyclable materials and residual waste. • Material recovery, re-use and recycling • Disposal of irrelevant recyclable waste to registered material recycling agents • Weekly haul-out of residual waste to municipal waste management facility.	100% Project compliance Project compliance to R.A. 9003
	Hazardous waste management	• Proper containment and storage of used oil, spent heavy equipment batteries, spent batteries, busted lightbulbs, ink cartridges, oily wastes	100% Project compliance to R.A. 6969

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		and laboratory reagents. • Haul out of hazardous waste by accredited hazardous waste transporter and treater	
	Resource use competition	• Rain harvesting from all Plant surfaces • Ground water extraction only for domestic use.	No resource use competition with local community
	Water pollution from Plant and Stockyard Water pollution from port operations and ships	• Silt control through settling ponds (Table 1.8) and Oil and Water Separators (OWS) (Table 1.9). • Cooperate with Coast guard on the implementation of Marine Pollution control guidelines by ships at port • Post signboards in port disallowing discharge of raw bilge and ballast water, and solid domestic waste • Coordinate with EMB 6 for TSD services for visiting ships	Water quality at project impact zone meet Class SB standard, DAO 2016-08 75% at least of the time for Oil and Grease, TSS and other parameters as reasonably required.
	Disturbance of potential coral habitat around jetty port area	• Require docking ships to use anchor blocks. Advice regarding disallowance of random anchoring	No further damage to corals near the jetty port

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
	Increased ambient dust pollution from cement grinding and product transport	• Install, operate and properly maintain air pollution control equipment (see Table 1.7) • Limit project vehicle speed to 30kph • Regular twice daily watering of unpaved access roads during dry days • Daily road dust sweeping in concrete road sections. • Return of collected road dust to Plant raw material bin to prevent dust re-suspension in air • Ensure tire wash has sufficient water to function, and minimize spreading of dust from muddy vehicle tires, inside and outside of Plant • Install signages for vehicle speed limit of 30kph	Monitored Total Suspended Particulates (TSP) and noise in monitoring stations in impact receptor communities will be <230 µg/Ncm for 24-hour averaging or <300 µg/Ncm for 1-hour averaging.
	Increased ambient carbonic particulates emitted by gensets	• Provide genset exhaust with catalytic converter or diesel particulate filters	

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
	Increased noise	• Use of rubber pallets and enclosure of noisy equipment • Enclose all noisy processes • Design internal walls of noise enclosure buildings with fire-resistant noise dissipators (corrugated gypsum boards, etc.	Monitored noise in residential areas will comply with standard under the NPCC Regulation for Noise in General Areas 80% of monitored time: Period dB(A) Morning 50 Daytime 55 Evening 50 Nighttime 45
	Slight increase in ambient temperature due to more concrete buildings in the Plant environment	• Maximize planting and maintenance of leafy vegetation in all vacant spaces in the Plant to serve as heat and noise sink	Ambient temperature within Plant is not > 1 °C higher than ambient temperature outside of Plant
	Unmitigated greenhouse gas emissions from genset operation.	• Carbon offsetting through mangrove reforestation and maintenance, ten (10) hectares annually with 1.5mx1.5m, planting interval, for twenty-five years and maintenance for another twenty-five years for total fifty years of Plant operation • Preparation of at least 33,300 viable mangrove cultivars in stabilized in nursery annually, ready for planting season starting September of each year. • Enter into MOA with DEPED for mangrove reforestation and	100% of greenhouse gas emissions are offset by mangrove carbon sink 85% of planted mangroves survive and thrive in annual inspection by CENRO.

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		maintenance, as planned above. • Lobby with Government to provide incentive to improve renewable energy supply in Ajuy.	
	Employment generation	• Comply with DOLE regulations regarding wages, occupational safety, and contract workers' benefits • Cause/fund the delivery of the following trainings: -Cooperative formation and development -Enterprise development, financial management and sustainability, including simple livelihood project feasibility preparation -Livelihood skills development *Kitchen operations *livestock growing and health protection (chicken, swine, goat) *food safety *food processing (chicken and pork-based products)	100% compliant with Philippine Labor Code At least 2 partner cooperatives continue to manifest viability indicators: -Officers selection and functioning, records keeping, financial management are in accordance with guidelines of Cooperative Development Authority (CDA) 100% of funded livelihood projects are viable and sustainable One (1) community display and trading center for assisted projects is established and operated by local community members. MOA with LGU for the display center space.

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		*snack food production *soap, cleaning materials (incl. ash cleansers) and implements production *tailoring *rag making *Product packaging *Product marketing and market networking • Organize, train, and enable local community cooperative partner to supply and operate Project Canteen, and supply own-grown food materials.	
	Threat to delivery of basic services	• Augment Barangay Social Development Projects through: - IEC on the importance of the following: * proper nutrition *composting, organic soil enrichment and home gardening *organic food production and its potential markets *climate change, mangrove reforestation and sustainable fishery	100% of Cemphil projects augment the LGU's socio-economic development programs MOA with LGU for the required mangrove reforestation areas is secured, covering at least ten (10) hectares per year, for twenty-five years.

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		• Establishment and annual replenishment of a revolving livelihood assistance and mutual fund managed by the association of partner cooperatives • Assist the establishment and operation of a common food processing facility identified based on "felt-need" basis. • Supplement workers' nutritional source by supporting food gardens in vacant areas in Plant • Promote the establishment of barangay- and school-based food and medicine mother stock nurseries and gardens, and mangrove nurseries. • Implement school-based mangrove reforestation • Support Bantay Dagat initiatives of local fishermen • Video / keep reproducible record of all trainings, education and	Municipal Ordinance for protection of replanted mangrove forest is obtained. MOA with DEPED and schools for a total of ten hectares mangrove reforestation and maintenance work is concluded each year. At least one program for Bantay Dagat is supported each year. One nursery and garden for mother stock for nutritious food, medicinal plants, forest trees and mangroves per partner Barangay (initially Bay-ang, Pedada, Luca in Ajuy and in Barangay Santiago, Barotac Viejo). The common food processing facility is viable and sustainable in terms of a) operating system [institutional aspect] (b) economic indicators (net present social value = >1.0, economic internal rate of return =>18%) and financial indicators (cash flow sensitivity => 15% overall).

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		information materials for annual replication / continuing efforts	School -based / coordinated nurseries are (a) thriving, (b) provide home planting materials to at least 100 different students annually (c) adequately supply Cemphil mangrove reforestation requirements At least 100 students benefit from Cemphil nursery development program each year 100% of information, education/training modules implemented are recorded, subject-catalogued and safekept
	In-migration, proliferation of informal settlers	• Post job opportunities and qualification requirement in highly visible places (Barangay and Municipal Halls) • Requirements for semi-skilled, skilled and engineers will first be posted in Ajuy • Municipal certification for 3-year Ajuy residency shall be a requirement for employment • Hiring of non-resident worker only when the requirement is not locally available	100% of labor requirement is sourced locally. Zero (0) shanties and new informal settlers within Barangay Bay-ang Zero (0) employees from new informal settlements (Base year 2021)

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		• IEC with LGUs on the control of proliferation of informal shops, shanties, stalls and vendors/sellers	
	Road safety hazards, traffic congestion	• Scheduling cement transport during off-peak hours. Road widening and concreting; provision of safety signages; provision of traffic aids. Lobby with DPWH and LGU for realization of access road support to Ajuy Economic Zone • Provision of road safety signages • Provision of traffic aids in highly populated sections and at schools	Zero (0) road accidents caused by Cemphil -related vehicles
	Increased sources of occupational safety hazards	• Regular safety meetings • Provision of safety installations in plant machinery and structures • Provision of workers PPE	Project is 100% compliant with DOLE OHS guidelines
	Increase in local tax revenues	• Lobby for approval of land reclassification from agricultural to industrial use	100% Project real estate tax payments are for industrial land classification.
Jetty Port Operation	Potential source of pathway conflict with local fishing boats	• Project ships are to follow LGU-provided navigational lane (Annex Z) • Project ship arrivals and departures are posted in Bay-ang	Zero (0) accidents related to Project ship ingress or egress

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		Barangay Hall Bulletin Board • Project ships blow horn upon entry into Ajuy municipal waters and exit from Cemphil Port	
Abandonment			
Equipment dismantling and demobilization	Waste generation	• Shredding of biodegradable waste and placing in compost pit • All recoverable materials will be disposed through accredited material recyclers • All residual wastes will be hauled out to municipal land fill. • Proper containment and storage of all hazardous waste materials, and disposal through authorized TSD agent.	100% of waste materials are hauled out from Project site within one year of closure notification. Zero (0) road accidents occur during abandonment phase.
	Potential public and workers' safety risks	• The property will be closed to the public to avoid public safety risks • All workers are trained for the job and provided with PPE • All structures and facilities that are public safety risks will be dismantled and removed. • Hauling will be done at nighttime to minimize contributing to road traffic load	Zero (0) accidents occur during abandonment phase 100% of final air and water quality sampling results, and report on final inspection for project exit from environmental indicate that the Project site is free from the existence of, and as source of environmental risks.

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
		• All haul trucks will be required to comply with LTO road safety requirement for oversized cargo and visibility markings • All settling ponds, drainage systems and oil and water separators will be cleaned-out. • All sources of environmental deterioration, if found, will be remediated by Cemphil. • A final air and water quality sampling will be undertaken, witnessed by the MMT and EMB6 or equivalent entities, to verify that environmental quality at abandonment complies with environmental regulation.	
	Water pollution from Plant and Stockyard	Desilting of settling ponds and desludging of Oil and Water Separators by TSD agent.	Water quality in project receiving waters is 100% compliant with Class SB under DAO 2016-08.
	Increased ambient dust from facility dismantling	Overhead sprinkling for dust suppression	Total Suspended Solids sampled at nearest community (Purok 4) is < 300µg/Ncm for 1-hr averaging.
	Mitigation of accumulated greenhouse gas	• Offsetting of project carbon footprint	CENRO concerned issues certification of average 85% survival

Activity	Impacts	Mitigating Measure	Target Performance / Efficiency
	emissions during project lifetime	through mangrove forestation	rate of all Cemphil mangrove forestation
	Loss of employment	• Provide employee benefits as per DOLE regulations • Early education of employees regarding personal savings and retirement investment planning • Prepare employees to avail of unemployment benefit from the Social Security System • Provide employee benefits as per DOLE regulations	Zero (0) employees are deprived of legally slated benefits 100% of employees are members of the Social Security System and have savings in emergency unemployment and retirement fund

6. Risk and Uncertainties Related to the Findings and Implications for Decision making

The risks and uncertainties related to the findings and implications for decision making are presented in the following table:

Table 6 Summary of Risks and Uncertainties

Module	Risks and Uncertainties	Implications for Decision Making
Land	Project site land use zone is officially still under Agricultural classification. The process for updating the Municipal Comprehensive Land Use Plan has not been completed.	Adherence to sound environmental basics such as sustainability of land use based on area physical features will preserve the integrity of decision-makers in the Project EIA process. As proposed, the fragile land features such as poor marginal and sloping land will be modified to better serve an economic purpose, while reducing erosion potential, improving land cover, and its implications in coral siltation, providing a nursery for nutritious food crops and traditional medicine. Project resources to extend nursery services to

Module	Risks and Uncertainties	Implications for Decision Making
		the local community will make better use of the area than its present land use. In the absence of official industrial zoning of the Project area, a Certificate of No Objection to the Project was issued by the Municipal Planning and Development Coordinator, noted by the Mayor, indicates that the LGU recognizes the Project to be a better use than what is allowed under its present land zonation. It is strongly believed that zonal conversion from Agriculture to Industrial use for the area will be carried in the updating of the Municipal CLUP. This conversion of land use classification is safe to be a post-ECC requirement.
Water	Well pumping productivity studies have not yet been undertaken to identify the exact location of production well, although soil investigation indicates the water table was encountered at depths between 0.5m to 6m.	The Project is not a water-intensive undertaking. Process temperature management will use cooling oil. Rainwater harvesting and collection will be incorporated in all building design, for use in dust suppression, cleaning, and landscape irrigation. Groundwater extraction will be limited for drinking and cooking water uses. The NWRB permit for groundwater extraction is safe to be a post-ECC requirement.
Air	Tier 4 air pollutants dispersion model was used in predicting Project air quality impact and identifying Area Sensitive Receptors who may experience an increase in ambient particulates due to the Project. Actual air quality impact during operation may be different from values forecasted using USEPA approved dispersion model tool AERMOD, due to seasonal and other background factors.	A wealth of knowledge, experience, and data exist regarding air quality impacts of cement finish grinding operations. It is fully known that these air quality impacts can be and are usually managed within the Implementing Rules and Regulations of R.A. 8749, the Philippine Clean Air Act. The required quarterly air quality monitoring within the Plant and the nearest impact receptor communities, the Multipartite Monitoring Team, the Grievance Mechanism, and regular EMB monitoring will help ensure Project compliance to Air Quality standards.

Module	Risks and Uncertainties	Implications for Decision Making
People	The project aspiration to assist the local community to develop involves several factors that are outside of the project purview, that is, instigation of determination and the willingness to self-sacrifice, both of which are necessary in attaining tangible development.	This concern to enhance the project development impact is a goal of many projects which however involves some degree of chance in coinciding with dynamic, talented and self-less local / community leaders, and massive resources. Local elected leaders regularly change due to the electoral process. Talented leaders also often are stretched to take care of an increasingly widening range of local development concerns. Expectations for project social development impact is thus forecast to be "moderate".

7. Potential Economic Loss of Economic Benefits Due to Plant Closure or Project Discontinuance

The economic benefits considered that might be lost due to Plant closure or discontinuance are the following:

1. Loss of Project investment in local components in Table 1.25
2. Loss of salaries to Project employees in Table 1.23 and mandatory benefits
3. Loss of Social Development Program funding in Table 1.25
4. Loss of potential income tax revenues to the National Government.

The following benefits are not unaccounted in the estimate due to inadequate reference:

1. Overtime pay and employee performance incentives
2. Duties and taxes to the National Government for imported Project components (Table 1.25) and imported raw materials (clinker, gypsum and pozzolan)
3. Economic value of cement to the local construction industry
4. Ancillary economic benefits such as jobs and local enterprises that will be indirectly created and supported by the Project.

A conservative estimate of economic benefits to be lost is in Annex AB. Due to the 50-year project life, the total financial value of selected economic benefits to be lost if the Project is completely abandoned before it starts is **PhP 80,068,524,531.** Annex AB shows an estimate of selected project economic benefits at every year of operation. At any time, the Project unexpectedly closes, the expected annual benefit for the following years will be lost, including the unaccounted economic benefits mentioned above.

CEMPHIL CEMENT GRINDING PROJECT

PROJECT DESCRIPTION

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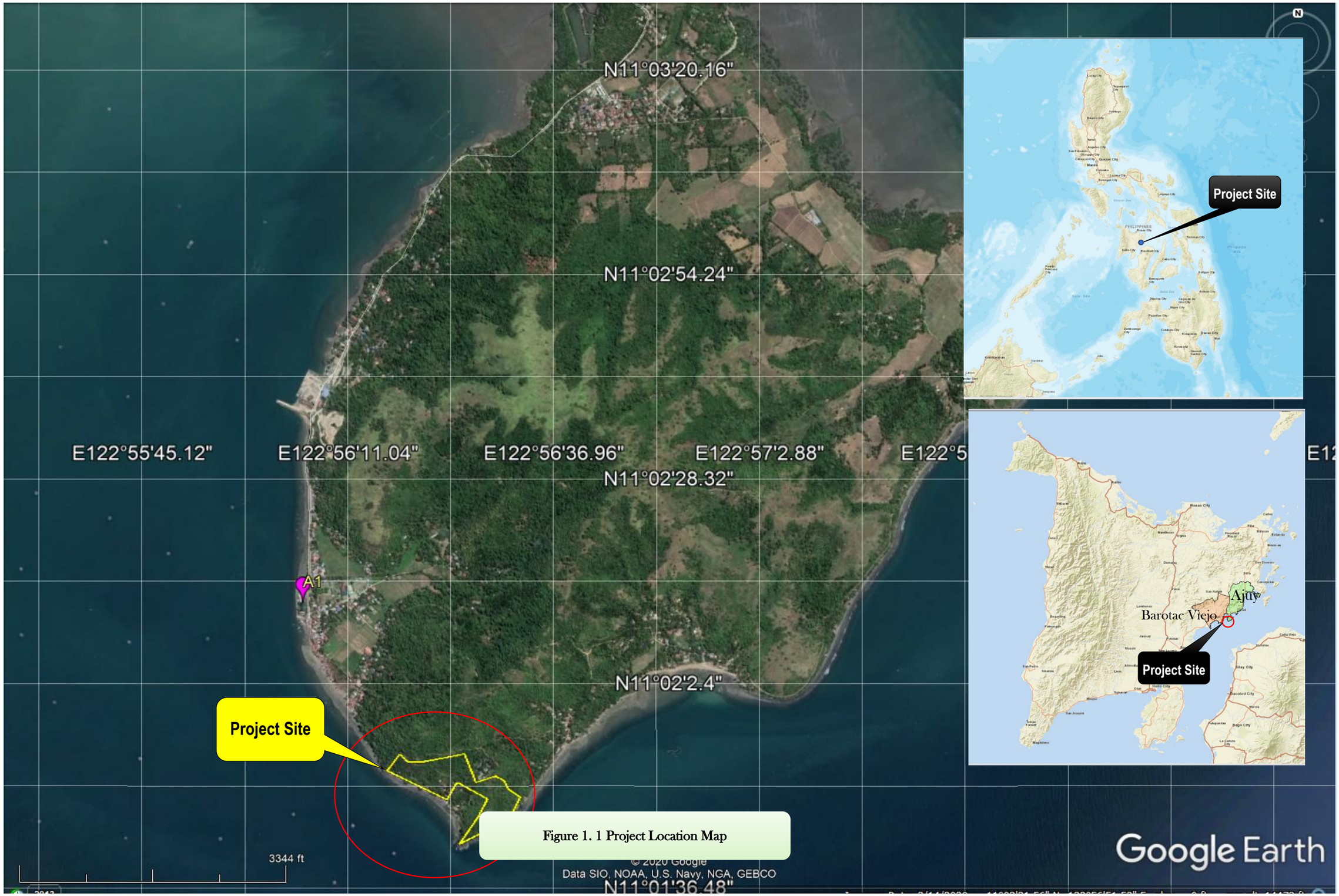


Figure 1. 1 Project Location Map

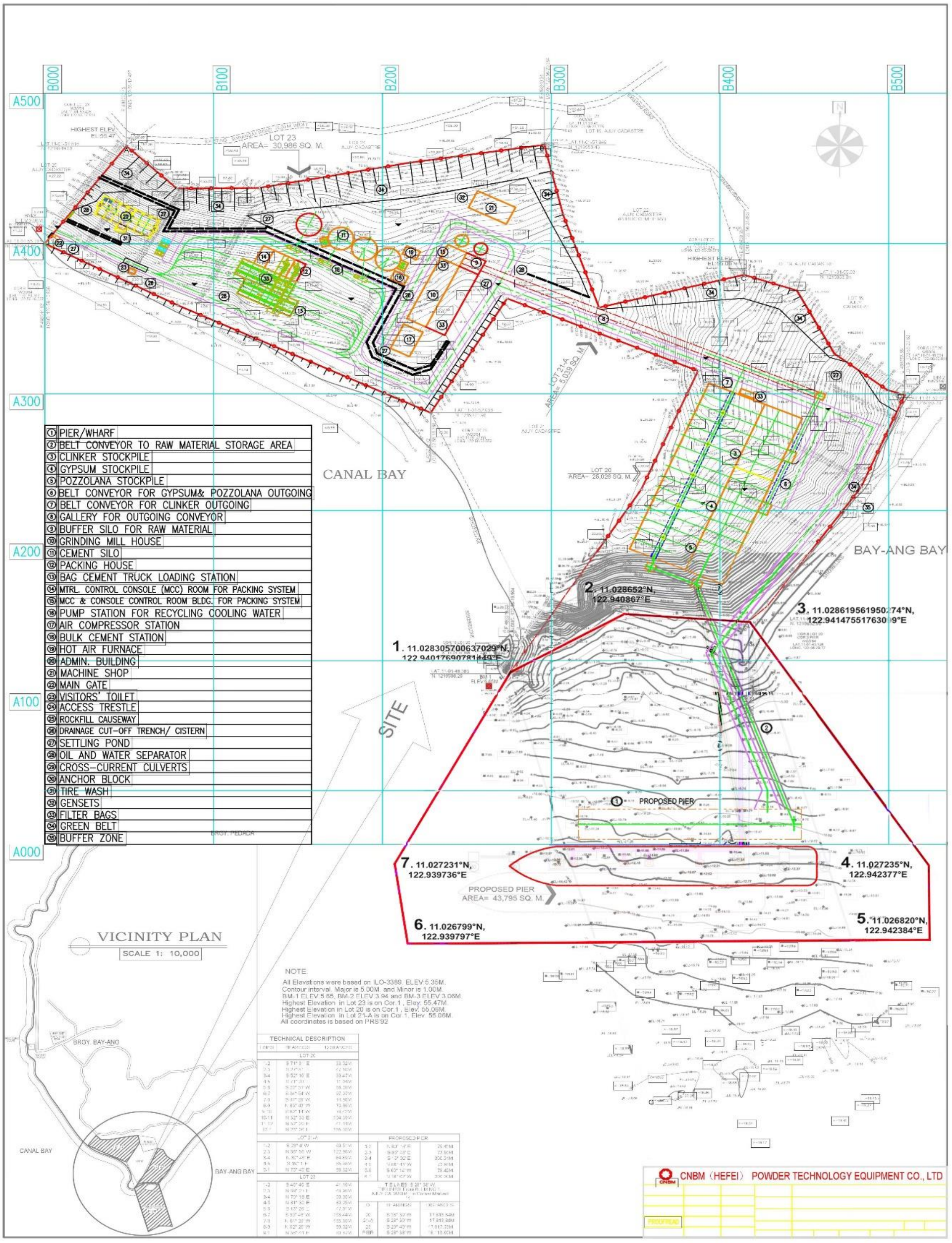


Figure 1. 2 Overview of Facility Lay Out

1. Project Description

1.1 Introduction

The Cemphil cement grinding project is a manufacturing plant that will use dry process in grinding clinker, limestone, gypsum, and tuff to produce cement. The project will not involve clinker production and quarry operations. The clinker will be imported while limestone and other materials will be domestically sourced from independent suppliers and legitimate quarry operators.

This project is envisaged to supply 1,200,000 metric tons of cement annually to distributors in Panay and Negros Island, which are 100% cement importers. As of the end of 2019, two (2) million bags of cement enter the Port of Iloilo annually. The project will supply only a small percentage of this demand. This project is also hoped to be the centerpiece or the investment attractor to the Ajuy Industrial Development Zone, which will make use of nutrient-poor, stony, and currently idle lands in the southwestern tip of the Bay-ang headland.

The Project's major facilities / components include the (i) jetty-port for receiving materials and shipping-out products, (ii) the material stockpile area, (iii) the enclosed bucket conveyor belt system for materials handling, and the (iv) cement milling and packing equipment (Figure 1. 2). shows the site development plan and rendered in 3D (Figure 1. 4).

Cemphil is a Filipino corporation registered with the Securities and Exchange Commission in September 2018 for the primary purpose of manufacturing and wholesale/retail sale of cement. Its incorporators come from Iloilo and Albay who have organized to manufacture cement using imported clinker and domestic raw materials, stimulated by the continuing growth in cement demand from private sector construction, and the current Administration's massive infrastructure investment program.

The Municipal Government of Ajuy strongly supports this project to create an anchor to attract investors to the Ajuy Industrial Development Zone to promote local economic production, generate jobs, taxable incomes, and better land use. The Regional Development Council (RDC) Region VI of the Department of Public Works and Highways (DPWH) has deliberated on and endorsed the access roads to the Ajuy Industrial Zone (Annex D).

1.2 Project Location and Area

The Cemphil cement grinding plant is located in a titled property along the coastal area of Barangay Bay-ang, Municipality of Ajuy, Iloilo, bordered in the east, south, and west by the Visayan sea; and in the north by the Municipal cemetery of Ajuy. The municipality of Ajuy is a second-class municipality classified as an agricultural town with an approximately 84-kilometer coastline. The geographic coordinates that identify the project location are in Table 1. 1, referring to points indicated in Figure 1. 1. The project property encompasses a total area of 6.1051 hectares, with 2.5 has. designated as a material stockyard and 3.9 has. for processing plant facilities. An area applied for Foreshore Lease Agreement (FLA) consisting of 0.97 hectares brings the total area applied for ECC to 7.0751 hectares.

Table 1. 1 Coordinates Bounding Stockyard, Processing Plant & Jetty-Port/ Wharf

Point	Latitude	Longitude
A	11-01-57.816	122-56-12.427
B	11-01-57.848	122-56-20.584
C	11-01-55.030	122-56-24.483
D	11-01-52.422	122-56-27.620
E	11-01-47.513	122-56-24.579
F	11-01-38.129	122-56-27.312
G	11-01-36.999	122-56-22.636
H	11-01-46.383	122-56-19.904
I	11-01-52.038	122-56-18.368
J	11-01-55.705	122-56-10.836

Jetty-Port / Wharf

Point	Latitude (°N)	Longitude (°E)
1	11.0283057006	122.940176909°E
2	11.028652	122.940867
3	11.028619561950	122.94147551
4	11.027235	122.942377
5	11.026820	122.942384
6	11.026799	122.939797
7	11.027231	122.939736

Additional Areas

There will be no additional areas to be developed for Phase 2 of the Project. Phase 2 will simply be the construction of cement silo no. 3 and no. 4 within the Plant and the addition of cement grinding equipment within the mill house.

1.3 Project Accessibility

The municipality of Ajuy is 88 kilometers from Iloilo City, the capital of the Province of Iloilo. Ajuy is accessible from Manila through an hour and fifteen-minute flight from the Ninoy Aquino International Airport to the Iloilo International Airport in the municipality of Cabatuan, about twenty kilometers from Iloilo City. From the town of Cabatuan, the travel by private vehicle to Ajuy through the Iloilo East Coast-Capiz Road will take about an hour and a half.

There are four alternatives to access the Cemphil Plant, one through sea mode and three by land. The sea mode will be facilitated by the jetty port component of this project. The three land access

options are: (i) through the Pedada-Bay-ang Road; (ii) the Bay-ang Hill Road; and the (iii) Bay-ang Pedada Coastal Road, shown in Figure 1. 3.

The materials for cement grinding will come from Albay, Vietnam, China, Indonesia, and Cebu and will be brought-in through the Jetty Port.

The Cemphil Jetty-Port - Cemphil, Inc. will bring in the cement production materials mostly through the jetty-port at Bay-ang Point via closed bucket conveyor system (see Figure 1. 4) or hauled by trucks serving the Pedada-Bay-ang road. The Jetty Port components are listed in Table 1. 4.

The Bay-ang-Pedada Coastal Road is a long-unfunded project of Barangay Bay-ang, conceived in response to the invitation of the National Disaster Risk Reduction Management Council to Local Government Units affected by Typhoon Yolanda-affected to submit proposals to reduce disaster risk in their locality. The project, besides providing shorter access for residents in Purok 5 and 6, to the center of Barangay Bay-ang, will serve as protection against coastal erosion and storm surge. This project was proposed to Cemphil as a social entry strategy and Cemphil accepted the request to fund its construction. Initial estimate measures the missing link to the Bay-ang Pedada Coastal Road to be 811 meters long, from Cemphil West Gate to the Bay-ang Barangay Hall, where it connects to the existing Barangay Bay-ang Road. The proposed coastal road link is ten (10) meters wide, inclusive of two 3.5-meter-wide lanes and 1.5-meter-wide shoulders. The road top elevation is designed at 5.35m above Mean Lower Low Water (MLLW). Cemphil will submit the Project ECC application to EMB Region 6 Office.

The Pedada-Bay-ang Road will be 2.76 km, starting from Junction National Road and will run towards Barangay Luca. It will traverse Barangay Pedada, and end at the Bay-ang Port. It is an existing earthen road used by the local community, with widths varying from three to five meters. It was endorsed by the Municipal Government to the National Economic Development Authority Regional VI and by the Regional Development Council to the DPWH to support the Ajuy Industrial Zone. This option has about 80% flat to gently undulating vertical alignment. It is on Alienable and Disposable land classification and has good lane widening potential requiring minimal slope cuts. It is in elevation >25masl, above the storm surge level of 4.5 masl. Construction equipment to the Project site will be brought to the Plant through the Pedada-Bay-ang Road.

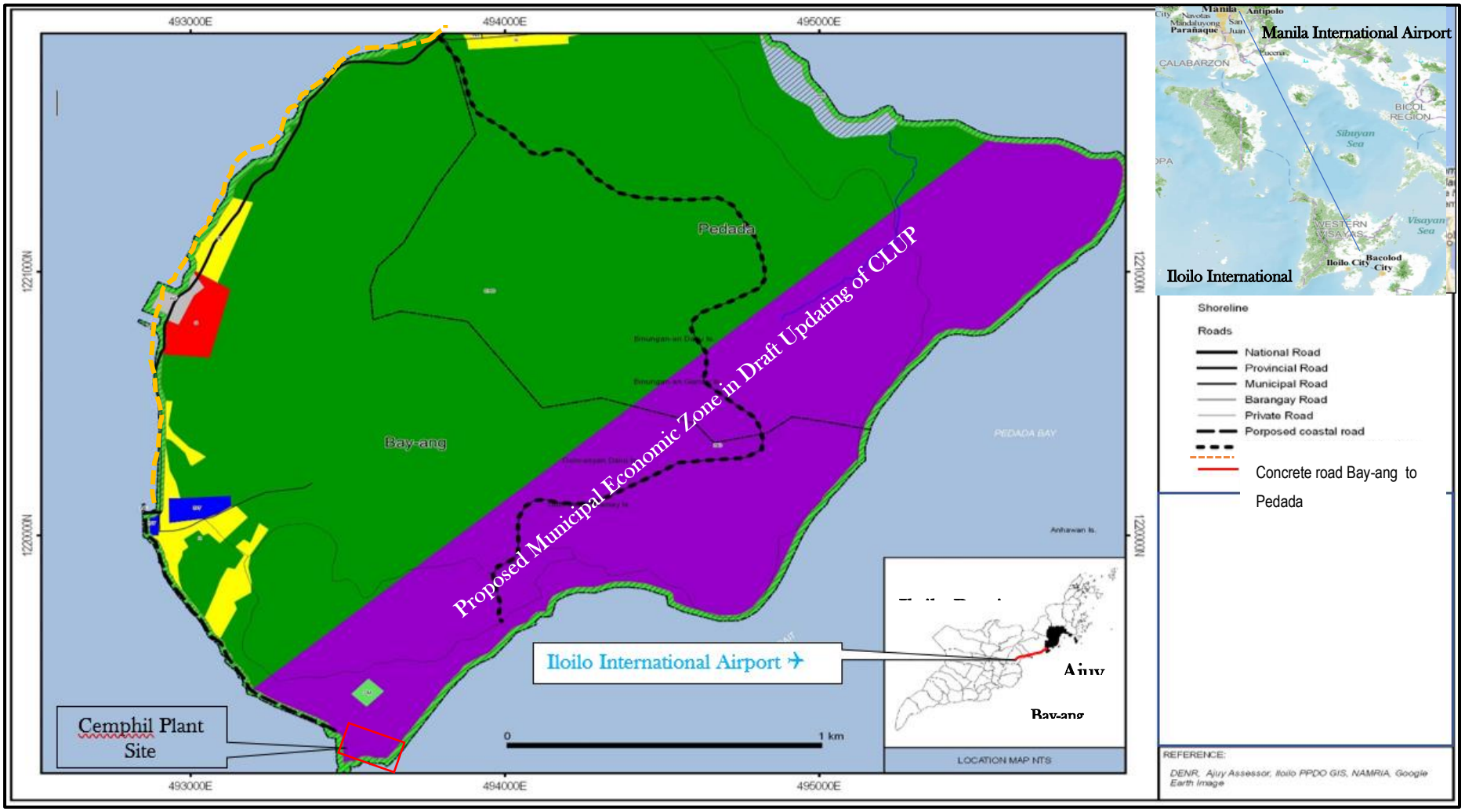


Figure 1. 3 Access Options to Cemphil Plant Site

Figure 1. 4 3D Visualization of Plant and Indicative Location of Major Facilities

1.4 Project Facilities

The project facilities by component is listed in Table 1. 2, referenced to the numbers indicated in Figure 1. 4.

Table 1. 2 Planned Location and Area of Facilities

Project Component	No. in Fig. 1.2	Pollution Emitted	Combustion Source? (Yes / No)	Components	Longitude	Latitude	Surface Area (m²)	Facility Top elevation (m)
Jetty Port	1	Dust	No	Pier Deck	11-01-53.9979	122-56-58.9249	2,025	+4 masl
					11-01-53.9985	122-57-02.8138		
					11-01-53.4776	122-57-02.8139		
					11-01-53.4770	122-57-58.9250		
				Rock Causeway			306	
				Access Trestle			594	
				Mooring dolphins			144	
				Catwalk to mooring dolphins			320	
Material Handling	2	Dust	No	Gantry Cranes, Conveyor System (Port) Conveyor Bridge	11-01-53.9967	122-57-02.7251	1,001	+6 masl
					11-02-06.0566	122-56-58.3428		+38 masl
Storage Facilities	3	Dust	No	Stockyard	11-02-04.0084	122-57-02.0349	11,250	+43 masl
	4				11-02-03.2432	122-57-03.8543		
	5				11-01-59.6484	122-57-02.3052		
					11-02-00.4136	122-57-00.4857		
	9			Bunkers (2 units)	11-02-07.0972	122-56-57.2091	270	+39 masl
					11-02-06.9173	122-56-57.5787	270	
	11	Dust		Cement Silo ------ unit 1	11-02-07.4434	122-56-54.2239	225	+39 masl
		Dust		unit 2	11-02-07.1412	122-56-54.8447	225	+39 masl
		Dust		unit 3	11-02-06.9167	122-56-55.3059	225	+39 masl
		Dust		unit 4	11-02-06.6922	122-56-55.7671	225	+39 masl
Cement Grinding	10	Dust	No	Mill house	11-02-06.7199	122-56-56.7913	2,708	+35 masl

Project Component	No. in Fig. 1.2	Pollution Emitted	Combustion Source? (Yes / No)	Components	Longitude	Latitude	Surface Area (m²)	Facility Top elevation (m)
		Dust			11-02-06.3601	122-56-57.5304		
		Dust			11-02-05.0459	122-56-56.8748		
		Dust			11-02-05.4057	122-56-56.1357		
Packing Facilities	12	Dust	No	Cement Pack House	11-02-06.7855	122-56-53.7487	182	+32 masl
					11-02-06.5840	122-56-54.1626		
					11-02-06.2043	122-56-53.9732		
					11-02-06.4058	122-56-53.5593		
Auxiliary Support Facilities	21		No	MCC Room for Packing System	11-02-06.9869	122-56-53.3350	182	+35 masl
					11-02-06.7855	122-56-53.7487		
					11-02-06.4058	122-56-53.5593		
					11-02-06.6072	122-56-53.1456		
				Admin Building	11-02-08.0807	122-56-50.2289	554.36	+32 masl
					11-02-07.5482	122-56-51.3227		
					11-02-07.1393	122-56-51.1188		
					11-02-07.6718	122-56-50.0223		
		CO_2, PM	Yes	Generator Sets	11-02-08.0270	122-56-57.2158	390	+32 masl
		Dust	No	Machine Shop	11-02-08.1766	122-56-57.5177	309.89	+32 masl
					11-02-07.8188	122-56-58.2570		
					11-02-07.4561	122-56-58.0771		
					11-02-04.5581	122-56-57.3383		
			No	MCC Room of packing system	11-02-07.0119	122-56-56.9369	125	+38 masl
					11-02-06.8320	122-56-57.3065		
					11-02-06.5400	122-56-57.1608		
					11-02-06.7199	122-56-56.8177		
						Total	21,531.25	

Footprint areas of Support Facilities

Project Component	Pollution Emitted	Combustion Source? (Yes / No)	Components	Surface Area (m2)	Longitude	Latitude
Auxiliary Support Facilities	N/A	No	Filter Bags (Phase 1)	50	11-02-03.7800	122-57-06.6861
				50	11-02-06.5560	122-56-56.8428
			Filter Bags (Phase 2)	50	11-02-05.2703	122-56-56.8194
				50	11-02-06.2807	122-56-53.3914
			Unloading point at wharf area	50	11-01-53.5725	122-57-01.0945
			Raw material shed	50	11-01-	122-56-
			Material Crushing & Grinding area	50	11-01-	122-56-
Water Pollution Control Facilities	None	No	Silt trap /settling pond	27	11-01-58.7899	122-57-02.4342
See Table 1. 9				12	11-02-04.1778	122-57-04.5164
				16	11-02-04.1767	122-56-57.6910
				22	11-02-04.7011	122-56-55.7067
				9	11-02-07.5579	122-56-53.4241
				22	11-02-07.6770	122-56-51.3877
				22	11-02-06.9141	122-56-49.6258
				9	11-02-04.7011	122-56-55.7067
See Table 1. 10	None	No	Oil and Water Separators	3	11-01-54.1206	122-57-02.4927
				3	11-01-58.3847	122-57-02.8577
				3	11-02-06.5000	122-57-02.8563
				3	11-02-05.9108	122-56-56.1604
				3	11-02-05.8978	122-56-52.5558
				3	11-02-07.7590	122-56-49.8767
Toilets	hydrogen sulfide (H_2S), CO_2, methane (CH_4)	No	Septic tanks compliant with the Revised Philippine Plumbing Code and PD 856 Code on Sanitation of the Philippines			
			Primary Treatment Capacity	10		
			Secondary Treatment	12		

Project Component	Pollution Emitted	Combustion Source? (Yes / No)	Components	Surface Area (m2)	Longitude	Latitude
Environmental Protection Facilities		No	Perimeter greenbelt	30	11-01-59.2934	122-56-59.8573
				30	11-02-01.7563	122-57-04.8630
				30	11-02-05.4096	122-57-03.8086
				30	11-02-05.9684	122-57-02.0805
				30	11-02-08.0978	122-56-58.8742
				500	11-02-08.1989	122-56-55.6353
				3,000	11-02-07.8414	122-56-52.4489
				2,030	11-02-08.5545	122-56-50.6624
Plant Side			Buffer Zone A	2,500	11-01-58.3921	122-57-00.5246
Stockyard Side			Buffer Area B	1,250	11-02-01.3147	122-57-05.1384
			Oil Boom (m)	750		
			Anchor Block 1 (left to right)	36	11-01-53.7273	122-56-57.4322
			Anchor Block 2	36	11-01-53.7245	122-56-58.2286
			Anchor Block 3	36	11-01-53.7444	122-57-03.4989
			Anchor Block 4	36	11-01-49.4749	122-57-05.5418
			Anchor Block 5	36	11-01-50.000	122-57-03.4989
			Anchor Block 6	36	11-01-51.00	122-57-05.5418
			Tire Wash	10		
			Total	10,406		

Table 1. 3 Indicative land area utilization by various Plant facilities and uses

Land Facilities	Units	Area (m2)	Total
Material Handling	1	322	322
Storage Facilities	1	11,250	11,250
Bunkers	2	270	540
Cement Silo	4	225	900
Mill house	1	2,708	2,708
Cement Pack House	1	182	182
MCC Room for Packing System	2	182	364
Admin Building	1	554	554
Machine Shop	1	310	310
Generator Sets	1	390	390
Filter bags	4	50	200
Raw material shed	1	50	50
Material Crushing & Grinding area	1	50	50
settling ponds	7	140	980
Oil and Water Separators	6	18	108
Septic tanks	3	8	24
Greenbelt / Tree Planting areas	1	9,430	9,430
Tire Wash	1	10	10
SUBTOTAL FACILITIES		26,149	28,372
Concreted Open Areas:			**12,575**
Pedestrian safe zone walkways		1,500	-
Roadways		1,000	-
Ditches		75	-
Base of the northern slope terraces		10,000	10,000
Unsealed soil surfaces			**4,000**
Maneuver Areas		2,500	-
open spaces for aesthetics		1,500	-
Total			**44,947**

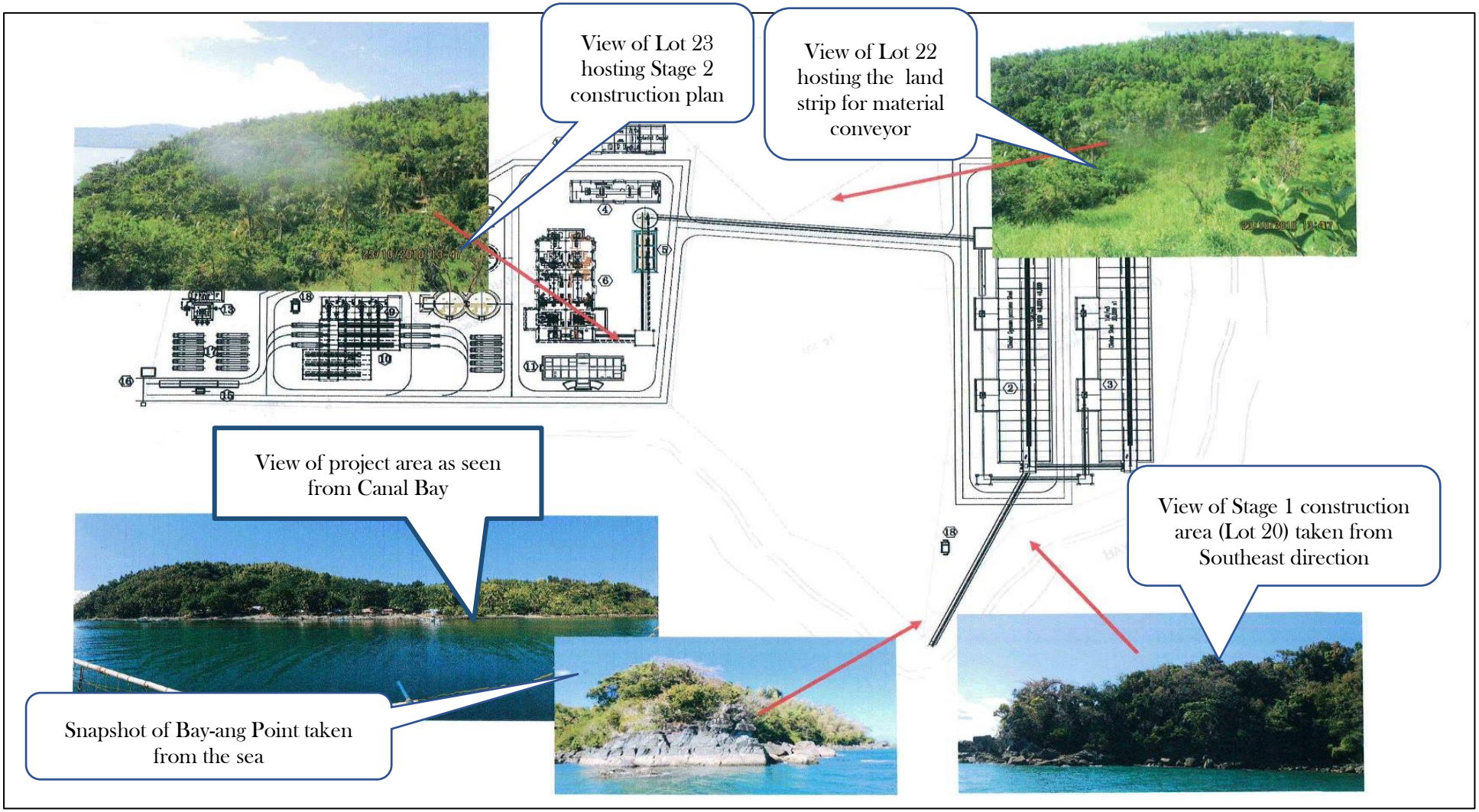
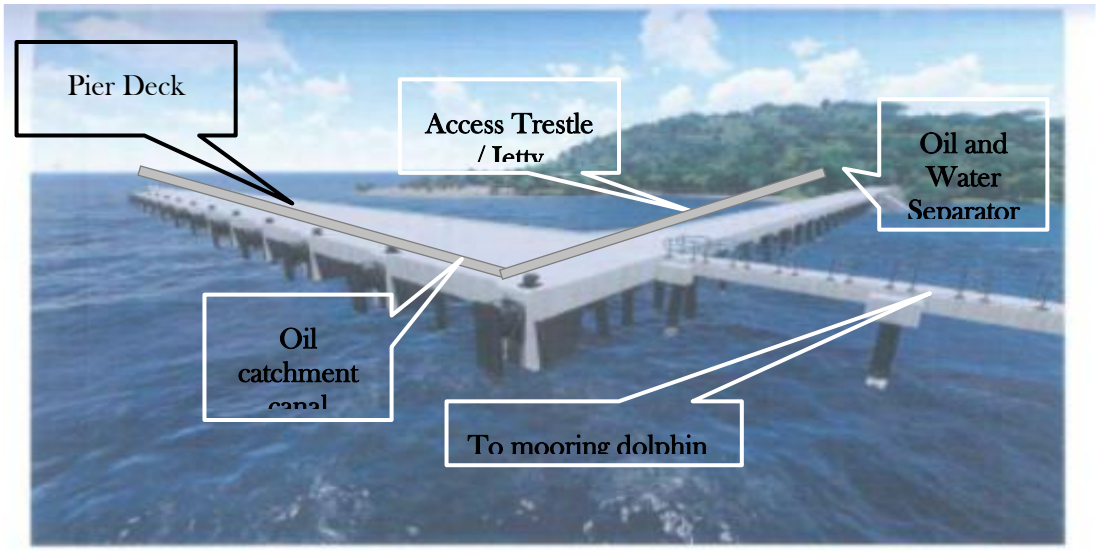
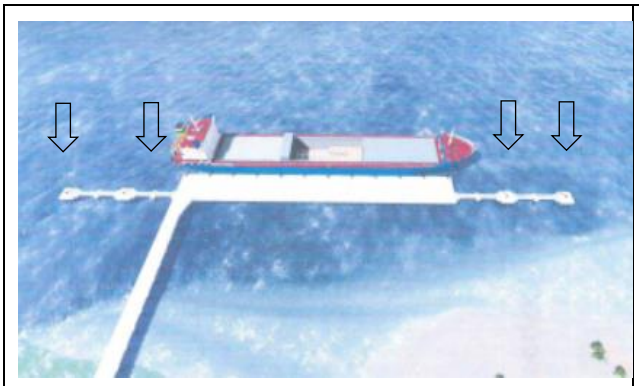


Plate 1. 1 Site Photos





Mooring dolphins

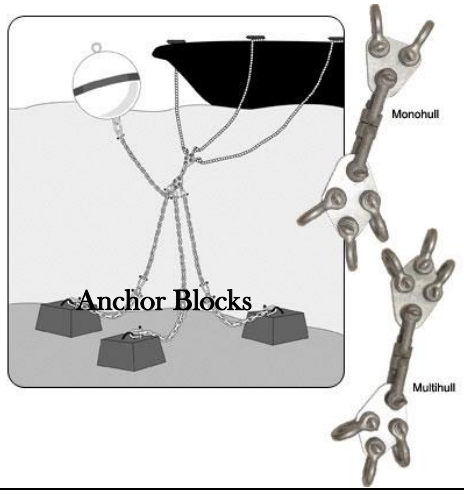
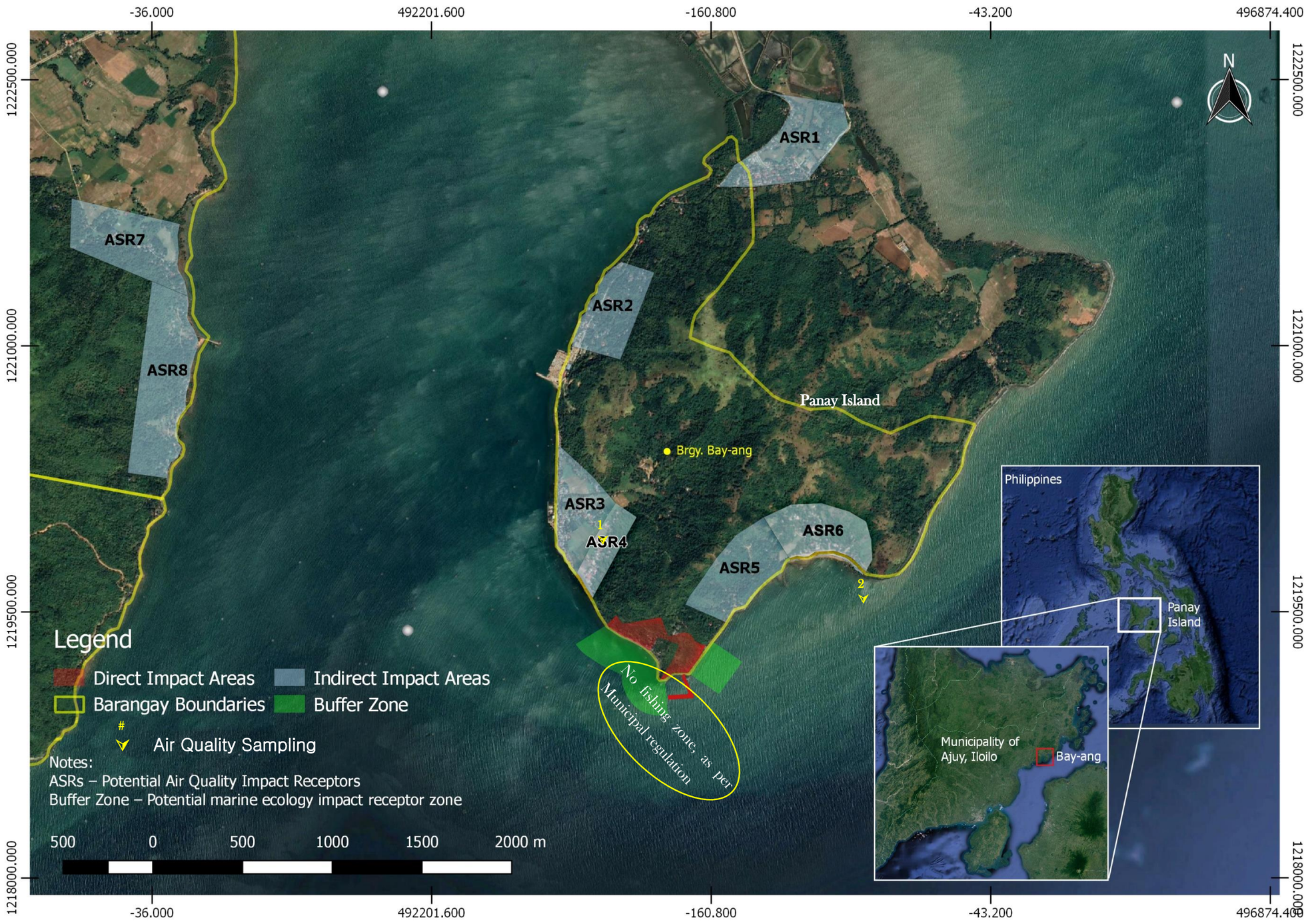


Plate 1. 2 Visualization of Proposed Port Development Works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-43.200
496874.400
1222500.000
1221000.000
1219500.000
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ASR1
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ASR3
ASR4
ASR5
ASR6
ASR7
ASR8
Panay Island
Brgy. Bay-ang
1
2
Philippines
Panay Island
Municipality of Ajuy, Iloilo
Bay-ang
No fishing zone, as per Municipal regulation
Legend
Direct Impact Areas
Indirect Impact Areas
Barangay Boundaries
Buffer Zone
Air Quality Sampling
Notes:
ASRs – Potential Air Quality Impact Receptors
Buffer Zone – Potential marine ecology impact receptor zone
500 0 500 1000 1500 2000 m

1.5 Project Rationale

The Philippines is currently importing massive volumes of cement to supply domestic demand, particularly to the Administration's Build-Build-Build program. This program seeks to develop the necessary support infrastructures to provide better transportation and economic support facilities to make the Philippines a competitive investment and tourist destination for employment generation and sustainable economic growth.

Data from the Department of Trade and Industry (DTI) shows that imports of cement rose by 64% year-on-year to 1.74Mt in the first quarter of 2019 despite the introduction of a 4% tariff in January 2019. Imports were 1.06Mt in the same period in 2018, according to the Philippines News Agency. As of 2016, even without the implementation of the Philippines' Build-Build-Build program, the country imported 6.8 million metric tons (Mmt) cement, and the volume grew to 8.6 Mmt in 2017. Since 2013, the Philippine cement industry has been lagging the supply of domestic cement requirements. Recent market studies suggest that the total cement requirement of the construction industry will increase to more than 50,000,000 MTA by 2027.

In a more local aspect, the municipality of Ajuy has expressed its desire for economic vitality. Its population is currently mostly rural as 32 of the 34 barangays comprise the rural area of Ajuy. However, by instituting an industrial zone, the municipality will eventually lead to significant regional development.

To tackle these concerns, this project intends to increase domestic cement production capacity which will increase Philippine government tax collection potential, reduce dependency on imported cement supply, and reduce demand for foreign exchange. At the same time, it shall be the mainspring of the industrial zone of the municipality of Ajuy. It is expected to accumulate and increase employment and stimulate balanced economic growth in the area as the Project brings more investments and consequently more commercial establishments.

1.6 Project Alternatives

1.6.1 Site Selection and Factory Land Use

The site is selected based on the following: (1) availability of a sufficiently deep harbor for port operations with fair access to international sea lanes; (2) distance from populated centers and the presence of hilly landform that shields adjacent populations from potential particulate emissions from the Plant: and (3) the assurance provided by the Local Chief Executive (LCE) of Ajuy that maximum possible support will be provided within the legal powers of a Municipal LCE, to be able to generate and attract economic activities, employment in, and tax revenues for Ajuy. The area has also been investigated to have sufficient soil bearing capacity and suitable geology for the nature of the project. The area's susceptibility to rain-induced landslides is easily mitigated through land regrading and slope stabilization, while the area's susceptibility to storm surge (historical maximum 4.5 masl) is easily mitigated through land development.

The Plant minimum platform design elevation is 10masl to address threats brought by the possible increase of storm surge heights due to climate change. An alternative site identified in Barotac Viejo was not selected due to the corals that underlie the proposed port location.

1.6.2 Resources

Local material resources will not be exploited for project operation. The use of limestone from permitted resources in Albay eliminates the need to open new quarries in Iloilo.

The Plant design will include rainwater harvesting from the entire land area through appropriate roofing and downspout design, a rainfall collection cistern, and a process water recycling system, to address the difficult water situation in Bay-ang. The architectural design will include good use of natural ventilation at the offices and non-dusty operations and maximizing the use of natural lighting to reduce electricity requirement.

1.6.3 Technology Selection

Imported clinker will be used in the cement grinding process. Clinker importation is opted due to unstable energy supply in Ajuy, the protracted process of securing a Mineral Production Sharing Agreement for domestic supply of raw materials for clinker production, and the perceived stringent air quality standards which the cement plant must maintain.

The use of retaining walls to stabilize the first level of slope bench and slope revegetation for higher benches is an inexpensive slope stabilization method while maximizing groundwater percolation potential. The size of the stockpile area and the provision of sediment sumps around the Plant help collect and recover production materials, which otherwise would be lost to the sea. Cemphil Inc. opts to facilitate environmental compliance and smoother project operations through the use of process water filtration for industrial re-use and bag filters for particulate pollution control.

The air pollution control installation of choice are bag houses and bag filters due to its ability to capture fine particulate matter with high degree of efficiency and thus clean the emissions from industrial operations. Fabric filter in industrial air pollution control systems, are able clean itself of the collected contaminants to maintain an efficient system even under high temperature. It requires less electrical energy as compared to other dust collection devices. Experience and practices in the cement industry in the Philippines show that dust control systems applied in finish grinding mills are bag filters.

1.6.4 "No Project" Option

A "No Project" scenario will generate the following negative outcomes:

1. Cemphil Inc. will suffer significant loss from the investment made in land acquisition & project preparation.
2. the local government will lose the opportunity to generate jobs.
3. Major setback in infrastructure development projects due to cement undersupply.
4. Decrease in foreign exchange reserves as it may be accessed to back cement imports; and
5. Potential property/infrastructure damage or even loss of life due to the use of uncertified, low-grade imported cement, which will, therefore, cause a disturbance in economic activity.

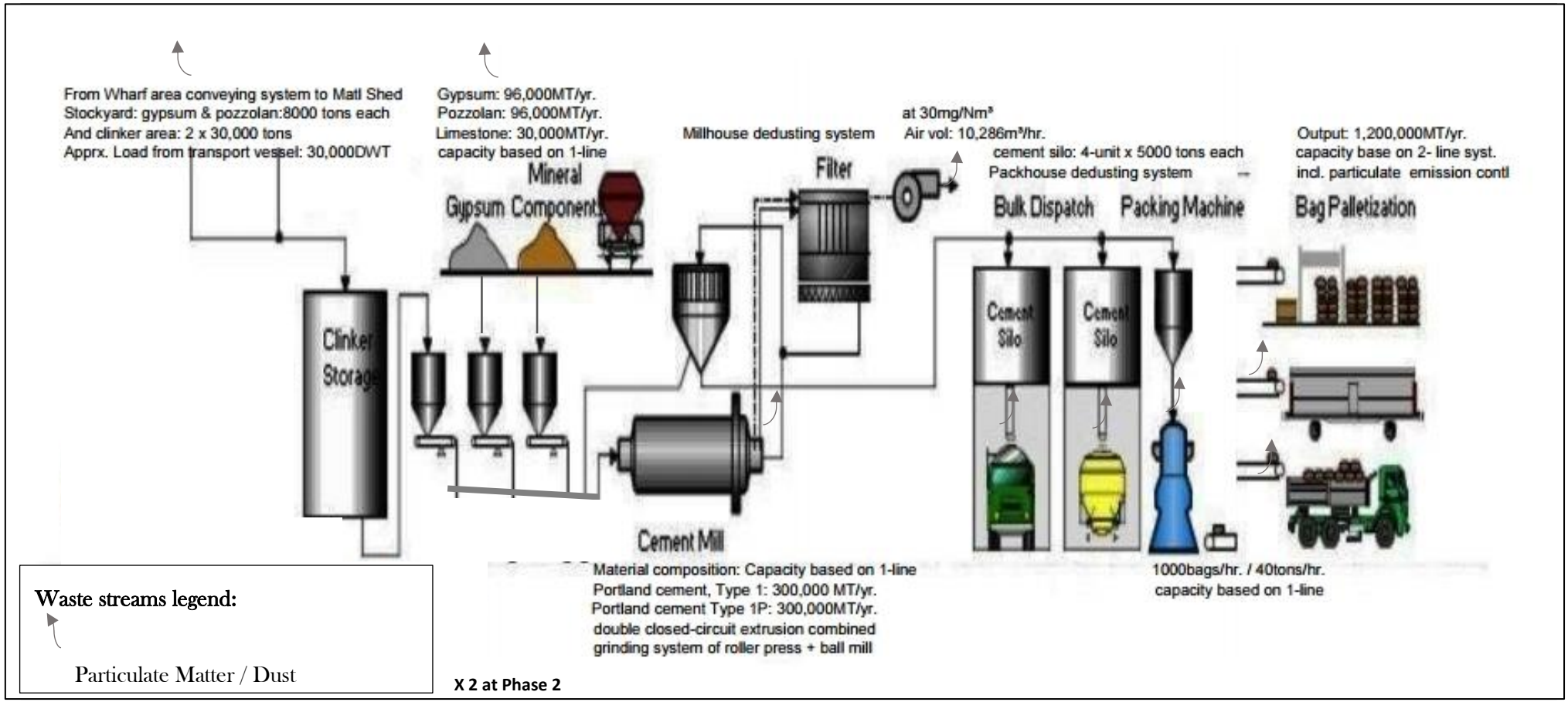


Figure 1. 6 Production Process Flow

1.7 Process / Technology

The cement manufacturing process uses dry method. Figure 1. 6 **Production Process Flow** shows the general cement grinding process that will be used by Cemphil.

1.7.1 Transport from Wharf to Plant

The raw materials for cement manufacturing will be brought from cargo vessels to their respective sheds in the material stockyard section through a closed bucket belt conveyor system. The materials (clinker, limestone, gypsum, and tuff) will later be transported to Plant facilities according to proportion requirement, through a closed bucket belt conveyor system (No.8, Figure 1. 4).

1.7.2 Milling

The semi-processed ground particles of limestone and gypsum, generally between 3 to 25 mm diameter delivered to the Plant's stockpile area are sorted out, together with each material, by a weigh feeder in accordance with the designated product (Type 1 or Type 1P). The proportioned materials are loaded on the conveyor and subsequently transported to the mill house. The materials will pass through a high-pressure roller press and will then proceed to finish milling for thorough blending with the aid of pressurized circulating hot air.

1.7.3 Temperature control

Temperature control is required in the cement grinding process to manage the chemical reactions and to ensure desired cement quality is produced. A closed circulating oil system will be used in this process.

A series of cyclones with bag filter dust collectors will be installed in the milling plant. A cyclone underflow will be fed back to the mill for finish grinding.

1.7.4 Cement Packing

Cement from the finish grinding mill will be stored in the silo, to be withdrawn through bucket elevators aided by air slides. Cement is then routed to the packhouse and distributed to different packing bins, i.e., for 40 kg. bags, 1-ton bags or bulk directly to cement mixer trucks. Bagging of 40kg cement bags will be done by a semi-automatic packing machine.

Residue cement or spill over during bagging will be collected by a reclaimer screw conveyor on a telescopic conveyor which returns it to distributing bins via bucket elevator. All transfer points of cement from one machine to another especially in the packaging/ bagging section are equipped with dedusting system that release exhaust to bag filters. The collected cement dust in the bag filters will likewise be returned to the packaging bins.

1.7.5 Dispatch

The cement products will be dispatched through the access roads via the coastal road, the Pedada-Bay-ang road or the Cemphil Inc. jetty port.

1.8 Project Components

1.8.1 Wharf /Jetty Port

Table 1. 4 Jetty Port Components

Component	Specification
Rock causeway with cross-current culverts	6m x 51m (306m^2 footprint)
Access trestle	6m x 99m (594m^2)
Wharf deck	15m x 118m (2,025 m^2)
Piling system	600mm∅ & 700mm ∅tubular steel piles
Fendering system	Trelleborg Dual SCN800H F2.1
Mooring system	100 tons mooring bollards
Mooring dolphins	(4 units) 6m x 6m (total 36 m^2)
Reinforced Concrete catwalk to mooring dolphins (for maintenance)	2m x 80m (320 m^2)
Concrete type	Structural concrete 4,000 psi with synthetic microfiber, early strength concrete
Smallest vessel berthing capacity	10,000 DWT
Largest vessel berthing capacity	30,000 DWT
Design depth	- 12m MLLW
Deck elevation	+4.0 MLLW

1.8.2 Port Construction Materials

The port construction materials will mostly be concrete, as may be observed in 3D images and technical specifications in Annex AD. There will be no earth embankment. However, a 306 m2 rock causeway will transition the port for a length of 51 meters from the ground surface at shore, to the piles supporting the access trestle in nearshore area. The rock materials for the causeway will be sourced from permitted quarries of capable stone materials in Bay-ang. There are many private land at mid-land elevation in Bay-ang that are reported to be underlain with basalt material and the owners of these lands have approached the Proponent to supply rock and stone materials for the Project causeway and perimeter wall. The interested prospective suppliers were informed that the Project will source its natural construction materials from permitted sources, namely with quarry permit and Environmental Compliance Certificate (ECC) from EMB Region 6.

Dredging will not be necessary to change the bathymetry at the port area. The port is planned to be under a Design-Build contract with Marra Builders, Inc., Philippines, which has completed numerous major port projects, among them are the Iloilo Port expansion Project, Tacloban Port Expansion Project Phase 1, and the Davao Reclamation Paving Blocks Rehabilitation Project.

Table 1. *5* Material Handling Facilities

Item no.	Location	Description	Qty	Unit	Specification	Capacity (kw)	Total Capacity (kw)
1	Wharf area	Loading & Unloading gantry cranes	*5*	set	max wheel load: 200kN, Power: 100KW or 134 HP, 3ph, capacity: 1000ton/hr; belt width: 1400mm, chute extend length: 19.5m	100	*500*
2	Raw material shed	Belt conveyor 1 - wharf to TT1 material, 574ft L, Vert lift: 9m	175	m	Belt width: 42 in, Vertical lift: 30ft; belt capacity: 250TPH, Power: 12KW or 16 HP	12	12 (kw
3	Raw material shed	Belt conveyor 1 - wharf to material shed, 482ft L, Vert lift: 19m	147	m	Belt width: 42 in, Vertical lift: 62ft; belt capacity: 250TPH, Power: 18KW or 24 HP	18	18
4	Raw material shed	stacker-reclaimer at Clinker stockpile	2	set	capacity: stacker: 600TPH / Reclaimer: 450TPH, 7 bucket x0.22m^3, power: 80KW or 107 HP	80	160
5	Raw material shed	stacker-reclaimer at Gypsum stockpile	1	set	capacity: stacker: 600TPH / Reclaimer: 450TPH, 7 bucket x0.22m^3, power: 80KW or 107 HP	80	80
6	Raw material shed	stacker-reclaimer at Pozzolan stockpile	1	set	capacity: stacker: 600TPH / Reclaimer: 450TPH, 7 bucket x0.22m^3, power: 80KW or 107 HP	80	80
7	Raw material shed	Belt conveyor for gypsum and pozzolana - out, 413 ft L	126	m	Belt width: 42 in, Vertical lift: 30ft; belt capacity: 250TPH, Power: 12KW or 16 HP	12	12
8	Raw material shed	Belt conveyor for clinker out, 209 ft L	64	m	Belt width: 42 in, Vertical lift: 30ft; belt capacity: 250TPH, Power: 10KW or 13 HP	10	10
9	Raw material shed	Conveyor & Gallery for outgoing raw material, 916 ft L	276	m	Belt width: 42 in, Vertical lift: 30ft; belt capacity: 250TPH, Power: 24KW or 32 HP	24	24

1.8.3 Cement Grinding and Packing Facilities

Table 1. 6 Cement Grinding and Packing Facilities

Item no.	Location	Description	Qty	Unit	Specification	Capacity	Total Capacity	Unit
11	Grinding mill house	Roller press	2	set	Model: HFCG160-140, Roller Ø: 1600mm, Roller width: 1400mm, Motor rating: 2 x 1120KW or 2 x 1,500 HP, material feed size: less than 70mm, output: 680TPH	1150	2,240	kw
12	Grinding mill house	High Efficiency separator	2	set	Model HFX-3500, air vol: 210,000 m^3/hr; capacity: 140 TPH Motor capacity: 132KW or 177 HP; rotating speed: 100 rpm	132	132	kw
13	Grinding mill house	ball mill with high efficiency filter	2	set	Type Ø3.2x13m, output of fine: 32TPH; motor capacity: 1600KW or 2,145 HP	1,600	1,600	kw
14	Grinding mill house	Accessory parts and pollution control components (bag filters etc)	2	set	Accessory parts and components include grinding media, spare parts, dust control at grinding mill house	100	100	kw
15	Packing house	air slide conveyor, Screw conveyor, air compressor, vibrio motors at loading bins & controls, pollution control devices	4	set	Ducting, magnetic vibrators, sensors, limits switches & load cells	10	20	kw
16	Packing house	roto packer, bag making system	2	set	Three (3) mouth, capacity: 45 ton/hr., 40km/bag, power: 18.7KW or 25 HP, 220V /380V	19	37	kw
17	Packing house	cement bag machine	2	set	Capacity: 20 to 200 pcs/min, power: 9 KW or 12 HP, Weight: 6.5ton	9	9	kw

Item no.	Location	Description	Qty	Unit	Specification	Capacity	Total Capacity	Unit
18	Grinding mill house	MCC and CRR, laboratory building of grinding system	1	set	Ducting, magnetic vibrators, portable fume & dust collector	10	10	kw
19	Grinding mill house	Control systems monitor system (camera-etc), laboratory equipment (heater / dust-fume control/ small scale grinding system. Mixing system, air compressor. Portable pumps, small roller & press system)	1	set	Ducting, magnetic vibrators, sensors, limits switches & load cells	10	10	kw
20	Compressor station	air compressor	1	set	Air capacity: 157 m^3/min, pressure: 58.8 Kpa; rotating speed: 1310 rpm; driving method: belt & coupling drive, power: 220KW, includes oil and grease separators.	220	220	kw
22	Machine shop	lathe machine	3	set	Horizontal lathe machine. Dimension (L*W*H): 2420x1150x1700mm.	4	12	kw
23	Machine shop	punching and shearing machine	2	set	Cutting punching and bending of flat, angle, round bar, dim: 1830mm810mmx1785	6	11	kw
24	Machine shop	welding machine (MiG/tig/ord/ gas system)	5	set	Heavy duty welding machine	18	90	kw

1.8.4 Raw Material Storage Facilities

Table 1. 7 Raw Material Storage Facilities

Material Handling	Planned Specification
Stockyard	1,920 m^2 per material gypsum & pozzolanic ash= 80 meters length x 24m wide, at 8000 tons capacity each.
Clinker Shed	42,403 m^3 capacity 2-unit, 80mL x 36mW x 8mH or 2 x 30000 tons
Material storage silo	Includes one set air slide conveyor, 15 tons capacity. Screw conveyor, air compressor, Vibrio motors at loading bins & controls, ducting, magnetic vibrators, sensors, limits switches & load cells with a 15-kw power rating.
Cement Silo	**Phase 1:** 2 sets, 15m dia. x 22.5mH of Lipov steel sheet, concrete bottom, and structure, 5000 tons each. **Phase 2:** Additional 2 sets, 15m dia. x 22.5mH of Lipov steel sheet, concrete bottom, and structure, 5000 tons each. Total: 4 sets, 15m dia. x 22.5mH of Lipov steel sheet, concrete bottom, and structure, 5000 tons each.

1.8.5 Pollution Control Facilities – Support Facilities

Table 1. 8 List of Pollution Sources and Control Installations

Pollutant: Ambient Particulates. Control Method : Particulate filtration using air bag filters	
	Specification
Wharf unloading	Enclosed Bucket conveyor with 5 bag filters (46000 m3/hr capacity), ≤ 50 mg/m^3 design emission rate. Transport vessel has covered cargo hull.
Wharf transport point	1 bag filter (12000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate.
Shed transport point	1 bag filter (12000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate.
Clinker Shed Transport Point	1 bag filter (12000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate.
Clinker shed Trench Discharge Point	1 bag filter (46000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate.
Batching Station Transport Point	1 bag filter (12000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate.
Roof of Clinker Storehouse	1 bag filter (12000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate.
Material crushing & Grinding / Roller Press System	Dust collection devices – 1 bag filter (24000 m^3/hr capacity), ≤ 50 mg/m^3 design emission rate; 2,145 HP; portable fume & dust collector
Cement packing area	Dust collector fans with bag filters; Mist fans; dust-fume control/ 2 units Portable pumps 760m^3/min. Enclosed area.

Pollutant: Ambient Particulates. Control Method : Particulate filtration using air bag filters	
Pollutant: Industrial – level Noise. Control Method : Noise Enclosure	
Crushing, grinding, roller mill, machine shop	Processes will be enclosed in building for noise dispersion control
Pollutant: High level of Sediment Load in Surface Run-Off. Control Method: Settling Ponds, Cut–Off Channels	
Stockpile area Pier area Access trestle /causeway Lot 20-Lot 23 conveyor bridge area Grinding, milling area, Packing area	7 units settling ponds and drainage ditches with total holding capacity of 8,085 m^3 (see Table 1.8)
Pollutant: Sediment Run-Off. Control Method : Slope Stabilization, Slope Terracing, Slope Benching, Slope Revegetation	
Slope benches, unutilized land	Tree planting on 20,213 m^2 within Factory (see Figure 1. 4).
Pollutant: Sewage. Control Method : Treatment by septic tanks complying with the Revised Philippine Plumbing Code and Sanitation Code of the Philippines	
In each building	125 service individuals, total capacity of 20 m^3 required.
Pollutant: Potentially excessive Oil and Grease in Surface Run-Off. Control Method: Oil and Water Separator	
Strategic locations in Plant	Seven (7) OWS within Factory, plus one at truck waiting area.
Pollutant: Potential Silt Plume reaching Corals from Port Construction. Control Method: Silt Boom	
Pollutant: Potential Oil Spills from Ships. Control Method: Oil Boom	
Pier area	Sections of 20meter length, 1-meter wide polyethylene filters joined to form a continuous barrier with lace-up eyelets. Float dia. of 150mm, ballast chain of 8mm, fabric with 200-micron pore size, effectively trapping particles greater than 50 microns.
Threat to Restoring Coral Communities: Reckless Anchorage. Control Method : Use of Anchor Blocks	
Pier area	Four (4) large anchor blocks to avoid undue seabed disturbance. Local divers will be employed to dive to guide latching of carefully lowered ship anchor to the anchor blocks. No careless throwing of anchor overboard.

Telecommunications

The available telecommunications service in the area are provided by Globe and Smart telecommunications companies. However, the cellular signal is weak and the Project may establish signal booster units to improve its telecommunications.

Safety, Health and Emergency Provisions

Plant safety devices will be compliant with the requirements of the Occupational Health and Safety Standards of the Department of Labor and Employment.

A cement manufacturing plant is considered a hazardous workplace, according to Section 1039 of Rule 1010 of the Occupational Health and Safety Standards (OHSS), DOLE 2017. As such, workers will be provided with PPE under Rule 1080, particularly industrial particulate masks to meet the standard under Rule 1070. Plant safety devices will include the following:

a. Adequate lighting and air circulation systems
b. Machinery guards, protection railings and guards in maintenance ladders and elevated structures,
c. Pedestrian lane and truck lane markings
d. Fire alarms, fire control facilities, fire exits
e. Organization of a fire and rescue brigade who will have annual training /refresher courses
f. Safety advisory boards,
g. Health and medical clinic
h. Personnel, periodic safety trainings and drills for fire, earthquakes, extreme typhoons, and tsunami
i. Provision of Personnel Protection Equipment (PPE) following DOLE guidelines.

The details of the Safety, Health Protection, and Emergency Preparedness and Response are included in Chapter 4 – Environmental Risk Assessment.

Accommodations

Temporary accommodations for non-resident construction crew will be constructed in Phase 1, Stage 1 area. Domestic and sanitary waste management facilities complying with the Sanitation Code of the Philippines as amended will be part of the construction contract. The actual size and capacity of the workers' barracks are not known as of writing. Acceptance of employment applications awaits favorable ECC application review.

In about six months from the expected start of the operation, a staff house for thirty non-resident professional and technical project personnel will be constructed outside of the Plant site. The maximum land area for the staff house will be less than 1,000 m^2. The construction design and sanitary facilities will comply with the Philippine Building Code and the Sanitation Code of the Philippines. All requisite permits such as the Building Permit, Sanitary Permit, among others, will be secured prior to construction.

Parking Area for Delivery Trucks and Cement Mixers Trucks

A 1,000m^2 to 2000 m^2 parking or waiting area for cement vehicles will be purchased by Cemphil Inc. shortly before project operation. This will avoid the use of public road lanes for parking by cement transport vehicles.

1.8.6 Description of Pollution Control Facilities

Dust Control Facilities

The project will use variants of centrifugal dust collectors with non-woven filters. Each dust-emitting handling and process equipment, such as the hoist/gantry-based material transport system, bucket conveyors, clinker storage, portioning equipment, crushing and grinding systems, silos, and cement packing, will have a respective dust collector installation (see inset) of various configurations. In a cyclone dust collector, dust is sucked into the collection inlet where the gas stream enters at an angle and is spun rapidly. Cyclonic action separates dust particles from the gas stream and the centrifugal force created by the circular flow throws the dust particles toward the wall of the cyclone. After striking the wall, these particles fall into a hopper, container, or a lined dust bag located below the intake point. Exhaust airstream will be coursed through non-woven bag filters before being vented to the atmosphere. This method will recover valuable powder from exhaust streams. Dust will be regularly collected using a portable dust collector (see **Plate 1.3**). Large collection points such as the clinker shed, millhouse, cement silos, and pack-house will collect dust in hoppers which unload directly to a pipe connecting to the production process bins.

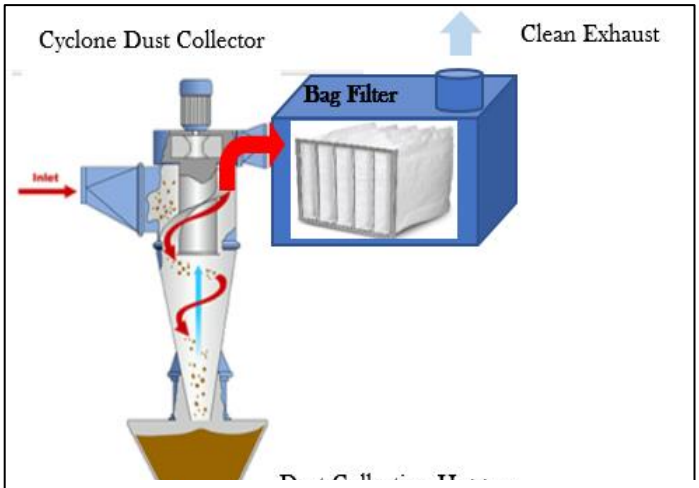
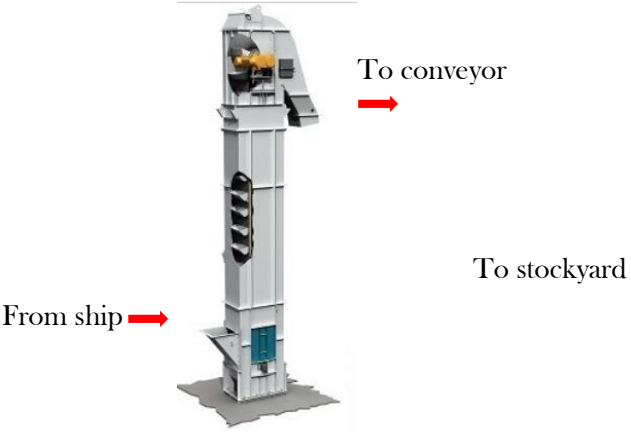


Figure 1. 7 Schematic Diagram of Dust Control Method

Plate 1. 3 Small Portable Dust Collector Unit



Enclosed bucket elevator at port connects to

Noise Control

Noise disturbance to surrounding residents from the Cemphil cement plant is a significant problem due to the shielding provided by the hilly landform between the Plant and the community pockets in Bay-ang. Nonetheless, noisy processes will be enclosed in noise control buildings to control noise dispersion.

Silt Control Structures comprising of the **drainage trenches and settling ponds** are part of the Project conceptual design. The total holding capacity of drainage trenches and settling ponds and will

be 8,085 m3, shown in Table 1. 9. These are intended to detain silt from run-off falling within the Cemphil factory area. The settling ponds will be distributed to low-lying areas in the Plant premises. Figure 3-11 shows the settling ponds locations.

Table 1. 9 Location of Silt Control Structures of Cemphil Cement Grinding Plant

No.	Description	Capacity (m^3)
At Mill Area		
1	Settling Pond near Main Gate	1500
2	Settling Pond at base of benched slopes near Admin office	300
3	Drainage Trench -Near Packhouse	630
4	Settling Pond Near Cement Silos	500
5	Drainage Trench -Near MCR and CCR of Grinding System	405
6	Drainage Trench -Near Machine Shop	300
7	Settling Pond at back of Grinding House	1000
8	Settling Pond at inner junction of Conveyor belt and Mill House	150
9	Settling Pond near foot of benched slope midway of link conveyor	1000
At Stockyard		
10	Settling Pond at NE edge of Lot 20	1000
11	Drainage Trench / Ditch at Stockyard	150
12	Settling Pond near junction of port conveyor and stockyard	1000
At Jetty Port		
13	Settling Pond at base of rock causeway	150
Grand Total		8,085

Loose sediments from the settling ponds will be collected weekly and when these are sufficiently dewatered for easy hauling. The collected sediments will be sub-dried and returned to the stockpile. There will be no provision for water overflow to the public domain. Some settling ponds may have an earthen bottom to allow underground percolation of surplus storm drainage water. The drainage trench will be graded to guide overflow to the settling ponds. Settling Pond No. 1 will have a third chamber designed to receive a large volume of clarified overflow water, with silt settled in its two initial chambers. The third chamber of Settling Pond No. 1 will have pipe connecting to a prepared area outside the Plant where the public, including waiting haul trucks and lorries, may access water for cleaning (TSS 100 mg/L or less).

Drainage trench/canal/cistern system. Run-off from plant ground surfaces will be collected in a drainage trench. The top opening of the drainage trench canal will vary from, 500 mm to 1000mm depending on the ground condition and available space. Figure 1. 10 shows the sedimentation trench/canal plan and shows a section of how a roof drain spout connects to the sedimentation trench which will also serve as a rainfall collection cistern (Section A). The drainage sedimentation trench/cum cistern will have silt barriers in some locations (Section B) to decelerate storm drainage flow and enable certain portions of sediment load to drop and be detained by the sediment barriers.

Clearer water may then overflow and finally end up at the settling ponds or a portion of the drainage channel (Section C) that will serve as a cistern for clarified for cooling process water. The process water will then go through a filtration pump, to meet quality requirements. Overall, the containment capacity of the clean water chamber of the cistern will be 8085 m^3.

Oil and Water Separator (OWS). Since heavy machinery requires regular greasing, some heavy equipment and haul trucks will inevitably spill some minor oil and grease on plant flooring which may end-up in the sea transported by surface run-off if the Plant has no OWS. Eight (8) units of oil and water separator tanks will be built, seven within the plant and one off-site, at the truck parking area. The OWS within the Plant are as follows:

Table 1. 10 Location of Oil & Water Separators of Cemphil Cement Grinding Plant

No.	Location	Service Area	Remarks
1	At the Packhouse	Packhouse	Embedded, built into deck design. Supported by the perimeter/ring canal around the service area
2	At the motor pool	Motor Pool	Embedded, built into deck design. Supported by the perimeter/ring canal around the service area
3	At the Mill House	Mill House	Embedded, built into deck design. Supported by the perimeter/ring canal around the service area
4	Beside the settling pond at the inner junction of Conveyor belt and Mill House	Link Conveyor Bridge	Embedded, built into deck design. Supported by the perimeter/ring canal around the service area. Outfall may empty into a settling pond
5	At stockyard	Stockyard	Embedded, built into deck design. Supported by the perimeter/ring canal around the service area. Outfall may empty into a settling pond
6	At base of access trestle to pier		Embedded on earth, supported by canal lines from access trestle
7	Within Pier	Pier Deck	Embedded in pier deck, built into deck design. The first chamber will be larger, also to accommodate spilled sediments from material transport at this point. Supported by the perimeter/ring canal around the service area. Outfall may drain to sea, Class SB standard (DAO 2016-08).
8	Off-site	Cemphil Haul truck parking area	Designed to receive high sediment load from the unpaved parking lot. Ring canal around the parking lot (1m W x 1m D) will have a 20-30cm diameter stone in heaps of .25 cubic meter every 20 meters (interval) to decelerate storm drainage flow, hopefully, to prevent surface overflow toward the sea. Depending on lot location, it may not need an OWS as the earthen ring canal may facilitate ground infiltration and thus, oil filtration. This will depend on the result of project monitoring.

Figure 1. 8 shows the details of the OWS units. The OWS design shall be capable of delivering effluent quality Class SB (DAO 2016-08) at the jetty and pier. It will be mechanical in nature and will depend on the natural separation of oil and water molecules. The OWS can effectively do its job when input water is slow flowing. Thus, the canals leading to the OWS should be corrugated and may be enclosed to control the free release of Volatile Organic Compounds from petroleum derivatives. OWS maintenance shall be once monthly, through hydraulic withdrawal through the maintenance portal. The top cover is removable for heavy desludging.

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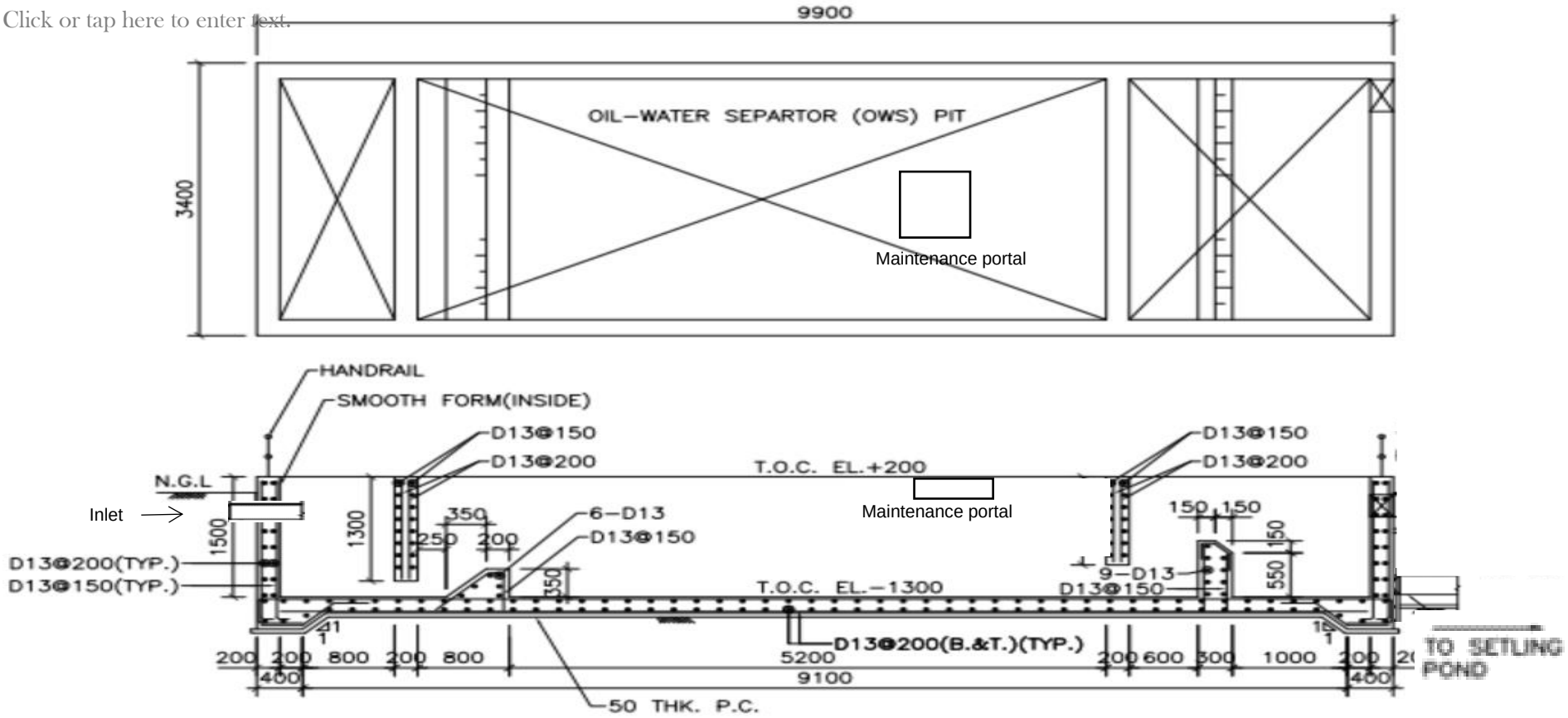


Figure 1. 8 Oil and Water Separator Details

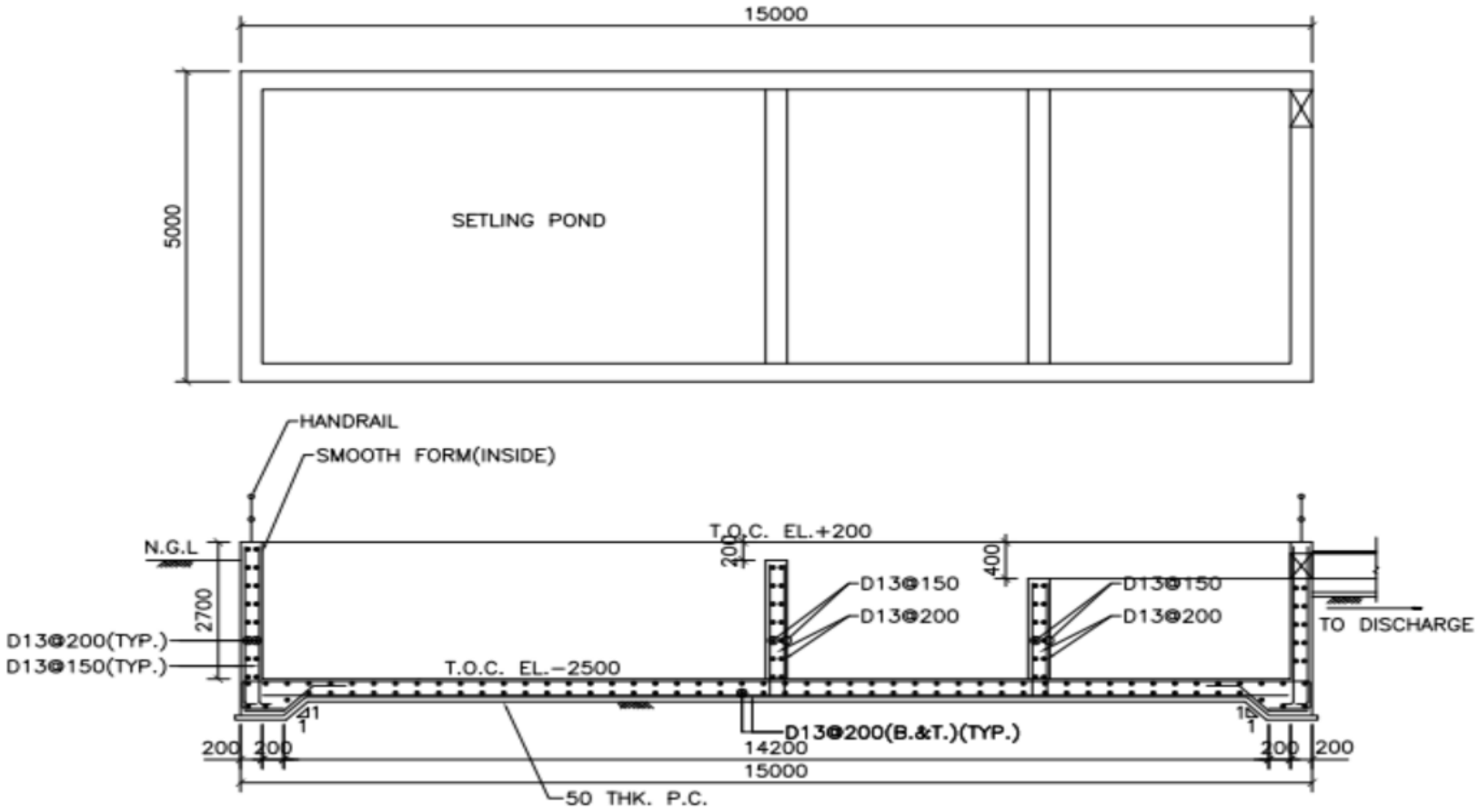
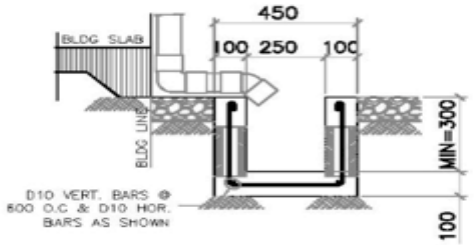
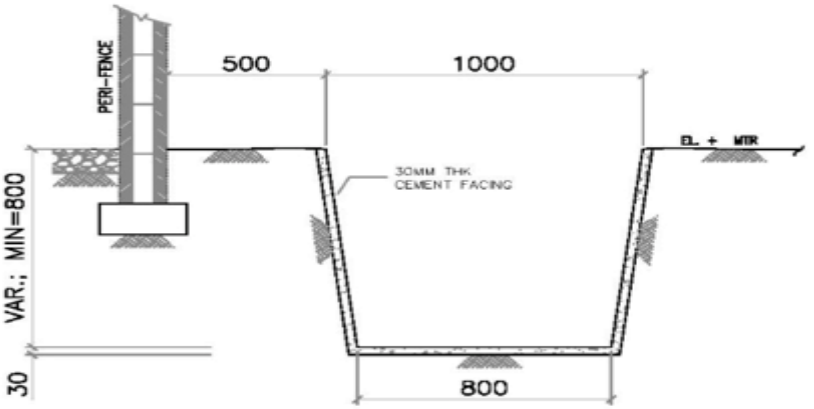


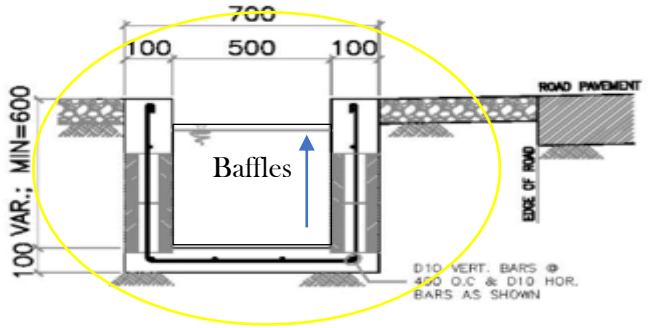
Figure 1. 9 Settling Pond Details



Section A – Rain drainage spout connection to sedimentation trench cum rain collection cistern



Section C larger chamber for clear water accumulation



Section B showing silt barrier

Figure 1. 10 Drainage Trench Canal System

1.8.6.1 *Water Requirement and Source*

During the construction phase, an average of 20m^3 water will be utilized daily for personal, dust suppression, and cleaning purposes (25 liters per person x 200 pax + miscellaneous cleaning). Of this, about two (2) m^3 will be recovered as gray water for dust suppression, 16m^3 will be lost to evaporation due to the nature of use, and about two (2) m^3 will go to the septic tank to be provided at the workers' barracks (See Table 1. 11). Water will be supplied through water delivery tankers and stored in a 150m^3 overhead water tank to be constructed during this phase. A larger capacity storage tank will enable more efficient water delivery, requiring a lesser number of delivery trips per week.

Table 1. 11 Water Requirement and Wastewater Disposal

Item No.	Description	Usage per person per day (liter)	Qty per day (m^3)	Wastewater Generated Daily		
				To Recycling Pond	Evaporation Loss	To Septic Tank
1	Construction phase					
	200 persons (personal consumption, shower, washing, etc.)	25	5	2	1	2
	Construction usage (dust suppression, washing, etc.)		15		15	
2	Operations phase					
	100 persons (personal consumption, shower, washing, etc.)	25	10		.5	0.25
	Operation usage (general cleaning, irrigation, dust suppression, storage, etc.)		120	100.4	19.1	

Table 1. 12 Proposed Water Sources

Item No.	Available Source	Qty.
1	Deep well, for personnel use (potable source) 1- location within the plant site	2.78 liters per second well production capacity. Project drawdown on maximum will be 120 meters per day. Maximum domestic use is 10m^3, and 50m^3 will top-up process water supply during extremely dry seasons.
2	Harvested rainwater, after sediment settlement and clarified.	8,085m^3 capacity cistern/drainage channel ending up in filtration unit, to supply dry season requirement.

Cement grinding is a dry industrial process. Water requirement is limited to dust control through overhead misting at the crusher and primary grinding area, for cleaning and domestic purposes.

On the average, the Cemphil cement grinding plant will require about 86 m^3 for dust suppression (30m^3 daily), domestic use (3m^3), general cleaning (17m^3 daily), and landscape irrigation (17m^3 daily. A deep well with a **2.78 liters per second** (240 m^3 per day) dry season production capacity will be a supplementary source of water supply. Rainwater harvesting will become the primary source of water supply as the sediment and oil control for marine ecosystem protection will require sufficient residence time of a major percentage of storm run-off. Groundwater extraction is estimated to average 50 m^3 daily during dry seasons, none during rainy seasons when collected rainwater exceeds the daily requirement or 120 m^3 daily under extreme dry season conditions. Table 1. 13 shows an estimate of dry-season water balance while Table 1.13 is an estimate of annual average water balance. Surplus stormwater will be percolated underground through the settling pond base.

Rain harvesting. All project roof systems will collect and drive water to a cistern for rainwater harvesting. The surface run-off will also be collected through the drainage trench which will serve as a settling pond and a cistern for rain harvesting. The Plant deep well will be operated only with **Permit from the NWRB.**

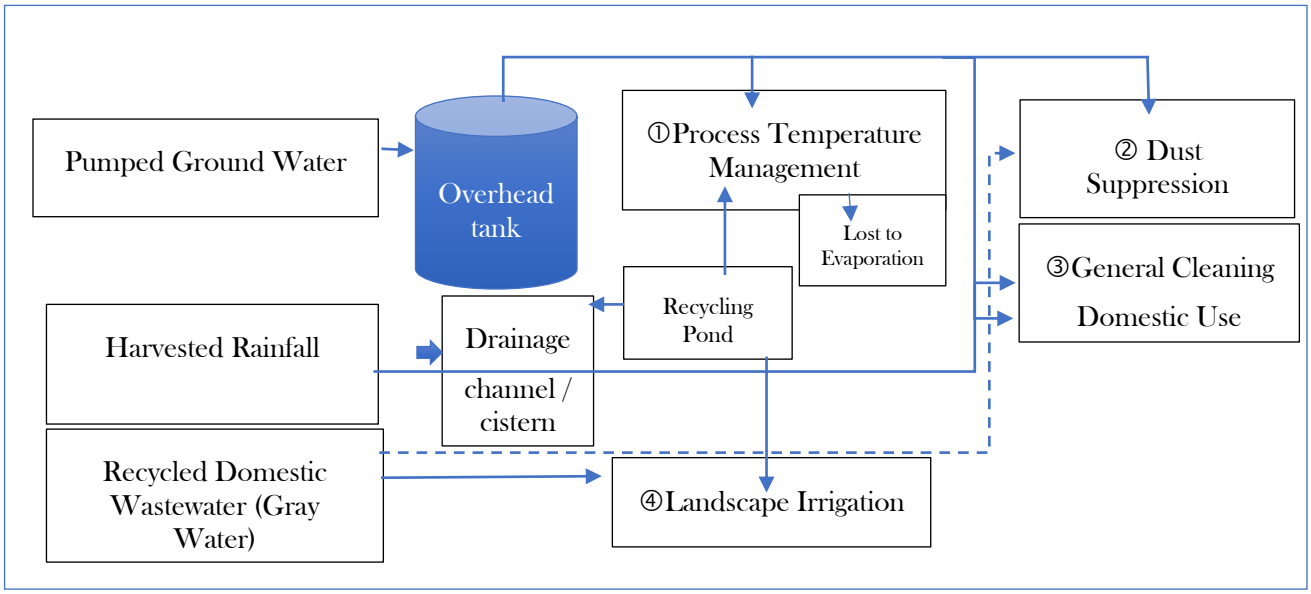


Figure 1. 11 Water Process Flow Diagram

Table 1. 13 Dry Season Daily Water Balance (worst case)

Supply (m^3)		Demand (m^3)	
Pumped Ground Water	50	Dust Suppression – Stockyard Area	15
Harvested Rainfall	17	Dust Suppression - Process Area	15
Recycled Wastewater	53	Domestic Use	3
		General Cleaning	17
		Landscape Irrigation	17.6
		Lost to Evaporation	19.1
		Storage in the Pipeline	6.3
Total	93	Total	93

Table 1. 14 Average Daily Water Balance

Supply (m^3)		Demand (m^3)	
Pumped Ground Water	11	Dust Suppression – Stockyard Area	15
Stored Harvested Rainfall	1682	Dust Suppression - Process Area	15
Recycled Wastewater	26	Domestic Use	3
		General Cleaning	17
		Landscape Irrigation	17.6
		Lost to Evaporation	19.1
		Harvested Rainfall Stored in Cistern	1632.3
Total	**1,719**	**Total**	**1,719**
		Water Balance	**0**

Table 1. 13 assumes dry season conditions with minimal rainfall stored in the system.

Table 1. 14 takes a reference to Table 2.2.3 Year-Round Water Balance. The computation in

Table 1. 14 assumes rainy season rainfall harvest is accumulated and stored.

1.8.6.2 *Energy Requirement and Sources*

The major equipment in the cement grinding process are electricity-driven. On average, 1.78 kilowatt-hours power is consumed to process/mill one metric ton cement, or 6.610 MW-hours per day for a maximum of 3,696 mt cement. The total energy requirement of equipment to be established under Phase 1 is shown in Error! Reference source not found. below. Additional equipment will be installed in Phase 2 to produce 3,750 metric tons cement daily.

Table 1. 15 Power Requirement

Item No.	Location	Description	Qty	Unit	Capacity	Total Capacity (kw)
1	Wharf area	Loading & Unloading gantry cranes	5	set	100	500
2	Raw material shed	Belt conveyor 1 - wharf to TT1 material, 574ft L, Vert lift: 9m	175	M	12	12
3	Raw material shed	Belt conveyor 1 - wharf to material shed, 482ft L, Vert lift: 19m	147	M	18	18
4	Raw material shed	stacker-reclaimer at Clinker stockpile	2	Set	80	160
5	Raw material shed	stacker-reclaimer at Gypsum stockpile	1	Set	80	80
6	Raw material shed	stacker-reclaimer at Pozzolana stockpile	1	Set	80	80
7	Raw material shed	Belt conveyor for gypsum and pozzolana - out, 413 ft L	126	M	12	12
8	Raw material shed	Belt conveyor for clinker out, 209 ft L	64	M	10	10
9	Raw material shed	Conveyor & Gallery for outgoing raw material, 916 ft L	276	M	24	24
10	Material storage silo	air slide conveyor, Screw conveyor, air compressor, vibro motors at loading bins & controls	1	Set	15	15
11	Grinding mill house	Roller press	1	Set	2,240	2,240
12	Grinding mill house	High Efficiency separator	1	Set	132	132
13	Grinding mill house	ball mill with high efficiency filter	1	Set	1,600	1,600
14	Grinding mill house	Accessory parts and pollution control components (bag filters etc.)	1	Set	100	100
15	Packing house	air slide conveyor, Screw conveyor, air compressor, Vibrio motors at loading bins & controls, pollution control devices	2	Set	10	20
16	Packing house	roto packer, bag making system	2	Set	19	37
17	Packing house	cement bag machine	1	Set	9	9
18	Grinding mill house	MCC and CRR, laboratory building of grinding system	1	Set	10	10
19	Grinding mill house	Control systems monitor system (camera-etc.), laboratory equipment (heater/ dust-fume control/ small scale grinding system. Mixing system, air compressor. Portable pumps, small roller & press system)	1	Set	10	10
20	Compressor station	air compressor	1	Set	220	220
21	Machine shop	lathe machine	3	Set	4	12
22	Machine shop	punching and shearing machine	2	Set	6	11
23	Machine shop	welding machine (MiG/ tig/ ord/ gas system)	5	Set	18	90

Item No.	Location	Description	Qty	Unit	Capacity	Total Capacity (kw)
24	Machine shop	Overhead & gantry cranes	2	set	3	6
Sub-Total- Power requirement						5,408 kwh
Other power requirement, in house consumption						752 kwh
Project Total Power requirement per day						6,610 kw
Say						6.610 MW
Note: Cement grinding capacity in Tons: 154 T/H						

The Administration Building and all buildings in the Plant complex will be designed to maximize the use of sunlight and assist natural air circulation to minimize power requirements. The power supply is proposed to be sourced partly from a battery of in-house generators and from the Sara Substation of the Iloilo Electric Cooperative III.

Table 1. 16 Proposed Power Sources

	Description	Qty	Unit	Capacity	Total Capacity (kw)
First Option	In-house, power generator: 540KVA diesel engine generator.	12	sets	540	6,480
Second Option	Arrangement with ILECO III for tapping an additional power supply aside from existing SARA Supply Station with a capacity of 10MW.	1	set	6,500	6,500
				Total	**12,980**

1.8.6.3 *Fuel Requirements*

Table 1. 17 Estimated Annual Fuel Requirements

Item No.	Description	No. of Units	Consumption (L/day/unit)	Consumption (L/day)	Consumption (L/month)	Consumption (L/year)
Construction Phase only (for 1-1/2-year period)						
1	Excavator	4	100	400	10,000	124,800
2	Pay loader	2	50	100	2600	31,200
3	Generator	2	150	300	7800	93,600
4	Dump truck	5	100	500	13000	156,000
5	Roller compactor	2	20	40	1040	12,480
6	Bulldozer	1	20	20	520	6,240
7	Cranes	2	100	200	5200	62,400
8	Service vehicles	6	20	120	3120	37,440
					Sub-Total	524,160
Operation Phase (after commissioning period)						

Item No.	Description	No. of Units	Consumption (L/day/unit)	Consumption (L/day)	Consumption (L/month)	Consumption (L/year)
1	Payloaders	2	7	14	196	2,352
2	Forklifts	2	4	8	112	1,344
3	Sked loader	1	4	4	56	672
4	Generators (maintenance running only)	2	10	20	520	6,240
5	Hot air furnace	2				
					Sub-Total	10,608
Note:						
1	While no power supply is received from ILECO III, back up diesel engine electric Generator will provide all the power requirement	12	300	3,000	78000	936,000

1.8.6.4 *Fuel and Storage Facility*

The project will use industrial diesel fuel for the gensets. These will be purchased from local suppliers whose sources undergo Philippine Government permitting, which, among others, impose limits on sulfur content. The Plant will have a 30 m^3 capacity diesel fuel storage facility, meeting the standard prescribed by the Department of Energy of holding a 10-day fuel supply for full genset operation.

Diesel fuels are flammable, and handling and storage will also follow the guidelines under DAO 29 series of 1992, the Implementing Rules and Regulations of Republic Act 6969, "Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990". **Annex E** is Diesel Fuel Material Safety Data Sheet, for ready reference.

1.8.6.5 *Emission Inventory*

The emission factor database of the Intergovernmental Panel on Climate Change was employed to generate the Greenhouse Gas Emission potential of the Project (Table 1. 18). Table 1. 17 and assumptions in **Annex F** were used in GHG emission calculation.

Table 1. 18 Greenhouse Gas Emission Inventory

Diesel Use during Construction	Liters	Emission Factors (kg/TJ)			
		CO2	NOx	CH4	SOx
Heavy equipment	779040	74100	28.6	4.15	
Service vehicles	56160	74100	800	5	
Total	835200	148200	28.6	9.15	0
Diesel Use during Operation	**Liters**	**Emission Factors (kg/TJ)**			
		CO2	NOx	CH4	SOx
Service Vehicles	37,440	74100	800	5	0
Heavy equipment	4,368	74100	28.6	4.15	0
Background genset	6,240	74100	0.06	3	0.3
Back-up power generation (2hrs/day, 312 days/year	936,000	74100	0.06	3	0.3

Emissions During Construction Phase				Emissions (Mg)			
	Liters	BTU	Tera joules	CO2	NOx	CH4	SOx
Heavy equipment	779040	4.10406 E+11	433.00	32,085.40	346.40	2.17	-
Service vehicles	56160	2958564 9600	31.21	2,313.00	24.97	0.16	-
				34,398.40	371.37	2.32	9.53
Global Warming Potential (GWP) per gas, 100 yrs.				1	298	25	
GWP of Project emissions				**74,100.00**	**17.88**	**75.00**	
Total in Megagram (CO2 E)				**74,192.88**			

Emissions During Operation Phase				Emissions (Mg)			
	Liters	BTU	Tera joules	CO2	NOx	CH4	SOx
Service Vehicles	37,440	1.97E+10	21	1,542.00	16.65	0.10	-
Heavy equipment	4,368	2.3E+09	2	179.90	1.94	0.01	-
Background genset	6,240	3.29E+09	3	257.00	0.00	0.01	0.00
Back-up Genset	936,000	4.93E+11	520	38,549.93	0.03	1.56	10.68
Total				40,528.82	18.62	1.69	-
Annual GWP per gas				**40,528.82**	**5,549.18**	**42.18**	-
Total Annual GWP in Megagram				**46,120.18**			

1.8.6.6 *Waste Management*

Table 1. 19 Summary of Project Wastes and Management System

Project Waste	Nature	Volume	Waste Management System	Disposal Method	Maintenance
During Construction					
Construction waste – scrap wood, form lumber, cement bags, equipment packaging materials, surplus excavated soil	Solid, non-hazardous	Varying between two to three tons per week, >fifteen plus tons at construction completion phase Estimated surplus excavated soil volume is 5000 metric tons	Waste segregation	Shredding of degradable materials to add to compost heap, in cooperation with LGU for mobile shredder Haul out of plastic and styrophore wastes to municipal land fill Cut and haul to backfill separate Bay-ang Coastal Road project.	Weekly (every Saturday) clean-up and haul-out of residual waste
Used engine oil	Liquid, hazardous	100 liters per quarter	Collection and storage	Transport and disposal by EMB-accredited hazardous waste treater	Haul out schedule will depend on economic viability determined by accredited hazardous waste transporter and treater. Haul out frequency will be determined during project implementation.

Project Waste	Nature	Volume	Waste Management System	Disposal Method	Maintenance
Busted lightbulbs	Solid, hazardous	3 to 5 bulbs per week maximum	Collect and store for proper disposal	Bring to municipal or EMB hazardous waste disposal facility	Haul out frequency will be determined during project implementation.
Domestic waste from workers' barracks	Liquid, Hazardous	2 tons per week	Biogas digester for operations will be built ahead to serve Construction phase.	Sledge removal, drying, to be used as soil conditioner for Plant landscaping	Desludging after construction phase
Methane from septic sludge	Gas, Hazardous	0.14 tons /week	none	Use to power barracks requirements for lightbulbs and cooking	As necessary. Maintenance agreement will be secured from equipment provider
During Operation					
Dust emissions from cement grinding	Dust, Hazardous to health		Dust collection equipment installed within process facilities, see Figure 1. 7	Returned into production process	Quarterly preventive maintenance of dust collection installations, following manufacturers' instructions for efficient functioning
Used engine oil	Liquid, hazardous	200 liters per quarter	Collection, storage, and re-use for lubrication of mechanical parts	Final decomposition of oily/greasy accumulated particles/ machinery dust through bacterial action at compost pit	Weekly removal of stored collected waste oil and transfer to storage containers. Procedure will follow DAO 29 series of 1998

Project Waste	Nature	Volume	Waste Management System	Disposal Method	Maintenance
Waste from office operations	Solid, Non-Hazardous	60kg per week	Waste segregation, composting, material recovery and recycling	haul-out of residual waste to municipal landfill	Weekly
	Liquid, Hazardous	1 ton per week	Biogas digester	Sledge removal, drying, to be used as soil conditioner for Plant landscaping	Annual septic tank desludging
Methane from septic sludge	Gas, Hazardous	700 kg /week	none	Use for fuel in employees' canteen	As necessary. Maintenance agreement will be secured from equipment provider

1.9 Project Size

The Project land area acquired by Cemphil for this purpose is 6.1051 hectares. The total area expected to be modified (cut, levelled, and filled) is 4.5 hectares.

The cement production design volume is 1,200,000 MT/year, broken down to:

Phase 1: 600,000 MT/year in first year of operation and

Phase 2: Additional 600,000 MT/year onwards.

The major components are:

Private land area: 6.1051 hectares

Construction footprint: 4.5 has.

Foreshore Lease Agreement applied area: 0.97 hectares

Wharf construction footprint: 3,069 m2 0.31 has.

Total Project Area applied for ECC: 7.0751 hectares

Marine buffer zone 3.515 has. (fifty meters coastal perimeter of Plant)

1.10 Project Development Plan, Description of Project Phases and Timeframes

1.10.1 Pre-Construction Phase

The initial phase in pre-construction and project preparation is the accomplishment of an environmental impact assessment to determine needed environmental management measures and estimate the necessary costs to be included in the project feasibility study. Matters considered include soil bearing capacity, land development design, storm surge, and oceanic currents stress potential on the proposed pier structure.

When an initial project feasibility study generates viable economic and financial indices, the facilities are planned in detail, and project cost estimate and funding plan is firmed up.

Other pre-construction activities are:

1. **Completion of project Feasibility Study (FS)**. CEMPHIL undertook social preparation and consultation process among others, to inquire on local public opinion of its environmental performance, and possible public concerns related to its proposed production expansion in compliance with DENR DAO 2017-15, (new) "Guidelines on Public Participation in the EIA Process".
2. **Completion of the Foreshore Lease Agreement (FLA) application**. The bathymetric survey for FLA has been completed and other requirements are being prepared for submission to CENRO Barotac Viejo.
3. **Opening of Letter of Credit (LOC) for the necessary equipment purchases**; and
4. **Selection of Contractor and contract negotiations**. All commitments in this Environmental Management Plan and ECC conditions will be discussed with the potential Contractors for incorporation in the Contract, monitoring, and compliance.

1.10.2 Construction Phase

All construction works will be through the contract. The Contract will specify preferential sourcing of 100% of unskilled and semi-skilled labor from the Municipality of Ajuy and provisioning of workers' benefits in accordance with Philippine Labor Laws.

The general construction phasing of construction is shown in Table 1. 20

Table 1. 20 Phasing of Construction Works

Schedule	Project Component	Construction Schedule	Remarks
1	Jetty Port	June 23, 2021 to May 27, 2022	Or earlier as Permits are secured
2	Materials Storage (Phase 1 Stage 1)	June 23, 2021 to Sept. 28, 2022	Or earlier
3	Cement Processing Plant (Phase 1 Stage 2)	July 9, 2021 to May 5, 2022	Earlier if informal dwellers are resettled earlier
4	Additional Cement Grinding Facilities and 2 Silo (Phase 2)	Jan.4,2024 to October 4, 2022	Contingent on project economic performance market conditions

Figure 1. 12 indicates the general location of construction phases.

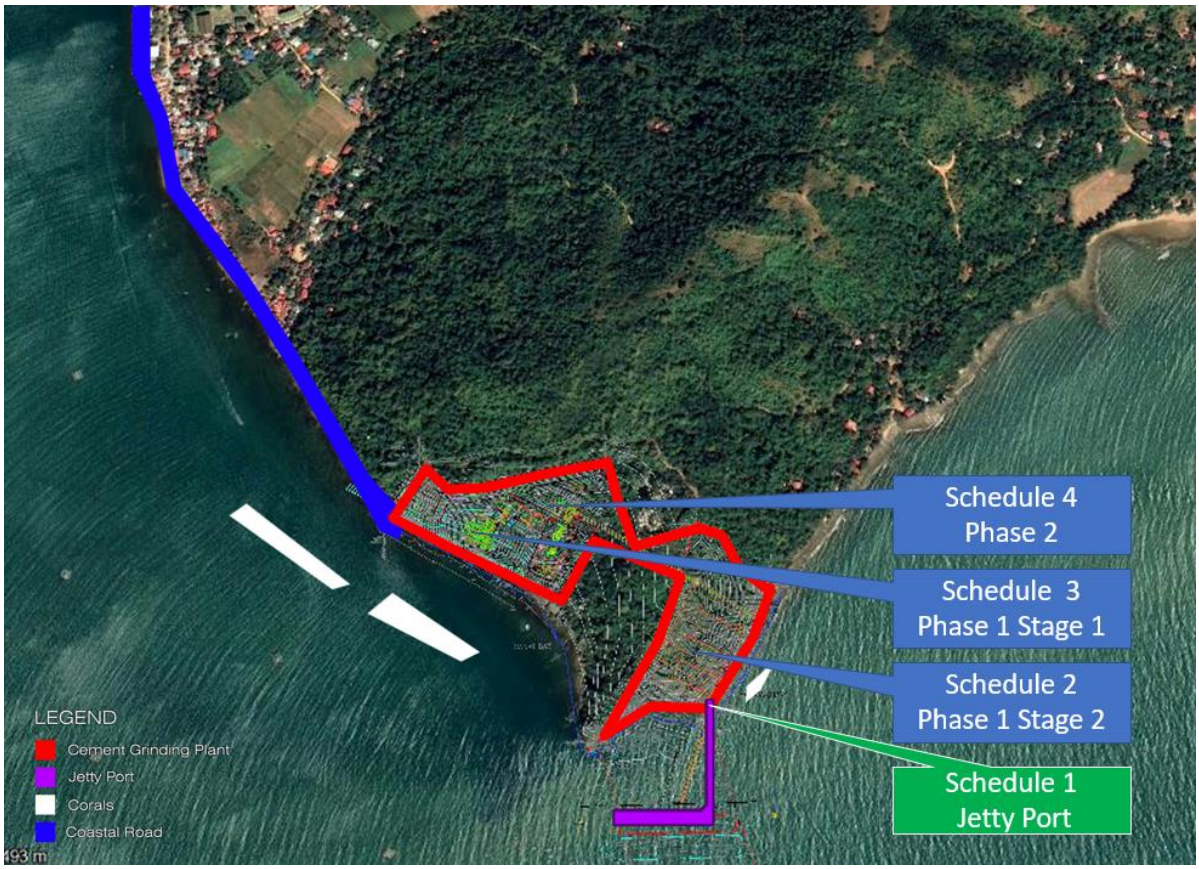


Figure 1. 12 Phasing of Construction Works

The general activities during the construction phase applicable to each of the scheduled activities as they fall due, are the following:

1) Manpower selection and hiring.
2) Construction equipment mobilization
3) Staking / delineation of construction limits
4) Construction of on-site management office/workers' barracks, near the planned Administration Building
5) Mobilization and temporary installation of the Construction of overhead water tank in the Plant Plan, to already serve construction phase.
6) Construction of septic tank for the admin office, to already serve construction phase.

Each of the scheduled works has some varying and some similar construction activities, discussed below.

7) Jetty Port Construction
   a) **Establishment of Silt and Oil boom/ barrier protecting coral areas from potential resuspended sediments disturbed by construction works**. Cemphil Inc. shall follow the manufacturer's instruction on the proper installation of silt and oil boom and will regularly maintain these for effective functioning. The placement of the silt and oil boom will consider the seasonal wind directions in **Section 2.3.1.5.** Additional areas may be provided with the silt and oil boom as construction shall proceed in these areas. Areas where the activities are completed and no disturbance from construction are scheduled may be released from coverage of the silt and oil boom.
   b) **Construction of rock-fill causeway involving laying of armor rocks by crane assisted on floating platform, manual construction of formworks and steelworks for the cross-drain culverts; delivery, and placement/pouring of pre-mixed concrete into the prepared structure forms for the cross-drain culverts**. An oil and water separator unit is designed into the rock-filled causeway structure. It is located at a lower elevation within the rock-filled causeway structure. It is expected to receive oily run-off /droplets from the overhead conveyor system, washed-down by rain. The surface grading design of the causeway depresses at 1% to 2% slope to drain surface run-off toward the oil and water separator unit.
   c) **Construction of the jetty bridge through pile drilling of coated steel columns and placement/ installation of girders**. An oil and water separator unit is designed into the jetty bridge structure. It is located at a lower elevation within the structure, the receive oily run-off from droplets from the overhead conveyor system, carried by rain. The surface grading design of the jetty depresses at 1% to 2% slope to drain surface run-off toward the oil and water separator unit.
   d) **Construction of the piers to carry the pier deck, installation of pre-stressed, prefabricated pier deck**. An oil and water separator (OWS) unit is designed into the rock-filled causeway structure. A circumferential/ring canal runs around the pier deck with the elevation/ slope design of about 1% to 2% slope that leads the surface run-off toward the oil and water separator unit, which is located lower than the canal discharge point, to receive run-off from the ring canal.
   e) **Pile drilling of dolphin moorings**.
   f) **Installation and commissioning of material conveyor systems**.
8) Plant Construction
   a) **Geodetic survey** to mark and stake boundaries of facilities to be constructed.

b) **Construction of retaining wall sandbag barriers at Phase 1 stage 1 construction site (Materials stockpile area).** To protect the marine environment and to quickly proceed to construction, sandbag barriers will be placed between the construction site and the sea, to filter sediments/soil that is expected to be carried by rain towards the sea. The placement of sandbag barriers will be the first physical activity after construction staking.

c) **Clearing of vegetation where necessary.** Only areas for needed facility construction will be cleared. Slope excavation and benching in the areas shown in Figure 3.1.4 are necessary to attain necessary land grades for efficient industrial operation. Existing trees with a diameter of >10cm at breast height will be avoided and preserved by avoiding excavation within three meters radius of the tree or tree trunks. The slope benching design shall be based on the location of trees to preserve the young trees. Trees that cannot be avoided due to centrality to the planned facilities will only be cut when TREE CUTTING PERMIT is granted by the Department of Environment and Natural Resources (DENR).

d) **The removed vegetation will be stockpiled near the toes of the terraced slopes, to later be returned on top of slope terraces to prepare it for revegetation.**

e) **Construction of retaining walls** at the base of the steep slope at the north–northeast portion of property and areas where landfill will be added to level the landform for heavy industrial use. Figure 3.1.4 shows the slope terracing and retaining walls.

f) The land development procedure will generally follow a **cut-fill-compaction process**. The stockpile of cut earth will not remain more than one day. On normal procedure, dump trucks will work alongside the excavator and payloader to receive extracted soil to lower areas needing backfilling. At the receiving end, bulldozers and compactors will immediately distribute and compact the filled earth. The expected excavation volume is 50,000m^3 and the required fill volume is 45,000m^3.

g) **Land development of Phase 1 Stage 1 (materials stockpile area) and Stage 2 (cement grinding area)** will be through slope cutting, earthmoving, filling, and soil compaction.

h) **Construction for Phase 1 Stage 2** in Lot 23, which is inhabited by informal settlers, will only commence once the settlers have been resettled.

i) **Construction of the retaining wall** will start on Phase 1 Stage 2 (cement grinding area). The retaining wall will enable the site to receive fill materials to raise land elevation to eight (8) or ten (10) meters above mean sea level for the factory to the platform to be above the storm surge level.

j) Surplus earth materials of 5000 m^3 will be brought to **fill the embankment of the Cemphil coastal road project.**

k) The north- and northeast portions of the project area have 30 to 50 masl of elevation. The factory deck in this location is 25 to 30 masl and slope excavation will be necessary to attain needed elevation. The **slope excavation** will be finished with benching and contouring. Slope protection measures such as retaining wall at the base and revegetation of the higher slopes will be provided immediately after completion of all construction works.

l) **Equipment installation and commissioning.**

Pollution Control Measures

The pollution control measures for operations phase that need to be provided-for, or constructed or during the construction phase are the following:

1. Drainage trenches and canals and settling ponds for rain drainage management and water resource generation
2. Oil and Water Separator facilities
3. Slope benching for stabilization and erosion control

The important pollution control facilities whose proper and efficient functioning need to be verified to secure permits to operate are the following:

1. Drainage canal / water cisterns and settling ponds
2. Oil and Water Separators
3. Air pollution control installations listed in Table 1. 8.
4. The project facilities by component is listed in Table 1. 2, referenced to the numbers indicated in Figure 1. 4.

1.10.3 Operation Phase

1.10.3.1 *Estimated Cement Production Types, and Material Sources*

Table 1. 21 Cement Milling Production Material and Sources

				Phase 1	Phase 1 &2
Annual Cement Production				600,000.00	1,200,000.00
Portland Cement Type 1 Projected Production				300,000.00	600,000.00
Portland Cement Type IP Projected Production				300,000.00	600,000.00
Production Materials					
	Particulars	Percentage	Source	Annual Requirement (MT)	
1.	Clinker	75	Vietnam, China	450,000	900,000
2.	Gypsum	4	Cebu/Taiwan	24,000	48,000
3.	Pozzolan	16	Taiwan	96,000	192,000
4.	Limestone	5	IRDC	30,000	60,000

ASTM C150 SPECIFICATION FOR PORTLAND CEMENT

Type I - General purpose

Type IP - Portland pozzolan cement containing 15-40% pozzolan

1.10.3.2 *Production Process*

The Cemphil cement manufacturing process flow is shown in Figure 1. 6.

1.10.3.2.1 Production Materials Acquisition

The Cemphil, Inc. cement grinding plant in Barangay Bay-ang, Ajuy, Iloilo will secure the acquisition of production materials through supply contracts with sources who are licensed and permitted by the Philippine Government to engage in such material supply activities.

1.10.3.2.2 Transport from Wharf to Plant

Production materials will be brought from the cargo vessels into the cement grinding facilities through a closed conveyor system and deposited in respective material stockpile sheds (clinker, limestone, gypsum, iron sand).

1.10.3.2.3 Milling

Ground particles of limestone and gypsum are generally between 3 to 25 mm diameters. They shall be delivered to the Project site and into the stockpile area, where each material, together with clinker, will be sorted by a weigh feeder according to the designated product (Type 1 or Type 1P). The proportioned materials are subsequently loaded on to the conveyor and transported to the mill house and into mill equipment. The materials will pass through a high-pressure roller press and will then proceed to finish milling, where the materials are thoroughly blended with the aid of pressurized circulating heated air.

1.10.3.2.4 Temperature control

The cement grinding process requires temperature control to manage the chemical reactions to ensure the desired cement quality. A closed system of circulating cooling oil will be used in process temperature management.

1.10.3.2.5 Particulate Matter Control

A series of industrial cyclone fans with bag filter dust collectors will be installed in the milling plant. Cyclone underflow will be fed back to the mill finish grinding.

1.10.3.2.6 Cement Packing

Cement is withdrawn from cement silos through bucket elevators and air slides and routed to the packhouse for packaging. Transported materials will be distributed to different packing bins prior to dispatching. Cement will be dispatched in 40-kilogram cement bags, in 1-ton bags, and by bulk truck. Bagging of 40kg cement bags will be done by a semi-automatic packing machine.

Residue cement will be collected by a reclaimer screw conveyor and a telescopic conveyor and returned to distributing bins via bucket elevator. The transfer points are equipped with a dedusting system that release exhaust through baghouses. Collected materials from baghouses are returned likewise to the bins.

1.10.3.2.7 Dispatch

The distribution of cement products will be through the Coastal Road and through the project wharf.

1.10.4 Abandonment Phase

The projected economic life of the Cemphil cement plant is at least fifty (50) years.

The Cement Plant is an economic asset on the titled property. In the event of abandonment, Cemphil Inc. will ensure that the manufacturing facility will not pose environmental or safety hazards to the public. Factory gates will be closed to the public to avoid unnecessary risks while the decommissioning phase is in progress. The cement plant equipment will be dismantled and hauled out. All hazardous materials (used oil, laboratory chemical reagents, spent batteries, and light bulbs) will be hauled through an accredited hazardous waste transporter and treater.

In the event of large-scale oil contamination of soil, the contaminated soil and the contaminated area will be cordoned off and treated with lipophilic bacteria to decompose the oil. Treated soil will then be tested for suitability for agricultural use.

The project does not use large volumes of chemicals nor will it have regular wastewater discharge to the environment. The collection of accidental oil spills in marine water will be through oil absorption by the oil booms. Oil-bearing oil booms will have organic materials and will be sent to the Municipal Solid Waste Management facility for shredding and treating with lipophilic bacteria. The resulting compost may be mixed with vermicast to use as soil conditioners for the Company's reforestation program.

Guidelines on Safety of the Department of Labor and Employment (DOLE) and those under DAO 1998-29 will be followed in the facility dismantling activities.

The alternative use of the cement plant facility after a project terminal closure will still be for industrial use because it is in the Municipal industrial zone, and the presence of a jetty port enables efficient procurement of raw materials and product distribution.

1.11 Personnel Requirements

The planned manpower requirements for the Project are listed in Table 1. 22 and Table 1. 24. Cemphil Inc. will prioritize hiring from within Barangay Bay-ang and Ajuy Municipality as much as possible. Personnel for the Construction Phase will be hired by the Construction Contractors while personnel in Table 1. 24 will be directly hired by Cemphil Inc. Hiring notifications both for construction and operations phase, and for all available work opportunities, will be posted in the Barangay Halls of Bay-ang, Pedada, Luca, locations that are relatively close to the Project site. Hiring notifications will also be posted at the Ajuy Municipal Hall Bulletin Board.

Cemphil, Inc. gives equal employment opportunities to men and women. **Work applicants who manifest capability to perform the required work, regardless of non-essential impairment or physical limitation, will be evaluated based on personal qualification for the job applied.** Certain work such as those indicated in Table 1. 22 and Table 1. 24 are relatively light and may be accomplished by Senior Citizens or Persons with Disabilities. The Project will post its manpower requirement prominently at the Municipal Hall of Ajuy. The initially identified workforce requirement is indicated in Table 1. 22 and Table 1. 24. Other employment opportunities in other enterprises will ensue from the project such as for drivers of haul trucks and vehicle maintenance mechanics and workers, suppliers of sundry materials, and those in the food industry. These, however, are not quantified hereunder.

Cemphil has the responsibility of reviewing all subcontract agreements to ensure that the budget for workers' statutory benefits is provided-for in the respective contracts with Cemphil.

Table 1. 22 Composition of Key Personnel for Construction Phase

(Under Construction Contract)

Item no.	Division	Description	No. of Personnel	Will Accept PWD?	Eligible Gender	
					Male	Female
1	Construction Manager Office	Construction manager	1		Yes	Yes
1	-Same-	Admin Manager	1		Yes	Yes
1	-Same-	HRD Manager	1	Yes	Yes	Yes
1	-Same-	Logistic Manager	1	Yes	Yes	Yes
1	Construction Manager Office	Staff	3		Yes	Yes
1	Construction Manager Office	Site Managers	1		Yes	Yes
1	Construction Manager Office	Warehouse Manager	1	Yes	Yes	Yes
2	Gen Affair Dept.	Clerks- Others	1	Yes	Yes	Yes
2	Gen Affair Dept.	Drivers (heavy truck & service vehicle)	5		Yes	Yes
2	Gen Affair Dept.	HRD clerks	2	Yes	Yes	Yes
2	Gen Affair Dept.	Mechanics	2		Yes	Yes
1	Gen Affair Dept.	Community Relations	1		Yes	Yes
2	Gen Affair Dept.	Nurses (4-shift)	1		Yes	Yes
2	Gen Affair Dept.	Operator (crane, backhoe, roller compactor, bulldozer, payloader)	5		Yes	Yes
2	Gen Affair Dept.	Purchasers	2		Yes	Yes
2	Gen Affair Dept.	Surveyor	2		Yes	Yes
3	Safety/Health Dept.	Guards (outsourced 12)	0		Yes	Yes
3	Safety/Health Dept.	Inspectors for pollution, safety & sanitation)	2		Yes	Yes
3	Safety/Health Dept.	Safety officer	1		Yes	Yes
3	Safety/Health Dept.	Safety Aide	2		Yes	Yes
4	Warehouse & Cost Acct Dept.	Warehouse Supervisor	1		Yes	Yes
4	Warehouse & Cost Acct Dept.	Cost-account monitoring officer	2	Yes	Yes	Yes
4	Warehouse & Cost Acct Dept.	Warehouse operators	3	Yes	Yes	Yes

Item no.	Division	Description	No. of Personnel	Will Accept PWD?	Eligible Gender	
					Male	Female
5	Civil Dept.	Foreman	8		Yes	Yes
5	Civil Dept.	Painter	9		Yes	Yes
5	Civil Dept.	Finishing worker	14		Yes	Yes
5	Civil Dept.	Carpenter	30		Yes	Yes
5	Civil Dept.	Laborer	30		Yes	Yes
5	Civil Dept.	Mason	30		Yes	Yes
6	Electric Dept.	Foreman	1		Yes	Yes
6	Electric Dept.	Electricians	4		Yes	Yes
6	Electric Dept.	Technician (HVAC, pumps, machines)	4		Yes	Yes
7	Mechanical Dept.	Foreman	1		Yes	Yes
7	Mechanical Dept.	Mill weigher	2	Yes	Yes	Yes
7	Mechanical Dept.	Pipe fitter	4		Yes	Yes
7	Mechanical Dept.	Technicians	4		Yes	Yes
7	Mechanical Dept.	Welder	4		Yes	Yes
7	Mechanical Dept.	Fabricator	5		Yes	Yes
7	Mechanical Dept.	Erector	8		Yes	Yes
8	Environment Dept.	Pollution Control Officer	1		Yes	Yes
8	Environment Dept.	Nursery tenders, gardeners	3		Yes	Yes
		GRAND TOTAL	**203**	**8**		
Estimated Locally Available (Admin. Mgr, HRD Mgr. Nurse, ComRel, HRD Clerks, Gen. Clerk, Construction Mgr. Staff, Electricians, Carpenters, Masons, Welders, Safety Aide, Safety Inspectors, Laborer, Painters, etc)			**125**			

Table 1. 23 Construction Milestones and Corresponding Personnel Requirement

Construction Target/ Milestone	Manpower Requirement	Duration	Sanitary Facilities Aggregate Capacity to be Made Available	Sanitary Facilities Location
Jetty Port	50	260 days	7 m^3	Composting toilet tank at Barracks within stockyard site
				Portalet, maintained daily at stockyard site nearest jetty port site
Land Preparation	100	80 days	10 m^3	Composting toilet tank for workers and portalet for guests at the construction site
Plant site civil works	100	260 days	Same as above +1 additional portalet	
Mechanical Equipment Erection	100	110 days	Additional 10m^3 sanitary composting tank	
Electrical Equipment Erection	50	110 days	Permanent sanitary facilities of the Factory will be in place and operational	
Individual Equipment Testing	30	40 days	Same as above	
Material Preparation	50	10 days	Same as above	
Grinding system test	30	10 days	Same as above	
Testing for Permit to Operate and Discharge Permit	40	10 days	Same as above	
Training and Commissioning	100	118 days	Same as above	

Table 1. 24 Directly – Hired Regular Positions for Operation Phase

Item no.	Division	Description	No. of Personnel	Will Accept PWD?	Acceptable Gender	
					Male	Female
1	President office	President	1		Yes	Yes
1	President office	Secretaries	2	Yes	Yes	Yes
1	President office	Vice-President	2		Yes	Yes
2	Financial Division	Accountants	2	Yes	Yes	Yes
2	Financial Division	Auditors	2	Yes	Yes	Yes
2	Financial Division	Cashiers	1	Yes	Yes	Yes
2	Financial Division	Supervisor	1		Yes	Yes
3	Sales division	Manager	1		Yes	Yes
3	Sales division	Salesmen	6		Yes	Yes

Item no.	Division	Description	No. of Personnel	Will Accept PWD?	Acceptable Gender	
					Male	Female
4	Gen. Affair division	Drivers	2		Yes	Yes
4	Gen. Affair division	Manager	1	Yes	Yes	Yes
4	Gen. Affair division	Purchasers	2	Yes	Yes	Yes
4	Gen. Affair division	Staffs	2	Yes	Yes	Yes
4	Gen. Affair division	Nurses	1		Yes	Yes
4	Gen. Affair division	Safety Aide	2		Yes	Yes
5	Plant manager office	Plant manager	1		Yes	Yes
5	Plant manager office	Shift Eng.	3		Yes	Yes
6	Quality Control Dept.	Chem. analysis Optr. (4-shift)	3	Yes	Yes	Yes
6	Quality Control Dept.	Engineers	2	Yes	Yes	Yes
6	Quality Control Dept.	Foreman	1	Yes	Yes	Yes
6	Quality Control Dept.	Physical analysis Optr.	2	Yes	Yes	Yes
6	Quality Control Dept.	Secretary	1	Yes	Yes	Yes
6	Quality Control Dept.	Supervisor	1		Yes	Yes
7	Finish mill section	Engineer	1	Yes	Yes	Yes
7	Finish mill section	Maintenance Tech	2		Yes	Yes
7	Finish mill section	Operators(4-shift)	6		Yes	Yes
7	Finish mill section	Shift foremen	3		Yes	Yes
8	Cement dispatch Dept.	Engineers	1		Yes	Yes
8	Cement dispatch Dept.	Operators(2-shift)	12		Yes	Yes
8	Cement dispatch Dept.	Shift foreman	3		Yes	Yes
8	Cement dispatch Dept.	Supervisor	1		Yes	Yes
8	Cement dispatch Dept.	Technicians	2	Yes	Yes	Yes
9	Warehouse & Cost Acct Dept.	Cashier	1	Yes	Yes	Yes
9	Warehouse & Cost Acct Dept.	Cost-accountant	2	Yes	Yes	Yes
9	Warehouse & Cost Acct Dept.	Supervisor	1		Yes	Yes
9	Warehouse & Cost Acct Dept.	Warehouse operators	3	Yes	Yes	Yes
10	Safety/Health Dept.	Foreman	2	Yes	Yes	Yes
10	Safety/Health Dept.	Manager	1		Yes	Yes
11	Mechanical Dept.	Engineers	3		Yes	Yes

Item no.	Division	Description	No. of Personnel	Will Accept PWD?	Acceptable Gender	
					Male	Female
11	Mechanical Dept.	Foreman	2		Yes	Yes
11	Mechanical Dept.	Technicians	3		Yes	Yes
12	Electric Dept.	Electricians	3		Yes	Yes
12	Electric Dept.	Engineers	1		Yes	Yes
12	Electric Dept.	Shift Electricians	3		Yes	Yes
12	Electric Dept.	Shift Foreman	3		Yes	Yes
13	Environment Dept	Compliance Mgr.	1		Yes	Yes
13	Environment Dept	Pollution Control Officer, ComRel	2		Yes	Yes
13	Environment Dept	Nursery tenders, gardeners	3	Yes	Yes	Yes
GRAND TOTAL			107	18		
Locally available qualifications			17 (16%)			

The average number of days of operation per year is 312 days during Phase 1. During Phase 2, Item Nos. 5 to 12 will have three (3) shifts daily. Chemical analysts will have four shifts to avoid fatigue and judgment errors. The shifting of production sections will be on a staggered basis to have a bridge in ensuring continuity of the production process. The general service sections will only have one shift per day. Shift details are in Table 1. 25.

Table 1. 25 No. of Days of Operation

Item no.	Division	Description	Days per Month	Days per Year
Construction Phase				
1	Construction manager office	1- Shift, 8 hours per shift per day	26	312
2	Gen Affair Dept.	1- Shift, 8 hours per shift per day	26	312
3	Safety/Health Dept.	1- Shift, 8 hours per shift per day	26	312
4	Warehouse & Cost Acct Dept.	1- Shift, 8 hours per shift per day	26	312
5	Civil Dept.	1- Shift, 8 hours per shift per day	26	312
6	Electric Dept.	1- Shift, 8 hours per shift per day	26	312
7	Mechanical Dept.	1- Shift, 8 hours per shift per day	26	312
8	Environment Dept	Pollution Control Officer	26	312
			Average no. of days	312
Operation Phase				
1	President office	1- Shift, 8 hours per shift per day	26	312

2	Financial Division	1- Shift, 8 hours per shift per day	26	312
3	Sales division	1- Shift, 8 hours per shift per day	26	312
4	Gen. Affair division	1- Shift, 8 hours per shift per day	26	312
5	Plant manager office	1- Shift, 8 hours per shift per day	26	312
6	Quality Control Dept.	1- Shift, 8 hours per shift per day	26	312
7	Finish mill section	1- Shift, 8 hours per shift per day	26	312
8	Cement dispatch Dept.	1- Shift, 8 hours per shift per day	26	312
9	Warehouse & Cost Acct Dept.	1- Shift, 8 hours per shift per day	26	312
10	Safety/Health Dept.	1- Shift, 8 hours per shift per day	26	312
11	Mechanical Dept.	1- Shift, 8 hours per shift per day	26	312
12	Electric Dept.	1- Shift, 8 hours per shift per day	26	312
13	Environment Dept	Pollution Control Officer	26	312
			Average no. of days	**312**

1.11.1 Employees to be Hired through a Manpower Agency

A total of seventeen (17) guards, both male and female will be hired through a licensed Security Agency authorized to provide Security Guard services.

1.11.2 Grievance and Redress Management

During construction phase, Cemphil will post a Project Engineer at site to monitor and supervise construction works. The Project Engineer will be authorized to receive public complaints during construction phase. The form for accepting and documenting the public complaint is in Annex X. The Project Engineer will furnish the Grievance Form to the Cemphil President via electronic communication application for quick response. The Cemphil President or his designated representative will act to investigate the complaint and correct the situation, as necessary.

During Project operation phase, the ComRel and PCO are the de-facto persons-in-charge of complaints and grievances issues. Grievances and complaints will initially be discussed internally at the level of the Environment Department who shall prepare actions for resolution of the complaints and submit the same to the Cemphil President for authorization of necessary the activities and compensation. Internal grievance / concerns from Project personnel will be received and acted-upon by the VP for Administration.

1.12 Project Cost

Table 1. 26 Project Cost

Item No.	Description	Import, Php	Local, Php	Total
1	Civil Scope includes Silt Trap & Settling Ponds. Annual Maintenance Cost: Php 400,000.00		93,308,000	93,308,000
2	Machinery: (Incl Local MFG, Spare Parts, Crane, GRDNG Media & Dust Control –Php 1,100,000.00)		111,762,000	111,762,000
3	Electric (Gen set, transformer, sub-station)	2,500,000	69,234,811	71,734,811
4	Heavy Machine (Incl Cement Mill, Packing, Del Equip, includes Oil & Grease Separators, Pollution Control Machine	157,809,258		157,809,258
5	Installation & Test Run		4,323,110	4,323,110
6	Wharf Facilities		80,000,000	80,000,000
7	Pre-operating Phase: (incl. gov't formalities, social development and environmental management fund, Php 250,000.00)		19,344,197	19,344,197
8	Other Cost: (includes laboratory, machine shop, equipment pollution control devices)		5,382,814	5,382,814
9	Project Administration (Annual)		2,500,000	2,500,000
Subtotal Capital Expenditure				**546,164,190**
Environmental Expense During Construction				**5,420,000**
10	Environmental Management Cost (Capital expense if not within Construction budget)			
Environmental Expense During Operation				**5,745,000**
11	Annual Environmental Management Cost During Operation			3,245,000
12	Year 1 to Year 5 Social Development Program			8,200,000
13	Annual Information and Education Activities			300,000
Total				**569,074,190**

1.13 Project Schedule

The preparation and construction of the cement grinding plant for Phase 1 are planned to be completed in thirty (31) months. Within one (1) year after commercial production of Phase 1, preparations for Phase 2 shall commence. Phase 2 facilities installation will be completed in one (1) year. Figure 1. 13 is a Gannt chart of project construction implementation. Thereafter, the company looks forward to fifty (50) years of operation.

	Duration (Days)	Start	Finish
Phase 1		1/4/'21	7/25/'23
Preliminaries	400	1/4/'21	5/13/'23
LGU & Nat Permit/Lic/Clearance (By Owner)	90	1/4/'21	4/24/'21
Land acquisition and conversion (by owner)	0	COMPLETED	
EIS for ECC	400	1/4/'21	5/13/'23
Survey works	60	1/4/'21	3/17/'21
Geotechnical Investigation	60	1/4/'21	3/17/'21
Construction Permits	60	1/4/'21	3/17/'21
Preconstruction phase		1/4/'21	12/26/'21
ITB Preparation	60	1/4/'21	3/17/'21
Evaluation & Contract Stage	24	3/31/'21	5/7/'21
Basic & Detail Design	150	6/1/'21	10/29/'21
Equipment Procurement	95	9/22/'21	12/26/'21
Manufacturing Equipment	200	10/30/'21	5/18/'22
Construction Phase		6/23/'22	
Equipment Delivery	105	6/23/'22	10/6/'22
Perimeter Wall/Settling Pond/Sandbag Installation	90	7/9/'22	10/26/'22
Land Preparation	80	6/23/'21	9/28/'21
Plant site civil work	260	7/9/'21	5/27/'22
Jetty civil work	260	7/9/'21	5/27/'22
Electrical equipment erection	100	10/26/'21	3/2/'22
Mechanical equipment erection	110	12/2/'21	4/21/'22
Equipment individual test	40	4/11/'22	5/31/'22
Material preparation	10	4/11/'22	4/25/'22
Grinding system test	10	4/22/'22	5/5/'22
Training & Commissioning		3/17/'23	7/25/'23
System Commissioning	40	3/17/'23	4/26/'23
Operational Adjustment & troubleshooting	40	4/27/'23	6/15/'23
Uninterrupted Trial Run	28	6/16/'23	7/14/'23
Performance Test	10	7/15/'23	7/25/'23
Phase 2			
Equipment Procurement	95	1/4/'24	4/8/'24
Manufacturing Equipment	115	1/4/'24	4/28/'24
Mechanical equipment erection	60	4/29/'24	7/11/'24
Electrical equipment erection (2 parts)	30*	4/29/'24	7/11/'24
Equipment individual test	20	7/11/'24	8/3/'24
Performance Test	10	8/4/'24	8/14/'24
Uninterrupted Trial Run	28	8/15/'24	9/11/'24
Securing Permit to Operate Air Pollution Source Equipment	20	8/15/'24	9/16/'24
System Commissioning	20	9/12/'24	10/2/'24

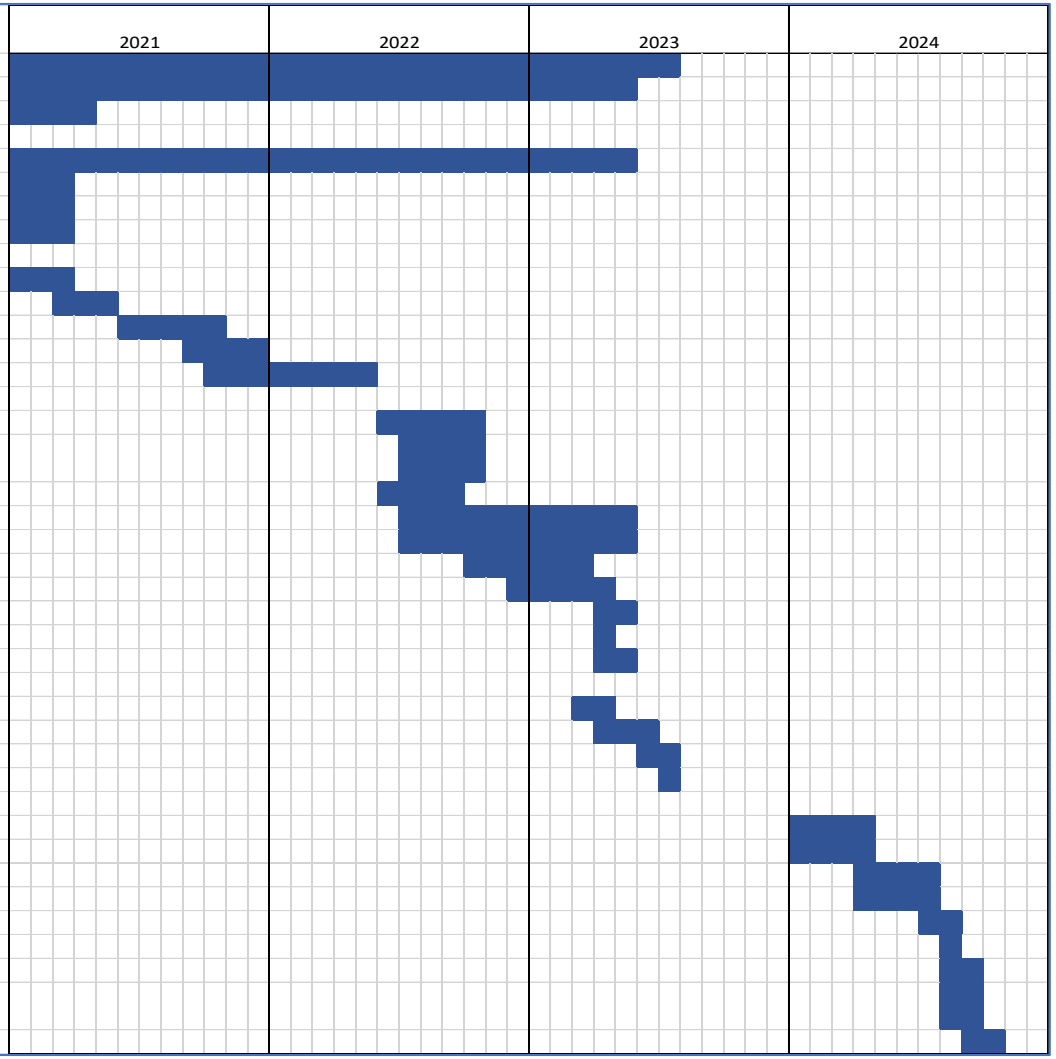


Figure 1. 13 Project Implementation Schedule

CEMPHIL CEMENT GRINDING PROJECT EIS

AIR MODULE

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2.3 Air

This section presents the baseline air quality conditions for project impact parameters at the project site, and impact assessment of the construction, operation, and abandonment of the proposed Cemphil cement grinding project.

The air environment that may be affected by the project operations includes the ambient air, ambient noise levels, and climate. The area geography, topography, and climate, particularly wind directions play important roles in the project's impact on air quality.

The project air quality impact is assessed based on emissions & project pollution control facilities.

2.3.1. Meteorology/Climatology

The Roxas City, Capiz Synoptic Station of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) provides the closest reference for climatology on the project site.

2.3.1.1. General Climate

The climate falls under Type III under the Modified Coronas Climate Classification (**Figure 2.3.** 2), with seasons that are not very pronounced. Based on thirty-year normal data, a relatively wet season persists from May to October and after that, relatively dry season persists for the rest of the year.

2.3.1.2. Rainfall

The average normal annual rainfall is 2,043.3 mm, with the heaviest falling between June to November, accounting for 72% of annual rainfall and 63% of the total number of rainy days of the year. Data from 1909 to 2017 indicate that the greatest rainfall within 24-hrs is 310.7 mm, which was recorded on May 16, 1966. The highest daily rainfall per month is shown in **Figure 2.3.** 1.

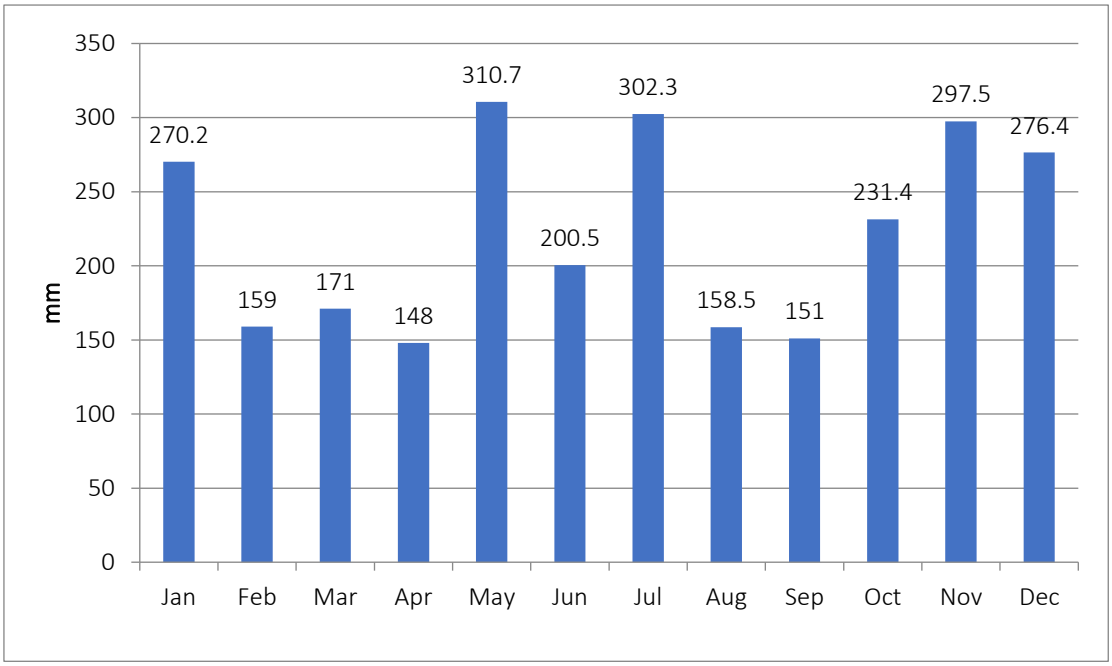


Figure 2.3. 1 Greatest 24-Hr. Rainfall, 1909-2010

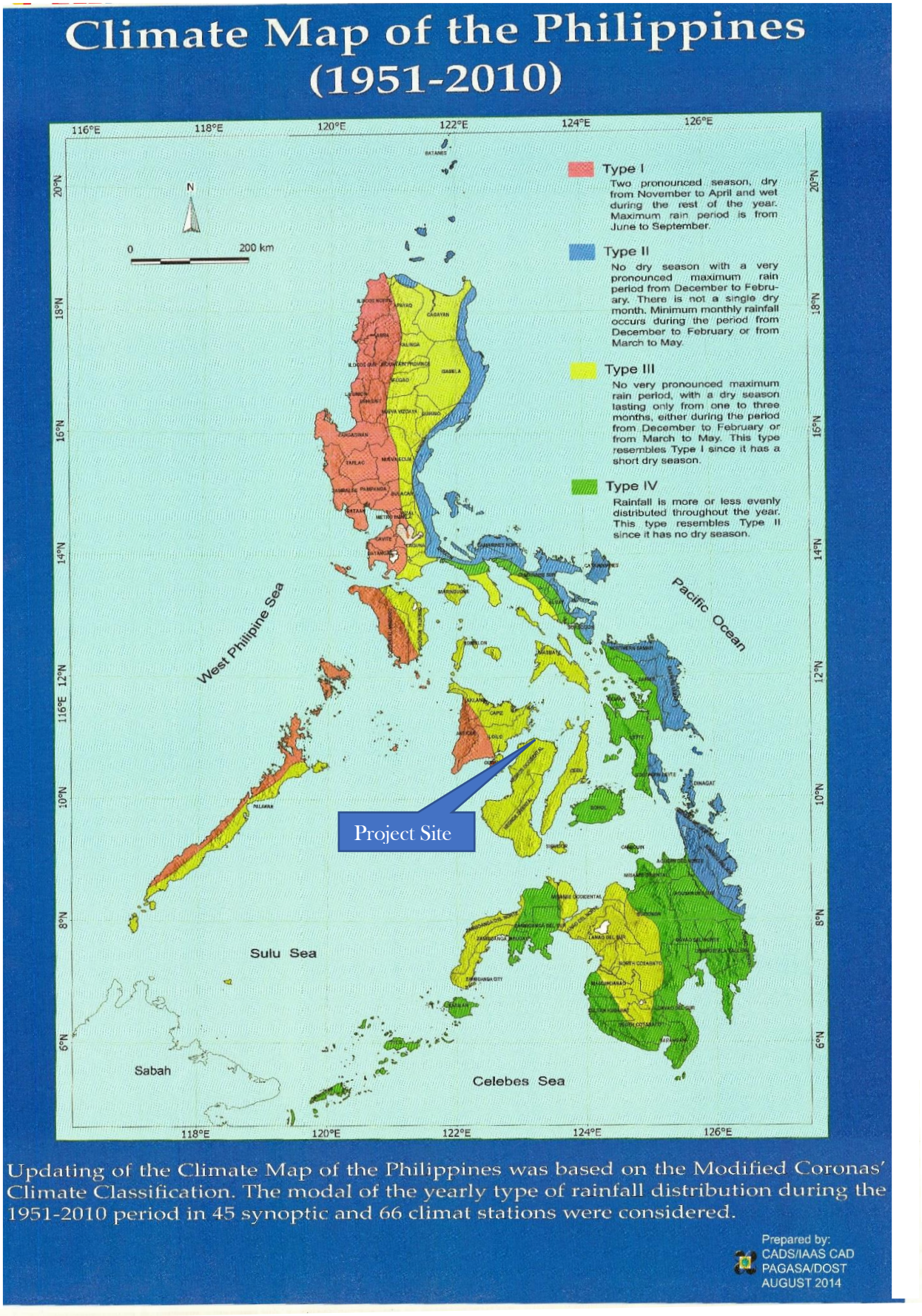


Figure 2.3. 2 Climate Map of the Philippines

Table 2.3. 1 Historical Mean Monthly Climatological Data, 1981-2010

MONTH	RAINFAILL		TEMPERATURE						VAPOR PRESS. (mbs)	RH (%)	MSLP (mbs)	WIND		CLOUD AMT. (Okta)	NO. OF DAYS W/	
	AMOUNT (mm)	NO. OF RD	MAX (°C)	MIN (°C)	MEAN (°C)	DRY BULB (°C)	WET BULB (°C)	DEW POINT (°C)				DIR (16pt)	SPD (mps)		TSTM	LTNG
JAN	72.1	12	29.1	24.1	26.6	26.5	24.4	23.6	29.1	84	1012.2	NE	4	5	1	2
FEB	49.3	8	29.5	24.1	26.8	26.7	24.4	23.6	29	83	1012.3	NE	4	5	0	1
MAR	63.7	6	30.5	24.5	27.5	27.5	25	24.1	29.9	82	1011.7	NE	3	4	2	3
APR	69.9	6	31.9	25.1	28.5	28.7	25.8	24.8	31.2	79	1010.4	E	3	4	5	7
MAY	144.7	10	32.6	25.2	28.9	28.9	26.1	25.2	31.9	80	1009.2	E	3	4	15	19
JUN	259	16	32.1	24.8	28.4	28.3	25.8	25	31.5	82	1008.8	S	2	5	20	21
JUL	253.4	16	31.5	24.5	28	27.8	25.5	24.7	31	83	1008,5	S	2	6	19	21
AUG	202.1	15	31.7	24.5	28.1	27.7	25.5	24.7	31.1	84	1008.2	S	2	6	18	19
SEP	213.5	16	31.5	24.4	28	27.7	25.5	24.7	31.1	84	1008.8	S	2	6	20	20
OCT	304.9	19	31	24.5	27.8	27.8	25.6	24.8	31.3	84	1009.1	N	3	6	18	21
NOV	239.4	17	30.6	24.8	27.7	27.7	25.5	24.7	31.1	84	1009.7	NE	3	5	9	14
DEC	171.3	15	29.4	24.5	27	26.9	24.9	24.2	30.1	85	1011.2	NE	4	5	3	7
ANNUAL	2043.3	156	31	24.6	27.8	27.7	25.3	24.5	30.7	83	1010	NE	3 I	5	130	155

Source: PAGASA Synoptic Station, Roxas City, Capiz, Iloilo

Table 2.3. 2 Climatological Extremes Roxas, 1903-2017

MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		STRONGEST WINDS (mps)			SEA LEVEL PRESSURES (mbs)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	33.1	01-24-1988	16.4	01-31-1905	370.2	01-01-1916	26	WSW	08-01-1972	1021.3	01-29-1998	1002.5	01-18-2015
FEB	34.4	02-23-1979	17.4	02-19-1914	159.0	02-16-1934	20	N	02-29-1996	1020.7	02-14-2017	1001.0	02-19-2001
MAR	35.3	03-30-1988	18.6	03-01-1905	171.0	03-10-1984	25	NNW	03-26-1982	1021.0	03-30-1958	1000.3	03-06-1999
APR	36.8	04-16-1931	20.0	04-23-1926	148.0	04-09-1996	22	WSW	04-20-1978	1018.8	04-07-1968	1003.0	04-09-1956
MAY	38.1	05-19-1926	20.3	05-27-1984	310.7	05-16-1966	36	WNW	05-16-1966	1016.6	05-10-1957	994.4	05-05-1951
JUNE	37.8	06-05-1967	16.7	06-28-1970	200.5	06-02-1995	22	NE	06-20-1980	1015.6	06-08-1997	999.2	06-10-1974
JULY	37.0	07-21-1968	16.5	07-16-1983	302.3	07-14-2003	26	WNW	03-07-1971	1015.5	07-26-2015	997.0	07-03-2001
AUG	36.9	08-01-1967	19.0	08-06-1907	158.5	08-22-1906	23	NW	08-20-1982	1015.2	08-19-2014	988.9	08-01-1986
SEP	37.6	09-07-1968	18.5	09-23-1908	151.0	09-14-2002	22	E	09-02-1984	1016.1	09-24-1967	998.5	09-29-1995
OCT	36.1	10-17-1967	19.0	10-19-1984	231.4	10-07-2004	25	NNW	10-20-1998	1016.8	10-28-1960	986.6	10-27-1952
NOV	35.6	11-15-1962	190	11-04-1984	297.5	11-06-1988	58	ENE	11-08-2013	1018.7	11-24-1957	992.1	11-06-1996
DEC	35.5	12-02-1924	17.5	12-03-1904	276.4	12-26-1917	30	SW	12-10-1998	1020.4	12-26-2001	986.4	12-10-1998
ANNUAL	38.1	05-19-1926	16.4	01-31-1905	370.2	01-01-1916	58	ENE	11-08-2013	1021.3	01-29-1998	986.4	12-10-1998
Period of Record	1903.2017				1903 - 2017		1951-2017			1949 - 2017			

Source: PAGASA Synoptic Station, Roxas City, Capiz, Iloilo

2.3.1.3. Temperature

The recorded average normal temperature in the area is 27.8°C. Daily high temperatures are around 31°C, rarely falling below 29.1°C or exceeding 32.1°C, while daily low temperatures are around 24.6°C, rarely falling below 24.1°C or exceeding 24.8°C. Historically, the highest temperature reported from Roxas City station was 38.1°C, occurring on May 19, 1926, and the lowest temperature was 16.4°C on January 31, 1905.

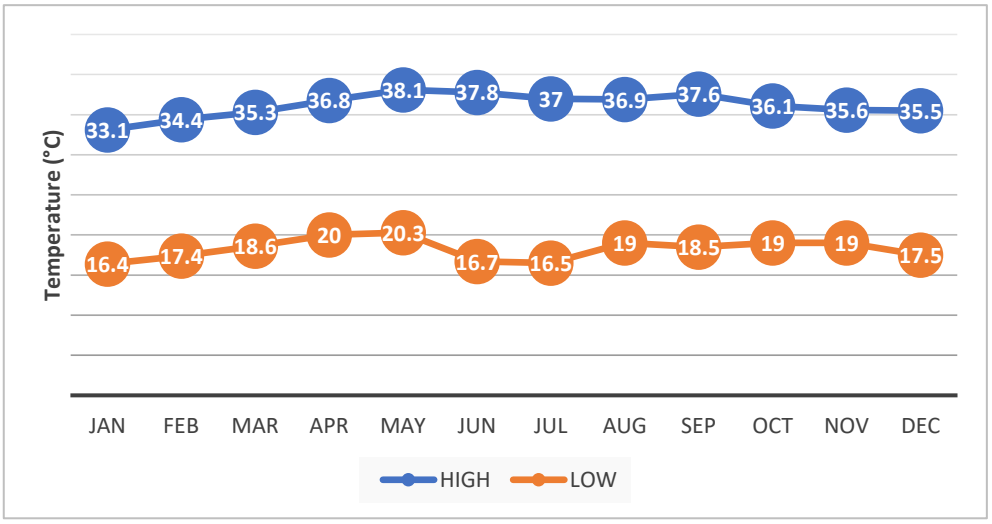


Figure 2.3. 3 Historical Temperature Extremes Per Month, 1909-2017

2.3.1.4. Relative Humidity

The relative humidity is the amount of water vapor present in the air expressed as a percentage of the amount needed for saturation at the same temperature. The average normal annual humidity recorded in Ajuy is 83%. Under normal climate conditions, December is the most humid month and April the least humid.

2.3.1.5. Winds

Figure 2.3. 4 shows the annual average normal wind speed, direction, and frequency in the area, generated through a WRP lot ver. 5.9 wind rose plotter. The prevailing wind direction occurring in 67% of the time is from the North-East direction has speed between 4.8 to 8 kilometers per second (kps), followed by winds from the West Southwest direction with speed between 3.36 to 9.2 kps occurring 33% of the time (**Figure 2.3.** 4). The maximum wind speeds range from 5.7 to 8.8 miles per second or 9.17 to 17.76 kps. Calm breezes blowing at 3-4 kilometers per second (kps) take up around 16.4% of the time.

Data from 1951 to 2017 (**Table 2.3.** 2) show that the strongest wind reported was on November 8, 2013, which was when Typhoon Haiyan, known in the Philippines as Super Typhoon Yolanda, was in the Philippine Area of Responsibility. The winds of Yolanda originated from the East-Northeast (ENE).

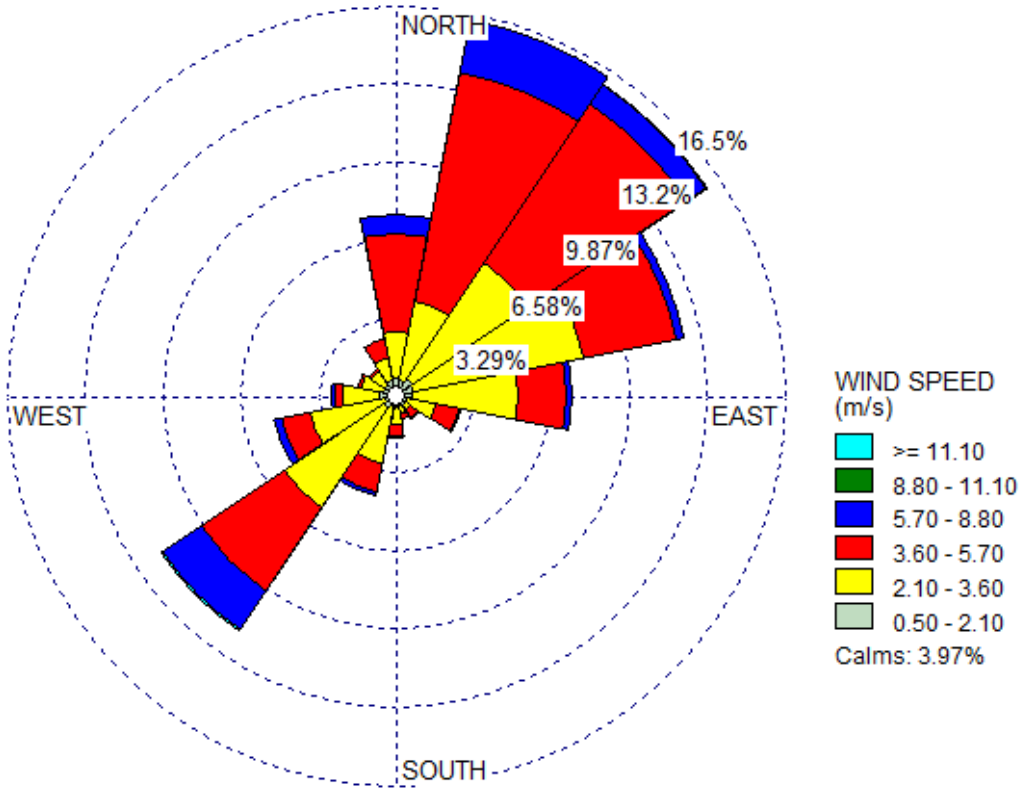


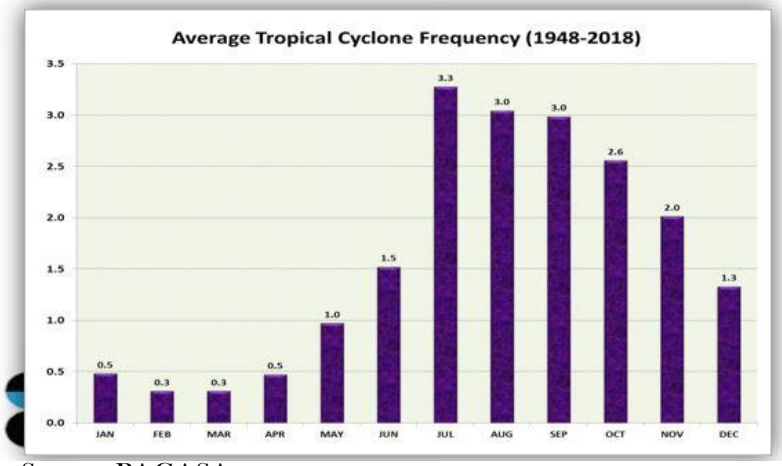
Figure 2.3. 4 Ajuy, Iloilo Wind Rose Diagram (Mesocale Regional Meteorological Data)

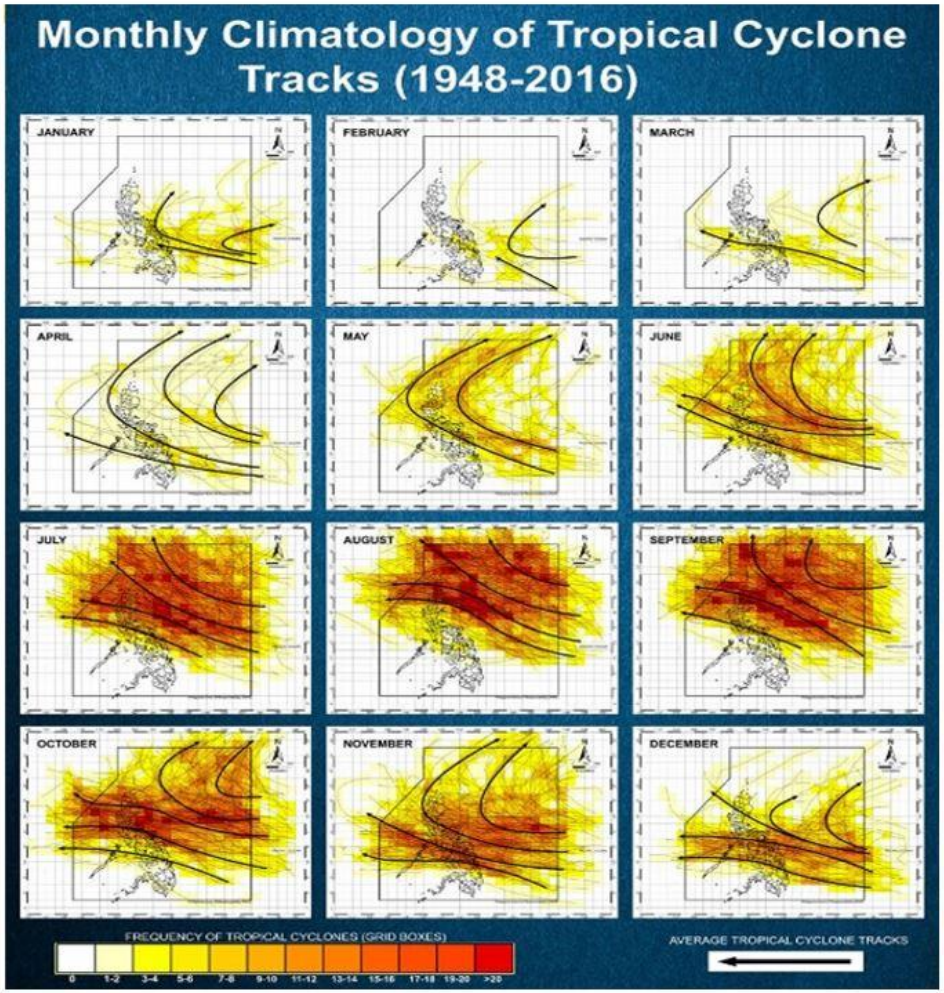
Source: Iloilo Synoptic Station, PAGASA

① ENSO UPDATES & OUTLOOK ② CLIMATE OUTLOOK ③ SUMMARY

Forecast Tropical Cyclone Frequency

Month	Number of TC
DECEMBER 2019	1 OR 2
JANUARY 2020	0 OR 1
FEBRUARY 2020	0 OR 1
MARCH 2020	0 OR 1
APRIL 2020	0 OR 1
MAY 2020	1 OR 2





Source: PAGASA

Figure 2.3. *5* Forecast Tropical Cyclone Frequency of the Philippines

2.3.1.6. Tropical Cyclone Frequency

An average of 20 tropical cyclones enters the Philippine Area of Responsibility (PAR) per year, with about eight (8) or nine (9) making landfall. Based on the average tropical cyclone tracks recorded by PAGASA from 1948-2016 (**Figure 2.3.** 5), an average of four typhoons or 20% of the typhoons in PAR pass the Panay Island, with one (1) to two (2) actually made landfall per year.

Typhoon Yolanda traversed Panay Island in 2013. Yolanda was an extreme climatic disturbance, with storm surge reaching up to 4.5 meters masl and wind strength, not experienced at any time in the past, both in the Philippines, Vietnam, and other countries it passed. As of writing, Iloilo is not included in the areas considered as having high average annual typhoon incidences such as the Bicol, Eastern Visayas Region, and provinces in the north-eastern Luzon seaboard.

2.3.2. Greenhouse Gas Emissions

Nitrogen oxides (NOx), Carbon Monoxide (CO), and Volatile Organic Compounds (VOCs or Hydrocarbons) are considered greenhouse gas precursors. They react with substances in the troposphere about six (6) to ten (10) kilometers from the earth's surface, to form ozone. While ozone in the stratosphere (about 28 kilometers above the earth's surface at 30° latitude) absorbs and protects the earth from harmful solar UV rays, ozone acts as a greenhouse gas in the troposphere, where all weather conditions take place. Most of the tropospheric ozone formation occurs when nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOCs), react in the atmosphere in the presence of the UV spectrum. Volumes 2 and 3 of the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories were used to quantify the greenhouse gas emissions of the proposed project.

2.3.2.1. Greenhouse Gas Emissions during Construction

Carbon dioxide (CO2), Nitrous Oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOCs), and carbonic particulates (PM) are emitted by-products of diesel fuel combustion. CO_2 is a greenhouse gas and NOx, CO, VOCs are greenhouse gas precursors. Sulfur Dioxide (SO_2) is also an irritant to the respiratory system and poses health hazards to humans exposed to levels above 13 mg/m^3[1].

An estimate of the volume of gaseous pollutants from Plant construction using emission factors and formula from the International Panel for Climate Change (IPCC) reaches **74,192.88** megagrams of CO^2 equivalent. In Table 2.3. 3**,** CO_2 has a Global Warming Potential (GWP) of 1 and is being used as a reference. CO_2 remains in the climate system for thousands of years. Annual emissions continue to accumulate in the atmosphere, forming a greenhouse effect, impacting climate as we have known it. Carbon dioxide levels today are higher than at any point in at least the past 800,000 years[1]. While humankind seems unable to sequester a significant portion of atmospheric carbon dioxide at this time, a responsible target at this time should be to offset carbon emissions so as not to aggravate the worsening climate change scenario.

1 Lüthi, D., et al., 2008. Based on EPICA Dome C data provided by NOAA NCEI Paleoclimatology Program.

2.3.2.2. Greenhouse Gas Emissions during Operation

The equation used to estimate potential greenhouse gas emissions is based on the use of diesel fuel during operation in **Table 2.3.** 3 and IPCC emission factors in Annex F:

$$\text{Emissions} = \text{Fuel Consumption}_{\text{Diesel Oil}} \; x \; \text{Emission Factor}_{\text{Diesel Oil}}$$

Table 2.3. 3 shows the input data, as well as the potential CO_2 emissions (Tons CO_2/year).

Table 2.3. 3 Potential Greenhouse Gas Emission During Operation

	Liters	BTU	Terajoules	CO_2	NO_x	CH_4	SOx
Service Vehicles	37,440	1.97E+10	21	1,542	16.65	0.10	-
Heavy equipment	4,368	2.30E+09	2	179.90	1.94	0.01	-
Background genset	6,240	3.29E+09	3	257.00	0.00	0.01	0.00
Back-up Genset	936,000	4.93E+11	520	38,549.93	0.03	1.56	10.68
Hot air furnace	200,000	1.05E+11	111	8,237.16	0.01	0.33	0.03
Delivery trucks*	252,720	1.33E+11	140	10,408.48	0.01	0.42	0.04
Total				59,174.47	18.64	2.44	0.76
	Global Warming Potential			1	280	56	
	Annual Global Warming Potential			59,174.47	5219.2	136.64	0
	Total Annual GWP in Megagram			64,531.07			-

Notes: The distance computed is only from Plant to Bay-ang Junction at National Highway. The transport of cement for development requirements of this part of Panay Island may start from the Port of Iloilo, 81 km away, as there is no cement producer in Panay and the island imports all of its cement requirements. The specific market destinations are also unknown as they will depend on the Purchase Orders when the Plant operates. The distance from Plant to Bay-ang junction is 5.2 km.

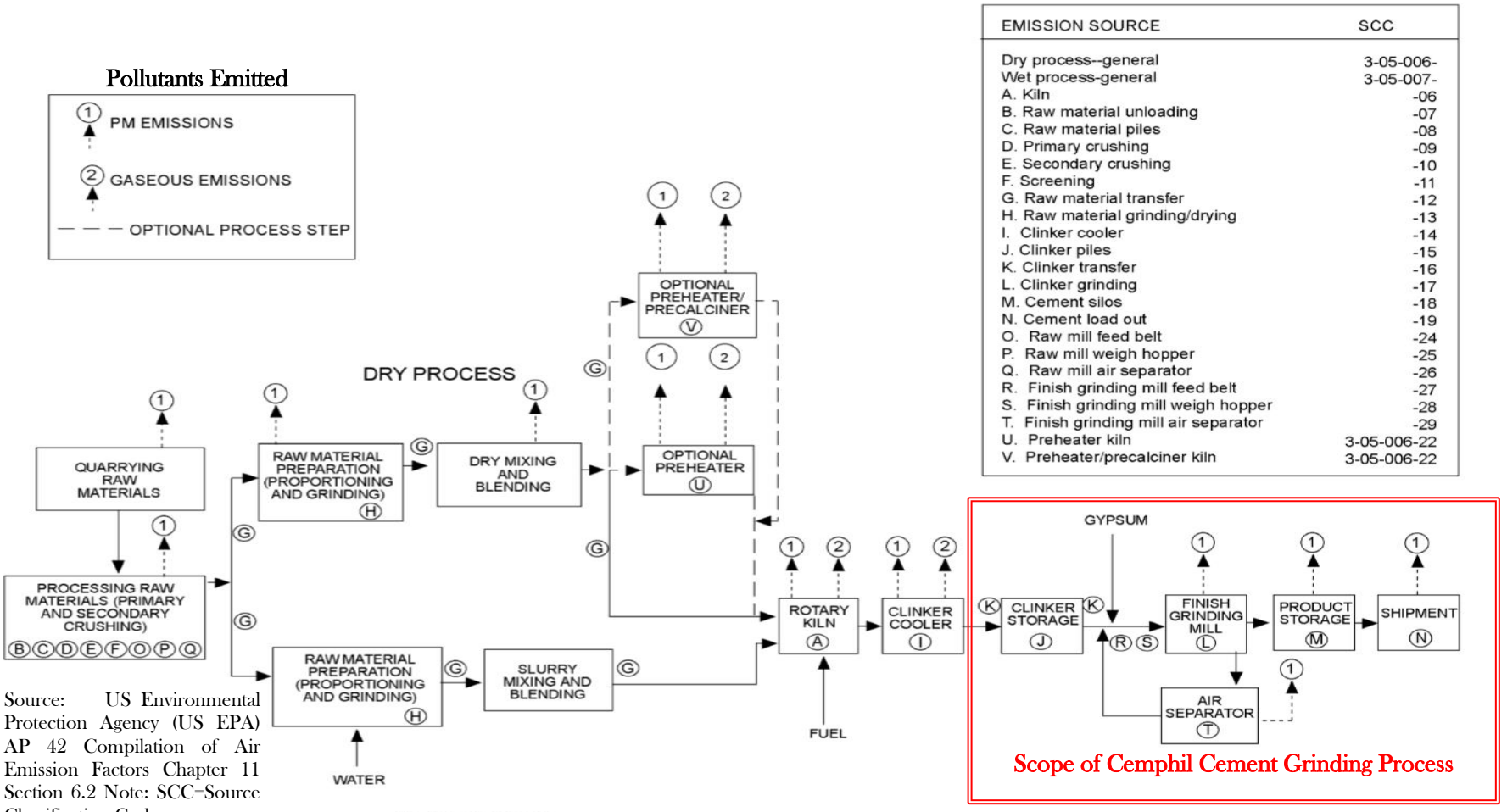
For the sake of projection, the total estimated project carbon footprint is **5,072,799.73 megagrams**, assuming the existing public power supply scenario and genset fuel remains to be the same for the next 50 years, the first year production is 600,000 mt and 1,200,000 mta production capacity kicks-in starting on the second year of operation.

2.3.3. Baseline Air Quality

To provide baseline to determine project air quality impact on ambient particulates and noise, 24-hour ambient air quality sampling was conducted on the 5th to 7th of July 2019 for Total Suspended Particulates and Noise. Along the major wind directions from the project site, North East and South West, are Mt. Bay-ang (NE) and Canal Bay (SW). The largest residential clusters are within west-north-west (WNW) and east-north-east (ENE) of the Plant, and air quality sampling were located there (see Figure 2.3. 7).

As baseline for air quality impact parameters for a cement grinding plant, analyses for Total Suspended Particulates (TSP) was conducted. Based on the US Environmental Protection Agency (US EPA) AP 42 Compilation of Air Emission Factors Chapter 11 – Mineral Industries, Section 6 (see Figure 2.3. 6 and

Table 2.3. 4), the air pollutants emitted by Portland cement grinding do not include Fine Particulates (PM_{10}), Sulfur Dioxide (SO_2), and Nitrogen Dioxide (NO_2). PM_{10}, SO_2, and NO_2 emissions are not expected to exceed regulation as there are no permanent sources that will generate these pollutants from cement grinding operations. The NO_2 and SO_2 emissions from the use of diesel fuel oil in Generator Set operation as assessed through the Emission Inventory (see **Section 2.3.2**) are temporary and incidental, while the Government is not able to manage the provision of adequate energy for industrial development. These emissions from direct petroleum fuel utilization will be monitored during operation and corresponding mitigating measures will be implemented through mangrove forestation. Baseline sampling in Purok 5 which is closer to the Plant than the Barangay Hall (Purok 4) was not implemented due failure of transport vehicle with low chassis to negotiate the rugged road in Mt. Bay-ang going to Purok 5.



EMISSION SOURCE	SCC
Dry process--general	3-05-006-
Wet process-general	3-05-007-
A. Kiln	-06
B. Raw material unloading	-07
C. Raw material piles	-08
D. Primary crushing	-09
E. Secondary crushing	-10
F. Screening	-11
G. Raw material transfer	-12
H. Raw material grinding/drying	-13
I. Clinker cooler	-14
J. Clinker piles	-15
K. Clinker transfer	-16
L. Clinker grinding	-17
M. Cement silos	-18
N. Cement load out	-19
O. Raw mill feed belt	-24
P. Raw mill weigh hopper	-25
Q. Raw mill air separator	-26
R. Finish grinding mill feed belt	-27
S. Finish grinding mill weigh hopper	-28
T. Finish grinding mill air separator	-29
U. Preheater kiln	3-05-006-22
V. Preheater/precalciner kiln	3-05-006-22

Source: US Environmental Protection Agency (US EPA) AP 42 Compilation of Air Emission Factors Chapter 11 Section 6.2 Note: SCC=Source Classification Code

Figure 2.3. 6 Process Flow Diagram for Portland Cement Manufacturing

Table 2.3. 4 Air Pollutants Emitted by Cement Grinding Processes

Process	Filterable[b]			
	PM	EMISSION FACTOR RATING	PM-10	EMISSION FACTOR RATING
Raw mill with fabric filter (SCC 3-05-006-13)	0.0062[c]	D	ND	
Raw mill feed belt with fabric filter (SCC 3-05-006-24)	0.0016[d]	E	ND	
Raw mill weigh hopper with fabric filter (SCC 3-05-006-25)	0.010[e]	E	ND	
Raw mill air separator with fabric filter (SCC 3-05-006-26)	0.016[e]	E	ND	
Finish grinding mill with fabric filter (SCC 3-05-006-17, 3-05-007-17)	0.0042[f]	D	ND	
Finish grinding mill feed belt with fabric filter (SCC 3-05-006-27, 3-05-007-27)	0.0012[d]	E	ND	
Finish grinding mill weigh hopper with fabric filter (SCC 3-05-006-28, 3-05-007-28)	0.0047[e]	E	ND	
Finish grinding mill air separator with fabric filter (SCC 3-05-006-29, 3-05-007-29)	0.014[g]	D	ND	
Primary limestone crushing with fabric filter (SCC 3-05-006-09)[h]	0.00050	E	ND	
Primary limestone screening with fabric filter (SCC 3-05-006-11)[h]	0.00011	E	ND	
Limestone transfer with fabric filter (SCC 3-05-006-12)[h]	1.5×10^{-5}	E	ND	
Secondary limestone screening and crushing with fabric filter (SCC 3-05-006-10 + -11, 3-05-007-10 + -11)[h]	0.00016	E	ND	

Notes: Factors are kg/Mg of material process, unless noted. ND = no data.
Source: USEPA AP42 Compilation of Emission Factors for Portland Cement Manufacturing

A comparison of monitoring data (Table 2.3.4.1) from existing cement plants indicate that fine particulates (PM_{10}) are not among the nuisance generated by cement plants. Monitored ambient air quality data suggest that PM_{10} concentrations above the NAAQS values are attributable to diesel fuel emissions in busy roads. Cement plant emissions are way below the NAAQ standard for PM_{10}. The EMB instituted DAO 2015-04" Implementation of Vehicle Emission Limits for Euro 4/IV and In-use Vehicle Emission Standards" in July 1,2015 and the Project PCO will help remind enforce

Table 2.3.4. 1 Comparison of Average Monitored Ambient PM_{10} Concentrations in Impact Areas of Selected Cement Plants

Parameter	Cement Plant						NAAQS (ug/Ncm)
	SMNCI*	TCPI*	GCC*	Republic *	Holcim* (24hraveraging)	Petra	
TSP (ug/Ncm)					±230		230
PM10 (ug/Ncm)					<100		
SOx (ug/Ncm)					<60		180
NOx (ug/Ncm)					<40		150
Monitoring Period					2012-2017		
Nature of source document	Approved EPRMP	3rd party sampling	3rd party sampling	Approved EPRMP	Approved EPRMP		
Data source in Annex H							

- With kiln operation

The baseline ambient particulate concentration in initially-identified receptor areas is shown in Table 2.3.5, and the certificates of laboratory analyses are in Annex H. The results of baseline air quality sampling for TSP indicate the baseline values for Total Suspended Particulates are way below the specified NAAQS limits. Using the US EPA Air Quality Index in **Table 2.3. 5**, the air quality in the populated areas nearest the Plant site can be defined as **"Good".** There are no sources of industrial air pollution in Bay-ang, Ajuy.

Table 2.3. 5 Baseline Air Quality for Ambient Particulates

Station	Location	TSP (µg/Ncm)
A1	Near Brgy. Bay-ang, Brgy. Hall (Purok 4) (N 11° 02' 11.8" E 122° 56' 04.7")	39
A2	Sitio Nipa Open Basketball Court, Brgy. Bay-ang (Purok 1) (N 11° 02' 05.4" E 122° 56' 53.8")	25
National Ambient Air Quality Standard (NAAQS) for 24-hour TSP sampling		230
Sampling Methods		High-volume / Filtration

Table 2.3. 6 Air Quality Index for Particulates – 24 hr. Average

Air Quality Index	Level of Concern	Description
0 to 80	Good. No concern	Air quality is satisfactory, and air pollution poses little or no risk.
81-230	Fair	
51 to 100	Moderate	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
231 to 349	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
350 to 599	Very Unhealthy	The general public may experience health effects; members of sensitive groups may experience more serious health effects.
600 to 899	Acutely Unhealthy	Health alert: The risk of health effects is increased for everyone.
900 and higher	Emergency	Health alert: The risk of health effects is increased for everyone.

*Including PM30, PM10, PM2.5. Source: Annex A, DAO 2000-81

There are no industrial sources of SO_2 and NO_2 pollutants around the Project site specifically near the Bay-ang Barangay Hall and the Sitio Nipa (Brgy Bay-ang) open basketball court.

2.3.1. Degradation of Air Quality

The Project's sources of air pollution during the construction phase are particulates from earthworks and gaseous pollutants, sulfur dioxide (SO_2), carbon dioxide (CO_2), carbon monoxide (CO), volatile organic compounds (VOCs), and carbonic particulates (PM) from diesel fuel combustion for the operation of construction equipment. These particulate and gaseous pollution are time-bound, limited to the Construction Phase.

Hexavalent chromium is also released in metal welding operations. Breathing of high levels of hexavalent chromium causes irritation to the nose, such as runny nose, nosebleeds, and ulcers and holes in the nasal septum. Long term exposure is a known carcinogen.

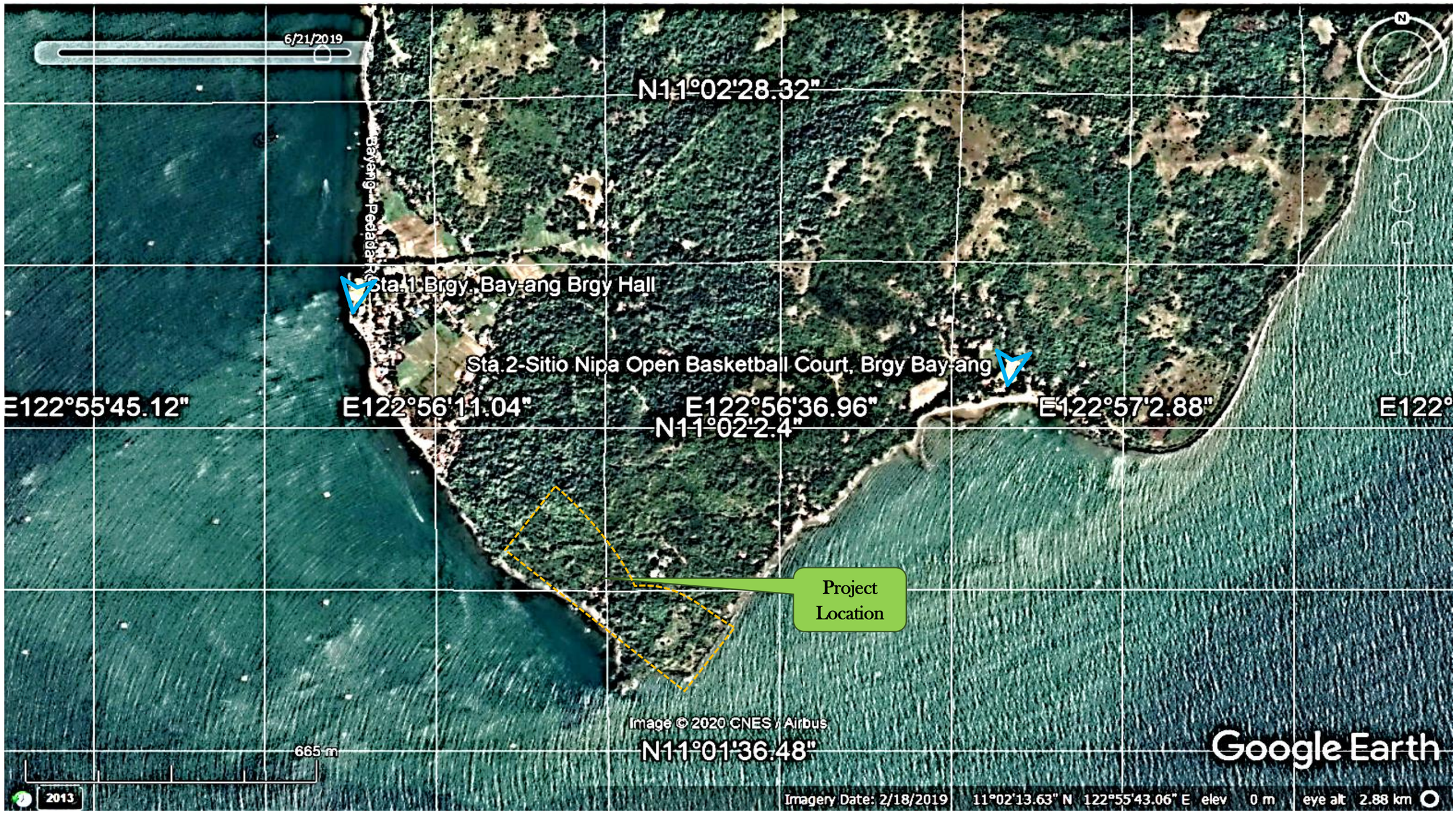


Figure 23.7 Baseline Air Quality Sampling Locations

2.3.1.1. Particulate Pollutants from Construction

Table 2.3.8 is an estimate of dust emissions during the construction phase, using emission factors in **Table 2.3.7** and the following formula from the United States Environmental Protection Agency (USEPA) AP42 – Compilation of Air Emission Factors:

Emission = activity emission factor x material silt fraction ÷ soil moisture content.

Source: AP 42, Fifth Edition, Volume I, Chapter 13, Heavy Construction Operations

Assumptions used:

a. Excavation volume of 50,000m^3 and the fill volume of 45,000m^3, considered as s bulk 95,000 m^3 from and on an area of 45,000 m2.
b. Overburden moisture 6%, Silt fraction, 6.9%
c. Haul truck silt content 4.3%, moisture 2.4%
d. No. of Construction Days = 280

Table 2.3. 7 Emission Factors for Uncontrolled Open Dust Sources

Activity	Particulates PM>30	Suspendable Particulates PM>15
Overburden Removal, Bulldozing, Site Preparation,	2.6	0.45
Grading	.0034	.0056
Loading of Debris on to Trucks	0.018	
Truck Transport of Debris	0.018	
Overburden Replacement	.0060	

Note: S=Silt content; M=Moisture Content

Emission Factors for Unpaved Roads

Formula used for deriving the unpaved road dust emission factors for publicly-accessible unpaved roads largely used by light vehicles is:

$$E = \frac{k\,(s/12)^a (S/30)^d}{(M/0.5)^c} - C \qquad (1b)$$

where k, a, b, c and d are empirical constants (Reference 6) given below and

E = size-specific emission factor (lb/VMT)
s = surface material silt content (%)
W = mean vehicle weight (tons)
M = surface material moisture content (%)
S = mean vehicle speed (mph) (30kph / 1.609344 = 18.64 mph)
C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

Source: USEPA AP42 Miscellaneous Sources 13.2.2 Unpaved Roads p.13.2.2-4

The metric conversion from ln/Vehicle Miles Traveled (VMT) to grams per Vehicle Kilometer Traveled used is 1 lb/VMT =281.9 g/VKT.

Reference 6: Constants used for unpaved road dust emission estimate

Constant	$PM_{2.5}$	PM_{10}	PM_{30}
K (lb/VMT)	0.18	1.8	6.0
Equivalent in g/VMT	50.742	507.42	1691.4

Constant	$PM_{2.5}$	PM_{10}	PM_{30}
a	1	1	1
b	-	-	-
c	0.2	0.2	0.3
d	0.5	0.5	0.3

The formula used in estimating particulate emissions for each activity in Table 2.3. 8 is:

$$E = A \times EF \times (1-ER/100)$$

where:

E = emissions A = activity rate EF = emission factor ER = overall emission reduction efficiency, %.

Source: USEPA AP42

Table 2.3. 8 Estimate of Annual Dust Emissions at Site During Construction

					Estimated Annual Emissions			
			Emission Factors		Uncontrolled		Controlled	
Activity	Area (m2)	No. Hrs. Worked	Particulates	Suspendable Particulates	Particulates (kg)	Suspendable Particulates (kg)	Particulates (kg)	Suspendable Particulates (kg)
			PM>30	PM>15				
Overburden Removal	450000	562.5	2.6s/M	0.45/M	1,681.88	291.09	168.19	29.11
Grading		562.5	0.0034	0.0056	1.91	3.15	0.19	0.32
Loading of Debris on to Trucks		675	0.018		12.15	0	1.22	nil
Truck Transport of Earth Materials (within site)		965	0.018		31.11	0	3.11	nil
Overburden Replacement		100.0	0.006		0.60	0	0.06	nil
Total					1,727.65	294.24	172.77	29.42

2.3.1.2. Estimate of Annual Volume of Fugitive (Road) Dust During Construction

The estimate for fugitive particulate emissions during construction phase makes use of the following particulate emission factors for transport through public-accessed unpaved roads computed as per formula above:

Table 2.3.8-1 Emission Factors for Unpaved Public Road

Emission Factor (kg/VKT)	$PM_{2.5}$	PM_{10}	PM_{30}
	0.55535105	7.3535105	14.807021

b) Use of access road Pedada-Bay ang with length of 2.76 kilometers

c) Estimated total weight of in-bound construction materials of 450,000 tons

d) use of 40-tonner trucks and container vans
e) In-bound and outbound trips are included

Table 2.3.8-2 Estimated Volume of Fugitive Road Particulate Emissions During Construction (tons)

	Uncontrolled			Controlled		
	$PM_{2.5}$	PM_{10}	PM_{30}	$PM_{2.5}$	PM_{10}	PM_{30}
Annual	22.76	301.39	606.68	3.41	45.21	91.03
Daily	0.07	0.91	1.84	0.01	0.14	0.28

The NAAQS limit for ambient particulates is 300 µg/Ncm for one-hour averaging. The total hourly uncontrolled particulate emissions estimated in **Table 2.3. 8** will exceed the NAAQS limit for ambient particulates.

Long term exposure to excessive ambient particulates severely affects the respiratory systems of all terrestrial animal life that exist from the ground up to ten meters above ground level. Carried by circulating wind currents and washed by rain to the sea, suspended particulates gradually sink into the water, may impede light penetration in the water column, and affect phytoplankton photosynthesis, affecting basic marine food production and eventually may coat, cover and suffocate coral communities.

2.3.1.3. Particulate Pollutants during Operation

A predictive digital dispersion model for project air pollutants was set-up and run to determine the concentrations and extent of dispersed air pollutants that project operations will generate. The model complied with the guidance under EMB MC 2008-003: Guidelines for Air Dispersion Modeling. TIER-4 Methodology was applied, using USEPA and EMB- approved dispersion model tool AERMOD, where the meteorological (metdata) accounts for land use, surface and upper-air temperature, and wind directions and their influence on mechanical and convective mixing, among other Planetary Boundary Layer (PBL) Parameters. The emission sources in the dispersion model include following: (1) Clinker and material handling at the jetty port; (2) Material Storage and Handling facilities composed of Material Stockyard and four (4) units Cement Silo; (3) Grinding Mill House; and (4) Cement Packhouse. Air pollution control facilities are listed in **Table 1.7**. The meteorological data used for the model was derived from the regional mesoscale meteorological model (MM5) for the area.

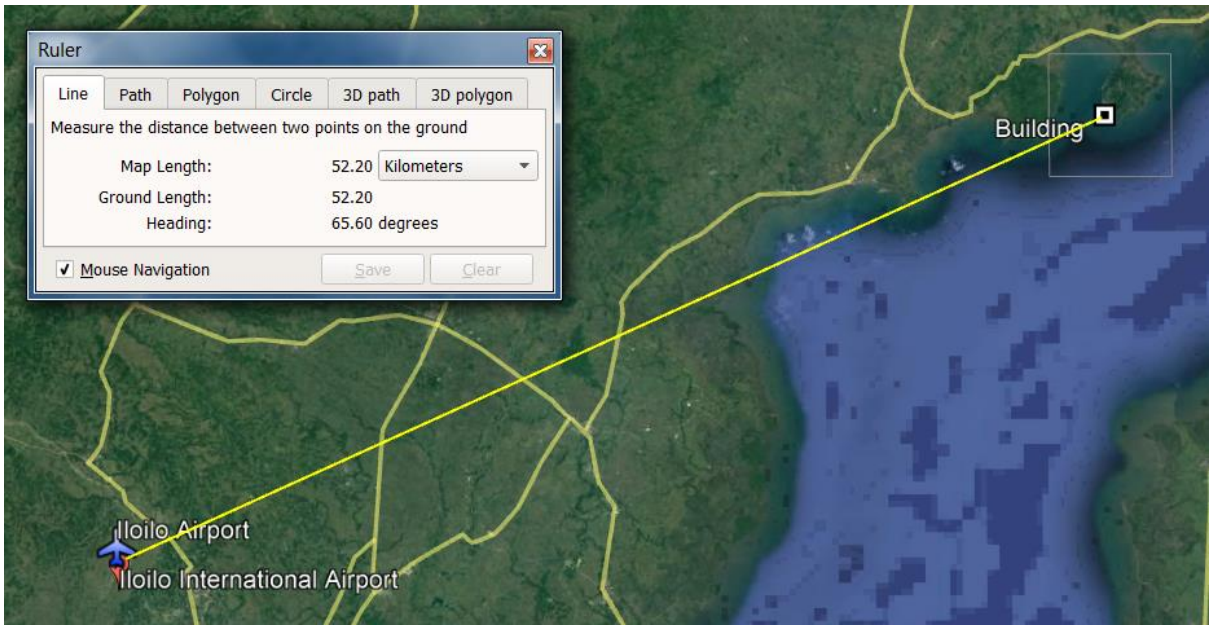


Figure 2.3. 8 Location of Iloilo (Meteorological Data Source) to Cemphil Plant

The terrain elevation data were obtained from a high-resolution database of the earth's topography collected during the Shuttle Radar Topography Mission (SRTM) (**Figure 2.3.** 9). AERMAP, the terrain preprocessor for the AERMOD air dispersion study, then processed the elevation data to calculate the hill height scale and elevations for receptors within a 6 km x 6 km model domain (Figure 2.3. 10).

Other technical aspects of the methodology in dispersion modeling are attached in **Annex J**.

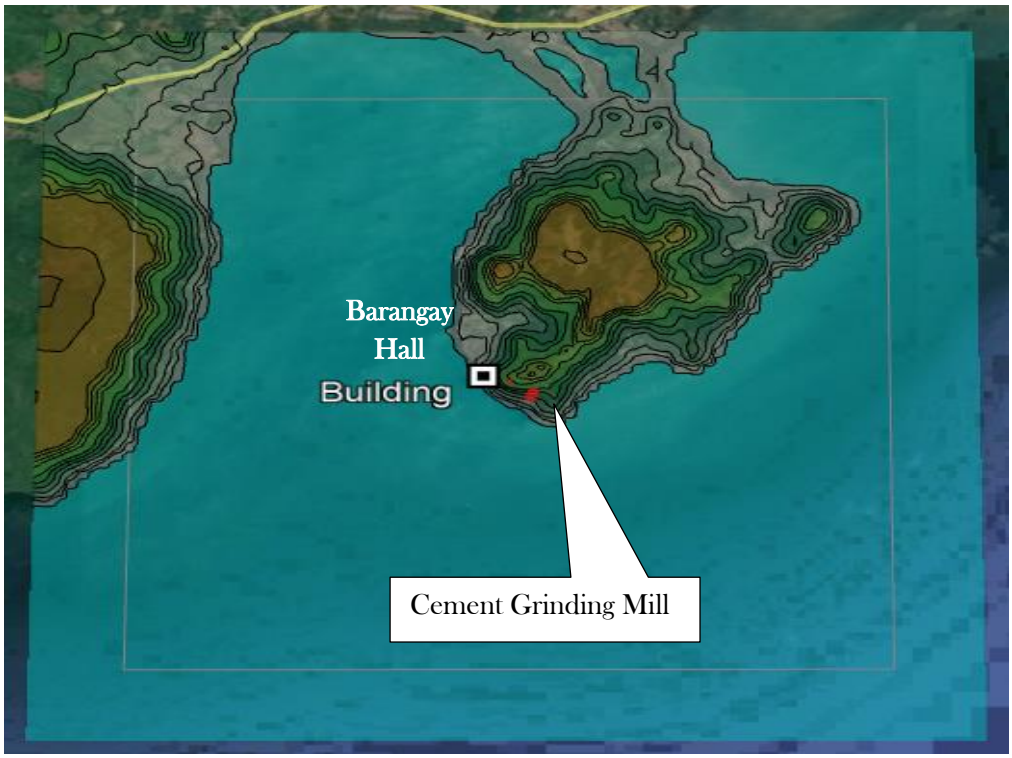


Figure 2.3. 9 Terrain SRTM Projection of Cemphil Project Site, Ayuy, Iloilo

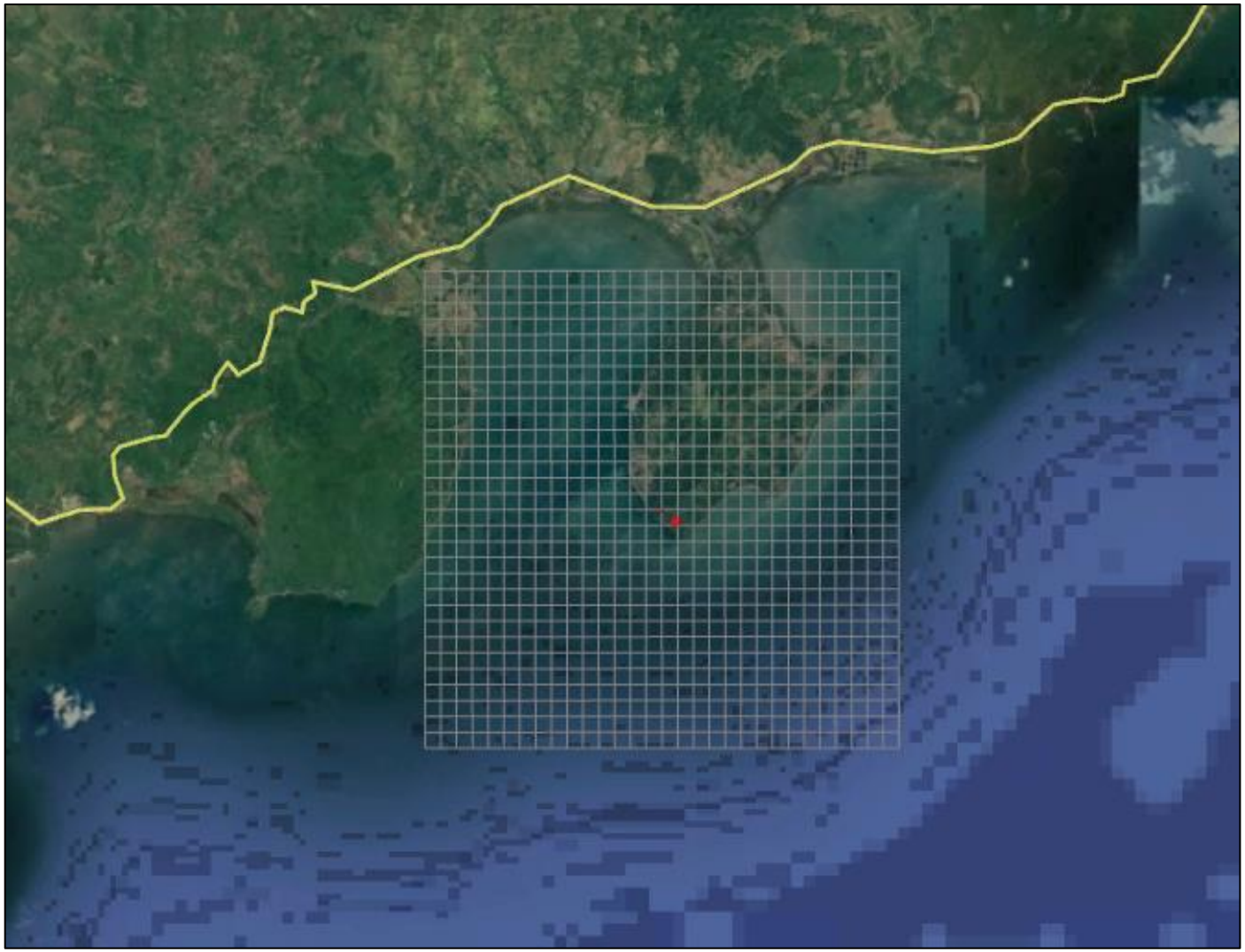


Figure 2.3. 10 Model Domain of the Study Area

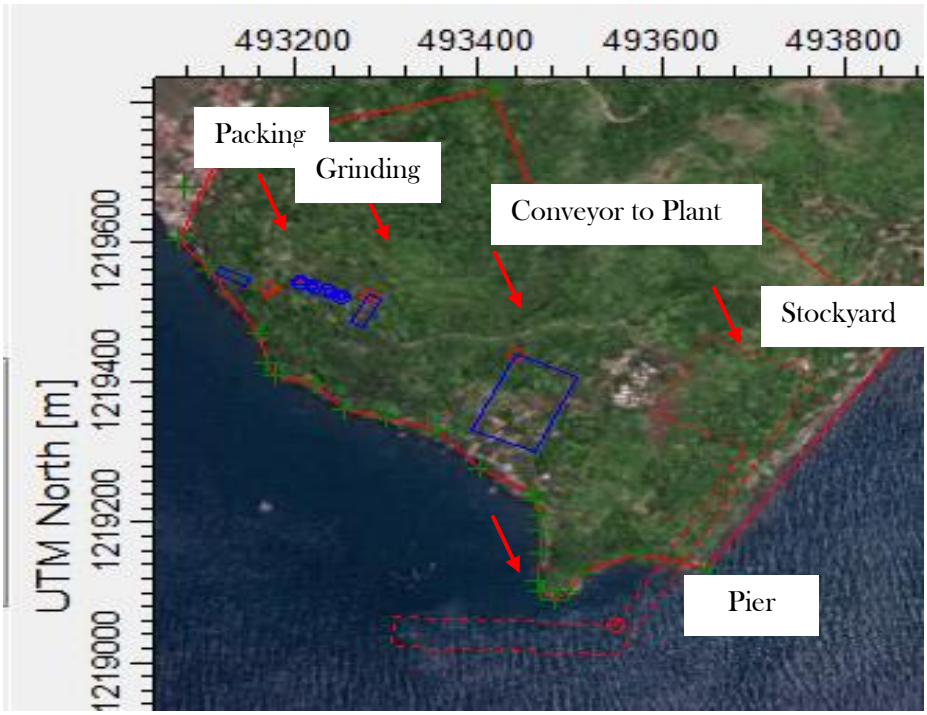


Figure 2.3. 11 Line Area Sources Including Jetty Storage and Conveyor Fugitive Emissions

Table 2.3. 9 Plant Emission Sources, Uncontrolled and Controlled

SOURCE ID	SOURCE	Cement Raw Material, Product Processing and Handling MT/yr	Uncontrolled TSP (g/sec/m2)	Controlled TSP (g/sec/m2)
SIL1	Cement Silo Unit 1	1,200,000	4.42E-01	4.42E-04
SIL2	Cement Silo Unit 2	1,200,000	4.42E-01	4.42E-04
SIL3	Cement Silo Unit 3	1,200,000	4.42E-01	4.42E-04
SIL4	Cement Silo Unit 4	1,200,000	4.42E-01	4.42E-04
GRND	Grinding	6,000,000	2.67E-01	2.67E-04
PCK	Packhouse	6,000,000	1.68E+00	1.68E-03
STCK	Stock Yard	6,000,000	1.58E-02	1.58E-05
Jetty Port Emission	Stock Yard, Conveyor	1,200,000	0.354	0.318

2.3.1.4. Result of Predictive Dispersion Model for Air Pollutants

2.3.1.1.1 Controlled Scenario

For the controlled 1-hour TSP run, the peak concentration is 717 ug/Ncm, falling approximately 20 m primarily towards the Southwest (SW) direction of the emission source equipment but within the Project fenceline. For 98 percentile controlled 1-Hour TSP run, the peak concentration is 254 ug/Ncm located also approximately 700 m towards the SouthWest (SW) direction. For 24-hour TSP run, peak concentration is 166ug/Ncm located 11.5 m towards SouthWest

(SW) direction. For 98 percentile controlled 24-Hour TSP run, the peak concentration is 125 ug/Ncm located also approximately 700 m towards the SouthWest (SW) direction. The result for 1 hour averaging time is above the NAAQ Standard of 300 ug/Ncm and the 24 hr guideline value of 230 ug/Ncm. The 1-hour hot spot area is within the fence line while the 24 hot spot area is in the bay area. One-hour runs, and twenty-four hour runs generate information on the highest predicted dispersed pollutants for this specified duration, from a defined source. Normally the dispersed pollutant levels also subside thereafter. "Controlled" conditions mean that the Project pollution control installations are factored-in the run. The percentile of occurrence of forecast dispersed pollutants is based on annual basis, that is, 365 days of the year is considered as 100% of the time, and 98% rank values indicate that these concentrations can most likely occur in 357.7 days of the year.

The one-hour and 24-hour runs indicate the peak predicted average ambient pollutant volume for that particular time period of measurement.

Table 2.3. 10 Summary of Maximum Ground Level Concentrations (GLC)

Uncontrolled								
Parameter	**Averaging Time**	**Concentration (µg/Ncm)**	**Longitude**	**Latitude**	**Distance* (m)**	**Dir**	**Limits**	**Remarks**
TSP	1 hr	16,094	122° 56' 38.303"	11° 1' 48.8748"	700	SW	300	in the water
TSP	24 hr	3,328	122° 56' 38.303"	11° 1' 48.8748"	700	SW	230	in the water
TSP	1 hr 98%ile	2,916	122° 56' 17.405"	11° 1' 54.3072"	20	SW	300	w/in workplace
TSP	24 hr 98%ile	2,011	122° 56' 17.405"	11° 1' 54.3072"	700	SW	230	w/in workplace
Controlled								
TSP	1 hr	717	122° 56' 38.303"	11° 1' 48.8748"	700	SW	300	in the water
TSP	24 hr	166	122° 56' 38.303"	11° 1' 48.8748"	700	SW	230	in the water
TSP	1 hr 98%ile	254	122° 56' 17.405"	11° 1' 54.3072"	20	SW	300	w/in workplace
TSP	24 hr 98%ile	125	122° 56' 17.405"	11° 1' 54.3072"	700	SW	230	w/in workplace

*From Cemphil Plant

2.3.1.1.2 Uncontrolled Scenario

The result of an uncontrolled scenario far exceeds the air quality standard of 300µg /Ncm for 24-hr averaging. For controlled 1-Hour TSP run, the peak concentration is 16094 ug/Ncm located approximately 528 m towards the SouthWest (SW) direction. For 98 percentile controlled 1-Hour TSP run, the peak concentration is 3328 ug/Ncm located also approximately 525 m towards the SouthWest (SW) direction. For 24-hour TSP run, the peak concentration is 2916 ug/Ncm located 520 m towards SouthWest (SW) direction. For 98 percentile controlled 1-Hour TSP run, the peak concentration is 2916 ug/Ncm located also approximately 525 m towards the SouthWest (SW) direction.

2.3.1.1.3 Receptor Areas

There are eight (8) communities within the project impact area of 6, 000 meters, identified as area Sensitive Receptor areas. Their locations indicated in **Figure 2.3. 12** and predicted air pollution levels when the project operates are listed in Table 2.3. 11.

Figure 2.3. 12 Area Sensitive Receptors Around the Project site

Table 2.3. 11 Maximum Ground Level Concentrations(GLC) in Area Sensitive Receptors(ASRs)

ASRs	Barangay	Longitude	Latitude	TSP (µg/Ncm)			
				1 hr	24 hr	1 hr 98%ile	24 hr 98%ile
Uncontrolled							
ASR1	Bay-ang Purok 1	122° 56' 43.559"	11° 3' 13.7556"	1,500	500	nil	20
ASR2	Pedada Purok 2	122° 56' 10.374"	11° 2' 44.8692"	1,500	500	nil	50
ASR3	Bay-ang Purok 4	122° 56' 7.382"	11° 2' 11.0076"	1,500	400	20	100
ASR4	Bay-ang Purok 5	122° 56' 11.868"	11° 2' 0.4272"	5,000	3,328	2,916	200
ASR5	Bay-ang Sitio Nipa	122° 56' 38.497"	11° 1' 55.3872"	6,500	3,328	2,916	2,011
ASR6	Bay-ang Purok 7	122° 56' 53.228"	11° 2' 6.0684"	1,500	500	100	200

ASRs	Barangay	Longitude	Latitude	TSP (µg/Ncm)			
				1 hr	24 hr	1 hr 98%ile	24 hr 98%ile
ASR7	Santiago, Barotac Viejo	122° 54' 51.235"	11° 3' 0.5112"	1,500	80	nil	nil
ASR8	Sitio Dalusan, Brgy Santiago, Barotac Viejo	122° 54' 55.894"	11° 2' 29.2236"	1,000	80	nil	nil
Controlled							
ASR1	Bay-ang Purok 1	122° 56' 43.559"	11° 3' 13.7556"	31.1	1.7	0.4	0.7
ASR2	Pedada Purok 2	122° 56' 10.374"	11° 2' 44.8692"	26.9	2.4	0.3	0.9
ASR3	Bay-ang Purok 4	122° 56' 7.382"	11° 2' 11.0076"	161.0	22.6	0.9	6.0
ASR4	Bay-ang Purok 5	122° 56' 11.868"	11° 2' 0.4272"	289.6	25.1	5.4	15.7
ASR5	Bay-ang Purok 6	122° 56' 38.497"	11° 1' 55.3872"	152.2	18.7	2.7	6.7
ASR6	Bay-ang Purok 7	122° 56' 53.228"	11° 2' 6.0684"	62.2	5.3	1.3	1.6
ASR7	Santiago, Barotac Viejo	122° 54' 51.235"	11° 3' 0.5112"	23.2	1.3	0.1	0.3
ASR8	Sitio Dalusan, Brgy Santiago, Barotac Viejo	122° 54' 55.894"	11° 2' 29.2236"	18.4	1.0	0.2	0.4
			Limits	300	230	300	230

The TSP concentrations in six the eight (8) identified receptor areas are within the air quality standards and guideline values when air pollution control equipment is operated and properly maintained.

Figure 2.3. 13 to Figure 2.3. 21 are important isopleths resulting from the dispersion model of project pollutants.

2.3.1.1.4 Isopleths of Controlled Scenario

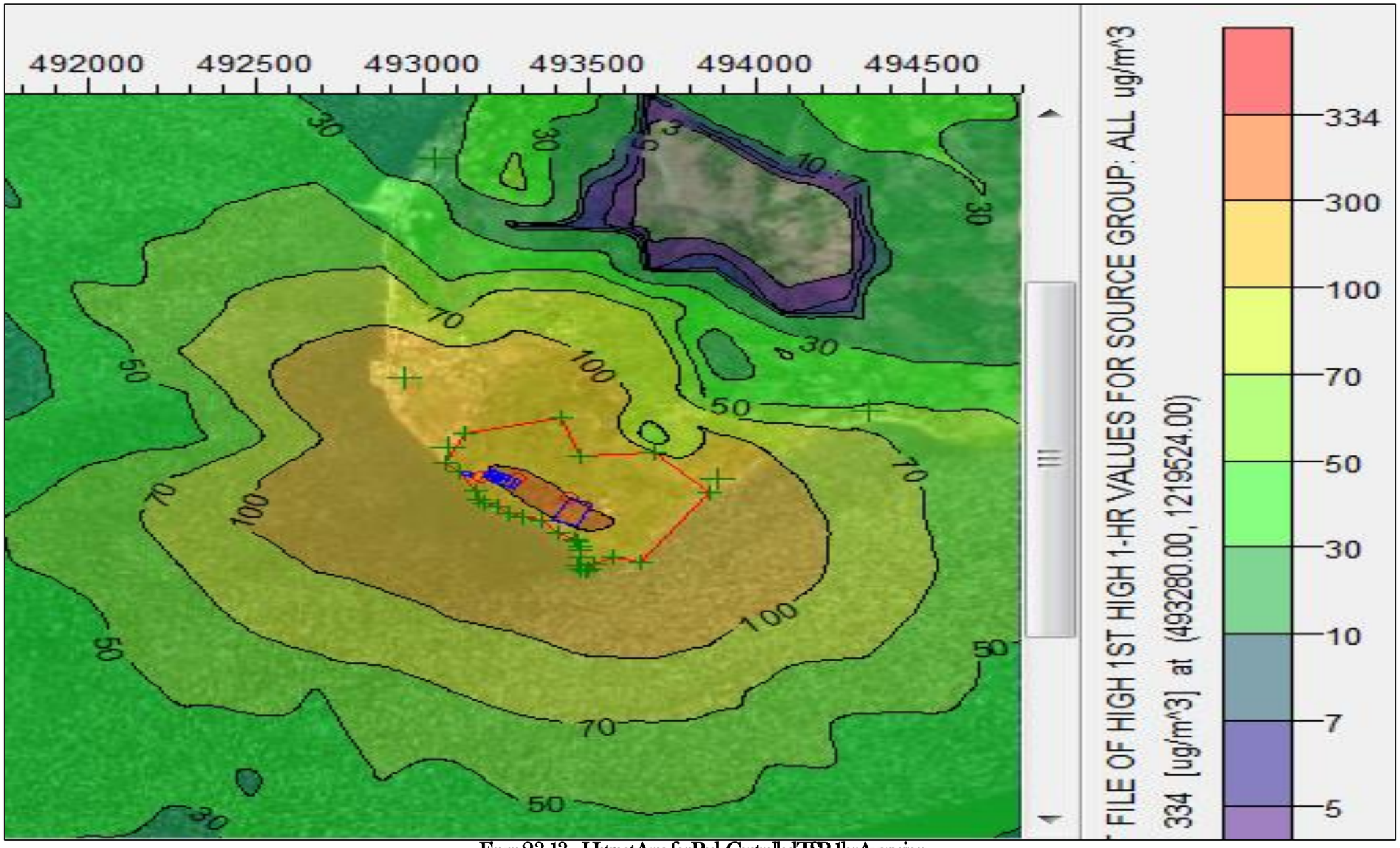


Figure 2.3.13 Hotspot Area for Peak Controlled TSP, 1hr Averaging

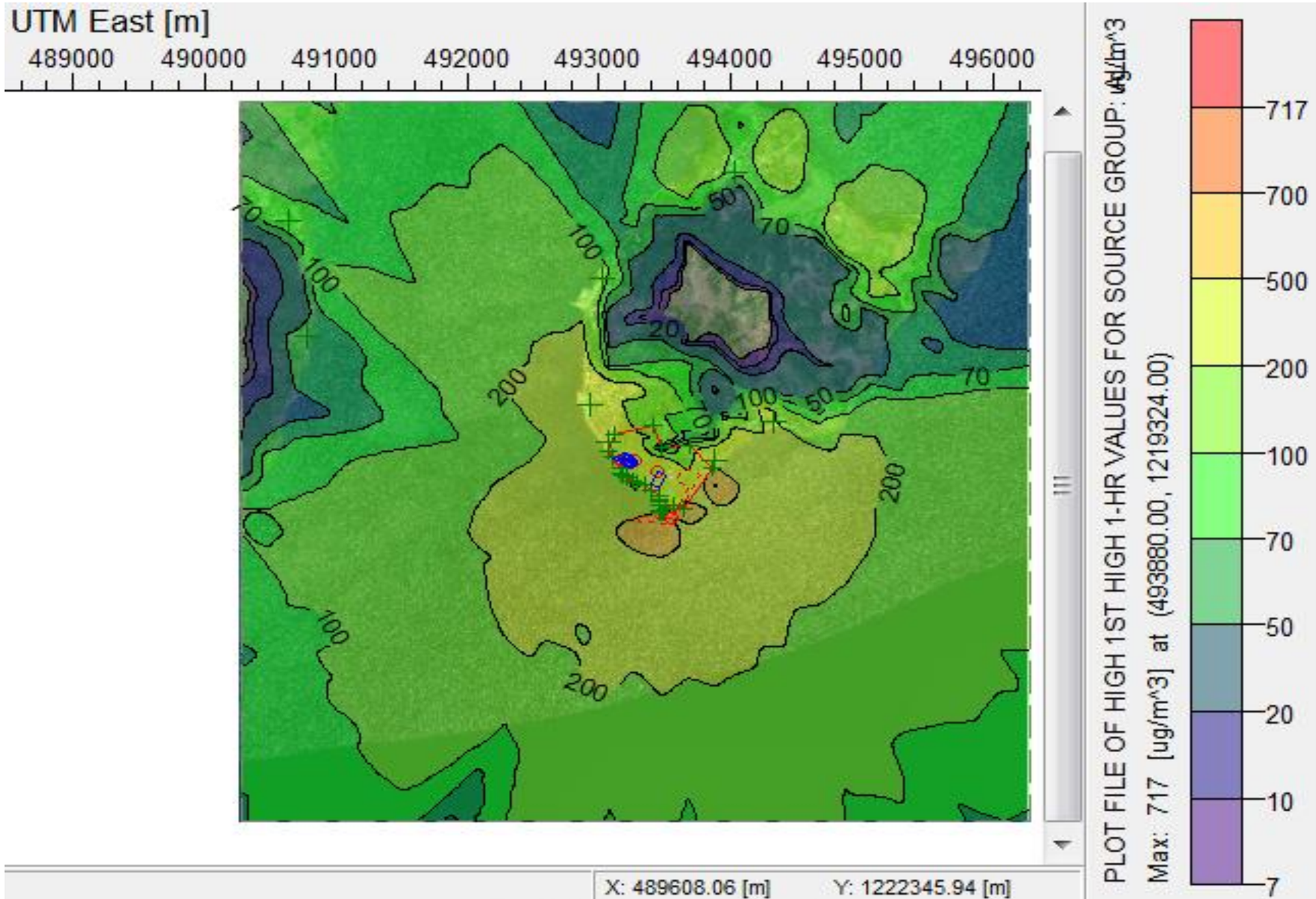


Figure 23.14 Peak Controlled TSP 1hr Averaging

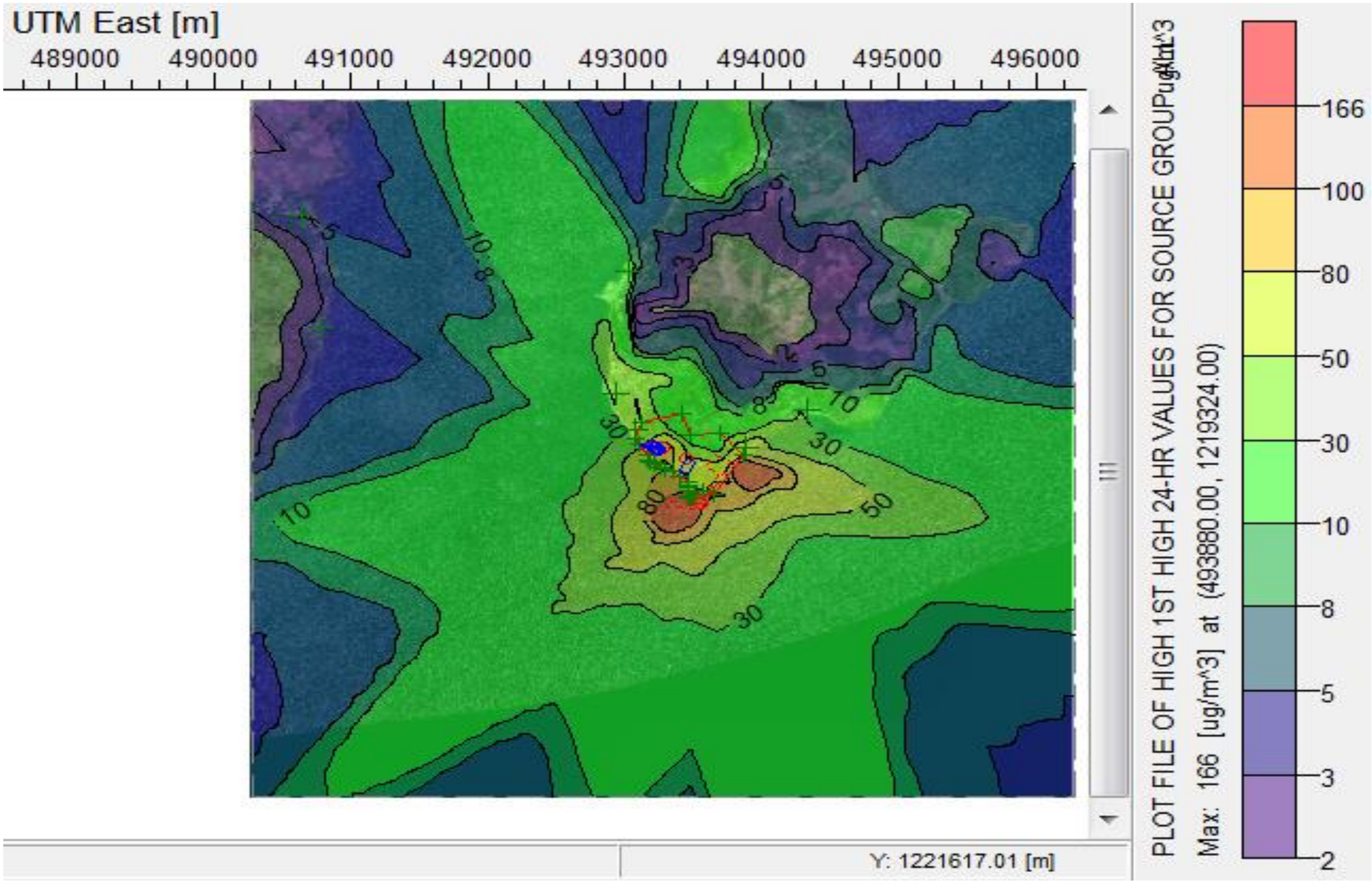


Figure 2.3.15 Peak Controlled TSP, 24hr Averaging

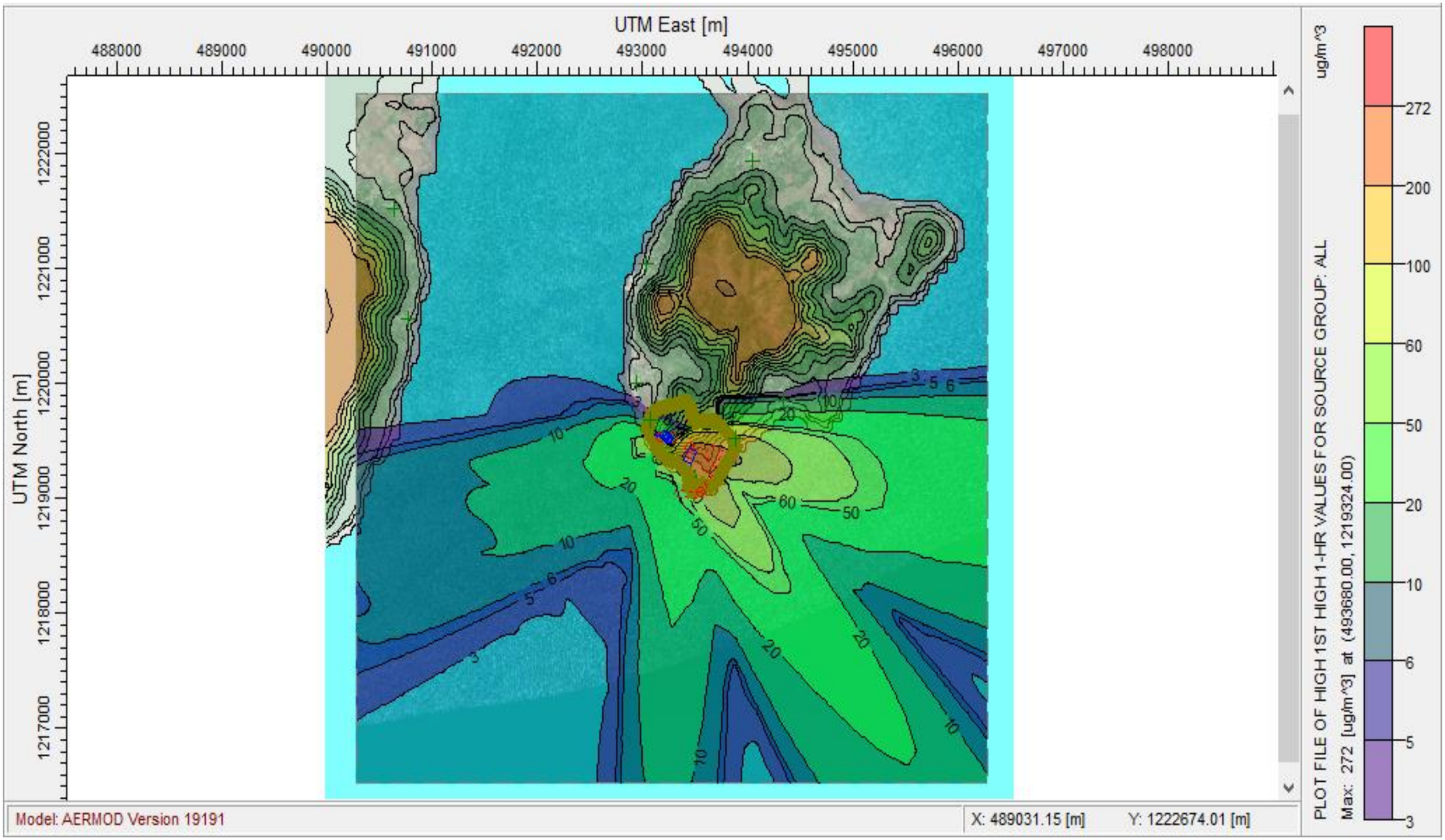


Figure 23.16 Controlled TSP 1hr 98 Percentile

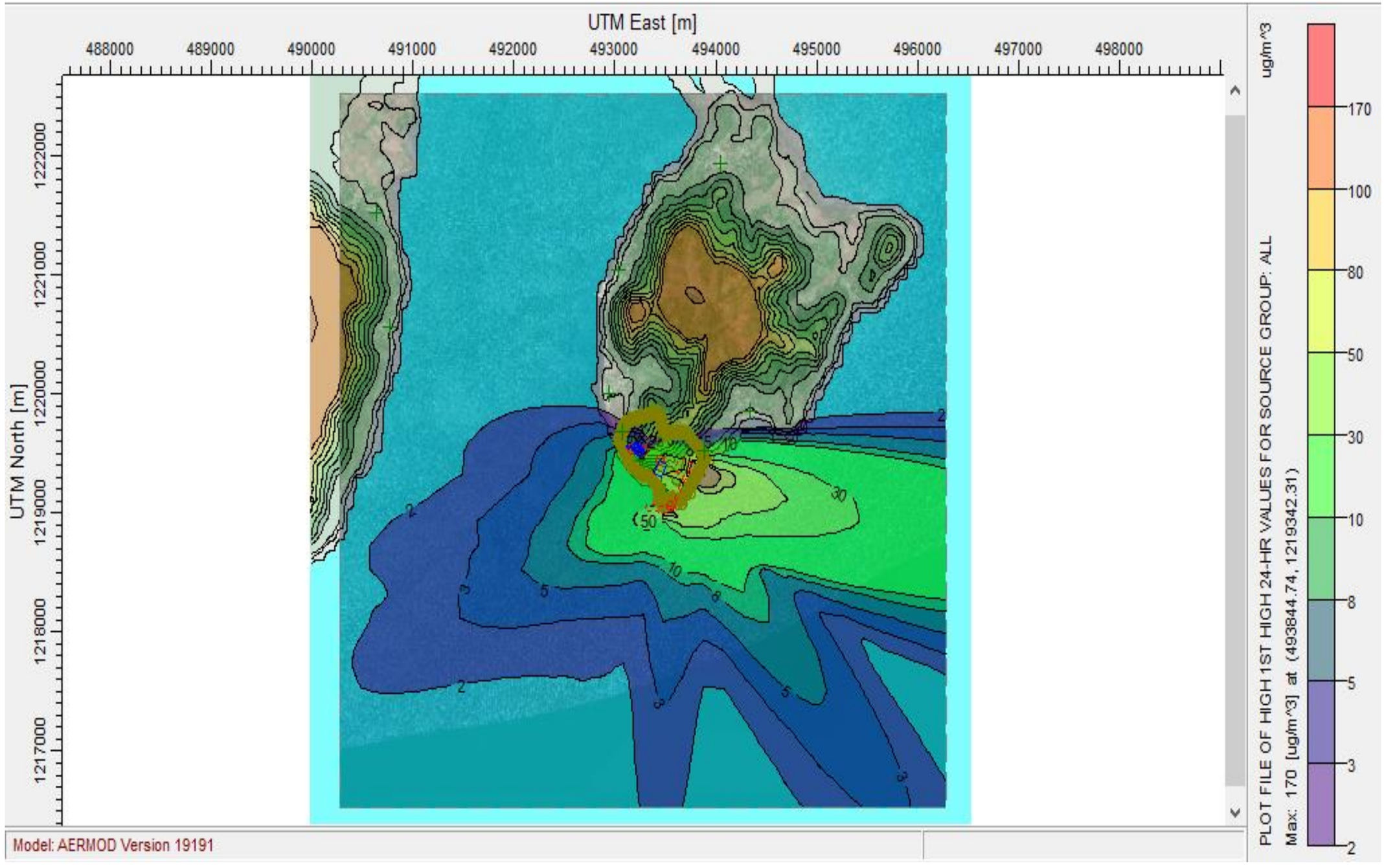


Figure 2.3.17 Controlled Total Suspended Particles – TSP (24 Hr) 98 Percentile

2.3.1.1.5 Uncontrolled Scenario

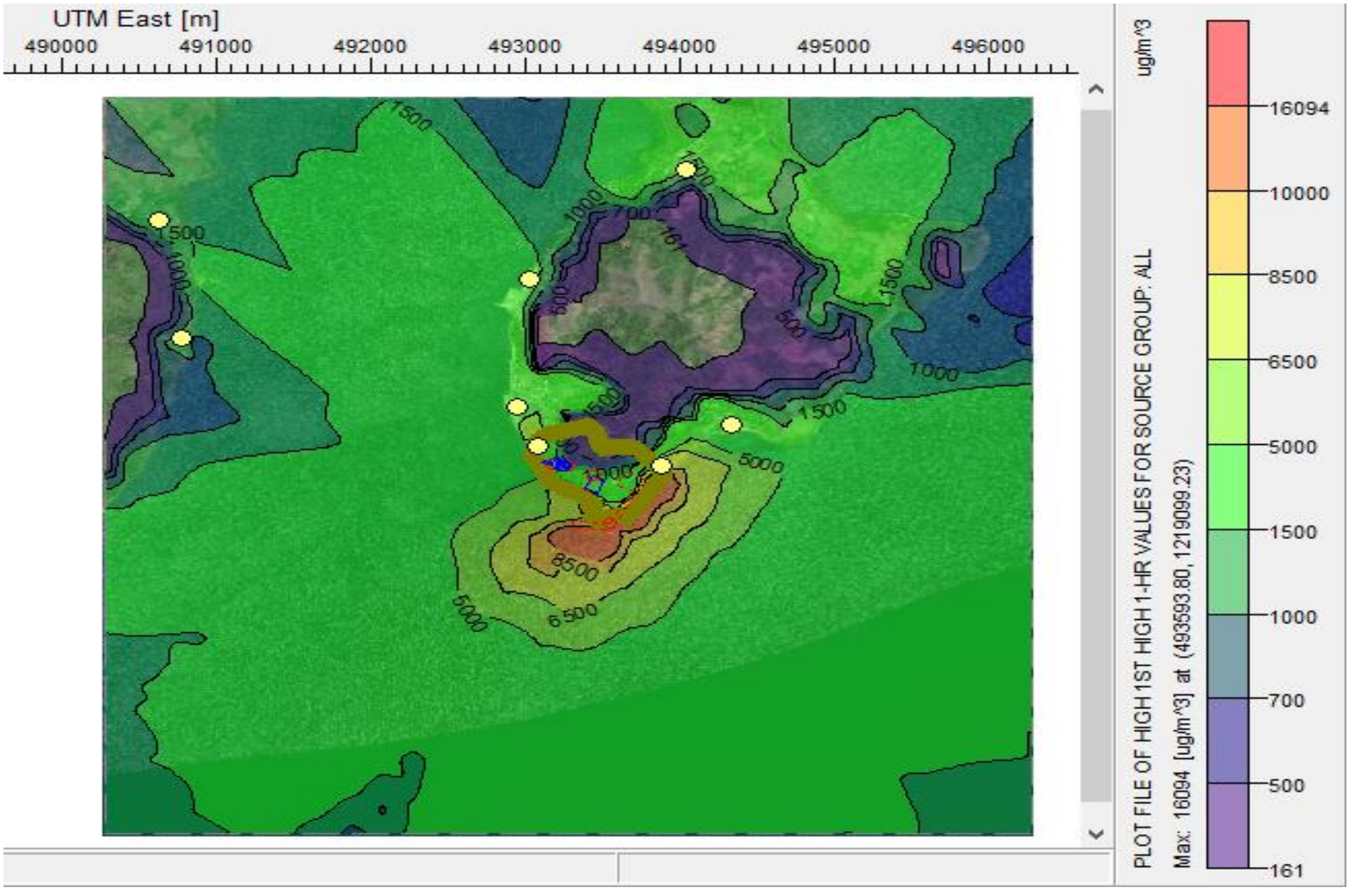


Figure 2.3.18 Uncontrolled Peak TSP with ASRs, 1-HR Averaging

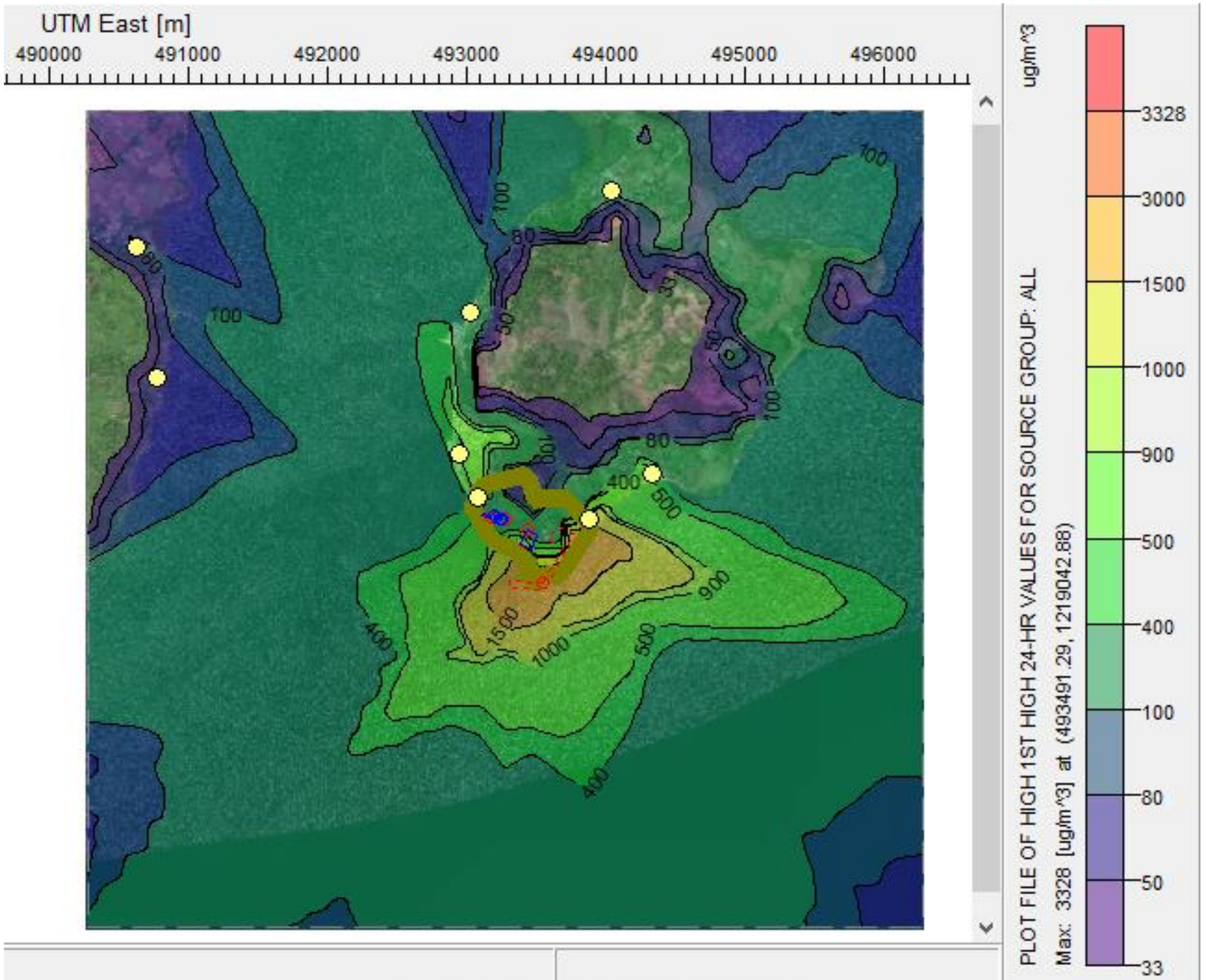


Figure 23.19 Uncontrolled Peak TSP 24HR WITH ASRs

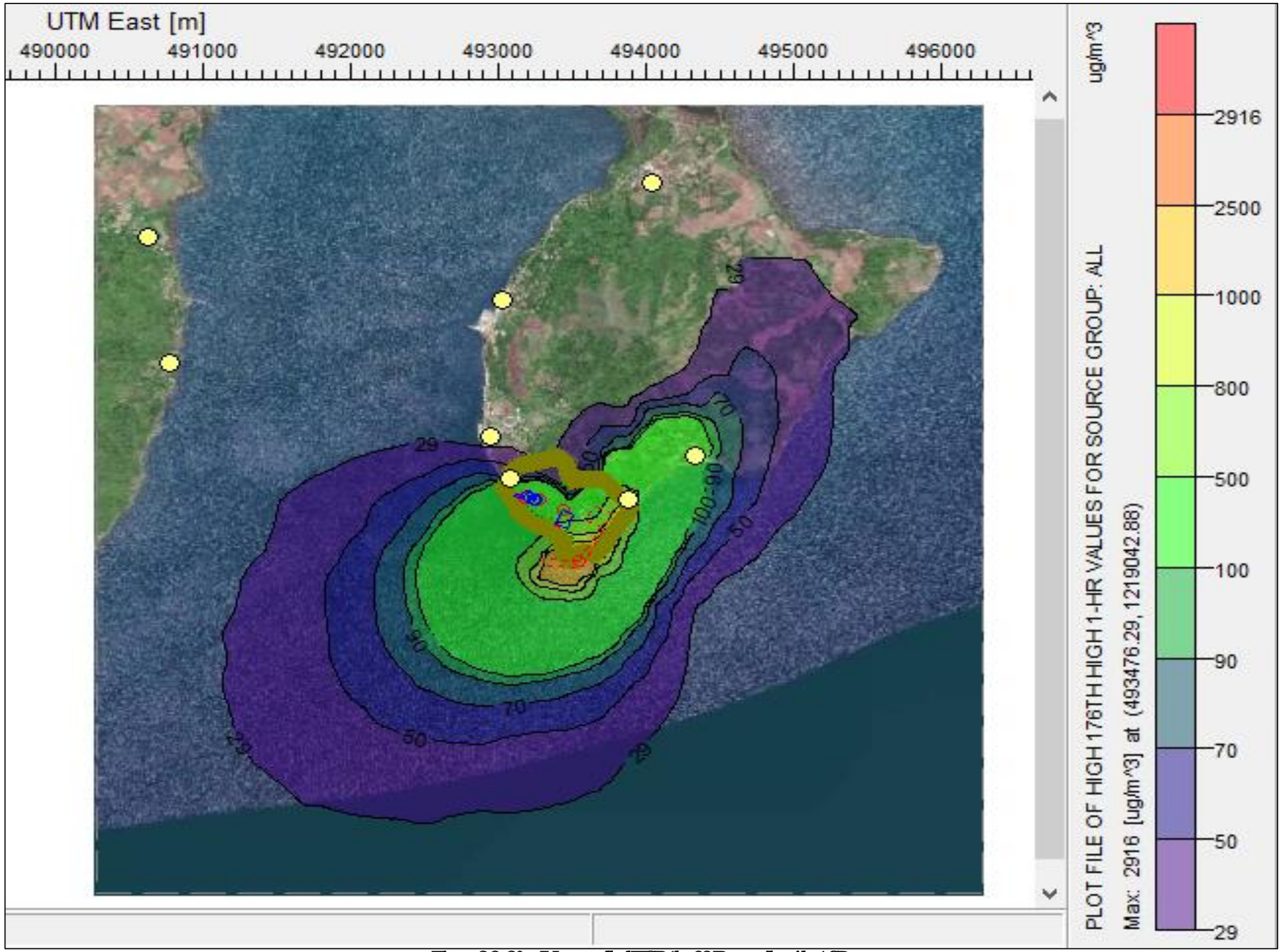


Figure 2.3.20 Uncontrolled TSP 1hr 98 Percentile with ASRs

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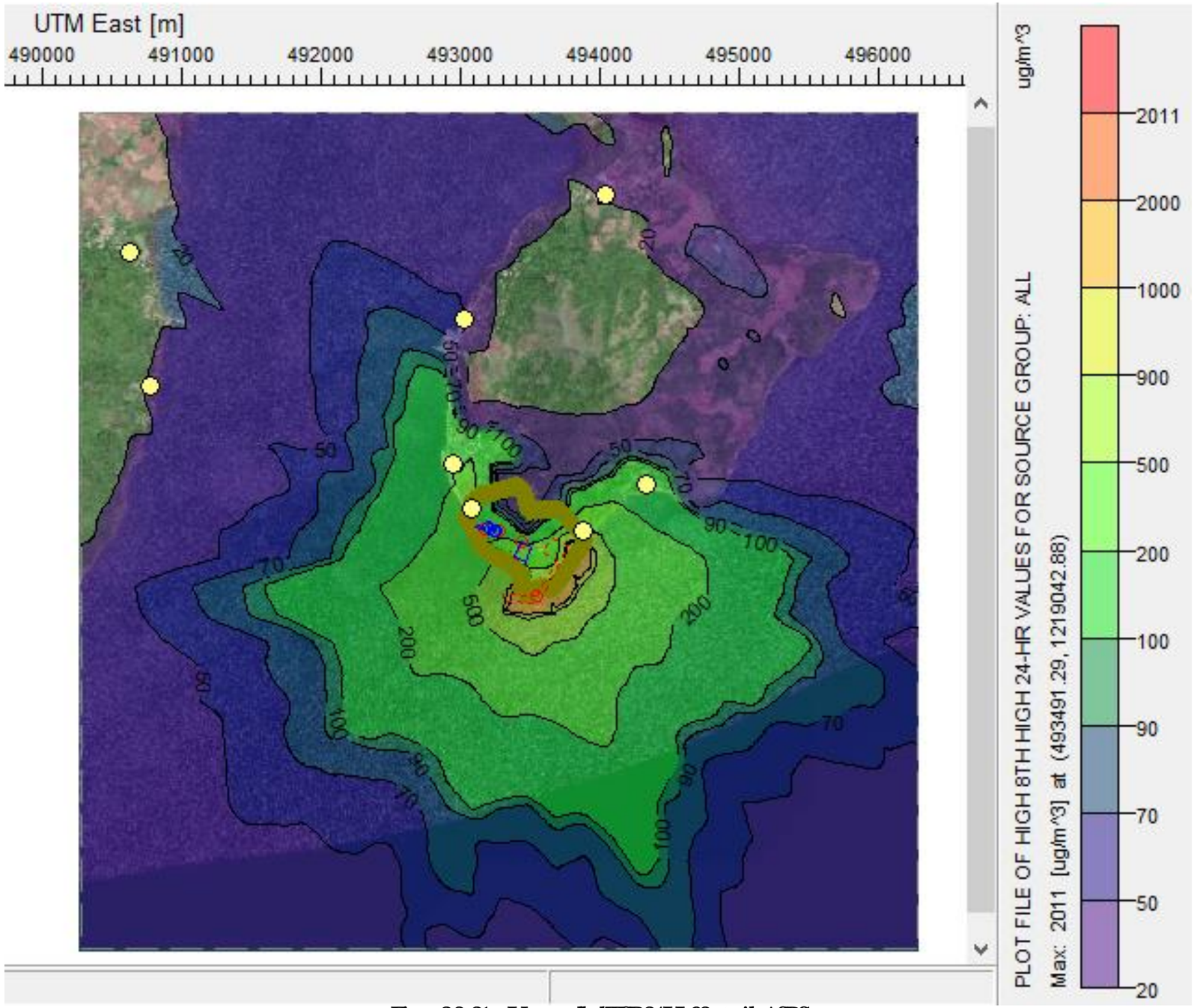

Figure 2.3.21 Uncontrolled TSP 24Hr 98% with ASRS

Under controlled conditions, TSP concentration in ambient air in 98% of time, both at 1 hour and 24-hour averaging are forecast to be within the National Ambient Air Quality Standard Limits. However, there is an expected TSP exceedance that could occur about for one hour in one year (Table 2.3. 12.) When the project operations do not install or operate air pollution control devices as stated in Table 1. 7, project dust emissions are expected to exceed the air quality standards (Table 2.3. 13).

Table 2.3. 12 Summary of Dispersion Model Run Result for Controlled Condition

Parameter	Ave.	Concentration (ug/Ncm)	Long	Lat	Distance (m)	Dir	Limits	Remarks
TSP	1 hr	717	493880	1219324	700	SW	300	in the water
TSP	24 hr	166	493880	1219324	700	SW	230	in the water
TSP	1 hr 98%ile	254	493246	1219491	20	SW	300	Within workplace
TSP	24 hr 98%ile	125	493246	1219491	700	SW	230	Within workplace

Table 2.3. 13 Summary of Dispersion Model Run Result for Uncontrolled Condition

Parameter	Ave.	Concentration (ug/Ncm))	Long	Lat	Distance (m)	Dir	Limits	Remarks
TSP	1 hr	16094	493594	1219099	700	SW	300	in the water
TSP	24 hr	3328	493491	1219043	700	SW	230	in the water
TSP	1 hr 98%ile	2916	493476	1219043	20	SW	300	Within workplace
TSP	24 hr 98%ile	2011	493491	1219043	700	SW	230	Within workplace

2.3.2. Fugitive Road Particulate Emissions from Cement Transport

The fugitive road particulate emissions from transport of cement products are estimated based on product transport through the paved Bay-ang – Pedada Coastal road with length of 811 meters, connecting to unpaved section in Pedada of about 1 kilometer then to the paved section from Pedada to the junction with Iloilo East Coast-Capiz Road (National Highway) (length 2.2 kilometers).

The transport will be by 40-tonner trucks, with an average 30 kph travel speed. At full production and assuming 70% of product dispatch is by land, there will be 30,000 outgoing truck-trips for 1,200,000 metric tons of cement per year.

The quantity of particulate emissions from resuspension of loose materials on the road surface due to vehicle travel on a dry paved road is estimated using the empirical expression from USEPA AP42 Chapter 13 "Miscellaneous Sources"

$$E = k\,(sL)^{0.91} \times (W)^{1.02}$$

In the estimate in Table 2.3. 14, the assumptions used are:

E = particulate emission factor (having units matching the units of k
k = particle size multiplier for particle size range and units of interest
sL = road surface silt loading 11.5g/m2
W = Average weight (tons) of vehicles travelling the road (40 tons)

Table 2.3. 14 Particle Size Multiplier for Paved Road Equation

Size range[a]	Particle Size Multiplier k[b]		
	g/VKT	g/VMT	lb/VMT
PM-2.5[c]	0.15	0.25	0.00054
PM-10	0.62	1.00	0.0022
PM-15	0.77	1.23	0.0027
PM-30[d]	3.23	5.24	0.011

Table 2.3. 15 Computed Paved Road Emission Factors (g/VKT)

$PM_{2.5}$	PM_{10}	PM_{15}	PM_{30}
64.05	264.72	328.77	1,379.12

Table 2.3. 16 Estimate of Resuspended Road Dust From Product Transport

ANNUAL	Uncontrolled				Controlled			
Production (mta)	600,000			1,200,000	600,000			1,200,000
tons	Paved Road	Unpaved Road	Total	Paved Road	Paved Road	Unpaved Road	Total	Paved Road
Road Length (km)	3.011	1		4.011	3.011	1		
$PM_{2.5}$	2.02	5.83	7.86	5.39	0.30	0.87	1.18	0.81
PM_{10}	8.37	77.21	85.58	22.30	1.26	11.58	12.84	3.34
PM_{15}	10.39		10.39	27.69	1.56	-	1.56	4.15
PM_{30}	43.60	155.47	199.08	116.16	6.54	23.32	29.86	17.42
Total	**64.39**	**238.52**	**302.91**	**171.55**	**9.66**	**35.78**	**45.44**	**25.73**
DAILY	**0.20**	**0.75**	**0.96**	**0.54**	**0.03**	**0.11**	**0.14**	**0.08**

It is assumed that by Year 3 when Phase 2 will enter commercial production, the 1-kilometer unpaved coastal road section in Barangay Pedada will be concreted under the DPWH Roll-It program (Roads leveraging linkages of industry and trade) under which the section is already listed.

2.3.2.1. Increase in Ambient Noise Level

Sampling was conducted on July 5 to 7, 2019 in the same air quality sampling locations in Figure 2.3. 7 with the sampling results summarized in **Table 2.3. 17**. As may be noted, the noise level in the noise sampling locations are within the standards for residential areas. The surrounding land uses are residential and the setting is rural.

Table 2.3. 17 Baseline Noise Levels in Potential Impact Receptor Communities

Conducted June 5 to 7, 2019

Station	Location	Actual Time / Time Bracket	Noise, dB	NPCC Standard for Class A Area (Residential Area)
N1	Near Brgy. Bay-ang, Brgy. Hall (N 11° 02' 11.8" E 122° 56' 04.7")	0545H / Morning	48	50
		1003H / Daytime	54	55
		2047H / Evening	48	50
		2321H / Nighttime	44	45
N2	Sitio Nipa Open Basketball Court, Brgy. Bay-ang (N 11° 02' 05.4" E 122° 56' 53.8") (Purok1)	0705H / Morning	49	50
		1305H / Daytime	52	55
		2008H / Evening	48	50
		2230H / Nighttime	42	45
Sampling Methods			Direct reading	

Source: Direct Sampling by FastLab

Noise will be generated by heavy equipment during construction and by operating equipment during operation. The noise attenuation calculation was undertaken to predict the potential increase in noise emanating from the perceived at area sensitive receptors, utilizing the formula:

$$L=10\log_{10}(10^{L1/10}+10^{L2/10}+10^{L3/10}+\ldots+10^{Ln/10})$$

Where L: Compound vibration level (dB),

n: The number of vibration source,

Ln: Vibration level from each vibration source (dB).

Reference: Handbook of mitigation measures for noise and vibration from construction works, 3rd edition, 2001. JICA Survey Team, Cagayan de Oro Flood FRMP Project

The source locations are described in **Table 1.2**. The Area Sensitive Receptors (ASR) are Purok 5, Purok 1, and the Bay-ang Barangay Hall (Purok 4) (see **Table 2.4.1**). These communities are closest to the Plant.

2.3.2.2. Noise Impact during Construction

Table 2.3. 18 provides information on the expected noise levels from construction equipment. **Table 2.3. 19** presents the expected noise levels at the Area Sensitive Receptors during the construction phase. The computation assumes the maximum number of construction equipment operating at the same time. **Figure 2.3. 22** shows the land elevation between Cemphil Plant and the nearest major settlement area.

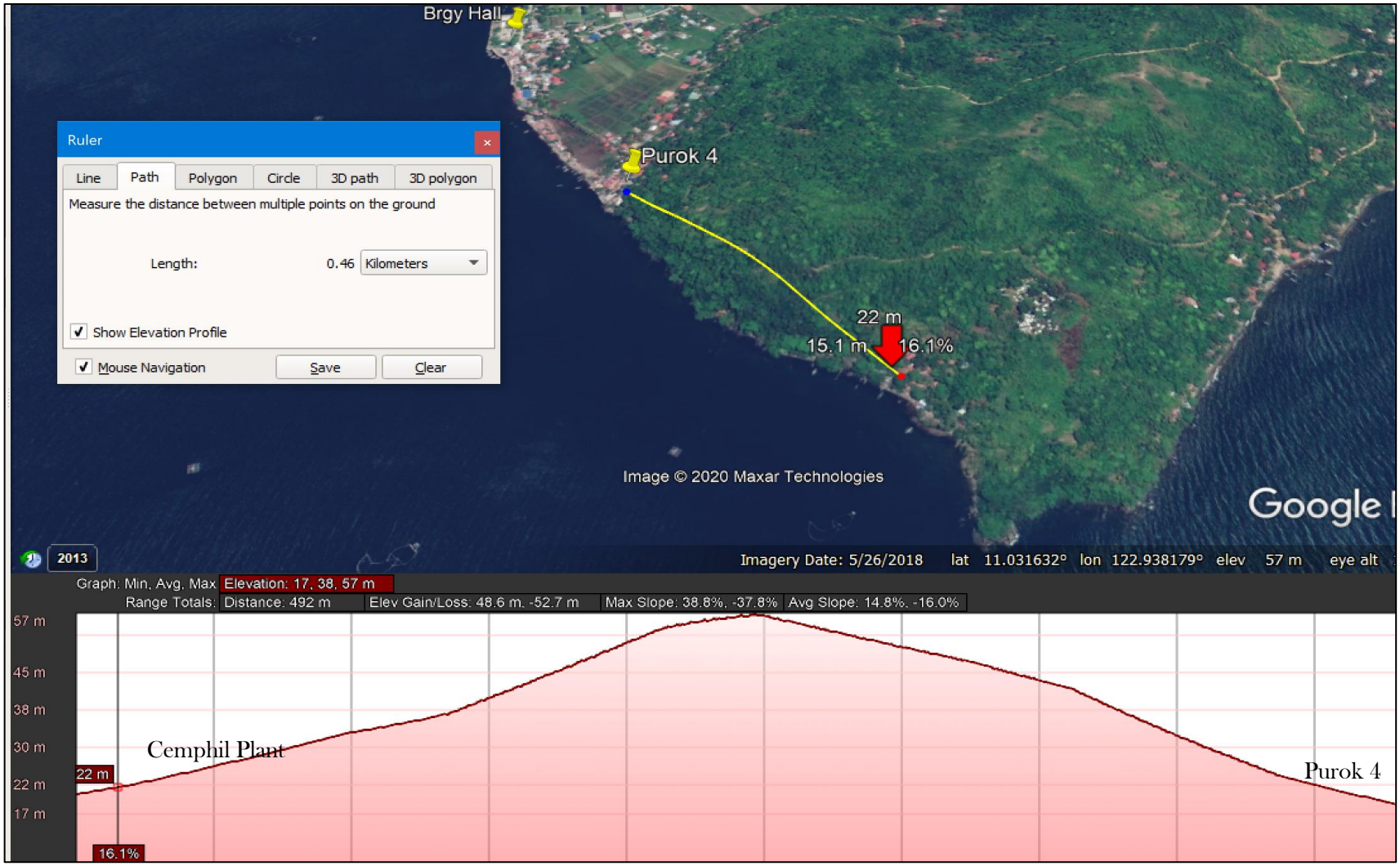

Figure 2.3. 22 Land Elevation Between Cemphil Plant and Nearest Major Settlement Area

Table 2.3. 18 Expected Noise Levels from Heavy Equipment, dbA

Equipment	Distance (m)				
	15	30	60	120	240
Front Loader	75	69	63	57	51
Backhoes	85	79	73	67	61
Graders	88	82	76	70	64
Trucks	91	85	79	73	67
Concrete Mixers	82	79	73	67	61
Cranes	83	77	71	65	59
Generators	78	72	66	60	54
Compressors	81	75	69	63	57

Source: Larry W. Canter, Environmental Impact Assessment, New York, 1977

Table 2.3. 19 Expected Uncontrolled Noise During Construction Based on Distance

				Distance from Project to: (in km)			Perceptible Project Noise level (dBA)		
Equipment	Units	noise from 1m	Total Equipment Noise	Purok 4	Purok 1	Barangay Hall	At Purok 4	At Purok 1	At Barangay Hall
Backhoe	1	85	85	0.4	0.53	0.9	32.96	30.51	25.92
Front Loader	1	83	83	0.4	0.53	0.9	30.96	28.51	23.92
Haul Trucks	2	100	200	0.47	0.51	0.91	146.56	145.85	140.82
Bulldozer	1	110	110	0.47	0.51	0.91	56.56	55.85	50.82
Graders	1	110	110	0.50	0.51	0.91	56.02	55.85	50.82
Concrete Mixers	1	90	90	0.51	0.49	0.92	35.85	36.20	30.72
Crane	1	85	85	0.44	0.52	0.89	32.13	30.68	26.01
Generator	1	70	70	0.40	0.53	0.90	17.96	15.51	10.92
effective dB rating							146.56	145.85	140.82

While the noise from construction equipment may exceed the standard, there is a hill with a top elevation at 57 meters above sea level, between Cemphil Plant site and the nearest major human settlement area (see **Figure 2.3. 22**). Because this landform also serves as a barrier, the noise emitted by construction equipment may be hindered and absorbed by the surrounding vegetation, making the noise almost imperceptible or tolerable in the nearby residential areas when mitigating measures are implemented.

2.3.2.3. Noise Impact during Operation

Table 2.3. 20 Expected Uncontrolled Noise During Plant Operation

		Distance from Project to: (in km)			Perceptible Project Noise level (dBA)		
Equipment	Noise from 1m	Purok 1	Purok 4	At Barangay Hall	At Purok 1	At Purok 4	At Barangay Hall
Crane	85	1	0.7	1.2	25.00	28.10	23.42
ball mill	*110*	0.47	0.51	0.91	56.56	55.85	50.82
finish mill grinding	*220*	0.50	0.51	0.91	166.02	165.85	160.82
Conveyor	*65*	1.00	0.70	1.20	5.00	8.10	3.42
machine shop	*90*	0.51	0.49	0.92	35.85	36.20	30.72
packhouse	*90*	0.44	0.52	0.89	37.13	35.68	31.01

Equipment	Noise from 1m	Distance from Project to: (in km)			Perceptible Project Noise level (dBA)		
		Purok 1	Purok 4	At Barangay Hall	At Purok 1	At Purok 4	At Barangay Hall
effective dB rating					166.02	165.85	160.82

Source: Larry W. Canter, Environmental Impact Assessment, McGraw-Hill, New York, 1977

2.3.2.4. Noise from Transport

The perceived 40-tonner truck noise at 10 meters distance is 65 DbA; the truck perceptible noise at 1km distance is 25 dBA. For Phase 1 at 600,000 metric tons annual production, an average of 2 trucks (one for outgoing and one for incoming) will pass through the populated area near Barangay Hall and onward to Bay-ang Junction at National Highway every thirteen minutes. During Phase 1 production, an average of nine (9) to ten (10) trucks will pass near residential areas along the Plant access roads daily, for 310 days of the year. The noise of one operating truck is above the threshold for residential areas. At 30kph travel speed, the truck can cover 1 km of distance in 1.8 minutes. While each truck noise tends to dissipate in 1.8 minutes as the vehicle is one (1) kilometer away from a receptor, the total expected noise level from two (2) cement haul trucks moving in opposite directions may exceed the noise level prescribed for light industrial areas during morning and evening runs (see **Table 2.3. 21**).

Table 2.3. 21 NPCC 1978 Rules and Regulations for Noise in General Areas

Classification	Description	Maximum Allowable Noise Levels dB(A)			
		Morning (5 AM - 9 AM)	Daytime (9 AM - 6 PM)	Evening (6 PM-10 PM)	Nighttime (10 PM-5 AM)
AA	Section or contiguous area that requires quietness (e.g. area within 100 m from school sites, nursery schools, hospitals and special homes for the aged)	45	50	45	40
A	Section or contiguous area primarily used for residential purposes	50	55	50	45
B	Section or contiguous area primarily used for commercial purposes	60	65	60	55
C	Section primarily reserved as a light industrial area	65	70	65	60
D	Section primarily reserved as a heavy industrial area	70	75	70	65

2.3.3. Change in the local micro-climate

Changes in local microclimate are expected due to vegetation clearing and construction of concrete buildings that reflect solar heat throughout the construction phase. During operations, this change is expected to persist in the first five (5) years as plant growth in landscaped and revegetated areas is not yet sufficient to replace lost vegetation cover. After five (5) years, however, the local microclimate is expected to be more resilient as vegetation flourishes.

The project will not include clinker production or radiated heat by-products from kiln operation (kilns operate optimally at 1,400°C). In contrast, the project will operate a hot air furnace for drying wet limestone. Unlike the heat radiation by-product in kiln operation, the temperature of the hot air furnace will only be in the range of 115° C to 230°C.

The heat generated in the grinding process causes gypsum ($CaSO_4.2H_2O$) to lose water, forming bassanite ($CaSO_4.0.2\text{-}0.7H_2O$) or γ -anhydrite ($CaSO_4. \sim 0.05H_2O$). The latter minerals are rapidly soluble, and about 2% of these in cement is needed to control tricalcium aluminate hydration. If more than this amount forms, crystallization of gypsum on their re-hydration causes "false set" – a sudden thickening of the cement mix a few minutes after mixing, which thins out on re-mixing. This is caused by high milling temperature. Obtaining the optimum amount of rapidly soluble sulfate requires milling with a mill exit temperature within a few degrees of 115°C. Complete dehydration of this mixture yields the optimum 2% γ -anhydrite.

The replanted trees will serve as a heat sink, which will mitigate the rise of ambient temperature due to the increase of concrete buildings in the Plant site.

Table 2.3. 22 Summary Impact Assessment on the Air Environment

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandon-ment	
Degradation of Air Quality	The Project will generate dust in excess of the National Ambient Air Quality Standard, if without air pollution control measures	✔	✔		Dust suppression through watering of dusty construction areas. Installation of dust collector fans and bag filters, with a total capacity of 176,000/hr (see **Table 1.7**) Dust minimization along access roads through water sprinkling and road concreting
Increase in Ambient Noise Level	Incremental noise from Project construction, plant operation, and product hauling will exceed the noise standard for heavy industries without control measures	✔	✔		Consider scheduling of operating hours of noisiest equipment only during daytime and avoid co-operation of several noisy equipment simultaneously and in close proximity with each other. The enclosure of noisy processes in noise control buildings Provision of noise control muffs with communication equipment to grinding, milling, and other personnel regularly exposed to high noise levels. Limit personnel exposure to noise to a maximum of six (6) hours per day

CEMPHIL CEMENT GRINDING PROJECT EIS

LAND MODULE

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2 Assessment of Environmental Impacts

2.1 Land

2.1.1 Land Use and Classification

The proposed Cemphil, Inc. grinding plant will be situated in the coastal area of Barangay Bay-ang, Municipality of Ajuy, Iloilo. The project property encompasses a total area of 6.491 hectares, 2.5 ha of which is designated for a material stockyard and 3.9 ha for processing plant facilities.

The Municipality of Ajuy has a land area of 17,557.19 hectares. The land use distribution Table 2.1.1) was obtained from the municipality's draft Comprehensive Land Use Plan, which has undergone two public hearings for updating in compliance with Executive Order 72 "Providing for the preparation and implementation of the Comprehensive Land Use Plans (CLUPs) of Local Government Units under the Local Government Code of 1991". Predominantly, the land in Ajuy is under agricultural use, with approximately 5,707.84 hectares represents 32% of the municipality's total land area, devoted to agricultural crop production.

Table 2.1.1 Land Use Classification and Land Area Covered

Land Use Classification	Existing	
	Area (has.)	% to Total Land Area
Built-Up	702.84	4.01
Agricultural	4,350.51	24.78
Fishpond	1,169.14	6.60
Forest/Timberland	5,369.02	30.52
Mangroves	250.55	1.43
Bodies of Water	145.40	0.83
Dump site	10.22	0.05
Pastureland	5,556.96	31.66
Eco-Tourism	1.80	0.01
Industrial	20.81	0.12
TOTAL	**17,557.19**	**100.00**

Source: 2018 draft CLUP, Municipality of Ajuy

The proposed land, according to the updated draft of the General Land Use Plan of the Municipality of Ajuy, indicates the site area as Industrial Zone.

2.1.1.1 Impact on Compatibility of Existing Land Use with Proposed Land Use

The utilization of land, which is presently classified for Agricultural Use, is untilled due to poor soil suitability. Thus, the area is suggested to be converted to Industrial Use to generate the "best use" of the land. The proposed industrial land use is also consistent with the proposed Municipal Comprehensive Land Use Plan update (see **Figure 2.1.** 1). With the land use change, the land resources of Ajuy will produce more benefits to the people and the government in comparison to the present land use. **Section 2.1.5** on Pedology provides information on chemical analysis of available nutrients and productivity rating of the soil in the project area which explains the actual land use.

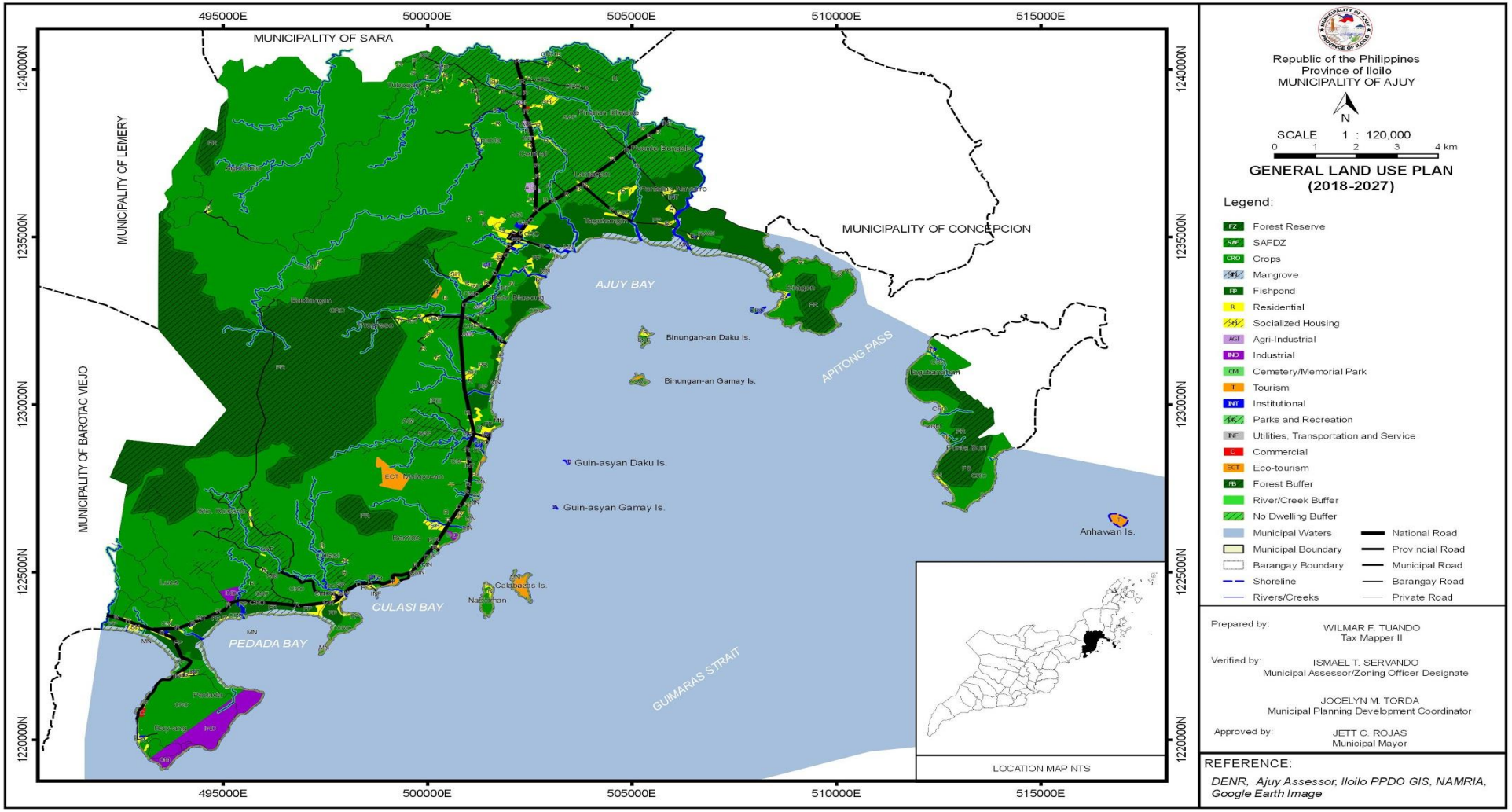
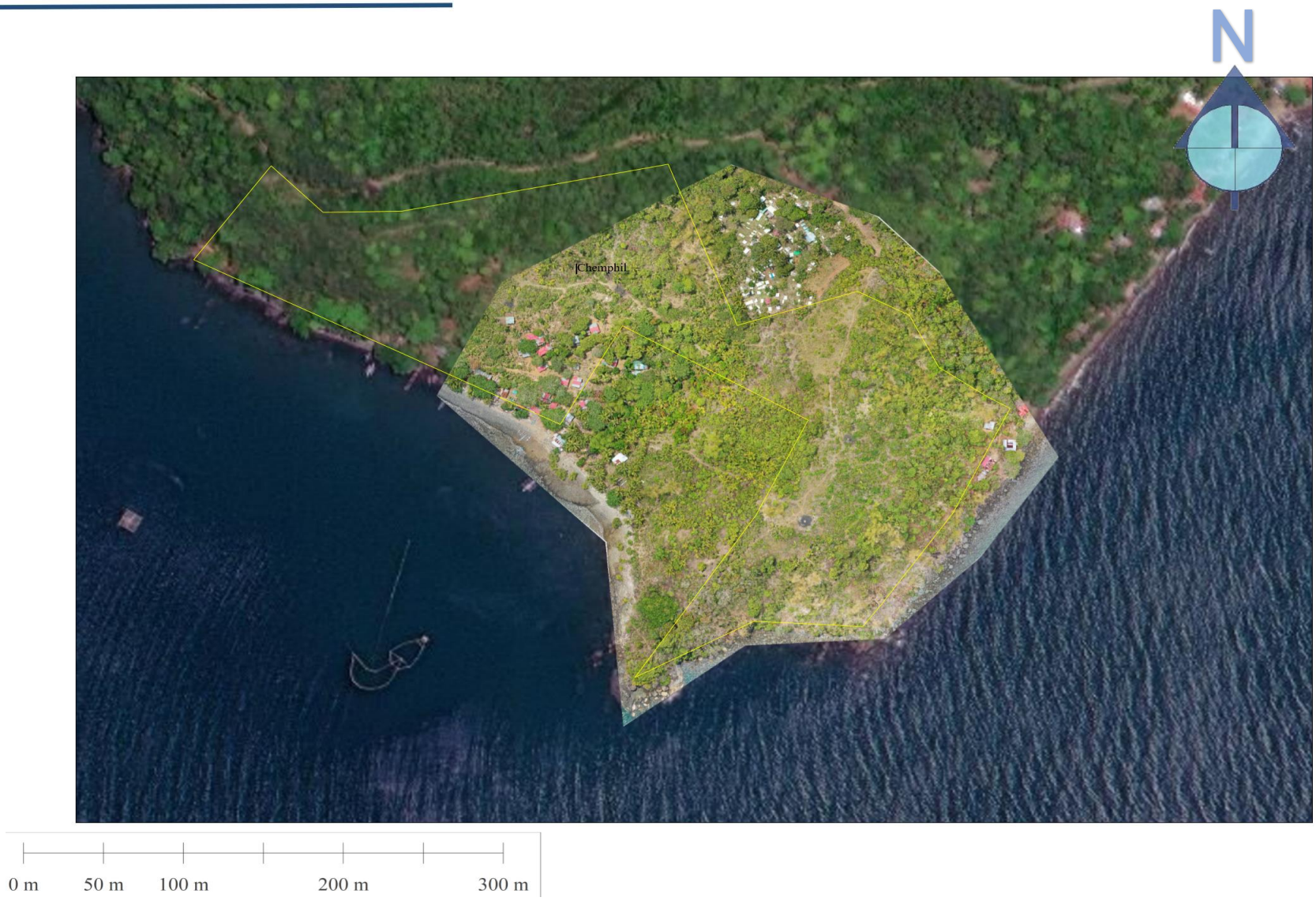


Figure 2.1. 1 Proposed Updating of Comprehensive Municipal Land Use Plan of Ajuy, Iloilo



Source: Lighter -colored image is actual drone-captured unfiltered imagery stitched onto Philippine geoportal image in arch info base map view, Feb.2020

Plate 2.1. 1 Aerial View of Project Site, June 2019

2.1.1.2 Impact on Compatibility with Classification as an Environmentally Critical Area

The proposed project site does not fall within any declared environmentally critical area (ECA), defined in DENR Administrative Order No. (DAO) 2017-15 as "an area that is environmentally sensitive and is listed under Presidential Proclamation No. 2146, Series of 1981, as well as other areas which the President of the Philippines may proclaim as environmentally critical in under Section 4 of Presidential Decree No. 1586." It also does not meet the conditions that define an Environmentally Critical Area under Proclamation No. 2146 (see **Table 2.1.** 2).

Table 2.1. 2 Comparison of Project Site Features with Definitions of Environmentally Critical Areas under Proclamation No. 2146

Definition of Environmentally Critical Area	Project Condition Meets the ECA Definition (Yes or No)	Remarks
1. All areas declared by law as national parks, watershed reserves, wildlife preserves, sanctuaries	No	Project is titled private property
2. Areas set aside as aesthetic potential tourist spots	No	Site features and impending LGU land use designate the area classification as industrial
3. Areas which constitute the habitat of any endangered or threatened species of Philippine wildlife (flora and fauna)	No	Floral and faunal survey indicate no endangered or threatened species exist in the Project site
4. Areas of unique historic, archaeological, or scientific interests	No	The project site has no significant historic, archaeological, or scientific feature
5. Areas which are traditionally occupied by cultural communities or tribes	No	The Ati community in Ajuy live in the mountain areas. The project site is not traditionally occupied by the Ati community.
6. Areas frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.)	No	Area had been affected by typhoon Yolanda. Based on the annual typhoon tracks data 1948-1918, 4 out of 20 typhoons entering PAR pass Panay Island annually. Of these, an annual average of 1 typhoon make landfall.
7. Areas with critical slopes	No	The highest slope gradient in project site is 12%
8. Areas classified as prime agricultural lands	No	Area is classified industrial zone. It is presently idle grassland with sparse young miscellaneous tree species
9. Recharge areas of aquifers	No	No aquifer recharge area is found within project site
10. Water bodies characterized by one or any combination of the following conditions: tapped for domestic purposes; within the controlled and/or protected areas declared by appropriate authorities; which support wildlife and fishery activities	No	No natural water body exists within the project site. The area is under "controlled" or regulated harvest. Project will be partner in monitoring and reporting fishing in the area.

Definition of Environmentally Critical Area	Project Condition Meets the ECA Definition (Yes or No)	Remarks
11. Mangrove areas 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; areas which act as natural buffers against shore erosion, strong winds and storm floods; areas on which people are dependent for their livelihood.	No	Project site has no area populated with mangroves
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	No	Project area does not have living corals, is not a nursery area for fish. Project will increase rock-face areas to support growth of juvenile crabs and will add to breakwater structures to protect the coastlines.

Environmentally Critical Areas (ECAs) are environmentally sensitive areas declared under Presidential Proclamation No. 2146 of 1981 where significant environmental impacts are expected if certain types/thresholds of the proposed project are located, developed, or implemented in it.

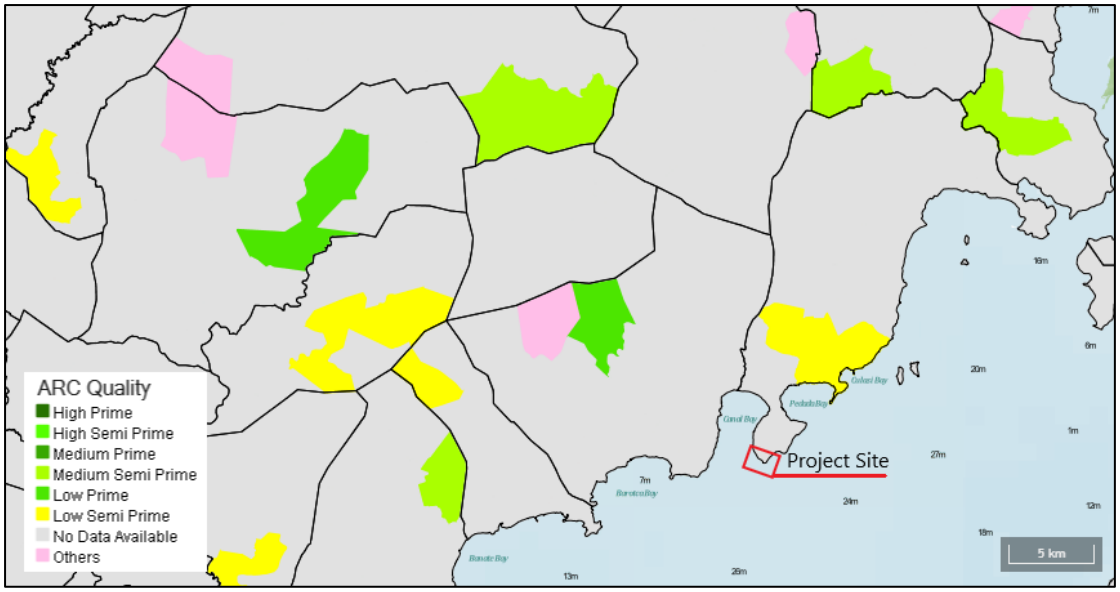
The project will have no impact on any ECA as the project will not reach the mangrove areas in Barangay Pedada. The Project will likewise have minimal impact on the corals 50 m to 75 m seaward of the project site due to silt curtain/ barrier during seasons of high sediment disturbance. Moreover, the Cemphil, Inc. plant site is more than nine (9) km from the nearest marine protected areas, the closest of which is the Nasidman Island Sanctuary, which, based on the emission inventory, may not be reached by project particulate emissions to any notable level.

There are existing and proposed protected areas in the municipality. The area hosting the Cemphil Jetty-Port, in particular, is under the "No Take" status, due to overfishing (see **Figure 2.1.** 3). The Project will cooperate with the LGU to monitor and prevent fishing from the CRMP "No Take" Zone.

2.1.1.3 Impact on Existing Land Tenure Issue/s

The proposed project area has been purchased by Cemphil, Inc.; the copies of land titles and Deed of Sale are in Annex B. No land tenure issues are perceived relative to the Cemphil, Inc. land ownership. The area is not covered by the Comprehensive Agrarian Reform Program (CARP). It is also not subject to a Certificate of Ancestral Domain Claim (CADC), Certificate of Ancestral Domain Title (CADT), Certificate of Ancestral Land Claim (CALC), Certificate of Ancestral Land Title (CALT), Integrated Forest Management Agreement (IFMA), Community-Based Forest Management Agreement (CBFMA), or any other tenurial instrument evidenced by the existing land titles. **Figure 2.1.** 2 shows the location of Agrarian Reform Communities in Ajuy.

The Project will avail of Cemphil Inc.'s rights to the land under existing formal land tenure arrangements.



Source: Philippine Geoportal, 02/18/2020

Figure 2.1. 2 Location Map of Agrarian Reform Communities (ARCs) in Ajuy

2.1.1.4 Impairment of visual aesthetics

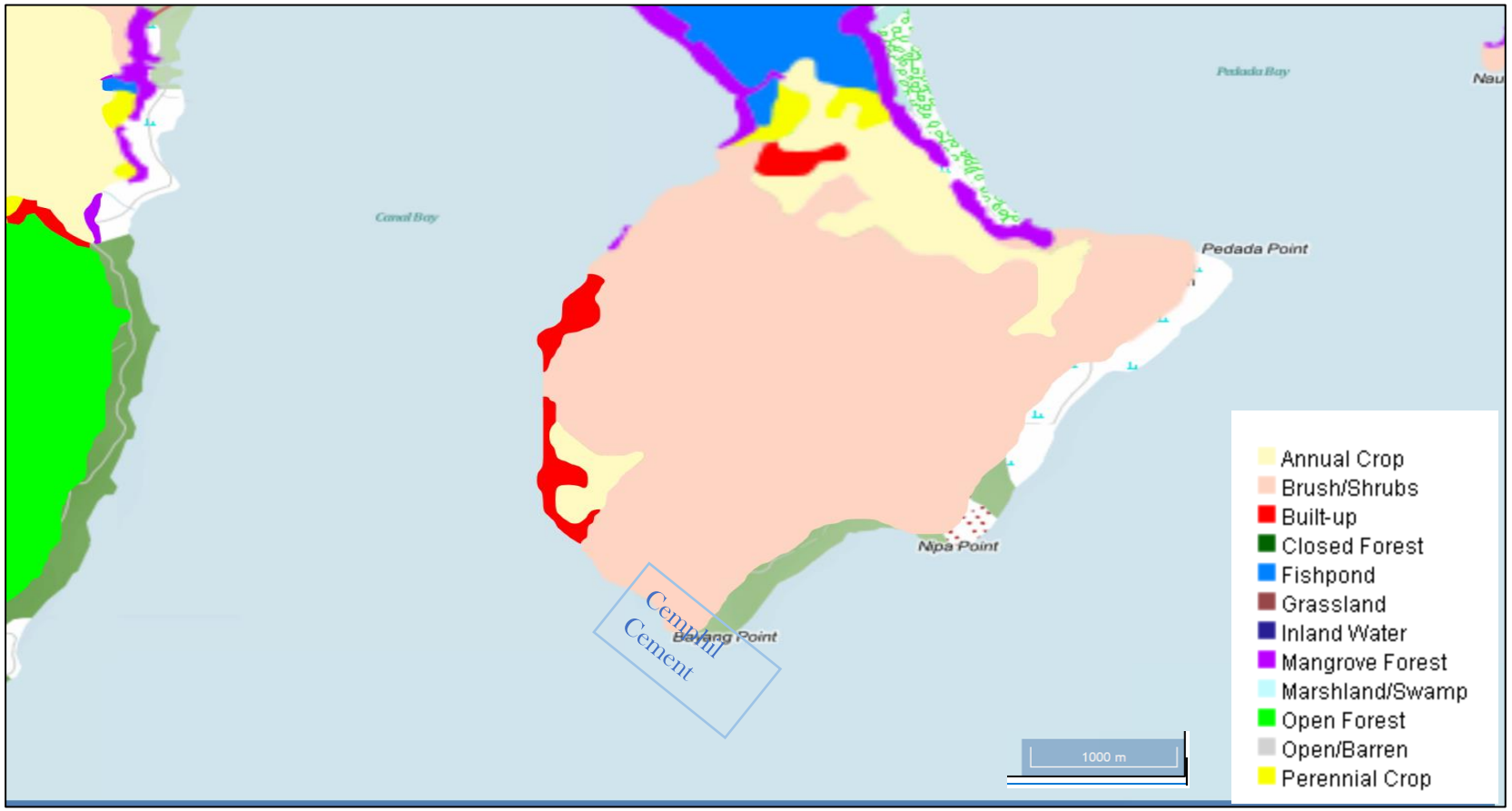
The baseline visual Plate value of the project site can be observed from **Plate 2.1.** 1. While secondary growth, shrubs, and bushes dominate the area, it cannot be described as having lush and appreciable vegetation.

The impact of the Cemphil, Inc. grinding plant construction to the existing surrounding visual landscape will be significant in the coastal area during construction as the land cover will be stripped, and the earth will be laid bare for a time. These, however, will be temporary, as construction works will be undertaken by sections, through the "Open, build and cover" method. The Cemphil Plant will be designed with landscaping to minimize barren soil patches and to provide aesthetic value to the area as its contribution to the Ajuy Municipal tourism development plan. Instead of the current near-barren, hilly land view of the area (**Plate 2.1.** 1), the project will contribute to a better scenery close to or better than **Figure 1.3** upon completion. Tourists passing by sea crafts will see a sustainable environment in harmony with industry.

After construction, the area's visual aesthetics are hoped to improve, with denser vegetation in areas not directly used for industrial purposes.

Source: Ajuy Coastal Resource Management Plan

Figure 2.1. 3 Proposed Marine Protected Area around Cemphil Project Site



Note: Land cover map and land mass outline do not match in source, Philippine Geoportal, NAMRIA. Understanding is requested. Downloaded Jan.2020

Figure 2.1. 4 2015 Land Cover of a Portion of Ajuy Municipality, Iloilo

2.1.1.5 Devaluation of land value as a result of improper solid waste management and other related impacts

During construction, almost the entire six and a half (6.5) hectares of project property will be regraded (cut and filled) for efficient cement grinding operations. The slopes will be benched and contoured. The earth volume needed to create the working platforms in **Figure 1.3** is 40,000 m^3, while the total excavated material is computed to be 45,000 m^3, creating a surplus volume of 5,000 m^3. The surplus earth material will be brought and filled into the embankment of the proposed Bay-ang coastal road which will be constructed by Cemphil, Inc. and donated to Municipal and Barangay Government Units of Ajuy and Bay-ang. The Construction personnel will be given an orientation by their Pollution Control Officer on how to attend to and manage the land clearing, as well as how to handle the earth materials so as not to produce waste stockpiles. Topsoil overburden with organic materials will be set aside to decompose in an area designated for future landscaping and will then be mixed with compost. This will be used as potting soil for replanting for landscape development and nursery for slope revegetation. The activity will be under regular monitoring of the Multipartite Management Team which will include the Barangay Captains of Bay-ang, Pedada, and Luca.

2.1.2 Geology and Geomorphology

Panay Island is divided into four major tectonic stratigraphic terranes: Buruanga Peninsula, Western Panay Antique Range, Central Panay Iloilo Basin, and Eastern Panay Magmatic Arc. The project area is located in the Barotac Viejo Quadrangle in Eastern Panay Magmatic Arc stratigraphic terrane.

The Panay magmatic arc is dominated by Cretaceous to Paleogene volcanic rocks with intercalated clastic sedimentary rocks, mostly wackes, agglomerate, and andesite flows. These rocks overlie unconformably amphibole-feldspar-quartz-schist which occurs as a limited erosional window north of the municipality of Sara. Metavolcanic rocks are regionally metamorphosed and together with the basement rocks are intruded by the diorite intrusive complex. The intrusive rocks consist of quartz diorite, granodiorite, and diorite porphyry. In turn, these old rocks are intruded by Pliocene to Pleistocene volcanic plugs and dikes. The volcanic rocks consist variously of hornblende andesite, porphyritic andesite, dacite porphyry, and tuff.

2.1.2.1 Geology of Barotac Viejo Quadrangle

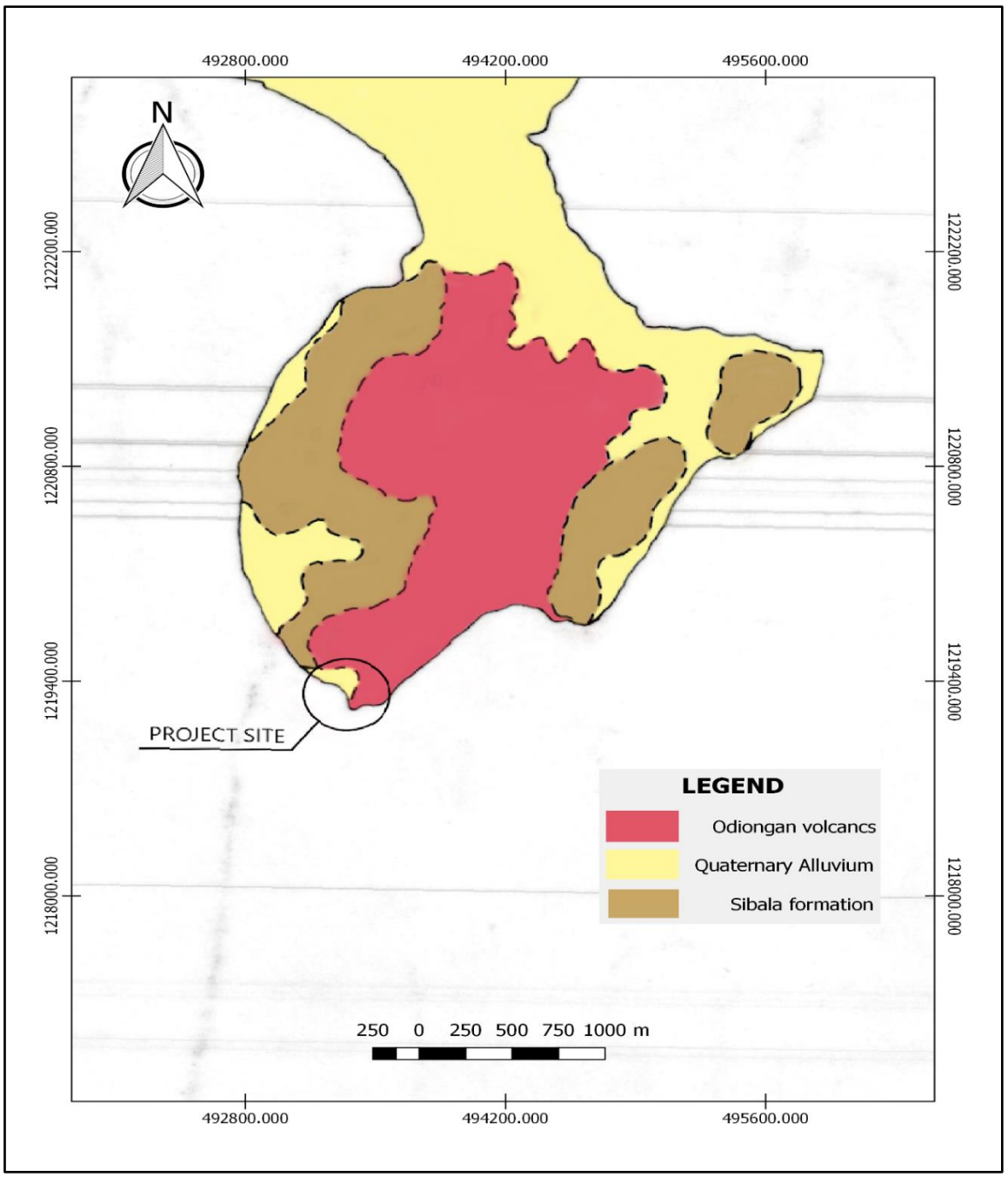
The dominant geologic formations underlying the general area of Ajuy are Quaternary Alluvium, Odiongan volcanics, Bayuso volcanics, Sara Diorite, and Sibala formation. The dominant rocks underlying the project site are the Odiongan volcanics, Quaternary Alluvium, and Sibala formation.

Dated Pliocene to Pleistocene, Odiongan volcanics is generally composed of hornblende andesite, porphyritic andesite, dacite porphyry, and tuff. It occurs largely as lava flows overlaying unconformably the Sibala formation and/or as plugs and dikes.

Quaternary Alluvium is largely comprised of fine to medium sand derived from weathering and erosion of the Sibala formation. It is unconsolidated deposits of sand, silt, pebbles, and cobbles along the valley, beaches, and river deltas. Sibala formation is the oldest rock formation at the project site. It is generally composed of andesitic to basaltic lava flows, and includes intercalated classic rocks, agglomerate, and tuff. The rock is commonly dark grey, chloritized and epidotized. It also includes minor chert beds.

The project site may belong to the Sara Diorite of the Eastern Panay Magmatic Arc. Sara Diorite is composed of tonalite, quartz diorite, and andesite. This formation is distributed from Pilar, Capiz to Barotac Viejo, Iloilo, which covers an area of about 60,000 hectares (Mines and Geosciences Bureau 2010).

Figure 2.1. 5 shows a portion of the Geologic Map of the Barotac Quadrangle containing the Cemphil Plant site.



Source: Geologic Map of Barotac Viejo Quadrangle, Mines and GeoSciences Bureau

Figure 2.1. 5 General Geology of Bay-ang

2.1.2.2 Subsoil Investigation

The Geotechnical investigation was undertaken from August 20 - September 23, 2019. The study obtained soil samples on which the following laboratory analyses were conducted (see **Table 2.1.** 3).

Figure 2.1.6 shows the soil profile in the project site and the intercepted water table. A copy of the borehole location map and logs is in Annex G.

Table 2.1. 3 Laboratory Analyses for Engineering Qualities of Soil in Project Site

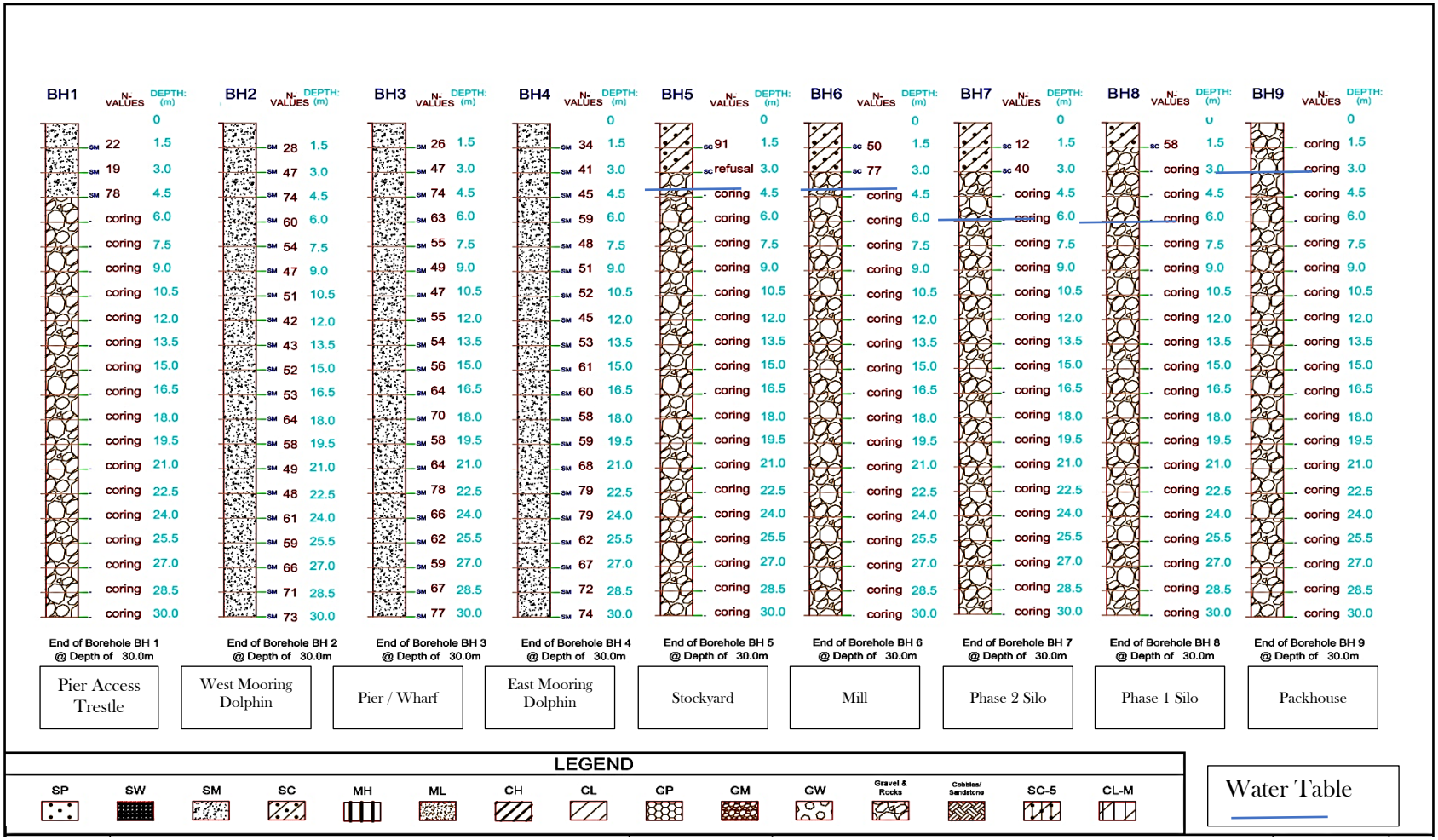
Type of test	ASTM Designation	No. of tests
Grain Size Analysis	ASTM D422	70
Atterberg Limits	ASTM D4318	0
Moisture Content Determination	ASTM D2216	86
Soil Classification	ASTM D2487	70
Unconfined Compressive Strength	ASTM D2938	16

Standard Penetration Tests and Split Barrel Sampling (ASTMD1586) conducted yields information summarized in **Table 2.1.** 4.

Table 2.1. 4 Summary Result of Soil Penetration Tests

Borehole number	Depth (m)	Groundwater Level (m)	Date Drilled	Stratigraphy
BH-1	0 to 4.5	0.5	Aug. 20, 2019	Silty sand
	4.5 to 30.0			Boulders
BH-2	0 to 30.0	0.5	Sep. 6, 2019	Silty sand
BH-3	0 to 30.0	0.5	Sep. 19, 2019	Silty sand
BH-4	0 to 30.0	0.5	Sep. 27, 2019	Silty sand
BH-5	0 to 3.0	4.0	Aug. 9, 2019	Clayey sand
	3.0 to 15.0			Sandstone
	15.0 to 30.0			Siltstone
BH-6	0 to 3.0	4.0	Sep. 18, 2019	Clayey sand
	3.0 to 30.0			Boulders
BH-7	0 to 3.0	6.0	Sep. 6, 2019	Clayey sand
	3.0 to 30.0			Boulders
BH-8	0 to 1.5	6.0	Aug. 19, 2019	Clayey sand
	1.5 to			Cobbles
BH-9	0 to 30.0	3.0	Sep. 23, 2019	Boulders

Table 2.1.5 shows the allowable soil bearing capacity in the locations investigated.



Source: Proponent's Geotechnical Investigation Report

Figure 2.1.6 Result of Borehole Investigation

Table 2.1.5 Allowable Soil Bearing Capacity of Specific Locations in Project Site

Allowable Soil Bearing Capacity (kPa)									
Depth (m)	BH-1	BH-2	BH-3	BH-4	BH-5	BH-6	BH-7	BH-8	BH-9
0 to 1.5	250	250	250	537	1868	1868	826	2398	2115
1.5 to 3	349	754	754	754	2240	2240	1707	3760	2806
3 to 4.5	1686	1686	1686	971	3814	3814	4450	4450	3496

The result of the soil Geotechnical investigation indicates that the project subsoil falls under the classification of Type SD (stiff soil profile), referring to the National Structural Code of the Philippines (NSCP 2015) using the N method.

2.1.2.3 Change in subsurface geology/ underground conditions

The Project does not include activities that will introduce changes in underground conditions such as underground excavation, mineral extraction, massive groundwater extraction, or the introduction of significant volumes. By the nature of project operations, no factors promoting or inducing changes in subsurface geology will directly or indirectly ensue.

2.1.2.4 Tectonics

The Philippine Archipelago is in a dynamic setting with the convergence of the Pacific and Philippine Sea Plates in the East and with the Continental Eurasian and Indo-Australian Plates from the West and Southwest of the Proto-Philippine Island Arc. Data from the National Aeronautics and Space Administration indicates that the uplifting of the Philippine plate has resulted from the tectonic activities imposed by the surrounding plates which also have caused the various associated formations in the earth's surface, i.e., oceanic trenches, mountain ranges, and volcanic belts, through the high incidence of seismic and volcanic activities.

The Philippines is surrounded by opposite trending subduction zones: Manila Trench, Negros Trench, and Sulu Trench to the west and east Luzon Through and Philippines Trench to the east (**Figure 2.1.** 7). Most of the major earthquakes, volcanic activity, and orogenic processes are associated with plate tectonics. Apart from subduction zones, major active faults are known to occur within a radius of 150 km of the site. The most prominent active faults and subduction zones that are expected to influence the seismicity at the site are the Philippine Fault System and West Panay Fault.

2.1.3 Topography

The Municipality of Ajuy has an irregular land surface with high mountain ranges in the western part with an elevation of up to 500 meters above sea level, and coastal plain at an elevation ranging from 3.56 to 100 meters above sea level.

The Cemphil Project site will lie on the western foothills of Mt. Bay-ang, between elevations 3.56 to 50 meters above sea level (masl) (see **Figure 2.1.** 8 and **Figure 2.1.** 9). Natural topography within the project site is moderately undulating, with a average slope of 12%.

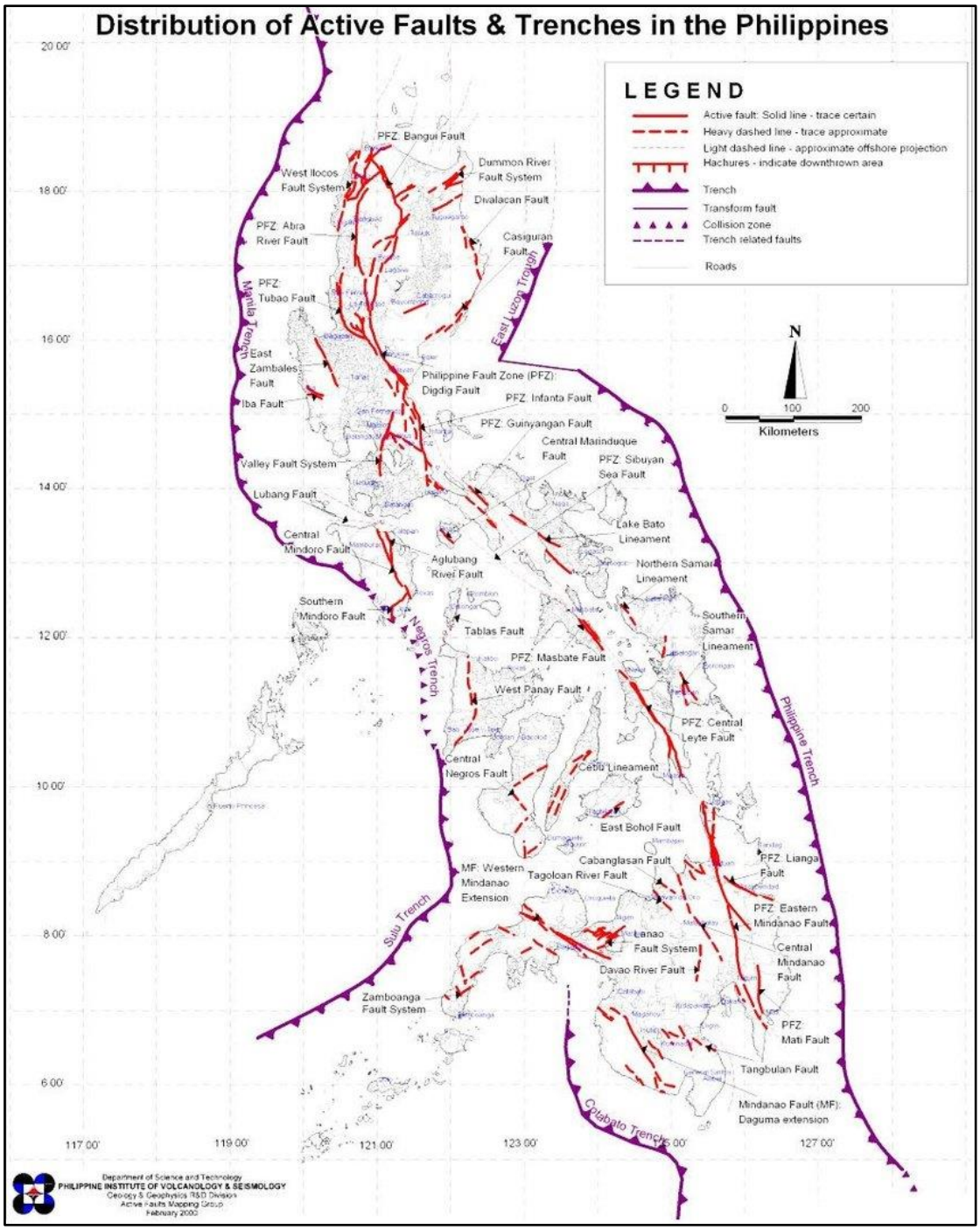
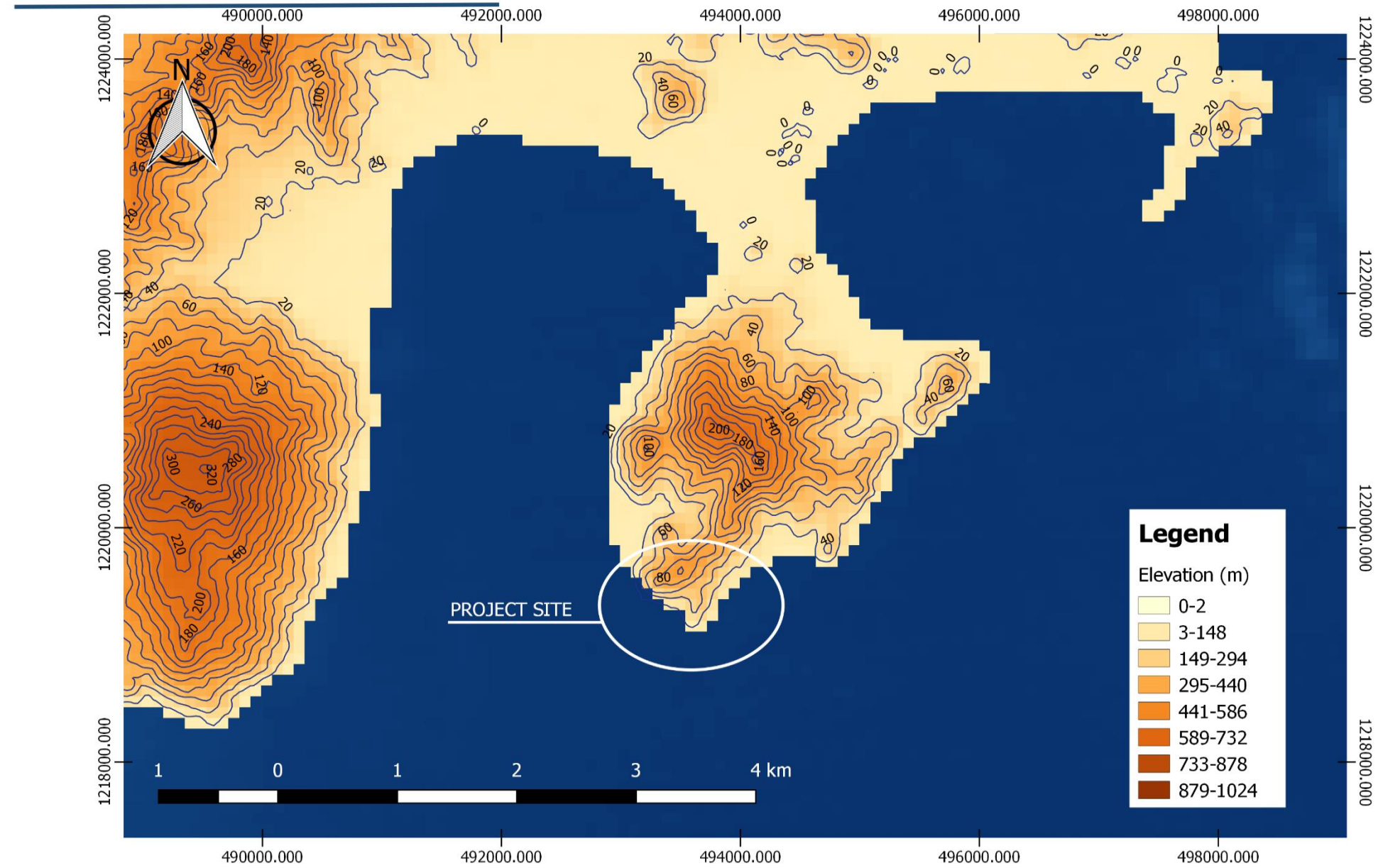


Figure 2.1. 7 Distribution of Active Faults and Trenches in the Philippines

2.1.3.1 Change in Landform

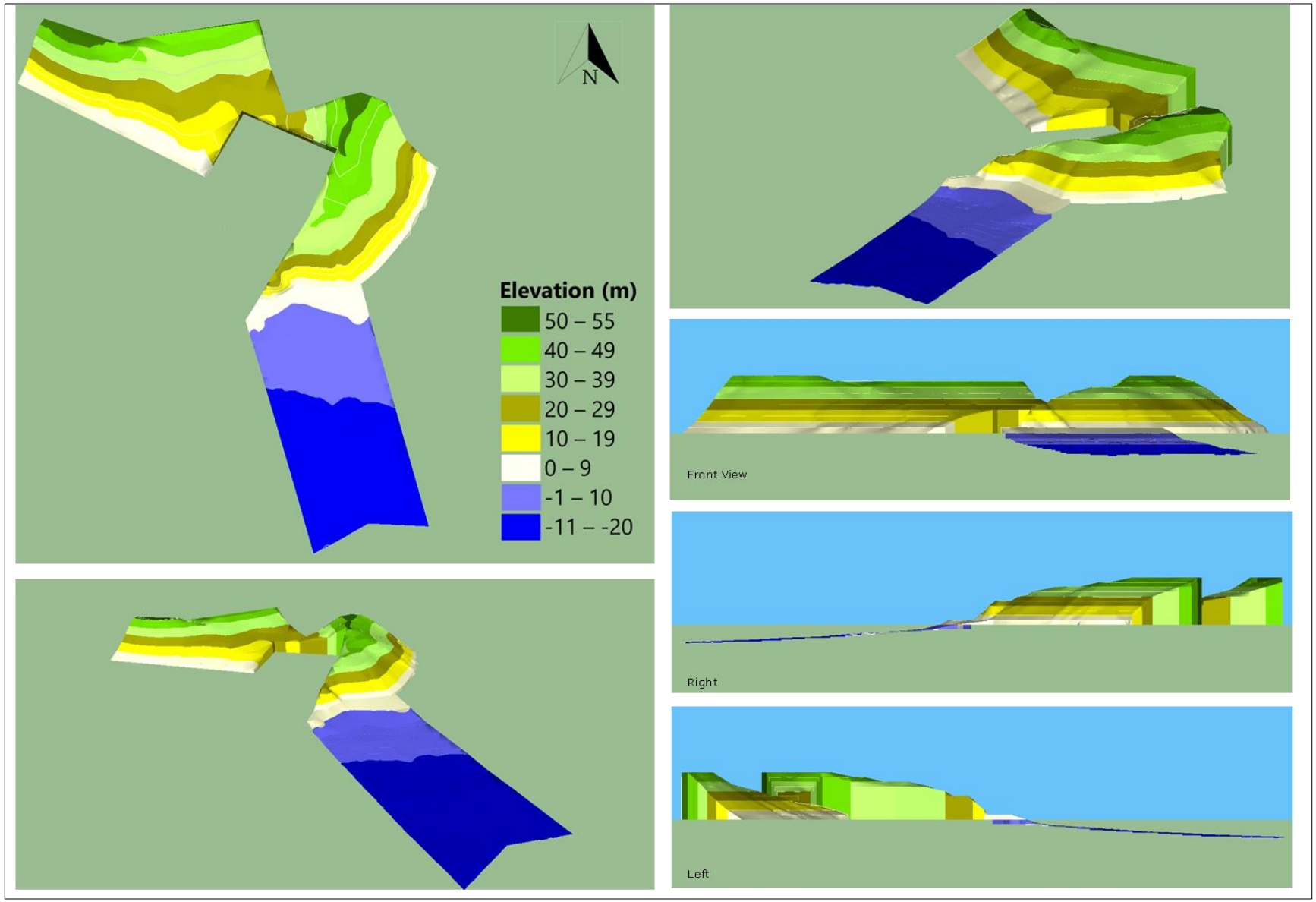
The landform will be modified to stabilize the slope, reduce area soil erosion potential, and provide for ease and efficiency in the cement manufacturing operation. **Figure 1.3** is a visualization of the project facility lay-out plan with the modified landform.

The modified landform will be provided with sufficient surface drainage courses ending in a major drainage trench running through the length of the property, which can accommodate >60% of peak run-off from the project site. In some portions, it will co-function as settling pond and water reservoir. Retained water will be used for the Plant water requirement for cleaning and dust suppression.



Source: SRTM digital elevation data by NASA

Figure 2.1. 8 Topographic Map



Source: Proponent topographic survey

Figure 2.1. 9 Project Area Elevation

2.1.4 Geohazards

2.1.4.1 Earthquake Generators and Seismicity

Within a radius of 200 km from the project site, there are at least four earthquake generators that had been identified by PHIVOLCS. Because of this, the project area is embraced in a region characterized by moderate seismicity. The active trench and faults include Negros Trench, West Panay Fault, and the Philippine Fault Zone (PFZ).

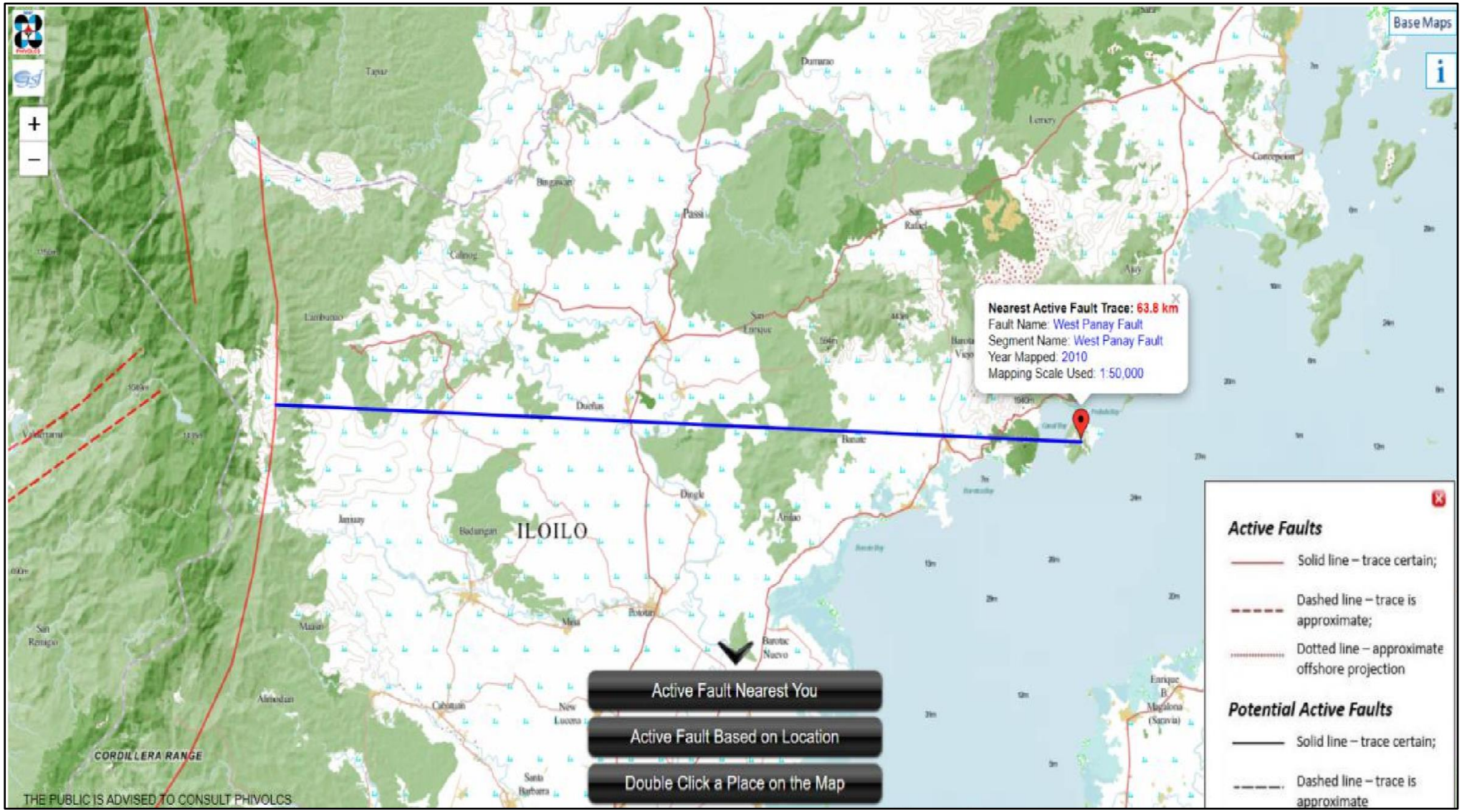
Negros trench is located 36 km west of the western Panay coastal area. Relatively very few seismic events have been apparently generated by it. The largest earthquake recorded ranged from Ms 6.5 to Ms 6.9. Using the geological criteria based on the strike length, larger earthquake magnitudes than those recorded could be expected. A maximum credible earthquake (MCE) of about Ms 7.8 could be assumed. A maximum credible earthquake is the largest conceivable earthquake that an active fault can generate. The trace of Negros trench nearest to the project site is 148 km.

West Panay Fault is a north-bounding active fault. Several earthquake epicenters occur very near the projection of the West Panay Fault. These earthquakes, presumably generated by the West Panay Fault, reached as much as an Ms 7.0 earthquake. However, utilizing the geological criteria, West Panay Fault can generate MCE of as much as Ms 7.5. The trace of West Panay Fault nearest the site is 63.8 km (**Figure 2.1.** 10).

The Philippine Fault Zone (PFZ) is one of the most active faults in the Philippines. It is known to have generated at least three strong earthquakes in Luzon and is reported to have ruptured several times in Mindanao, mostly along the trace of the fault between Davao and Agusan. And although instrumental records show that the fault is not known to have moved in the Visayas, geological features associated with the fault system, such as fault scarp, displaced mountain ridges, and valleys, stream offsets, and fault line valleys, strongly demonstrate that the fault trace in the Visayas has ruptured in the recent past. The PFZ Masbate Fault is located about 150 km east of the site.

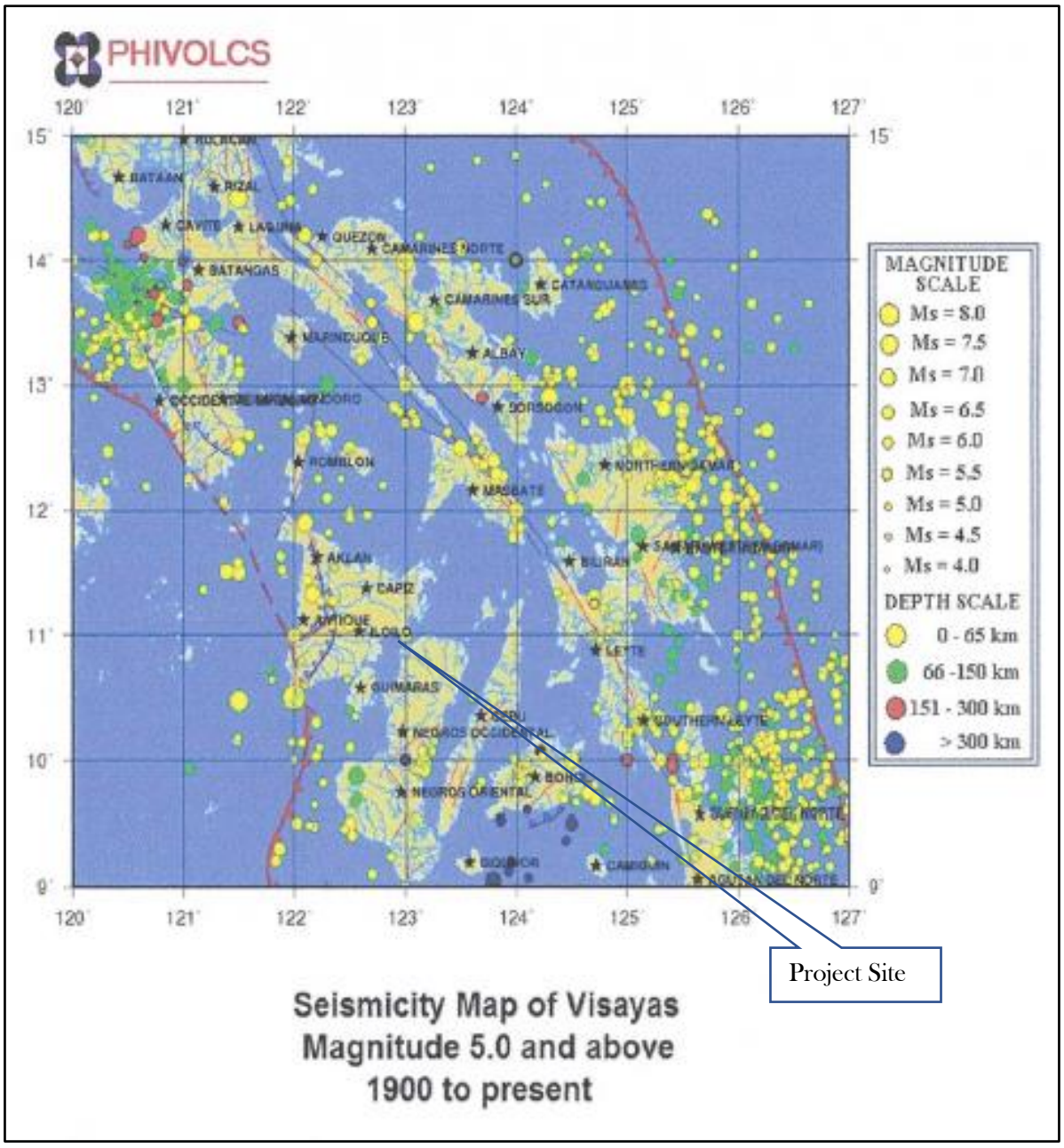
2.1.4.2 Seismicity

The Seismic Map of Visayas (**Figure 2.1.** 11) indicates that most of the earthquake epicenters are located near known active faults and subduction zones. As may be noted, no earthquake epicenter occurred within a 10 km radius of the project site. As may be observed from **Figure 2.1.** 10 and **Figure 2.1.** 11, the project site is not in a seismically active zone. There are a few isolated clusters of earthquake epicenters that appear unrelated to known active faults. These isolated earthquake epicenters probably indicate the high possibility of finding yet unrecognized active faults but none of these are within a 50 km radius of Ajuy.



Source: PHIVOLCS Fault Finder App

Figure 2.1. 10 Map Showing the Location of Nearest Fault Trace

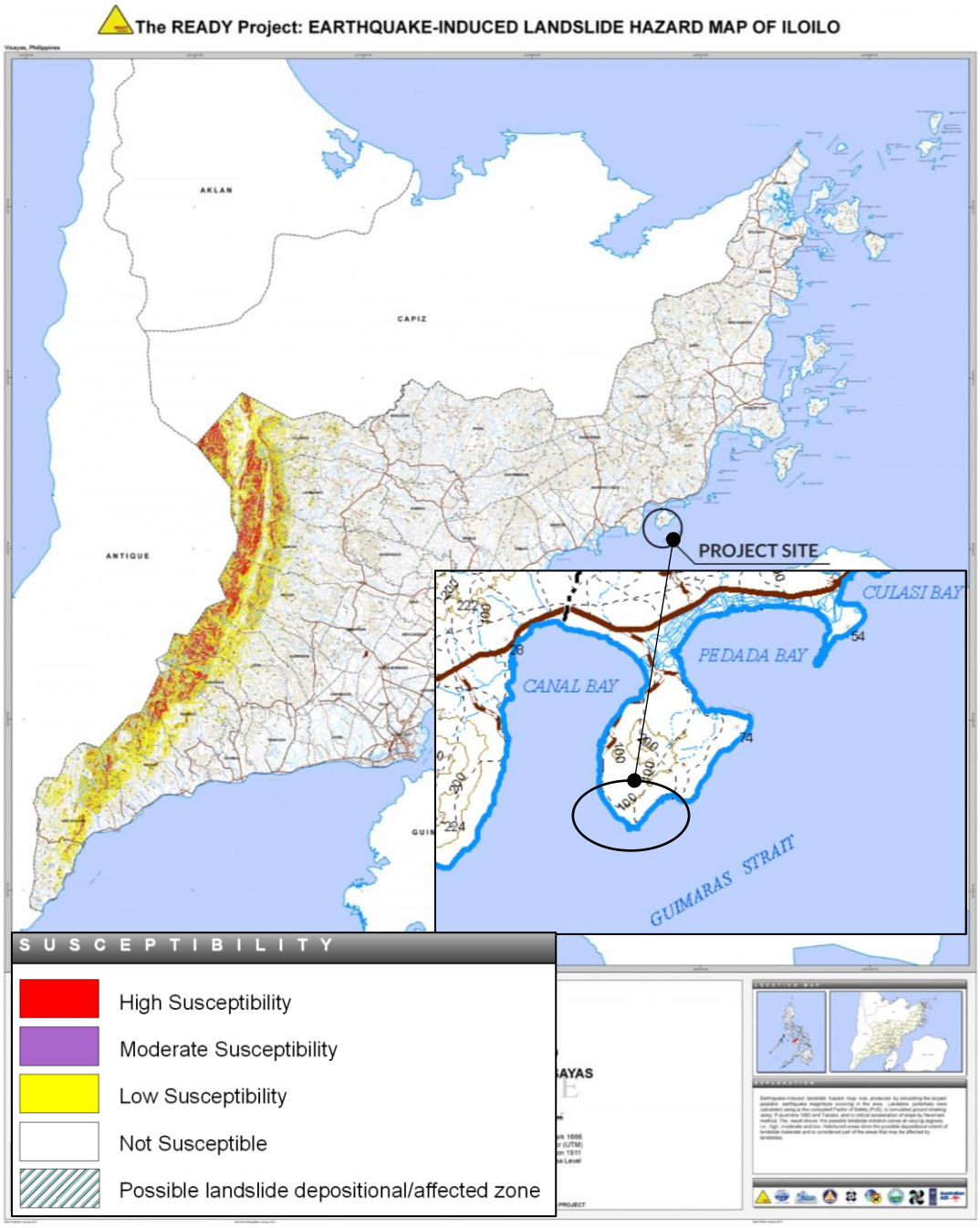


Source: PHIVOLCS

Figure 2.1. 11 Seismic Map of Visayas

2.1.4.3 Landslide Potential

Based on the Ready Project Hazard Maps of Iloilo (**Figure 2.1.** 12 & **Figure 2.1.** 13) by the Office of Civil Defense (OCD), the proposed project area is not susceptible to earthquake-induced landslides, however, it has **low to high susceptibility to rain-induced landslides.** Based on the general assessment of the area geohazard potential provided by the READY maps and a **closer investigation of the project area through a topographic survey, it is revealed that the area's average slope gradient is ± 12% which is not particularly susceptible to landslides. However, earthworks involving slope excavation will introduce a temporary increase in susceptibility in the background slope, which may have 50% to 90% vertical slant from excavator cut during on-going excavation work.**



Source: NAMRIA READY Project Maps

Figure 2.1. 12 Earthquake-induced Landslide Hazard Map of Iloilo

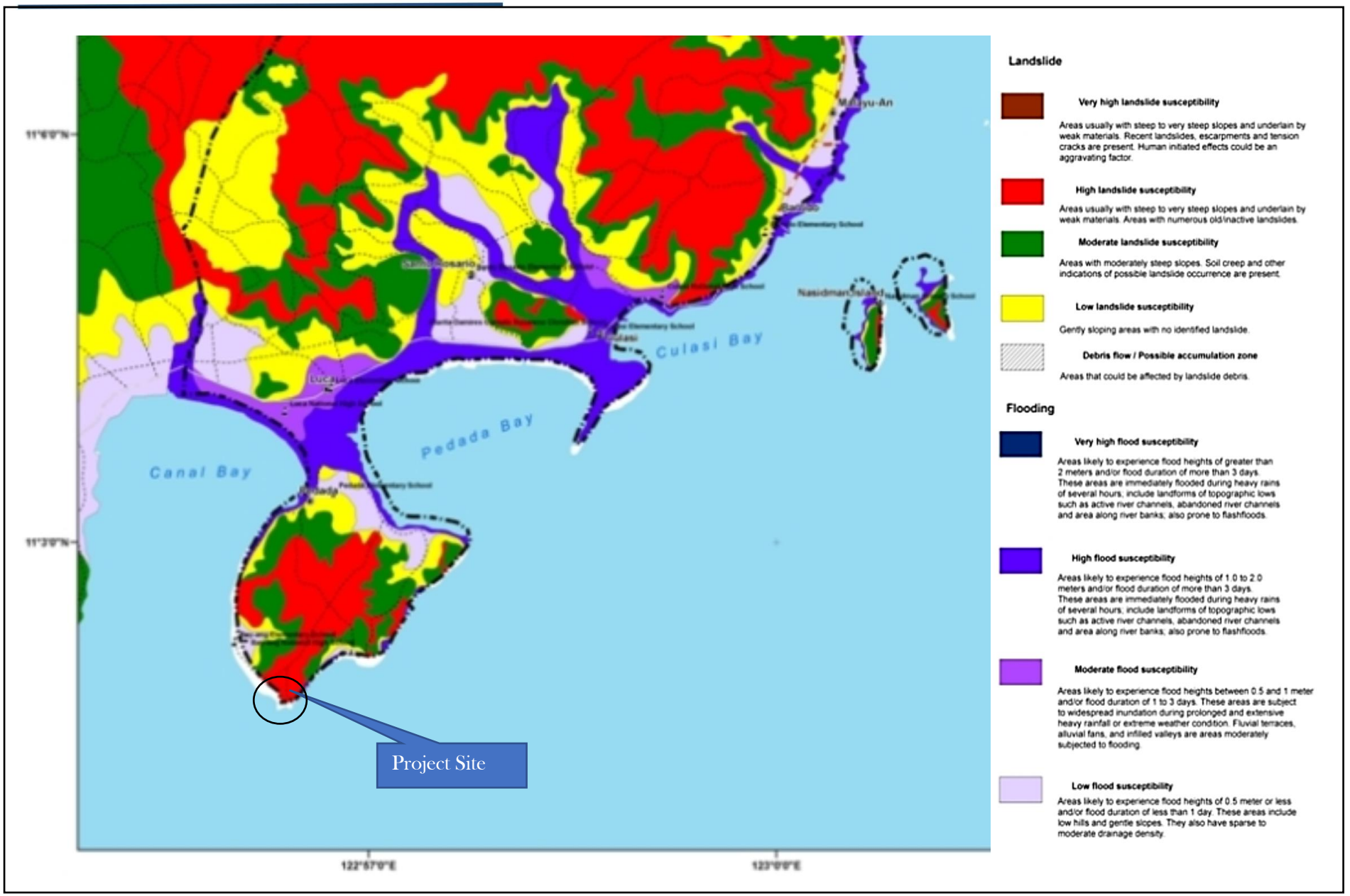


Figure 2.1. 13 Rain-induced Landslide Hazard Map of Iloilo

2.1.4.4 Inducement of Subsidence, Liquefaction, Landslides, Mud / Debris Flow, etc.

Land subsidence is the gradual settling or sinking of land. Its primary causes are the removal of underground water, compaction, and drainage of organic soils resulting in a reduction in the elevation of the land surface. Other causes include underground mining or massive sudden underground sediment transport caused by man-induced activities. These causes are not present in the project nature.

The Project will use the dry process and will extract only 10 cubic meters of groundwater to replace water lost in evaporation during the dry season, and for drinking purposes. The underground soil characteristics are also resistant to subsidence (**Figure 2.1.6**). The location of heavy facilities has been identified in consideration of the soil bearing capacity required by these heavy facilities such as cement silo, and crusher. The Geotechnical soil investigation report will be made available upon request.

The natural conditions of the area are evaluated to be highly susceptible to rain-induced landslides (see **Figure 2.1.** 13). The factors that contribute to this vulnerability are land slope, loose dry soil, and poor soil cover. The Project will not necessarily generate conditions that will induce landslides, as there will be no repetitive slope excavation such as in quarrying. The earth is moved to develop land surface for efficient industrial operation. Slope excavation will be done methodically, and an engineered retaining wall will be constructed to support the first slope bench, for stability.

Landslide occurs when there is a decrease in the shear strength of the slope material and an increase in the shear stress borne by the soil. During earthworks, run-off water channels will be carved to manage drainage to prevent soil oversaturation. No earth stockpiles will be left for more than one day, to prevent water impounding and avoid landslide.

For the operation phase, the resulting project landform (**Figure 1.2**, 3D Visualization of Facility Lay-Out) will have reduced potential for rain-induced landslide susceptibility through slope benching, provision of contour canals and drainage trenches for drainage management, provision of engineered retaining wall and slope revegetation, reducing sloping lands through terracing, increasing flatlands, and increasing land surface strength through concreting.

2.1.4.5 Flooding

The project site is not at all susceptible to flooding due to its slope features that promote efficient drainage.

2.1.4.6 Ground Shaking

The intensity of ground shaking, when it occurs, is dependent on three factors: the magnitude of the earthquake, the distance of the epicenter; and site soil conditions. Ground shaking is more intense when surface wave magnitude is high, when the epicenter is close, and when the ground is composed of loose materials.

The Ground Shaking Hazard Map of Iloilo (**Figure 2.1.** 14) indicates that, based on the PHIVOLCS Earthquake Intensity Scale (PEIS), the ground shaking potential of the project area

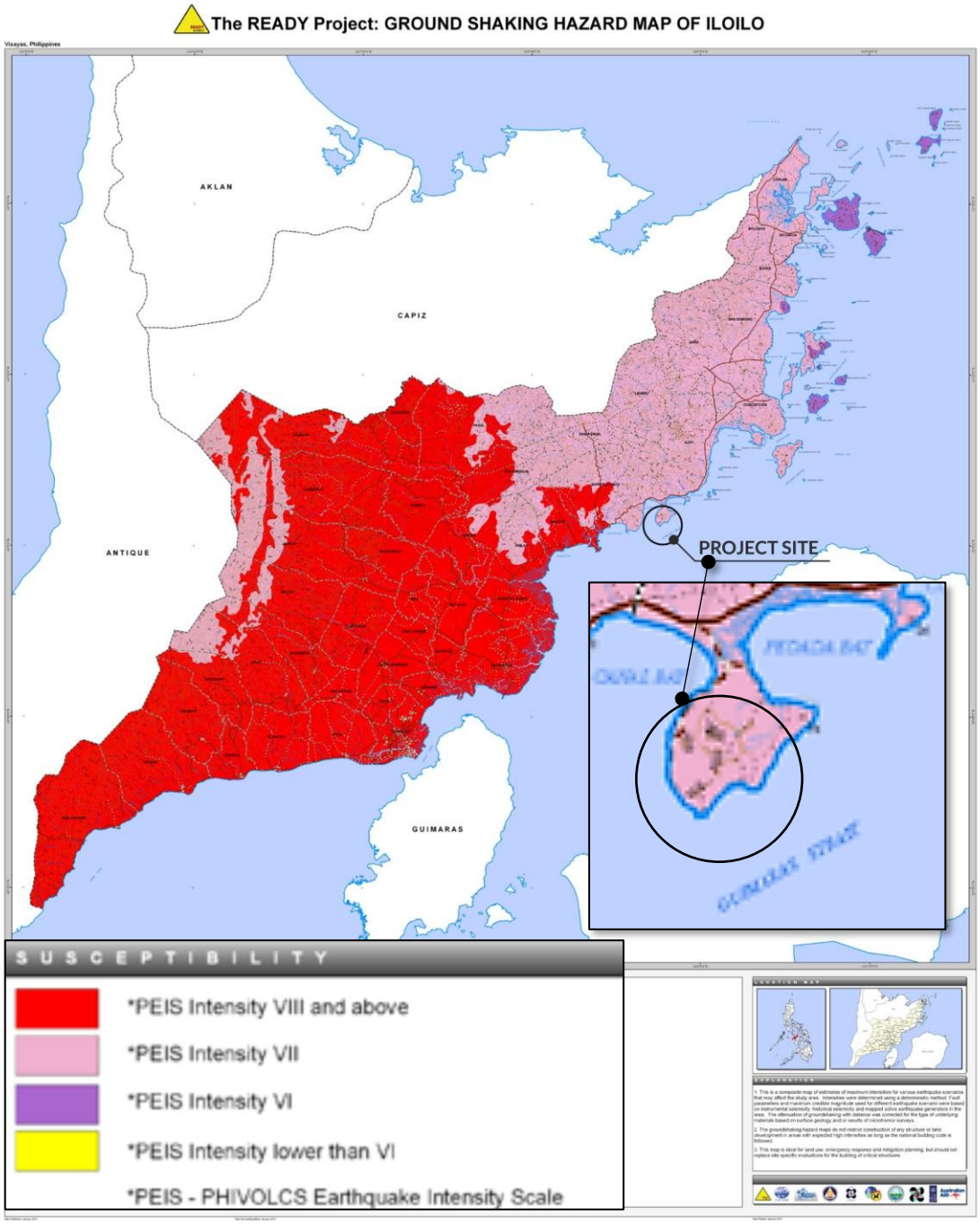
is up to PEIS Intensity VII, which is characterized as destructive. **Table 2.1.** 6 shows the description of each scale and its equivalence to seismic scales. The Municipality of Ajuy has lower ground-shaking potential than many Municipalities in the western portion of the Province, including Iloilo City, the Provincial capital which has a Ground Shaking Potential of up to PEIS VIII.

Table 2.1. 6 PHIVOLCS Earthquake Intensity Scale (PEIS)

Intensity Scale	Description		Equivalent to other seismic scales	
			Modified Mercalli	Shindo
I	Scarcely perceptible	• Delicately balanced objects are disturbed slightly. • Still water in containers oscillates slowly.	I	0
II	Slightly felt	• Felt by few individuals at rest indoors. • Hanging objects swing slightly. • Still water in containers oscillates noticeably.	II	1
III	Weak	• Felt by many people indoors especially in upper floors. • Hanging objects swing moderately. • Still water in containers oscillates moderately. • Feels like a *light* truck passing by	III	2
IV	Moderately strong	• Felt generally by people indoors and by some people outdoors. • Hanging objects swing considerably. • Motorcars may rock slightly. • Liquids in containers are slightly disturbed. • Water in containers oscillates strongly. • A rumbling sound may sometimes be heard. • Feels like a *heavy* truck passing by.	IV	2–3
V	Strong	• Felt by most people indoors and outdoors. • A strong shaking and rocking is felt throughout the building. • Hanging objects swing violently. • Small, light, and unstable objects may fall or overturn. • Liquids spill from filled open containers. • Vehicles rock noticeably. • Leaves and twigs of trees shake.	V	3
VI	Very Strong	• Furniture and other heavy objects are displaced. • Wall plaster may crack. • People may lose balance. • Small church bells may ring. • If on the road, it may feel like driving with flat tires. • Very old or poorly built houses and man-made structures are slightly damaged though well-built structures are not affected. • Limited rockfalls and rolling boulders occur in hilly to mountainous areas and escarpments. • Trees shake	VI	4
VII	Destructive	• Heavy objects and furniture overturn or topple. • Difficulty standing on upper floors. • Old or poorly-built structures suffer considerable damage. • Some well-built structures are slightly damaged. • Some cracks may appear on dikes, fishponds, road surface, or concrete hollow block walls. • Limited liquefaction, lateral spreading and landslides are observed. • Trees shake noticeably.	VII	
VIII	Very Destructive	• People will find it difficult to even stand outdoors. • Many well-built buildings are considerably damaged. • Concrete dikes and foundation of bridges are destroyed by	VIII, IX	5–6

Intensity Scale	Description		Equivalent to other seismic scales	
			Modified Mercalli	Shindo
		ground settling or toppling. ● Railway tracks are bent or broken. ● Utility posts, towers, and monuments may tilt or topple. ● Water and sewer pipes may be bent, twisted, or broken. ● Liquefaction and lateral spreading cause manmade structures to sink, tilt, or topple. ● Numerous landslides and rockfalls occur in mountainous and hilly areas. ● Boulders are thrown out from their positions particularly near the epicenter. ● Fissures and faults rupture. ● Trees shake violently. ● Water splashes over dikes or the banks of rivers.		
IX	Devastating	● People are forced to the ground. ● Most buildings are totally damaged. ● Bridges and elevated concrete structures are toppled or destroyed. ● Numerous utility posts, towers, and monuments are tilted, toppled, or broken. ● Sewer pipes are bent, twisted, or broken. ● Landslides and liquefaction with lateral spreading and sand boils are widespread. ● The ground is distorted into undulations. ● Trees are shaken very violently with some toppled or broken. ● Boulders are commonly thrown out. ● River water splashes violently or slops over dikes and banks.	X, XI	7
X	Completely Devastating	● Many trees are toppled, broken, and uprooted. ● Practically all man-made structures are destroyed. ● Massive landslides and liquefaction, large-scale subsidence and uplifting of landforms and many ground fissures are observed. ● Changes in river courses and destructive seiches in large lakes occur.	XII	

Source: PHIVOLCS



Source: NAMRIA READY Project Maps

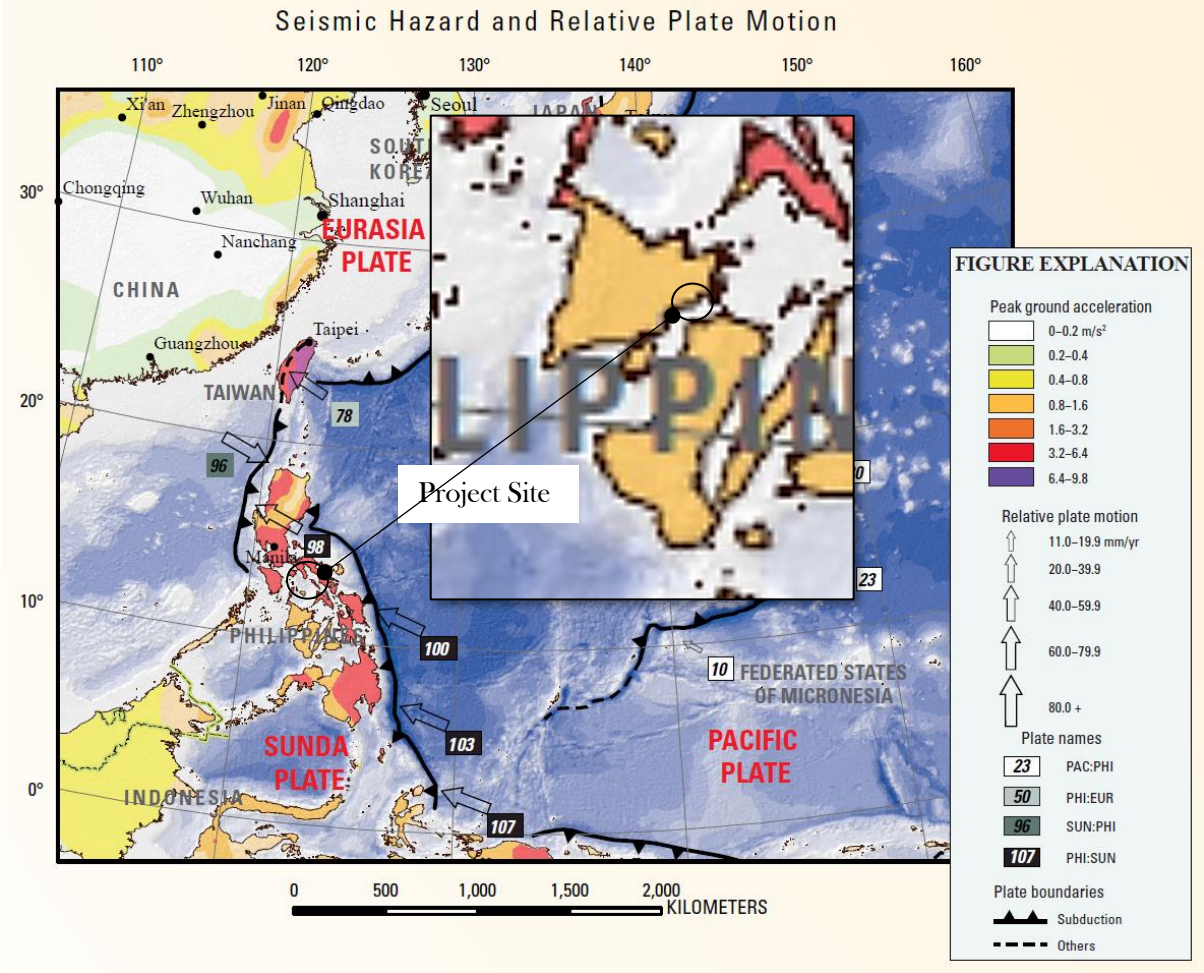
Figure 2.1. 14 Ground Shaking Hazard Map of Iloilo

2.1.4.8 Peak Ground Acceleration

According to data obtained from the United States Geologic Survey (USGS) office, the Peak Ground Acceleration in Ajuy and its nearby municipalities could likely be between 0.8 to 1.6 m/s^2 (**Figure 2.1.** 15), as measured by an accelograph. The peak ground acceleration is the maximum strength of shaking in an area in an earthquake event. In an earthquake, damage to buildings and infrastructure is related more closely to ground motion, of which PGA is a measure, rather than the magnitude of the earthquake itself. **Table 2.1.** 7 was developed by USGS to compare the different ways of classifying and describing seismic events and how these descriptions relate to ground acceleration ratings.

Table 2.1. 7 Instrumental Intensity Scale

Instrumental Intensity	Acceleration (g)	Velocity (cm/s)	Perceived shaking	Potential damage
I	< 0.0017	< 0.1	Not felt	None
II–III	0.0017 – 0.014	0.1 – 1.1	Weak	None
IV	0.014 – 0.039	1.1 – 3.4	Light	None
V	0.039 – 0.092	3.4 – 8.1	Moderate	Very light
VI	0.092 – 0.18	8.1 – 16	Strong	Light
VII	0.18 – 0.34	16 – 31	Very strong	Moderate
VIII	0.34 – 0.65	31 – 60	Severe	Moderate to heavy
IX	0.65 – 1.24	60 – 116	Violent	Heavy
X+	> 1.24	> 116	Extreme	Very heavy



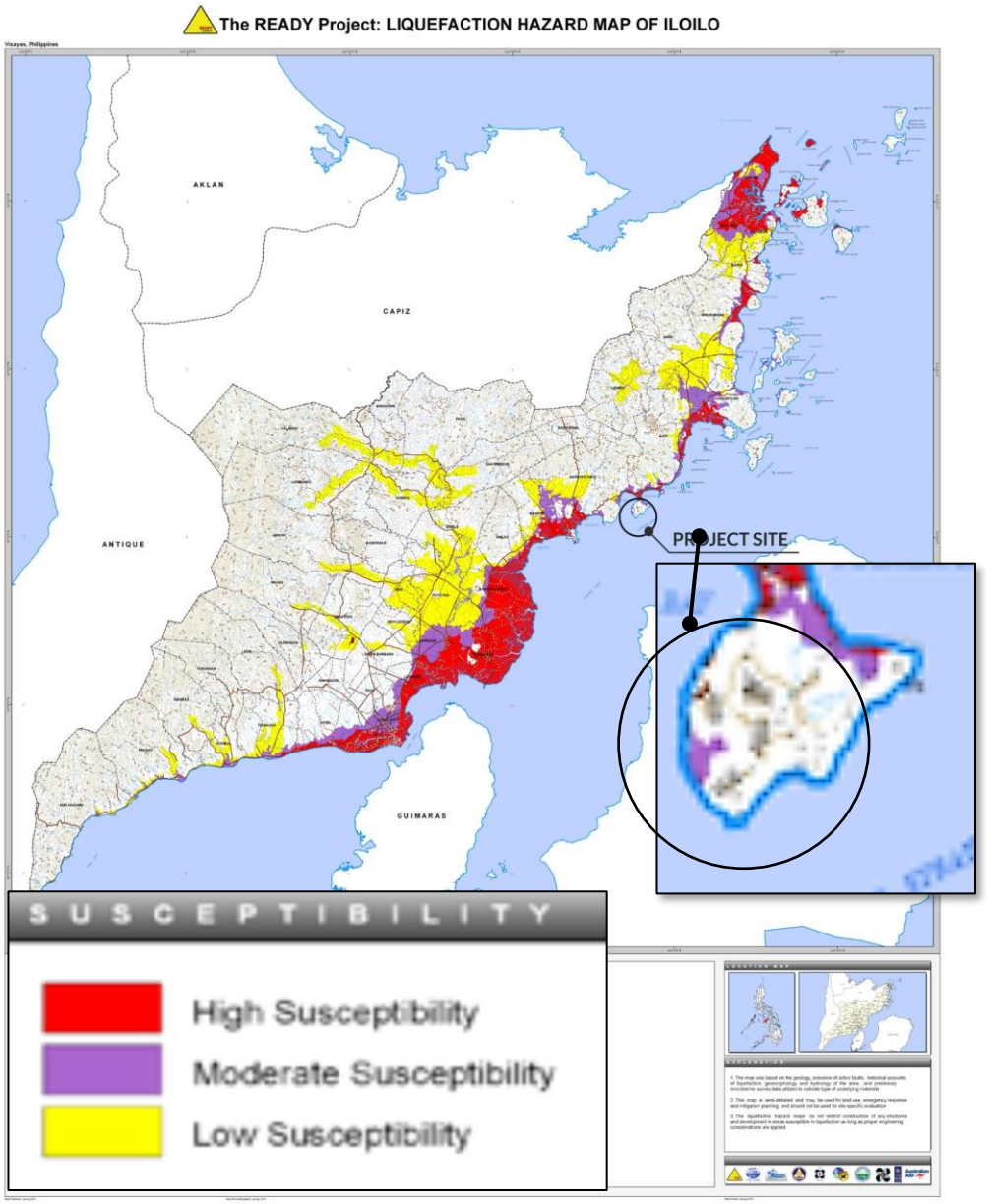
Data source: United Stages Geologic Survey

Figure 2.1. 15 Peak Ground Acceleration Map

2.1.4.9 Ground Rupture/ Liquefaction

Fully saturated loose fine sand is considered as the soil type most vulnerable to liquefaction. Fine-grained sands are relatively impervious. Cohesive soils are also highly resistant to liquefaction except for perhaps the very soft and highly sensitive clays. And previous soils, such as gravel, coarse sand, and sand with a limited number of fines (either poor graded sand or well-graded sands), are not prone to liquefaction.

Other factors of liquefaction include a continuous, loose sand bed, and the sand layer must be more than one (1) meter thick. These conditions are not found on the project site. Considering the soil type and geology of the area (most of the sediments are dense and pervious), soil in the project area is not susceptible to liquefaction. This characteristic is borne by the result of the Geotechnical investigation (**Figure 2.1.6**). The Liquefaction Hazard Map of Iloilo also indicates the site area is not susceptible to liquefaction.

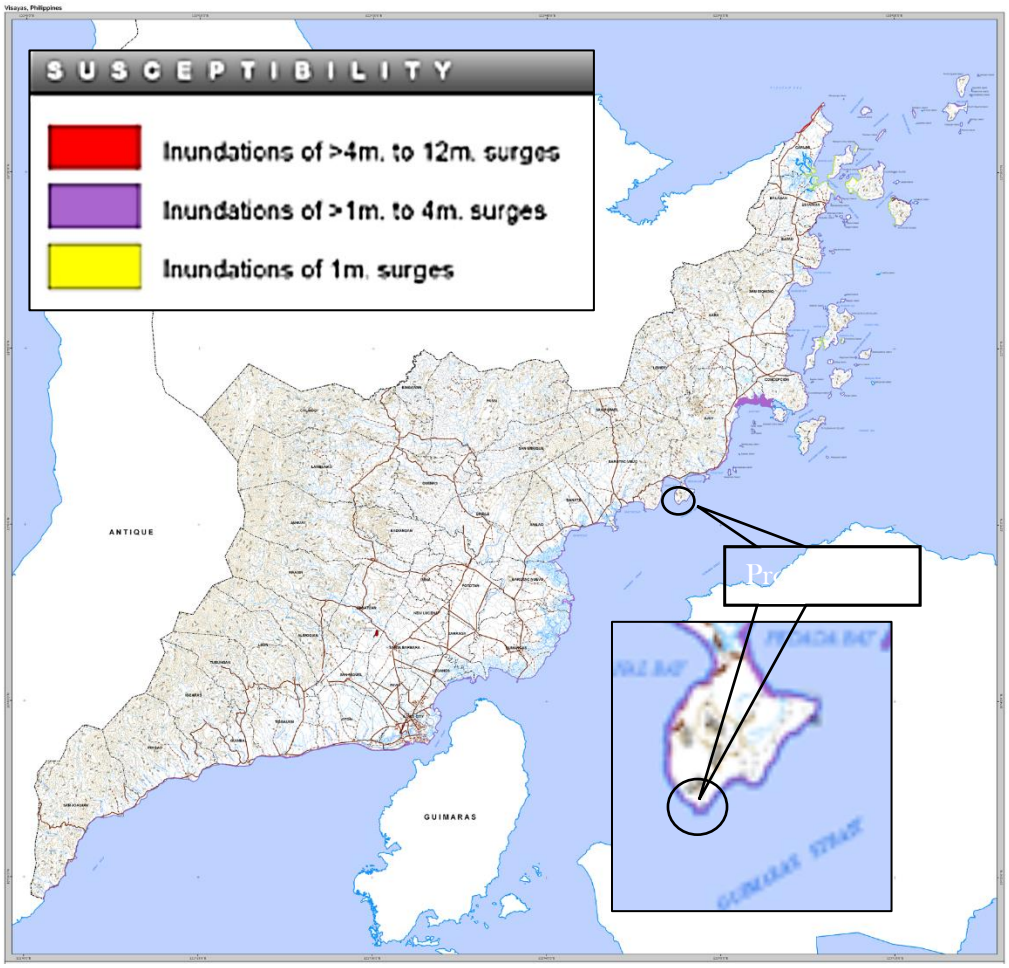


Source: NAMRIA READY Project Maps

Figure 2.1. 16 Liquefaction Hazard Map of Iloilo

2.1.4.10 Storm Surge

The Project site is vulnerable to storm surge that may rise to four (4) meters high, according to the READY Project Storm Surge Hazard Map of Iloilo published in 2013. Bay-ang was along the path of Typhoon Yolanda (international name: Haiyan). During Typhoon Yolanda, storm surge in Bay-ang reached 4.5 meters high according to anecdotal accounts. Typhoon Yolanda was a Category 5 storm, with a sustained wind speed of 345 km per hour. The occurrence of typhoons in Ajuy is not frequent; only one or two typhoons affect Ajuy annually. The severity of the impact of Typhoon Yolanda to Barangay Bay-ang was the first of its kind.



Source : NAMRIA READY Maps

Figure 2.1. 17 Storm Surge Hazard Map of Iloilo

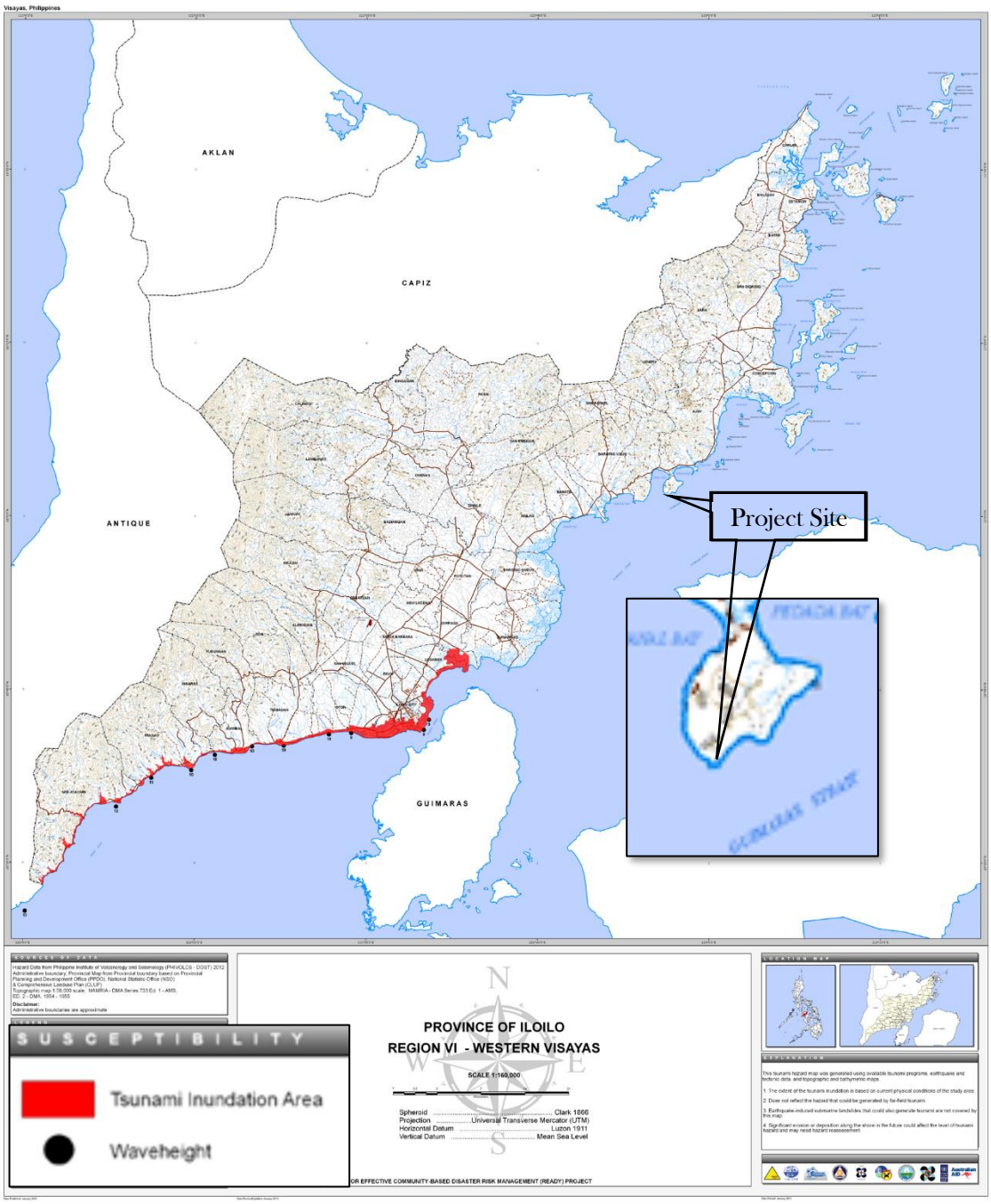
2.1.4.11 Tsunami

The Project site is not susceptible to tsunami (**Figure 2.1.** 18). There are no underwater volcanoes or trenches within 100 km that may cause a tsunami. Tsunamis are a series of large, very destructive waves caused by the displacement of a large volume of water, due to underwater earthquake, volcanic eruption, or explosion.

2.1.5 Pedology

2.1.5.1 Soil Characteristics

The project site is underlain by Barotac loam. Loam soil consists of three textural components: silt, sand, and clay. These elements combined with organic matter, water and air make up loam soils. The Barotac Loam soil series is a residual soil, developed from basalts overlaid on shales. The surface soil ranges from 20 to 30 centimeters deep. It is shallow along the slopes, such as in the Cemphil Project site. External drainage of Barotac Loam is excellent to excessive, but internal drainage is fair to good.



Source: NAMRIA READY Maps

Figure 2.1. 18 Tsunami Hazard Map of Iloilo

The areas on the mountain slopes that have undergone kaingin are usually abandoned after two (2) years of planting corn, upland rice, camote, and other root crops. These areas were converted to second-growth forests. Interviews with residents on the project site confirm that the area has been planted with corn and various backyard food crops in the past and planting is already abandoned due to poor yield. The growth of forest tree species planted by the informal settlers has been good.

A typical profile of the Barotac loam is as follows:

Table 2.1. 8 Typical Barotac Loam Profile

Depth of soil cm.	Characteristics
0 to 30	Surface soil, brown to light reddish-brown loam, moderate and medium granular structure and moderately friable in consistency. Gravels and stones are oftentimes present in this horizon. The soil is fairly rich in organic matter. The boundary separating this layer from the subsoil is diffused and smooth.
30 to 70	Subsoil, dark brown clay loam, slightly crumbly, slightly compact, with granular. Boundary is diffused and smooth.
70 to 110	Dark brown clay loam, moderately hard and brittle, compact with gravels and stone. Boundary is diffused.
110 to 150	Substratum, light gray to grayish brown clay loam, moderately hard, brittle, and slightly compact, and also stony and gravelly.

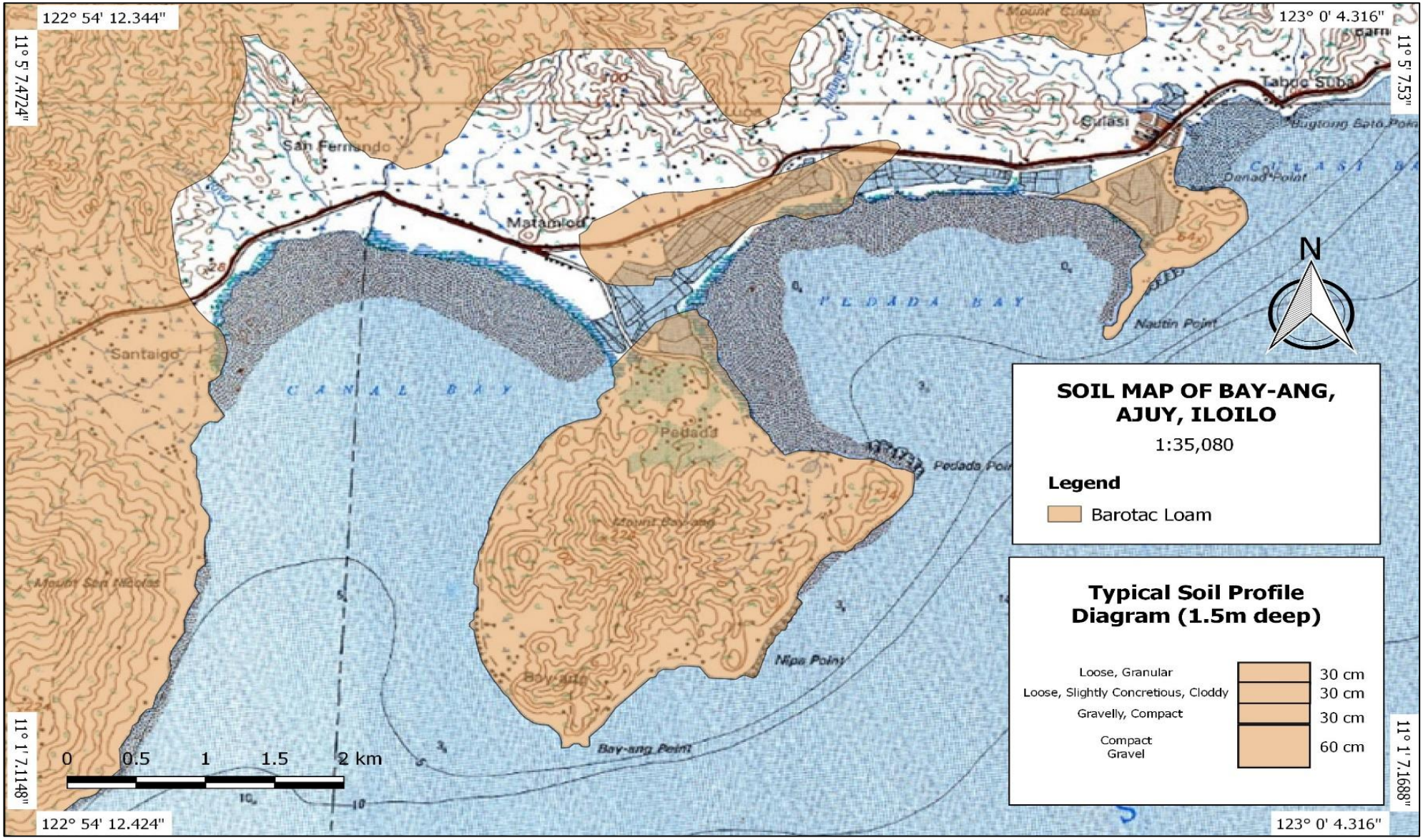
2.1.5.2 Soil Fertility

There are three crucial soil nutrients required for successful crop cultivation: nitrogen, phosphorus, and potassium. Nitrogen helps leaf growth and protein production, phosphorus supports seedling growth, while potassium makes sure nutrients and water travels within the plant.

As shown in **Table 2.1.** 9, the Barotac loam has low nitrate content, typically at <2 ppm, it also has low phosphorus content at <0.5 ppm, and low potassium content, at 4.p.p.m. The normal background level of nitrates in soil not fertilized or used for commercial crops ranges from 5 to 10 parts per 1 million ppm. The optimum nitrate level for soil used for corn (*Zea mays*) production is more than 25 ppm. For rice cultivation where the rice crop (straw plus grain) takes up around 16 kg N per ton of grain yield (10 kg N in grain + 6 kg N in straw), the cost of N fertilizer can easily be around PHP 636 per ton of grain per hectare, given the <2 ppm NO_5 in the soil in the project area.

For soils with <30 ppm phosphorus, additional phosphorus must be applied to build up the soil for optimum crop production.

Potassium is associated with the movement of water, nutrients, and carbohydrates in plant tissue. It is involved with enzyme activation within the plant, which affects protein, starch, and adenosine triphosphate (ATP) production. The production of ATP regulates the rate of photosynthesis. Potassium also helps regulate the opening and closing of the stomata, which regulates the exchange of water vapor, oxygen, and carbon dioxide.



Source: Bureau of Soil and Water Management

Figure 2.1. 19 Soil Map of Bay-ang, Ajuy, Iloilo Province

Table 2.1. 9 Chemical Analysis of Selected Plant Nutrients Available in the Soils of Iloilo Province

SOIL TYPES	PH	Nitrate (NO_5)		Phosphorous (P)		Potassium (K)		Calcium (Ca)	
		p.p.m.	Kilo per hec. 25 cms depth.	p.p.m.	Kilo per hec. 25 cms depth.	p.p.m.	Kilo per hec. 25 cms depth.	p.p.m.	Kilo per hec. 25 cms depth.
Sta. Rita clay	6.5	2	18	0.5	4.3	Low	27	90	810
Sta. Rita clay loam	6.0	10	90	1.0	9.0	Low	27	70	640
Barotac clay loam	5.5	3	27	<0.5	<4	4	36	20	180
Barotac loam, rolling phase	5.5	<2	<18	<0.5	4.0	4	36	20	180
Umingan fine sandy loam	6.0	10	90	0.5	4.5	Low	a27	80	720
Alimodian clay loam	6.0	5	45	a0.5	a4.5	Low	a27	100	900
Alimodian silt loam	5.0	2	18	0.5	4.5	Low	a27	30	270
Bantog clay loam	5.0	a2	a18	a0.5	a4.5	4	30	40	360
Faraon clay loam	6.5	12	108	0.5	4.5	Low	a27	175	1580
Sara sandy loam	4.0	a2	a18	a0.5	a4.5	Low	a27	30	270
Sara silt loam	4.5	a2	a18	a0.5	a4.5	Low	a27	20	180
San Rafael loam	5.5	a2	a18	a0.5	a4.5	Low	a27	70	640
Guimaras clay loam	5.0	a2	a18	a0.5	a4.5	Low	a27	40	360
Luisiana loam	5.5	25	225	0.5	4.5	11	99	50	450
Coastal beach sand	6.0	a2	a18	0.5	4.5	15	135	100	900

Source: Studies on the Soils of Iloilo Province, Bureau of Soil and Water Management

Table 2.1. 10 Productivity Ratings of the Soil in Iloilo

Soil Types	Crop Productivity Index *							
	Lowland palay 100-160 cavans per ha.	Corn 100-170 cavans per hectare	Coconut 100-3740 nuts per hectare	Sugar cane 100-80 piculs per ha	Mungo 100-7 cavans per hectare	Sweet Potato100-8 tons per hectare	Tobacco 100-1478 kilogram per hectare	Cassava 100-15 tons per hectare
1. Sta.Rita clay	130	50	35	75	115	10	60	30
2. Sta.Rita clay loam	35	70	40	110	60	85	70	60
3. Bantog clay loam	65	80	-	85	-	10	-	-
4. Sara silt loam	40	60	-	50	-	15	-	-
5. Sara sandy loam	20	40	40	65	100	40	30	40
6. Umingan fine sandy loam	-	115	85	95	80	75	80	75
7. Coastal beach sand		-	90	(c)	(c)	-	-	-
8. Guimaras gravelly loam	20	25	75	-	-	10	-	40
9. Faraon clay	-	-	80	(c)	-	-	-	-
10. Barotac clay loam	25	60	60	-	-	10		35
11. Barotac loam	35	65	40	85	85	15	60	45
12. Barotac loam, rolling phase	40	50	-	-	25	-	-	-
13. Alimodian clay loam	40	115	70	85	60	15	70	unknown
14. Alimodian silt loam	60	40	75	35	80	10	80	unknown
15. Alimodian-Barotac complex	-	-	-	-	-	-	-	-
16. Luisiana loam	65	50	-	85	-	25	40	unknown
17. San Rafael loam	-	40	-	-	-	40	(e)	(e)

*based on natural condition without fertilizer amelioration

Source : Studies on the Soils of Iloilo Province, Bureau of Soil and Water Management, 1973

The low level of key soil nutrients N, P, and K in Barotac loam is reflected in **Table 2.1.** 10. This data is based on crop productivity index which is without fertilizer amelioration. Based on this, the soil in the Project site is not conducive for crop production.

The project will concretize about 4.5 hectares of the 6.5-hectare project area. The remaining 2 hectares and all open soil will be re-soiled with topsoil earlier removed, for landscaping. While the remaining open soil will be limited in spatial extent, these areas are expected to have improved soil quality.

2.1.5.3 Soil Contamination

The operation of Cemphil cement milling plant will involve the use of diesel fuel oil as a back-up generator and ensure continued power supply. It involves numerous passage of haul trucks to distribute cement to various destinations. The mechanical components of mill machinery will also require regular lubrication. The use of diesel fuel oil and lubricants will have some leaks and spills in the plant facility one time or another.

The spillage of fuel or lubricants on project soil is not expected to be significant, but it will not be tolerated by management, nonetheless. There are numerous proven methods of controlling fuel and lubricant leakages in an industrial setting, such that leakages and spills indicate a loss in inventory and a diversion in manpower and resource expenditure that otherwise should be spent on production.

Contamination of soil with oil will not have a significant impact on land value since the project area is not utilized for crop production. It will neither affect soil quality as lipophilic bacteria, which breaks down oil, will be used for treatment. The decomposed hydrocarbons will also contribute organic matter to the soil.

2.1.5.4 Soil Erosion/ Loss of Topsoil/ Overburden

Soil erosion is a function of land slope and land cover. A slope is the inclination of the land surface, expressed either in degrees or in percent. The slope gradient is one of the most important features in assessing soil/ land suitability. It influences crop sustainability and soil conservation management practices for sustainable land use. This is because slope affects the retention and movement of water, transport of soil materials, soil depth and rate, and amount of run-off. Gently sloping soils have slight erosion hazards and can be easily adapted to many uses. The steeper slopes are susceptible to soil erosion when not terraced or when soil conservation practices are not applied.

The Project will modify the slopes in the project area to create more flatlands suitable for efficient industrial operation (see **Figure 1.3**, 3D Visualization of Project Facility). The north-eastern slopes will be cut and benched for stabilization. The first bench will be provided with retaining walls and the upper slopes revegetated with endemic fast-growing tree species. This will reduce the soil erosion potential of the area.

Table 2.1. 11 shows an estimate of soil loss of various disturbed slope classifications while **Table 2.1.** 12 estimates the reduction in the average annual volume of eroded soil due to the project land development. The estimated soil erosion volume with the project is expected to persist only for the first five (5) years, after which, soil erosion is expected to reduce as the roots of planted vegetation deepen, expand and grow effective in soil loss control.

During site development, soil erosion is predicted to increase as this activity involves earth movement. This problem can be amplified by the expected removal of some trees and soil binders.

Table 2.1. 11 Soil Erosion Potential of Disturbed Soils

Slope Class	Description	Degree of Erosion	Ave. Vol. of Soil Loss, t/ha/year
0-3	Level to gently sloping	No apparent erosion	
3-8	Gently sloping to undulating	Slight erosion	1.05
8-18	Undulating to rolling	Moderate erosion	6.97
18-30	Rolling to moderately steep	Severe erosion	26.21

Source: BSWM

Table 2.1. 12 Comparison of Average Annual Soil Loss with and Without Project

Slope Class	Soil Loss (ton)	W/O Project (has.)	Average Annual Soil Loss w/o Project (tons)	Average Annual Soil Loss During Construction (tons)	Slope Distribution with Project	Average Annual Soil Loss Years 1 to 5	Estimated Average Annual Soil Loss Years 6 onward	Change (tons)
0-3	0	0.32		-	4.34	-		
3-8	1.05	2.27	1.19	2.39	0.97	1.02	0.51	-0.68
8-18	6.97	3.89	13.57	27.15	0.84	5.88	2.94	-10.63
18-30	26.21	-	-	-	0.32	8.51	4.25	4.25
		6.49	14.77	29.53	6.49	15.41	7.71	-7.06

Reference: Modified USLE, BSWM

Although significant sediment transport from the northeastern wall will continue in the first five (5) years, soil erosion is expected to be significantly controlled during construction. This is because the root systems of the replanted vegetation will not be fully developed yet in that time period. (**Table 2.1.** 23).

The project landform design is consistent with the recommendation of the Nationwide Operational Assessment of Hazards (NOAH) (**Figure 2.1.** 20).

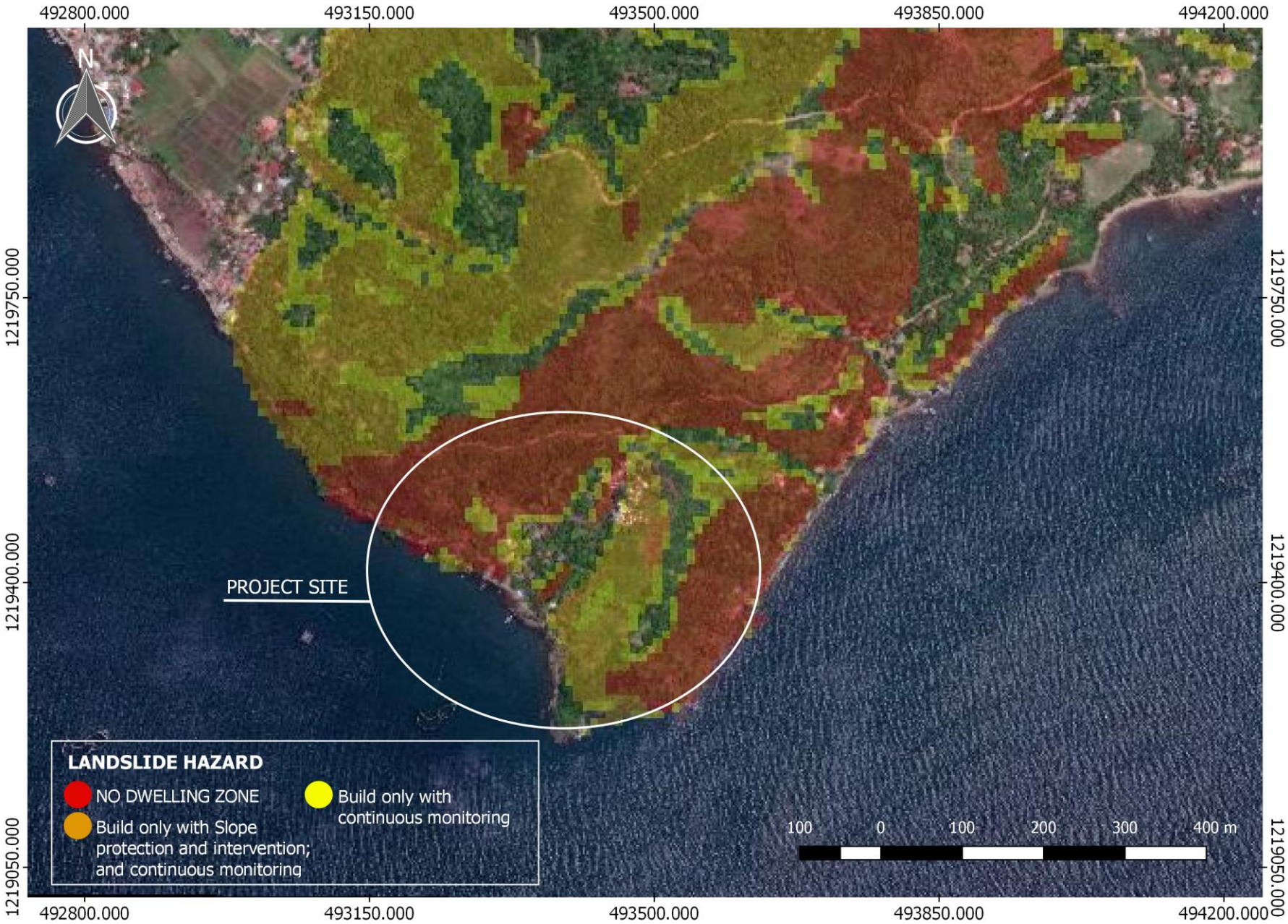
2.1.5.5 Change in Soil Quality/Fertility

An area with low agricultural productivity used under environmentally sustainable management in a viable sector will produce more advantages to society per hectare than a comparable hectare of land used for agriculture, allowing food supply to be secured elsewhere.

The projected changes in the quality and fertility of the soil are as follows:

a) During construction:
   - The area will receive more frequent compression from the weight of heavy equipment operating in the area, causing soil degradation.
   - The area will be de-vegetated and graded.
   - Sediment transport/soil erosion will be high during the construction period. Soil nutrients are expected to be washed down and soil capability to support vegetation further declines.

b) During Operation:
   - During operation, much of the area will be compacted, cemented, or otherwise sealed due to the heavy equipment used in cement manufacturing.

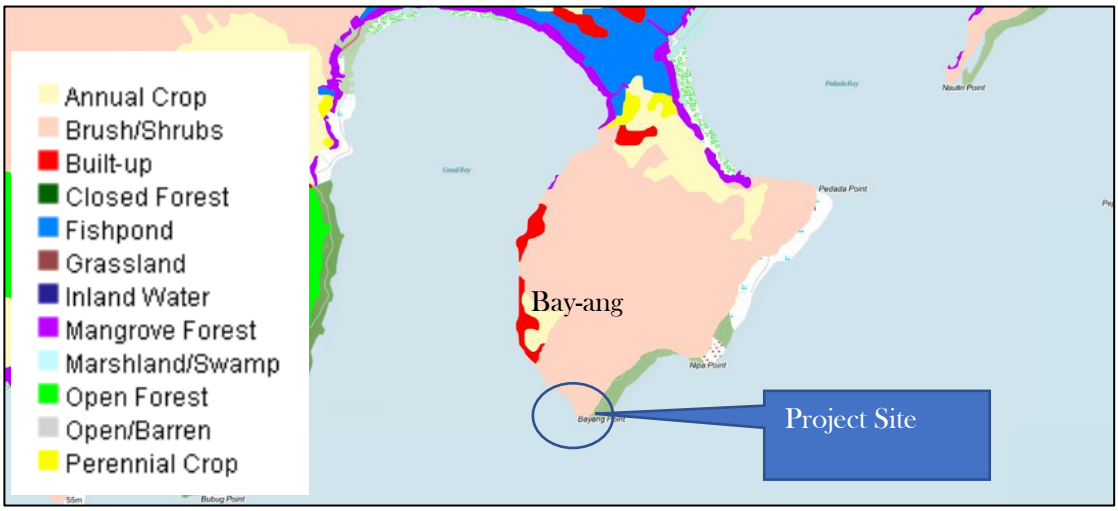


Source: Nationwide Operational Assessment of Hazards (NOAH)

Figure 2.1. 20 Map of Unstable Slope

2.1.6 Land Cover

In the Municipality of Ajuy, 3,947.37 ha, or 3.46% of its 19,346 ha. total land area is classified as forest land (Figure 2.1. 21 and **Table 2.1.** 13). **Figure 2.1.** 21, obtained from the Philippine Geoportal Project of the National Mapping and Resource Information Authority, shows the land cover of Barangay Bay-ang, Ajuy, with bushes and shrubs as the dominant vegetation.



Source: Philippine Geoportal

Figure 2.1. 21 Land Cover Map of Project Site

The area designated for the cement plant project is a titled property under agricultural classification but remains idle and is mostly shrubland. Using land cover definitions under DENR 2005-005 "Adopting Forest Definitions Concerning Forest Cover/Land Use", the land cover at the project site falls within the definition of "Other Land", defined as having tree cover less than 5%. Under DENR DAO 2005-005, the definition of "Other Lands" applies to agricultural land, pastures, built-up areas, bare areas, grassland, others". The estimation of ground cover in the project site was done through measuring the different land cover types and applying the definitions given in DAO 2005-005. To summarize, the project land cover is comprised of 95% shrubland and 5% low-density built-up area (**Table 2.1.** 13). An overview of land cover in the project site may be seen in Figure 2.1. 21.

Table 2.1. 13 Land Cover in Project Site

Land Cover Classification	Stockyard Area (m^2)	% ground cover	Mill Area (m^2)	% ground cover	Total Area (m^2)	% ground cover
Other land, built-up area	0	0	2,961	7%	2,961	5%
Shrubs / bushes/Grass	25,060	100%	36,889	93%	61,949	95%
Total	25,060	100%	39,850	100%	64,910	100%

Figure 2.1. 22 Sampling Map of Terrestrial Flora and Faunal Survey

Plate 2.1. 2 Photos of the General Land Cover within the Proposed Project Site

2.1.7 Terrestrial Vegetation

A flora survey was conducted from May 14-16, 2019 to generate the required baseline information. The assessment was focused on the remaining patches of trees which are mostly located along sloping land. **Figure 2.1.** 22 shows the flora and fauna survey locations.

Nested quadrat sampling technique was used to assess and characterize the structure and species composition of the existing plant communities. This sampling methodology is illustrated in **Figure 2.1.23**. Eight (8) quadrats were established (**Figure 2.1.** 22), spread throughout the project site. The elevation of the quadrats ranged from 5 to 40 meters above sea level (**Table 2.1.** 14). The large woody plants inside the 20m x 20m quadrat were measured at breast height (DBH). Other information listed were the merchantable height (MH), and total height (TH). The frequency of occurrence of shrubs, poles, and saplings inside the 5m x 5m quadrat was counted to account for the understory species.

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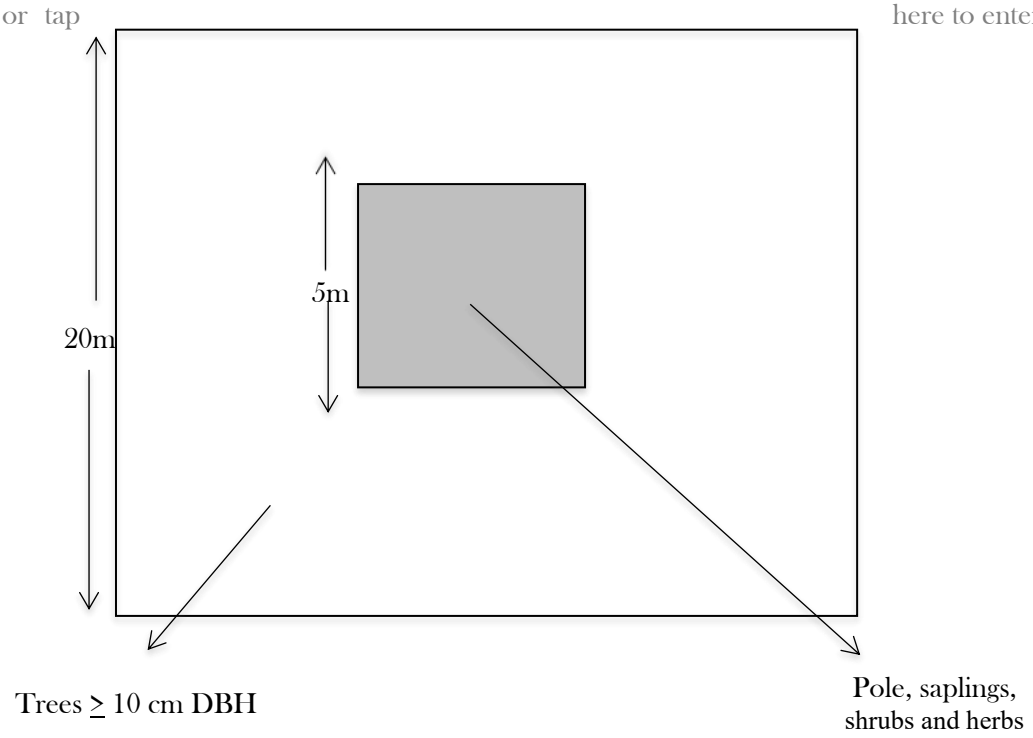

Figure 2.1.23 Nested quadrant sampling design used in the survey.

The sampling sites for flora and fauna were placed proximate to each other in the following locations:

Table 2.1. 14 Quadrant Sampling Locations

Site No.	Latitude	Longitude
1	Lat	Long
2	11° 2' 20.904"	124° 56' 16.181"
3	11° 2' 20.9292"	124° 56' 18.632"
4	11° 2' 21.552"	124° 56' 20.879"
5	11° 2' 20.706"	124° 56' 22.819"
6	11° 2' 19.2156"	124° 56' 23.572"
7	11° 2' 19.3884"	124° 56' 25.559"
8	11° 2' 16.3752"	124° 56' 26.016"

2.1.7.1 Tree Species

A total of 163 tree individuals in 17 tree species from 10 families was observed in the project site. **Table 2.1.** 15 shows the species, their family, and the corresponding number of individuals present while **Figure 2.1.** 24 shows the tree species distribution in the project site.

Table 2.1. 15 Frequency of Tree Species

TREE SPECIES	FAMILY	FREQUENCY
Alstonia macrophylla	Apocynaceae	13
Alstonia scholaris	Apocynaceae	3
Anthocephalus chinensis	Rubiaceae	3
Artocarpus blancoi	Moraceae	5
Artocarpus heterophyllus	Moraceae	3
Cassia fistula	Fabaceae	3
Ficus hauili	Moraceae	3
Ficus pseudopalma	Moraceae	31
Gmelina arborea	Lamiaceae	3

TREE SPECIES	FAMILY	FREQUENCY
Leucaena leucocephala	Fabaceae	5
Leucosyke capitellata	Urticaceae	3
Macaranga tanarius	Euphorbiaceae	3
Mangifera indica	Anacardiaceae	23
Strebius asper	Moraceae	36
Swietenia macrophylla	Meliaceae	16
Terminalia catappa	Combretaceae	10
Vitex parviflora	Lamiaceae	3
TOTAL		163

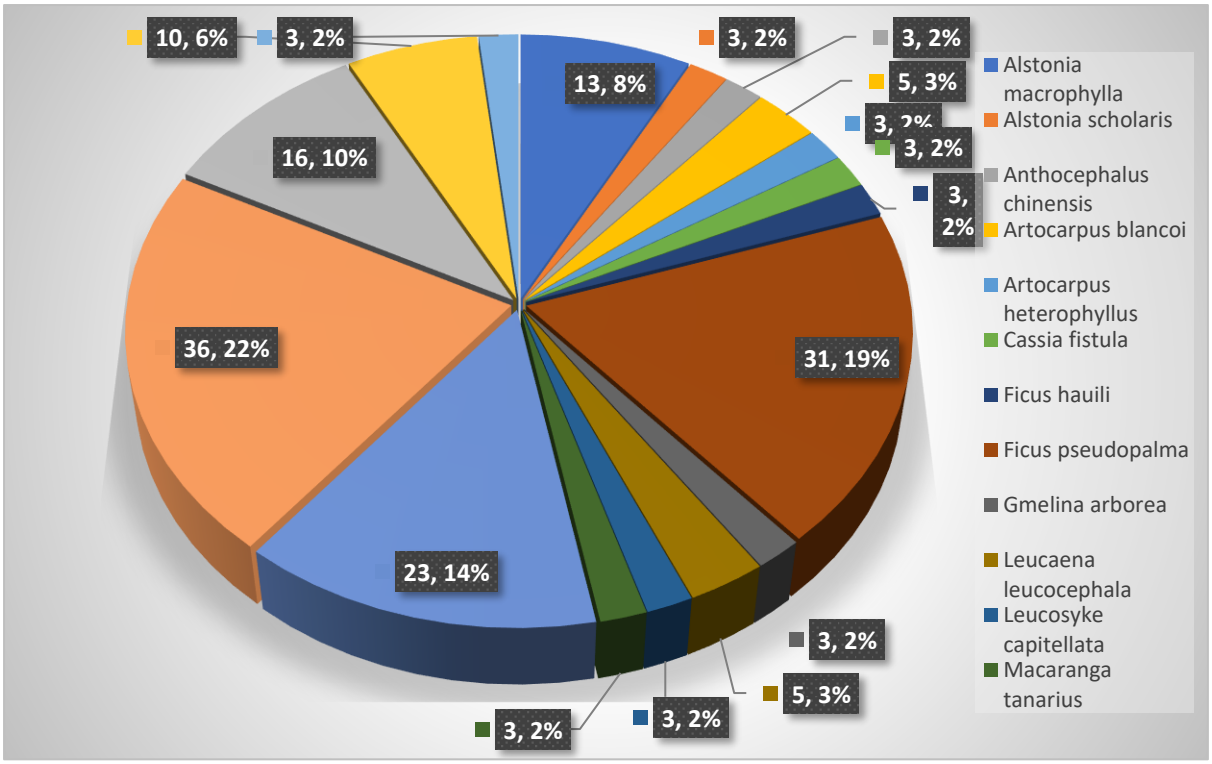

Figure 2.1. 24 Tree Species Distribution

2.1.7.2 Shrubs and Bushes

A total of 5 understory species from 5 families were observed at the project site (see Table 2.1.16 and **Plate 2.1.4**). One of the understory species found is *Saccharum spontaneum*, an opportunistic species which colonize exposed poor soils washed each year by the receding storm drainage. It is an indicator species for nutritionally depauperate soils.


Alstonia macrophylla


Gmelina arborea


Anthocephalus chinensis


Artocarpus blancoi


Alstonia scholaris


Cassia fistula


Ficus hauili


Ficus pseudopalma


Artocarpus heterophyllus


Terminalia catappa


Leucosyke capitellata


Macaranga tanarius


Mangifera indica


Strebius asper


Leucaena leucocephala


Swietenia macrophylla


Vitex parviflora

Plate 2.1. 3 Tree Species Recorded

Table 2.1.16 Understory Species Found

Understory Species	Family
Centrosema pubescens	Fabaceae
Chromolaena odorata	Asteraceae
Melicope triphylla	Rutaceae
Pasiflora foetida	Passifloraceae
Saccharum spontaneum	Poaceae

Plate 2.1. 4 Understory Species Observed

Centrosema pubescens

Chromolaena odorata

Melicope triphylla

Pasiflora foetida

Saccharum spontaneum

2.1.7.3 Tree Diameter Size Class Distribution

Grouping the Diameter at Breast Heights (DBHs) of the inventoried trees according to Richards' Ideal Distribution (**Table 2.1.17**), we can derive an estimate of the development phase of the tree population. **Figure 2.1.** 25 below shows the relative tree development phase of the surveyed tree population based on diameter at breast height based on the generalized ideal age classification distribution proposed by Richards (1982). The age of most of the inventoried trees is in young phase (137 individuals or 82.5 % of the total surveyed population). The other phases have the following individuals and percentages: established phase (10 individuals or 6 % of the total surveyed population), maturing phase (12 individuals or 7.2 % of the total surveyed population), and mature phase (7 individuals or 4.2 % of the total surveyed population). Based on community discussions during meetings, the informal population within the Project site harvested the trees "they planted".

Table 2.1.17 Generalized Ideal Tree Diameter Distribution

Diameter at Breast Height	Classification
0 – 20.32 cm	young trees
20.33 – 43.18 cm	established
43.19 – 60.96 cm	maturing
more than 60.96 cm	mature trees

Source: N.A. Richards, 1982

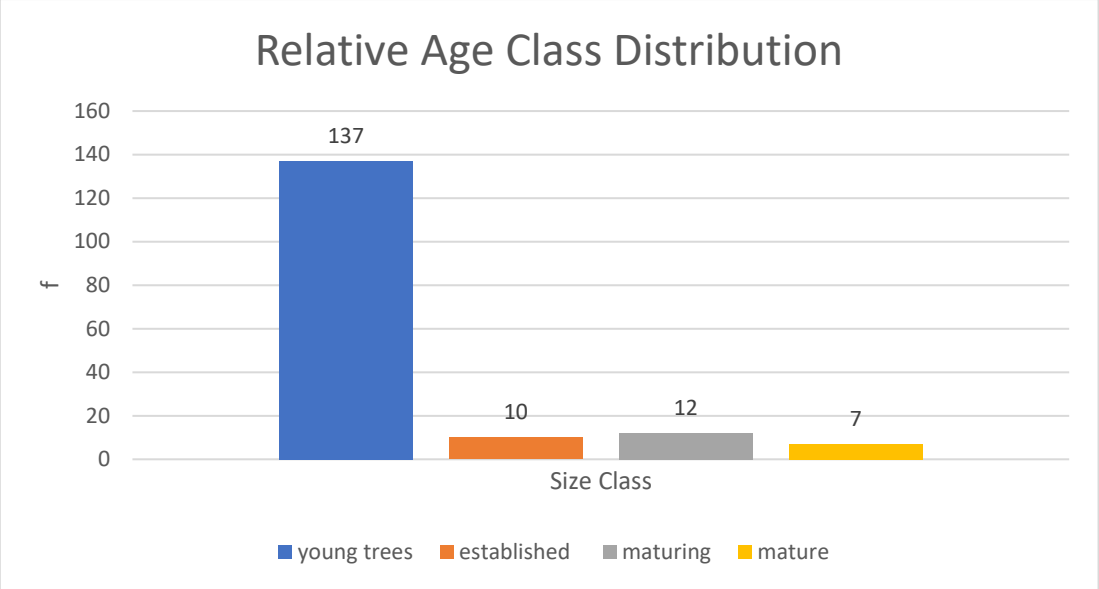

Figure 2.1. 25 Relative Age Class Distribution of Trees in Cemphil Site Based on the DBH

2.1.7.4 Conservation Status

The conservation status of the following identified species is categorized by IUCN Red List and by DAO 2017-11 as follows:

Table 2.1. 18 Conservation Status of the Identified Species Based on IUCN & DAO 2017-11

Species	IUCN Red List Category	DAO 2017-11
Alstonia macrophylla	Least Concern – Unspecified Pop'n Trend	Not Listed
Alstonia scholaris	Least Concern - Unspecified Pop'n Trend	Not Listed
Anthocephalus chinensis	Not Evaluated	Not Listed
Artocarpus blancoi	Vulnerable	Not Listed
Artocarpus heterophyllus	Not Evaluated	Not Listed
Cassia fistula	Least Concern – Stable Pop'n Trend	Not Listed
Ficus hauili	Not Evaluated	Not Listed
Ficus pseudopalma	Not Evaluated	Not Listed
Gmelina arborea	Not Evaluated	Not Listed
Leucaena leucocephala	Not Evaluated	Not Listed
Leucosyke capitellata	Not Evaluated	Not Listed
Macaranga tanarius	Not Evaluated	Not Listed
Mangifera indica	Data Deficient	Not Listed
Strebius asper	Not Evaluated	Not Listed
Swietenia macrophylla	Vulnerable	Not Listed
Terminalia catappa	Not Evaluated	Not Listed
Vitex parviflora	Vulnerable	Not Listed
Centrosema pubescens	Not Evaluated	Not Listed
Chromolaena odorata	Not Evaluated	Not Listed
Melicope triphylla	Not Evaluated	Not Listed
Pasiflora foetida	Not Evaluated	Not Listed
Saccharum spontaneum	Least Concern – Stable Pop'n Trend	Not Listed

The IUCN classifies species into the following categories:

- Not Evaluated – a taxon that has not yet been evaluated against the criteria that prompt conservation.
- Data Deficient (DD) - when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

- Least Concern (LC) – a taxon that has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near-Threatened. Widespread and abundant taxa are included in this category.
- Near Threatened (NT) – a taxon that has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable at the time of evaluation, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
- Vulnerable (VU) – a taxon considered to be facing a high risk of extinction in the wild.
- Endangered (EN) – a taxon considered to be facing a very high risk of extinction in the wild.
- Critically Endangered (CR) - considered to be facing an extremely high risk of extinction in the wild.
- Extinct in the Wild (EW) – a taxon that is known only to survive in cultivation, in captivity or as a naturalized population/s well outside the past range; and
- Extinct (EX) – a taxon is extinct when there is no reasonable doubt that the last individual has died.

In **Table 2.1.** 18, the surveyed populations in the project site are listed as species with Least Concern status in the IUCN Red List of Threatened Species, i.e., *Alstonia macrophylla, Alstonia scholaris, Cassia fistula, and Saccharum spontaneum*, are either stable or have insufficient information. *Mangifera indica* is categorized as Data Deficient due to inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. Hence, there is a need to further assess this species. *Artocarpus blancoi, Swietenia macrophylla,* and *Vitex parviflora* are categorized as Vulnerable species. These are facing a high risk of extinction in the wild and are recommended to be conserved properly and be used sustainably. Note also that these species are endemic to the Philippines and population are not found naturally anywhere elsewhere in the world (galapagos.org).

The importance of conservation of endemic species should be prioritized as these species have significant implications for the conservation of biodiversity as the loss of endemics as a group might also represent the loss of unique ecological interactions (Bailey, 2014). The presence of these threatened species in the study areas underscores the significance of a need for biodiversity conservation as these habitats store species that may otherwise become threatened in the wild.

2.1.8 Analysis of Biodiversity Indices

Information gathered in the field were tabulated and analyzed to characterize floral composition within the study area.

2.1.8.1 Shannon-Wiener Diversity Index (H')

The Shannon-Wiener Index of Diversity (H') Index was used to determine flora species diversity. It is the most widely used index of diversity, which combines species richness and evenness, and also not affected by sample size. The large value of H', the greater the uncertainty. The index increases with the number of species in the community, but in practice, for biological communities H' does not exceed 5.0. The following is the formula of H':

$$H' = - \sum_{i=1}^{s} (Pi \log a Pi)$$

Where:

H' = the Shannon-Wiener Diversity Index
$\sum$ = the summation symbol
s = the number of species

Pi = the proportion of individuals or the abundance of the species in the sample
log a = the logarithm to a base

The Shannon-Wiener Index of Diversity is based on measuring uncertainty. The degree of uncertainty of predicting the species of a random sample is related to the diversity of a community. If a community by one species (low diversity) and the uncertainty of prediction is low, a randomly-sampled species is most likely going to be the dominant species. However, if diversity is high, uncertainty is high. The Shannon-Winer Index of Diversity can be interpreted using the Fernando Biodiversity Scaling System (Fernando, 1998) as seen in **Table 2.1.** 19.

Table 2.1. 19 Fernando Biodiversity Scaling System 1998

Relative Values	Shannon-Wiener Index of Diversity (H')	Evenness (J')
Very High	3.5 and above	0.75-1.0
High	3.0 -3.49	0.5-0.74
Moderate	2.5 – 2.99	0.25-0.49
Low	2.0 – 2.49	0.15-0.24
Very Low	1.9 and below	0.14 and below

2.1.8.2 Index of Evenness (J')

Species evenness refers to how close in numbers each species in an environment is. Mathematically, it is defined as a diversity index, a measure of biodiversity which quantifies how equal the community is numerically. It is constrained between 0 and 1. The less variation in communities between the species, the higher J' is. The following is the formula of J':

$$J' = H'/H'_{max}$$

Where:
J' = Index of Evenness
H' = the number derived from the Shannon diversity index
H'_{max} = $-\sum 1/s \ln 1/s = \ln S$; S is the total number of species

The results of Shannon-Wiener Index of Diversity (H') and Index of Evenness (J') of the tree species in the project site were presented in the table below:

Table 2.1. 20 Biodiversity Indices of the Trees Present in the Sampling Sites

Tree Biodiversity Indices	
Shannon-Wiener (H')	Evenness (J')
2.34	0.82

In **Table 2.1.** 20, for the tree species recorded, the value of H' is 2.34. This can be interpreted using Fernando Scale as having a low relative value diversity index. The low relative value of the diversity index signifies that the proposed project site has poor flora richness, and this may be due to continuous human disturbance like kaingin and charcoal-making, as shown below in **Plate 2.1.** 5. The area is apparently stressed with relatively few ecological niches and a relatively few organisms thriving in the site.

The relevant abundance of rare and common species is called evenness. It is rated between zero to one, with zero signifying no evenness and one, complete evenness. The result in **Table 2.1.** 20 revealed

the index of evenness of 0.82 of the assessed area, which is relatively high. When the area is dominated by one or a few species, the evenness is low. Whereas, when the number of individuals of the various species is more-or-less evenly distributed, the area may be said to have high species evenness.

Plate 2.1. 5 Evidence of Kaingin and Charcoal-Making Activities Found within Proposed Project Site

2.1.9 Economic Significance

All the species on the Cemphil project site either have community medicinal, food, or economic value. The economic importance of the various plant species is indicated in **Table 2.1.** 21.

Table 2.1. 21 Economic Importance of Flora in Project Site

TREE SPECIES	ECONOMIC IMPORTANCE
Alstonia macrophylla	Medicinal, as anti-amoebic, anticholeric, antidysenteric, antimalarial, antiperiodic, emmenagogue, febrifuge, tonic and for headache relief. The powdered bark, mixed with water, is used against skin diseases. Wood is used for construction, furniture, flooring
Alstonia scholaris	Used in the manufacture of pencils, wood for coffin, net floats, household utensils, trenchers, corks. Medicinal, used as antidysntery, stringent tonic, anthelmintic, and antiperiodic
Anthocephalus chinensis	Wood is used in matchsticks boxes, tea boxes, bobbins, veneer, plywood, crates, and furniture (Chudnoff 1984, Zabala 1990a). The logs are used for dugout canoes, roof structures, and light construction (Alam and others 1991). It can also be used for joinery work (Gamble 1922). The sapwood of A. chinensis rates fair for wood wool or cement boards (Kamil and Serwandi 1975).
Artocarpus blancoi	Used for paper production and being a shade provider. Seeds and fruits are edible
Artocarpus heterophyllus	Food material, either as fruit or vegetable
Cassia fistula	Ornamental, supplemental feedlot for cattle and goats. Herbal laxative
Ficus hauili	Medicinal, Diuretic, sudorific, antiherpetic, antirheumatic. bruised with oil, used as poultice for headaches
Ficus pseudopalma	Young shoots are edible. Leaves are eaten as vegetables. It is highly nutritious, highly acceptable in taste, texture, and color.
Gmelina arborea	Leaves cooked and eaten as vegetable. Seeds and ripe fruits reportedly edible. Leaves used as medicinal tea.
Leucaena leucocephala	In some provinces, seeds occasionally used as a coffee substitute. Leaves and seeds used as human food. Used as anthelminthic. Good fuelwood.
Leucosyke capitellata	Used to improve the quality of backyard sugar. Bark and leaves use in making a fermented drink, basi,
Macaranga tanarius	Medicinal. Decoction of roots used for phthisis, coughs, headache and gastralgia. Subanens in Dumingag, Zamboanga del Sur, apply the bark on the throat for treatment of cough. Subanen tribe of Lapuyan, Zamboanga del Sur eat small amounts of stem for cough. Necklace made out of the outer layer of stem put around the child's neck for colds. Decoction made from trunk with leaves of *Coleus aromaticus* and roots of *Flemingia strobilifera* drunk for cough. Bark used for its strong base fibers in making ropes. Leaves, with its one-sided roughness, used for scouring pots and pans.
Mangifera indica	High value food
Strebius asper	Folkloric medicine - Decoction of bark used for disinfecting wounds; also used for internal skin disease "culebra." - The bark is chewed as an antidote for snake poisoning. - Bark decoction also used for fever, dysentery, and diarrhea. - Root powder used for dysentery; poultice applied to unhealthy ulcers. - In Ayurvedic medicine, used for filariasis, leprosy, toothaches, dysentery, diarrhea, cancer.
Swietenia macrophylla	Highly prized reddish-brown wood popular for making of furniture, musical instruments, boats, caskets. Branched wood and crooked

TREE SPECIES	ECONOMIC IMPORTANCE
	stems are used to make charcoal. Species included in Government reforestation program in the 1980's.
Terminalia catappa	Kernels are edible, with a sweet-acidic pericarp. Seeds are a good source of minerals - in descending order: potassium, calcium, magnesium, sodium. Oil: Kernel contains a fixed oil, 51-63% called Indian Almond oil, oil of Badamier, or in the Philippines, as Talisay oil. Tannin / Dye: Fruits and roots used for tanning leather and provides an ink and black dye for dyeing cotton and rattan. Fodder: Foliage used as feed for silkworms; also, as animal feed. Wood: Tree provides red, cross-grained, good quality timber. Used for construction of boats, bridges, crates, planks, water troughs, etc. Trunk is a source of gum or resin
Vitex parviflora	Known in the Philippines as Molave, highly prized for its extremely hard wood with a density of 940 kg/m^3 at 15% moisture, resistant to fungal, termite, and Lyctus beetle attack, but not to marine borers. Used like teak for shipbuilding and construction in contact with the ground. Also, a source of firewood. Fruit and bark used as fish poison in the Philippines. Leaves used as fodder. Exudes a yellow resin when the wood is treated with lime. Shavings soaked in water yields a yellow extract (tannin) used as dyestuff

2.1.10 Past Occurrences of Pest Infestation, Forest Fire & Similar Incidences

Based on the response from key informant interviews of current and former members of the Barangay Council, and the elders of Bay-ang, no pest infestation, forest grass fire or natural calamities aside from Typhoon Yolanda occurred in the area.

2.1.11 Vegetation removal and loss of habitat

Most of the plant species on the project site will be affected during construction due to vegetation removal for land development. While the clearing of certain individuals is necessary for project construction, the extinction of vulnerable species due to this project is unlikely if the basis is DAO 2017-11, as the species in the project site are widely distributed throughout the country, and none are listed as threatened species. The affected Vulnerable species in the IUCN Red List, among others, will be earth-balled and nursed in the nursery for later replanting. The replanting of indigenous tree species, bushes, and shrubs at benched slopes and sloping lands that will be without direct industrial use will recreate habitat for existing birds and insect species, in the least.

The summary of impacts and their corresponding mitigating measures are listed in **Table 2.1.** 23 below. For tree cutting that cannot be avoided, Permit for Tree Cutting Permit will be secured by Cemphil Inc. from DENR Region VI through the CENRO Sara Office.

2.1.12 Mangrove species

Mangroves are intertidal flora species found growing at slightly above the mean sea level (MSL), in areas that area tidally inundated not more than 30% of the time (Kjerfve 1990). These species may be distributed both vertically according to low, mid, and high tidal level, and in a freshwater environment, horizontally from downstream, intermediate, and upstream. Near the project site, in Barangay Pedada, adjacent and east of the site, exist two mangrove species that are noted to have historical importance in the area: *Sonneratia caseolaris* and *Lumnitzera racemosa*. The reason is that

the names of the two of the Ajuy's barangays i.e., Brgy. Pedada and Brgy. Culasi stemmed from the common names of these mangrove species. Another notable mangrove species found nearby with significant value is Sonneratia alba. This species is very important in protecting the coastal areas. It is a front-liner mangrove species that grow in low coastal elevation capable of withstanding extreme wave impact.

The table below shows the conservation status of the mangrove species in the area based on IUCN and DAO 2017-11 category.

Table 2.1. 22 Conservation Status of the Mangrove Species Based on IUCN & DAO 2017-11

Species	IUCN Red List	DAO 2017-11
Lumnitzera racemosa	Least Concern – Decreasing Pop'n Trend	Not Listed
Sonneratia alba	Least Concern - Decreasing Pop'n Trend	Not Listed
Sonneratia caseolaris	Least Concern - Decreasing Pop'n Trend	Not Listed

In Table 2.1. 22, populations of the listed mangrove species are classified as of Least Concern (but with decreasing population trend) status based on IUCN Red List. While per DAO 2017-11, all the said listed mangrove species are not listed under DAO 2017-11.

Table 2.1. 23 Summary of impacts for Terrestrial Flora and Corresponding Mitigating Measures

List of Key Impacts	Phase Occurrence				Proposed Mitigation Activities
	Pre-Construction	Construction	Operation	Abandonment	
Vegetation removal and loss of habitat		✔	✔		Transfer planting of viable individuals to designated landscaping areas. Seedling production, regular tree planting, donations of seedlings for planting by Barangay, schools, and local cooperatives. Rainforestation farming is recommended as a reforestation approach for the project Bio-engineering strategies that combine vegetative and engineering schemes for steep slopes
Threat to existence and/ or loss of important local species		✔	✔		Extinction of important species is unlikely as these species are well distributed in Ajuy and in the country. Transfer planting of viable individuals to designated landscaping areas. Seedling production, regular tree planting, replanting, donations of seedlings for planting by LGUs and local cooperatives Monitor plant growth to ensure survival

List of Key Impacts	Phase Occurrence				Proposed Mitigation Activities
	Pre-Construction	Construction	Operation	Abandonment	
Threat to abundance, frequency, and distribution of important species		✔	✔		Transfer planting of viable individuals to designated landscaping areas. Seedling production assisted natural regeneration where suitable, regular tree planting, replanting, donations of seedlings for planting by LGUs and local cooperatives as part of the effort toward carbon footprint neutralization. Monitor plant growth to ensure survival Establishment of nature parks/pocket parks featuring the important species of Panay Island in accessible areas meant for recreation of the community and project employees
Proliferation of invasive species		✔	✔	✔	Use only of indigenous species for propagation in nursery & reforestation efforts Generate list of invasive species and raise personnel and community awareness to avoid their reintroduction in the area

2.1.13 Terrestrial Fauna

2.1.13.1 Herpetofauna

Opportunistic sampling and ethnobiological accounting were done within an established 4-kilometer transect. Active searching was conducted for three consecutive days during the early and mid-morning and late afternoon where skinks and lizards are most active and after dusk when amphibians are out to breed, as well as other nocturnal reptiles that are active at nighttime.

A total of seven species of amphibians and reptiles has been noted, with two (2) species of frogs, one (1) snake, and three (3) lizards (Table 2.1. 24). The species were listed from opportunistic sampling and ethnobiological accounts. According to Tanalgo (2017), among species noted, the following are commonly hunted in the Philippines: *P. reticulatus* and Common water monitor lizard (*Varanus salvator*).

Anuran (frog) species belonging to two (2) families were also noted to occur in the area, such as the banded bullfrog (*Kaloula pulchra*) and the cane toad (*Rhinella marina).* The former species is sensitive to changes in habitat weather conditions and temperatures within 27–29 °C (Encyclopedia of Life). *Rhinella marina* is a known invasive and pest species that prefers wet habitats overlapping with native species (Mayer et al., 2017). These observed species are known to occur in a variety of habitats including highly disturbed areas.

Table 2.1. 24 Summary of the Herpetofauna Observed in the Area

Scientific Name	Common Name	IUCN Status	CITES	DAO 2004-15	Distribution	Observation
FROGS AND TOADS						
BUFONIDAE *Rhinella marina* (Linnaeus, 1758)	Cane toad	LC	-	-	Introduced, Invasive	Seen
MICROHYLIDAE *Kaloula pulchra* (Gray, 1831)	Banded bullfrog	LC	-	-	Introduced, Invasive	Ethno
SNAKES AND LIZARDS						
PYTHONIDAE *Python reticulatus*	Reticulated python	LC	App II	-	Resident	Ethno
VARANIDAE *Varanus salvator* (Laurenti, 1768)	Common water monitor	LC	-	-	Resident	Seen
SCINCIDAE *Lamprolepis smaragdina*	Emerald tree skink	LC	-	-	Resident	Seen
GEKKONIDAE *Gekko gecko*	Tokay gecko	LC	-	-	Resident	Heard/Seen



Plate 2.1. 6 Emerald Tree Skinks (left), Tokay Gecko (middle) and Common Water Monitor (right) seen in the area.

2.1.13.2 Avifauna

Eight transect lines with a total length of 1-km traversing various locations in the project site (**Figure 2.1.** 22) were established for the avifaunal survey (BMB, 2017). Bird counting and identification were conducted at approximately the same time each day. Continuous observation through a paced-walk was done to avoid double counts of individuals. All surveys were carried out early in the morning (05:30-09:00) and late in the afternoon (15:00-17:00) for three consecutive days. All birds were counted, excluding those that flew over the canopy. Bird species exhibiting territorial behaviors such as singing and calling were noted.

From the established 8 transect lines, a total of 293 individuals belonging to 25 species of avifauna representing 19 families was observed (see Table 2.1. 25 & Table 2.1. 26). The results show that the most dominant family based on the number of species observed is family Columbidae or the dove/pigeon group with three represented species. At the species level, bird assessment revealed that the most dominant species on the site was White-breasted Woodswallow with 62 individuals. Co-dominant species were White-breasted Woodswallow (*Artamus leucorynchus*, Linn.), and Philippine Pied Fantail (*Rhipidura nigritorquis*, Vigors). Such degree of dominance could be attributed to the land-use and availability of forage materials since the area has a largely open canopy.

Table 2.1. 25 Checklist of Avifauna Observed in the Site

No.	Family Name	No.	Common Name	Scientific Name	Species Authority
1	Acanthizidae	1	Golden-bellied Gerygone	*Gerygone sulphurea*	Wallace, 1864
2	Alcedinidae	2	White-collared Kingfisher	*Halcyon chloris*	Boddaert, 1783
3	Apodidae	3	Glossy Swiftlet	*Collocalia esculenta*	Linnaeus, 1758
4	Ardeidae	4	Intermediate Egret	*Egretta intermedia*	Wagler, 1827
		5	Cattle Egret	*Bubulcus ibis*	Linnaeus, 1758
5	Artamidae	6	White-breasted Woodswallow	*Artamus leucorynchus*	Linnaeus, 1771
6	Campephagidae	7	Pied Triller	*Lalage nigra*	Forster, 1781
7	Columbidae	8	Red Turtle Dove	*Streptopelia tranquebarica*	Bonaparte, 1855
		9	Spotted Dove	*Spilopelia chinensis*	Scopoli, 1768
		10	Zebra Dove	*Geopelia striata*	Linnaeus, 1766
8	Corvidae	11	Large-billed Crow	*Corvus macrorhynchos*	Vieillot, 1807
		12	Slender-billed Crow	*Corvus enca*	Horsefiield, 1822
9	Estrildidae	13	Chestnut Munia	*Lonchura mallacha*	Vieillot, 1807
10	Hirundinidae	14	Barn Swallow	*Hirundo rustica*	Linnaeus, 1758
11	Laniidae	15	Brown Shrike	*Lanius cristatus*	Linnaeus, 1758
		16	Long-tailed Shrike	*Lanius schach*	Linnaeus, 1758
12	Locustellidae	17	Striated Grassbird	*Megalurus palustris*	Horsfield, 1821
13	Muscicapidae	18	Pied Bush Chat	*Saxicola caprata*	Linnaeus, 1766
14	Nectariniidae	19	Olive-backed Sundbird	*Cinnyris jugularis*	Linnaeus, 1766
15	Passeridae	20	Eurasian Tree Sparrow	*Passer montanus*	Linnaeus, 1758
16	Pycnonotidae	21	Yellow-vented Bulbul	*Pycnonotus goiavier*	Scopoli, 1786
17	Sturnidae	22	Asian Glossy Starling	*Aplonis panayensis*	Scopoli, 1783
18	Rhipiduridae	23	Philippine Pied Fantail	*Rhipidura nigritorquis*	Vigors, 1831
19	Cuculidae	24	Greater Coucal	*Centropus cinensis*	Scopoli, 1786
		25	Lesser Coucal	*Centropus bengalensis*	Gmelin, 1788

Table 2.1. 26 Summary of Bird Species Counted and Method of Identification

No.	Common Name	frequency	S	Remarks
1	Golden-bellied Gerygone	1	0.3413	obs
2	White-collared Kingfisher	6	2.0478	obs
3	Glossy Swiftlet	3	1.0239	obs
4	Intermediate Egret	2	0.6826	obs
5	Cattle Egret	1	0.3413	obs
6	White-breasted Woodswallow	62	21.1604	obs
7	Pied Triller	1	0.3413	obs
8	Red Turtle Dove	12	4.0956	obs
9	Spotted Dove	5	1.7065	obs
10	Zebra Dove	2	0.6826	obs
11	Large-billed Crow	1	0.3413	obs
12	Slender-billed Crow	2	0.6826	obs
13	Chestnut Munia	12	4.0956	obs
14	Barn Swallow	6	2.0478	obs
15	Brown Shrike	6	2.0478	obs
16	Long-tailed Shrike	3	1.0239	obs
17	Striated Grassbird	2	0.6826	obs
18	Pied Bush Chat	2	0.6826	obs
19	Olive-backed Sundbird	15	5.1195	obs
20	Eurasian Tree Sparrow	14	4.7782	obs
21	Yellow-vented Bulbul	22	7.5085	obs
22	Asian Glossy Starling	32	10.9215	obs
23	Philippine Pied Fantail	56	19.1126	obs
24	Greater Coucal	13	4.4369	obs/snd
25	Lesser Coucal	12	4.0956	obs/snd
	Total	293	100.00	

*"obs" = observation and "snd" = sound

Plate 2.1. 7 Some of the bird species observed in the area
a. White-collared Kingfisher,
b. Yellow-vented Bulbul,
c. Asian Glossy Starling (immature stage),
d. Chestnut Munia
e. Eurasian Tree Sparrow,
f. Philippine Pied Fantail,
g. Pied Triller,
h. White-breasted Woodswallow,
i. Olive-backed Sunbird (Photos of Wencelito Hintural)

2.1.13.3 Volant and Non-Volant Mammals

The mist netting method was employed for the bat survey. A six-meter mist net was set up in each of the area sampling areas. Using poles, mist nets were erected strategically in order to capture more bats. It was placed across the slope with a narrow opening over trails. The mist net set up was monitored every three hours each day for two consecutive days. For small mammals, particularly rats and rodents, cage trapping was done with roasted coconut and peanut butter as bait.

Opportunistic sampling and ethnobiological accounts from interviews with workers and locals indicated the presence of bats and rodents in the area. However, they have also noted that bats (*Megachiropterans and Microchiropterans*) only appear in the area during fruiting season of trees (particularly lanzones) and are very minimal during regular days. Species observed are Greater musky fruit bat (*Ptenochirus jagori*) and Lesser short-nosed fruit bat (*Cynopterus brachyotis*). Both species are of least concern according to IUCN and could thrive in disturbed areas.

Sampling for Murids (rats and mice) were also done using live traps with roasted coconut and peanut butter as bait. Traps were set in locations where the mammals are suspected to pass through such as near ground holes, fallen logs, and thick litterfall. Cage trapping was done for three days, but no rodents were caught. However, house rats (*Rattus rattus*) were seen abundantly and interviews with the locals revealed the presence of Philippine forest mouse (*Rattus everetti*) in the area.

2.1.13.4 Feeding Guilds

A total of six feeding guild types were identified. These are insectivores, carnivores, omnivores, frugivore/insectivore/granivore, granivore, and nectarivore. Most of the birds observed in the area are insectivores (10 species, 40%) or insect-eaters. Such domination is attributed to land-use

since the area is open canopy forest favoring their feeding guilds/diet (Zakaria et al. 2009). Specific details on the diversity feeding guilds of birds can be observed in the table below.

Table 2.1. 27 Summarized Feeding Guilds of Avifauna Species Recorded in the Area.

No.	Feeding Guild	No.	Common Name	f	%
1	Carnivore	1	White-collared Kingfisher	3	12
		2	Intermediate Egret		
		3	Cattle Egret		
2	Frugivore, Insectivore, Graniivore	4	Yellow-vented Bulbul	1	4
3	Graniivore	5	Red Turtle Dove	5	20
		6	Spotted Dove		
		7	Zebra Dove		
		8	Chestnut Munia		
		9	Eurasian Tree Sparrow		
4	Insectivore	10	Glossy Swiftlet	10	40
		11	White-breasted Woodswallow		
		12	Barn Swallow		
		13	Brown Shrike		
		14	Long-tailed Shrike		
		15	Striated Grassbird		
		16	Pied Bush Chat		
		17	Golden-bellied Gerygone		
		18	Pied Triller		
		19	Philippine Pied Fantail		
5	Omnivore	20	Large-billed Crow	5	20
		21	Slender-billed Crow		
		22	Asian Glossy Starling		
		23	Greater Coucal		
		24	Lesser Coucal		
6	Nectarivore	25	Olive-backed Sunbird	1	4

2.1.13.5 Diversity Indices

Diversity indices are the measure of species diversity about richness in a forest community. The indices calculated for this study included the Shannon-Wiener Index of Biodiversity (H') and Index of Evenness (J') and Dominance.

2.1.13.6 Species Diversity and Evenness

Table 2.1. 28 Biodiversity Indices of the Trees Present in the Sampling Sites

FAUNA BIODIVERSITY INDICES	
Shannon-Wiener (H')	Evenness (J')
2.559	0.7951

Considering that the area is quite disturbed due to nearby human communities, as well as their slash and burn, logging, and charcoal-making activities, etc., Shannon Diversity Index (H') suggests that the level of diversity of birds of 2.559 according to Fernando and Castillo (1996) is still moderate. This is attributed to the composition and vegetation structural components of the site and the availability of food (Subasinghe et al. 2014). The Evenness Index, on the other hand, indicates that every species in the area is evenly distributed (0.7951, very high).

2.1.13.7 Species Distribution, Conservation Status, and Population Trends

Table 2.1. 29 and **Table 2.1.** 30 show the profile of the surveyed birds in terms of distribution, conservation status, and global population trends. Such information could yield into the best mitigation and environmental impact framework which can be used as a guiding principle in managing this group of organisms. Of the total birds observed, about 74.19% (23 species) are residents, 16.13% (five species) are migratory and 9.68% (three species) are endemic.

Using the database provided by the Biodiversity Management Bureau (2014), endemic species observed are Greater Coucal, Philippine Pied Fantail, Lesser Coucal, and Yellow-vented Bulbul.

Table 2.1. 29 Summary Status of Avifauna Species Recorded in the Area

Distribution Status	No. of Species	% Frequency
Resident	18	68
Introduced	1	4
Endemic	4	16
Migratory	3	12

It is of interest to note that every species observed in the area are neither listed in the Appendix of the CITES of Wild Fauna and Flora nor in DAO 2004-15 and IUCN 3.1 (2017). They are all characterized as Least Concern (LC). In terms of global population trends, the current trends of 11 species observed are declining. Such a population trend is thought to be decreasing as a result of the conversion of land-uses, illegal logging, and poaching. Meanwhile, 12 species are at stable status, three (3) species are currently proliferating, while the global population trend of the remaining five species is still unknown due to data limitation. Specific details as to what particular species relative to its distribution, conservation status, and population trends are shown in **Table 2.1.** 30.

Table 2.1. 30 Conservation Status of Birds Observed

No.	Common Name		Conservation Status		
		Distribution	2014 CITES	DAO 2019-09	IUCN 3.1 2017-3
1	Golden-bellied Gerygone	Resident	NL	NL	LC
2	White-collared Kingfisher	Resident	NL	NL	LC
3	Glossy Swiftlet	Resident	NL	NL	LC
4	Intermediate Egret	Migratory	NL	NL	LC
5	Cattle Egret	Migratory	NL	NL	LC
6	White-breasted Woodswallow	Resident	NL	NL	LC
7	Pied Triller	Resident	NL	NL	LC
8	Red Turtle Dove	Resident	NL	NL	LC
9	Spotted Dove	Resident	NL	NL	LC
10	Zebra Dove	Resident	NL	NL	LC
11	Large-billed Crow	Resident	NL	NL	LC
12	Slender-billed Crow	Resident	NL	NL	LC
13	Chestnut Munia	Resident	NL	NL	LC
14	Barn Swallow	Migratory	NL	NL	LC
15	Brown Shrike	Resident	NL	NL	LC
16	Long-tailed Shrike	Resident	NL	NL	LC
17	Striated Grassbird	Resident	NL	NL	LC

No.	Common Name		Conservation Status		
		Distribution	2014 CITES	DAO 2019-09	IUCN 3.1 2017-3
18	Pied Bush Chat	Resident	NL	NL	LC
19	Olive-backed Sundbird	Resident	NL	NL	LC
20	Eurasian Tree Sparrow	Introduced	NL	NL	LC
21	Yellow-vented Bulbul	Endemic	NL	NL	LC
22	Asian Glossy Starling	Resident	NL	NL	LC
23	Philippine Pied Fantail	Endemic	NL	NL	LC
24	Greater Coucal	Endemic	NL	NL	LC
25	Lesser Coucal	Endemic	NL	NL	LC

* Distribution status based on BMB Checklist of Birds Species in the Philippines (2014) and *Population trends based on IUCN 3.1, NL- Not Listed, LC- Least Concern

Table 2.1. 31 Species Population Trends and Habitat Ecology of Avifauna in Ajuy, Iloilo

No	Common Name	Scientific Name	Distribution	Population Trend	Habitat Ecology
1	Golden-bellied Gerygone	*Gerygone sulphurea*	Native (Resident)	Decreasing	Forest, Artificial/Terrestrial
2	White-collared Kingfisher	*Halycon chloris*	Native (Resident)	Decreasing	Marine Intertidal, Artificial/Terrestrial, Savanna, Grassland, Wetlands (inland), Forest, Marine Neritic
3	Glossy Swiftlet	*Collocalia esculenta*	Native (Resident)	Stable	Caves and Subterranean Habitats (non-aquatic), Artificial/Terrestrial
4	White-breasted Woodswallow	*Artamus leucorynchus*	Native (Resident)	Stable	Forest, Artificial/Aquatic & Marine, Artificial/Terrestrial, Savanna, Grassland, Wetlands (inland)
5	Pied Triller	*Lalage nigra*	Native (Resident)	Decreasing	Forest, Shrubland, Artificial/Terrestrial
6	Red Turtle Dove	*Streptopelia tranquebarica*	Resident	Decreasing	Forest, Shrubland, Savanna
7	Spotted Dove	*Spilopelia chinensis*	Resident	Increasing	Forest, Wetlands (inland), Artificial/Terrestrial
8	Zebra Dove	*Geopelia striata*	Native (Resident)	Stable	Artificial/Terrestrial, Shrubland
9	Large-billed Crow	*Corvus macrorhynchos*	Resident	Stable	Forest, Wetlands (inland), Marine Intertidal, Artificial/Terrestrial, Savanna
10	Slender-billed Crow	*Corvus enca*	Resident	Stable	Forest, Artificial/Terrestrial
11	Chestnut Munia	*Lonchura mallacha*	Native (Resident)	Stable	Forest, Wetlands (inland), Shrubland, Artificial/Terrestrial, Artificial/Aquatic & Marine
12	Barn Swallow	*Hirundo rustica*	Migratory	Decreasing	Farmland where buildings provide nesting sites and where water is nearby.
13	Brown Shrike	*Lanius cristatus*	Native (Resident)	Decreasing	Forest, Grassland, Artificial/Terrestrial, Desert, Shrubland
14	Long-tailed Shrike	*Lanius schach*	Native (Resident)	Decreasing	Wetlands (inland), Artificial/Terrestrial, Forest, Desert, Shrubland, Grassland

No	Common Name	Scientific Name	Distribution	Population Trend	Habitat Ecology
15	Striated Grassbird	*Megalurus palustris*	Native (Resident)	Unknown	Artificial/Aquatic & Marine, Wetlands (inland), Grassland, Artificial/Terrestrial
16	Olive-backed Sunbird	*Cinnyris jugularis*	Native (Resident)	Stable	Artificial/Terrestrial, Shrubland, Forest, Grassland
17	Eurasian Tree Sparrow	*Passer montanus*	Native (Resident)	Decreasing	Settlements, Forest, Shrubland, Artificial/Terrestrial
18	Yellow-vented Bulbul	*Pycnonotus goiavier*	Native (Resident)	Increasing	Farmland where buildings provide nesting sites and where water is nearby.
19	Philippine Pied Fantail	*Rhipidura nigritorquis*	Endemic	Stable	Forest, Marine Intertidal, Artificial/Terrestrial, Savanna, Shrubland, Wetlands (inland)
20	Asian Glossy Starling	*Aplonis panayensis*	Native (Resident)	Unknown	Artificial/Terrestrial, Forest
21	Lesser Coucal	*Centropus bengalensis*	Native (Resident)	Increasing	Tall grass, reedbeds, swamps and marshlands, bamboo thickets, second-growth forest
22	Greater Coucal	*Centropus sinensis*	Native (Resident)	Stable	Tall grass, reedbeds, swamps and marshlands, bamboo thickets, second-growth forest
23	Pied Bushchat	*Saxicola caprata*	Native (Resident)	Stable	Shrubland, Savanna, Artificial/Terrestrial, Grassland, Wetlands (inland)
24	Cattle Egret	*Bubulcus ibis*	Migratory	Increasing	Forest, Wetlands (inland), Grassland, Artificial/Terrestrial
25	Intermediate Egret	*Egretta intermedia*	Migratory	Decreasing	Artificial/Aquatic & Marine, Wetlands (inland), Marine Intertidal, Grassland, Marine Coastal/Supratidal, Forest, Marine Neritic

2.1.13.8 Threat to Existence and/or Loss of Important Local Species

The project will require land clearing resulting in the removal of portions of remaining vegetation to give way for the construction. This entails the disturbance of wildlife, loss of habitats, and reduction to the biodiversity composition of the area. The eighteen resident species (see **Table 2.1.** 31) could be affected by vegetation clearing.

2.1.13.9 Threat to Abundance, Frequency and Distribution of Important Species

Considering that the area where the proposed Cement Plant will be constructed is already a disturbed area, wildlife present in the area is already adapted to disturbed conditions. However, the establishment of the Plant could further disrupt the existing wildlife due to various likely impacts such as dust blanketing of foliage that can affect photosynthesis, food production, and area capacity to support wildlife. The Plant construction and operation could result in the disturbance, displacement, and removal of wildlife species within the area. If existing wildlife is not totally disturbed and displaced during construction, they could eventually be totally displaced during operations which are expected to last for at least fifty years.

While the fauna in the Cemphil project site are listed by IUCN, CITES and DENR in DAO 2004-15 as Vulnerable and Threatened, 11 of the species have declining population trends. The endemic species that have a limited distribution may be affected as well.

Noise to be generated, particularly during the construction phase, could affect most especially the birds that heavily rely on the few trees for their habitat. Likely to be affected are specialist species that have limited capacity in terms of feeding guild. Removal of trees will result in lesser food source and lesser structural support for the variety of birds and other wildlife species' niche. A study by Hernandez (2008) revealed that deforestation and, more importantly, land-cover change decrease the possible spatial distribution of endemic bird species because of reduced habitat area and prevalence of competitors and parasites.

Birds are extremely mobile creatures and are likely to be driven out during vegetation clearing and by construction noise. Fortunately, all the birds found at the site are classified as Least Concern (LC) in the IUCN List and therefore no critical species will be affected by the project. Although the loss of vegetation will result in the removal of their habitats within the project site, it is anticipated that birds will relocate to neighboring environments that are not impacted by the construction and noise.

Surveys have shown that bird counts and bird density in the air are considerably lower in disturbed areas in comparison with unpolluted forest areas. It has also been mentioned that air pollution causes physiological and behavioral disturbance among bird species. Noise pollution can cause physical harm to the ears, stress responses, flight or flushing reactions, foraging habits, and other bird behavioral reactions in laboratory conditions (Ortega, 2012). Birds have greater breathing rates and are more exposed to the open air thus more particles can penetrate deep into their lungs when in areas of high air pollution. (Qin 2015).

Table 2.1. 32 Summary of Potential Impacts and Mitigation Measures for Terrestrial Fauna

Project Activities	Potential Impacts	Phase Occurrence			Mitigation
		Pre-Con/ Construction	Operation	Abandonment	
Vegetation clearing; air and noise pollution generation	Fragmentation and loss of wildlife species' habitat	✔			Preparation of management plans and protection/conservation strategies (pest management plan and biological offsetting).
	Disturbance, displacement and/or removal of wildlife population	✔			Create reserve or protected areas (protective nesting/foraging areas) to still produce and sustain biodiversity even with the implementation of the proposed Project
	Physiological and reproductive stress for some species (bird collisions and electrocution because of poles and power lines)	✔	✔	✔	Strict compliance with air quality and noise standards during operation
	Increased threats from illegal hunting/poaching	✔	✔	✔	Regular monitoring through annual or semi-annual assessment (wet and dry season) of wildlife species
	Ingestion of toxic substances and drinking of contaminated water and alike fluids that may be emitted or spilled by heavy equipment	✔	✔	✔	Construct a temporary shelter for accidentally captured species, including those that pose threat to workers and the local community & report the same to DENR-CENRO for turnover to DENR
Habitat fragmentation and air pollution generation	Long term changes in the community structure, distribution, and abundance of wildlife species (proliferation of invasive species)	✔			• Restore/replant/ transplant affected area vegetation to benched slopes and unneeded sloping land to restore wildlife habitat • Strict compliance with air quality and noise standards during operation • Conduct of IEC or Capacity building activities among construction workers regarding the Wildlife Protection Act
Emission of Dust, Air	Coating of leaves with heavy dust affecting	✔	✔		• Strict compliance with air quality and noise

Project Activities	Potential Impacts	Phase Occurrence			Mitigation
		Pre-Con/ Construction	Operation	Abandonment	
Pollutants and Greenhouse Gases Contribution	photosynthesis, affecting food production and wildlife food supply				standards during construction and operation • Proper disposal of chemicals and other hazardous materials/substances • Preparation of monitoring plan
Release spillage of hazardous substances to the soil which could reach marine environment	Ingestion of toxic substances and drinking of contaminated water by wildlife	✔	✔	✔	Handling of hazardous substances (fuels, oils, laboratory chemicals) to follow guidelines under DAO 29-92

2.1.13.10 Hindrance to Wildlife Access

The proposed project is not expected to be of hindrance to wildlife access to habitat or food as it will not fragment a forest or wildlife reserve. There are no forest reserves or protected habitat within 1000 meters of the project site, and the wildlife in the area is adapted to the disturbed environment.

The site has been classified as Alienable and Disposable (A&D) lands and allowed to be titled and the possibility that it be intensively used by humans has been part of the state consideration in its designation of the area as A & D. The area is also included in the proposed Municipal industrial zone.

Existing wildlife is expected to repopulate and flourish in the Cemphil area when the area is landscaped and revegetated after construction.

2.1.14 Solid Waste Generation – Generation of Construction Spoils

Project construction activities are expected to generate the following spoils that if un-managed may pose threat to workers' safety and release of toxic chemicals to land and marine environment:

1. Excess excavated soil
2. Waste Form lumber
3. Waste equipment packaging
4. Waste construction materials

The following hazardous waste are also expected to be generated at site during construction:

1. Used machinery and engine oil
2. Spent vehicle, alkaline and cellular batteries
3. Busted light bulbs
4. Waste rubber tires
5. Waste damaged and replaced engine parts

Table 2.1. 33 Summary Impact Assessment on the Land Environment

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandonment	
1.1.Impact on compatibility with existing land use	No impact. Project is consistent with Municipal Land Use Plan	N.A.	N.A.	N.A.	N.A.
1.1. Impact on compatibility with classification as an Environmentally Critical Area	No impact. Project site is in proposed Municipal Industrial Zone	N.A.	N.A.	N.A.	N.A.
Impact in existing land tenure issue/s	No impact. Area is titled to Proponent. 24 informal settler-families willing to be relocated.	Social displacement			Provision of permanent formal housing to displaced households
Impairment of visual aesthetics	Visually significant landforms/ landscape/structures	Land clearing, Slope excavation			Landscaping, revegetation, slope terracing
Devaluation of land value as a result of improper solid waste management and other related impacts	Construction waste (removed vegetation and debris from dismantling of informal dwellings) Debris from office operations, canteen waste Debris from facility dismantling / removal	✔	✔	✔	Solid and liquid waste management in all project phases.
Change in surface landform/ geomorphology/ topography/ terrain/slope	Modification of landform for industrial use	✔			Slope benching and stabilization; Adequate drainage design and run-off management
1.2.Change in sub-surface geology/underground conditions	No change to be introduced to subsurface or underground	N.A.	N.A.	N.A.	N.A.
1.2IInducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	Project will -Not change area insusceptibility to flood - Not change area insusceptibility to liquefaction or earthquake-induced landslide - Not change site insusceptible to tsunami - Not change site insusceptibility to ground rupture				

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandonment	
	-Will mitigate site vulnerability to rain-induced landslide - Will address site storm surge vulnerability of up to 4.5 meters above MLLW Will address site Potential Peak Ground Acceleration in area of up to 0.8 to 1.8g (violent to extreme shaking), very damaging	✔ ✔ ✔			Slope benching, slope stabilization engineering and revegetation Raise Plant land platform to 8 or 10masl Factor-in PGA in foundation and structural design
1.3.Soil erosion / Loss of topsoil/overburden	Increased soil erosion potential Loss of soil nutrients with removal of topsoil	✔ ✔			Slope stabilization Run-off management Topsoil restoration on areas to be revegetated
1.3.Change in soil quality/ fertility	Soil in project site is low in natural fertility				Enrichment of soil organic material from project ecological waste management
1.4.Vegetation removal and loss of habitat	Area vegetation cover is predominantly shrubland Project will cause vegetation removal in 5.5 of 6.5 has. Project area. 3/17 flora species are Vulnerable (Artocarpus blancoi, Swietenia macrophylla and Vitex parviflora). There are no Endangered or Threatened flora or fauna species in the project site. Majority of flora species in area (14/17) are of least concern (IUCN) and 100% are not listed in DAO 2017-11. Area has low flora and fauna species diversity and very high species evenness for both.	✔	✔		Revegetation of 2/6 hectares after construction. Vegetation restoration upgrading and densification in 2 hectares from shrubland to tree species

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandonment	
	Fauna population are of least concern or not listed in 2014 CITES, DAO 2004-15 or IUCN 3.1 2017-3. However, 11 species population have declining trend.				
1.4.Threat to existence and/or loss of important local species	Disturbance to wildlife due to vegetation removal, dust, and noise	✔	✔		Minimization of land clearing to absolute necessary Avoidance of tree cutting where possible Restoration of flora community structure in revegetation program Preference of fruit-bearing trees for tree planting
1.4Threat to abundance, frequency, and distribution of important species	Vegetation removal. Remaining flora have community medicinal value, are sources of food materials, sources of fuelwood and have miscellaneous economic value except Mahogany and Molave	✔	✔		Avoidance of tree cutting where possible Restoration of flora community structure in revegetation program
1.4.Hindrance to wildlife access	Project will not cause hindrance to wildlife as the general area has been converted to A&D and are titled lands. Existing flora and fauna are adapted to human disturbance. The surrounding areas have similar flora and fauna habitats. Disturbed wildlife in area may shelter in nearby unpopulated areas.	N.A.	N.A.	N.A.	N.A.
1.5 Generation of Construction Spoils	Un-managed construction spoils may pose threat to workers' safety and release of toxic chemicals	✔			Careful material and procedure planning to

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandonment	
	to land and marine environment				minimize waste, Weekly waste collection and segregation, Material recovery Haul out of residual waste to municipal land fill Haul out of hazardous waste by EMB-accredited Hazardous waste transporter and treater

The Project greenhouse gas mitigation involving mangrove plantation (to cover 250 hectares over a period of twenty-five years) and the 50-year maintenance plan, will generate habitats for marine species and provide ecosystem services which are presently important to the diet, sustenance, and economic activities of about 41% of the population of Ajuy municipality.

CEMPHIL CEMENT GRINDING PROJECT EIS

WATER MODULE

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2.2 The Water

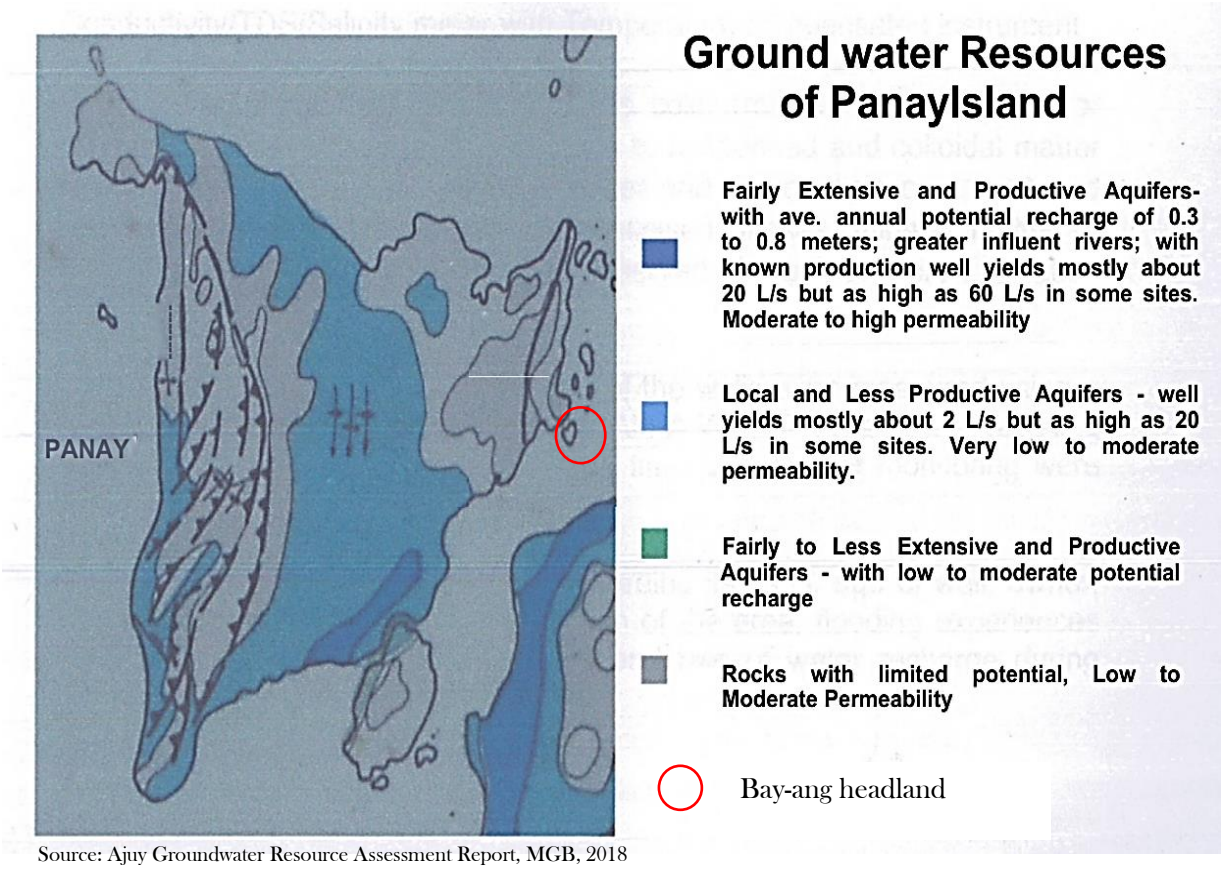
2.2.1 Hydrology

The proposed project site is located on a headland jutting seaward from the coast of the Municipality of Ajuy. Considering the topography of the project area and its surroundings (**Figure 2.1.8**), the natural drainage pattern of Bay-ang headland is separate from the natural drainage pattern of the mainland (Figure 2.2. 2).

Surface drainage of this headland directly drains to the sea in view of area topography (Figure 2.2. 3) **There is no surface drainage structure such as a river or creek that traverses the project site (**Figure 2.2. 2**).** Surface run-off in project site drains towards Canal Bay in the west and towards Guimaras Strait in its southeast border (Figure 2.2. 3).

2.2.1.1 Ground Water Resources

The groundwater resources in the Project site are very limited. Generally, the rocks underneath the project site have limited groundwater potential (Figure 2.2. 1). Drilling commissioned for soil geotechnical investigation, however, has intercepted static groundwater at elevations of -3, -5 -9, and -12 masl (**Figure 2.2. 4**). The log of borehole investigation is in **Annex G**.



Source: Ajuy Groundwater Resource Assessment Report, MGB, 2018

Figure 2.2. 1 Ground Water Resource Potential in Project Site

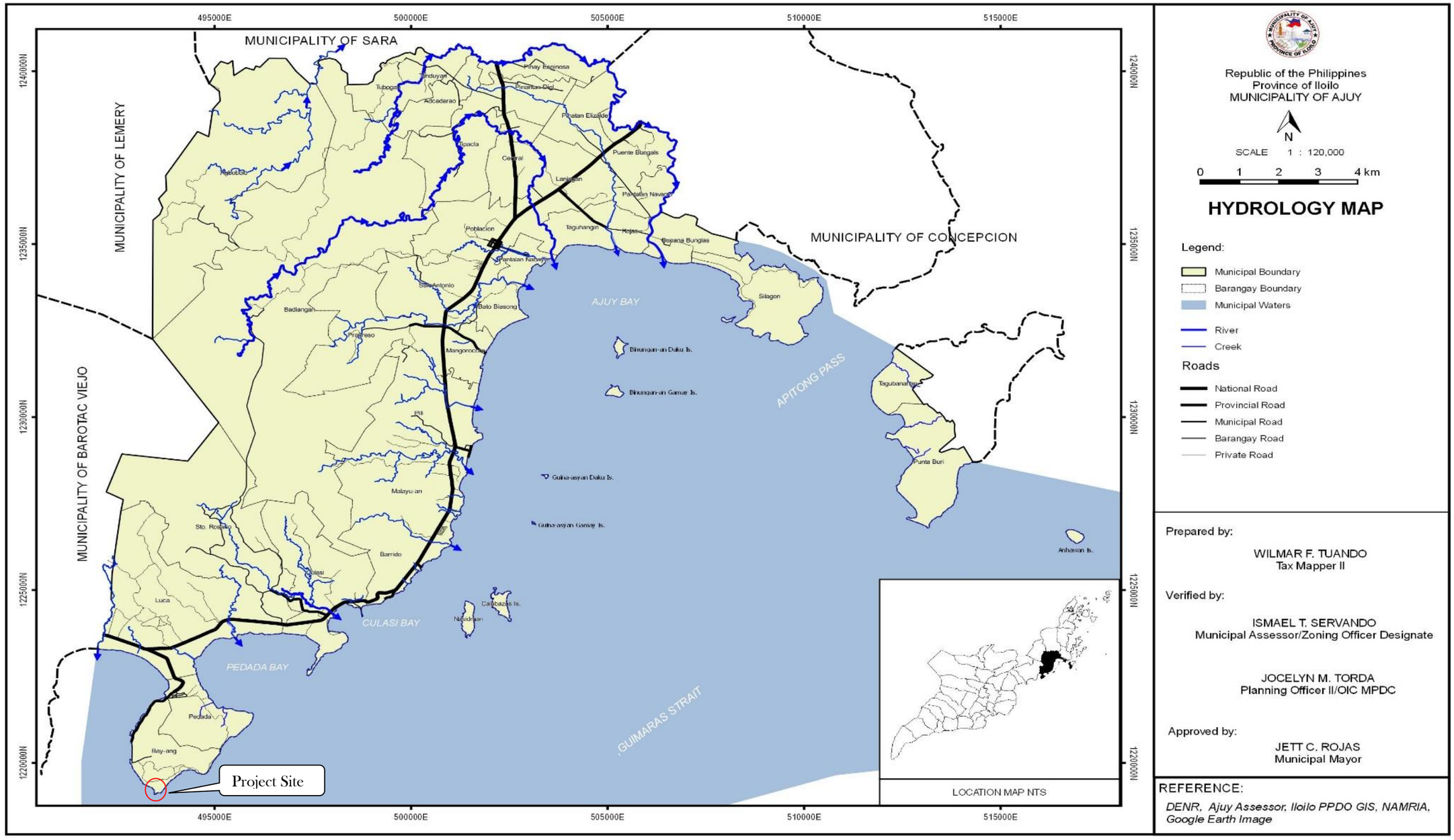


Figure 2.2. 2 Hydrology Map of Ajuy

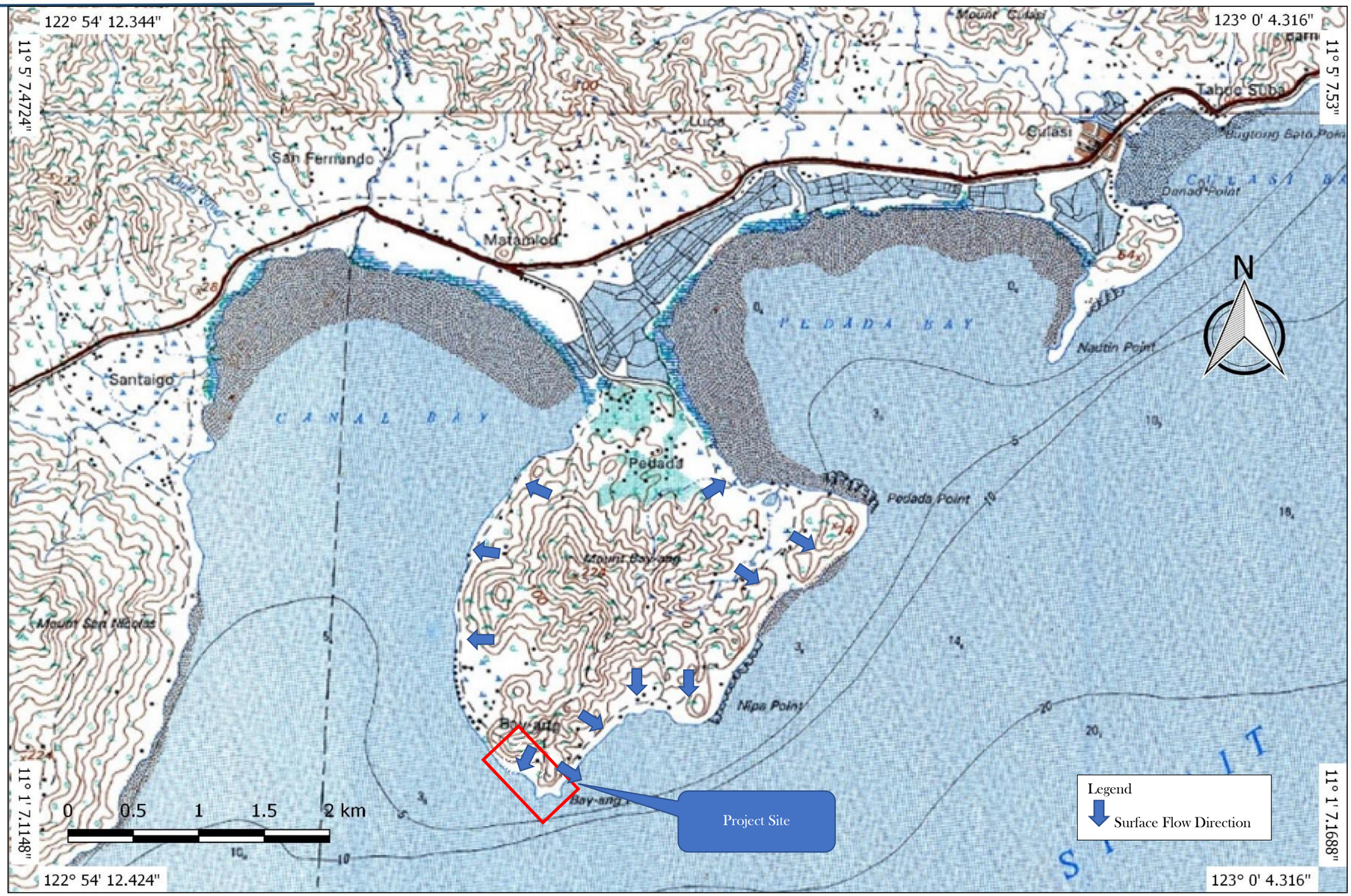
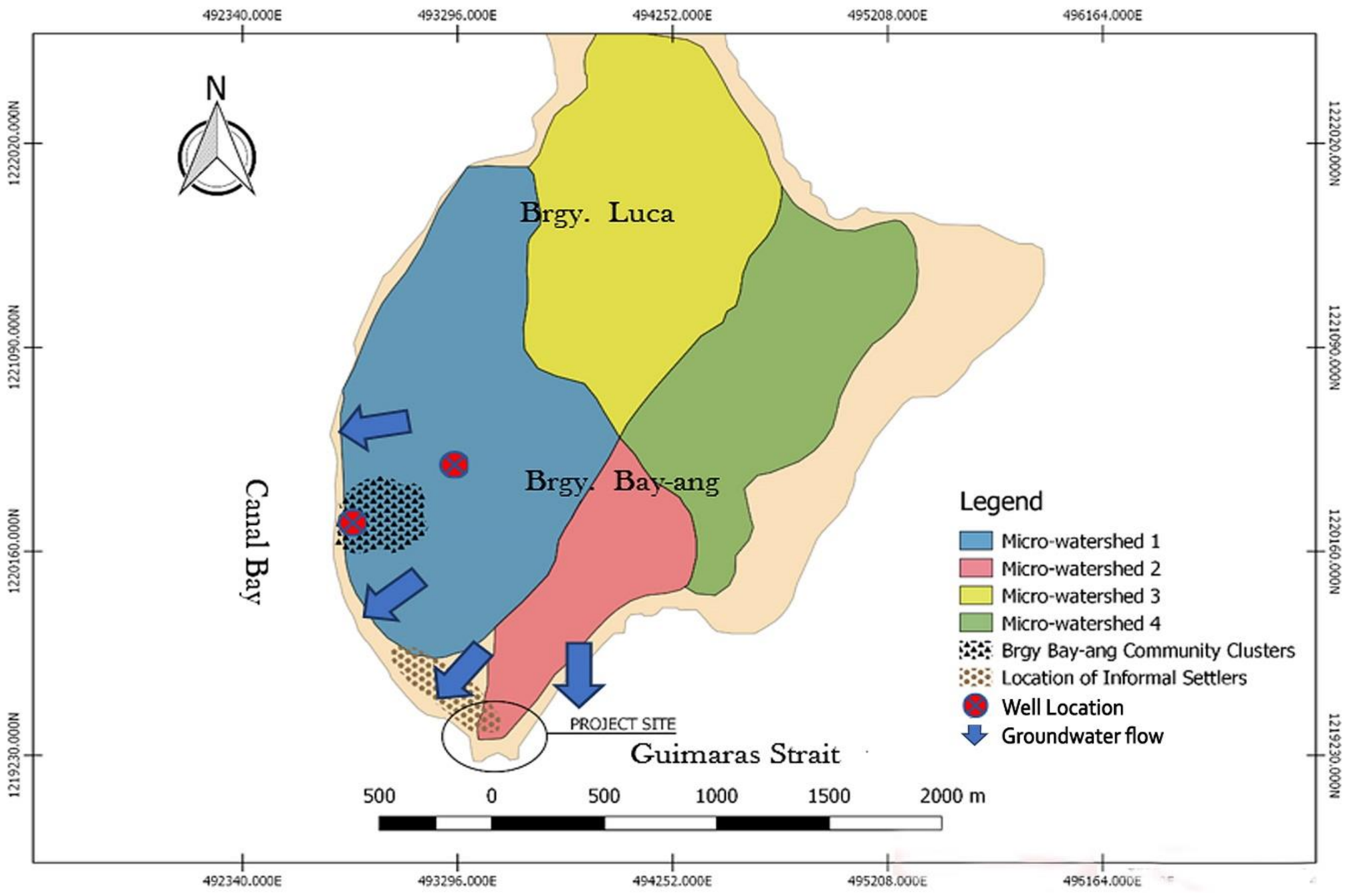


Figure 2.2. 3 Drainage Map of the Project Area



Data source: Topographic Maps

Figure 2.2. 4 Micro-watersheds and Well Locations of Bay-ang

2.2.1.2 Wells

There are two wells within Bay-ang (see Figure 2.2. 4), both outside the Cemphil site. One is a 60-year old, free-flowing well with concrete casing owned by Mr. Erwin Delagao in Purok 1 and the other, a 40-year old hand pump with steel casing in the Barangay central area (Purok 4) owned by the LGU.

2.2.1.3 Delineation of Micro watersheds

Four (4) micro watersheds comprise the Bay-ang headland, three (3) of which are within the jurisdiction of Barangay Bay-ang and the other, under Barangay Luca. The micro watersheds of Barangay Bay-ang directly drain to the sea (**Figure 2.2. 4**). The corner coordinates are:

	Lat	Long.	Micro watershed	Area (Has.)
NW	11° 3' 46.026"	122° 55' 13.444"	1	167.9512
NE	11° 3' 46.062"	122° 58' 24.028"	2	49.3135
SE	11° 1' 33.6684"	122° 58' 24.038"	4	101.1387
SW	11° 1' 33.636"	122° 55' 13.48"	Total	318.4034

2.2.1.4 Change in Drainage Morphology

During Construction Phase

The project site has no surface drainage structure, because of the very limited catchment area that directly trains to sea in the surface run-off. The area is naturally not susceptible to flooding due to its gently sloping terrain and because more than 98% of its surface is above five (5) meters above mean sea level. Its topography likewise does not have pockets of depression or basins where run-off may accumulate. The change in drainage morphology is inevitable due to planned changes in area landform to develop surfaces for industrial operations.

During the Construction Phase, drainage patterns at the project site will tend to change, varying with the location of construction activities, draining to the sea unless environmental impact mitigating measures are instituted. There are no significant waterways in the Project site.

Freshwater draining into the marine environment is part of the natural hydrologic cycle and is beneficial to some species in the intertidal zone. The negative impact, however, is generated by the increased sediment load resulting from soil disturbance during the Construction Phase, discussed below in **Section 2.4.2**, Degradation of Marine Water Quality.

During the Operation Phase

It is expected that surface run-off volume will increase (**Table 2.2. 1**), due to the concreting of almost 70% (4.5 has.) of the 6.5-hectare land area. **Table 2.2. 1** shows the change in drainage hydrology due to the project.

Table 2.2. 1 Project Run-off Volume with and Without Project

Land Cover Classification	Without Project			With Project, From Stockpile Area		With Project, From Mill Area		Total Effective Run-Off with Project (m^3
	Existing Land Use (m2)	C	Effective Run-Off (m^3)	Stockpile Area (m^3)	Effective Run-Off (m^3)	Mill Area (m^3)	Effective Run-Off (m^3)	
Other land, built-up area	**2,961**	**0.95**	**1,041.35**	**17,542**	**6,169.35**	**25,903**	**9,109.65**	**15,279.00**
Other land, natural, grassland	**61,949**	**0.5**	**11,466.76**	**1,253**	**231.93**	**-**	**-**	**231.93**

Land Cover Classification	Without Project			With Project, From Stockpile Area		With Project, From Mill Area		Total Effective Run-Off with Project (m^3)
	Existing Land Use (m2)	C	Effective Run-Off (m^3)	Stockpile Area (m^2)	Effective Run-Off (m^3)	Mill Area (m^2)	Effective Run-Off (m^3)	
Other land, cultivated	-	0.5	-	6,265	1,159.65	13,948	2,581.68	3,741.33
Total	64,910	0.51	12,508	25,060	7,560.93	39,850	11,691.33	19,252.26

Source: Computed Based on Rational Method Runoff Coefficient Table

The total effective run-off from the project site after construction will increase by about 6,744 m^3 (54%) from 12,508m^3 to 19,252 m^3. Given the planned 8,085 m3 capacity of project silt control facilities (**Table 1.8**), the net effective run-off volume that may find its way to the sea will be nil as run-off within the Project site will however be captured within the drainage system and percolated underground through the settling ponds.

2.2.1.5 Silt Control

If uncontrolled, earthworks during construction will be a major source of water pollution. Intensive activities involving the handling of earth materials are expected to cause an increase in sediment transport to the sea, including dried mud and dirt from the tires of haul trucks.

During operation, the combined settling pond capacity of 7,935 m^3 (see **Table 1.8**) can detain about 69% of the peak of the total run-off from peak 24-hr precipitation (see **Table 2.2. 2**) that will fall within the Cemphil cement plant and has capacity to detain at least 80% of loose sediment yield from open earthworks (Table 2.1.12).

Effective silt control during construction phase has to be carefully worked out because the work area will constantly be changing.

2.2.1.6 Change in stream, lake water depth

There is no stream or river traversing or near the project site/vicinity.

2.2.1.7 Depletion of Water Resources/Competition in Water Use

The Project will not compete with residents of Purok 6 in regard to water usage since it will employ dry process in cement manufacture. It requires water supply in minimal volume only for domestic use.

As may be observed from Figure 2.2. 4, the micro-watershed hosting the community in Barangay Bay-ang is different from the micro-watershed that host the Project site. There will be no water resource use competition with the population of Barangay Bay-ang. The Project will derive water supply through rainwater harvesting and from a shallow well to be established within the Plant site with permit from the National Water Resources Board. Table 2.2. 2 is an estimate of the year-round water balance calculation using normal rainfall data from PAGASA.

Table 2.2. 2 Year-Round Water Balance

Month	Mean Rainfall		Effective Rainfall	Estimated Ten-Day Run-off Volume	Effective Rainfall within Plant (m^3)	Potential Evapo-Transpiration Loss 8%	Drainage Cut-off/ Settling Pond / Cistern Capacity (m^3)	Sediment Yield (m3)	Theoretical Accumulated Water Volume in Cistern/ Settling Pond	Project 10-day Requirement	Pumped Ground Water (10 days)	Water Balance
	Monthly	10-day period										
	72.1	24	12	12	780	62	8,085	2	711	930	219	0
	72.1	24	12	12	780	62	8,085	2	711	930	219	0
Jan	72.1	24	12	12	780	62	8,085	2	711	930	219	0
	49.3	16	8	8	533	43	8,085	2	485	930	445	0
	49.3	16	8	8	533	43	8,085	2	485	930	445	0
Feb	49.3	16	8	8	533	43	8,085	2	485	930	445	0
	63.7	21	11	11	689	55	8,085	2	628	930	302	0
	63.7	21	11	11	689	55	8,085	2	628	930	302	0
Mar	63.7	21	11	11	689	55	8,085	2	628	930	302	0
	69.9	23	12	12	756	60	8,085	2	689	930	241	0
	69.9	23	12	12	756	60	8,085	2	689	930	241	0
Apr	69.9	23	12	12	756	60	8,085	2	689	930	241	0
	144.7	48	24	24	1,565	125	8,085	4	1,429	930	0	0
	144.7	48	24	24	1,565	125	8,085	4	1,429	930	0	0
May	144.7	48	24	24	1,565	125	8,085	4	1,429	930	0	0
	259	86	43	43	2,802	224	8,085	6	2,560	930	0	0
	259	86	43	43	2,802	224	8,085	6	2,560	930	0	0
Jun	259	86	43	43	2,802	224	8,085	6	2,560	930	0	0
	253.4	84	42	42	2,741	219	8,085	6	2,505	930	0	0
	253.4	84	42	42	2,741	219	8,085	6	2,505	930	0	0
Jul	253.4	84	42	42	2,741	219	8,085	6	2,505	930	0	0
	202.1	67	34	34	2,186	175	8,085	5	1,997	930	0	0
	202.1	67	34	34	2,186	175	8,085	5	1,997	930	0	0
Aug	202.1	67	34	34	2,186	175	8,085	5	1,997	930	0	0
	213.5	71	36	36	2,310	185	8,085	5	2,110	930	0	0
	213.5	71	36	36	2,310	185	8,085	5	2,110	930	0	0
Sep	213.5	71	36	36	2,310	185	8,085	5	2,110	930	0	0
	304.9	102	51	51	3,299	264	8,085	7	3,015	930	0	0
	304.9	102	51	51	3,299	264	8,085	7	3,015	930	0	0
Oct	304.9	102	51	51	3,299	264	8,085	7	3,015	930	0	0
	239.4	80	40	40	2,590	207	8,085	5	2,366	930	0	0
	239.4	80	40	40	2,590	207	8,085	5	2,366	930	0	0
Nov	239.4	80	40	40	2,590	207	8,085	5	2,366	930	0	0
	171.3	57	29	29	1,853	148	8,085	4	1,693	930	0	0
	171.3	57	29	29	1,853	148	8,085	4	1,693	930	0	0
Dec	171.3	57	29	29	1,853	148	8,085	4	1,693	930	0	0
Average(m3)			28.38	28.38	1,842.09	147.37	8,085.00	4.10	1,682.43	930.00	100.56	0.00

Effective rainfall is precipitation less evaporation = run-off less groundwater infiltration. Run-off is calculated using the Soil Moisture Balance Formula:

$$Run\text{-}off = r * p * N * a$$

Where:

r = Rainfall [mm, 10-day estimates], 3rd column, Table 2.2. 2

p = Precipitation coefficient, 0.75

N = runoff coefficient, 0.45

A = Drainage area [m^2] of 64,910 m2.

The catchment area considered is the 6.491-hectare Cemphil Plant as it will be enclosed in the perimeter wall and the process will cause changes in the normal surface flow direction, diverting flow on non-project surfaces outside the Plant premises.

Evaporation loss is assumed at 8% of total volume. The total holding capacity of the Plant drainage system in **Table 1.8** of 8,085 m^3 is maximized. This is designed to retain 100% of peak run-off volume plus 18% allowance for climate change anomaly. 300% of the sediment volume was calculated by modified USLE (**Table 2.2. 8**). 300% of the estimated sediment yield from stabilized slopes within the Cemphil site (Table 2.2. 2) is deducted from the drainage system water holding capacity, with allowance for cases when immediate desilting is not undertaken. Assuming no rainwater is accumulated at the start of project operation, 120 m^3 will be withdrawn daily from ground water sources and stored in 1,500-liters overhead storage tank (alternatively, one 250 liters overhead tank for drinking and 1,250 liters for domestic use, from harvested rain water). As the Project is able to accumulate harvested rain water, an average of 50 cubic meters daily will need to be withdrawn from groundwater sources (**Table 1.10**). Considering the large volume of rainwater that could be accumulated in the Project drainage system, groundwater extraction may not be necessary at all.

The Project will not compete with the local community on groundwater use because the micro watersheds that feed the wells and serve the community in Bay-ang and the Project site are different (**Figure 2.2. 4**). The groundwater movement from the inland areas are also toward the sea, each micro watershed having draining toward the sea. Ground water resources in the micro watershed hosting Cemphil do not flow from or to the other micro watershed catchment areas in the Bay-ang headland.

2.2.2 Oceanography

2.2.2.1 Hydrodynamic Model

The circulation study was carried out by simulating the tide-driven water circulation of the area. A hydrodynamic model with a resolution of approximately 30-40 meters was generated using the Delft3D modeling suite from Deltares to simulate the water circulation.

The general bathymetric slope in the study area is towards the Guimaras Strait, a strait in the Western Visayas region of the Philippines that connects the Visayan Sea to the Panay Gulf and beyond the Sulu Sea. To the north and west are Panay and Guimaras Islands, while Negros Island is to the south and east.

Six (6) scenarios were run to account for the seasonal changes such as the consideration of the northeast and southwest monsoons with and without the reclamation works. The model domain is shown in Figure 2.2. 5 together with the curvilinear computational grid with an approximate horizontal resolution of 20m for each grid cell. Tidal forcing was used in the model at the open boundary conditions generated from TPXO 7.2 Global Inverse Tide Model using Delft Dashboard. The bathymetry of the area was obtained from GEBCO and from field data obtained by a bathymetric survey in 2019 by a DENR-VI accredited Geodetic surveyor (the Cubing Surveying Team).

The model duration ran for three (3) months for the monsoon winds to be represented in the models and to allow the models to have a spin-up time to reduce errors. Meteorological data available from Iloilo International Airport station were utilized in the models.

Actual three-hourly wind speed and direction data for the months of December 2019, January 2020 and February 2020 were extracted and added to the model to simulate the northeast monsoon

circulation. Similarly, three-hourly wind data were also extracted for the months of June 2019, July 2019, and August 2019 as representatives for the southwest monsoon simulation.

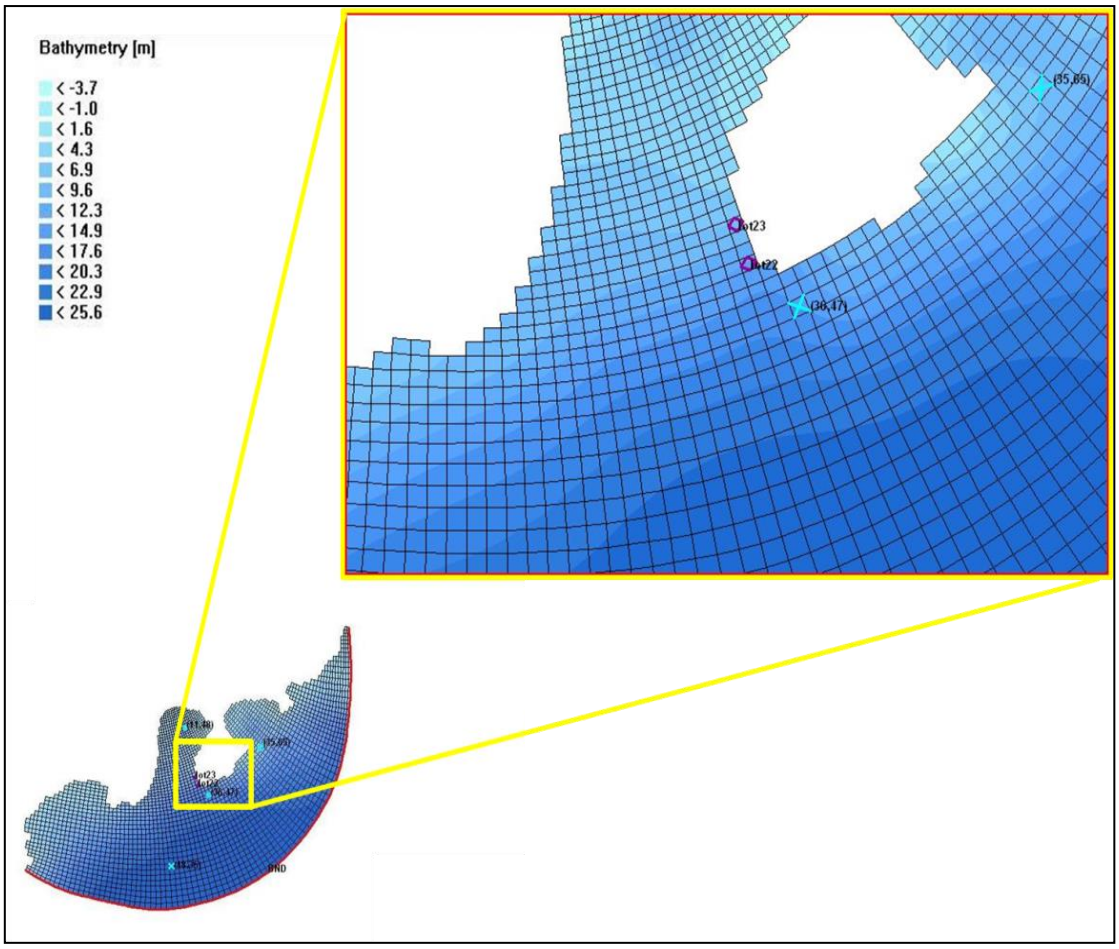
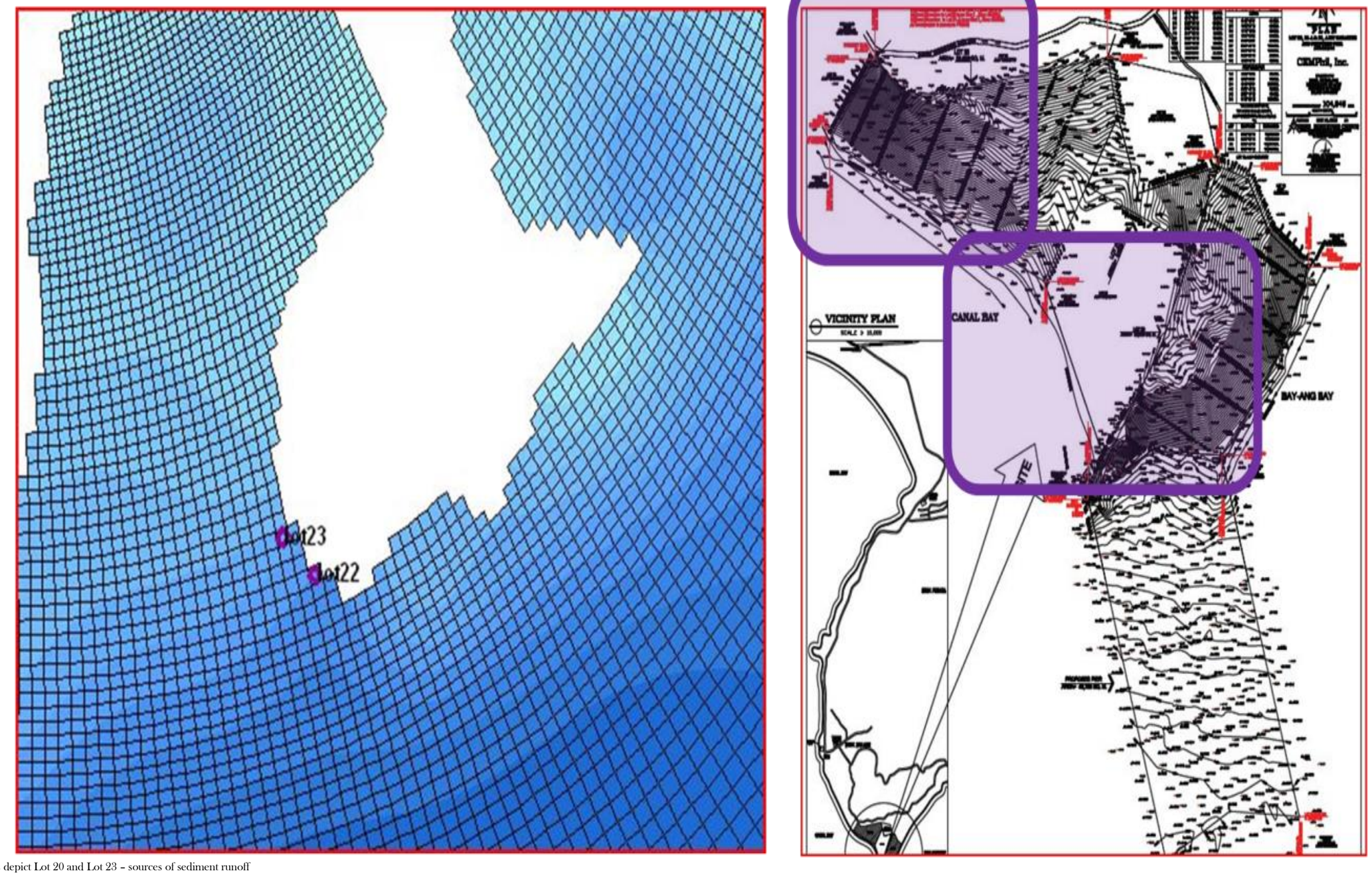


Figure 2.2. 5 Grid, Bathymetry and Model Domain

Six (6) model scenarios were simulated to account for the differences with and without the proposed jetty port, with each prevailing monsoon season and during the monsoon transition (no wind). The summary of the different conditions is shown in Table 2.2. 3.

Table 2.2. 3 Hydrodynamic Model Scenarios

SCENARIO		WITHOUT JETTY PORT			WITH JETTY PORT	
	no wind	NE monsoon	SW monsoon	no wind	NE monsoon	SW monsoon
1	X					
2		X				
3			X			
4				X		
5					X	
6						X



Purple colors depict Lot 20 and Lot 23 – sources of sediment runoff

Figure 2.2. 6 (left) Model domain and (right) CEMPHIL Plant plan

2.2.2.2 Sediment Transport Model

Using the Delft3D-modeling suite, a tide-induced model was constructed to observe the transport of sediments that come from run-off in areas northeast of the proposed jetty port (Figure 2.2. 6) and how the presence of the proposed jetty port will influence sediment transport in these areas. The cement plant will have settling ponds that aim to retain 80% of sediments.

In the computational domain (Figure 2.2. 6), Lot 20 and Lot 23 are the sources of run-off with a computed sediment load of 7,717.91 m^3/year and 12,272.89 m^3/year, respectively with 45.54m^3 and 72.41m^3 sediment load respectively. With computed peak annual run-off volume of 6,431.59 m^3 and 10,227.41 m^3 respectively from Lot 20 and Lot 23, the in-Plant sediment control measure (drainage trench, settling ponds) will detain almost 50% of peak run-off and can cause 80 percent of sediment load to drop within Plant sediment control facilities and residual storm run-off with 0.0584 m3 and 0.0928 m3 sediment load overflow to the sea. The annual sediment load from **Table 2.1.12** was computed using Modified USLE, and considering the known peak rainfall volume (Table 2.3.2).

The model asks for a runoff rate, which was calculated using the Rational Method equation used to calculate peak stormwater runoff rate (Bengtson, no date). The equation for calculating the runoff rate is:

$$Q = CiA \quad \text{(for U.S. units)}$$

or

$$Q = 0.0028\,CiA \quad \text{(for S.I. units)}$$

Where:
A = the area of the watershed (drainage area) that drains to the point for which the peak runoff rate is needed (acres for U.S. units) (ha for S.I. units)

C = runoff coefficient for drainage area A. A physical interpretation is the faction of rainfall landing on the drainage area that becomes storm water runoff (dimensionless for both U.S. and S.I. units)

i = the intensity of the design storm for peak runoff calculation (in/hr for U.S. units) (mm/hr for S.I. units)

Q = the peak storm water runoff rate from the drainage area, A, due to the design storm of intensity, i. (cfs for U.S. units) (m^3 /s for S.I. units).

The runoff coefficient (C) of 0.16 for agricultural land was used for the model scenarios. S.I units were used in calculating the runoff rate.

Since the model also requires sediment concentration in kg/m^3, it was computed using the equation:

$$\rho = m/v$$

The data for average bulk density for non-cohesive sediments (2,650 kg/m^3) and the provided data on sediment load were used to compute for the sediment concentration. These values for runoff rate and sediment concentration were used constantly throughout the timeframe of the models.

A total of six (6) simulations for sediment transport scenarios were made, as shown in **Table 2.2. 4**.

Table 2.2. 4 Sediment Transport Scenarios

SCENARIO	NO JETTY PORT			WITH JETTY PORT		
	no wind	NE monsoon	SW monsoon	no wind	NE monsoon	SW monsoon
Sed. Transport 1	X					
Sed. Transport 2		X				
Sed. Transport 3			X			
Sed. Transport 4				X		
Sed. Transport 5					X	
Sed. Transport 6						X

2.2.2.3 Model Validation

The nearest station that collects data on tidal statistics is Iloilo Station, which is approximately 62km northeast of the project site. **Table 2.2. 5** shows pertinent information on the tidal statistics in the area. The mean higher high water is 1.59m.

Table 2.2. 5 Tidal Statistics

Station	Primary Benchmark	Elevations in meters above mean lower low water (MLLW)[1]				
		Benchmark	Mean Tide Level (MTL)	Mean High Water (MHW)	Mean Low Water (MLW)	Mean Higher High Water (MHHW)
Iloilo	BM 3[2]	4.074	0.78	1.30	0.25	1.59

Source: List of Secondary Tide Station Datum Planes by NAMRIA

[2]BM 3 - is located on the base of a street steel lamp post about 20m NE of the entrance gate o DPWH Compound. The BM on the base of the plate is elevated about 0.60m above the street curb. Mark is a crosscut-on top of the four steel bolts with inscription "BM 3" at the side of the frustum base of lamp post.

The tide prediction table from NAMRIA offers the predicted high and low water level height reached by the rising and falling tides, respectively. The tide prediction tables give the times and heights of high and low water.

A good indication of model performance is when the model results coincide with the predicted tides. Validation of the model was done by comparing the model sea level with the water level at the nearest tide station (shown in the red dot, **Figure 2.2. 7**). **Figure 2.2. 8** shows the water level provided by the model (red) plotted against the water level from the nearest tide station (blue) located in Guimaras.

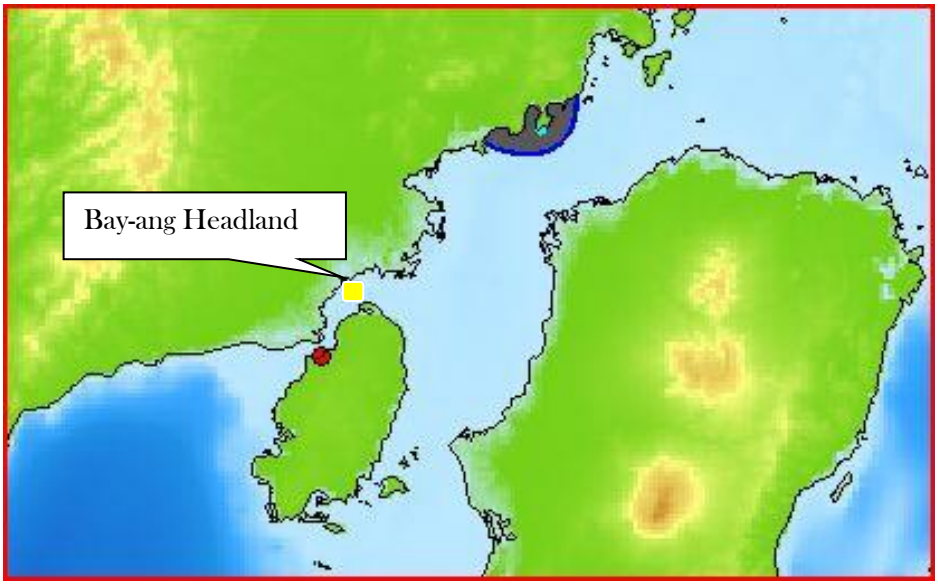


Figure 2.2. 7 Nearest Tide Station (Red Dot) to Area of Interest

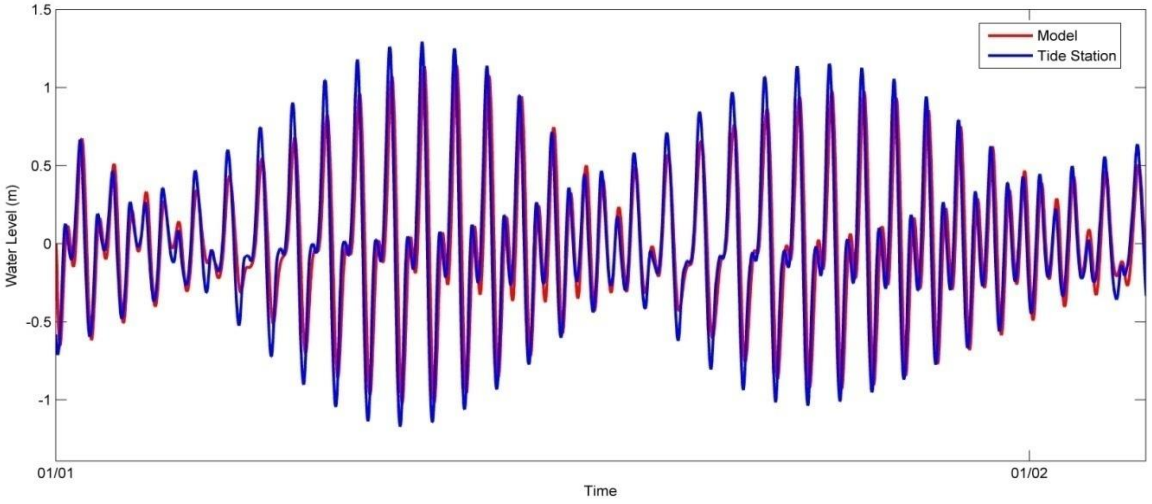


Figure 2.2. 8 Comparison of Water Level From Model vs Water Level from Nearest Tide Station (Guimaras)

As may be observed from **Figure 2.2. 8**, the water level of the waters along the coast of Bay-ang, Ajuy, Iloilo range from 1m to -1m MLLW. During the highest high tide (spring tide), the water level can reach up to 1m, and -1m during the lowest low tide (neap tide). The variance between the NAMRIA forecast tide within the studied domain and the result of the tidal pattern from the model run without the project is narrow, thus a reliable model has been established.

2.2.2.4 Results of Hydrodynamic Modeling with and Without the Project

Key parameters such as water level and average depth current velocity are discussed below. Changes in tidal water level and current velocity from the unmodified area are compared to the results from the simulation with the jetty port in place. Water level and current velocities from the model are validated using the Philippines Tide and Current Table 2019 from the National Mapping and Resource Information Authority (NAMRIA).

2.2.2.5 Change in Bathymetry

Error! Reference source not found. shows the bathymetry of the area with and without the jetty port. The bathymetry will remain essentially unchanged by the project. This is because of the relatively small area covered by the structure, the project structure's location in shallower depths, the cross-current openings at the rock-fill causeway that give clearance to the play of the littoral tide, and the design of the project to be on columns and piers. The Project design poses no significant obstruction to tidal and current movements, thus, changes to sediment deposition patterns and possible causes in the change of bathymetry in the area will be minimal. These are interactive.

On the project impact to bathymetry under the forecast sea-level rise under the climate change scenario, the Project will be designed higher than the forecast increase in sea level and thus pose minimal resistance to currents and tides. Therefore, the project will not cause significant changes to area bathymetry, sediment transport, and current circulation.

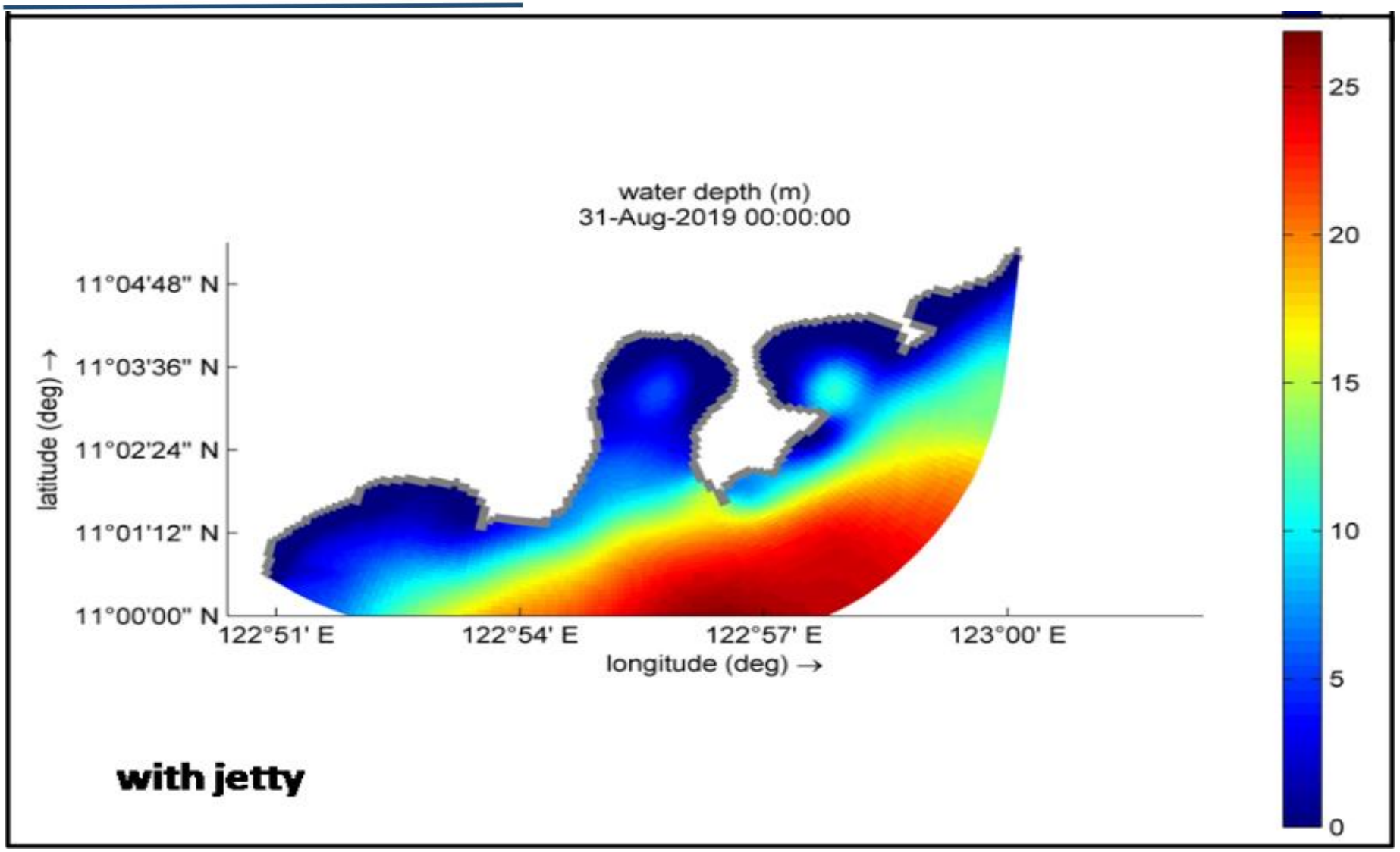


Figure 2.2. 9 Bathymetry off Bay-Ang Coast with Jetty Port in Place

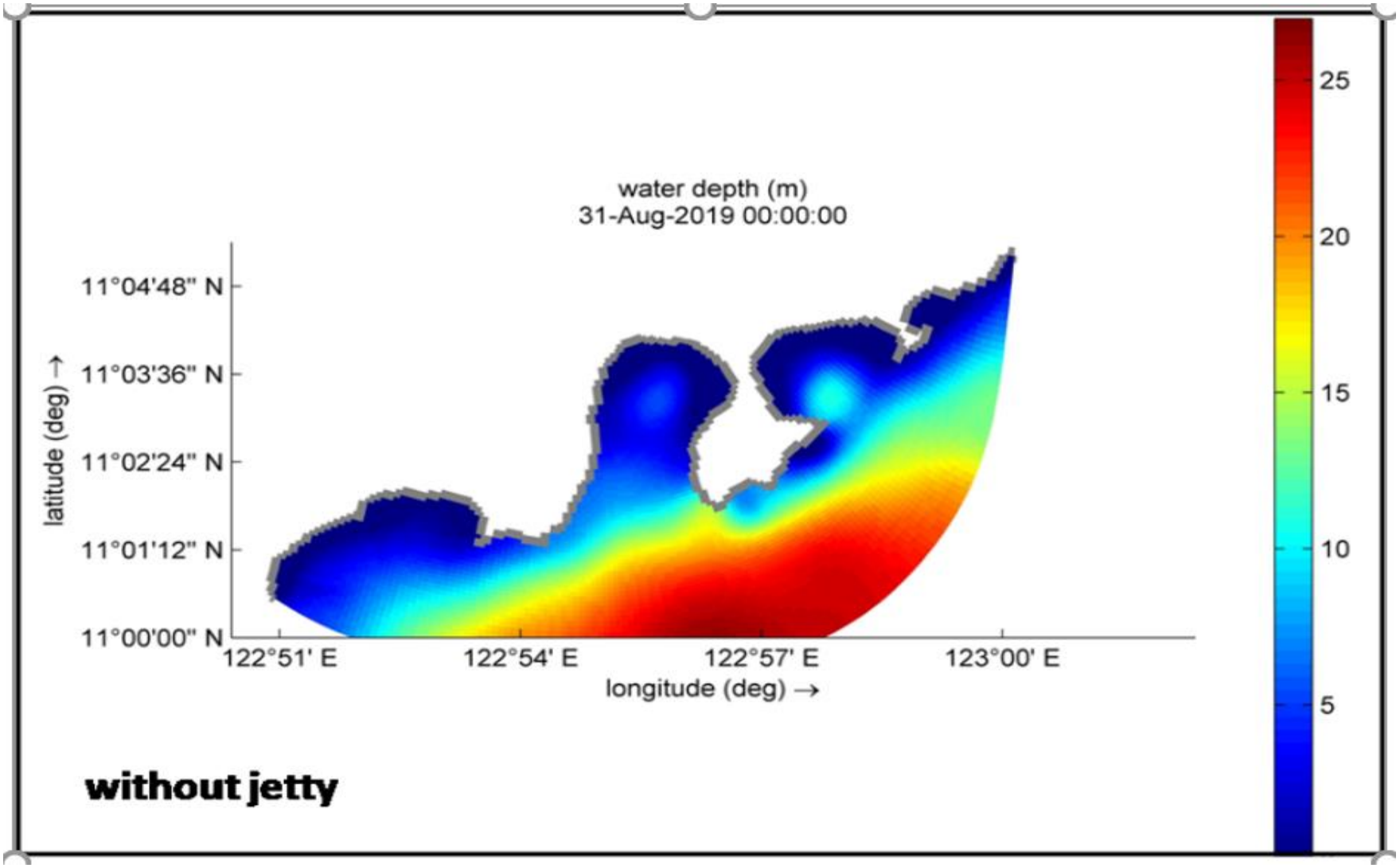


Figure 2.2. 10 Bathymetry off Bay-Ang Coast without the Jetty Port

2.2.2.6 Change/Disruption in Water Circulation Pattern, Littoral Current and Sediment Deposition

Flow velocity without the jetty port during no-wind condition, northeast monsoon, and southwest monsoon

Error! Reference source not found., the result of the first scenario (without jetty port, no wind), presents the residual tides on the depth-averaged current velocities under no-wind conditions. It shows the current magnitude is very weak in the area closest to the site with velocities ranging from 0.001 - 0.002 m/s. The average direction of the current near the site is outward, going towards Guimaras strait. Overall, the current is non-uniform, with some of the water in the southwest part of the domain forming a gyre in the clockwise direction. Northeast of the domain, the current flows towards the southwest direction. Current velocities in the whole domain range from 0.001 – 0.007 m/s.

During the northeast monsoon, the average flow in the domain is towards the southwest direction, influenced by winds coming from the northeast (Error! Reference source not found.). These southwestward currents also have increased in magnitude compared to the "no-wind" scenario. The gyre or the clockwise current seen in the southwest part of the domain is still present, but with greatly reduced speed compared to the no-wind condition. It can also be noted that inside Bay-ang Bay, the current magnitudes increase slightly.

Using the southwesterly winds in the simulation, the gyre regained its magnitude, and the current moving from the northeast going towards southwest weakened (Error! Reference source not found.). Influenced by the winds coming from the southwest, the circular current going outward into the direction of Guimaras strait occupies a greater area compared to the residual (no-wind) and northeast monsoon scenarios. Along the coast of Bay-ang near the area where the jetty port will be located, the transport of water is still outward.

With the jetty port in place, it was observed from all simulations that the presence of the port increased the current magnitude at the location of the port, though the current remains weak.

The jetty port creates a slight deflection in the outward current a few meters from the jetty port, but the current along the coast of Bay-ang remains weak. The average velocity during the no-wind simulation ranges from <0.001 m/s to 0.005 m/s (Error! Reference source not found.).

During the northeast monsoon, the current velocities moving towards the southwest direction of the domain become stronger with velocities ranging from 0.005 – 0.008 m/s. There is a convergence of weak currents at the far end of the proposed jetty port, but a few meters southwest of the port the currents move towards the southwest, influenced by winds coming from the northeast (Figure 2.2.15).

During the southwest monsoon, the highest current velocities (0.008m/s) can be observed in the currents coming from the southwest of the domain, influenced by the southwest monsoon, seemingly forming a gyre in the clockwise direction (Error! Reference source not found.).

Current velocities at the location of the jetty port remain essentially weak, ranging from 0.001 – 0.005 m/s. While the tip of the jetty port creates a convergence of weak currents, the average current direction still remains eastward and outward (towards Guimaras strait, **Figure 2.2.16**).

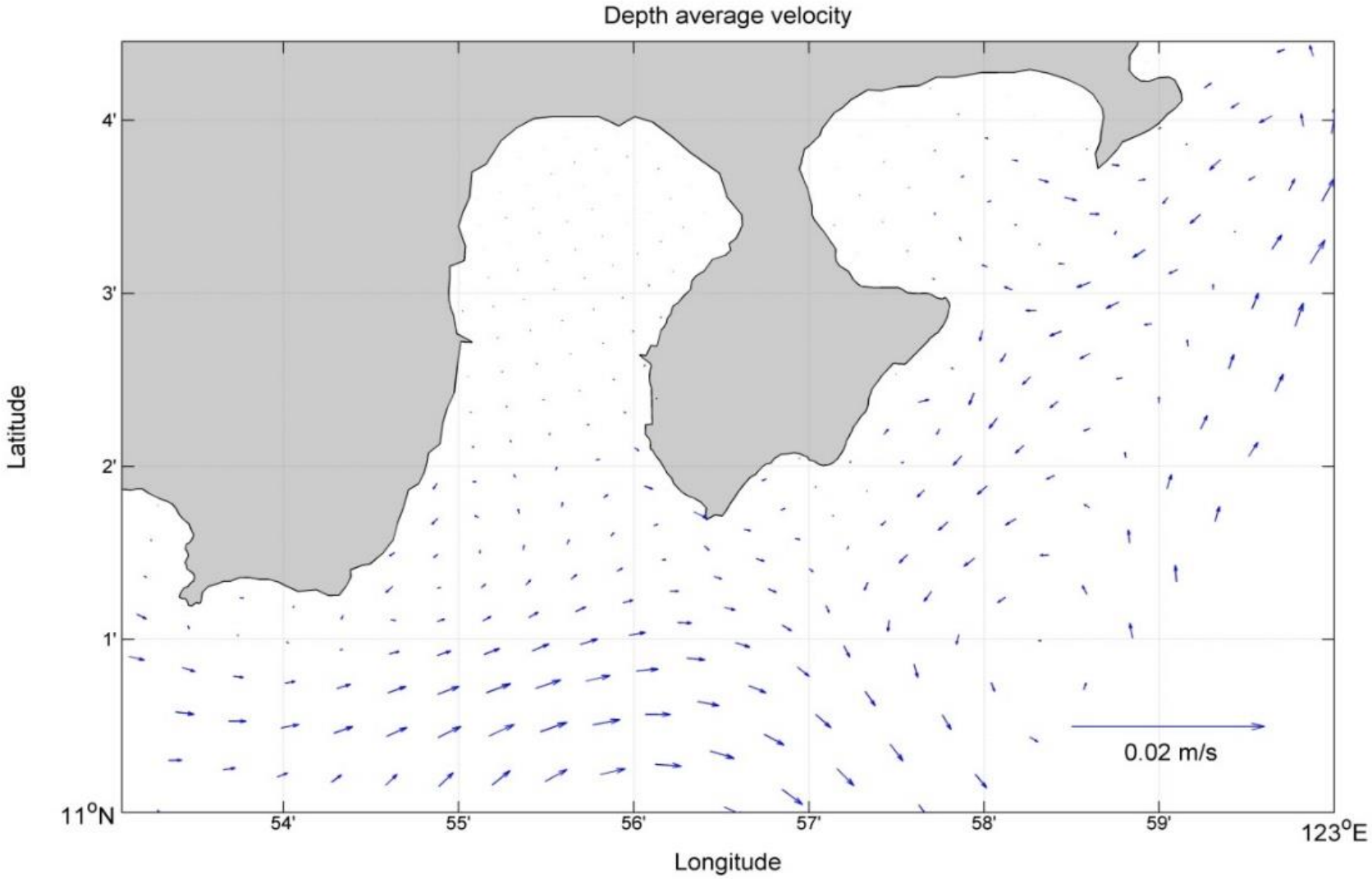


Figure 2.2. 11 Depth-Averaged Current Velocities without Wind, Sediment, and Jetty Port

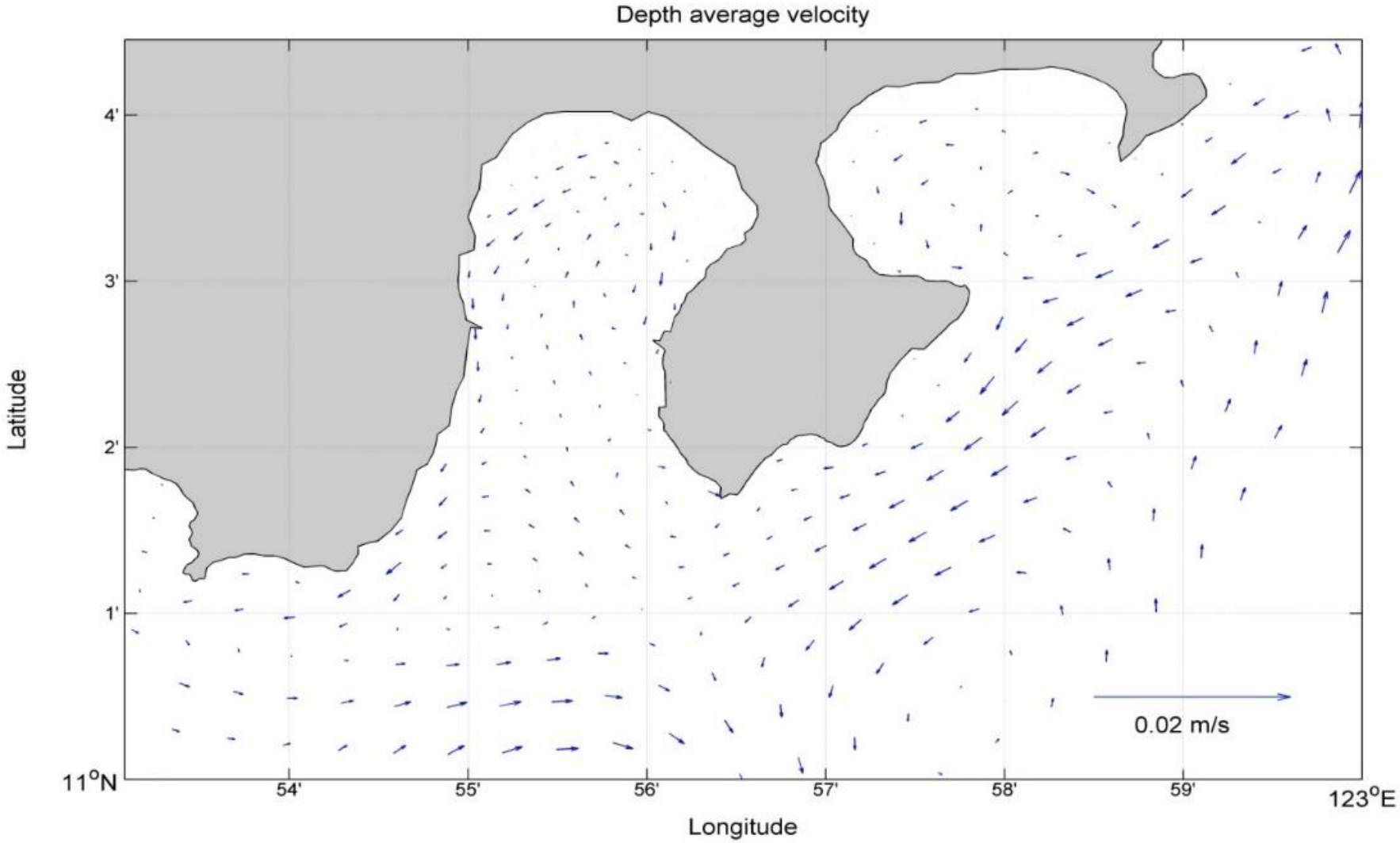


Figure 2.2. 12 Average Current Velocities During Northeast Monsoon without the Jetty Port

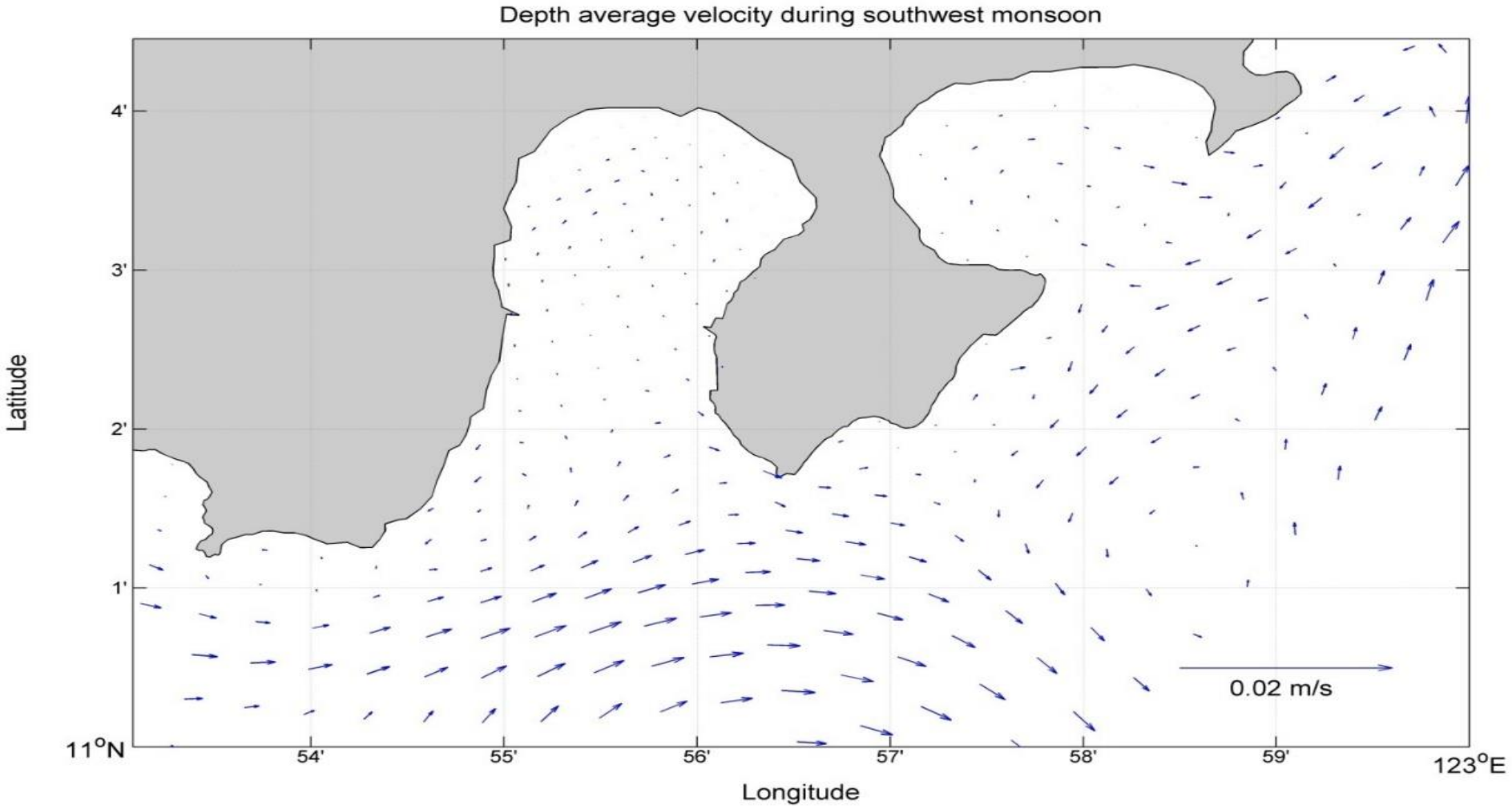


Figure 2.2. 13 Average Current Velocities during Southwest Monsoon w/o the Jetty Port

Flow velocity with the jetty port in place during no-wind condition, northeast monsoon, and southwest monsoon

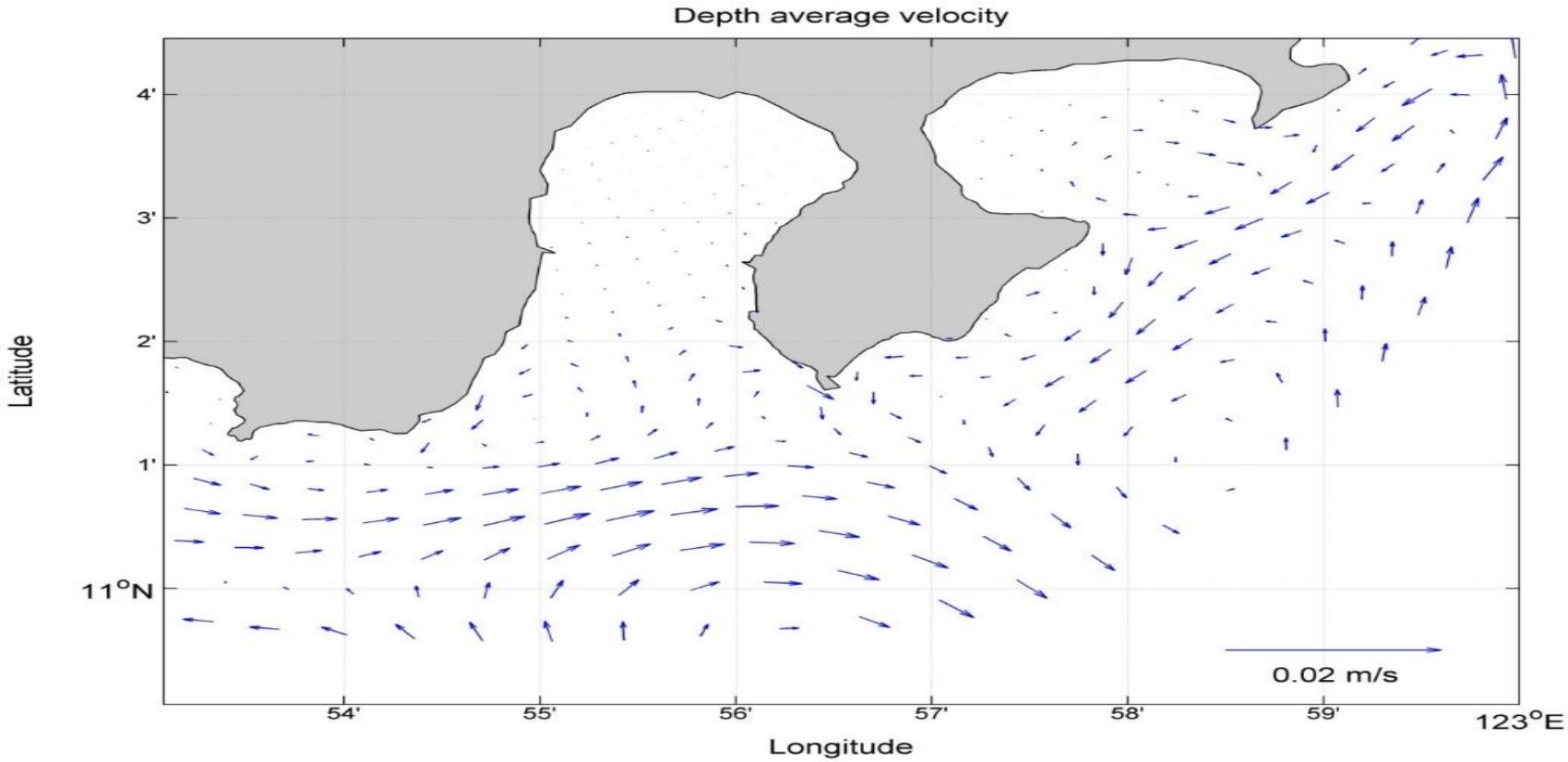


Figure 2.2. 14 Average Current Velocities in No-Wind Conditions w/Jetty Port installed

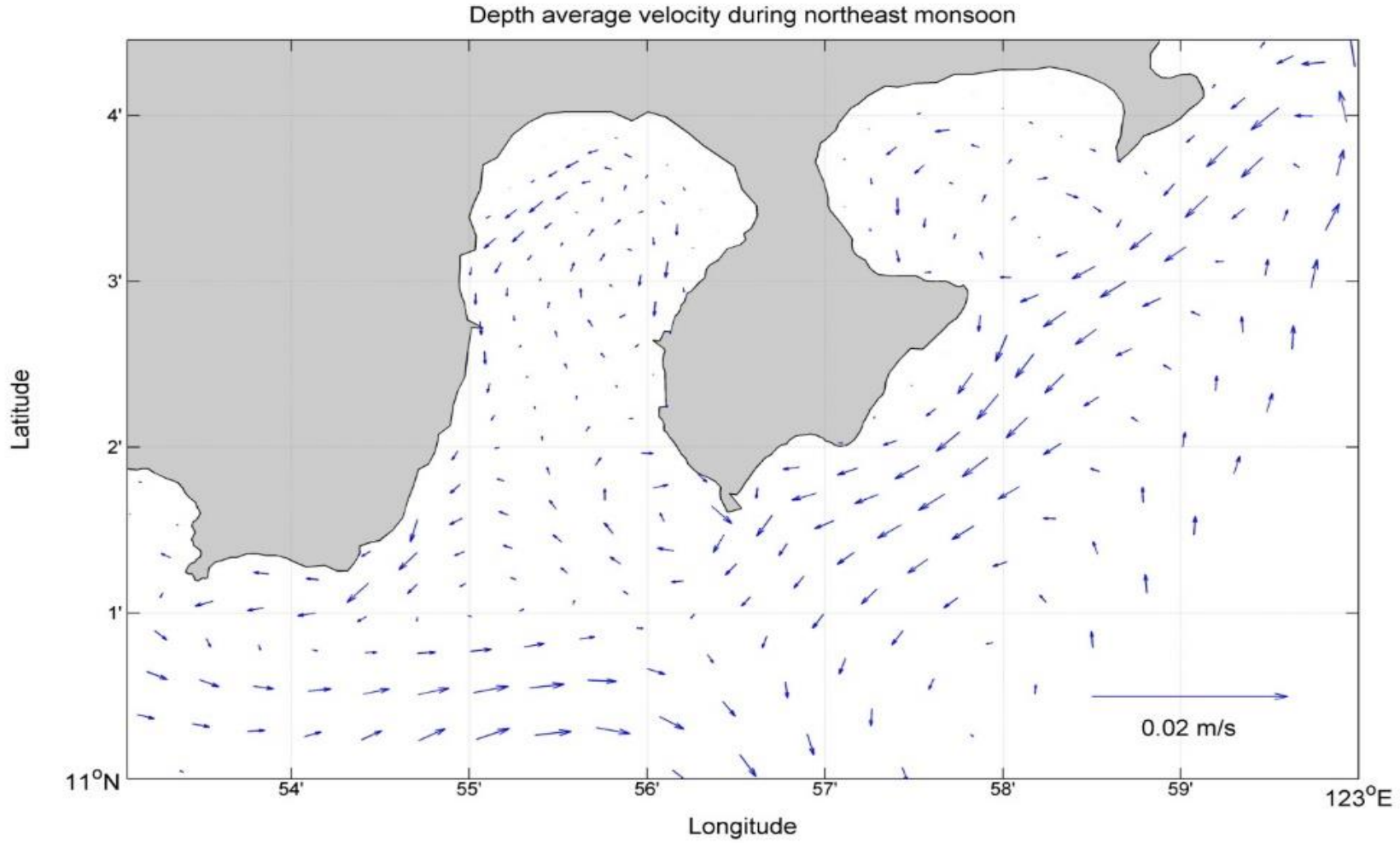


Figure 2.2. 15 Average Current Velocities during Northeast Monsoon w/Jetty Port installed

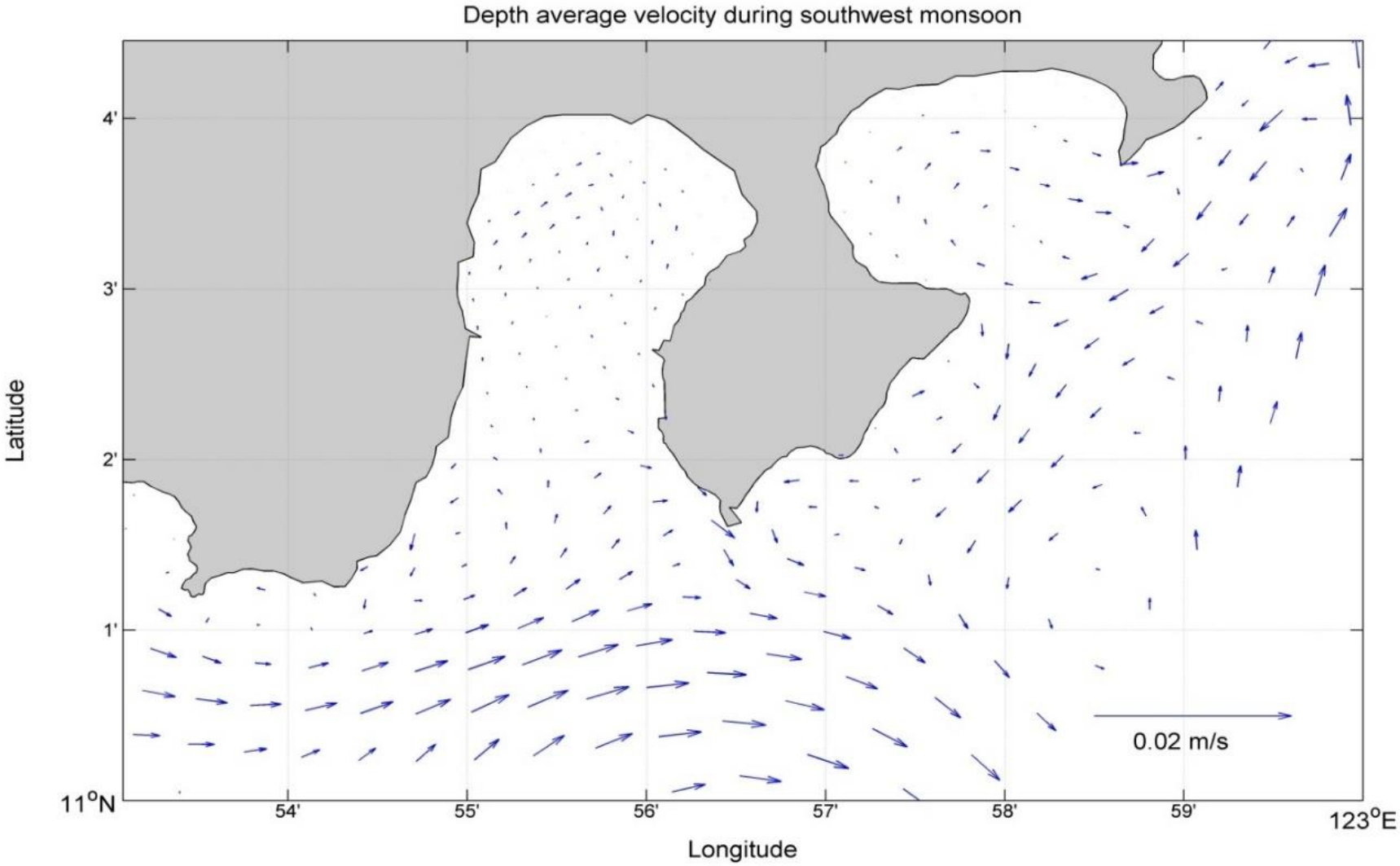


Figure 2.2. 16 Average Current Velocities During Southwest Monsoon w/Jetty Port installed

2.2.2.7 Change/Disruption in Sediment Deposition

Non-cohesive sediment model is plugged into two (2) random grids along the coast of Lot 20 and Lot 23, with a constant concentration of 0.985 kg/m^{3}and 1.58 kg/m^3 respectively. These sediment concentration values were computed based on the known average bulk density of non-cohesive sediments and sediment load (m^3/year) in **Table 2.1.12**. "Comparison of Average Annual Soil Loss with and without Project". Throughout the timeframe of the study, very low concentrations of sediments were observed in the areas near the jetty port and even in areas adjacent to the grids where sediment discharge was located (**Table 2.2. 8**, Water Quality).

Sediment Transport without the Jetty Port, with project

Error! Reference source not found. shows the three-month average sediment concentration without the jetty port and without winds. It can be observed that the relatively high concentrations of sediments are coming from the boundaries of the domain (up to 1 kg/m^3). Due to the very low concentrations of sediment from the discharge points, the z-axis was set to a scale of 0 to 0.0000005 kg/m^3 of sediment.

During northeast monsoon simulation (Error! Reference source not found.), sediment concentrations from the boundary (northeast of the domain) higher than 0.0000005 kg/m^3 had a greater reach, spreading sediments (up to 1 kg/m^3) along the coast of Ajuy facing Guimaras strait. The discharge coming from Lot 20 and Lot 23 is still less than 0.0000005 kg/m^3 (hence, not visible on the scale).

During the southwest monsoon simulation (**Figure 2.2. 19**), relatively higher sediment concentrations (higher than 0.0000005 kg/m^3) are coming from the southwest part of the domain. South of Bay-ang, sediments can be found with concentrations of 0.00000015 kg/m^3. The discharge coming from Lot 20 and Lot 23 is easily dispersed outward and are still less than 0.0000005 kg/m^3 (hence, not visible on the scale).

Sediment transport with the jetty port

With the jetty port in place, the three-month average sediment concentration yields (0.00000025 – 0.0000005 kg/m^3) was plotted at the tip of the proposed jetty port during no-wind conditions (**Figure 2.2. 20**). These sediments are in very low concentrations assumed as residual sediments coming from Lot 20 and Lot 23 pushed towards the jetty port. Higher sediment concentrations can be observed coming from both boundaries (1 kg/m^3) delineating the terminus of the project site.

Error! Reference source not found. shows the sediment concentration with the jetty port in place during the northeast monsoon. The sediment from the northeast boundary reaches a few meters south of the jetty and converges with the sediment runoff from Lot 22 and Lot 23. The sediment concentrations at jetty port remain very low, ranging from 0.00000001 - 0.00000005 kg/m^3.

Error! Reference source not found. shows the sediment transport during the southwest monsoon. Unlike the northeast monsoon where sediments from the northeast boundary reach the proposed jetty port location, only the sediments coming from the Lot 22 and Lot 23 runoff are pushed towards the jetty port location and concentrate on the tip of the jetty port during the southwest monsoon. The concentrations remain essentially low, ranging from 0.00000005 – 0.000005 kg/m^3.

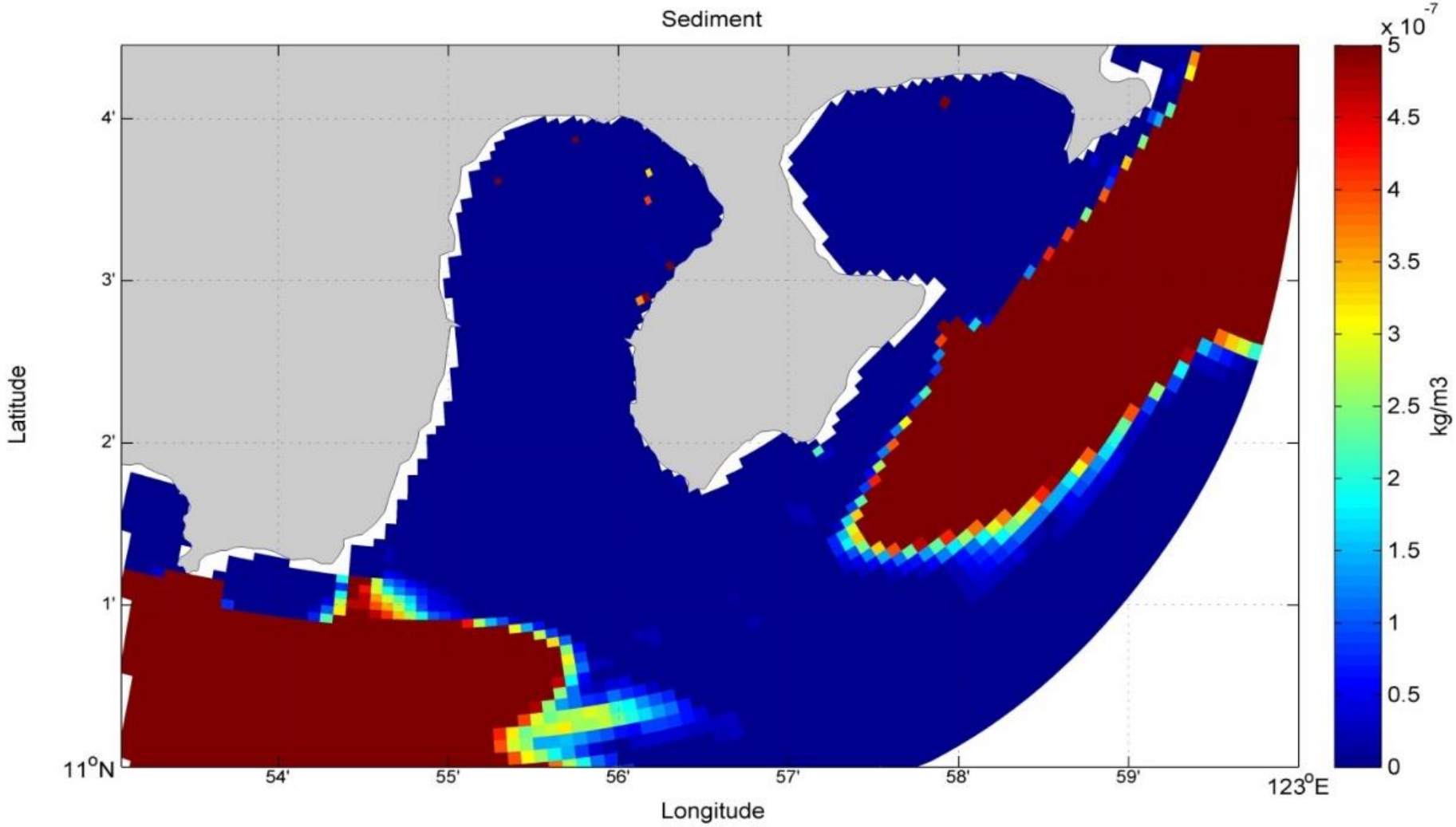


Figure 2.2. 17 Sediment Concentration w/o Jetty Port During No-Wind Condition

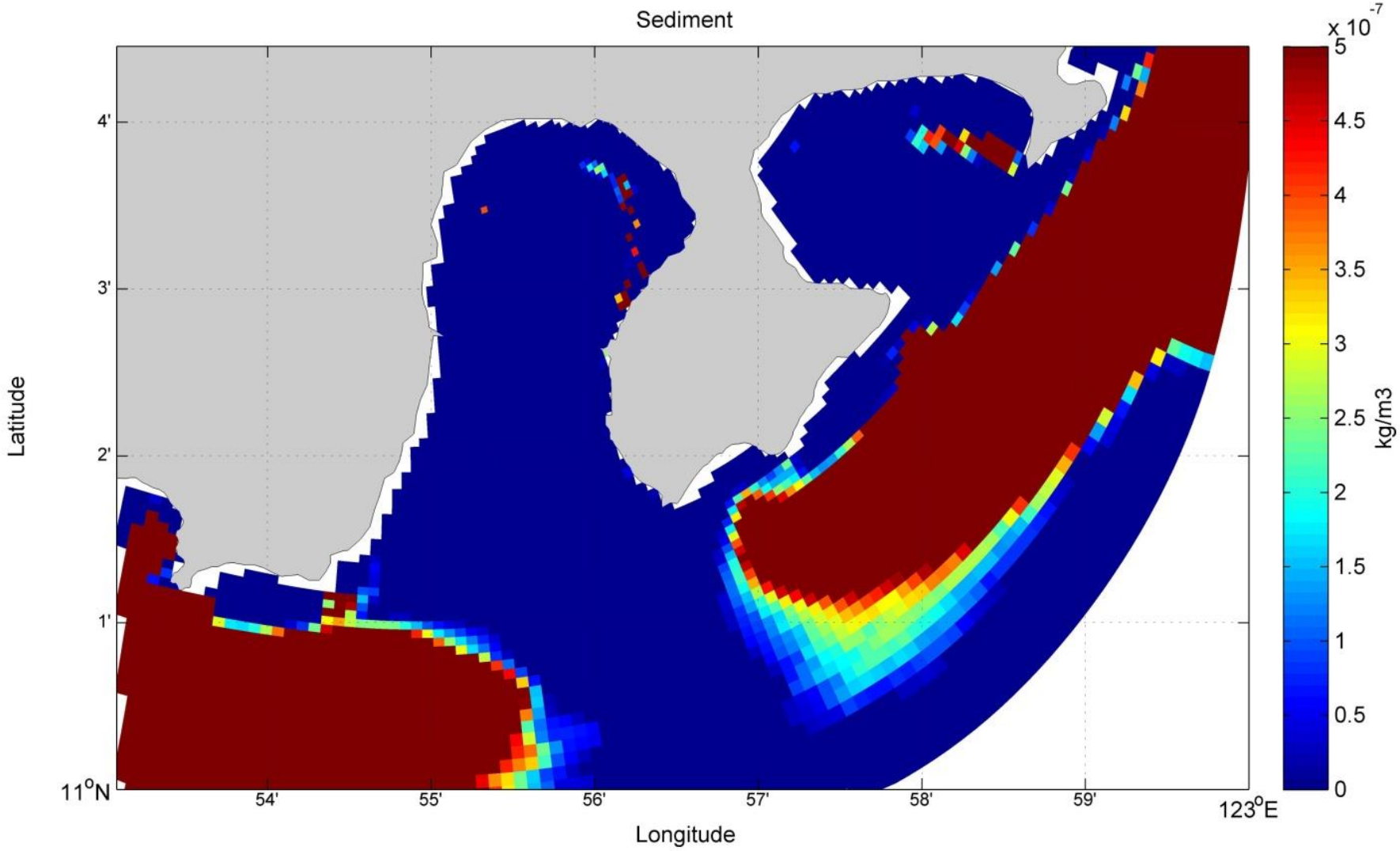


Figure 2.2. 18 Sediment Concentration w/o Jetty Port During Northeast Monsoon

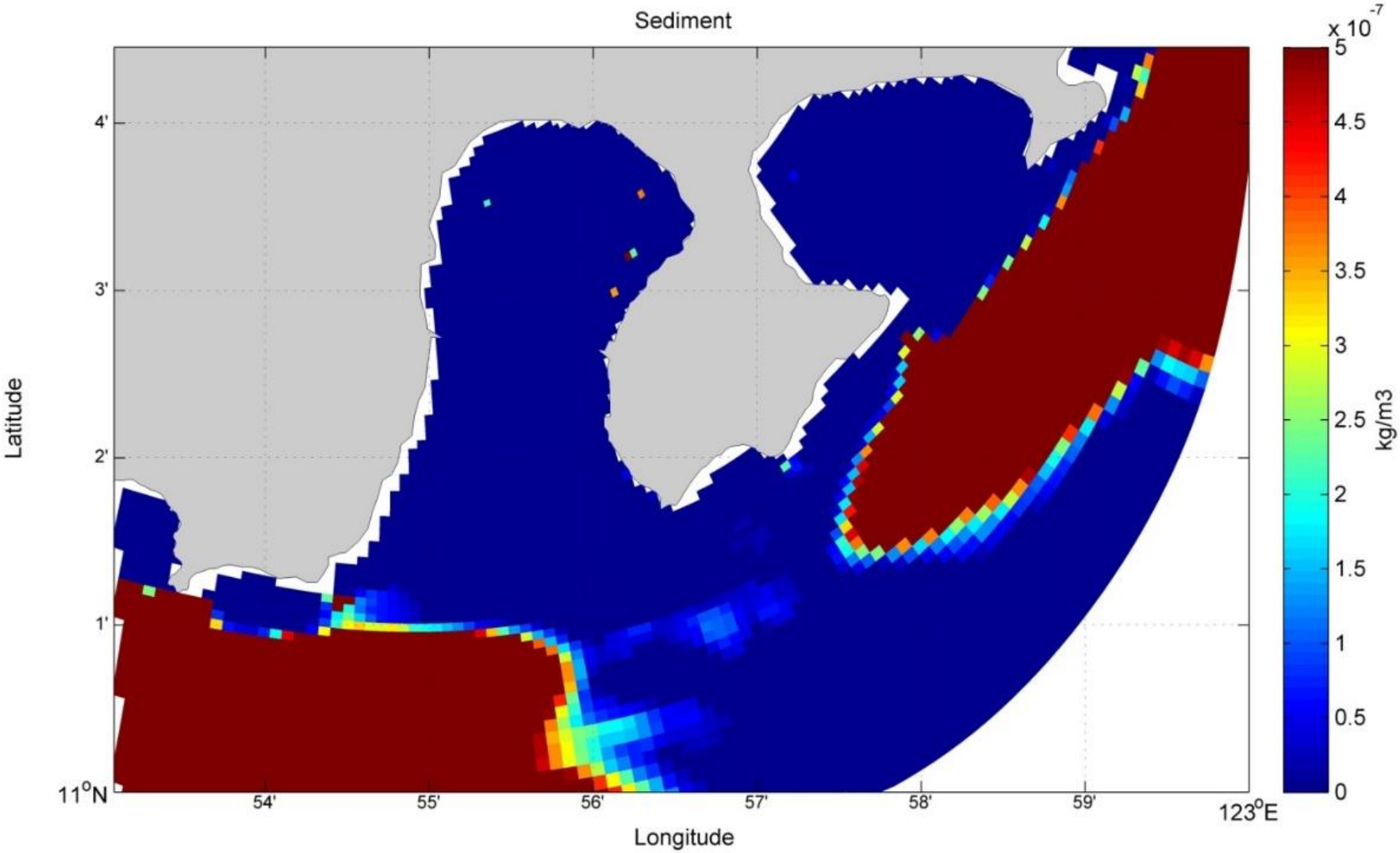


Figure 2.2. 19 Sediment Concentration w/o Jetty Port during Southwest Monsoon

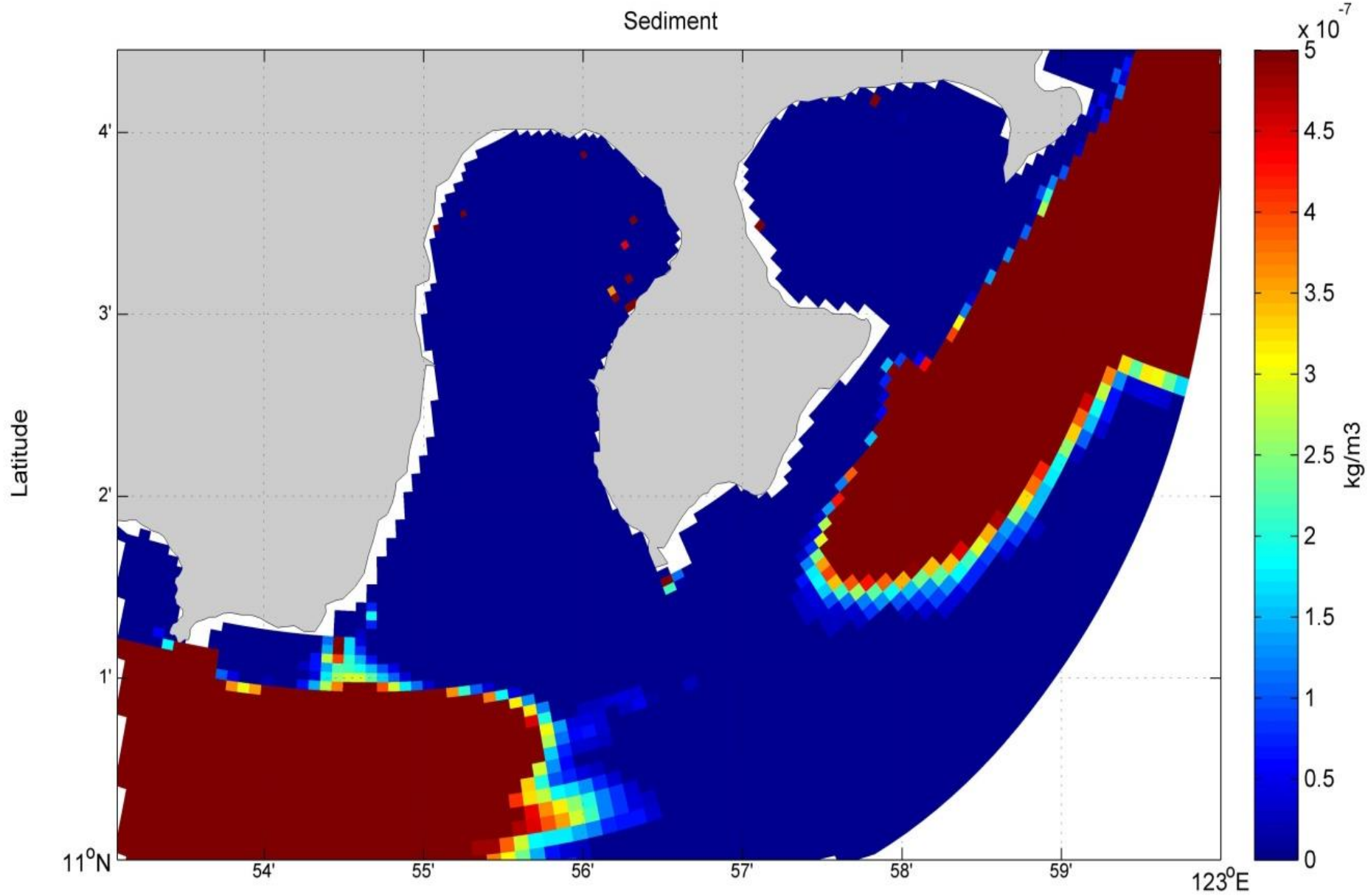


Figure 2.2. 20 Sediment Concentration w/ Jetty Port installed During No-Wind Conditions

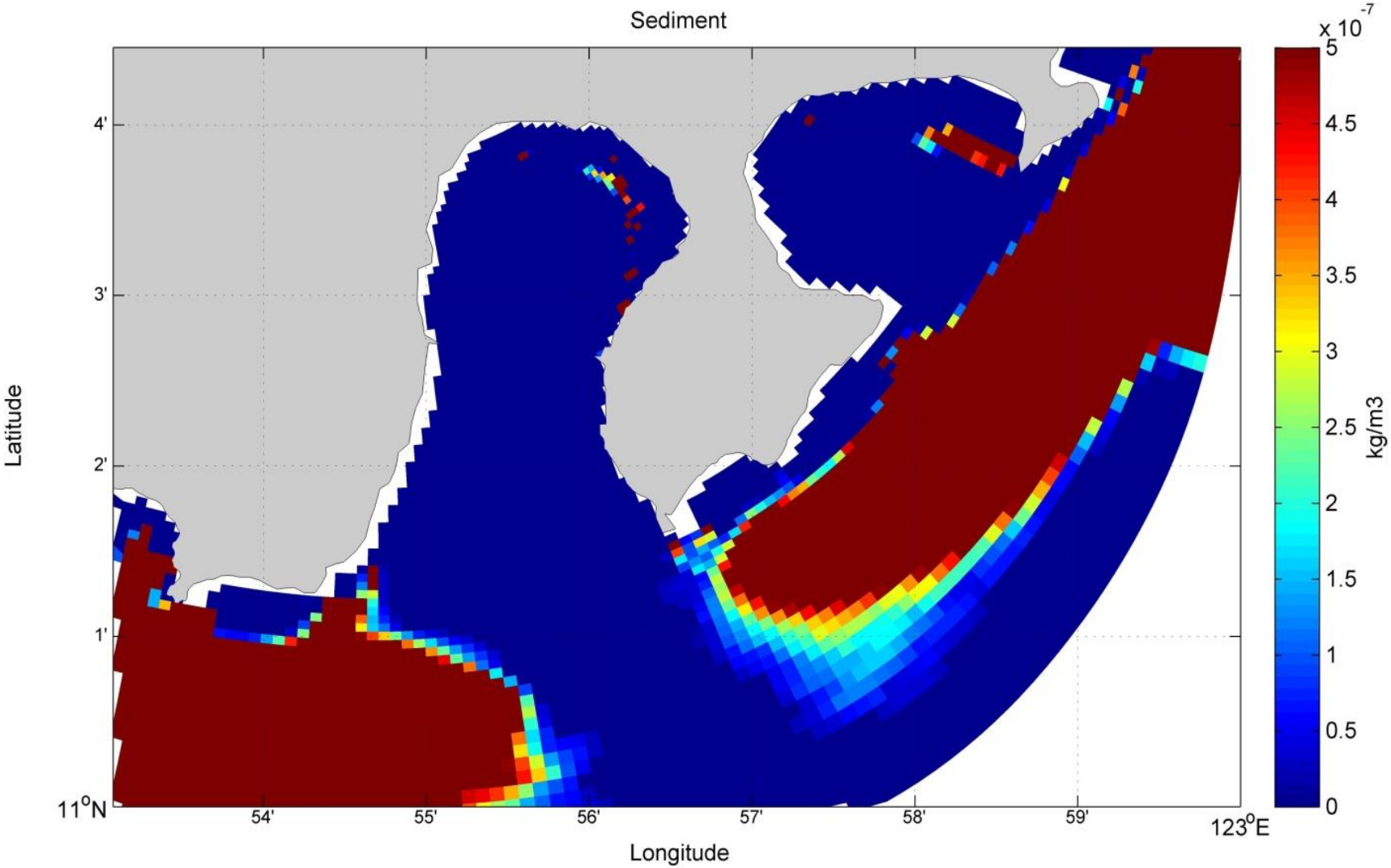


Figure 2.2. 21 Sediment Concentration w/ Jetty Port During Northeast Monsoon

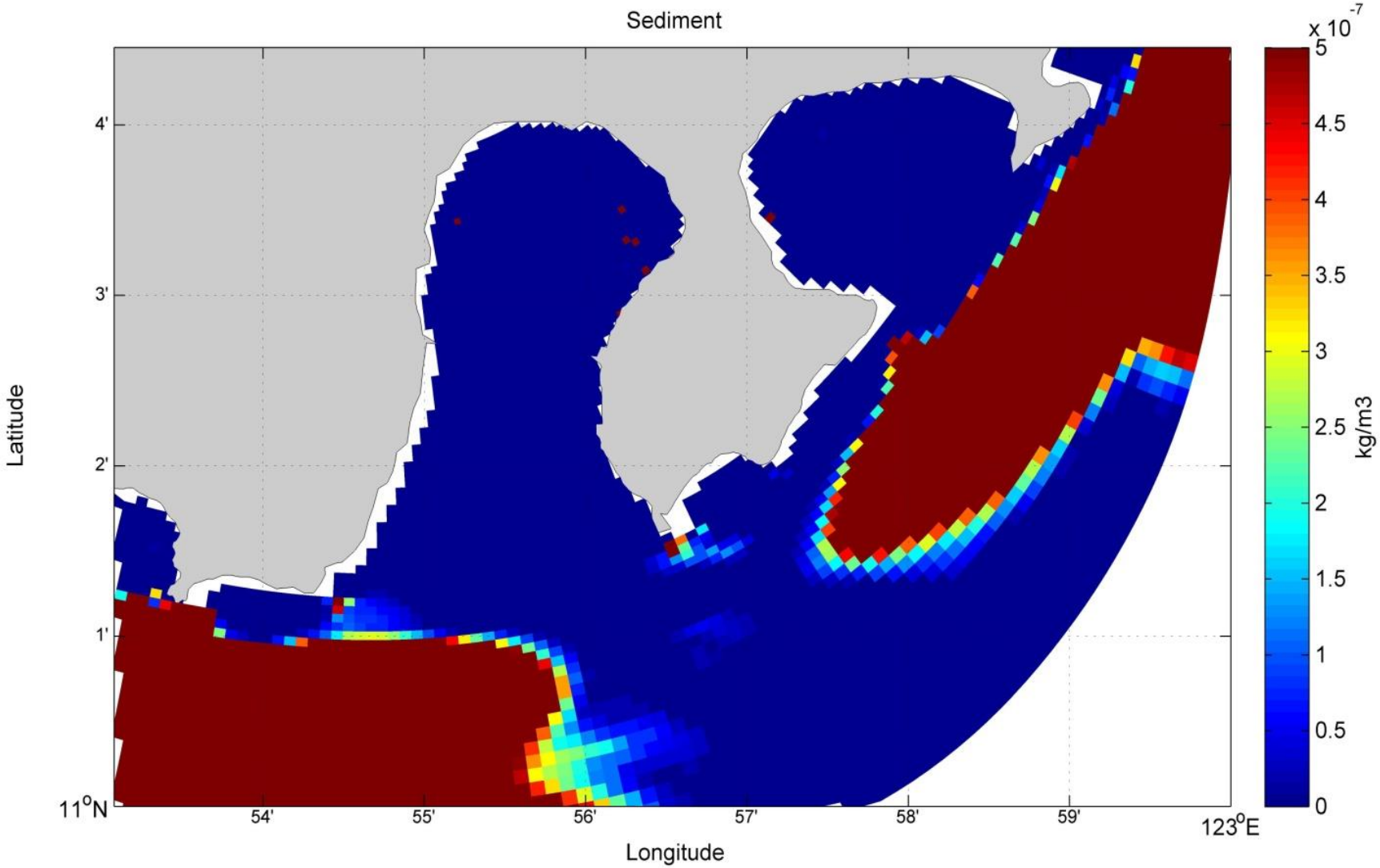


Figure 2.2. 22 Sediment Concentration w/ Jetty Port During Southwest Monsoon

2.2.2.8 Project Impact on Coastal Erosion

Based on the results of the study, the jetty-port structure will have a negligible effect in decelerating storm surge and coastal erosional forces due to a limited structure.

The retaining walls of the Plant facility will be designed to withstand shoreline erosion and to raise Plant base elevation to eight (8) to ten (10) meters above mean sea level for shoreline erosion control.

2.2.2.9 Conclusion

The results of the hydrodynamic study for Project impact on current circulation around Bay-ang point showed that the average velocities range from <0.001 to 0.008 m/s for the residual circulation during the northeast and southwest monsoons, for simulations with and without the jetty port of the CEMPHIL plant.

With the jetty in place at the southwest tip of Ajuy, the currents converge at the point of the jetty location but remain essentially weak in both sides of the jetty. At the southwest part of the port, there is an observed slight increase in current magnitude pushing towards the Guimaras strait in all three scenarios (no wind, northeast monsoon, and southeast monsoon winds) with the jetty port. In all six (6) hydrodynamic models, a clockwise gyre at the southwest part of the domain is evident, but the gyre changes in magnitude depending on the wind conditions. The Project by itself causes no significant change in current magnitude in the project influence area of up to 1 km from the jetty port.

For the sediment transport studies, non-cohesive sediment was plugged into two (2) random model grids located along the coast of Bay-ang to represent discharge points of Lot 20 and Lot 23, with a constant concentration of 0.985 kg/m^3 and 1.58 kg/m^3 respectively, for the duration of the simulation. This volume represents the 20% sediments of soil loss from the disturbed 4.5 hectares of the project area transported in peak storm run-off during the construction phase, which is may find its way to sea. The sediment concentration values were computed based on the known average bulk density of non-cohesive sediments and sediment load (m^3/year) and values as stated. The high sediment concentrations were mostly coming from the boundaries. Without the jetty port, the current disperses the residual runoff sediments from Lot 20 and 23 resulting in very low sediment concentrations (5 x 10 –12 kg/m^3) even in areas adjacent to the grids assigned as discharge location. With the jetty port in place, there was a slight increase in sediment concentration at the tip of the port (1 x 10-7 – 5 x 10 -7 kg/m^3) evident in no-wind, the northeast monsoon, and southwest monsoon scenarios. Despite this increase, the sediment concentration ensuing from the project remains very low. Background sediment concentrations resuspended from the seabed will tend to increase, according to climate condition, but project contribution will be negligible if planned silt control installations are in place and properly maintained.

Table 2.2. 6 Result of Sediment Transport Study With and Without Jetty Port

SCENARIO		SEDIMENT (ppm)	
	no	NE	SW
	wind	monsoon	monsoon
Sed. Transport 4	$2.5 \times 10^{-4} - 5 \times 10^{-5}$		
Sed. Transport 5		$1 \times 10^{-5} - 5 \times 10^{-5}$	
Sed. Transport 6			$5 \times 10^{-5} - 0.005$

In summary, the foregoing hydrodynamic and sediment transport study indicates that the proposed Cemphil jetty-port will cause no significant changes in the water circulation pattern, sediment deposition pattern, and area bathymetry both during construction and during operations due to its small jetty port size and project design on piers.

However, the jetty port is expected to cause a slight increase in sediment deposition at the east side of the rock-fill causeway (**Figure 2.2. 20**) and around the base of the piers/columns. Due to the limited number and size of the columns, the sediment deposition will be minimal and not cause significant changes in water circulation or the littoral current (see Error! Reference source not found. to Error! Reference source not found.).

To some extent, the jetty port will dissipate strong wave energy going into Canal Bay and to a minimal extent reduce the wave scouring and coastal erosion potential toward the coast of Barangay Bay-ang. This impact is however negligible due to the limited project structure.

2.2.3 Water Quality

2.2.3.1 Degradation of Groundwater Quality

During Construction

The groundwater quality may be affected by accidental oil spills due to the influx of heavy equipment and material delivery and haul trucks during the Construction Phase. Accidental oil spills will also happen during the Operation Phase, from material product haul trucks.

Another aspect that may affect groundwater quality is the influx of workers in the area. Groundwater quality may be affected by domestic wastewater.

Assessment of Septic Tank Requirement for Peak Construction Period

Assumptions :

Estimate of Septic Tank Capacity Requirement \1

		Liters per Day\1
Type of Users:	Live-in (non-resident special workers	75
	Day population (residents)	125
Estimated waste flow rate per person per day (L) \1:		
	Live-in	189.3
	Day population	75.6
Estimated total waste flow rate per day (L)		
	Live-in	14,198
	Day population	9,450
	Total	23,648
Recommended Design Criteria for waste flow >5,677.5 liters per day:		
Flow X 0.75 +1125 = Septic Tank Size (L)		18,860.63
Total Septic Tank Capacity (Primary Treatment Requirement (m3)		**18.86**
Secondary Treatment Unit Capacity Requirement (m3)		**23.65**

\1 Reference: Table B3, Revised Plumbing Code

During operation

The project operating activities do not have activities that will affect ground water quality due to the following inclusions in the Project design:

1. Septic tanks are compliant with the Sanitary Code and the Plumbing Code of the Philippines as amended.
2. The Project production process is not water-intensive.
3. Absence of a process involving the injection of liquid to the substrate; and
4. Absence of a process involving hydraulic extraction of substantial water volume, causing constant high negative pressure that may promote deeper absorption of pollutants on the ground surface into the underground environment.

During operations phase, the septic tanks used during Construction Phase will serve the purpose.

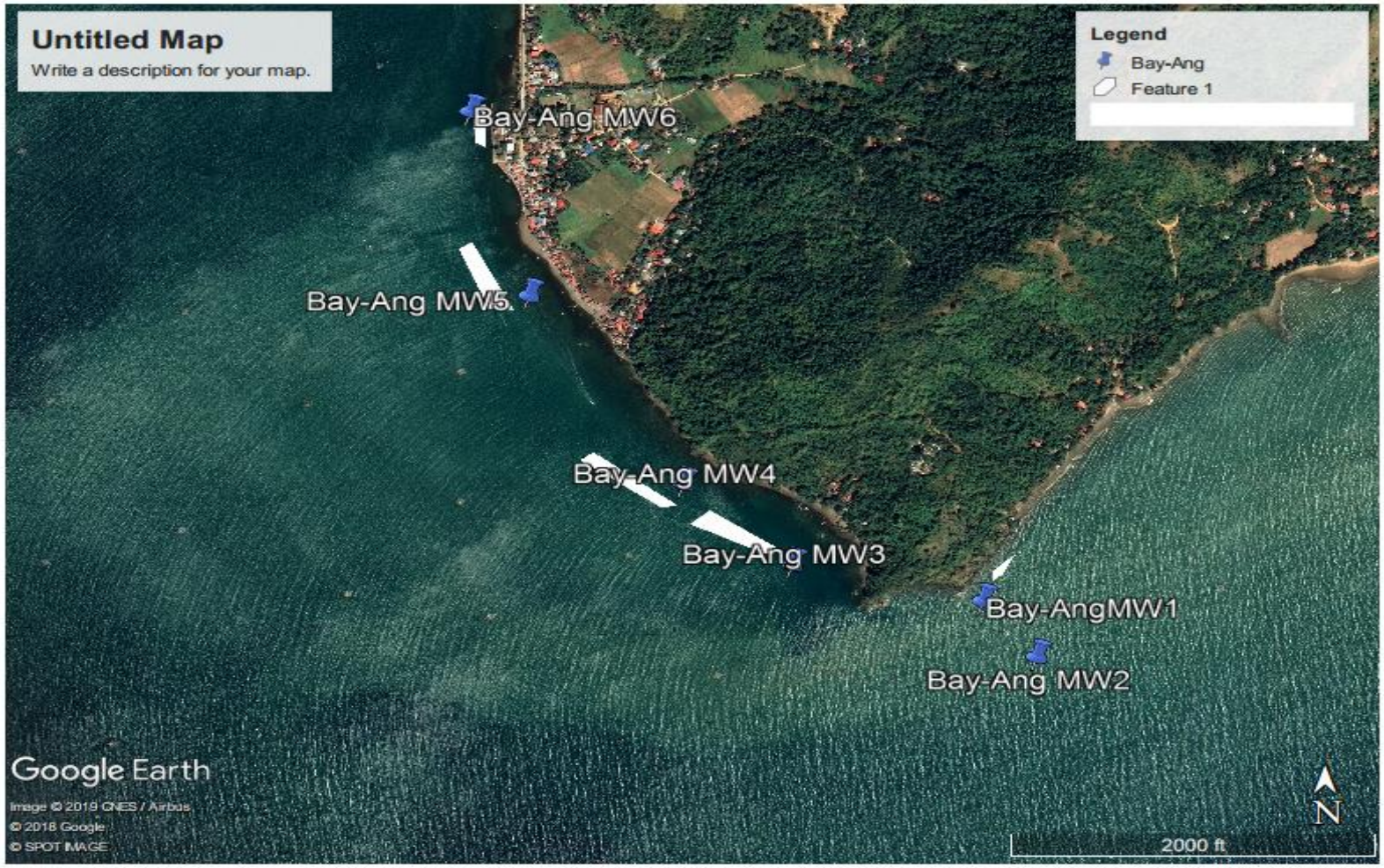


Figure 2.2. 23 Water Quality and Marine Ecology Sampling Map

2.2.3.2 Degradation of Surface Water Quality

There are no immediate inland surface water bodies within the project site, therefore the proposed project will not cause degradation of inland surface water quality.

2.2.3.3 Degradation of Coastal/Marine Water Quality

The potential sources of water pollution from the project are the following:

Table 2.2. 7 Potential Sources of Water Pollution from the Project

	Project Phase			
Pollutant	Construction	Operation	Abandonment	Potential Source/s
From Land-based Plant Facilities				
High sediment load of surface run-off	✓	✓	✓	Earthworks, spills facility dismantling, equipment removal
Oil and Grease	✓	✓	✓	Heavy equipment operation, poor handling and storage of fuels and lubricants Oil and Grease from Company Canteen
Fecal coliform	✓	✓	✓	Poor maintenance of sewage facilities
Plastic wastes, domestic waste	✓	✓	✓	Poor waste management
Chromium $_{vi}$		✓		Leachate from imported clinker exposed to elements/ rain. Production processes of imported clinker may not exclude hexavalent chromium in raw materials or fuel. Certain milling additives may contain Cr_6
Cadmium		✓		Leachate from imported clinker.
Lead		✓		Spilled diesel fuel
From Jetty Port Operations				
High volume of sediments in water column	✓	✓		Construction, pile driving, spills from material handling
Oil and Grease	✓	✓	✓	Heavy equipment operation, discharge of ballast water and wastewater by ships
Chromium		✓		Leachate from imported clinker exposed to elements/ rain.
Cadmium		✓		Leachate from imported clinker.
Lead		✓		Discharged ship ballast water
Invasive marine species		✓	✓	Discharged ship ballast or bilge water

During Construction

Vegetation clearing and earthworks will cause an increase in the sediment load of surface run-off, more so when earthworks coincide with the rainy season which is expected from May to October. Surface run-off with increased sediment yield may flow directly to the marine environment and cause the siltation of nearby coral communities if no silt control measures are instituted.

Table 2.2. 8 Potential Annual Sediment Load of Surface Run-Off

Lot No.	Area (has.)	Disturbed Area During Construction	Potential Annual Sediment Load of Run-Off to Sea (m^3)			
			During Construction w/ Control Measure	During Construction w/ Silt Control Measure	During Operation w/o silt control installations	During Operation w/ silt control installations
23	3.99	2.76	15.64	7.82	6.90	1.38
20	2.51	1.74	13.89	6.94	8.51	1.70
Total	6.49	4.50	29.53	14.77	15.41	3.08

Source: Modified USLE, BSWM. Ref.: Table 2.1.11

An increase of oil concentration in marine water may also occur when stored containers of fuel or used/spent lubricant topple over and spill for one reason or another, or the transfer, loading of fuel, or disposal of used oil occurs without handling safeguards.

The construction workers' barracks and project site office may also be a source of raw sewage that may cause health issues if unaddressed. Kitchen wastewater will contain oil and grease.

During Operation

The Project has no wastewater discharge. The main water quality management facility of the project are the drainage channel and settling ponds which are embedded in the landscape, and the oil and water separators (Table 1.8).

The annual sediment load of peak surface run-off is expected to reduce during the Operation Phase as the larger portion of the Plant surface area will be concreted (see **Table 2.1.12**). It is expected to reduce further with the installation of silt control features (**Table 1.8**).

Marine water quality may be affected by possible spills of production materials (clinker, limestone, pozzolan, fuels, and lubricants) both at the plant and at the jetty port. These spills, however, are expected to be minimal and not expected to be persistent or part of the regular operation because the production materials have economic value and management will control wastage as standard operating policy.

2.2.3.4 Baseline Water Quality

Marine water samples were collected from five (5) stations (**Figure 2.2. 23**) on July 15 to 16 and on August 5 to 7, 2019 to obtain baseline marine water quality for project impact parameters. The result of which is tabulated in **Table 2.2. 9**. The water sampling procedure followed the DENR Water Quality Monitoring Manual of 2008. The analysis was done by EMB-accredited laboratories. Certificates of laboratory analyses are in **Annex H**.

Table 2.2. 9 Baseline Coastal Water Quality for Selected Parameters

Parameter	MW1	MW2	MW3	MW4	MW5	Class SB Standard*
Total Suspended Solids (mg/L)	37.5	31.8	32.4	26.6	43.0	50
Oil & Grease (mg/L)	4.06	0.80	5.60	1.76	10.5	5
Cadmium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	0.006

Parameter	MW1	MW2	MW3	MW4	MW5	Class SB Standard*
Chromium$_6$ (mg/L)	<0.002	<0.002	<0.002	<0.002	<0.002	0.01
Lead (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	0.02
COD (mg/L)	137	127	145	82	174	60
Fecal Coliform (MPN/100mL)	<1.8	7.8	<1.8	33	23	200
pH	7.9	8	8.1	8	8.5	6.5 to 9.0
Temperature ° C	27	28	28.3	29	29.5	Δ 3 ° C

*DENR AO No. 2016-08

Based on the results in **Table 2.2. 9**, the existing water quality meet Class SB standard except for exceedance of Chemical Oxygen Demand (COD) in all stations, averaging 222% go beyond the standard. The COD exceedance may be attributed to raw wastewater discharge from home-scale crabmeat processing in Bay-ang. The Oil and Grease concentrations in Station 3 near the shore where informal settlers in Lot 23 are located, and in Station 5, likewise exceed standard. This is attributed to loose handling of diesel fuel used in banca motors and discharge of kitchen wastewater from the houses. It is notable that the fecal coliform in all sampling sites meet the standard.

The reference standard used is DAO 2016-08 for Class SB or for Recreational Water Class II water bodies. This is applicable to the existing beneficial use of the receiving waters, i.e., commercial and sustenance fishing, and the planned use of Pedada Bay area for eco-tourism and contact recreation.

Ferrous ion (Fe^{+2}) required in the technical scoping checklist was not analyzed at the laboratory, as there will be no source of this from the project. A review of **Table 1.20**, the project does not plan to produce Type III cement which uses iron sand at the finishing phase. Cemphil cement grinding project only covers the finishing phase of cement manufacturing. It will import finished clinker as its primary raw material and use diesel fuel to operate back-up generators to mitigate the frequent power outages in Ajuy.

2.2.4 Marine Ecology

The identification of sampling sites for underwater dives was done in consultation with local fishermen. Based on the project facility layout map, the coastal area from Bay-Ang Barangay Hall to the location of the proposed Jetty Port was equally divided into one (1) kilometer segments, and one sampling site was designated for each. Key informant interviews of the Barangay Chairperson and fishermen from the area provided information for a rapid resource appraisal of the current fishery situation in Bay-ang. The location of reefs and seagrass beds were requested to be identified from the locals using the Project Location Map (the base map for **Figure 1.4**), with reference land-based landmarks inquired and recorded for each. The resulting marine survey sampling map is in **Figure 2.2. 23**. The description and location of the sampling sites are reflected in **Table 2.2. 10**.

Table 2.2. 10 Location of the Sampling Sites

Label	Geographical Position	Description	Data taken
MW1	N11° 01.700' E122° 56.524'	in front of rock cliff, entrance of the bay	benthos, fish, plankton
MW2	N11° 01.638' E122° 56.574'	offshore of the most distant house in the community	plankton
MW3	N11° 01.740' E122° 56.350'	in front of rock cliff	benthos, fish, plankton
MW4	N11° 01.829' E122° 56.251'	offshore the distal end of the concrete dike	benthos, fish, plankton
MW5	N11° 02.036' E122° 56.110'	offshore the middle portion to the concrete dike	benthos, fish, plankton
MW6	N11° 02.239' E122° 56.056'	base of the proximate point of concrete dike, entrance to boat harbor	benthos, fish, plankton

The benthic cover was assessed using the Line Intercept Technique (LIT) outlined by English et al. (1996). A 25-meter transect was laid on the benthos. Photos of the bottom features were taken by a diver in SCUBA. Post-dive processing was done with photos by noting the total length of the benthic feature directly under the transect line. Percent cover for each category was computed by getting the quotient of the feature and the total length of the transect. Other features were noted from both sides of the transect line. For corals, a quantitative description of the reef was done following Gomez et al. (1994).

Using the same transect, fish assemblages were noted using visual census (English et al., 1996). The observation was made after every five (5) meters along the transect. The diver in SCUBA made an 80-observation of fish species. The frequency of fish species was also noted on an underwater slate.

Plankton community was documented by collecting 30-liter surface water in a clean pail and passing it through a 250-µm diameter mesh. The net was backwashed before samples at the cod-end were transferred to prescribed plastic bottles. Samples were preserved in 1% formalin by volume before transport to the laboratory. The density and taxonomic identity were determined in the laboratory.

2.2.4.1 Corals

Fringing reefs can be found at depths of about one (1) to 10 meters. Reefs still do not form large consolidated structures, rather patches of sub-massive to massive coral heads grow on rocks and sandy bottom. As the sampling period was done during a southeast monsoon season, water visibility is very low at all sites that range from one-meter to three-meter at best.

Sites that are adjacent to the coast were found to have reef areas. MW1 has a good coral cover on 41% of the site (**Table 2.2. 12**), dominated by sub-massive lifeforms, particularly *Lobophylla* and *Goniopora*. Visibility at the site is very poor owing to the abundance of fine particles resuspended from wave action. Non-living component of the reef was at more than 50% of the bottom cover.

MW2 is underlain by sand and rubble.

MW3, on the other hand, has a poor coral cover at 23.56%. The dominant feature is sand patches where coral heads occur. Its adjacent site, MW4, has a relatively better coral cover at 33.52%. Noticeably, the dead coral covered with turf algae (DCA) is the main feature of the reef with a total cover of more than 42%.

Both MW5 and MW6 has a fair coral cover at more than 45%. Dominant lifeforms are the sub-massive and massive forms, they include *Lobophyllia* and *Porites*, which are ecologically adaptable to sites with high resuspension potential as their polyps can readily remove silt deposits on their surfaces.

Among the sites surveyed for corals, MW6 has the highest number of coral genera at 16. This was followed by MW4 with 10 while the rest of the sites have one or two less. Most of the genera have either sub-massive or massive growth form. 100-yr corals exist 75-m seaward near the Bay-ang Barangay Hall.

Table 2.2. 11 Coral Cover on Sampling Sites within the Reef Area

Components	Cover									
	MW1		MW3		MW4		MW5		MW6	
	(m)	(%)	(m)	(%)	(m)	(%)	(m)	(%)	(m)	(%)
Living/Coral										
digitate	0	0	0	0	0.24	0.96	0.32	1.28	0	0

Components	Cover									
	MW1		MW3		MW4		MW5		MW6	
	(m)	(%)	(m)	(%)	(m)	(%)	(m)	(%)	(m)	(%)
branching	0.18	0.36	0	0	1.65	6.6	1.78	7.12	0.65	2.6
encrusting	1.43	2.86	0	0	0.83	3.32	1.26	5.04	3.06	12.24
massive	2.68	5.36	0.58	2.32	1.44	5.76	3.78	15.12	3.17	12.68
sub massive	13.69	27.38	1.2	4.8	4.11	16.44	3.87	15.48	3.89	15.56
thin plates	2.62	5.24	3.67	14.68	0.07	0.28	0.22	0.88	0.44	1.76
solitary	0	0	0.44	1.76	0.04	0.16	0.64	2.56	0.08	0.32
Sub-total*		41.2		23.56		33.52		47.48		45.16
Living/Others										
Heliopora	0	0	0.09	0.36	0	0	0	0	3.63	14.52
Millepora	0.06	0.12	0.09	0.36	0	0	0	0	0	0
soft coral	2.46	4.92	0	0	0	0	0	0	0	0
sponge	0.12	0.24	0	0	0	0	0	0	0	0
Crown-of-thorn	0	0	0.09	0.36	0	0	0	0	0	0
Sub-total		5.28		1.08		0		0		14.52
Non-living										
sand	9.07	18.14	13.71	54.84	0	0	3.69	14.76	0.22	0.88
dca	17.69	35.38	5.13	20.52	10.57	42.28	9.44	37.76	6.82	27.28
silt	0	0	0	0	0.03	0.12	0	0	3.04	12.16
sand and rock	0	0	0	0	6.02	24.08	0	0	0	0
Sub-total		53.52		75.36		66.48		52.52		40.32
Total	50	100	25	100	25	100	25	100	25	100

*Quantitative description of coral cover based on Gomez et al., 1994: 0-25 - poor; 26-50 – fair; 51 – 75 – good; 76-100 - excellent.

Table 2.2. 12 Taxonomic Composition (Coral Genera) on Sampling Sites w/ Corals, Brgy. Bay-Ang, Ajuy, Iloilo, August 2019

Genera	MW1	MW3	MW4	MW5	MW6
Porites	√		√	√	√
Goniopora	√	√	√	√	√
Oulophyllia	√	√		√	√
Favia	√		√		√
Pavona	√		√		√
Favites	√	√	√	√	√
Turbinaria	√		√		√
Poccillopora	√		√		√
Alveopora	√				√
Symphilia	√	√		√	√
Lobophyllia		√	√	√	√
Merulina		√			√
Platygyria		√			√
Pectinia		√	√	√	√
Acropora			√	√	√
Fungia					√
TOTAL	9	8	10	8	16

Source: Cemphil EIA Survey 2019

2.2.4.2 Mangroves

No mangrove was found along the coast from Bay-ang Barangay Hall to the Project site.

However, the Municipal Government of Ajuy, through the Municipal Coastal Resource Management Plan, documented the existence of Mangrove species in Ajuy in in 2004 (**Table 2.2. 13**). Municipal data indicate that mangroves in the surrounding barangays have average to good condition. It also observed that mangroves in Ajuy have historically decreased due to land conversion for fishponds and dwellings. The only ones remaining are in Pedada, Luca, Silagon, Rojas, and Tagubanhan.

Table 2.2. 13 Mangrove Species List Across 11 Barangays of Ajuy

Mangrove species	Local Name	Phil.[a]	1	2	3	4	5	6	7	8	9	10	11
Acanthus ebracteatus	Lagiwliw, Ragoyroy	*						*b					
Acanthus ilicifolius	Lagiwliw, Ragoyroy	*						*b					
Acanthus volubilis	Lagiwliw, Ragoyroy	*											
Nypa fruticans	Nipa	*						*b			*b		*b
Avicennia alba	Piapi, Bungalon	*											
Avicennia officinalis	Piapi, Bungalon	*						*			*		
Avicennia marina	Bungalon	*	*	*	*	*	*	*	*	*	*	*	*
Avicennia rumphiana	Piapi, Bungalon	*						*	*		*		*b
Camptostemon philippinensis	Gapas-gapas	*		*	*b			*	*		*		
Lumnitzera littorea	tabao, culasi	*									*		
Lumnitzera racemosa	tabao, culasi	*						*	*b			*b	*
Excoecaria agallocha	Lipata, Buta-buta	*			*b			*	*b		*b	*b	*
Pemphis acidula	Bantigi	*	*				*						
Xylocarpus granatum	Tabigi	*				*		*	*b			*b	*b
Xylocarpus moluccensis	Piag-ao	*		*b				*					*
Aegiceras corniculatum	Saging-saging	*						*			*b		*b
Aegiceras floridum	Tinduk-tindukan	*	*	*	*	*b	*					*	
Osbornia octodonta	Tawalis, Bunot-bunot	*	*		*			*			*		
Aegialitis annulata	unknown	*											
Bruguiera cylindrica	Pototan, Busain	*						*b				*	*
Bruguiera gymnorrhiza	Pototan, Busain	*											
Bruguiera parviflora	Langarai	*											
Bruguiera sexangula	Pototan	*											
Ceriops decandra	Baras-baras	*			*			*			*		*
Ceriops tagal	Tungog, Tangal	*											
Kandelia candel	unknown	*											
Rhizophora apiculata	Bakhaw-laki	*								*	*	*b	*
Rhizophora x lamarckii	Bakhaw	*											
Rhizophora mucronata	Bakhaw-bayi	*						*	*		*		*
Rhizophora stylosa	Bakhaw-bato	*	*	*	*			*b			*	*b	*
Scyphiphora hydrophyllaceae	Nilad	*						*			*b		*b
Sonneratia alba	Pagatpat	*	*	*	*		*	*	*	*	*	*	*
Sonneratia caseolaris	Pedada	*											
Sonneratia ovata	Pedada	*											
Heritiera littoralis	Dungon	*											
Total		35	6	6	8	3	4	19	8	3	15	9	15
[a] *Primavera et al.,2004*		[b] not in Marine Ecology Survey plots											

Barangay identification code:

1-Binungan-an Daku	4-Guin-asyan Daku	7-Mangorocoro	10-Punta Buri
2-Binungan-an Gamay	5-Guin-asyan Gamay	8-Nasidman	11-Silagon
3-Culasi	6-Luca	9-Pedada	

2.2.4.3 Fish

The damselfishes dominate the fish assemblage from all reef sites sampled (**Table 2.2. 14**). Damselfishes are mostly ecological indicators of reef health with their ecology tightly linked to their reef habitat. They, however, are not appreciated in ways that economically important and bigger species are because of their economic contributions. Their presence and diversity in a site indicate a well-functioning ecosystem that can support bigger species.

Table 2.2. 14 Fish Assemblage from Coral Reef Area, Brgy. Bay-Ang, August 2019

Family	Scientific Name	Common Name	MW1	MW3	MW4	MW5	MW6
Amphriprionidae	*Amphriprion clarkii*	Clark's anemonefish	5	3	8	1	-
Apogonidae	*Apogon hatzfeldii*	Hartzfield's Apogon	14	12	-	-	-
	Apogon sp.		-	-	-	2	-
Chaetodotidae	*Chaetodon deccusatus*	Indian Vagabond butterflyfish	-	-	3	4	-
	Chaetodon octofaciatus	Banded butterfly fish	-	-	4	5	-
	Chelmon rustatus	Long-nose butterflyfish	-	-	6	1	2
Labridae	*Hologymnosus annulatus*	Banded wrasse	-	-	-	-	2
Lethrinidae	*Lethrinus ornatus*	Ornate Emperor	-	-	-	2	-
Lutjanidae	*Lutjanus guttatus*	Two-spot snapper	-	2	-	1	-
	Lutjanus madras	Indian Snapper	-	-	-	12	-
Mullidae	*Nemipterus nematoporus*	Yellow-lined bisugo	-	-	-	-	2
Pomacanthidae	*Pomacanthus navarchus*	Blue girded angelfish	-	4	3	2	-
Pomacentridae	*Abudefduf bengalensis*	Bengal surgeant	3	3	6	1	-
	Abudefduf sexfaciatus	Six-lined soldierfish	-	-	-	-	5
	Chromis alpha	yellow specled Chromis	-	2	9	1	-
	Chromis flaveomaculata	Yellow-spotted chromis	-	-	-	14	-
	Chryseptira unimaculata	Onespot Damoiselle	5	2	9	1	-
	Neopomacentrus filamentosus	Brown Damoiselle	2	12	24	5	2
	Pomacentrus armellatus	Borneo Damsel	4	-	-	-	-
	Pomacentrus taeniometopon	Brackish damsel	-	-	-	4	-
Scaridae	*Scarus dimidiatus*	Yellow-barred parrotfish	-	-	-	3	-

Family	Scientific Name	Common Name	MW1	MW3	MW4	MW5	MW6
	Scarus flavopectoralis	Yellow-bellied parrotfish	-	-	-	-	1
Serranidae	*Cephalopholis boenak*	Chocolate grouper	5	5	-	3	-
NO. OF INDIVIDUALS			38	45	72	62	14
SPECIES RICHNESS			7	9	9	17	6

Source: Cemphil EIA Survey 2019

Commercially important species from the sites include chocolate grouper or lapu-lapu, snappers, bisugo, and parrotfishes. The observation of other commercially important species, however, was limited by low visibility, which also limits the computation of total harvestable biomass.

Among the sampling sites, MW4 has the highest density of fish assemblage, dominated by the damselfishes. In terms of the number of species, MW5 has 17, dominated by the commercially important snappers.

2.2.4.4 Phytoplankton

The phytoplankton community sampled from the survey area is presented in **Table 2.2. 15**.

The diatoms are the most specious of the phytoplankton group as well as the most dominant group among phytoplankton groups, registering 70% to more than 90% of the total phytoplankton count from each site. Diatoms are generally regarded as the "grasses of the sea," being able to photosynthesize and reproduce rapidly and being consumed by most zooplankton. Diatoms largely form that base of the marine primary production. Among the diatom species, *Thallosionema* composes more than 90% of the total density with all points having more than 100,000 cells per liter density. *Thallasionema* is a chain-forming diatom with no specific threat for bathers but may color the water brown in high concentrations.

2.2.4.5 Zooplankton

The zooplankton community sampled from the survey area is presented in **Table 2.2. 16**.

While diatoms make up the majority of the plankton community, it is important to point out that the harmful algal bloom (HAB), causing organisms dinoflagellate, is represented in all sites during the sampling. Specifically, *Ceratium furca, C. fractus, and Protoperidinium* are represented in the sample by over 1,000 cells per liter from MW1, MW2, and MW3. While the concentration does not merit a declaration of a HAB, the presence of a multi-specific community with concentrations of more than 1,000 cells per liter indicate the possibility of a HAB event. Favorable conditions such as the temperature, concentrated nutrient availability, and hydrodynamic flow that concentrate cells may result in a HAB event in the future.

The copepods dominated the water column of the bay both in adult and larval forms. Copepods are microcrustaceans that makes up the base of the secondary production in the marine environment. They are the staple for small fishes that feeds the secondary producers in the marine environment and dominance of the group indicate abundance of secondary producers.

The presence of decapod zoea in the larval zooplankton pool matches the crab pot fishery prevalent in the area.

Table 2.2. 15 Phytoplankton Community Composition from Bay-Ang Bay, July 2019

TAXA	MW1		MW2		MW3		MW4		MW5		MW6	
	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD
Cyanobacteria												
Trichodesmium	303	123	303	123	173	61	433	61	520	0	520	61
Sub-total (n/L)	303	123	303	123	173	61	433	61	520	0	520	61
Diatoms												
Bacillaria	542	398	477	61	238	153	498	92	412	214	412	398
Campylodiscus	0	0	238	153	238	92	542	276	0	0	0	61
Chaetoceros	0	0	1,300	1,593	303	61	412	214	238	92	238	92
Coscinodiscus	477	61	542	31	802	950	672	153	303	123	303	0
Guinardia	0	0	0	0	282	92	563	368	498	460	498	337
Melosira	238	92	195	153	347	306	477	61	455	153	455	31
Navicula	0	0	0	0	368	31	520	61	325	92	325	245
NItzschia	433	306	433	123	390	245	607	123	152	92	152	61
Odontella	0	0	0	0	260	123	390	61	0	0	0	61
Pleurosigma	1,517	613	1,278	276	195	31	477	123	260	61	260	153
Proboscia	0	0	0	0	325	92	238	153	152	92	152	0
Pseudonitzschia	260	184	607	61	953	61	1,343	184	390	0	390	31
Rhizosolenia	0	0	650	184	282	92	477	184	217	61	217	31
Thalassionema	96,804	1,641	180,700	3,064	279,067	28,190	307,667	94,988	132,340	15,076	132,340	306
Thalassiosira	433	61	1,105	153	195	31	715	214	715	92	715	31
Sub-total (n/L)	100,704	2,990	187,525	4,688	284,245	26,382	315,597	93,579	136,457	13,727	136,457	1,532
Dinoflagellates												
Ceratium furca	1,733	981	1,322	214	260	123	412	31	260	123	260	184
Ceratium fusus	0	0	217	184	130	61	412	214	715	92	715	92
Ceratium macroceros	238	153	303	123	260	184	325	31	477	61	477	31
Ceratium tripos	1,192	398	1,257	306	152	31	173	61	282	153	282	337
Ceratuim trichoceros	303	123	325	31	152	92	303	123	477	61	477	429
Dinophysis caudata	433	61	585	276	0	0	260	184	0	0	0	0
Diplopsalis	563	368	498	276	238	153	498	92	347	245	347	61
Goniodoma	173	61	260	184	108	31	217	61	455	337	455	0
Gonyaluax	477	123	260	184	152	31	282	92	542	31	542	245
Ornitohocercos	455	31	607	245	217	123	325	92	347	245	347	184
Peridinium	0	0	195	153	0	0	390	245	0	0	0	0
Phalacroma	520	123	477	61	260	184	173	0	823	0	823	184
Prorocentrum	0	0	0	0	0	0	130	0	195	31	195	61

TAXA	MW1		MW2		MW3		MW4		MW5		MW6	
	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD
Protoperidinium	**1,668**	**276**	**1,430**	**613**	**1,148**	**337**	**1,040**	**0**	**628**	**31**	**628**	**31**
Pyrophacus	**1,213**	**1,287**	**542**	**337**	**0**	**0**	**325**	**31**	**217**	**61**	**217**	**214**
Sub-total (n/L)	8,970	3,432	8,277	1,593	3,077	674	5,113	919	5,763	1,164	5,763	1,501
Grand Total (N/L)	109,977	6,544	196,105	6,404	287,495	25,769	321,143	92,598	142,740	12,563	142,740	3,095

Zooplankton, on the other hand, is presented in Table 2.2. 16.

Table 2.2. 16 Zooplankton Community Composition in surveyed sites in Bay-Ang Bay, July 2019

TAXA	MW1		MW2		MW3		MW4		MW5		MW6	
	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD	Ave.	SD
Adult zooplankton												
Calanoid copepod	*505*	**39**	*665*	**39**	**330**	**48**	*285*	**22**	*265*	**24**	*325*	**24**
Chaetognath	*75*	**2**	**0**	**2**	**90**	**0**	**80**	**6**	**0**	**6**	**70**	**0**
Cyclopoid copepod	*2,405*	**9**	*1,220*	**9**	*560*	**85**	*705*	**47**	*550*	*50*	*385*	**31**
Favella	**0**	**0**	*165*	**0**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**0**
Foraminiferan	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**130**	**0**
Harpacticoid copepod	*325*	**19**	*185*	**19**	**170**	*15*	*65*	*15*	**160**	**6**	*95*	**10**
Larvacean	**100**	**1**	**0**	**1**	*85*	**0**	**170**	**6**	**110**	*15*	**0**	**10**
Sub-total (n/L)	3,410	71	2,235	71	1,235	158	1,305	96	1,085	100	1,005	76
Larval Zooplankton												
Balanus nauplius	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	*75*	**0**	**140**	**6**
Bivalve veliger	*495*	*25*	*135*	*25*	**0**	**13**	**80**	**0**	**280**	**6**	**240**	**22**
Cyprids	**680**	**31**	**90**	**31**	**0**	**11**	**0**	**0**	**100**	**0**	**0**	**6**
Decapod Zoae	*105*	**4**	**0**	**4**	**130**	**0**	**0**	**12**	**0**	**0**	**0**	**0**
Eggs	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	*65*	**0**	**0**	**6**
Gastropod veligers	*75*	**1**	*75*	**1**	**0**	**6**	**40**	**0**	**145**	**3**	**90**	*15*
Nauplius copepod	*27,750*	**0**	**880**	**0**	**390**	**61**	*595*	**32**	**345**	**61**	**1,790**	**39**
Polychaete trocophore	*335*	**13**	*75*	**13**	**180**	**6**	**1,250**	**13**	**205**	*85*	*65*	**16**
Sub-total (n/L)	29,440	45	1,255	45	700	96	1,965	57	1,215	155	2,325	110
Grand Total (N/L)	32,850	25	3,490	25	1,935	254	3,270	153	2,300	255	3,330	186

Source : Project EIA study

2.2.4.6 Sea Grass

No sea grass was found within the survey areas in **Figure 2.2. 23.** Out of the 18 coastal barangays in the Municipality of Ajuy, 11 Barangays namely: Binungan-an gamay/Marbuena (Bato Biasong), Culasi, Guin-asyan Gamay (Malayu-an), Mangoroco, Nasidman, Binungan-an Daku (Pantalan Nabaye), Pedada, Punta Buri, Silagon, Luca, and Guin-asyan Daku (Pili) still have seagrass meadows and patches based on actual observations. The Municipal Coastal Resource Management Plan documented no sea grass beds in Barangay Bay-ang in 2017.

2.2.4.7 Economic Significance

Bay-ang Bay is known for crabs. Local fishermen deploy crab pots in specific areas, marking their location and ownership. Harvest is made after two (2) to three (3) days, longer in inclement weather. Other than crabs, small scale fisherfolks source out commercial fish species from the area: groupers, sweetlips, wrasses, and scissortails. Mollusk resources are also gathered from the area during low tide and comprise an important portion of the local nutritional intake. Gastropods include strombids and neritids, while bivalves include oysters and scallops.

2.2.4.8 Municipal Marine Reservation Zones

The more immediate coastal waters of Pedada and Bay-ang are protected from fishing activities. An estimated area of 364 hectares that covers the coastal waters of Pedada and Bay-ang is classified as a No Take Zone area, which means all types of fishing activities or any activities that involve harvesting, gathering, and culture that will disturb the area are restricted (**Figure 2.1.3**).

2.2.4.9 Endemicity and Conservation Status

None of the species observed are endemic or threatened, based on the IUCN Red List of Threatened Species 2019.

2.2.4.10 Threat to Existence and/or Loss of Important Local Species and Habitat

Construction Phase

Construction would entail earth movements that can generate fine materials that, may we washed by run-off or be carried by the wind and deposited in water bodies. Silt deposited in the marine environment through run-off or wind may impact the plankton community by reduction of light penetration thus reducing photosynthetic activity. In some cases, where silt carries sufficient nutrients, an algal bloom may also occur. Silt deposition on the coral head may smother the polyps, which eventually lead to bleaching. Although the area is dominated by head-type corals, which are considered resistant to sedimentation, synergy with other factors like warmer sea surface temperature often leads to partial mortality of colonies.

Dumping of soil materials without retaining walls will make silt available for smothering coral colonies. Habitats of mollusk and young crustacean resources may also be compromised. The rocky area where mollusks are harvested and where young crabs forage may also be buried.

Machine operation may also increase the availability of oil and grease into the marine resources. These may create slick which may bear toxic chemicals in the water that may threaten coral head and other invertebrate species.

Operation Phase

The operation of the cement grinding facility will make fine dust particles more available that may be carried by run-off or by the wind to the marine environment. Increased traffic in the area may also increase disturbance that may increase available silt materials, as well as increase heavy metal availability to the marine resources.

Oil and grease from machine operation may also be carried to the marine environment. Ships carrying raw materials may pose a risk for oil and grease leakage, as well as the risk of contamination of coastal waters through ballast water release. Ballast waters are known to cross-contaminate bodies of water with potentially harmful species such as red tide species, or invasive species.

Abandonment Phase

Abandonment of the production area may leave machines that may be contaminated with oil, grease, and other materials that may pose risks when carried into the marine environment by surface run-off.

The threat to the existence and loss of important local species and habitat posed by the Project is not as significant as the impacts attributable to the project are incidental and avoidable. The Project structure impinging on the marine habitat will occupy less than 4,300 square meters, 90% of which will be on piles and the rock embankment having cross-current culverts so as not to impede the littoral tide. The rough rock face of the rock embankment will provide foraging area for juvenile crabs.

The Project operations do not involve marine resource extraction or wastewater discharge to sea. The existence of Municipal "No Take Zone" and Buffer Zones in waters surrounding the Project site (**Figure 2.1.3**) provide a refuge for fish that may be disturbed by the commotion from project construction and jetty port operation. These No Take Zone and Buffer Zone are the primary protection against human harvesting, which is a major threat and cause of loss of threatened species. The project environmental impact control measures are discussed in the following chapter, the Environmental Management Plan.

2.2.4.11 Threat to Abundance, Frequency and Distribution

Construction Phase

The Project is most threatening to the marine ecosystem at the Construction Phase due to the high probability of increased silt loading from earthworks, oil spills from the construction equipment operation, and other pollution loads. discussed in **Section 2.2.4.10** above.

Operation Phase

The project is not expected to cause a threat to the abundance, frequency, and distribution of marine species. The primary causes of threat to marine species are overfishing/over-extraction and habitat destruction, both of which are not necessary for the pursuit of project activities and may be avoided.

The project retaining walls and rock embankment will have the presence of armor rocks that could attract colonization for a variety of marine species, and shelter and foraging area to a number of organisms in the intertidal zone. These engineered structures will enhance the marine habitat, and support biodiversity and marine productivity.

Abandonment Phase

Activities during the abandonment phase may generate the same level of pollution as during the Construction Phase (**Table 2.2. 7**). These impacts, however, are spatially limited, time-bound, and avoidable.

The mitigating measures to avoid negative environmental impacts during the project abandonment phase are discussed in the following Chapter, Environmental Management Plan.

Table 2.2. 17 Summary Impact Assessment on the Water Environment

			Phase Occurrence				
	Project Activities	**Potential Impacts**	**Pre-Con/ Construction**	**Operation**	**Abandonment**	**Project Impact Control Measure**	**Residual Impact**
	Column A	**Column B**	**Column C**	**Column D**	**Column E**	**Column F**	**Column G**
Row 1	Vegetation Clearing	Depletion of water resources	No Impact Expected	No Impact Expected	No Impact Expected	Minimal vegetation clearing on 4.5 has, revegetation in 2 has. target mangrove reforestation project in 250 has. in Ajuy coastal areas as per the CRMP.	No negative residual impact expected
Row 2		Degradation of coastal/marine water quality	✓			Construction of retaining walls in sections directly draining to sea, provide cut-off channel to divert surface drainage from non-project areas to adequate settling ponds, sandbags as silt/sediment control where retaining wall or settling pond is not feasible.	No negative residual impact expected
Row 3	Earthworks, land development, facility construction, workers' barracks kitche	Change in drainage morphology	✓	✓		Silt control for all active construction sites; Design the landform to control silt and water flow to sea.	No negative residual impact expected
Row 4		Inducement of flooding	No Impact Expected	No Impact Expected	No Impact Expected	None necessary	N/A
Row 5		Reduction in stream	N/A	N/A	N/A	N/A	N/A

			Phase Occurrence				
	Project Activities	Potential Impacts	Pre-Con/ Construction	Operation	Abandonment	Project Impact Control Measure	Residual Impact
	Column A	Column B	Column C	Column D	Column E	Column F	Column G
	n operations	volumetric flow					
Row 6		Change in stream, lake water depth	N/A	N/A	N/A	N/A	N/A
Row 7		Degradation of groundwater quality	N/A	N/A	N/A	N/A	N/A
Row 8		Degradation of inland surface water quality	N/A	N/A	N/A	N/A	N/A
Row 9		Degradation of coastal/marine water quality	✓	✓	✓	Provision of Oil and Water Separators in Plant and Jetty Port. Provision of adequate sanitation facilities for workers' barracks. Provision of oil and grease separator for kitchen wastewater. Use of pre-mixed concrete Same as Row2 Column F (R2-F)	No negative residual impact expected
Row 10	Jetty Port Construction	Change/disruption in water circulation pattern	✓	✓		Provision of cross current culverts at rockfill causeway; access trestle and pier deck on piles	No negative residual impact expected
Row 11		Change in littoral current pattern around 330 m^2 rockfill causeway	✓				Short-term, limited spatial impact, limited duration to construction phase
Row 12		Change in coastal erosion	nil	nil		None necessary	No significant residual

			Phase Occurrence				
	Project Activities	Potential Impacts	Pre-Con/ Construction	Operation	Abandonment	Project Impact Control Measure	Residual Impact
	Column A	Column B	Column C	Column D	Column E	Column F	Column G
							impact expected
		Change in sediment deposition	nil	nil		None necessary	No significant residual impact expected
Row 13		Degradation of coastal/marine water quality	✓	✓		Use of pre-mixed concrete Provision of silt curtain and oil boom around active construction site. Provision of adequate sanitation facilities for workers' barracks	
Row 14		Threat to existence and/or loss of important local species	N/A	N/A	N/A	Same as R13-F	No significant residual impact expected. Project does not extract marine life.
Row 15		Threat to important habitat				Same as R13-F	Project does not directly destroy marine habitat.
Row 16		Threat to abundance, frequency, and distribution of species					
Row 17	Jetty Operation	Change in bathymetry	N/A	N/A	N/A	N/A	N/A
Row 18		Threat to existence and/or loss of important	N/A	N/A	N/A	Rock-fill causeway provides additional rocky surfaces for foraging by juvenile crabs and habitat to	N/A

			Phase Occurrence				
	Project Activities	Potential Impacts	Pre-Con/ Construction	Operation	Abandonment	Project Impact Control Measure	Residual Impact
	Column A	Column B	Column C	Column D	Column E	Column F	Column G
		local species and habitat				species in the littoral zone	
Row 19		Threat to abundance, frequency, and distribution of species					
Row 20	Cement Production	Depletion of water resources / competition in water use		N/A	N/A	Project will recycle process water, harvest rainfall for process use, irrigation, and domestic use minimal ground water extraction only for drinking or make-up/top up water	No negative residual impact expected
Row 21		Degradation of coastal/marine water quality				Provision of adequate emergency oil control boom; provision of storm drain retention facilities close to 50% of peak run-off from Plant area; Kitchen operations and human sanitation facilities to meet Philippine Plumbing and Sanitation Code guidelines	

CEMPHIL CEMENT GRINDING PROJECT EIS

PEOPLE MODULE

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2.4 The People

This section provides baseline general information on the demographic, socio-economic, public health, and cultural profile of the Municipalities of Ajuy and Barotac Viejo, and an assessment of the potential impacts of the proposed project expansion to these municipalities.

Information on the socio-economic profile, life, and health condition of in these Municipalities were obtained from the latest available information from completed portions of the draft Comprehensive and Use Plan (CLUP) of Ajuy, the updated three (3) -year Executive and Legislative Agenda of Ajuy Municipality (Annex Y), Barangay Socio-economic profiles of the Bay-ang and Pedada of Ajuy Municipality and available Municipal information on Barotac Viejo. Additional data on demographics and socio-economics were culled from the Census of Population and Households 2015 of the Philippine Statistics Authority. The 2020 Census of Population and Households (CPH) scheduled for implementation by the Philippine Statistics Authority in May 2020 was postponed due to the Covid19 pandemic. Updated relevant socioeconomic data both from the CPH 2020 and the updated Municipal Comprehensive Land Use Plans, and Community-Based Monitoring System (CBMS) data on Barangays Bay-ang and Pedada for 2021 will be compiled by Cemphil, Inc. as soon as available, to augment socio-economic baseline information in this section.

The primary impact population is the 24 families residing within the Cemphil property in Purok 6, who will be relocated, the 26 households within 10 meters from the edge the primary access road from Barangay Luca via Pedada to Bay-ang, and the 30 households along the secondary access road from National Highway/junction Bay-ang to Cemphil (Figure 2.4. 1). The expected impacts on households along the haul road are increased ambient dust and noise, and road safety risks.

The secondary impact population are eight communities within the 6km x 6km potential air quality impact receptor zone who may experience increased ambient dust above the National Ambient Air Quality Standards (NAAQS) when Project air pollution control equipment malfunction to an extent that the project has no functioning air pollution control equipment.

The Project Impact Population and Respective Expected Impacts are indicated in Table 2.4. 1

Table 2.4. 1 Primary Project Impact Population

Impact Receptor	Nature of Impact	Impact Occurrence			Impact Control Measure
		Construction Phase	Operation Phase	Abandonment Phase	
24 Families in Project Area	Relocation	✔			Provision of resettlement site with access to water, power, and transportation
Households within Purok 4	Increased ambient dust and noise	✔	✔	✔	Dust suppression by water sprinkling; Dust emission control in Plant processes Noise control through equipment management and encapsulation of noisy production processes

Impact Receptor	Nature of Impact	Impact Occurrence			Impact Control Measure
		Construction Phase	Operation Phase	Abandonment Phase	
Households within Purok 1	Increased ambient dust and noise	✔	✔	✔	Same as above
Households within Purok 5	Increased ambient dust and noise	✔	✔	✔	Same as above
Households within 10 meters of Access Road Option 1	Increased ambient dust and noise	✔	✔	✔	Dust suppression by water sprinkling; Road concreting. Haul traffic load distribution Plantation of roadside noise buffer vegetation
Households within 10 meters of Access Road Option 2	Increased ambient dust and noise	✔	✔	✔	Same as above
Households within 10 meters of Access Road Option 3	Increased ambient dust and noise	✔	✔	✔	Same as above
Households in Area Sensitive Receptors 1 to 8	Increased ambient dust		✔ without air pollution control		Install, operate, and maintain air pollution control equipment in compliance with the Clean Air Act of 1999

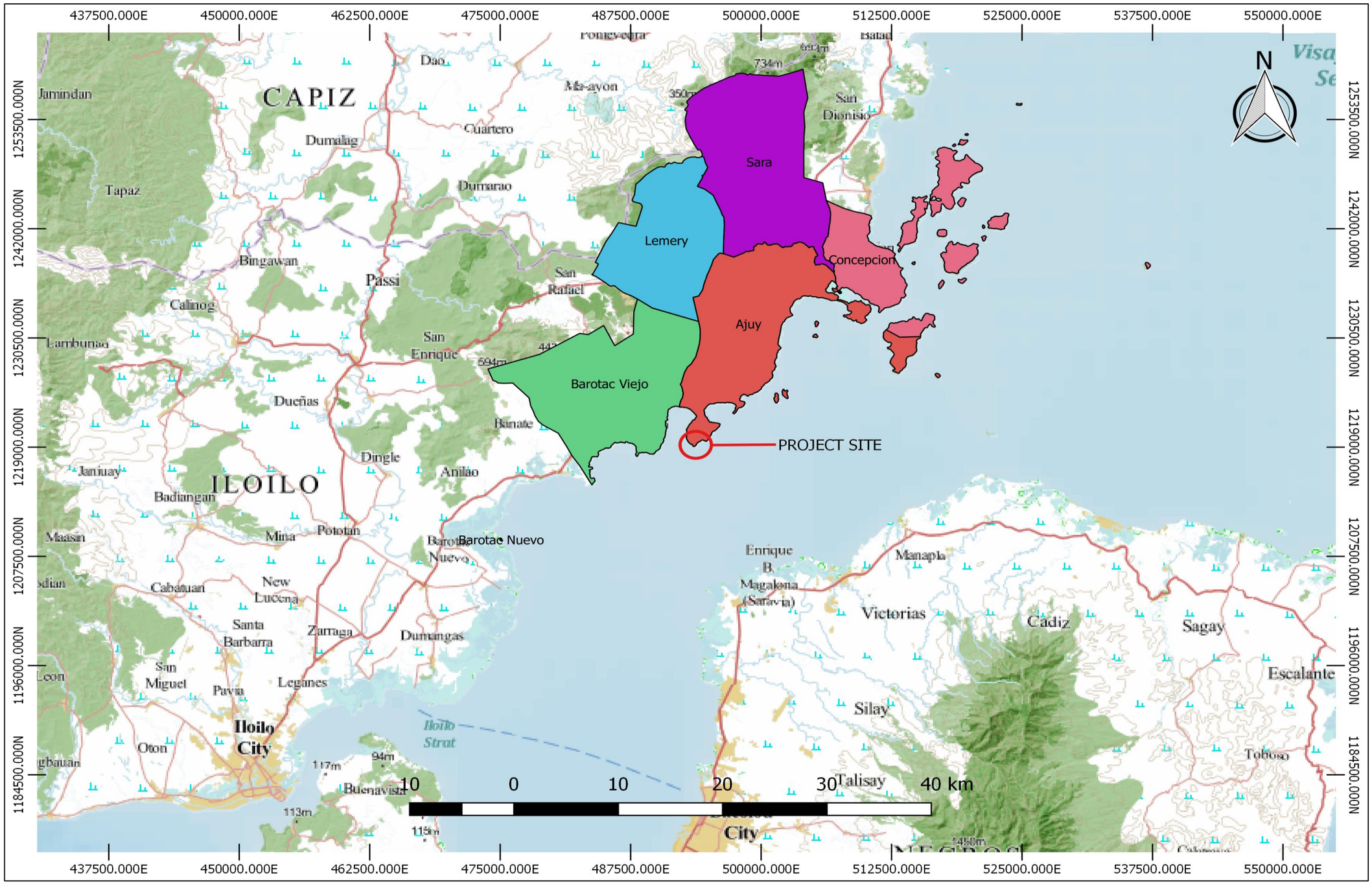


Figure 2.4. 1 Map Showing Ajuy and its Bounding Municipalities

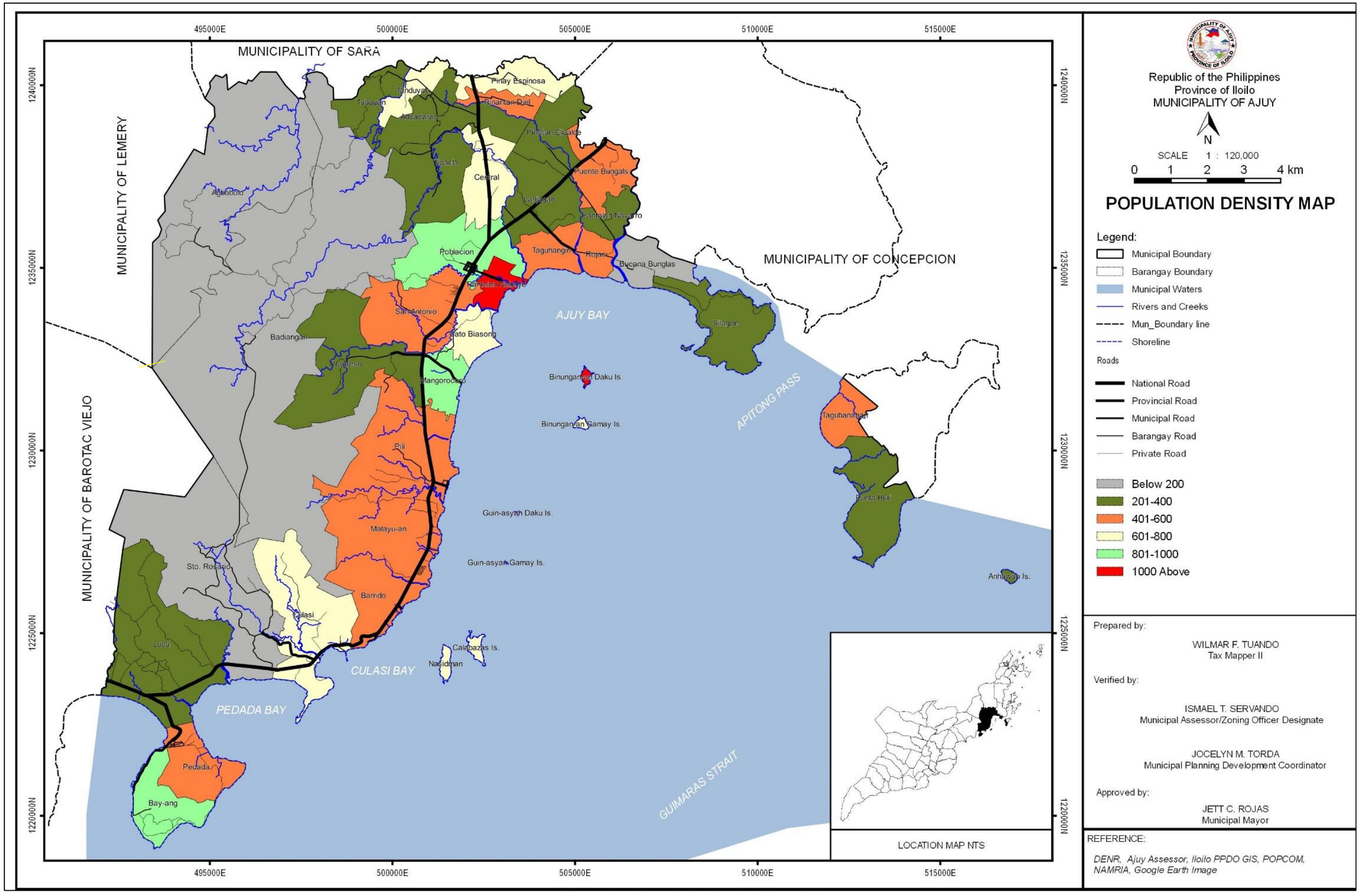


Figure 2.4. 2 Population Density Map of Ajuy

Figure 2.4. 3 Settlements Map of Barangay Bay-ang

2.4.1 Land Area and Population

The Municipality of Ajuy is a second-class municipality in the province of Iloilo located on the northeastern part of Panay Island, found within the coordinates 123° 01' 16" N and 11° 10' 30" E. It is bounded the Municipality of Sara in the north, by the Ajuy Bay in the south, by the Municipality of Barotac Viejo and Lemery in the west and the Municipality of Concepcion in the east. Figure 2.4. 1 shows the municipalities bounding Ajuy.

Ajuy's land area encompassing 17,557 hectares distributed among 34 barangays was inhabited by 54,858 persons as of 2015 census. Figure 2.4. 2 shows the Barangays of Ajuy with respective population density. The political subdivision of Ajuy is given in Table 2.4. 2. The project primary and secondary impact barangays are Barangay Bay-ang and Pedada. The respective land areas that account for 1.7% and 1.5% respectively, of Ajuy municipal land area.

Table 2.4. 2 Political Subdivisions of Ajuy Municipality

NO.	NAME OF BARANGAY	DISTANCE (Km.)	GEOGRAPHICAL TYPE
1	Adcadarao	6.50	Inland Barangay
2	Agbobolo	11.00	-do-
3	Badiangan	6.00	-do-
4	Barrido	10.00	Coastal Barangay
5	Bato-Biasong	4.50	-do-
6	Bay-ang	22.50	Peninsula
7	Bucana Bunglas	6.00	Coastal Barangay
8	Central	2.50	Inland Barangay
9	Culasi	14.00	Coastal Barangay
10	Lanjagan	2.00	Inland Barangay
11	Luca	18.00	Coastal Barangay
12	Malayu-an	9.00	-do-
13	Mangorocoro	5.00	-do-
14	Nasidman	14.00	Island Barangay
15	Pantalan Nabaye	1.00	Coastal Barangay
16	Pantalan Navarro	6.00	Inland Barangay
17	Pedada	20.00	Peninsula
18	Pili	7.00	Coastal Barangay
19	Pinantan Diel	5.00	Inland Barangay
20	Pinantan Elizalde	6.00	-do-
21	Pinay Espinosa	9.00	-do-
22	Progreso	3.50	-do-
23	Puente Bunglas	5.00	-do-
24	Punta Buri	7.00	Island Barangay
25	Rojas	5.00	Inland Barangay
26	San Antonio	0.50	-do-
27	Silagon	8.00	Peninsula
28	Sto. Rosario	16.00	Inland Barangay

NO.	NAME OF BARANGAY	DISTANCE (Km.)	GEOGRAPHICAL TYPE
29	Tagubanhan	6.00	Island Barangay
30	Taguhangin	4.00	Inland Barangay
31	Tanduyan	6.00	-do-
32	Tipacla	3.50	-do-
33	Tubogan	7.00	-do-
34	Poblacion	87 kms. from Iloilo City	-do-

Source: Ajuy MPDO

Barangay Bay-ang has population density close to that of the Municipal Poblacion, indicating relatively good living conditions. Barangay Bay-ang is a coastal Barangay that lay along the 4,739.19 hectares (ha) of the shoreline of Ajuy, representing 27% of the municipal land area.

2.4.2 Demographics

2.4.2.1 Population *and Average Household Size*

The Municipality of Ajuy had an average annual population growth rate of 2.1% over its 2010 census population of 47,248 individuals. According to PSA data, Ajuy had higher average annual population growth rate than the growth rate in the Regional Western Visayas Region and the Iloilo Provincial growth rates (Error! Reference source not found.).

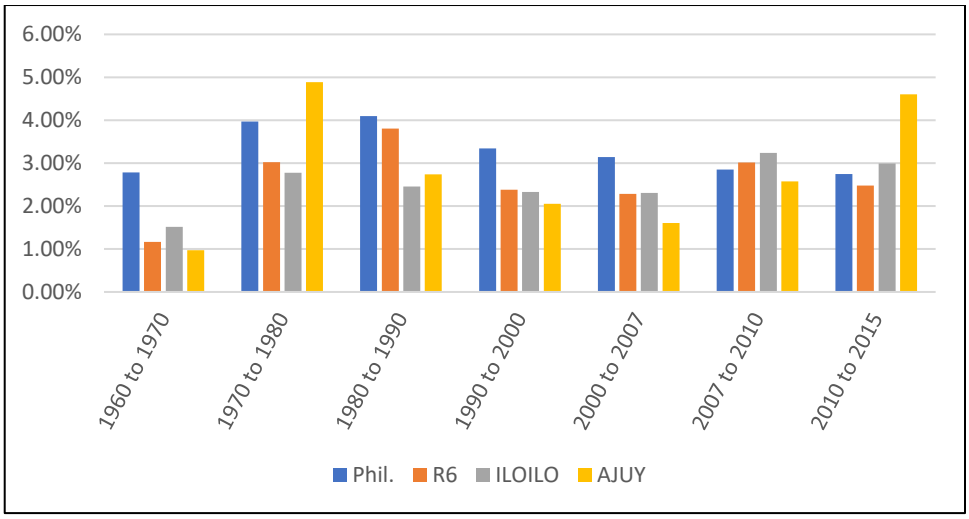


Figure 2.4. 4 Comparison of Average Annual Population Growth Rates of Selected Areas

Source: Philippine Statistics Authority

The average household size in Ajuy as of the 2015 census was 4.4. An extended family set-up is common in Ajuy, with an average of 1.154 families dwelling under one roof.

The population of Bay-ang accounted for 6.3% and Pedada accounted for 2.9% of the Ajuy municipal population as of 2015. The average annual barangay growth rate of Bay-ang and Pedada was 6.3% and 3.4% respectively for the same period, higher than the Municipal average.

The average household size in Bay-ang and Pedada were 4.8 and 4.4 respectively; both are higher than the Municipal average. Less than half (38.3%) of the population live in the coastal Barangays. The Ajuy Barangay are ranked by the population in

Table 2.4. 3.

Table 2.4. 3 Ajuy Barangay Population Distribution, 2015

Rank	Name of Barangay	Total No. of Males	Total No. of Females	Total Households	Total Families	Total Population	Gender Ratio
1	Culasi	2,084	2,080	1,097	1,690	4,164	1.00
2	Poblacion	1,979	2,029	939	1,101	4,008	0.98
3	Luca	1,898	1,768	838	940	3,666	1.07
4	Malayu-an	1,738	1,733	783	843	3,471	1.00
5	Pili	1,637	1,478	779	817	3,115	1.11
6	Bay-ang *	1,833	1,616	618	724	3,449	1.13
7	San Antonio	1,373	1,196	631	682	2,569	1.15
8	Sto. Rosario	1,343	1,212	567	602	2,555	1.11
9	Central	979	1,027	468	520	2,006	0.95
10	Barrido	886	898	397	471	1,784	0.99
11	Progreso	900	826	390	468	1,726	1.09
12	Tipacla	897	803	364	444	1,700	1.12
13	Punta Buri	771	706	374	392	1,477	1.09
14	Puente Bunglas	747	727	345	389	1,474	1.03
15	Mangorocoro	773	723	320	378	1,496	1.07
16	Pedada *	844	757	327	365	1,601	1.11
17	Badiangan	566	524	312	316	1,090	1.08
18	Lanjagan	558	557	279	312	1,115	1.00
19	Pantalan Nabaye	676	662	249	298	1,338	1.02
20	Pinay Espinosa	657	609	283	298	1,266	1.08
21	Taguhangin	513	453	205	248	966	1.13
22	Bato Biasong	471	459	225	241	930	1.03
23	Silagon	515	503	230	241	1,018	1.02
24	Tagubanhan	522	503	209	215	1,025	1.04
25	Tanduyan	418	369	186	201	787	1.13
26	Tubogan	404	334	179	201	738	1.21
27	Pinantan Diel	321	309	147	171	630	1.04
28	Pinantan Elizalde	310	279	134	166	589	1.11
29	Pantalan Navarro	297	318	142	163	615	0.93
30	Nasidman	314	321	139	158	635	0.98
31	Adcadarao	305	284	128	146	589	1.07
32	Rojas	248	272	115	126	520	0.91
33	Bucana Bunglas	189	174	87	103	363	1.09
34	Agbobolo	206	177	96	96	383	1.16
	TOTAL	28,172	26,686	12,582	14,526	54,858	1.06

*Secondary impact population

2.4.2.2 Population Density

Population density gauges the urbanization and defines the level of development of an area. The HLURB has established the following criteria to determine the degree of urbanization based on the number of persons per hectare:

Table 2.4. 4 HLURB Population density standards

Population density	Degree
150 persons per hectare	Low density area
151 to 250 persons per hectare	Medium density area
Above 250 persons per hectare	High density area

Source: HLURB land use planning guidebook

The population density of the Municipality of Ajuy as of 2015, which was 2.98 persons per hectare, is way below the threshold for a low-density area (150 persons/ha). Among the coastal Barangays, Bay-ang has the second-highest population density with 11.48 persons per hectare. Barangay Pedada had 5.95 per ha and Luca had 2.67 persons per ha (Table 2.4. 4).

2.4.2.3 Gender Distribution

The Municipal gender ratio is 1.055: 1.07 in Luca, 1.13 in Bay-ang and 1.11 in Pedada. A higher Gender Ratio indicates a higher percentage of males in the population.

2.4.2.4 Age Distribution

Ajuy has a large young population (16,050 individuals) within the age range of 0 to 14 years old (30%). The labor age group (15 to 59 years old) account for 61%, while 2,979 or 6% are in the senior group. The child dependency ratio is 47% and the aged dependency ratio is 9%. The total dependency ratio is 55%.

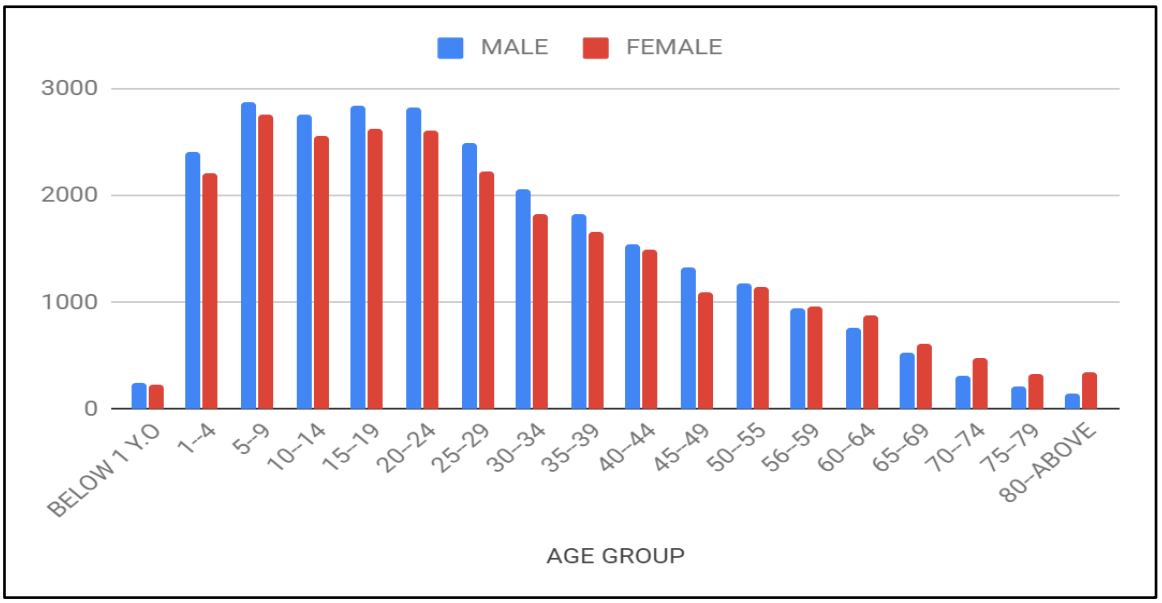
The dependency ratios are computed using the following formulae:

$$\text{Child dependency ratio} = \frac{\text{number of people aged 0 to 14}}{\text{number of people aged 15 to 64}} \times 100$$

$$\text{Aged dependency ratio} = \frac{\text{number of people aged 65 and over}}{\text{number of people aged 15 to 64}} \times 100$$

$$\text{(Total) Dependency ratio} = \frac{(\text{number of people aged 0 to 14}) + (\text{number of people aged 65 and over})}{\text{number of people aged 15 to 64}} \times 100$$

A higher population of males lives from infancy to 55 years old (Figure 2.4. 5). As the population data approach, the senior citizen age bracket (56 to 80 years old above), there are more females than males, indicating a higher life expectancy rate among females.



Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

Figure 2.4. 5 Population Distribution by Age Group and Gender (2015)

2.4.2.5 Distribution of Population Ten Years and Older by Civil Status

Nearly half (45%) of the population of Ajuy is single (Table 2.4. 5), 26% of which are under 20 years old. Married individuals comprise 43% of the population, 5% are widowed, 1% are divorced and 6% are living together as common-law couples.

Table 2.4. 5 Distribution of Household Population 10 Years and Older by Age Group and Marital Status

Sex, Age Group, and City/Municipality	Household Population 10 Years Old and Over	Marital Status					
		Single	Married	Widowed	Divorced/ Separated	Common-Law/ Live-in	Unknown
Both Sexes	40,873	18,468	17,432	2,139	345	2,480	9
Below 20	10,879	10,612	80	-	-	180	7
20 - 24	4,908	3,425	795	5	6	677	-
25 - 29	4,018	1,745	1,648	9	21	595	-
30 - 34	3,503	918	2,152	26	44	363	-
35 - 39	3,208	536	2,346	29	58	239	-
40 - 44	2,751	338	2,146	58	53	156	-
45 - 49	2,543	232	2,057	117	46	91	-
50 - 54	2,276	186	1,787	190	39	74	-
55 - 59	2,073	142	1,633	236	26	36	-
60 - 64	1,667	93	1,214	311	20	28	1
65 - 69	1,141	88	733	296	10	14	-
70 - 74	788	64	430	269	10	15	-
75 - 79	563	34	258	258	9	4	-
80 years and over	555	55	153	335	3	8	1

Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

Table 2.4. 6 Number of Households by Age Group, Sex of Household Head and Household Size, Ajuy, 2015

Sex, Age Group and Household Head	Total Number of Households	Household Size								Average Household Size
		1	2	3	4	5	6	7	8 &>8	
Male Head	9,670	539	981	1,854	,109	1,589	1,070	695	833	4.5
Below 20	29	3	10	13	1	2	-	-	-	2.6
20 - 29	1,255	56	164	533	359	106	25	9	3	3.3
30 - 39	2,392	93	166	449	696	486	288	131	83	4.3
40 - 49	2,300	105	104	256	441	458	335	271	330	5.2
50 - 59	1,924	113	153	254	329	317	269	192	297	5.1
60 - 69	1,176	82	213	235	194	158	121	79	94	4.2
70 - 79	464	59	133	86	75	52	27	12	20	3.4
80 years and over	130	28	38	28	14	10	5	1	6	3.0
Female Head	2,551	486	521	465	382	284	174	113	126	3.5
Below 20	19	2	6	5	5	1	-	-	-	2.8
20 - 29	166	21	37	44	38	14	10	-	2	3.2
30 - 39	284	12	42	52	61	51	30	23	13	4.2
40 - 49	345	29	35	65	60	54	45	21	36	4.5
50 - 59	521	65	97	99	75	74	38	29	44	3.9
60 - 69	569	125	139	92	82	62	30	19	20	3.2
70 - 79	459	144	121	87	44	21	20	17	5	2.6
80 years and over	188	88	44	21	17	7	1	4	6	2.3

Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

2.4.3 Health Situation

2.4.3.1 Fertility and Mortality Indices

The crude birth rate in Ajuy is at a declining rate by 40% from 2013 to 2017 (Table 2.4. 7). The annual death rate has likewise been declining at 20% for the same period. The rate of infant mortality was uneven, with improving, deteriorating, and steadying at 6 (six) per thousand population in 2017. The mortality rate among young children zero (0) to four (4) years old in on the declining trend. The annual maternal mortality rate, however increased almost twice from 2013 to 2016.

Table 2.4. 7 General Health Statistics, Ajuy, 2013-2017

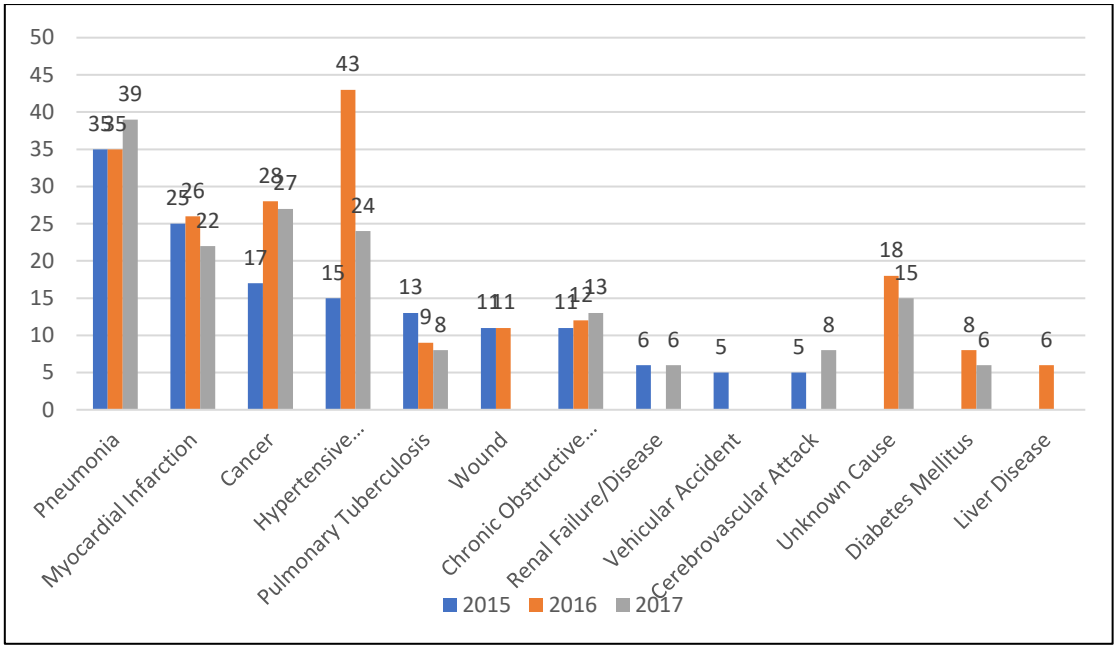
Health Indicator	2013	2014	2015	2016	2017
Crude Birth Rate (CBR)	15/1000	15/1000	13/1000	9/1000	9/1000
Total Fertility Rate					
Crude Death Rate (CDR)	5/1000	5/1000	4/1000	5/1000	4/1000
Proportioned Mortality Rate (PMR)					
Infant Mortality Rate (IMR) (0-11 month)	6/1000	6/1000	2/1000	7/1000	6/1000
Young Child Mortality Rate (YCMR) (0-59 month)	12/1000	7/1000	8/1000	14/1000	6/1000
Maternal Mortality Rate (MMR)	123/100000			229/100000	

Source: Ajuy Municipal Health Office

2.4.3.2 Top Causes of Mortality

The Municipal Health Office data (Figure 2.4. 6) show that the ten (10) leading causes of mortality from 2015 to 2017. As may be observed, cases of pneumonia, chronic obstructive pulmonary diseases, and pulmonary tuberculosis are on the increasing trend, while the incidence of hypertensive cardiovascular disease, myocardial infarction, and cancer, diabetes mellitus, and other unknown causes are on the declining trend. The recording of renal failure, vehicular accident cerebrovascular attack, and liver disease have single-year data, and trends cannot be observed at this time.

As apparent from Figure 2.4. 6, the top three causes of mortality in 2017 were pneumonia, hypertensive/cardiovascular disease, and cancer. It is also observed that respiratory diseases, namely pneumonia, chronic obstructive pulmonary diseases, and tuberculosis account for 36% of mortality causes in 2017.

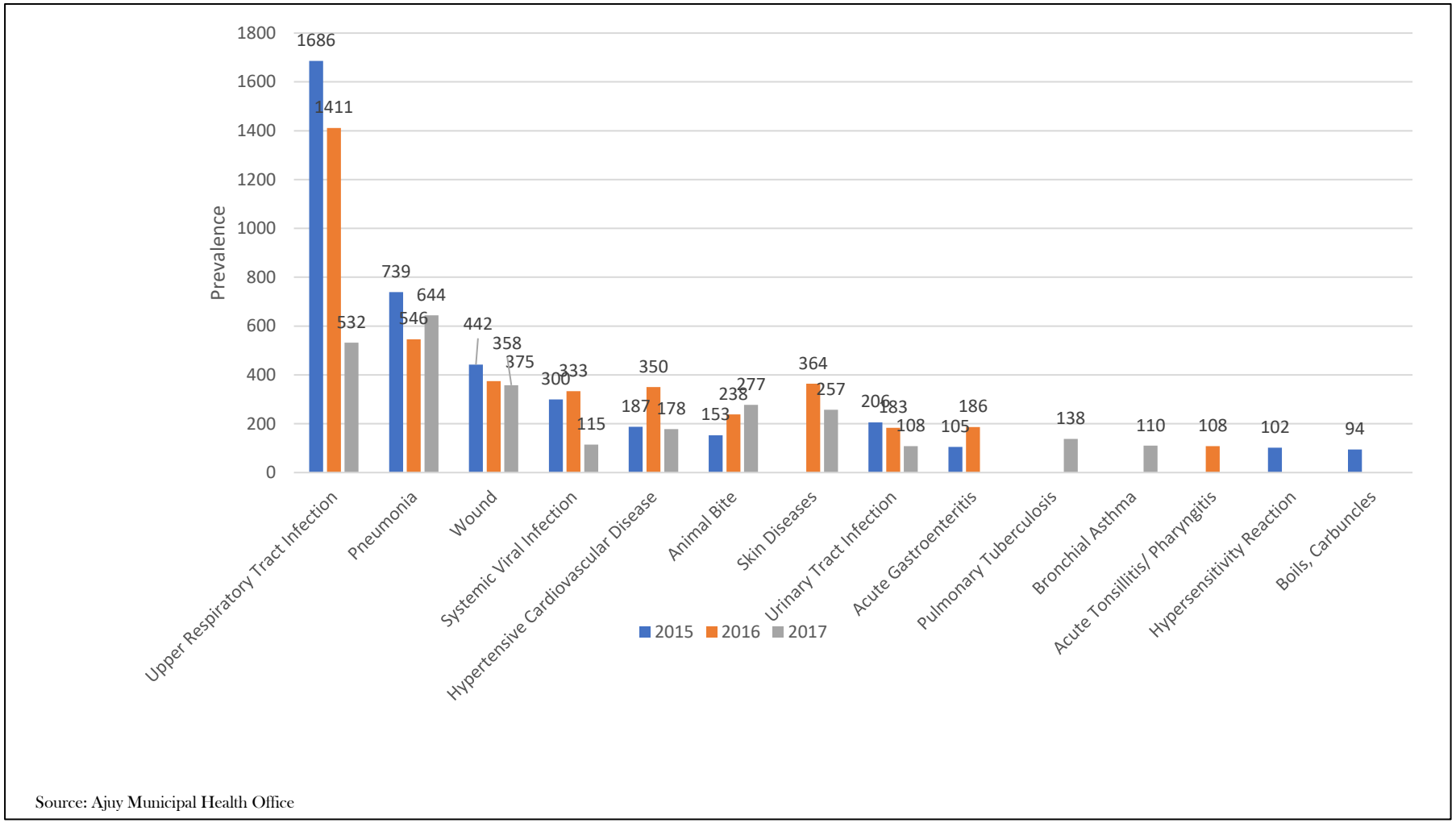


Source: Ajuy Municipal Health Office

Figure 2.4. 6 Graph of Ten Leading Causes of Mortality, 2015 to 2017

2.4.3.3 Top Causes of Morbidity

From 2015 to 2017, the morbidity rate in Ajuy had a reducing trend, from 84.96 per thousand population in 2015 to 55.16 in 2017. The top two (2) morbidity and tenth (10th) highest morbidity causes are related to respiratory infections, while Asthma ranks 11th. Based on the three (3) year-data, the Upper Respiratory Tract Infection (URTI) is the top illness in the municipality (Figure 2.4. 7). Other minor causes of morbidity affecting a relatively smaller number of the population of Ajuy are summarized in Figure 2.4. 7.



Source: Ajuy Municipal Health Office

Figure 2.4. 7 Graph of Ten Leading Morbidity Causes 2015 to 2017

2.4.3.4 Health Facilities

Thirty one (31) of the 34 Barangays of Ajuy municipality have Health Centers that serve 100% of Ajuy population (see Table 2.4. 9). The populations of Barangays Barrido, Bato Biasong, and Bucana Bunglas access health services through respective neighboring Health Centers.

2.4.3.5 Threat to Public Health

The single most probable threat to public health due to the Project are particulate emissions from the cement processing plant, which if uncontrolled may cause a variety of respiratory ailments.

Sensitive receptors are sensitive individuals in the population such as people who have allergies to dust, the very young people, and the elderly. Sensitive institutions include hospitals, schools, and daycare facilities. In this report, the Area Sensitive Receptors (ASRs) (Figure 2.4. 8) identified are the population clusters found within the 6 x 6-kilometer domain studied for potential air quality impact receptors.

The air pollutants dispersion model was conducted in accordance with guidelines under MC 2008-003: "Guidelines for Air Dispersion Modeling". The peak particulate concentrations in the ASRs generated by the model in Table 2.4. 8, which are found to be within the National Ambient Air Quality Standards.

Table 2.4. 8 Summary of Forecast Ground Level TSP Concentration in Area Sensitive Receptors

ASRs	Location	Peak TSP 1 hr	Peak TSP 24 hr	TSP 1 hr 98%ile	TSP 24 hr 98%ile
ASR1	Bay-ang Purok 1	31.1	1.7	0.4	0.7
ASR2	Pedada Purok 2	26.9	2.4	0.3	0.9
ASR3	Bay-ang Purok 4	161.0	22.6	0.9	6.0
ASR4	Bay-ang Purok 5	289.6	25.1	5.4	15.7
ASR5	Bay-ang Sitio Nipa	152.2	18.7	2.7	6.7
ASR6	Bay-ang Purok 7	62.2	5.3	1.3	1.6
ASR7	Santiago, Barotac Viejo	23.2	1.3	0.1	0.3
ASR8	Sitio Dalusan, Santiago, Barotac Viejo	18.4	1.0	0.2	0.4
Standard		300	230	300	230

Table 2.4. 9 List of Barangay Health Stations

60Barangay	Infrastructure	Level of Exposure/ Susceptibility					Level of Exposure/ Susceptibility					HH BENEFECIARIES		Description / Remarks
		LANDSLIDE					FLOOD					DIRECT	INDIRECT	
		N	L	M	H	V	N	L	M	H	V			
Adcadarao	Barangay Health			√				√				144		Concr
Agbobolo	Barangay Health		√					√				108		Concr - Needs
Badiangan	Barangay Health			√				√				335		Concr - Needs
Bay-ang	Barangay Health				√			√				640		Concr
Central	Barangay Health		√					√				524		Concr
Culasi	Barangay Health		√					√				1085		Concr
Lanjagan	Barangay Health		√						√			526		Concr
Luca	Barangay Health		√						√			807		Concr - Needs
Malayu-an	Barangay Health		√							√		901		Concr - Needs
Mangorocoro	Barangay Health		√						√			336		Concr - Needs
Nasidman	Barangay Health		√					√				144		Concr
Pantalan	Barangay Health		√						√			310		Concr
Pantalan	Barangay Health		√							√		150		Concr
Pedada	Barangay Health		√						√			350		Concr
Pili	Barangay Health			√				√				872		Concr - Needs
Pinantan Diel	Barangay Health		√						√			164		Concr
Pinantan	Barangay Health		√									138		Concr
Pinay	Barangay Health		√							√		289		Concr
Poblacion	Barangay Health		√							√		965		Concr
Progreso	Barangay Health		√							√		410		Concr
Puente	Barangay Health		√							√		368		Concr
Punta Buri	Barangay Health			√						√		373		Concr - Needs
Rojas	Barangay Health		√								√	120		Concr - Needs
San Antonio	Barangay Health		√							√		683		Concr - Needs
Sto. Rosario	Barangay Health		√							√		586		Concr
Silagon	Barangay Health		√							√		227		Concr - Needs
Tagubanhan	Barangay Health		√							√		226		Concr
Taguhangin	Barangay Health		√								√	219		Concr
Tanduyan	Barangay Health		√							√		198		Concr - Needs
Tipacla	Barangay Health		√							√		390		Concr
Tubogan	Barangay Health		√							√		197		Concr

Source: Ajuy Municipal Health Office

Figure 2.4. 8 Location of ASRs

The Project therefore is not expected to generate threats to public health when the air pollution control installations are operational and properly maintained. The Department of Environment and Natural Resources – Environmental Management Bureau through the regular meetings and processes of the Multi-Partite Monitoring Team (MMT) regularly checks Project compliance with the national air quality guidelines and will sanction non-compliance to the Philippine Clean Air Act.

2.4.4 Education

The majority (71%) of the household population aged five (5) to twenty-four (24) years old, the age group which should be attending school, were actually attending school in 2015 (Table 2.4. 10). The ratio of males against females who were in school was 1.07:1. This means more female than male individuals who should be in school were not attending school. The larger portion of the population (36%) who attended school were in the five (5) to nine (9) years old age bracket, 35% were aged 10 to 14, 24% were aged 15 to 19 and 5% were in the 20-24 years old. Almost all (97% to 98%) of school-age individuals (five (5) to 19 years old) were attending school, while 33% of individuals between 20 to 24 years old did not attend school. Overall, there were more males than females who should be attending school but were not. The largest out-of-school subgroup were aged 20 to 24.

Table 2.4. 10 Distribution of Household Population 5-24 Years Old Who Were Currently Attending School in Ajuy by Age Group & Sex, 2015

Age Group and City/Municipality	Household Population 5 to 24 Years Old			Household Population 5-24 Years Old Who Were Currently Attending School		
	Both Sexes	Male	Female	Both Sexes	Male	Female
Total	21,473	11,207	10,266	15,242	7,884	7,358
5 - 9	5,686	2,941	2,745	5,511	2,848	2,663
10 - 14	5,523	2,815	2,708	5,406	2,744	2,662
15 - 19	5,356	2,831	2,525	3,588	1,849	1,739
20 - 24	4,908	2,620	2,288	737	443	294

Source: Philippine Statistics Authority, CPH 2015

2.4.4.1 Literacy Rate

Based on the 2015 data from Philippine Statistics Authority (Table 2.4. 11), the literacy rate among the population of Ajuy is very high, at 99.15%. There are 347 (0.85%) illiterate individuals out of the 40,837 population. Only 0.92% of males and 0.77% of females are illiterate. The age group 25-29 had the highest literacy rate (99.68%), while ages 65 and above have the lowest literacy rate (95.93%) with the highest illiteracy rate of 4.07%.

Table 2.4. 11 Literacy of the Household Population in Ajuy 10 Years Old and Over by Age Group, 2015

Age Group	Household Population 10 years old and over			Literate			Illiterate		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
10 - 14	5,523	2,815	2,708	5,495	2,798	2,697	28	17	11
15 - 19	5,356	2,831	2,525	5,327	2,810	2,517	29	21	8
20 - 24	4,908	2,620	2,288	4,892	2,613	2,279	16	7	9
25 - 29	4,018	2,115	1,903	4,005	2,106	1,899	13	9	4
30 - 34	3,503	1,970	1,533	3,484	1,955	1,529	19	15	4
35 - 39	3,208	1,714	1,494	3,191	1,704	1,487	17	10	7
40 - 44	2,751	1,430	1,321	2,733	1,418	1,315	18	12	6
45 - 49	2,543	1,346	1,197	2,522	1,332	1,190	21	14	7
50 - 54	2,276	1,121	1,155	2,251	1,109	1,142	25	12	13
55 - 59	2,073	1,028	1,045	2,053	1,014	1,039	20	14	6
60 - 64	1,667	762	905	1,650	752	898	17	10	7
65 +	3,047	1,220	1,827	2,923	1,168	1,755	124	52	72
Total	40,873	20,972	19,901	40,526	20,779	19,747	347	193	154

Source: Philippine Statistics Authority, CPH 2015

2.4.4.2 Profile of Educational Attainment

According to PSA survey shown in TABLE 2.4. 12, 2.10% or 981 of the 46,742 total population have no educational attainment, this includes individuals aged 6 and below. For those aged 15 (minimum employable age) and above, 0.85% or 302 of 35,527 have no educational attainment.

At the time of the survey, it is assumed that around 688 persons (1.47%) are in preschool. This figure was taken from the number of five (5) year-olds who attained preschool education as preschool age, according to DepEd, should normally be up to 5 years old only. Only one (1) of the total population was enrolled in special education.

The elementary age range before the adaption of K-12 was 6-12 years old, while the high school age range was 12-16. From this, it assumed around 6,184 (13.21%) are in elementary during the time of the survey, while 565 (1.20%) individuals included in the elementary age range have already graduated elementary. Overall, attending Elementary level is the highest educational attainment of the largest proportion of residents of Ajuy (38.35%). For those in the high school age range, it can be assumed 3,200 (6.85%) individuals are in high school during the time of the survey, and 223 (0.48%) have graduated high school. High school is the second-highest educational level attained by the second largest proportion of the sample (19%).

1,153 or 2.47% of the total sample population has a post-secondary education background; 96.96% (1,118 or 2.39% of the total sample population) of which graduated during the time of the survey,

while 3.04% (35 or 0.07% of the total sample population) are post-secondary education undergraduates.

There are 8,765 individuals who attained college education, but only 3,204 (6.85% of the total sample population) are academic degree holders. This means only 38.36% of those who attained college education graduated. 48 (0.10% of the total sample) or 0.57 of those who had college education have attained post-baccalaureate studies. 11.01% of the total sample population are college undergraduates during the time of the survey.

There is a total of 16 individuals (0.03%) who did not state their educational attainment.

TABLE 2.4. 12 DISTRIBUTION OF POPULATION 5 YEARS AND OLDER IN AJUY BY HIGHEST GRADE/YEAR COMPLETED AND BY AGE, 2015

Highest Grade/Year Completed	Total Population 5 Years Old and Over	Age																	
		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 - 24	25 - 29	30 - 34	35 and over
No Grade Completed	931	510	85	6	7	7	5	-	3	2	4	12	19	5	18	2	18	14	16	198
Pre-School	1,455	638	640	148	13	-	4	2	1	1	-	-	-	-	-	-	3	1	-	4
Special Education	5	-	-	-	-	-	1	-	-	-	-	1	-	-	1	1	-	-	-	1
Elementary	17,924	-	352	1,067	1,115	1,092	1,172	1,067	884	524	258	203	113	121	100	126	697	684	735	7,614
1st - 4th Grade	9,206	-	352	1,067	1,115	1,092	941	469	172	78	55	56	29	39	42	43	254	254	283	2,865
5th - 6th Grade	3,908	-	-	-	-	-	231	431	314	128	63	43	26	37	20	41	216	201	191	1,966
Graduate	4,810	-	-	-	-	-	-	167	398	318	140	104	58	45	38	42	227	229	261	2,783
High School	16,906	-	-	-	-	-	-	-	192	546	860	1,033	792	612	517	467	2,235	1,830	1,589	6,233
Undergraduate	7,870	-	-	-	-	-	-	-	192	546	860	1,003	599	271	198	150	691	549	552	2,259
Graduate	9,036	-	-	-	-	-	-	-	-	-	-	30	193	341	319	317	1,544	1,281	1,037	3,974
Post-Secondary	1,153	-	-	-	-	-	-	-	-	-	-	-	-	2	14	25	222	240	158	492
Undergraduate	35	-	-	-	-	-	-	-	-	-	-	-	-	2	4	3	6	4	5	11
Graduate	1,118	-	-	-	-	-	-	-	-	-	-	-	-	-	10	22	216	236	153	481
College Undergraduate	5,148	-	-	-	-	-	-	-	-	-	-	-	94	300	388	395	1,175	696	512	1,588
Academic Degree Holder	3,156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	582	585	509	1,475
Post Baccalaureate	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	5	36
Not Stated	16	9	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-
Total	46,742	1,157	1,077	1,221	1,135	1,099	1,182	1,069	1,080	1,073	1,122	1,249	1,018	1,040	1,045	1,021	4,934	4,055	3,524	17,641

Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

2.4.4.3 Educational Facilities

There are 22 elementary schools and seven (7) public high schools operating in Ajuy. Of these, one Elementary school and one High School are located in Barangay Bay-ang (see Figure 2.4. 9). There are a couple of small private training facilities that specialize training in caregiving, vocational and trade skills.

2.4.5 Housing and Shelter

2.4.5.1 Type of Housing Structures and Housing Materials

In terms of the housing type, almost all (97%) the houses have single detached designs, while only 3% are duplex structures (Table 2.4. 14). 42% have bamboo/sawali/cogon/nipa walls and 37% have bamboo/sawali/cogon/nipa roofs. Less than a quarter of the municipal population (22.47%) live in structures that have outer walls made of concrete, brick, or stone with galvanized iron/aluminum roof (**Source:** Housing Tables 2015, Philippine Statistics Authority
).

2.4.5.2 Status of Tenure

The majority (76%) of the households has established dwelling on land owned by other people. Among these households, 74% own the housing structures, while 1% live rent-free with consent on housing structures owned by other persons. Only 24% dwell in structures built on owned land (see Table 2.4. 16). An informal settler is defined as one who established dwelling on land on, which s/he has no legal claim or no ownership claim.

2.4.5.3 Sanitation Facilities

According to the latest available statistic from the MPDO, dated 2017, 89% of households in Ajuy have water-sealed septic tanks used exclusively by the household, while five percent (5%) use open pit toilets and less than a decile (9%) have no family toilets.

Table 2.4. 13 Number Households in Ajuy by Kind of Toilet Facility: 2015

Type of Toilet Facilities	Number of Households	Percentage
Water Sealed septic tank used exclusively by the household	10,697	85%
Open Pit Toilet Facility	809	6%
No Toilet	1,146	9%
TOTAL	12,652	

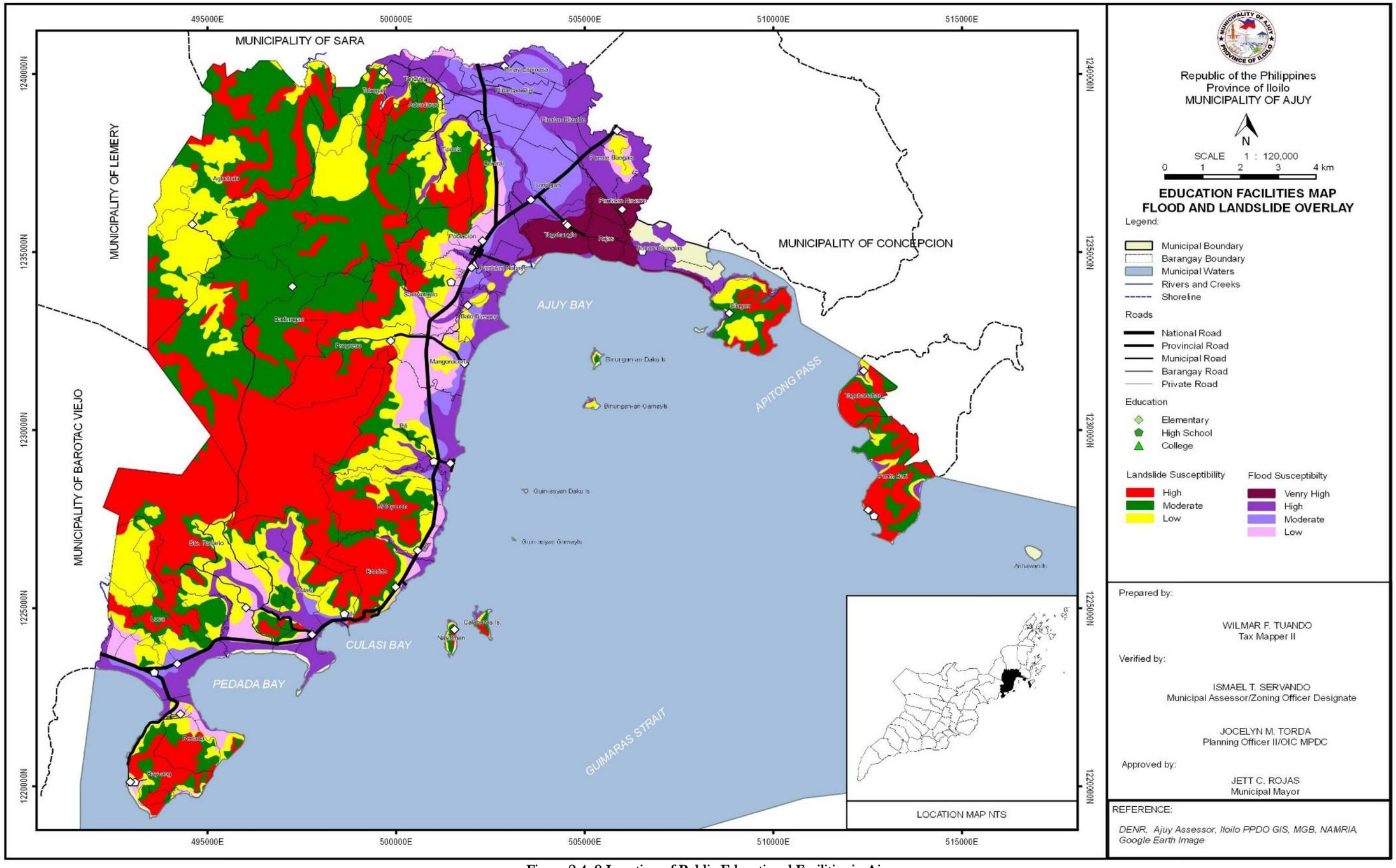


Figure 2.4. 9 Location of Public Educational Facilities in Ajuy

Table 2.4. 14 Number of Occupied Housing Units, Number of Households, Household Population, and Ratio of Households and Household Population to Occupied Housing Units in Ajuy by Type of Building, 2015

Type of Building and City/Municipality	Occupied Housing Units	Number of Households*	Household Population*	Average Household Size	Ratio of Households to Occupied Housing Units	Ratio of Household Population to Occupied Housing Units
Single house	11,800	11,857	50,519	4.26	1.00	4.28
Duplex	326	327	1,417	4.33	1.00	4.35
Multi-unit residential	24	24	106	4.42	1.00	4.42
Commercial/industrial/agricultural	9	10	35	3.50	1.11	3.89
Institutional living quarter	-	-	-	-		
Total	12,162	12,221	52,084	4.26	1.00	4.28

Source: Housing Tables 2015, Philippine Statistics Authority

Table 2.4. 15 Occupied Housing Units in Ajuy by Construction Materials of the Outer Walls and Roof, 2015

Construction Materials of the Outer Walls	Total Occupied Housing Units	Construction Materials of the Roof								
		Galvanized iron/ aluminum	Tile/ concrete/ clay tile	Half galvanized iron & half concrete	Bamboo/ cogon/ nipa/anahaw	Asbestos	Makeshift/salvaged / improvised materials	Trapal	Others	Not Reported
Concrete/brick/stone	2,733	2,578	124	22	6	-	2	-	1	-
Wood	1,407	1,076	3	35	288	-	3	2	-	-
Half concrete/brick/stone and half wood	2,453	1,944	16	429	58	-	6	-	-	-
Galvanized iron/aluminum	179	143	3	6	27	-	-	-	-	-
Bamboo/sawali/cogon/nipa	5,120	3,539	-	35	1,522	-	17	7	-	-
Asbestos	6	6	-	-	-	-	-	-	-	-
Glass	-	-	-	-	-	-	-	-	-	-
Makeshift/salvaged/improvised materials	183	110	-	-	23	-	49	1	-	-
Trapal	31	18	-	-	4	-	-	9	-	-
Others	8	6	-	-	-	-	1	-	1	-
No walls	-	-	-	-	-	-	-	-	-	-
Not Reported	42	41	-	1	-	-	-	-	-	-
Total	12,162	9,461	146	528	1,928	-	78	19	2	-

Source: Housing Tables 2015, Philippine Statistics Authority

Table 2.4. 16 Number of Households in Ajuy by Type of Building, Tenure Status of the Housing Unit, 2015

Tenure Status of the Housing Unit and Lot and City/Municipality	Number of Households*	Type of Building						
		Single house	Duplex	Multi-unit residential	Commercial/ industrial/ agricultural	Institutional living quarter	Others	Not Reported
Own or owner like possession of house and lot	2,968	2,759	203	1	4	-	-	1
Rent house/room including lot	22	22	-	-	-	-	-	-
Own house rent lot	489	478	10	-	1	-	-	-
Own house rent-free lot with consent of owner	8,569	8,430	109	23	5	-	-	2
Own house rent-free lot without consent of owner	24	24	-	-	-	-	-	-
Rent-free house and lot with consent of owner	146	141	5	-	-	-	-	-
Rent-free house and lot without consent of owner	3	3	-	-	-	-	-	-
Total	12,221	11,857	327	24	10	-	-	3

Source: Housing Tables 2015, Philippine Statistics Authority

2.4.6 Labor Force and Employment

The labor force population consists of individuals aging between 15 to 59 years old. From Table 2.4. 19 it can be observed that the labor force comprises 67.9% of the population (35,527 individuals). Among the labor force, only 52% are gainfully employed (18,565 individuals) while unemployment rate is 47%.

Table 2.4. 17 Ajuy Labor Force Population by Sex and Employment Status

SEX	POPULATION 15 YEARS AND OVER	EMPLOYED	%	UNEMPLOYED	%
Female	17,211	5,136	14	12,075	34
Male	18,316	13,429	38	4,887	14
Both Sexes	35,527	18,565	52	16,962	47

Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

The largest single occupational group in the survey (Table 2.4. 18) are workers in the Elementary Occupations (36.2%), followed by the Skilled Agricultural, Forestry and Fishery Workers (24.6%), which have large numbers among all working-age brackets. Three and a half percent (3.5%) belong to a growing group of professionals ages 20 to 54.

Ajuy has a robust number of residents in managing positions (5.4%), the bulk of which are aged above 40 years.

2.4.7 Poverty Incidence

The incidence of families who lack the means necessary to meet basic personal needs for food, clothing, and shelter has been reduced from 16% in 2015 to 12% in 2018, according to the PSA survey in 2018. In terms of magnitude, the estimated number of families falling below the poverty threshold of P 22,786 in 2015 was 2,575 families. While the estimated magnitude of families (6,671) who fell below the poverty threshold of PHP 26,071 increased in 2018, the percentage against total population size reduced, overtaken by a high population growth rate.

Table 2.4. 18 Gainful Workers 15 Years Old and Over in Ajuy by Major Occupation Group, Age Group, and Sex, 2015

%	Major Occupation Group	Total Gainful Workers 15+ Years Old	Age Group										
			15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65+
	Total	18,565	844	2,371	2,420	2,338	2,180	1,841	1,747	1,518	1,339	913	1,054
5.4	Managers	1,004	2	39	65	99	130	123	132	121	106	91	96
3.9	Professionals	718	-	88	131	111	109	83	61	69	34	19	13
1.8	Technicians and Associate Professionals	335	6	62	51	56	32	27	27	25	25	11	13
2.2	Clerical Support Workers	412	13	104	89	65	41	21	23	16	17	13	10
12.4	Service and Sales Workers	2,305	135	421	367	262	227	191	206	155	130	94	117
24.6	Skilled Agricultural Forestry and Fishery Workers	4,572	189	370	458	505	500	468	496	439	432	314	401
6.2	Craft and Related Trades Workers	1,145	20	101	120	158	173	139	110	120	78	58	68
7.1	Plant and Machine Operators and Assemblers	1,314	24	133	219	245	230	188	113	72	59	22	9
36.2	Elementary Occupations	6,714	436	1,047	916	835	732	599	577	498	456	291	327
0.1	Armed Forces Occupations	23	-	6	3	2	6	1	2	3	-	-	-
0.0	Other Occupation Not Elsewhere Classified	2	-	-	-	-	-	-	-	-	2	-	-
0.1	Not Reported	21	19	-	1	-	-	1	-	-	-	-	-

Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

2.4.8 Agricultural Production

Ajuy is an agricultural and fishing municipality; its products are diverse, although in relatively small quantities due to topographic and geographic constraints. Ajuy is a coastal municipality with narrow arable flat lands hemmed by rocky coastal areas and hilly and mountainous areas in most of its interior Barangays. More than half of its land area (9,781 ha) have elevation of up to 100 masl. Notwithstanding the limitations, the population of Ajuy strive to produce rice, corn, assorted vegetables, livestock, fresh, brackish water, and marine fish for livelihood. Dried fish is also a major product of Ajuy Table 2.4. 19 to Table 2.4. 21 show the agricultural production of Ajuy.

Table 2.4. 19 Area Devoted to Agricultural Crop Production in Ajuy, 2017

Crops	Area (Hectares)	% to Total Agricultural Land Devoted to Crop Production	% to Total of Municipality's Land Area
1. Rice	3,107.84	54.45	17.7
2. Corn	50	0.87	2.84
3. Others	2,550.00	44.68	14.52
TOTAL	5,707.84	100	35.06

Source: Municipal Agriculture Office, Ajuy

Table 2.4. 20 Livestock and Poultry Production in Ajuy, 2017

Description	Number of Heads
1. Carabao	1,260
2. Cattle	896
3. Goat	620
4. Hogs	3,420
5. Sheep	30
6. Chicken	8,820
7. Ducks	6,630
8. Geese	500
9. Turkey	360
TOTAL	**22,266**

Source: Municipal Agriculture Office, Ajuy

Table 2.4. 21 Ajuy Aquaculture Production

Type of Culture	Area Harvested (has.)	Production (M.T)
1. Brackish water	1.170	8.775
2. Freshwater	2.15	5.25

Source: Municipal Agriculture Office, Ajuy

2.4.9 Post-Harvest Facilities

There are 58 post-harvest facilities in Ajuy, all of which cater to rice warehousing, drying and milling (Table 2.4. 22).

Table 2.4. 22 Post-Harvest Facilities in Ajuy

Type of Facilities	Number	Capacity
1. Warehouse	17	1,000 bags
2. Rice Mill	15	20 bags/hour
3. Cono Mill (stone disk huller)	14	8 bags/hour
4. Solar Dryer	12	50 bags
TOTAL	**1,078**	

Source: Municipal Agriculture Office, Ajuy

2.4.10 Food Security

Food security is defined as the availability of food and one's access to it. A household is considered food-secure when its occupants do not live in hunger or fear of starvation. Stages of food insecurity range from food secure situations to full-scale famine. The World Food Summit of 1996 defined food security as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life".

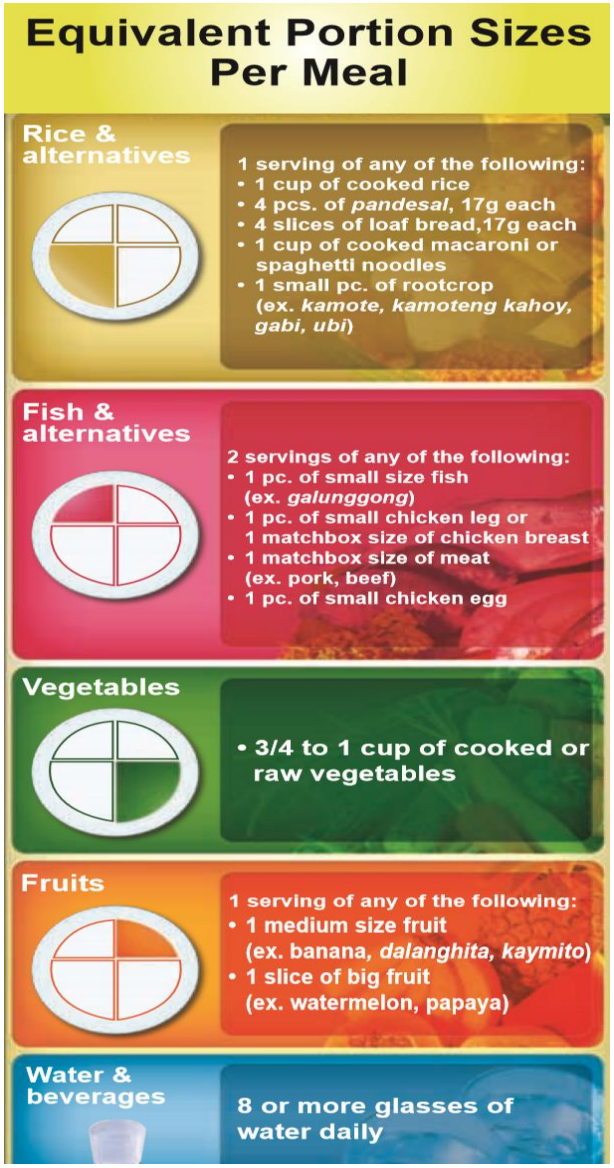
In 2014, the Food Nutrition and Research Institute (FNRI) of the Department of Science and Technology (DOST) launched Pinggang Pinoy, an easy-to-understand visual food guide that uses a familiar food plate model to convey the right food group proportions on a per-meal basis to meet the energy and nutrient needs of adults. **Annex P** is a copy of the Philippine Daily Nutrition Intake Tables which the Pinggang Pinoy Program aims to simplify to better guide daily meal planning for a healthy population. Figure 2.4. 10 is a simple, one-day meal plan guide for balanced adult nutrition, being promoted by the Pinggang Pinoy Program.

In 2015, the FNRI – DOST commissioned a food security survey "2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups" which reports less than half (33.9%) of Filipino families have food security, and less than a quarter (23.8%) of households in Western Visayas are food secure (please see **Source:** 2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups, FNRI

, Figure 2.4. 11). Table 2.4. 23 below defines the various categories of food insecurity surveyed under the said survey. Table 2.4. 24 further indicates that 13.4% of households in Western Visayas are mildly food insecure, 40.4% are moderately food insecure, and 22.5% of households are severely food insecure. Figure 2.4. 11 indicates that only around 25% of households in Iloilo Province are food secure.

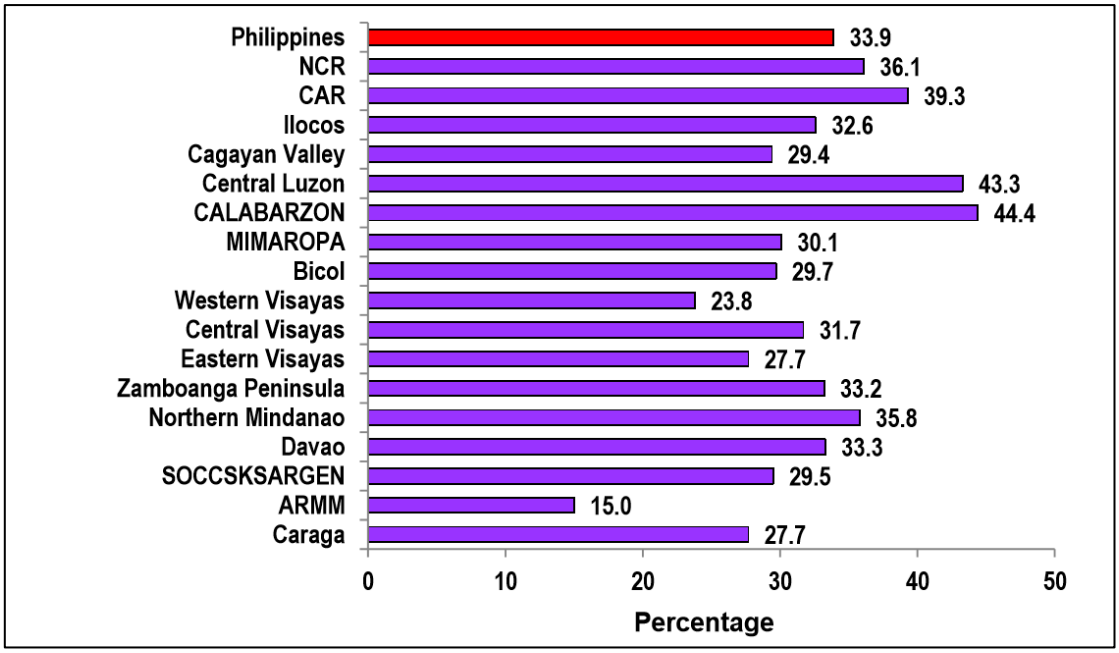
Reviewing Table 2.4. 25, which indicates the occupation of the majority of households in Ajuy, it is observed that households whose heads are in elementary occupations have about 19.8% food security level, and that food security is less (28% vs. 40.1%) in rural than in urban areas. Almost all Barangays of Ajuy manifest rural conditions.

Based on the same FNRI survey of 2015, data suggests that male-headed households, in general, have a lower degree of food security than female-headed households (32.6% vs. 38.5%). The percentage of households that are food secure has a direct correlation with the level of educational attainment of the household head. It is safe to declare that food security in Ajuy is less than 50%.



Source: DOH Pinggang Pinoy

Figure 2.4. 10 Simple One-Day Meal Plan Guide for Balanced Adult Nutrition



Source: 2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups, FNRI

Figure 2.4. 11 Proportion of Food Secure Households by Region, Philippines, 2015

Table 2.4. 23 Categories of Food Insecurity

Situation(s) experienced in the past month	Frequency		
	Rarely 1-2x	Sometimes 3-10x	Often >10x
1. Worry about food			
2. Unable to eat preferred foods			
3. Eat just a few kinds of foods			
4. Eat foods they really do not want to eat			
5. Eat a smaller meal			
6. Eat fewer meals in a day			
7. No food of any kind in the household			
8. Go to sleep hungry			
9. Go a whole day and night without eating			

Legend:	Food Secure	Mild	Moderate	Severe

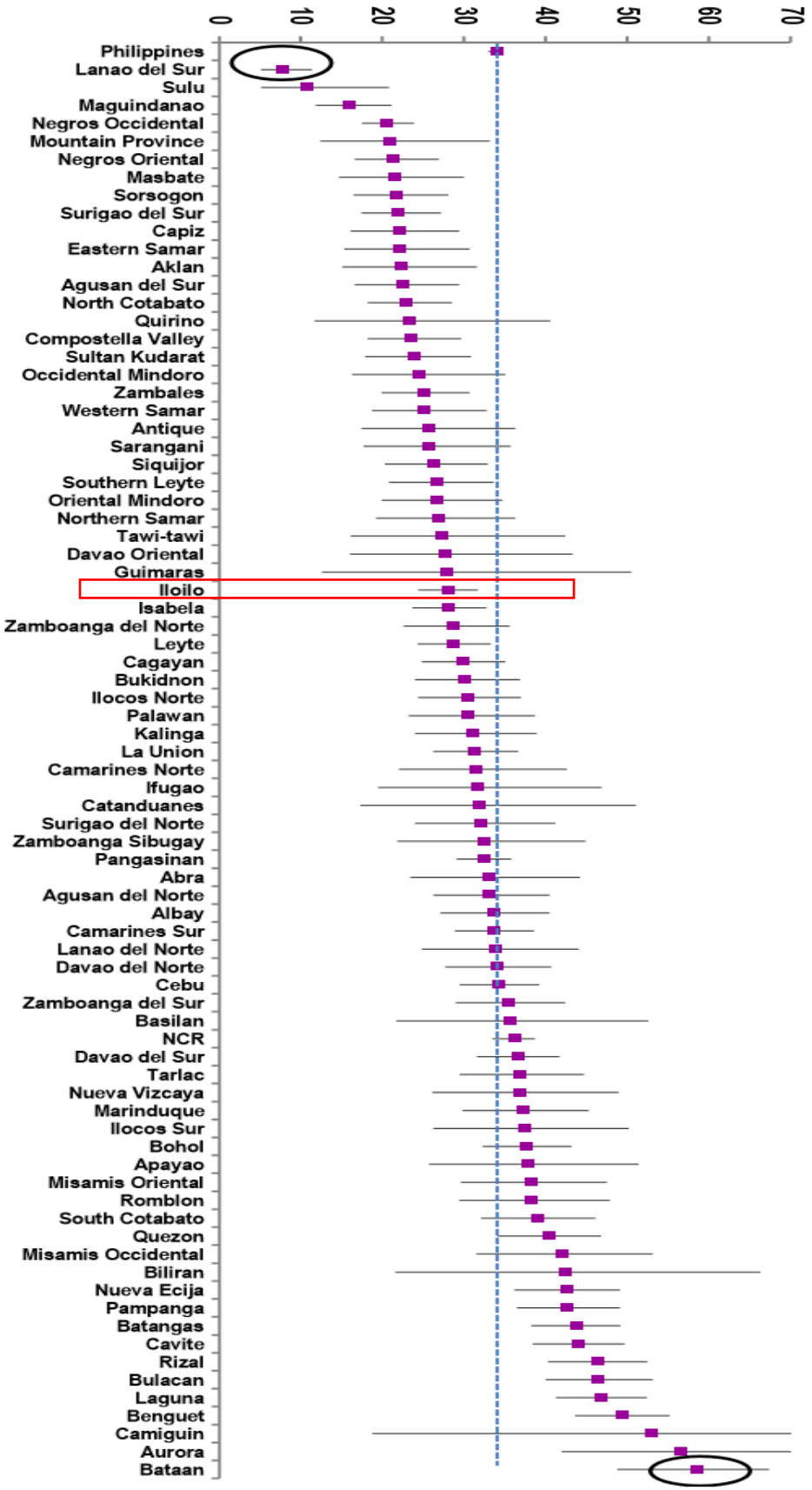
[1] Household Food Insecurity Access Scale Indicator Guide, v.3

Source : 2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups, FNRI

Table 2.4. 24 Percent Distribution of Households by Food Security Status & Region, 2015

Region	n	Food Security Status			
		Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure
Philippines	**41,282**	**33.9**	**12.3**	**31.9**	**21.9**
NCR	3,307	36.1	11.2	23.5	29.2
CAR	1,704	39.3	19.3	29.8	11.6
Ilocos	2,367	32.6	14.6	30.0	22.8
Cagayan Valley	2,308	29.4	14.4	34.7	21.4
Central Luzon	3,450	43.3	14.0	27.6	15.1
CALABARZON	4,328	44.4	12.6	24.0	19.0
MIMAROPA	1,316	30.1	11.7	32.2	26.0
Bicol	2,633	29.7	14.2	38.3	17.8
Western Visayas	3,141	23.8	13.4	40.3	22.5
Central Visayas	2,301	31.7	12.0	35.2	21.1
Eastern Visayas	2,461	27.7	12.2	37.8	22.4
Zamboanga Peninsula	1,745	33.2	13.3	37.9	15.7
Northern Mindanao	2,175	35.8	8.5	34.3	21.4
Davao	2,222	33.3	12.7	36.0	18.0
SOCCSKSARGEN	2,163	29.5	9.5	37.5	23.6
ARMM	1,734	15.0	5.8	34.7	44.5
Caraga	1,927	27.7	10.3	41.4	20.6

Source: 2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups, FNRI



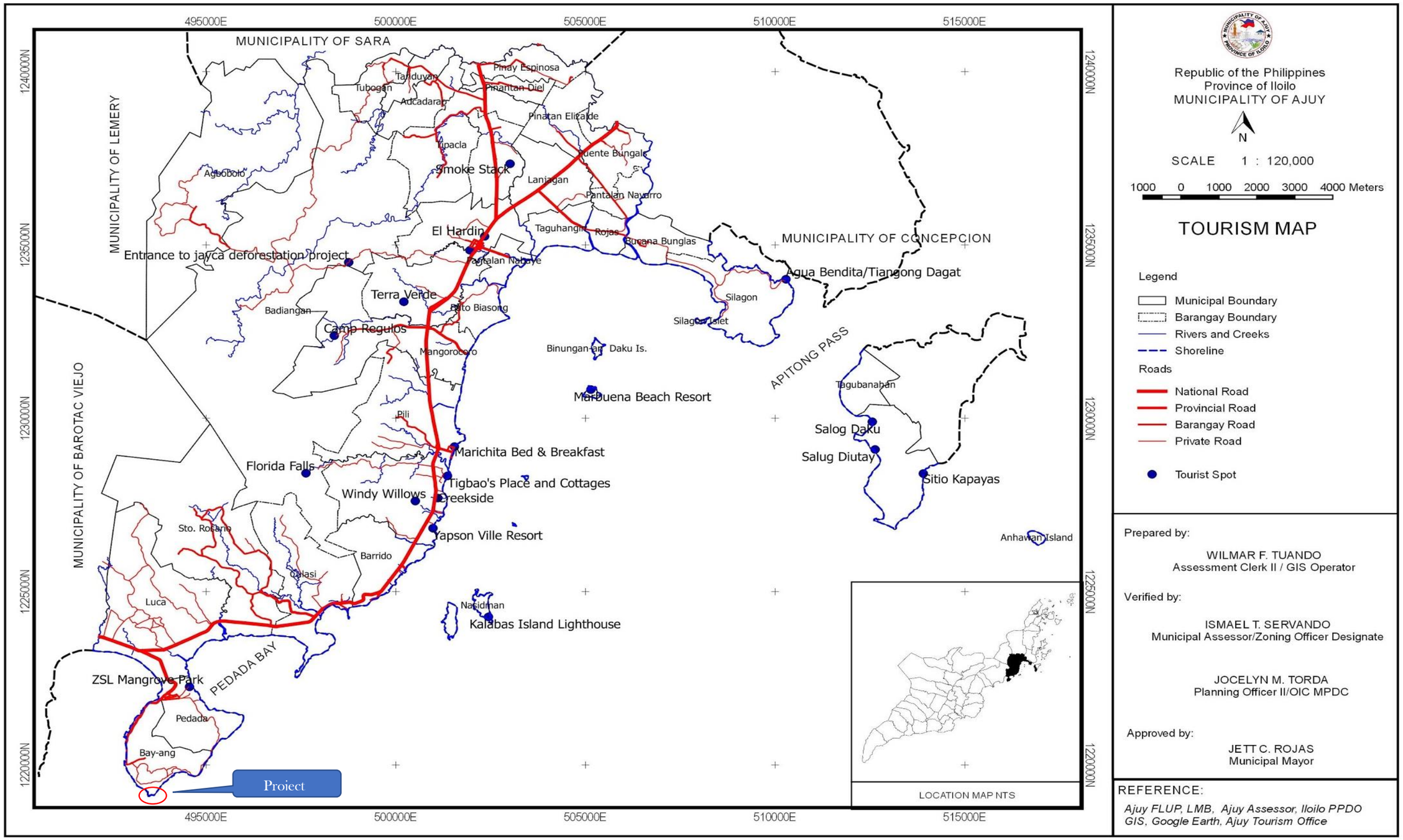
Source: 2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups, FNRI

Figure 2.4-1 Proportion of Food Secure Households & the 95% Confidence Interval by Province: Philippines, 2015

Table 2.4. 25 Percent Distribution of Households by Food Security Status and Demographic Characteristics, Philippines, 2015

Socio-demographic Characteristics	Food Security Status			
	Food Secure	Mildly Food Insecure	Moderately Food Insecure	Severely Food Insecure
Philippines	**33.9**	**12.3**	**31.9**	**21.9**
Household Size				
>5	25.9	12.0	35.8	26.3
≤5	37.8	12.5	30.0	19.7
Place of Residence				
Rural	28.0	12.3	36.6	23.2
Urban	40.1	12.4	27.0	20.6
Wealth Quintile				
Poorest	11.5	8.5	40.9	39.1
Poor	18.0	11.7	41.0	29.3
Middle	25.8	15.0	37.7	21.5
Rich	42.6	15.5	28.2	13.7
Richest	71.6	11.1	11.7	5.7
Sex of Household Head				
Male	32.6	12.5	32.7	22.2
Female	38.5	11.8	28.8	20.9
Occupation of Household Head				
Armed forces	62.9	12.3	18.4	6.5
Managers	59.6	10.8	20.2	9.4
Professionals	67.4	11.7	15.2	5.7
Technicians and associate professionals	50.9	13.7	22.5	12.9
Clerical support workers	51.1	12.4	22.7	13.8
Service and sales workers	35.4	13.6	30.9	20.1
Skilled agricultural, forestry and fishery workers	21.8	11.6	39.4	27.2
Craft and related trades workers	29.0	14.4	34.7	22.0
Plant and machine operators and assemblers	35.9	13.4	30.5	20.3
Elementary occupations	19.8	12.3	38.1	29.8
No Occupation	40.5	11.8	27.3	20.4
Educational Attainment of Household Head				
No Grade Completed	15.9	6.8	34.0	43.3
Elementary Undergraduate	19.6	10.4	37.9	32.1
Elementary Graduate	25.8	13.0	36.6	24.6
HS Undergraduate	27.2	12.3	36.6	24.0
HS Graduate	34.7	14.1	32.3	18.8
Vocational Undergraduate	43.3	12.4	27.4	17.0
Vocational Graduate	46.1	15.2	26.7	12.0
College Undergraduate	50.5	12.8	24.5	12.2
College Graduate	67.7	11.3	13.5	7.5

Source: 2015 Updating of the Nutritional Status of Filipino Children and Other Population Groups, FNRI



Republic of the Philippines
Province of Iloilo
MUNICIPALITY OF AJUY

N

SCALE 1 : 120,000

1000 0 1000 2000 3000 4000 Meters

TOURISM MAP

Legend

- Municipal Boundary
- Barangay Boundary
- Rivers and Creeks
- Shoreline

Roads

- National Road
- Provincial Road
- Barangay Road
- Private Road

- Tourist Spot

Prepared by:

WILMAR F. TUANDO
Assessment Clerk II / GIS Operator

Verified by:

ISMAEL T. SERVANDO
Municipal Assessor/Zoning Officer Designate

JOCELYN M. TORDA
Planning Officer II/OIC MPDC

Approved by:

JETT C. ROJAS
Municipal Mayor

REFERENCE:

Ajuy FLUP, LMB, Ajuy Assessor, Iloilo PPDO GIS, Google Earth, Ajuy Tourism Office

Figure 2.4. 12 Ajuy Tourism Destinations

2.4.11 Commercial Establishments and Activities

2.4.12 Local Tourism

Based on the Coastal Resource Management Plan of Ajuy, there are 13 existing tourism sites and 13 potential tourism sites in the municipality (see Figure 2.4. 12). Of interest to note is the inclusion of Bay-ang Point and Wharf and the Pedada Mangrove Eco-park in the list of the tourism sites of Ajuy. The Municipality of Ajuy aspires to promote eco-tourism as one of its assets for local development. The LGU endorsement of the Cemphil Project implies the expectation that the project facility and its operations will meet the basic environmental requirement to keep the Project area and its environs compatible with tourism activities.

2.4.13 Banking and Financial Institutions

The Land Bank of the Philippines and Philippine National Bank have branches in Ajuy. Digital financial intermediaries such as LBC and Palawan Express Padala also have offices in Ajuy. The services of Gcash, Smart Padala and Paymaya are only starting to be accepted in Ajuy but its use is limited to a few establishments in the town center.

2.4.14 Cultural Features

2.4.14.1 Ethnicity

The population on the island of Panay is predominantly Hiligaynon people (*mga Hiligaynon*), often referred to as Ilonggo people (*mga Ilonggo*). The Ilonggos are a Visayan ethnic group whose primary language is Hiligaynon, an Austronesian language of the Visayan branch native to Panay. Ilonggos have a reputation for being affectionate, friendly, and happy people. They are also known to be hardworking, honest, sincere, family-centered, and modest.

There are Ati or Aeta tribes in Panay Island. They are nomadic and visit Ajuy mostly during the town fiesta. They do not have a permanent settlement in the municipality of Ajuy.

2.4.14.2 Languages and Dialects

Among the town folks, Hiligaynon is widely spoken. However, Tagalog, Cebuano, and other dialects are also used as mediums of communication.

2.4.14.3 Religious Affiliations

The Municipality of Ajuy is dominantly Roman Catholic, with believers comprising almost 80% of the population. By order of percentage share of believers in the total municipal population, the remainder belongs to Aglipayan, Protestants, Iglesia Ni Cristo, Baptist, Seventh Day, Adventist, and other religious sects.

2.4.14.4 History and Archeology

The present Municipality of Ajuy started from a small settlement established by the early Malayan freedom-seekers on the north side of the Gubaton River, near the present site of Barangay Lanjagan. It was originally called “Asui” by the natives. How the name “Ajuy” was later adopted could not be

exactly ascertained because of the many versions related to it. The most popular story, however, which was later accepted as credible is the following.

One day in the old Spanish times, a Spaniard who was assigned to list the names of coastal villages of this portion of Iloilo, came to this place. He met a native who was gathering fuel. Talking in Spanish, which was accompanied by signs to make himself understood, the stranger asked for the name of the settlement. The native who could not understand Spanish thought that the Spaniard was asking what he was gathering and answered "Kahoy". The Spaniard did not distinctly hear the word, but instead noted down the word, "Ahoy", which was later changed to Ajuy, the present official name of the town.

After several years of its founding, the settlement prospered, and the population increased. The sources of livelihood became varied. Many people engaged in trade with the neighboring islands and towns. They found much difficulty in transporting their goods to those places from Asui, so they looked for a more convenient place. Thus, the present site of the Poblacion was chosen because of its ideal location.

The Municipality of Ajuy was formerly a part of the town of Sara. It became a full-fledged municipality in 1917 through the untiring efforts of its educated citizens, under the able leadership of Dionisio Del, Alejo Posadas, Manuel Arones, and Antonio Manipula. These men were mainly responsible for the separation of Ajuy from Sara.

2.4.15 Basic Services and Utilities

2.4.15.1 Water Supply

The Ajuy Water District serves nine (9) out of 34 Barangays of Ajuy from 10 wells within the Municipality. The rest of Ajuy draw water supply through manual and electric pumps from 202 wells, two of which are in Barangay Bay-ang (Table 2.4. 26). According to the 2015 data from PSA CPH (Table 2.4. 27), majority of the population in Bay-ang source drinking and cooking water (40% to 41% respectively) from shared tubed deep wells, about 15% draw water from protected springs, 12% to 14% draw water from shared faucets from the community water system, and between 2% to 3% respectively draw water for drinking and cooking from own use faucets in a community water system such as the Ajuy Water District.

Table 2.4. 26 Location of Wells in Barangay Bay-ang

Well No.	Sitio/Purok	Long/deg.	Long/min	Long/sec	Lat/deg	Lat/min	Lat/sec	Owner
164	Purok 5	122	56	18.3	11	2	22.3	Barangay
165	Purok 4	122	56	3.9	11	2	13.9	Erwin Delagao

Source: Ground Water Resource Assessment in the Municipality of Ajuy, MGB-VI. 2018

Table 2.4. 27 Number of Households in Ajuy by Main Source of Water Supply, 2015

Use	Number of Households	Source of Water Supply										
		Own use faucet in community water system	Shared faucet community water system	Own use tubed/piped deep well	Shared tubed/ piped deep well	Tubed/ piped shallow well	Dug well	Protected spring	Unprotected spring	Lake river rain and others	Peddler	Bottled water
For Drinking	12,221	198	1,499	847	4,904	469	903	1,826	121	7	663	784
		2%	12%	7%	40%	4%	7%	15%	1%	0%	5%	6%
For Cooking	12,221	401	1,660	1,095	4,990	472	1,013	1,794	126	17	538	115
		3%	14%	9%	41%	4%	8%	15%	1%	0%	4%	1%

Source: Iloilo Statistical Tables 2015, Philippine Statistics Authority

2.4.15.2 Power

Power is supplied in Barangay Bay-ang under the service coverage of Iloilo Electric Cooperative (ILECO) III.

2.4.15.3 Communication

Modes of communication in the Barangay Bay-ang include telecommunication lines and internet connections provided by Globe, Smart Telecommunication, and PLDT Inc. A post office is also available in the Municipality.

2.4.15.4 Transportation

The Municipality of Ajuy, as of 2015, has 26 km of highways and 72 km of inland waterways. Ajuy has no railways and airports but has seaports namely Bay-ang Port and Culasi Port.

The major modes of transportation in Barangay Bay-ang are tricycles and single motorcycles. Ceres bus from Iloilo to Capiz ply the Iloilo-East Coastal Road which passes through the center of Ajuy. Ceres busses pass through Ajuy every thirty minutes or so.

2.4.15.5 Police Services

The peace and order situation in the Municipality of Ajuy is generally peaceful. The Ajuy Municipal Police Station is located at Barangay San Antonio, Ajuy near the Northern Iloilo Polytechnic State College – Ajuy Campus, 150 meters away from the Municipal Hall and Ajuy Rural Health Unit. It has 34 PNP members, 4 Non-Uniformed Personnel, seven (7) traffic/auxiliaries/enforcers, 12 Barangay Tanods deployed in Barangay Poblacion, 340 Civilian Volunteer Officers/BPATS serving the 34 barangays of the municipality.

The police force is housed in a 365 square meter building and equipped with two (2) Police Patrol Cars, two (2) motorcycles. Given a ratio of 1:1000 or one (1) police officer in every 1,000 population, the Municipality of Ajuy lacks 19 members to attain the ideal number of police personnel.

Table 2.4. 28 is the available record of crimes from 2015 to 2017.

Table 2.4. 28 Crime Incidence in Ajuy by Barangay, from 2015 to 2017

CRIME	2015				2016				2017				Number of Cases Solved
INDEX CRIMES	Solved	Cleared	Unsolved	TOTAL	Solved	Cleared	Unsolved	TOTAL	Solved	Cleared	Unsolved	TOTAL	
Murder	1	4	1	6	4	1	1	6	6	1		7	19
Parricide				0	1			1					1
Homicide (Pure)	2			2	1			1					3
Physical Injury (Pure)	1	1	1	3	4		1	5	6	1		7	15
Frustrated Murder				0	1			1					1
Frustrated Homicide	1	1	2	4	2			2	4			4	10
Frustrated Parricide				0									0
Rape	2		1	3									3
Robbery		1	2	3			1	1	1		3	4	8
Theft (Pure)	1		3	4					2			2	6
Qualified Theft			4	4	1			1	1			1	6
Motornapping				0					3			3	3
Cattle Rustling				0									0
NON-INDEX CRIMES				0									0
TRAFFIC INCIDENTS				0									0
RIR Homicide	2		2	4	2			2	3			3	9
RIR Physical Injury	22		21	43	18		1	19	42	1		43	105
RIR Damage to Property	5		11	16	3		1	4	10		2	12	32
SPECIAL LAWS				0									0
RA 9165 (Comprehensive Dangerous Drugs Act of 2002)	4			4	17			17	5			5	26
RA 10591 (Illegal Possession of Firearms)	4			4	5			5	4			4	13
COMELEC Gun Ban				0									0
PD 1602 as amended by RA 9287 (Illegal Gambling)	3			3	10			10	4			4	17
RA 10654 (RA 8550)/Illegal Fishing	14		2	16					2			2	18
PD 1829				0									0
RA 7610 (Child Abuse Act)	3			3	1			1					4
RA 9262 (Anti-Violence Against Women and Their Children)	10			10	4			4					14
RA 9995				0									0

CRIME	2015				2016				2017				Number of Cases Solved
INDEX CRIMES	Solved	Cleared	Unsolved	TOTAL	Solved	Cleared	Unsolved	TOTAL	Solved	Cleared	Unsolved	TOTAL	
RA 7942				0									0
RA 9516				0									0
BP 6				0									0
BP BLG 881 (Omnibus Election Code of the Philippines				0	1			1					1
RA 9516 (ILLEGAL/UNLAWFUL POSSESSION OF EXPLOSIVES AND INCENDIARY DEVICES)				0					1	1		2	2
PD 705 (Illegal Logging)				0					1			1	1
OTHER NON-INDEX CRIMES				0									0
Adultery				0									0
Grave Threat	1			1	1	1	1	3	1		2	3	7
Malicious Mischief (Pure)			1	1	1			1	1			1	3
Alarm and Scandal	1			1									1
Resistance and Disobedience to a Person in Authority				0		1		1	2			2	3
Estafa			1	1									1
Direct Assault				0					1			1	1
Attempted Murder		1	1	2		1		1					3
Attempted Homicide				0						1	1	2	2
Attempted Parricide				0									0
Trespassing	1			1									1
Oral Defamation (Slander)				0						1		1	1
Acts of Lasciviousness	2			2					1			1	3
Libel				0									0
Unjust Vexation				0									0
Discharge of Firearms				0			1	1					1
Attempted Rape			1	1	1			1					2
Forcible Abduction				0					1			1	1
CICL	1			1									1
Bigamy	1			1									1
TOTAL	82	8	54	144	78	4	7	89	102	6	8	116	349

Source: Source: Ajuy Municipal Police Station

2.4.15.6 Fire Protection

The Ajuy Fire Station is located at Posadas St, Poblacion, Ajuy, Iloilo.

According to the Ajuy Municipal Fire Station (Table 2.4. 29), there was a total of 13 fire incidents in the municipality from 2016 to 2017, with Barangay Poblacion having the most cases (four/4). Most of the causes of fire is accidental, only one (1) case was intentional.

Table 2.4. 29 Fire Incidence in Ajuy from 2016 and 2017

Barangay	Origin/Cause	2016	2017
Agbobolo	Unattended Bonfire/Accidental	1	
Badiangan	Lighted Mosquito Killer/Accidental	1	
Culasi	Thinner Ignited by Unknown Person/ Intentional	1	
	Unattended Open Flame/Accidental	1	
Luca	Unattended Kerosene/ Accidental	1	
Malayuan	Unattended Electric Fan/Accidental	1	
Pili	Unattended Electric Fan/Accidental		1
Poblacion	Backfire Generator Motor Muffler/Accidental	1	
	Unattended Open Flame/Accidental		1
	Heat Generated by Kitchen's Open Flame/Accidental		1
	Played Lighter that Instigate a Fire/Accidental		1
San Antonio	Unattended Matchstick/Accidental	1	
Sto. Rosario	Electric Short Circuit/Accidental		1
Subtotal		**8**	*5*
TOTAL		**13**	

Source: Ajuy Municipal Fire Station

2.4.15.7 Threat to Public Safety

The project will generate employment and employees will have increased income, which will be spent in the local community. This will contribute to more financial resources circulating in the community. This could also mean lesser unmet needs and lower theft that may otherwise be caused by actions illegally perpetrated to meet the needs for food, medicines, or clothing.

2.4.15.8 Municipal Waste Management System

The Municipality of Ajuy has adopted general goals of solid waste management that establish waste reduction as the most preferred management technique, followed by reuse and recycling, then recovery, and least preferred is landfilling. These goals are embodied in the 10-Year Municipal Solid Waste Management Plan submitted to the Environmental Management Bureau Region VI Office in mid-2019.

2.4.15.9 Existing Waste Reduction Practices in the Municipality

Waste reduction program was undertaken through massive information and education campaigns (IEC) and trainings, provided to all sectors in the municipality, i.e., the barangay local officials and residents, students and teachers, transport sectors, farmers, and religious sectors. IEC materials were made available in the form of leaflets on RA 9003, waste segregation, and composting. SWM related posters were also distributed and posted by all 34 component barangays in Barangay Halls and high visibility posting areas.

At Barangay level, material recycling and composting are practiced to reduce solid waste.

2.4.15.10 Collection

The municipality utilizes one (1) garbage truck of four (4) cubic meters capacity for garbage collection. There are seven (7) serviced barangays out of 34 component barangays for waste collection (see Table 2.4. 30). Brgy Culasi has its own collection vehicle for the barangay waste generated.

Table 2.4. 30 Coverage of Garbage Collection in Ajuy

Barangay Served	Frequency/Schedule of Collection	Type of Collection
Poblacion	Daily (7 days-Market); and household	Segregated
San Antonio	Household once a week /every Tuesday	Segregated
Pantalan Nabaye	Household once a week every Tuesday	Segregated
Pili	Household twice a every week Tuesday and Friday	Segregated
Barrido	Household Once a week every Friday	segregated
Tipacla	Household twice a week every Monday and Thursday	segregated
Progreso	Household once a week every Tuesday	segregated

Source: Ajuy Municipal Government

2.4.15.10.1 Areas not covered by collection service

Barangays not covered by collection have established structured MRF/adopted MRF System and practice backyard composting, while residual waste is burned of disposed at the river, or intentionally littered at open areas.

The LGU has not commissioned private haulers for garbage collection. Barangays Bay-ang and Pedada are not included in the areas served by garbage collection and household waste disposal is managed by the Barangay Government Unit.

2.4.15.11 Waste Management Process Flow Facilities

The process flow of Ajuy Municipal Waste Management System is illustrated in Figure 2.4. 13.

2.4.15.12 Special Waste

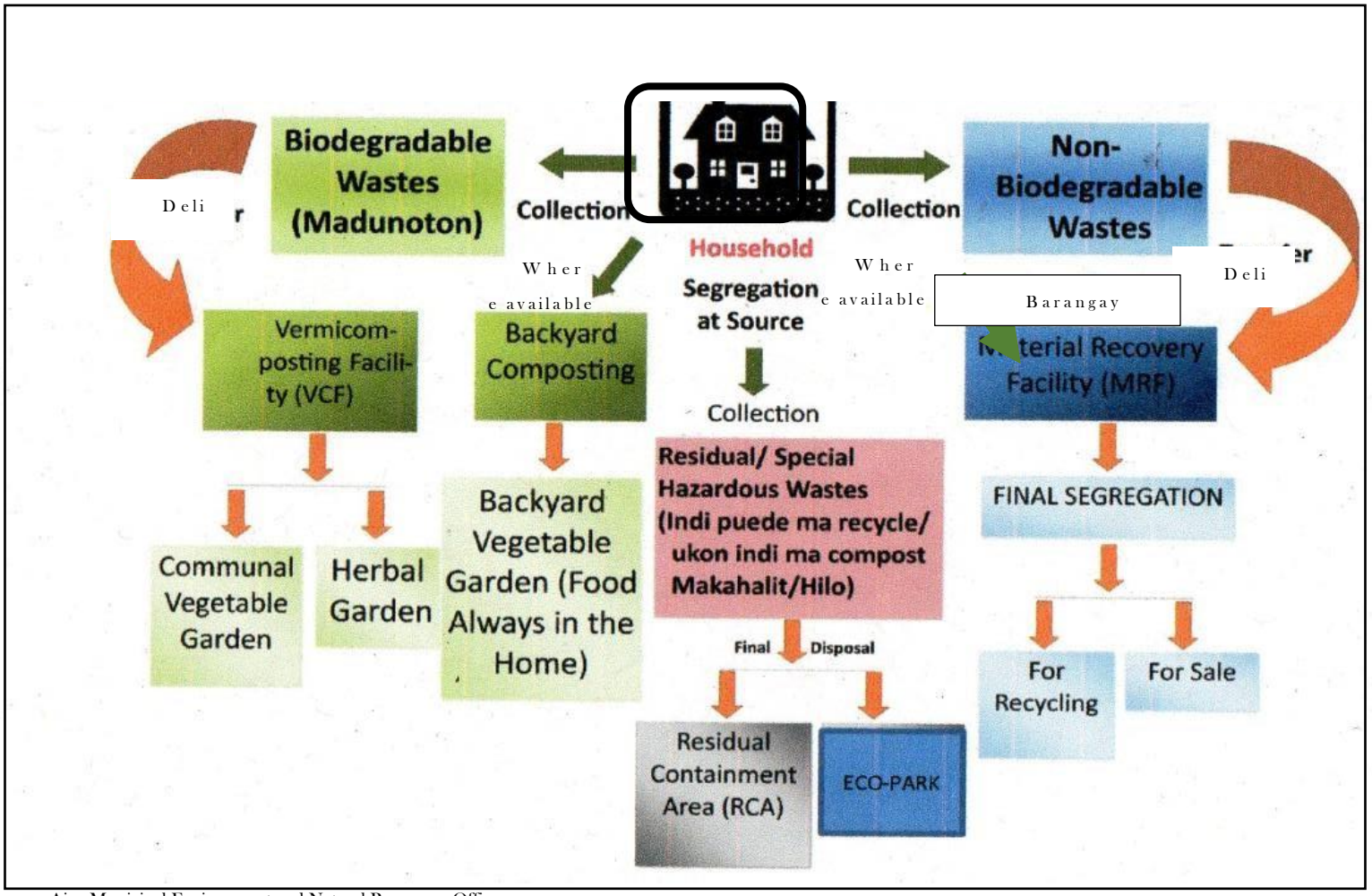
Based on the WACS conducted, special waste comprises 0.32% of the Municipal Waste.

2.4.15.13 Health care Waste

The Municipality has also established a septic vault for the disposal of generated health care waste.

2.4.15.14 Final Municipal Waste Disposal

The Municipal disposal is an open dump facility operated and owned by LGU, located in Barangay Poblacion. It was closed and rehabilitated since the Safe Closure and Rehabilitation Plan was submitted to the Environmental Management Bureau Region VI. Site grading and compaction, final soil covering of the old, dumped waste and completion of the perimeter fence, construction of drainage system and leachate pond, and installation of gas ventilation were undertaken. Within the facility, the MRF building and equipment was constructed in an area of about 200 m^2. Currently, the MRF materials serves the 34 barangays. The LGU operates the Residual Containment Area (RCA) with an area of 200 m^2 while the Municipal SWM facility is in a transition period for the establishment of the Eco-SWM Park. Recyclables from the MRF are brought to the Villar Sipag Foundation in San Miguel, Iloilo twice every month



Source: Ajuy Municipal Environment and Natural Resources Office

Figure 2.4. 13 Ajuy Municipal Solid Waste Management System Flow of Operation

2.4.16 Recreational Facilities

All of the Barangays of Ajuy have basketball courts with surrounding areas that also serve as children's playgrounds and communal gardens (see Table 2.4. 31). Only 11 of the 34 basketball courts have roofs.

Table 2.4. 31 Sports and Recreation Facilities in Ajuy by Barangay, Year 2017

Barangay	Sports Facilities	Recreational Facilities	General Condition
Adcadarao	Basketball Court	Children's Playground, Communal garden	Partially paved with lights, fence, concrete benches, and bleachers. Communal garden with vegetables and flowers.
Agbobolo	Basketball Court	Children's Playground, Communal Garden	Partially paved with fence, concrete benches. Communal garden with vegetables and flowers.
Badiangan	Basketball Court	Children's Playground, Communal Garden	Partially paved with light. Communal garden with vegetables and flowers.
Barrido	Covered Gym, Basketball Court	Children's Playground, Communal Garden, Beach Ground, Fishing Ground	Concrete Structures, partially paved with lights, fence, tot's play, concrete benches, and bleachers. Communal garden with vegetables and flowers. Undeveloped beaches and devoured fishing ground and shorelines.
Bay-ang	Covered Gym, Basketball Court	Children's Playground, Beach Ground	Concrete Structures, partially paved with lights, fence, concrete benches and bleachers. Beach ground with sea wall. Devoured fishing ground
Bato Biasong	Basketball Court	Children's Playground, Beach Ground	Partially paved with lights, concrete benches. Undeveloped beaches and devoured fishing ground and shorelines.
Bucana Bunglas	Basketball Court	Children's Playground, Beach Ground	Partially paved with lights, tot's play. Undeveloped beaches, devoured fishing grounds, mangrove area and shorelines.
Central	Basketball Court	Children's Playground	Partially paved with lights, tot's play
Culasi	Covered Gym, Basketball Court, Athletic Field	Children's Playground, Beach Ground	Concrete Structures, partially paved with lights, fence. Undeveloped beaches
Lanjagan	Basketball Court	Children's Playground, Garden	Concrete Structures, partially paved with lights, fence, tot's play, concrete benches
Luca	Covered Gym, Basketball Court, Athletic Field	Children's Playground, Communal Garden	Concrete Structures, partially paved with lights, fence, tot's play. Undeveloped beaches

Barangay	Sports Facilities	Recreational Facilities	General Condition
Malayu-an	Covered Gym, Basketball Court	Children's Playground, Beach Ground, Plaza & Park	Concrete Structures, partially paved with lights, fence, tot's play. Developed beaches
Mangorocoro	Basketball Court	Children's Playground, Beach Ground	Partially paved with lights, tot's play. Seawall protected reclaimed beach area
Nasidman	Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with lights basketball court and children's playground. Undeveloped beach ground and protected fishing ground.
Pantalan Nabaye	Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with lights
Pantalan Navarro	Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with lights and benches
Pedada	Basketball Court	Children's Playground, Beach Ground, Mangrove Eco-Park	Partially paved with lights, benches
Pili	Covered Gym, Basketball Court, Athletic Field	Children's Playground, Beach Ground, Fishing Ground	Concrete Structures, partially paved with lights, fence
Pinantan Diel	Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, tot's play
Pinantan Elizalde	Basketball Court	Children's Playground, Communal Garden	Partially paved with lights
Pinay Espinosa	Covered Gym, Basketball Court	Children's Playground, Communal Garden	Concrete Structures, partially paved with lights, fence
Poblacion	Covered Gym, Basketball Court, Athletic Field	Children's Playground, Plaza & Park	Concrete Structures, partially paved with lights, fence, tot's play
Progreso	Basketball Court	Children's Playground, Plaza & Park, Communal Garden	Partially paved with lights, fence, tot's play
Puente Bunglas	Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, fence, tot's play
Punta Buri	Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with
Rojas	Covered Gym, Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Concrete Structures, partially paved with lights, fence, tot's play
San Antonio	Covered Gym, Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, benches
Sto. Rosario	Covered Gym, Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, benches
Silagon	Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with lights, benches
Tagubanhan	Covered Gym, Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with lights, concrete benches

Barangay	Sports Facilities	Recreational Facilities	General Condition
Taguhangin	Basketball Court	Children's Playground, Beach Ground, Fishing Ground	Partially paved with lights, concrete benches
Tanduyan	Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, concrete bleachers
Tipacla	Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, concrete benches
Tubogan	Basketball Court	Children's Playground, Communal Garden	Partially paved with lights, concrete benches

Source: Municipal Engineering Office

2.4.17 Threat to Delivery of Basic Services/Resource Competition

Based on the nature of the Project, no activity is assessed to generate a direct threat to the delivery of basic services. Cemphil, Inc. will be a resource to provide social development assistance.

Possible resource use competition may come from competition for food, water, and land, which may trickle in through labor in-migration. The Project will institute policies to limit project-caused in-migration to trusted professionals and highly trained labor. The control of pressure in food, water, and land resources will be related to the control of in-migration which will be in the direct control of the Local Government Units.

The Municipal Coastal Resource Management Plan identify the following needs/development constraints:

Table 2.4. 32 Development Constraints / Identified Needs in Ajuy Coastal Resource Management

Needs	Particulars and Proposed Solutions
Lack of access to basic services (road, electricity, water)	Not enough number of serviceable households due to ddistance from main power line (currently not feasible/ serviceable for house servicing); No deed of donation from land owners for locations of roads, Low maintenance of existing road networks, Inaction from the part of affected barangays to facilitate road right of way acquisition;
No water source, Distant water source, Water shortage	Multiple spring box reservoir development for level 2 water access Desalination equipment
No access to electricity	Provision of solar powered lights
No road access	Facilitate execution of deed of donation Inclusion of road maintenance in the municipal Annual Investment Program
Restoration of mangrove habitats	Limited available funding for mangrove reforestation

2.4.17.1 Socio Economic Profile of Barangay Bay-ang

2.4.17.1.1 History

In the year 1898, Bay-ang was an island; it was the late Pablo Barrido who developed the seashore portion into a fishpond. The road was constructed and attached to the mainland.

This place looked like a jungle in those days, infested with wild animals like hogs, monkeys and several species of birds. In the middle of the 18th Century when the Philippines was still under the Spanish rule, three (3) families that of Domingo Diamante, Candido Balasan and Francisco Barabona came to settle to the place.

The first settler of Bay-ang, Apolonio Bermejo, transferred his residence to Barotac Viejo, Iloilo, and fortunately Candido Balasan was able to purchase land at main area of the barangay. He came somewhere from Ajuy and they resided here Bay-ang, together with his wife, Dionesia Baser and eight (8) children. They worked together, hand in hand, and converted some area into rice land. The upper portion were planted with corn and upland rice, root crops, coconut, bamboos and other kind of trees which were benefited to soothe their purpose. Sitio Agutay or Purok 1 was developed by Domingo Diamante, and likewise Sitio Nipa by Francisco Barabona.

It was orally related from one generation to the other, that the name Bay-ang had derived from a big tree named "Bayang" growing along the seashore. This tree was called Bayang and until now, we can find this tree growing in Punta Daku. Another anecdote on the origin of the name Bay-ang was the name of a fish "Bayang" (*Zebrasoma veliferum* (Bloch 1795)) that was caught in abundance in the area

2.4.17.1.2 Settlement Pattern

Barangay Bay-ang has 7 "Puroks" or community-clusters (see Figure 2.4. 15), Purok 5B and Purok 6 in the north-eastern part of the Barangay are more densely populated than other Puroks in Bay-ang. This area is near the mangrove areas in Pedada. The mangrove areas support a rich food resource base. As may be observed from Figure 2.4. 15, the land on which the Cemphil Project will be located, is in a sparsely-populated area in Purok 5A.

2.4.17.1.3 Population Profile

As per the LGU data, the barangay has a total population of 3,008 in 2019 in 368 households in 368 households. Bay-ang had 1194 families and on the average, one household is shared by 2.5 families. Families who make a living by fishing constitute 28% of the population, while farming families represent 3%. There were more males than females with a sex ratio of 1.05.

Table 2.4. 33 Bay-ang Population Profile, 2019

Puroks	Male	Female	4P'S Beneficiaries	Citizen Sen.	PWD	Farmers	Fisher folks	Families	HH	Population
1-A	138	135	9	27	5	7	60	68	62	273
1-B	138	138	7	24	2	0	1	78	64	276
2	91	108	19	18	1	1	21	51	44	199
3	145	141	4	15	5	2	21	78	59	277
4	178	172	9	46	9	5	14	99	75	350
5-A	146	119	19	21	6	5	25	65	61	267
5-B	305	265	23	27	5	7	47	565	101	570
6	171	168	25	18	5	1	55	80	72	339
7	231	226	32	23	4	3	34	110	100	457
Total	1543	1472	147	219	42	31	278	1194	638	3008
	51%	49%	5%	7%	1%	3%	23%	2.519263	4.714734	

Source: Barangay Profile of Bay-ang 2019

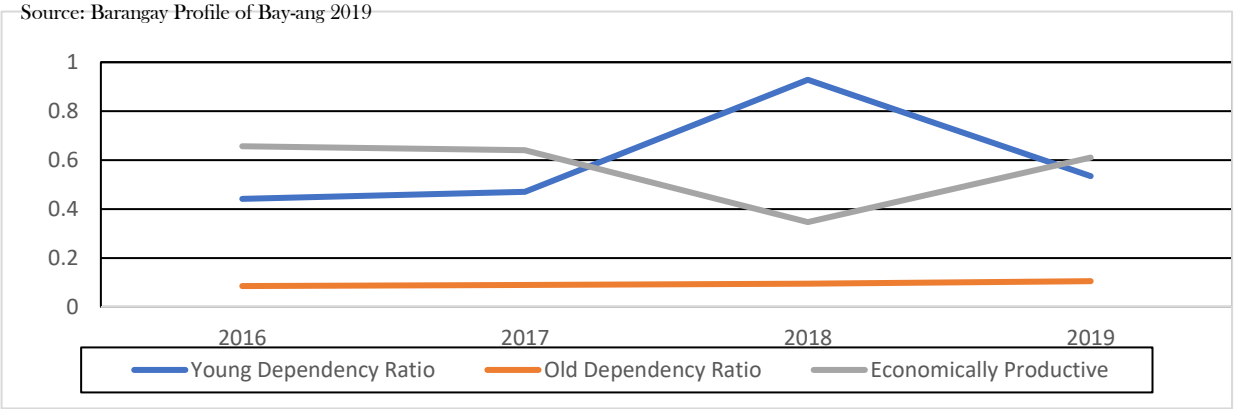
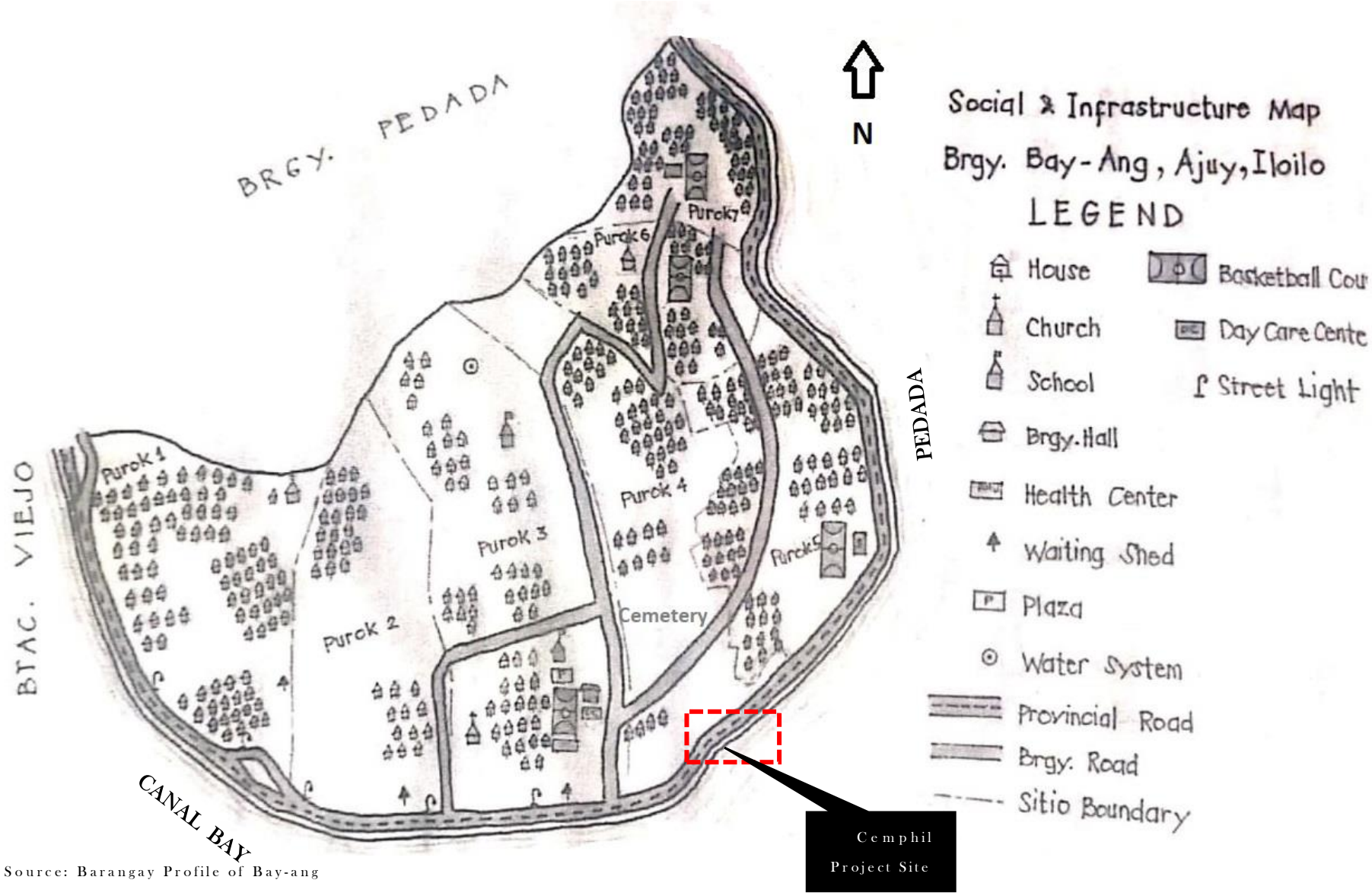
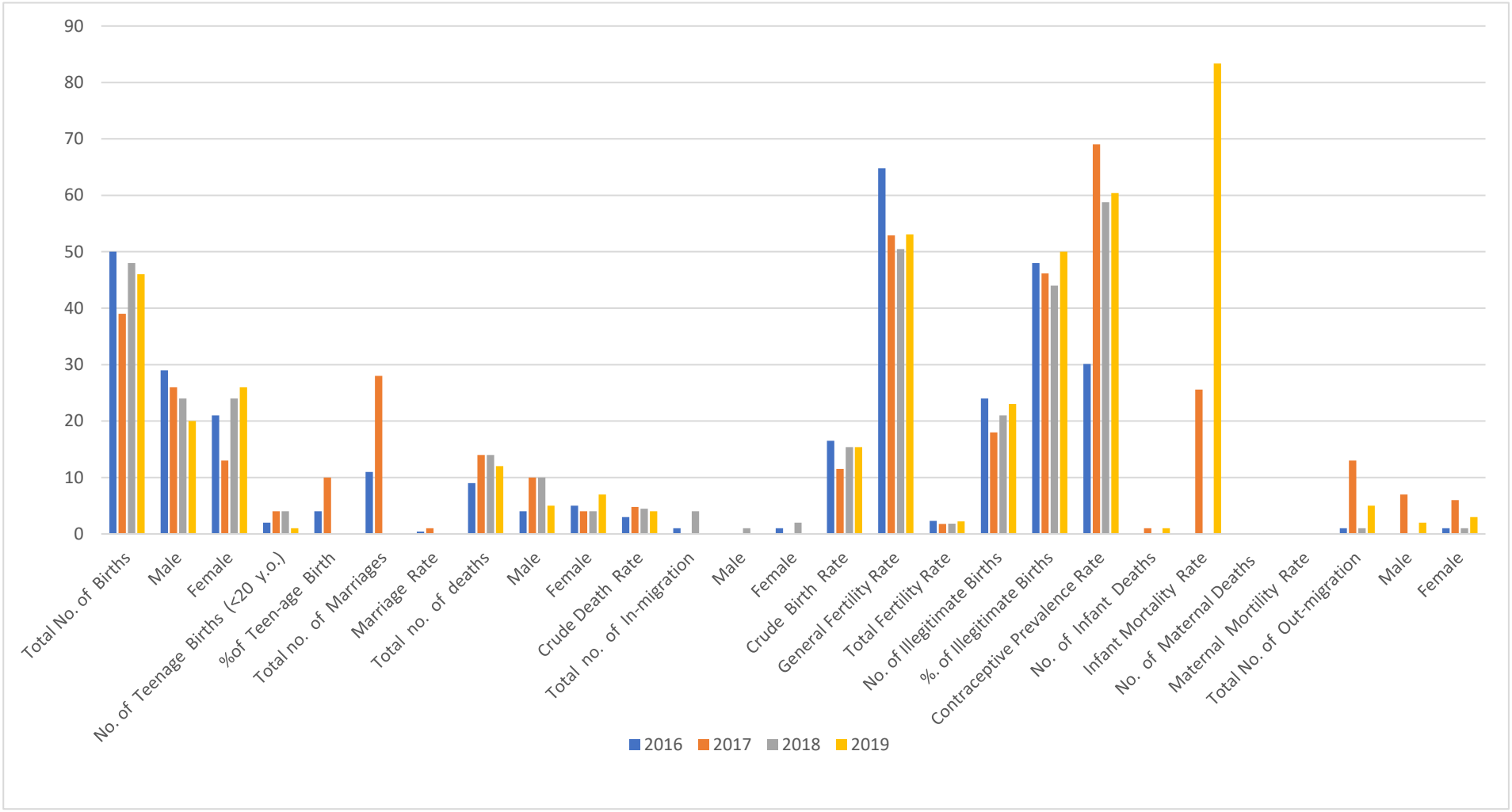


Figure 2.4. 14 Dependency Ratios of Bay-ang, 2019



Source: Barangay Profile of Bay-ang

Figure 2.4. 15 Spot Map of Barangay Bay-ang



Source: Barangay Profile of Bay-ang

Figure 2.4. 16 Social Statistics in Bay-ang, 2016 to 2019

The Young Dependency Ratio is the proportion of young population aged 0 to 14 against the economically productive population between the ages of 15 to below 65. The Old Dependency Ratio is the proportion of the population aged 65 years and more, against the labor-aged population. As may be observed from Figure 2.4. 14, the changes in Young Dependency Ratio and the economically productive population appear to have inverse relation from 2017 to 2018 where the young dependency ratio increased while the labor force decreased. In 2017, seven (7) males and six (6) females out-migrated (see Figure 2.4. 17). In 2019, the young dependency ratio reduced while the ratio of economically productive population increased. The increase in the young dependency ratio in 2018 coincided with the decline of the resident economically productive (male) population (see Table 2.4. 34), due to the departure of 13 individuals either for marriage or to find better employment elsewhere. During this period of spike in the number of newborns (23%), the number of families, marriages and households also increased although the average household size also reduced Many new families were established in 2017 as a result of new marriages (Table 2.4. 35, Figure 2.4. 16 and Figure 2.4. 17).

From 2016 to 2019, the population of Bay-ang had a generally declining trend (Table 2.4. 34), with declining birthrates due to increasing awareness of reproductive health and increasing prevalence of contraceptive use (Figure 2.4. 17), and moderate outmigration.

Table 2.4. 34 Bay-ang Population Growth, 2016 to 2019

	2016			2017			2018			2019		
AGE GROUP	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
<1 Year old	29	21	50	26	13	39	24	24	48	20	26	46
1-4	126	124	250	116	122	238	138	136	274	108	92	200
5-9	162	158	320	171	144	315	169	151	320	283	144	427
10-14	141	115	256	141	141	282	127	163	290	148	155	303
15-19	164	159	323	144	149	293	143	146	289	138	160	298
20-24	154	151	305	134	136	270	129	130	259	134	98	232
25-29	153	128	281	141	109	250	149	131	280	140	125	265
30-34	137	90	227	110	100	210	102	121	223	108	96	204
35-39	106	96	202	111	80	191	173	98	271	102	93	195
40-44	80	74	154	67	87	154	73	94	167	90	88	178
45-49	88	66	154	69	76	145	67	68	135	65	52	117
50-55	61	63	124	57	59	116	65	78	143	59	61	120
56-59	56	51	107	66	56	122	66	68	134	56	62	118
60-64	52	55	107	49	56	105	53	70	123	50	50	100
65-69	42	32	74	44	32	76	44	46	90	34	45	79
70-74	23	22	45	18	18	36	12	19	31	25	21	46
75-79	10	19	29	12	25	37	9	20	29	8	28	36
80-ABOVE	4	17	21	4	14	18	5	10	15	9	22	31
TOTAL	1553	1469	3022	1480	1417	2897	1548	1573	3121	1577	1418	2995
Changes				-5%	-4%	-4%	5%	11%	8%	2%	-10%	-4%

Source: Barangay Profile of Bay-ang

2.4.17.1.4 Gender ratio

As of 2019, males outnumber females by 11% in Bay-ang (Table 2.4. 35). This is the highest sex ratio since 2016, the lowest being 0.98 in 2017.

Table 2.4. 35 Gender Ratio in Bay-ang, 2016 to 2019

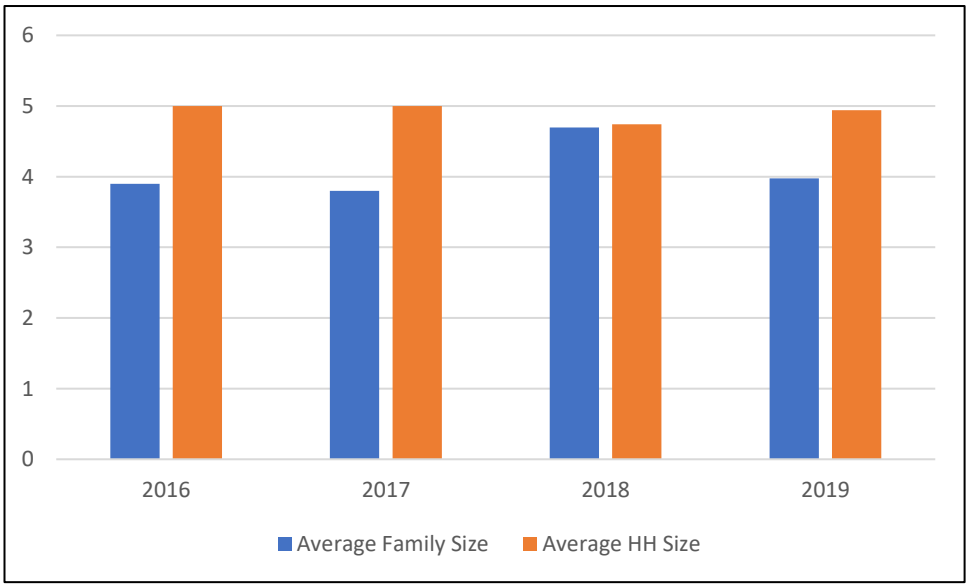
2016	**2017**	2018	**2019**
1.06	**1.04**	**0.98**	**1.11**

Source: Barangay Profile of Bay-ang

Table 2.4. 36 Population Density, Number of Families and Number of Households in Bay-ang, 2016 to 2019

	Population Density	No. of Families	No. of Households
2016	10.05	771	640
2017	9.6339	771	640
2018	10.379	787	658
2019	9.9598	753	638

Source: Barangay Profile of Bay-ang



Source: Barangay Profile of Bay-ang

Figure 2.4. 17 Changes in Average Family Size and Household Size in Bay-ang, 2016 to 2019

2.4.17.1.5 Income *and Employment*

Barangay Bay-ang is one of the progressive barangays of Ajuy. It is one of the coastal Barangays of Ajuy, located 20 kilometers away from the town proper. Their sources of income are through farming, fishing and some other business and human resources like overseas workers, teachers and some other professionals.

The land resources, which compose of agricultural land, residential land, institutional land, forest area, fishpond, and the mountainous area, have a total of 3,007.099 m^2. Coastal land resources encompass 200.002 m^2 or 6.7% of Barangay land area. In spite of the small percentage of coastal land area, fishery is a major livelihood source in Bay-ang.

Major Source of Income	Fishing
Major Field of Employment	Fish Drying

Major crops	Palay, Coconut and root-crops (Camote and Cassava)
Economic Services	
Agriculture:	
Major crops	Coconut and root crops
Livestock	Swine and Poultry
Social Sector	
Health Facilities	Brgy. Health Center
Educational Institution	Existence of Elementary and Secondary Schools in the area
Social Welfare Facilities	Barangay Day Care, Senior Citizen Center
Protective Services	Barangay Tanod
Infrastructure and Facilities	
Transportation	Tricycle and Single Motor
Communication	Globe and Smart Telecommunication
Power Supply	Iloilo Electric Cooperative III
Other Infra Facilities	Mini port, Multi-purpose Center, Market place-Bagsakan Center, Storm Drainage system

2.4.17.1.6 Barangay Coastal Management Initiatives

In view of the importance of fishery resources in local nutrition and livelihood, coastal resource management is strategic in maintaining social stability and sustainable, renewable food source not only of the population in Barangay Bay-ang, but likewise for the population of Ajuy.

The past marine conservation initiatives of the barangay were coastal clean-up and collection of discarded nets primarily to reduce the waste at the shoreline. Apart from this, mangrove tree planting was initiated to ensure the protection of soil erosion as well as a breeding area for marine organisms. The Barangay LGU adopted municipal fishery ordinances to support the Integrated Coastal Management (ICM). The BLGU recognizes the importance of marine resources as sources of livelihood, protection from big waves, and for erosion prevention.

2.4.17.1.7 Fisherfolks Association and Initiative

Barangay Bay-ang fisherfolks are actively functioning in Bantay Dagat though not all members are active in their participation. There is an existing Community Marine SCA Group registered to DOLE in 2014, with 172 members (100 female, 72 male). Barangay Bay-ang Fisherfolk Association (BBFA) expresses its initiatives by serving as Bantay Dagat for the enforcement.

2.4.17.1.8 Annual Investment Plan under Coastal Resource Management Program

For the Annual Investment Plan (AIP) 2018, Barangay Bay-ang has allocated funds for Environment (PHP 95,486), Economic Sector (PHP 74,190), Social Development (PHP 197,835.90), Gender and Development (PHP 7,350), and Disaster Risk Reduction (PHP 20,370.00).

2.4.17.1.9 Social Development Program

The Social Development Program of Bay-ang (Table 2.4. 37) are infrastructure projects needed by the community for water supply, waiting shed, streetlights for safety and security, rehabilitation of the multipurpose hall, and shed for people working the manual water pump owned by the Barangay. There are no “soft components” considered in the Bay-ang Social Development Plan due to budget limitations.

Table 2.4. 37 Social Development Projects under Barangay Development Plan

BARANGAY DEVELOPMENT PLAN
(Proposed Projects for Funding)
CY 2019
BAY-ANG

PROGRAM/PROJECTS/ACTIVITIES (Name of Projects)	Brief Description of the Projects	Quarterly Cash Requirements				Total Project Cost	Period of Implementation		Project Justification (Reason for Selected Program)
		1st	2nd	3rd	4th		Start	Finish	
SOCIAL DEVELOPMENT									
Const. of Cultural Stage	Purchase of Mat. & Facilities		70,000.00			70,000.00	April	June	To provide fund for the maint. of Day Care Center & Health Center
Rehab/Impt. of Water System	Purchase of Mat. & Water Facilities				40,000.00	40,000.00	Oct.	Dec.	For the benefit of constituents
Const. of Waiting Shed P2 & P3	For the Use of the Brgy.		110,000.00	60,000.00		170,000.00	April	Dec.	For the better structure of Brgy
Const./Maint. Of St. Lights	Rehab & Purchase of Elec. Supplies	121,446.00				121,446.00	June	March	To give better electrification during night time
Improvement/Rehab. Of Multipurpose Hall	Rehab & Purchase of Materials				144,338.00	144,338.00	Oct.	Dec.	To provide funds for the maint. of multi-purpose to cater OSY, womens
Const. of Water Pump Shed	Purchase of Materials			20,000.00		20,000.00	July	Sept.	Purchase of materials
	Sub-Total	121,446.00	180,00.00	80,000.00	184,338.00	565,784.00			

MIA B. BALAJADIA
Barangay Treasurer

FERDINAND B. BALURAN
Kgd. Chairman Committee on Infrastructure

ALVIN A. HARESCO
Kgd. Chairman Committee on Appropriation

JOSEPHINE A. BARRAMEDA
Punong Barangay

2.4.17.2 Socio Economic Profile of Barangay Pedada

Barangay Pedada is located in the southern part of the Municipality of Ajuy, Iloilo. It is 20 km away from the Poblacion and 80 km from Iloilo City. It is bounded on the north by Brgy. Luca and on the South by Brgy. Bay-ang, by Barangay Culasi on the north-eastern portion and Brgy. Santiago, Barotac Viejo on the west (see Figure 2.4. 1). The total population in 2016 was 1,741 composed of 443 households. From 2016 to 2019, Pedada population decreased by -6.7% or an annual average of -2% as many to almost 39 %. The total land area is estimated at 269.04 ha. Brgy. Pedada has 4 sitios or Purok where a council member is assigned. The majority of the households were beneficiaries of the Comprehensive Agrarian Reform Program (CARP) where the households availed at least one (1) ha of land each.

Source of livelihood and Income

The majority (72%) of the households in Pedada fish for their livelihood. The other sources are farm (8%), offer labor (8%), operate their own business (8%), practice seafaring (2%), or are pensioners (2%).

Generally, households in Pedada earn an average income of Php 4, 265.00 per month with the highest income pegged at Php 9, 000.00, and the lowest at Php500.00.

Education

The majority (32%) of the residents in Pedada graduated from high school, while 26 % reached high school but were not able to complete. 18% have reached the elementary level, but only 4% was able to graduate from elementary. Those who were able to reach college were 14%, while those who obtained a college degree is only 6 %.

Religious Affiliation

The majority (92%) of the households in Pedada is Roman Catholics. The remaining 8% are distributed into 6% Aglipayans and 2 % 7th day Adventists.

Lighting facility

Only 62% of the houses in Pedada have electricity. In the un-energized households, kerosene lamp is mostly used (95%, while the 5% use petromax).

Health and Sanitation

The majority (94%) of the households in Pedada have toilets while only 6% do not. Of the households with toilets, 60% are water sealed while the 40 % have “antipolo” or dug-pit type.

Daily food for most of the households consists of rice and fish.

For about 20 years, the common illness was high blood pressure, diabetes, arthritis, and pneumonia, diarrhea, and skin diseases. 2008 was considered as the year with the most cases of illnesses. Pedada residents stated that typhoon Frank damaged their water system, thus contaminating their water supply and making residents sick. Other diseases are caused by an unhealthy lifestyle.

The Source of water for the majority (80%) of the residents is deep well. The rest gets water from a spring (10%), an artesian well (8%), and/or and water service facility (2%).

The majority (86%) of the households in Pedada burn their garbage, 6% practice recycling, 6% both recycle and burn, while the remaining 2% bury waste materials.

Coastal and Marine resources

There are 24 species of mangroves in Pedada. The most important species are *Avicennia marina* and *Sonneratia alba*. *Avicennia m.* is the species with the highest average relative density and frequency, while *Sonneratia a.* is the predominant species. Stand basal area is high at 124.83 ha, reflective of the area's abundance of mature trees.

The physicochemical testing of soil and water revealed the water and soil to be slightly alkaline, as is common in coastal areas. High soil salinity and warm temperatures favor mangrove growth and survival.

Mangroves have been utilized by 22% of the residents in Pedada for firewood in the past 25 years. There is a total of 29.5 ha of mangroves remaining along the Pedada coastline.

The majority (50%) of the residents are not aware of the mangrove ordinance, 46% said they know about the mangrove ordinance, while only 4% have knowledge of it.

Corals

The latest survey shows that Pedada has a poor live hard coral cover with only 15.17%, and 73.2% were sand. This also relates to low rugosity with only 0.13 ± 0.02, which provides fewer crevices that could allow more spaces for fish.

Fish and fishing

Fish abundance in Pedada was moderate with an average of 233 individuals/250m^2 or 930 individuals/1000m^2. It comprised mostly of non-target fishes with a mean abundance of 219 individuals/250m2. Target fish are too low with only 10 individuals /250m2 which is not sufficient to support the growing population of Pedada. Fishing is engaged by 72% of the households in Pedada. The average number of years in fishing is 20 years with the longest pegged at 50 years. The average number of days a fisherman goes out to the sea to fish is 20 days per month, with an hour is spent in a day's fishing. The majority of the gears used are net. An estimated 46% of the households said that catch are both sold to traders and consumed at home.

The majority (58%) of the fishers said they know about the fishery ordinances, 38% said they familiar with them, while 4% said they do not have knowledge at all.

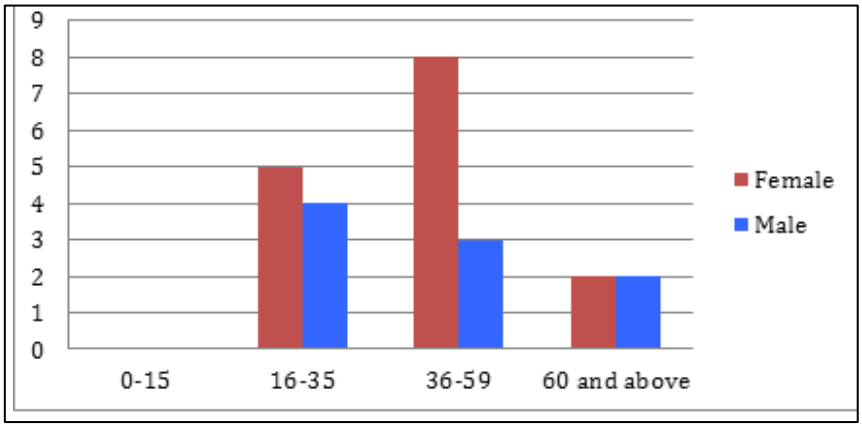
2.4.18 Socio Economic Profile of Primary Impact Population

A structured survey of the households within the Project site that will be relocated was conducted on July 5 to 8, 2019. A copy of the Household Survey Questionnaire and List of Heads of Families that need to be relocated are in **Annex N**.

2.4.18.1 Respondents' Profile

The respondents are the 128 inhabitants (24 families) of the Cemphil Lot 23 in Punta Bay-ang. Two (2) households are actually within the boundary of Lot 23 Punta Bay-ang. In consideration of the community's request to keep the community together, all households in the settlement cluster involving members within the Cemphil site are all considered as the primary impact population. Their residential cluster is only about 850 meters away from the Bay-ang community center in Purok 4, where they obtain drinking water. However, due to the lack of access road, the population of Purok passes a rugged 2.8-kilometer earthen road with forested sections through Mt. Bay-ang, or about thirty minutes by sea.

Amongst the respondent population, the majority (62.5%) identify as female while the minority (37.5%) are male. The eldest among all of the respondents is a female at 82 years old. The youngest respondents are three 22-year-old females. Overall, the average age among the respondents is 43 years (Figure 2.4. 18).



Source: Household Survey of Project PAF, 2018

Figure 2.4. 18 Gender-Age Distribution of Primary Impact Population

The household residence time range from five (5) to nine (9) years, while the average household size is 5.33 per household. The shortest time of residence as of 2019 would be five (5) years, while the longest is 51 years (Figure 2.4. 19).

Figure 2.4. 19 Respondents' Residency in the area

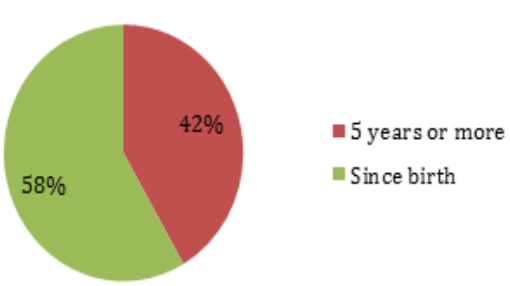
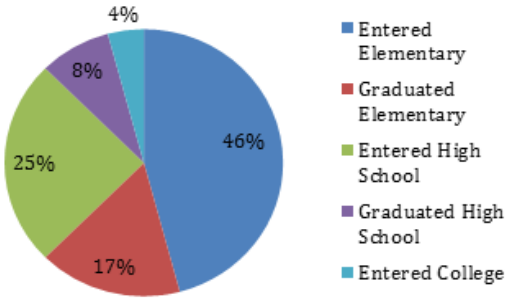


Figure 2.4. 20 Educational Attainment of Respondents



2.4.18.1.1 Educational Attainment

15 heads of families (63%) entered elementary, four (4) of whom have graduated; eight (8, 33%) entered high school, two (2) of whom have graduated high school; and one (1) entered college level (Figure 2.4. 20).

The majority (51%) of the reported total working-age population (15 to 60 years old) have reached or graduated high school, while 6% received higher education. This demonstrates that the educational level of more than half the population ranks average to high compared to the average years of schooling in the Philippines (9.5 years).

Three (3) have entered college, and two (2) of whom, coming from one common household, have completed college educations. The courses taken were BS Mechanical Engineering and BS Human Resource Management.

In addition to formal education, 12 people from 10 households reported to have received livelihood training. The livelihood training courses/programs taken are shown in Figure 2.4. 23.

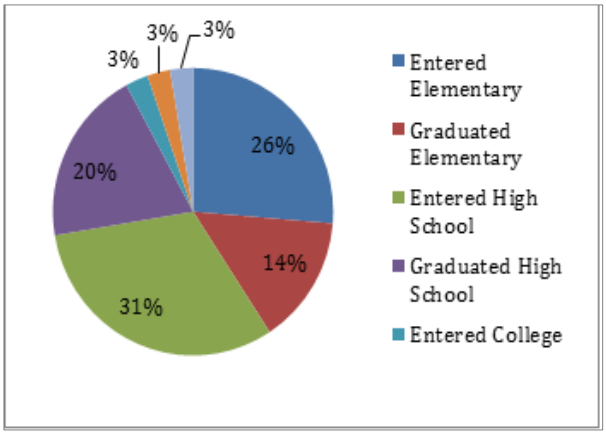


Figure 2.4. 21 Educational Attainment of the Labor Force in the Direct Impact Area

2.4.18.1.2 Livelihood Skills

A large percentage (38%) of the household heads have carpentry skills, 16% know about simple installation of household electrical connections. Other skills known by the sample include driving light-duty vehicles, tailoring, basic vehicle mechanical repair and maintenance work, commercial (town level) cooking, plumbing, beautician skills, and painting (Figure 2.4. 22). Many were also reported to have had livelihood training (Figure 2.4. 23). The most prevalent programs are fishing (27%), baking and pastry making (20%), and small engine repairing (13%).

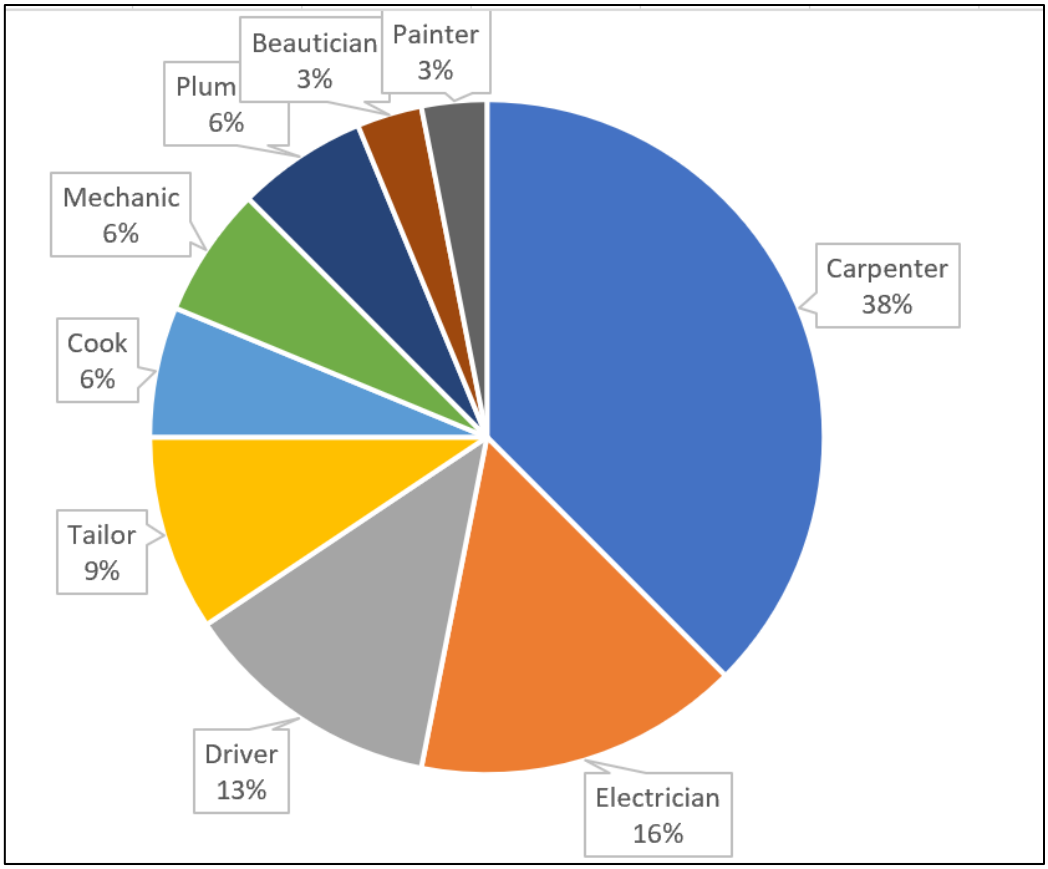


Figure 2.4. 22 Livelihood Skills among Impact Population Labor Force

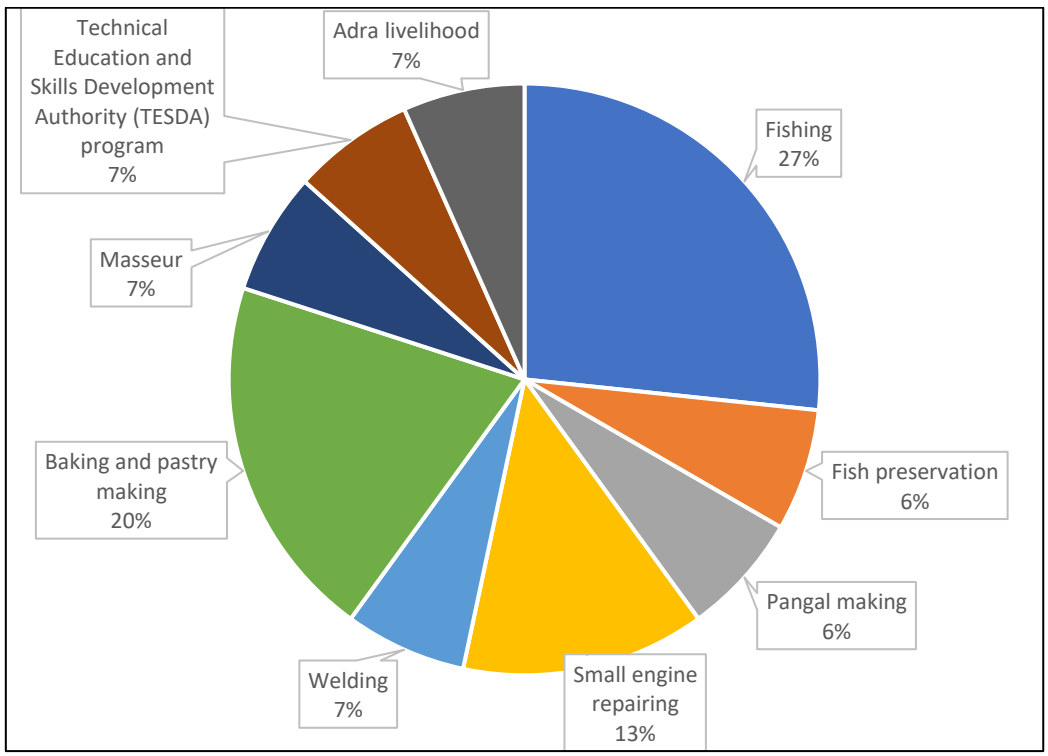


Figure 2.4. 23 Reported Livelihood Training Courses/Programs by Project Area Residents

2.4.18.1.3 Sources of Livelihood

The majority (21 of the 24 respondents) identified fishing as their primary livelihood, two (2) families depend on child support, while one (1) gets income by working as a chainsaw operator (Figure 2.4. 24).

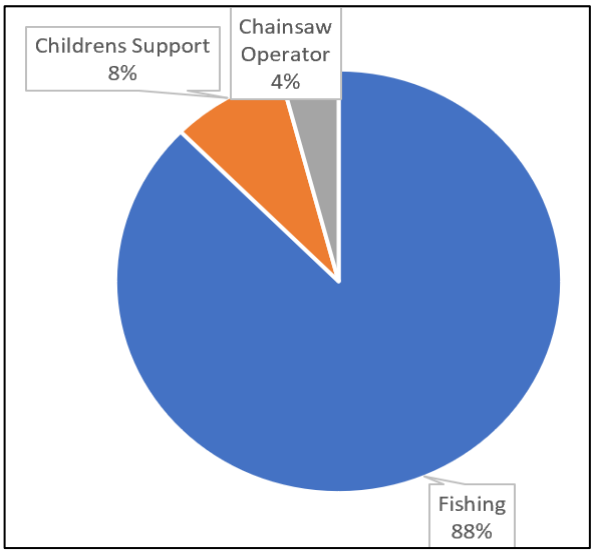


Figure 2.4. 24 Sources of Livelihood of Primary Impact Population

2.4.18.1.4 Income and Expenses

The daily income of the primary impact households ranges from PhP 30 to 1,500, with an arithmetic mean of Php 364. There are days they earn more than usual and, in those days, the daily income ranges from PhP 50 to PhP 10,000, with a mean of PhP 1,473.80. On the other hand, the average daily household expenditure is PhP 171 PHP (ranging from 20 to 500 PHP) and the average maximum daily expenditure is around PhP 329 PHP. Hence, the households in the project area are able to save between PhP 192 to PhP 1,145 in a day, depending on the season.

2.4.18.1.5 Tenure

The residents of Lot 23 have no legal claim to the land, which was recently purchased by Cemphil. None of them rent houses, but only eight (8, 33.33%) own the house they live in. The rest live in houses owned by other persons, with the owners' consent. Only one household pays rent for the land of their dwelling.

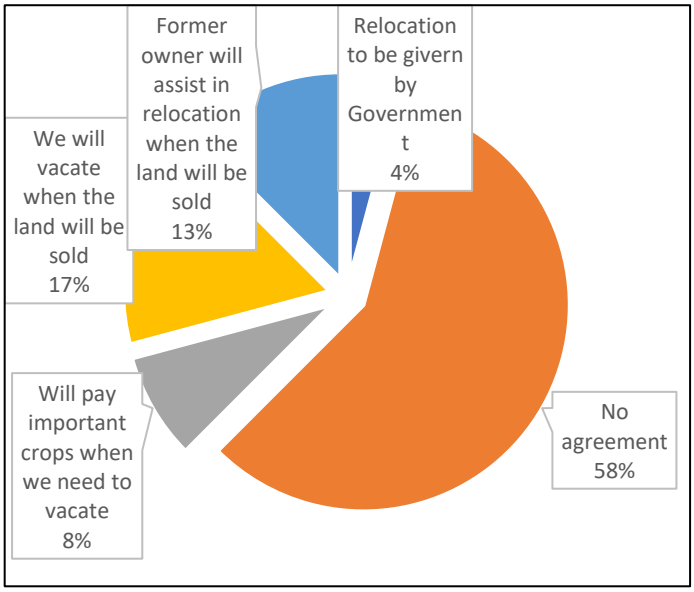


Figure 2.4. 25 Agreements with former Landowner when /if the Land is Sold or Needed

With regards to relocation, the majority (96%) of the respondents stated they are willing to be peacefully relocated; only three (3, 12.5%) have a relocation area in mind. Four (4) families (17%) replied they had agreements with the landowner to vacate the land when the land will be sold. Three (3, 3%) families responded that the former owner said he will assist in relocation when the land will be sold. Two (2) families (8%) responded they had an agreement with the former landowner regarding payment for important crops they have planted in the land when they must vacate. However, since the former landowner sold the land without their knowledge, they have harvested and sold the trees they planted. One (1) respondent claimed that the local government said they will be given land when they need to relocate more than half (58%) of the families had no agreement with the former landowner regarding any arrangements if or when the land is sold (see Figure 2.4. 25).

2.4.18.1.6 Informal settlement with Consent of Landowner

The majority (83%) of the settlers within Lot 23 have settled in the area with the consent of the landowner (Figure 2.4. 26). The common arrangements are for the families to live in the area, to plant trees, and to relocate when the land is needed by the owner. It is recalled that "site possession and implementing land development" which the informal settlers have done representing the landowner, are among the requirements for land titling under the Public Land Act, Commonwealth Act 141, amended by Act 2874 and Republic Act 11231.

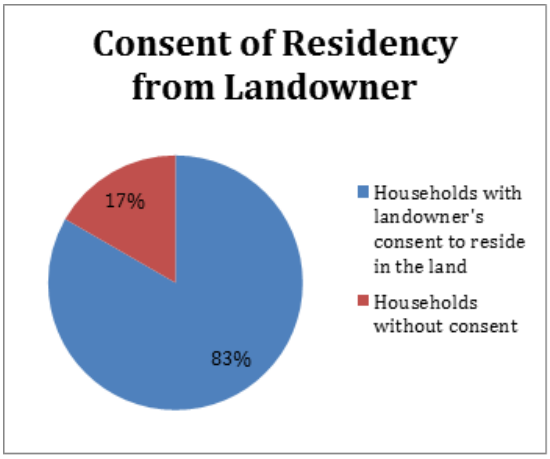


Figure 2.4. 26 Settlement with Landowner Consent

2.4.18.1.7 Settlers' Willingness to Relocate

Almost all (96%) of the settlers in Lot 23 are willing to relocate (Figure 2.4. 27). The majority had an agreement with the landowner that they will relocate or vacate the area when the landowner will need the land. A couple of families recall that the landowner mentioned they will be compensated for the trees they have planted and assisted to find a place to transfer and hold on to the hope that they will be given help to relocate rather than voluntarily and independently vacate the area.

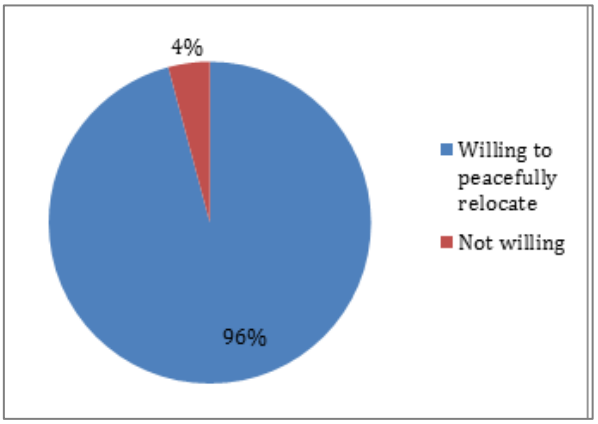


Figure 2.4. 27 Willingness to Relocate

2.4.18.1.8 Home Ownership

Less than half (33%) of the settlers own or co-own the house they live in. The majority (67%) live without rent in dwelling structures owned by previous residents (Figure 2.4. 28).

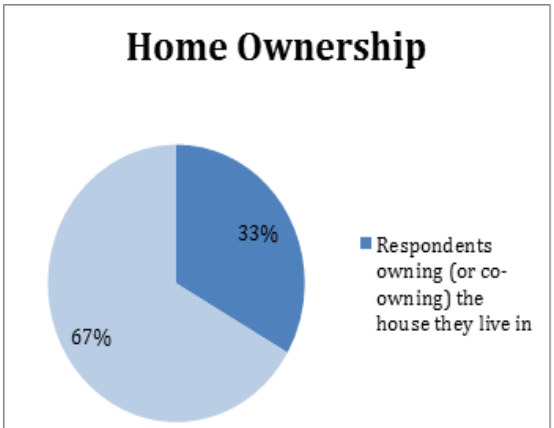


Figure 2.4. 28 Home Ownership

2.4.18.1.9 Housing Materials

All of the dwelling structures are single-detached units and made of light materials. The floor area of homes in the project area ranges from 15 to 816 m^2, with a mean area of 180 m^2. The majority (54%) use GI Sheet for roofing; the most popular wall material used is plywood (46%); the most commonly used flooring material is cement (38%) and bamboo (29%). The majority of the houses have floors elevated at least 0.5 meters from the ground, allowing tidal intrusions in inclement weather. Geo-tagged photos of the houses are in **Annex R**.

2.4.18.1.10 Health

2.4.18.1.10.1 Morbidity Causes

The survey asked the most occurring illnesses in the respondents' families. This is to aid in measuring the extent of the community's health and the provision of health facilities.

These are the expressed causes of morbidity in the community per thousand population (Figure 2.4. 29):

- Rank 1 (125/1000) Upper respiratory tract infection (cough, colds)
- Rank 2
  - Diarrhea (93.75/1000)
  - Toothaches (93.75/1000)
- Rank 3 (78.13%/1000) – Wounds
- Rank 4
  - Asthma (39.06/1000)–
  - Scabies, Boils, Other skin disease (39.06/1000)–
- Rank 5
  - Pneumonia (31.25/1000)–
  - Rheumatoid arthritis (31.25/1000)–
- Rank 6 - Kidney stones/ Urinary tract infection (23.44/1000)–
- Rank 7
  - Pulmonary tuberculosis (15.83/1000)
  - Acute Tonsillitis or Pharyngitis (15.63/1000)
- Rank 8
  - Systemic viral infection (7.61/1000)
  - Heart ailment (7.61/1000)
  - Diabetes (7.61/1000)

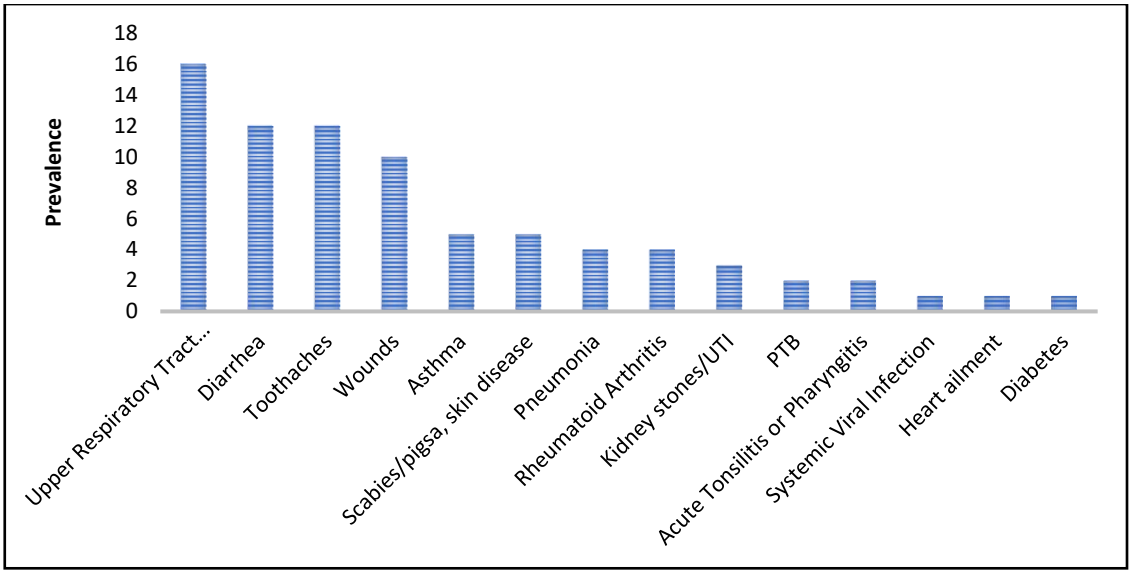


Figure 2.4. 29 Causes of Morbidity among the Primary Impact Population, 2019 (Cemphil Lot 23 Residents)

The respondents were also asked about what they perceive to be the topmost common causes of death in their area (Figure 2.4. 32). The causes of mortality based on the responses are:

- Rank 1 ((210.94/1000)– Old age
- Rank 2 (46.88/1000)– Heart Attack
- Rank 3 (39.06/1000) – Dengue
- Rank 4 (15.63/1000) -Liver Disease
- Rank 5 (7.81/1000)– Vehicle Accident (outside Punta Bay-ang)

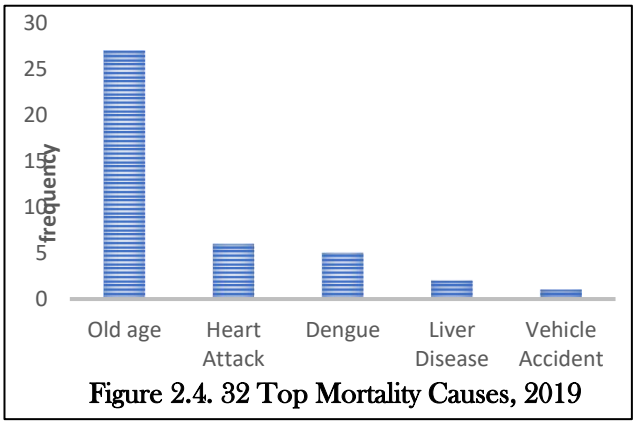


Figure 2.4. 32 Top Mortality Causes, 2019

Figure 2.4. 30 Perception of Access to Health Services

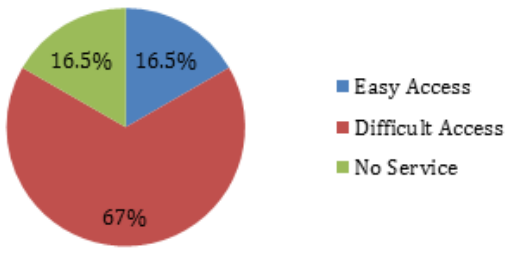
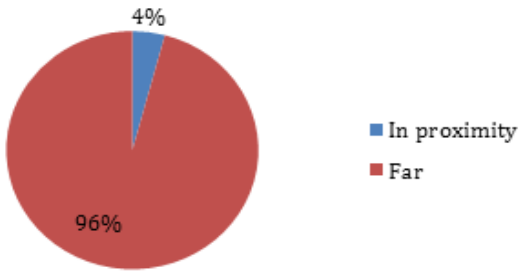


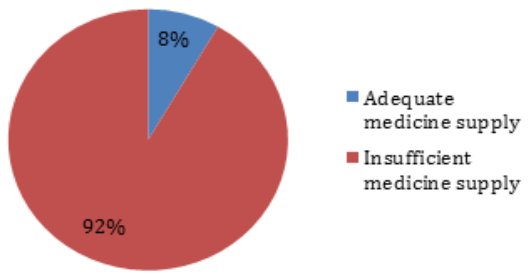
Figure 2.4. 31 Perception of Proximity to Health Center



2.4.18.1.11 Perception Regarding Health Services

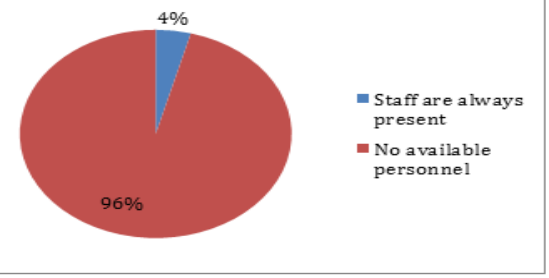
The respondents were asked to assess the accessibility of health services in the area. Only a few (16.5%) consider the health services to be easily accessible; the majority (67%) deem the services to be difficult to access, while 16.5% responded that there are no services whatsoever (Figure 2.4. 31). Almost all respondents (96%) responded that the distance of the health center is the primary reason for the inaccessibility of health services (Figure 2.4. 31). The Barangay Health Center is located in Purok 4, about 900 meters from Lot 23. The population in Purok 6 including Cemphil Lot 23 must go around through Mt. Bay-ang to reach the Barangay Health Center.

Figure 2.4. 34 Medicine Supply



Almost all claim that the health center staff is never present (96%) and that there are no medical practitioners that visit the Barangay (Figure 2.4. 33). Also, almost all respondents (92%) responded that the medicine supply in the health center is inadequate (Figure 2.4. 34).

Figure 2.4. 33 Availability of Health Center Staff



2.4.18.2 Displacement of Settlers

The 24 informal households in Cemphil Lot 23 will be willingly relocated to an area where they will be provided with titles to permanent and durable house structures and a lot. The relocation area will have water, power, and sanitation services which currently are not available in their homes. They will likewise be provided with assistance to purchase pedicabs for each family's means of transport and livelihood and will still be allowed to fish in their current fishing grounds, within the guidelines of the local government units. They will be given priority for training, hiring, and scholarships for their children under Cemphil and its subcontractors. Given this opportunity, the families that informally settled in the Cemphil property may be in a better situation than at present.

2.4.18.3 Displacement and Disturbance of Properties

Informal settlers reside within the project area (Cemphil Lot 23). Reportedly, all are willing to be relocated and trained to work in Cemphil, Inc. Cemphil, Inc. shall grant the operation of its plant canteen and its facilities to the People's Cooperative. The People's Cooperative will operate the Canteen from where all Plant workers and visitors may have regular meals and manage the Social Development Program activities among the direct impact population. Profits therefrom will go to their children's school requirements, family health emergency fund, and disaster emergency pool fund.

2.4.18.4 Change/Conflict in Land Ownership and Right of Way

Cemphil, Inc. has acquired a private land for the cement plant. The project is acceptable and well-perceived by the host and indirect-impact communities. There is no conflict in land ownership or on the right of way for Plant operations.

2.4.18.5 Impact on Public Access

The Project will cause increased public access to the surrounding areas by constructing the Bay-ang Pedada Coastal Road, which will be submitted to EMB Region 6 for environmental clearance. The project is proposed to be the centerpiece of the Ajuy Industrial Zone/Ecozone, which is envisaged to be a development attractor and employment generator. Because of this, the National Economic Development Authority Region VI and DPWH Region VI have included the Pedada-Bay-ang Road, Pedada -Junction Bay-ang Road and the Mt Bay-ang Road section (see **Figure 1.2**). These roads are intended to support the Ajuy Ecozone. Countryside Ecozones are among President R.R. Duterte's campaign promises to generate jobs in the countryside.

2.4.18.6 In-migration and Proliferation of Informal Settlers

The project has great potential to attract migrants because of the employment opportunities they will arrive during the Construction Phase and Operations Phase. Considering around 40% of the labor force of Ajuy is unemployed or underemployed, in-migration may be controlled through cooperation between the Project and the Local Government Units. The plan to mitigate this impact is discussed in the Environmental Management Plan.

2.4.18.7 Cultural/Lifestyle change

The project is not expected to cause a significant change in the culture and lifestyle of the host barangay and its neighboring communities during the Construction and Operation Phases because the majority of the labor, skilled, semi-skilled, and professional requirements for the Project will first be sourced in Ajuy.

It is expected that cement haul truck drivers from all over Panay Island will at some time visit Barangay Bay-ang, thus the interaction of locals and migrants from other islands in the Visayas, such as Cebuanos and Waray people, will transpire. As the Hiligaynons that predominate the Panay Island are likewise the predominant population in Ajuy and in Barangay Bay-ang, the changes in the local culture may not be very significant. However, the lifestyle of the local populace may change over time due to increased family income and access to modern conveniences, communication, and lifestyle models promoted by television and commercialism.

2.4.18.8 Impacts on Physical Cultural Resources

The project site or the access points to the project site are not known to have significant physical cultural resources as of date. The project will likewise not need to physically disturb areas outside of the Cemphil property. Should anything of archaeological, historical, religious, or cultural significance be found during the construction of Cemphil project facilities, they will be brought to the attention of the National Museum of the Philippines Archaeology Division, copy furnish the Environmental Management Bureau Regional Office.

2.4.18.9 Generation of Local Benefits from the Project

Triggered by the construction of the Pedada-Bay-ang and Mt Bay-ang road, employment opportunities, local and national taxes, economic opportunities for local entrepreneurs to trade in cement, lower cost of cement, and social development assistance projects are among the benefits that will be among the local benefits generated by the Project.

2.4.18.10 Enhancement of Employment and Livelihood Opportunities

Cemphil, Inc. will generate employment and livelihood opportunities for the local communities.

2.4.18.11 Increased Business Opportunities

Business opportunities will arise in auxiliary and ancillary services for cement grinding: engineering and construction subcontracts, material supply, equipment maintenance, and logistic support, such as trucking, vehicle maintenance, equipment maintenance, and parts supply. The food industry, agricultural production, housing industry, construction materials supply, and general population requirements may also arise because of the predicted increase of purchasing power among the community.

2.4.18.12 Increased Revenue of LGU

The local government units will receive increased revenues from real government taxes due to the project and from the additional businesses that would be generated once the project commences. The local government will also benefit from business taxes from the project and downstream new businesses that the project will cause such as gasoline stations, food businesses, pharmacies, entertainment, from taxes from local advertising/billboards, and others.

2.4.18.13 Benefits for the National Government

The national government stands to gain taxes from the project and personnel income, importation duties, reduced cement importation that reduce foreign exchange reserves, and readily available cement for infrastructure projects, which help reduce government accounts for Interest During Construction for its loan-funded projects and stabilize cement prices.

2.4.18.14 Traffic Congestion

Possible sources of traffic include the transport of raw materials and coal to the cement plant and the distribution of products by land.

Traffic congestion in front of the Barangay Bay-ang Barangay Hall and at the narrow road section connecting Bay-ang Barangay Hall to the national highway may occur if this route is used for product dispatch.

To mitigate this concern, efforts were exerted by the Municipal Government to seek National Government assistance to construct an all-weather, industrial road passing through Barangay Pedada to link the proposed Municipal Industrial zone to the National Highway. The Pedada Industrial Road has been discussed at the level of NEDA Region VI and DPWH Region VI and site visits have been conducted. **Figure 1.2** shows the alignment of the alternative access roads to project site.

2.4.19 The Municipality of Barotac Viejo

The Municipality of Barotac Viejo is a 3rd class municipality located west of the Municipality of Ajuy, with a total land area of 18,578 hectares and population of 45,808 people as of the 2015 census.

Barotac Viejo is politically subdivided into 26 barangays, as follows:

Table 2.4. 38 Population of Barotac Viejo by Barangay, 2015

Barangay Name	2015 Population	Portion of Municipal Population
Bugnay	679	1%
California	861	2%
Del Pilar	734	2%
De la Peña	1,064	2%
General Luna	1,797	4%
La Fortuna	1,448	3%
Lipata	2,019	4%
Natividad	2,218	5%
Nueva Invencion	1,897	4%
Nueva Sevilla	2,103	5%
Poblacion	4,824	11%
Puerto Princesa	1,060	2%
Rizal	1,266	3%
San Antonio	2,076	5%
San Fernando	1,505	3%
San Francisco	895	2%
San Geronimo	1,295	3%
San Juan	1,909	4%
San Lucas	4,519	10%
San Miguel	1,467	3%
San Roque	1,384	3%
Santiago	2,366	5%
Santo Domingo	1,257	3%
Santo Tomas	1,504	3%
Ugasan	1,221	3%
Vista Alegre	2,440	5%
Total	45,808	100.00%

Source: Census of Population 2015, Philippine Statistics Authority

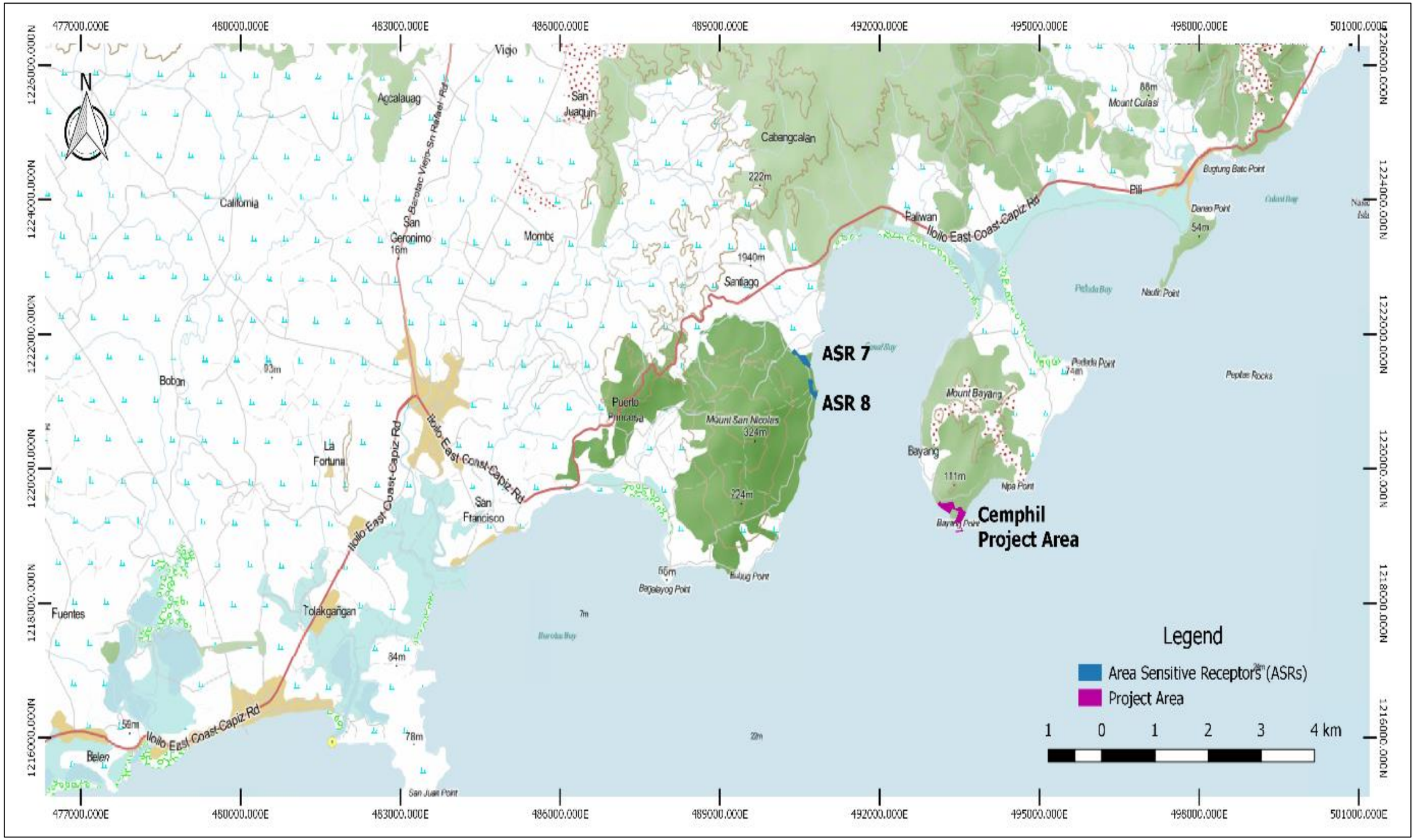


Figure 2.4. 35 Location of Area Sensitive Receptors in Barotac Viejo

Basemap source: Philippine Geoportal

2.4.19.1 Area Sensitive Receptors

Two Area Sensitive Receptors (ASRs) in Barangay Santiago, Municipality of Barotac Viejo (see Figure 2.4. 35), approximately 3.44 kilometers obliquely across Canal Bay from the Cemphil Plant site, were identified as potential receptor of air pollution in excess of air quality standard for about one hour once a year under uncontrolled scenario of the Cemphil operations (see Figure 2.3.12, Table 2.3.11).

From google earth imagery captured in **Figure 2.4. 36**, some 18 houses were counted in ASR 7 and 14 houses in ASR 8. The Don Felix Tupas Sr. Beach Resort is also located within ASR8.

About 800 meters from ASR 8 in Sitio Dalusan, Barangay Santiago, Barotac Viejo, is another local resort facility, Leda's Garden Beach (see **Plate 2.4.1**).

Under controlled scenario, that is, when the Project air pollution control installations are operating, the peak increase in ambient particulates reaching ASR 7 and ASR 8 are forecast to reach 23.2μg/Ncm and 18.4 μg/Ncm respectively, occurring about one hour in one year. Even under the uncontrolled scenario, the ambient particulates from the project reaching Barangay Santiago in Barotac Viejo are expected to be within the National Ambient Air Quality Standard (see Table 2.3.11) in 98% of the time (see Table 2.3. 11).

Figure 2.4. 36 Closeup of Location of Area Sensitive Receptors in Barotac Viejo

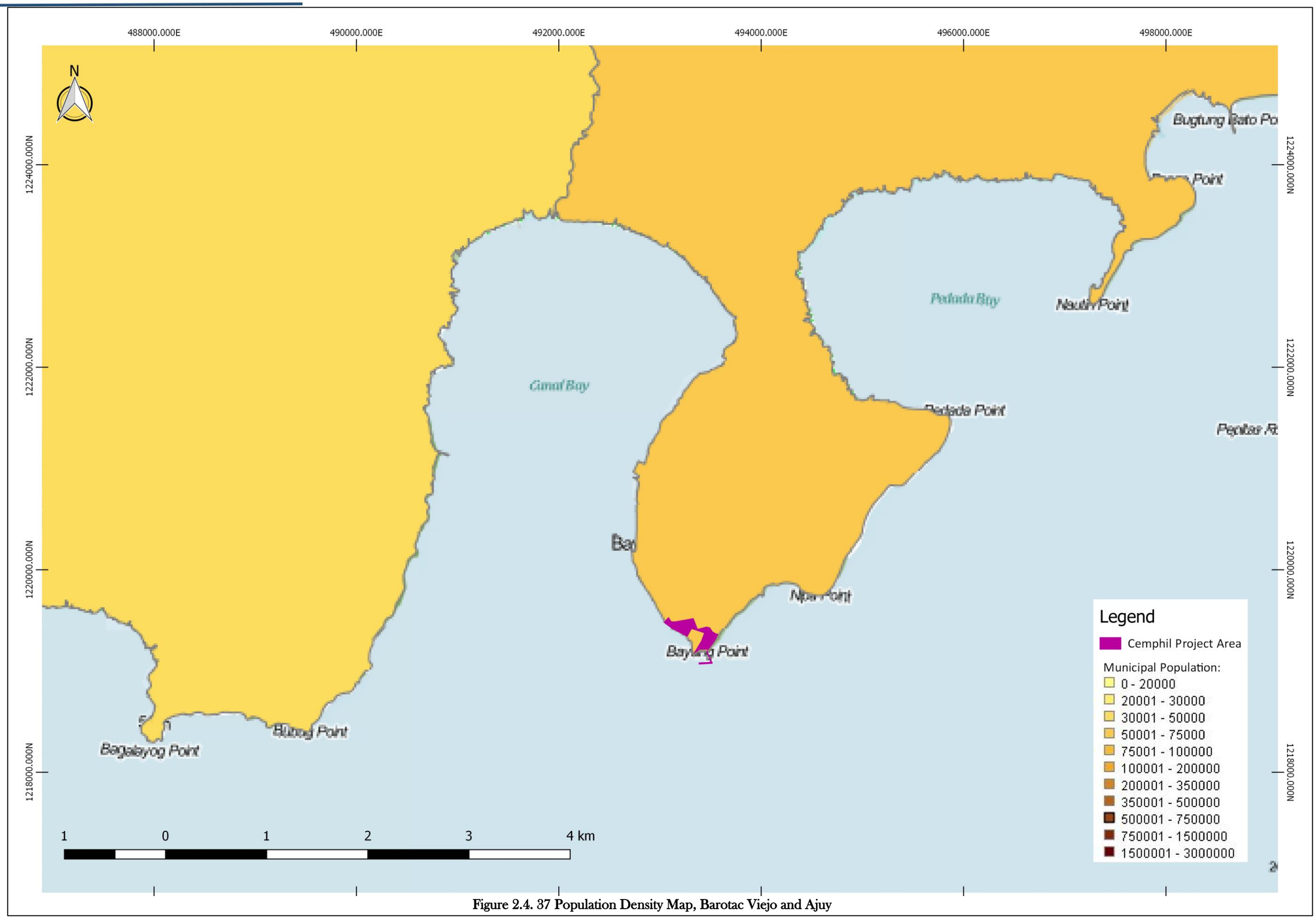
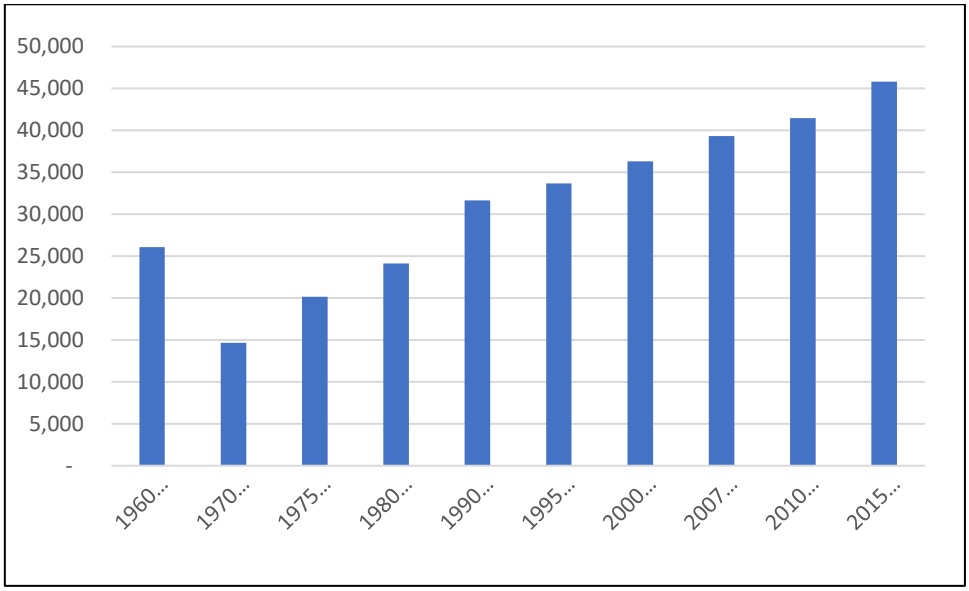


Figure 2.4. 37 Population Density Map, Barotac Viejo and Ajuy

Source: Philippine Geoportal

Plate 2.4.1 View of Project Area as seen From Leda's Garden Beach Resort in Sitio Dalusan, Brgy. Santiago, Barotac Viejo



Source: Philippine Statistics Authority

Figure 2.4. 38 Barotac Viejo Population Growth, 1960 to 2015

2.4.19.2 Demographics

2.4.19.2.1 Population Growth Rate

Barotac Viejo experienced an annual average growth rate of 2% from 1960 to 2015, as per national census data (see Figure 2.4. 38).

2.4.19.2.2 Population Density

The average population density in Barotac Viejo of 2.91 persons per hectare is slightly lower than in the Municipality of Ajuy of 2.98 persons per hectare. See Table 2.4. 39

The Gender Ratio in Barotac Viejo was 1.065 in 2015, with 1.065 males for every female (Table 2.4. 39).

Table 2.4. 39 also shows that the labor force (15 to 59 years old) of the Municipality of Barotac Viejo comprises 59% of its population, which is lower than the national figure of 63.3% in October 2015.

Table 2.4. 39 Gender Distribution by Age Group, Barotac Viejo, 2015

Age	Both Sexes	Male	Female	Proportion of Municipal Population
All Ages	45,808	23,630	22,178	
Under 1	920	480	440	2.0%
1 - 4	3,976	2,043	1,933	8.7%
5 - 9	4,926	2,541	2,385	10.8%
10 - 14	4,739	2,469	2,270	10.3%
15 - 19	4,514	2,341	2,173	9.9%
20 - 24	4,061	2,124	1,937	8.9%
25 - 29	3,698	1,953	1,745	8.1%
30 - 34	3,131	1,699	1,432	6.8%
35 - 39	2,911	1,549	1,362	6.4%
40 - 44	2,536	1,382	1,154	5.5%
45 - 49	2,388	1,256	1,132	5.2%
50 - 54	2,071	1,065	1,006	4.5%
55 - 59	1,761	887	874	3.8%
60 - 64	1,432	689	743	3.1%
65 - 69	1,000	450	550	2.2%
70 - 74	728	320	408	1.6%
75 - 79	536	216	320	1.2%
80 years and over	480	166	314	1.0%

Source: Philippine Statistics Authority

2.4.19.2.3 Marital Status

Almost half (44%) of the population of Barotac Viejo are married (see Table 2.4. 40). The single population 10 years and older comprise 43% of the population, however, the bulk of the singles group are aged below 20 years old, to 29.

Table 2.4. 40 Total Population 10 Years Old and Over in Barotac Viejo by Age Group and Marital Status, 2015

Age group	Total Population 10 Years Old and Over	Marital Status					
		Single	Married	Widowed	Divorced/ Separated	Common-Law/ Live-in	Unknown
Below 20	9253	8995	56	1	5	196	-
20 - 24	4061	2728	636	2	16	679	-
25 - 29	3698	1489	1500	7	31	670	1
30 - 34	3131	719	1930	28	39	415	-
35 - 39	2911	470	2100	28	52	261	-
40 - 44	2536	281	2010	58	34	153	-
45 - 49	2388	222	1933	77	45	111	-
50 - 54	2071	169	1666	123	43	70	-
55 - 59	1761	155	1356	182	24	44	-
60 - 64	1432	104	1038	227	25	38	-
65 - 69	1000	69	651	255	12	13	-
70 - 74	728	55	411	247	8	7	-
75 - 79	536	48	239	238	5	6	-
80 & over	480	42	160	276	1	1	-
Total	35986	15546	15686	1749	340	2664	1
	100%	43.20%	43.59%	4.86%	0.94%	7.40%	0.00%

Source: Philippine Statistics Authority

2.4.19.2.4 Household Size

Majority of households in Barotac Viejo have four (4) members, and the average household size is 4.1. Households headed by age group 40 to 49 years old have an average household size of 5 persons, and households headed by persons within the age group of 50 to 59 have an average size of 4.6 and the average household size tend to decline to 2.9 and less as the age of household head increase to 80 years old and over (see Table 2.4. 41).

Table 2.4. 41 Number of Households in Barotac Viejo by Age Group and Household Size, 2015

Age Group	Total Number of Households		Household Size								Average Household Size
			1	2	3	4	5	6	7	8 & over	
Below 20	37	0.3%	12	11	10	2	2	-	-	-	2.2
20 - 29	1,364	12.3%	96	209	549	355	117	27	7	4	3.2
30 - 39	2,430	21.9%	111	196	543	688	462	261	99	70	4.1
40 - 49	2,432	21.9%	121	147	309	470	488	359	243	295	5.0
50 - 59	2,161	19.5%	148	220	352	408	364	284	172	213	4.6
60 - 69	1,542	13.9%	185	300	315	266	178	115	87	96	3.8
70 - 79	846	7.6%	190	258	154	100	60	45	15	24	2.9
80 years and over	279	2.5%	101	76	45	23	15	11	7	1	2.4
Total	11,091		964	1,417	2,277	2,312	1,686	1,102	630	703	4.1
	100%		9%	13%	21%	21%	15%	10%	6%	6%	

Source: Philippine Statistics Authority

2.4.19.3 Education

2.4.19.3.1 Literacy Rate

Most (98.84%) of the population above 10 years old are literate. 1.16% or 414 illiterate individuals in the sample, 56.76% or 235 of which are male and 43.24% or 179 are female. The age group with the biggest literacy rate (99.46%) is ages 25-29, while ages 65 and over had the lowest literacy rate with 95.13% or a 4.82% illiteracy rate. It is inferred the literacy rate is increasing and will continue to increase as there is slightly more literate youth than literate elderly. See the table below:

Table 2.4. 42 Literacy of the Household Population 10 Years Old and Over in Barotac Viejo, by Age Group

Age Group	Household Population			Literate			Literate (%)		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
10 - 14	4739	2469	2270	4710	2448	2262	99.40	99.15	99.65
15 - 19	4508	2335	2173	4482	2320	2162	99.43	99.36	99.49
20 - 24	4025	2090	1935	3994	2070	1924	99.24	99.04	99.43
25 - 29	3652	1909	1743	3632	1896	1736	99.46	99.32	99.60
30 - 34	3084	1653	1431	3066	1640	1426	99.43	99.21	99.65
35 - 39	2877	1516	1361	2853	1499	1354	99.18	98.88	99.49
40 - 44	2492	1343	1149	2464	1323	1141	98.91	98.51	99.30
45 - 49	2343	1211	1132	2318	1191	1127	98.95	98.35	99.56
50 - 54	2044	1039	1005	2020	1028	992	98.82	98.94	98.71
55 - 59	1752	878	874	1723	865	858	98.34	98.52	98.17
60 - 64	1425	683	742	1397	670	727	98.04	98.10	97.98
>65	2738	1147	1591	2606	1088	1518	95.13	94.86	95.41
Total	35679	18273	17406	35265	18038	17227	98.84	98.71	98.97

Source: Philippine Statistics Authority

2.4.19.3.2 Profile of Education

The majority (72.05%) of individuals aged five (5) to 24 attended school at the time of the survey. There are slightly more females (72.93%, overall) in schools than males (71.22%, overall), except for the age group 20 to 24, in which there are slightly more males (16.46%) than females (14.32%). The majority that belonged in the age groups five (5) to nine (9) and 10 to 14 were in school (97.22% and 97.66% respectively), however, only 68.17% of those in the age group 15 to 19 and only 15.43% of those in the age group 20 to 24 were attending school. It is also possible some individuals in the age group 20 to 24 may have already finished their studies at the time of the survey. See Table 2.4. 43.

Table 2.4. 43 Household Population Who Attended School in Barotac Viejo by Age Group, 2015

Age Group	Household Population (5 to 24 Years Old)			Household Population Who Were Attending School (5 to 24 Years Old)			% of Household Population Who Were Attending School (5 to 24 Years Old)		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
5 - 9	4926	2541	2385	4789	2461	2328	97.22	96.85	97.61
10 - 14	4739	2469	2270	4628	2385	2243	97.66	96.60	98.81
15 - 19	4508	2335	2173	3073	1530	1543	68.17	65.52	71.01
20 - 24	4025	2090	1935	621	344	277	15.43	16.46	14.32
Total	18198	9435	8763	13111	6720	6391	72.05	71.22	72.93

Source: Census of Population and Households 2015, Philippine Statistics Authority

According to the census (see Table 2.4. 44), 2% or 1,003 of the 40,912 total population are individuals who are aged 6 and below and have not completed any nursery or pre-school preparation. At the time of the census, it is assumed around 378 (0.92%) are in preschool. This figure was taken from the number of five (5) year old children who attained preschool education as preschool age, according to DepEd Region VI.

For those aged 15 (minimum employable age) and above, 0.76% or 312 have no educational attainment, indicating good access to, and value of education.

Forty-two (42) individuals have received special education.

The elementary level is the highest educational attainment of the largest proportion of residents with 37% or 15,077. Of the 15,077, 3,838 (9.38%) elementary student-aged persons (6 to 12 years old) were in elementary and 508 (11.69%) graduated.

The second-largest proportion of the sample has high school as their highest education level attained (35%). The high school age range was 12 to 16 before the adaption of K-12; it is assumed 2,684 (6.56%) of this age range were in high school during the time of the survey and 192 (0.47%) have graduated.

1,459 or 4% of the total sample population have a post-secondary education background; 97.26% (1,419 or 3% of the total sample population) of which graduated during the time of the survey, while 2.74% (40 or 0.10% of the total sample population) are post-secondary education undergraduates.

There are 7,998 individuals who attained college education, but 3,765 (9% of the total sample population) were not able to attain degrees or were undergraduates. 4,205 or 10% of the residents are academic degree holders, and 28 (0.07%) have attained post-baccalaureate studies.

2.4.19.4 Employment Summary

A gainful worker refers to a worker who receives steady work and payment from their livelihood or employer. In Barotac Viejo, Elementary Occupations is the occupation group with the most percentage (35%) of reported gainful workers, followed by the Skilled Agricultural Forestry and Fishery Workers (21%). At 2,851 or 14.3%, the age group 25 to 29 has the greatest number of gainful workers. 878 (5.3%) individuals aged 65 and above are still gainfully employed. Please see Table 2.4. 45.

2.4.19.5 Housing and Tenure

2.4.19.5.1 Household Profile

There is a total of 11,076 reported the number of households and 11,076 reported occupied housing units in Barotac Viejo as of 2015 (Table 2.4. 46). Most (98%) of the housing units are single houses. The single houses in the municipality have an average household size of 4.11 and a ratio of household population to occupied housing units of 4.12. Other established housing types is a duplex (2%). The majority (61%) of the housing units are owned by their occupants but stand in another person's lot; the occupants reside in the lot rent-free and with consent from the owner. 30% of the households own both the housing unit and the lot (Table 2.4. 47).

Table 2.4. 44 Educational Attainment of the Population of Barotac Viejo

Highest Grade/ Year Completed	Total Population 5 Years Old and Over		Age																	
			5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 - 24	25 - 29	30 - 34	35 & over
No Grade Completed	1,003	2%	602	54	8	5	4	4	3	5	5	1	6	12	9	8	3	24	14	14	222
Pre-School	1,125	3%	378	640	91	5	5	-	1	1	1	-	-	-	-	-	-	1	-	-	2
Special Education	42	0%	-	1	5	2	-	1	-	3	1	5	-	5	2	2	1	11	2	-	1
Elementary	15,077	37%	-	304	965	977	880	969	888	847	555	271	186	100	90	106	111	497	524	553	6,254
1st - 4th Grade	7,931	19%	-	304	965	977	880	828	392	165	109	56	53	37	28	29	38	174	198	228	2,470
5th - 6th Grade	2,517	6%	-	-	-	-	-	141	387	283	125	58	40	17	18	29	23	96	101	100	1,099
Graduate	4,629	11%	-	-	-	-	-	-	109	399	321	157	93	46	44	48	50	227	225	225	2,685
High School	14,208	35%	-	-	-	-	-	-	-	121	398	659	837	669	522	396	350	1,760	1,682	1,408	5,406
Undergraduate	6,913	17%	-	-	-	-	-	-	-	121	398	659	822	492	249	160	158	655	629	486	2,084
Graduate	7,295	18%	-	-	-	-	-	-	-	-	-	-	15	177	273	236	192	1,105	1,053	922	3,322
Post-Secondary	1,459	4%	-	-	-	-	-	-	-	-	-	-	-	-	1	10	31	227	293	187	710
Undergraduate	40	0%	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	6	10	7	15
Graduate	1,419	3%	-	-	-	-	-	-	-	-	-	-	-	-	-	10	30	221	283	180	695
College Undergraduate	3,765	9%	-	-	-	-	-	-	-	-	-	-	-	95	279	356	305	810	426	337	1,157
Academic Degree Holder	4,205	10%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	730	754	627	2,072
Post Baccalaureate	28	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	5	19
Not Stated	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	40,912	100%	980	999	1069	989	889	974	892	977	960	936	1029	881	903	878	823	4,061	3,698	3,131	15,843
			2.4%	2.4%	2.6%	2.4%	2.2%	2.4%	2.2%	2.4%	2.3%	2.3%	2.5%	2.2%	2.2%	2.1%	2.0%	9.9%	9.0%	7.7%	38.7%

Source: Philippine Statistics Authority

Table 2.4. 45 Gainful Workers 15 Years Old and Over in Barotac Viejo by Major Occupation Group and Age Group, 2015

Major Occupation Group	Total Gainful Workers 15 Years Old and Over		Age Group										
			15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65 & over
Managers	720	4%	4	22	44	68	77	80	95	109	87	68	66
Professionals	814	5%	-	95	175	123	107	74	86	61	61	27	5
Technicians and Associate Professionals	394	2%	3	65	72	52	51	40	40	31	18	14	8
Clerical Support Workers	563	3%	12	118	117	82	62	28	43	42	26	23	10
Service and Sales Workers	2,034	12%	92	399	366	228	193	172	178	126	116	76	88
Skilled Agricultural Forestry and Fishery Workers	3,380	21%	126	254	301	359	342	375	360	363	318	227	355
Craft and Related Trades Workers	1,172	7%	25	94	149	140	137	137	138	128	97	65	62
Plant and Machine Operators and Assemblers	1,505	9%	28	129	224	269	250	224	144	108	74	32	23
Elementary Occupations	5,839	35%	432	839	893	746	712	541	479	383	320	233	261
Armed Forces Occupations	28	0%	-	2	8	8	5	3	2	-	-	-	-
Other Occupation Not Elsewhere Classified	-	0%	-	-	-	-	-	-	-	-	-	-	-
Not Reported	5	0%	-	-	2	1	-	1	1	-	-	-	-
Total	16,454		722	2,017	2,351	2,076	1,936	1,675	1,566	1,351	1,117	765	878
	100%		4.4%	12.3%	14.3%	12.6%	11.8%	10.2%	9.5%	8.2%	6.8%	4.6%	5.3%

Source: Philippine Statistics Authority

Table 2.4. 46 Number of Occupied Housing Units, Number of Households, Household Population, and Ratio of Households and Household Population to Occupied Housing Units in Barotac Viejo by Type of Building, 2015

Type of Building and City/ Municipality	Occupied Housing Units		Number of Households*	Household Population*	Average Household Size	Ratio of Households to Occupied Housing Units	Ratio of Household Population to Occupied Housing Units
Single house	10,851	98%	10,866	44,667	4.11	1.00	4.12
Duplex	200	2%	200	758	3.79	1.00	3.79
Multi-unit residential	19	0%	19	63	3.32	1.00	3.32
Commercial/ industrial/ agricultural	3	0%	3	6	2.00	1.00	2.00
Institutional living quarter	-		-	-	-		
Others	-		-	-	-		
Not Reported	3	0%	3	6	2.00	1.00	2.00
Total	11,076		11,091	45,500	4.10	1.00	4.11

Source: Philippine Statistics Authority

Table 2.4. 47 Number of Households by Type of Building, Tenure Status of the Housing Unit/Lot, Barotac Viejo, 2015

Tenure Status of the Housing Unit and Lot and Municipality - Barotac Viejo	Number of Households*		Single house	Duplex	Multi-unit residential	Commercial/ industrial/ agricultural	Institutional living quarter	Not Reported
Own or owner like possession of house and lot	3,381	30%	3,318	48	13	2	-	-
Rent house/room including lot	34	0.3%	31	3	-	-	-	-
Own house rent lot	577	5%	571	6	-	-	-	-
Own house rent-free lot with consent of owner	6,718	61%	6,585	126	3	1	-	3
Own house rent-free lot without consent of owner	179	2%	171	5	3	-	-	-
Rent-free house and lot with consent of owner	196	2%	184	12	-	-	-	-
Rent-free house and lot without consent of owner	6	0%	6	-	-	-	-	-
Not Applicable	-		-	-	-	-	-	-
Not Reported	-		-	-	-	-	-	-
Total	11,091	100%	10,866	200	19	3	-	3

Source: Philippine Statistics Authority

Table 2.4. 48 Occupied Housing Units in Barotac Viejo by Construction Materials of the Outer Walls and Roof, 2015

Construction Materials of the Outer Walls	Total Occupied Housing Units		Galvanized iron/ aluminum	Tile/ concrete / clay tile	Half galvanized iron and half concrete	Bamboo/ cogon/ nipa/ anahaw	Asbestos	Makeshift/salvaged/ Improvised materials	Trapal	Others
Concrete/brick/stone	2,386	21.5%	2,354	11	3	4	14	-	-	-
Wood	1,416	12.8%	1,369	1	9	35	-	2	-	-
Half concrete/brick/stone and half wood	1,885	17.0%	1,815	2	57	7	-	2	1	1
Galvanized iron/aluminum	66	0.6%	58	-	4	4	-	-	-	-
Bamboo/sawali/cogon/nipa	5,137	46.4%	4,361	-	29	726	-	16	5	-
Asbestos	3	0.0%	3	-	-	-	-	-	-	-
Glass	1	0.0%	1	-	-	-	-	-	-	-
Makeshift/salvaged/ improvised materials	105	0.9%	73	-	-	10	-	21	1	-
Trapal	16	0.1%	10	-	-	2	-	1	3	-
Others	1	0.0%	-	-	-	-	-	-	1	-
No walls	2	0.0%	1	-	-	-	-	-	1	-
Not Reported	58	0.5%	56	-	-	2	-	-	-	-
Total	11,076	100%	10,101	14	102	790	14	42	12	1
			91%	0.1%	0.9%	7.1%	0.1%	0.4%	0.1%	0.0%

Source: Philippine Statistics Authority

2.4.19.5.2 Housing Summary

Most (91%) of the housing units have galvanized iron or aluminum roofs, and 46% of the housing units have walls made of bamboo, sawali, cagon, and/or nipa (Table 2.4. 48). Electricity is the major source of lighting for most (90%) households, but kerosene or "*gaas*" was also reported to be used in a significant number of houses (10%) (Table 2.4. 49).

Table 2.4. 49 Number of Households in Barotac Viejo by Kind of Fuel for Lighting, 2015

Fuel for Lighting	Number of Households	
Electricity	9971	90%
Kerosene (Gaas)	1079	10%
Liquified Petroleum Gas (LPG)	2	0%
Oil (vegetable animal and others)	-	-
Solar panel	7	0%
Solar lamp	26	0%
Others	3	0%
None	3	0%
Not Reported	-	-
Total	**11,091**	**100%**

Source: Philippine Statistics Authority

2.4.19.5.3 Water supply

The most common source of water supply for both drinking and cooking is shared tubed/piped deep wells. Other general water sources are bottled water, protected springs, personal use tubed/piped deep well, and community faucet system, among others (Table 2.4. 50 and Table 2.4. 51).

Table 2.4. 50 No. of Households in Barotac Viejo by Source of Potable Water Supply, 2015

Source of Water Supply for Drinking	Number of Households	
Own use faucet community water system	310	2.80%
Shared faucet community water system	1117	10.10%
Own use tubed/piped deep well	1295	11.70%
Shared tubed/piped deep well	3105	28.00%
Tubed/piped shallow well	98	0.90%
Dug well	510	4.60%
Protected spring	1631	14.70%
Unprotected spring	77	0.70%
Lake, river, rain, and others	55	0.50%
Peddler	369	3.30%
Bottled water	2523	22.70%
Others	1	0
Not Reported	-	
Total	**11091**	**100.00%**

Source: Philippine Statistics Authority

Table 2.4. 51 Number of Households in Barotac Viejo by Source of Water Supply for Cooking, 2015

Source of Water Supply for Drinking	Number of Households	
Own use faucet community water system	353	3.20%
Shared faucet community water system	1594	14.40%
Own use tubed/piped deep well	1954	17.60%
Shared tubed/piped deep well	3600	32.50%
Tubed/piped shallow well	161	1.50%
Dug well	590	5.30%
Protected spring	1825	16.50%
Unprotected spring	85	0.80%
Lake river rain and others	69	0.60%
Peddler	398	3.60%
Bottled water	462	4.20%
Others	-	
Not Reported	-	
Total	11091	100.00%

Source: Philippine Statistics Authority

2.4.20 Summary Impact Assessment

Table 2.4. 52 Summary Impact Assessment on the People Environment

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandon-ment	
Displacement of settler/s Displacement/ disturbance of properties	24 households are Project-Affected Families (PAF) will be displaced from Cemphil property 24 dwellings will be dismantled	✔ ✔			Displaced informal settlers will be relocated to permanent and titled government housing project for families in areas under high storm surge risk.
Change/conflict in land ownership	No conflict in land ownership for project site and relocation site.	N/A	N/A	N/A	Project site is legally owned by proponent. Project-Affected Families will be given formal rights to respective relocation dwellings.
Change/conflict in right of way	No conflict in right of way. Access to project site thru proposed Bay-ang Coastal Road already granted by landowners.	N/A	N/A	N/A	Will be undertaken in separate Coastal Road project
Impact on Public Access	Project will enhance project access to Project area and environs	N/A	✔	✔	In other projects, ECC for other ecozone access road will be secured.
In-migration/	Project may create attraction for in-	✔	✔	N/A	Project will require LGU clearance as part

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandon-ment	
Proliferation of informal settlers	migration and proliferation of informal settlers				of employment requirement. Cooperation will be made with BLGU on this matter.
Cultural/Lifestyle change (especially on Indigenous Peoples, if any)	There are no IP settlements in Ajuy. No significant cultural change is expected. However, urbanizing lifestyle change associated with increased purchasing power may develop in Barangay Bay-ang and adjacent Barangay Pedada and Luca.	N/A	N/A	N/A	IEC effort to prepare adjacent communities to make the change work for them, and for values enhancement; For LGU to include in elementary and high school curriculum, related values enhancement lessons
Impacts on physical cultural resources	There are no known physical cultural assets in Bay-ang.	N/A	N/A	N/A	Proponent will report to LGU and National Museum any found physical cultural assets in the Project site.
Threat to delivery of basic services/ resource competition	No threat to delivery of basic services. No resource competition in water use.	N/A	N/A	N/A	
Threat to public health and safety	Uncontrolled dust and noise may pose threat to public health in Barangay Bay-ang, Pedada, Santiago, and Sitio Dalusan. Threat to road safety is expected in existing narrow and unpaved access roads	✔ ✔	✔ ✔		Proponent will construct Bay-ang Coastal Road meeting DPWH road safety standards for industrial use amidst residential setting. LGU received approval for industrial access roads to Ajuy Ecozone
Enhancement of employment and livelihood opportunities Increased business	200 jobs during construction and 100 regular jobs during operation will be created Increased incomes in locality will	✔ ✔	✔ ✔		

Potential Project Impact	Assessed Project Impact	Phase Occurrence			Mitigating Measure
		Pre-Con/ Construction	Operation	Abandon-ment	
opportunities and associated economic activities Increased LGU Revenues	trickle to increased local business opportunities in food, cement retail distribution, lower cement prices and other enterprises Local government Units will benefit from increased real estate taxes, business taxes	✔	✔		
Traffic congestion	Traffic congestion is expected at existing narrow Bay-ang Pedada Road, and alternative access road through Pedada to Bay-ang	✔	✔		Three (3) road improvement projects under DPWH are under project preparation

Cemphil Cement Grinding Project EIS

ENVIRONMENTAL MANAGEMENT PLAN

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3 Environmental Management Plan

This section presents the Environmental Management Plan (EMP) which is aimed at managing the potentially adverse impacts presented in the previous sections. The EMP covers moderate and significant negative and positive project impacts. The "List of Key Impacts" in the Project screening checklist is used as guidance in checking each potential environmental impact and impacts addressed by a common management measure is grouped in the discussion below, to simplify the presentation for use by Cemphil, Inc. The Summary of the Environmental Management Plan (Table 3. 12) is likewise presented based on a "clustered mitigation" approach. Several impacts across the "Land", "Water", "Air" and "People" environments are clustered across common mitigating measures to avoid redundancy.

Cemphil, Inc. will provide for the funding requirement indicated in Table 3. 12. to implement the Project Environmental Management Plan during all phases of the Project.

3.1 Preparation for Environmental Management During Pre-Construction Phase

There were no environmental impacts during pre-construction phase, resulting from the conduct of engineering and environmental surveys. Geodetic survey, geotechnical investigation, water quality, air quality and public interviews during pre-construction phase did not generate adverse environmental impacts.

However, during the pre-construction phase, Cemphil, Inc. will prepare for environmental compliance during the phases of Project construction and operations through the following acts:

1. Continue coordinating with the Community Environment and Natural Resources Office (CENRO Sara) for the conduct of 100% tree inventory in Project site. The cut trees will be donated to the Beatriz D. Tupas Memorial Elementary School, the catchment school for children in communities around the Project site. Cemphil will hire the manpower that will craft the trees into benches, shelves and tables for school use.

2. Continue to lobby with the Municipal Government for the conversion of land classification from Agricultural Use to Industrial Use, consistent with the proposed Ajuy Economic Zone Development Program. The Government will benefit from the land classification conversion as the latter involves higher real estate tax revenues for the Government.

3. Continue to follow-up with pertinent branches of Government for the endorsements and finally, the approval of the Project Foreshore Lease Agreement.

4. Make representation with the Department of Energy Visayas Field Office to pursue increased and reliable power services to Ajuy.

5. Secure all necessary permits such as Building Permits

In the issuance of Invitation to Bid (ITB) for Project Design / Detailed Engineering Design Contract, Cemphil, Inc. will:

1. Include a copy of the Project Environmental Management Plan and ECC to the Invitation to Bid for the Project Detailed Engineering Design and Construction.

2. Include the Philippine air quality standards under DAO 2000-81 and water quality standards under DAO 2016-08 as part of the performance requirement in the design of air pollution control and oil and water separator facilities, respectively.

3. Require the design the Project facility to be in aesthetic manner to add to the visual aesthetic value for tourism development in Ajuy and Region 6. The Project will be the first cement plant in Region 6 and it is favorable to the Company to have a showcase presenting the harmonious co-existence of industrialization and environmental sustainability. Areas that will not be needed for industrial use shall be protected from heavy equipment traffic as much as possible, to keep the soil viable for plant life.

4. Include the facility drainage design to retain at least 8,085 m3 collected from rainfall, and to allow run-off discharge to sea, if any, only from overflow of a series of at least three cascading settling ponds. Diminuition of collected run-off in settling ponds shall be by withdrawal for ground /road/ vegetation irrigation, evaporation or ground infiltration. There shall be no sluiceway to release accumulated water directly to the sea.

5. Cause the design all roof structures and downspouts for rain collection as this is needed during dry season, in view of the poor water situation in Ajuy.

In negotiating the Project Construction Contract, Cemphil, Inc. will:

1. Include provision for hiring a Pollution Control Officer in the Contractor's Contract, to facilitate compliance to the required environmental management measures.

2. Require the Contractor to comply with the following:

    a. Republic Act 9003, the Ecological Waste Management Act of 2000
    b. Republic Act 6969, on the Control of Toxic Substances, Hazardous and
        (1) Nuclear Wastes,
    c. Republic Act No. 9275, the Philippine Clean Water Act and DENR DAO 2016-
    d. Republic Act No. 9147, An Act Providing for the Conservation and Protection of Wildlife Resources and their Habitats
    e. P.D. 1151 – the Philippine Environmental Policy

3. Assign the responsibility for environmental compliance during construction phase, to the Contractor.

3.2 Particulars of Environmental Management Plan During Construction Phase

The Project major potential project impacts during construction phase according to degree of importance are the following:

1. Marine water pollution/siltation and habitat disturbance
2. Increased road safety risks
3. Increased ambient dust along haul/access roads and in the construction site
4. Increased sources for the generation of solid waste, septic waste and kitchen waste
5. Employment and livelihood source generation
6. Uncontrolled in-migration and proliferation of informal settlers

Other moderate potential impacts include the following:

1. Vegetation removal, habitat disturbance and wildlife species displacement
2. Change in floral community structure
3. Change in soil quality and soil contamination
4. Water resource competition
5. Increased noise from mobilizing and operating construction equipment

The following environmental management measures are presented according to chronological occurrence of potential environmental impacts and summarized using the environmental domain assessment sequencing commonly used in Philippine EIS reports "Land, Water, Air and People".

To reinforce environmental management plan implementation during construction phase, Cemphil Inc. will deploy a Pollution Control Officer to supervise environmental compliance and serve as community contact and action person for public complaints and grievances.

The environmental impact control measures during Construction phase will be implemented by the Contractor, enabled through inclusion of pertinent contract provisions using the EMP and ECC as reference. Cemphil, Inc. through an on-site Pollution Control Officer and the Contractor, through his Pollution Control Officer will monitor the pollution impact control measures, cooperate with each other and endeavor to render the impact measures effective.

3.2.1 Water Quality Protection: Installation of Perimeter Wall and Silt Control Structures Before Earthworks

Loosened sediments from earthworks can be easily transported to sea by run-off or wind action and cause coral siltation and destruction of marine habitat. Earthworks is recommended to commence only after soil erosion protection and sediment control works have been sufficiently installed.

Soil movement within the project site is of no significant environmental consequence when the silt control measures are in place. However, sediment flows into the marine environment can cloud the water column and affect the amount of sunlight received by planktons, reduce photosynthesis, affect the food chain and reduce human food production, among others.

When it rains, the construction foreman should observe surface run-off behavior at the active construction sites. Where run-off flows toward the sea without barrier, they should excavate canals to conduit surface run-off toward the settling pond or sandbag barriers or provide sandbag barriers where there is none. All

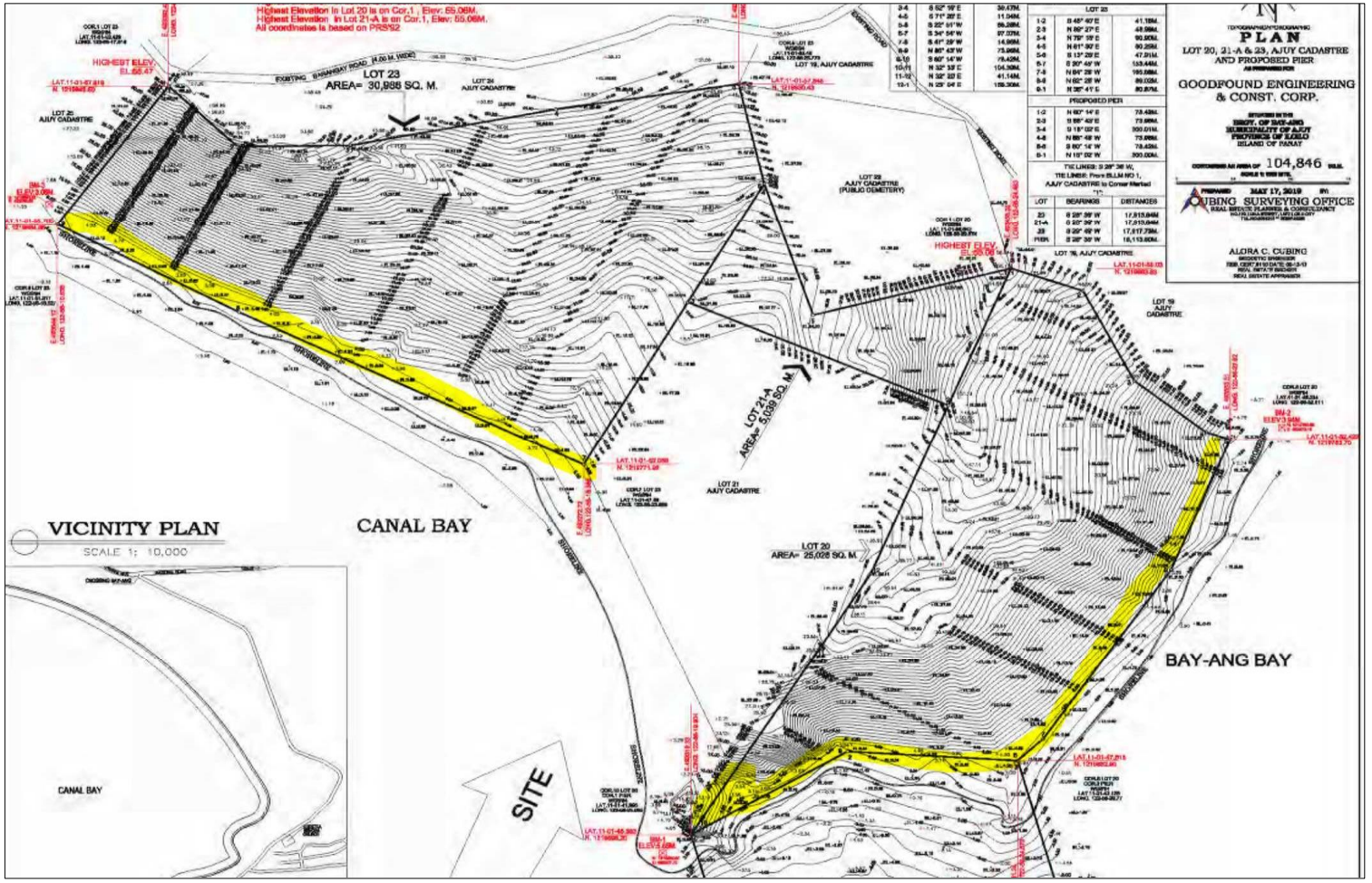

Figure 3. 1 Location of Retaining Walls cum Silt Control Structures

surface runoff from disturbed sections should drain toward the settling ponds or any effective silt barrier before overflowing to sea. Figure 3. 3 is an example of an isolated cupping sandbag barrier, as may be necessary based on area topography.

To avoid this, the following are recommended:

1. Land clearing and earthworks to proceed after sufficient silt control structures are installed. To meet the target construction completion schedule, site development may be undertaken by section for as long as silt control is ensured.

2. A cut-off channel carving-out the project perimeter will be dug-out. The purpose of which is to channel surface run-off from the non-project area into a separate settling pond without draining over the project site and unnecessarily washing down loose earth.

3. In this way, only rainfall falling directly on the project site need to be handled within the project site. Since the construction phase is time-constrained, shallow settling ponds may be constructed to direct the water from disturbed sections while the retaining wall is under construction. A series of ponds with barriers (see Figure 3. 2) at the perimeter of the active construction site can facilitate the detention of the larger silt volume before surface run-off proceeds to sea.

Figure 3. 2 Sample of Continuing Series of Settling Ponds

4. To maximize silt control efficiency, stones may be left in the bed surface of the drainage channel or in the series of settling ponds to decelerate storm flows and maximize the dropping of silt from the flowing stormwater.

5. Weekly desilting of settling ponds is recommended to maintain the settling pond holding capacity. Dredged materials may be loaded into the dump truck, hauling out extracted soil to "fill" areas.

6. While retaining walls in other segments are under construction, sandbags perpendicular to the retaining walls at both ends should be laid to control heavy sediment-laden run-off from flowing freely to the sea. The sandbag layers are to be of sufficiently tight interval and height to detain run-off water. Overflow will happen during extreme rain. Thus, the water retention capacity should be sufficient to contain at least four (4) hours of moderately heavy rain, such that overflow would have stayed some time behind the barrier before overflowing. In this manner, the sediment load of surface run-off is significantly reduced.

7. The sandbag layout should be able to capture or to "cup" (see Figure 3. 3) the run-off to allow sediments to drop before accumulated run-off overflows and drain to the sea.

8. In Figure 3. 3, the sandbags are covered/attached with an impermeable layer. A durable, pliable plastic sheet will do to avoid sediment transport from unfiltered rain, which could reduce sand content over time and reduce sandbag barrier containment efficiency. Otherwise, additional bags will be required to maintain the barrier function. Well-maintained sandbags may be re-bagged onsite for durable cover before being transferred for re-use when the retaining wall construction progress and the need for sandbag barrier are in another location.

Figure 3. 3 Sandbag Lay-out to control Sediment Flow

9. To supplement, in the event that turbid run-off to sea is noticed, settling ponds should be excavated in low-lying pockets within the construction site, supported by conduit canals from open earthworks areas. The settling ponds should function to collect all run-off and its size

should be sufficient to contain rainfall. Open bottom (unsealed, un-tamped) settling pond bottoms allow underground infiltration of run-off and reduce pressure toward unfinished retaining wall sections or sandbag barriers.

3.2.2 Prevention of Landslide During Slope Excavation

1. Slope protection will also be important to reduce the amount of loose and open earth traversed by run-off. It is recommended that the first slope bench in the northwestern part of the Mill Area will be provided with retaining walls to protect it from movement and landslide and reduce siltation.

2. The introduction of changes to surface landform through slope excavation and land development to develop areas suitable for industrial operations will be implemented systematically and per section, for land stability. Slope excavation will be undertaken gradually in sections of not more than three (3) meters high and three (3) meters wide. At all times, a drainage canal shall be provided at the toe of each bench which should not be less than 1' x 1' with a vertical gradient of ± 3% to avoid ponding and increasing soil infiltration, which increases landslide potential for soft (disturbed) soil.

3. The slope excavation for land development will be followed by slope stabilization through benching. There is some limitation of land space for competent bench design on the northeast wall of the plant site, and engineering reinforcement may be necessary. In the event of very loose subsoil that may be encountered in some areas during slope excavation, the Project engineer may decide to implement slope stabilization through engineering means instead of the currently conceived vegetative slope stabilization.

3.2.3 Provision of Adequate Sanitation Facilities for Workers' Barracks

Domestic wastewater will be generated by the construction workers. If untreated before disposal, wastewater may cause water pollution and present health problems to the nearby communities. For this reason, temporary sanitation facilities (e.g., toilet, bathing facilities) are to be provided by the Contractor at the construction site. The sanitary facilities are to comply with the requirements under the Sanitation Code of the Philippines. These shall be regularly maintained by assigned construction workers or hired service crew. For cost efficiency, Cemphil Inc. may consider planning to have the Plant's permanent septic tank or wastewater treatment facility be constructed ahead to serve sanitation requirements during Construction Phase. The workers' kitchen and mess hall will also be required to have an adequate grease trap. For 200 workers, assuming 19 liters of water is used per person per meal from food preparation, cooking and washing of kitchen equipment, the required grease trap unit using traditional method should have a capacity of 30 cubic meters, as computed below:

Formula from Plumbing Code of the Philippines: No. of meals at peak hour x waste flow rate x retention time x storage factor = grease interceptor size (liquid capacity)

Maximum persons per day:	210
Waste flow rate (L/person, from food preparation to cooking & dishwashing, etc)	18.9
Retention time (hrs.)	2.5
Storage factor: (Phil. Plumbing code)	3
Result, in liters:	29,767.50
Requirement for present average capacity, in cubic meters:	**29.77**

Say 30 cubic meters, with internal dimension of 3m x 5m x 2m depth

For cost efficiency, the permanent grease trap for Plant kitchen facility may be given priority in construction to be commissioned for use to support kitchen wastewater treatment in this phase. Figure 3. 4 illustrates the process flow in the operation of the kitchen grease trap.

It is good for Cemphil Inc. to consider including a grease trap for the Plant kitchens during the planning stage, as these can be constructed underground and with provision for maintenance access without the need to dismantle built-up structures. The grease trap may either be maintained by an EMB-accredited hazardous waste transporter and treater or with the use of biological or enzymatic grease treatment. The kitchen floor is best fitted with floor drains connected to the grease interceptor for easy cleaning and safety reasons. The floor drains will help keep the kitchen sanitary and reduce grease-related slips and trips.

There are also modern grease trap designs at the option of Cemphil Inc. These may be designed and certified by a Sanitary Engineer and included in the Project submission to the Environmental Management Bureau for the issuance of a Discharge Permit.

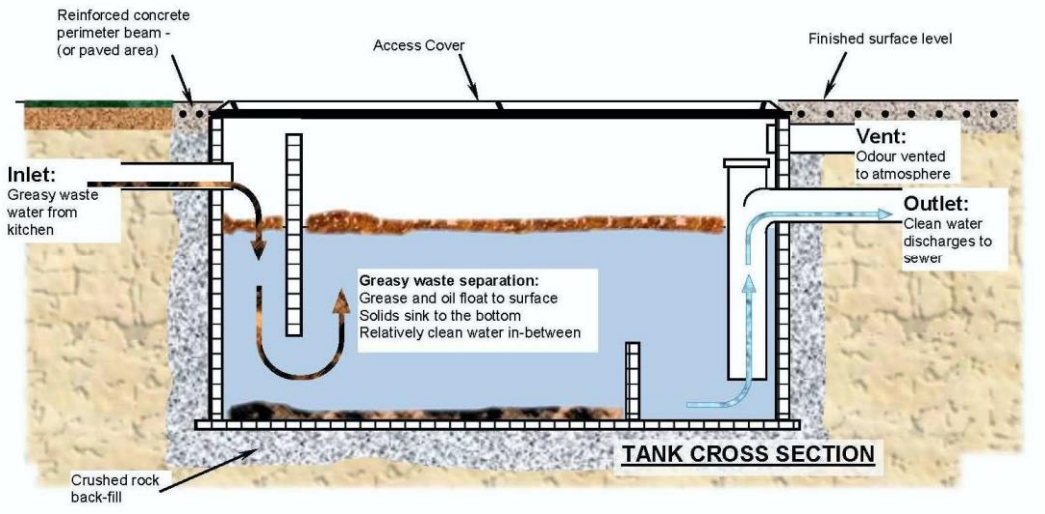

Figure 3. 4 Schematic Diagram of Traditional Grease Trap Design

The receiving surface waters will be regularly monitored through sampling and 29 laboratory analysis; thus, the Contractor should exert effort to control sediment30 laden run-off from flowing freely to the sea.

3.2.4 Minimizing Ground Water Extraction

The project will aim to be self-sufficient for its water requirement, primarily through rainwater harvesting and minimal groundwater extraction, which will be limited to drinking water usage.

1. The water requirement for construction will be reduced through the use of delivered pre-mixed cement.
2. The Project overhead water tank will be constructed ahead. The construction of the cement plant complex will require 120 m^3/day for the water usage of the workers and 5 m^3/day for the cleaning of construction equipment. The Plant overhead tank will be installed early to serve the Construction Phase. Cemphil Inc. will secure a groundwater extraction permit from the National Water Resources Board (NWRB) Region 6 Office prior to the construction, installation, and operation of the deep well facility.

3.2.5 Protection of the Marine Ecosystem during Jetty Port Construction

During the construction of the jetty port, preventive measures to contain resuspended seabed sediments and any oil spill from affecting the coral communities west of the port will be prepared. From June to December, the prevailing winds come from the southwest direction, moving toward the northeast direction. While the disturbance to the marine environment is relatively minor, some resuspended sediments from pile driving and rock embankment placement in the marine environment may drift toward the corals near Bay-ang Barangay Hall in the event of strong winds during southeast monsoon season. When turbid water from the pier construction site is observed to drift to the coral formations, the active construction area will be enclosed with a silt boom. Examples are shown in Figure 3. 5 and Figure 3. 6.

For practical reasons, the jetty port will be supported by a causeway connecting the access trestle to the pier. The causeway shall be rock-filled, instead of earth-filled, to eliminate a source of siltation of corals in Bay-ang bay. The causeway will utilize armor rocks, the outer rock faces will not be filled with concrete to provide juvenile crabs with rocky surfaces for foraging areas, as crabbing is a major livelihood activity in Bay-ang. The causeway will be provided with **cross- current culverts** so as not to impede littoral currents (see Figure 3. 5).

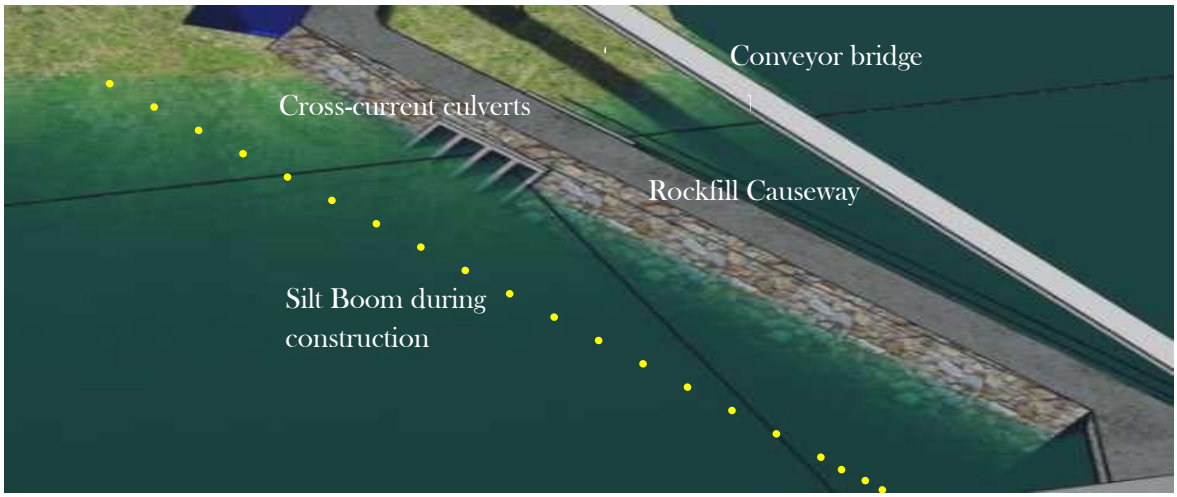

Figure 3. 5 Lay position of Silt Boom to Contain Resuspended Sediments Within the Causeway Construction Area

The drilling of piers for the access bridge and the pier enclosed in the silt and oil boom as each one is constructed when water turbidity drifts to the coral formations (identified in Figure 2.2.23). The enclosure will include the area location of the construction equipment. For the laying of superstructures, such as the girder and the deck, only the cranes ay be provided with a silt shroud and oil boom because, at that point, there is no more work underwater.

Figure 3. 6 Silt Boom Enclosing an Area with Seabed Disturbance

The silt and oil boom shall shield the coral communities west of the jetty port site from sediments carried by sea currents. The location of the silt and oil boom will depend on the season of construction. From January to May, the prevailing winds will come from the northeast to the southwest direction. For the months of January to May, the general wind direction will be coming from the northeast. Thus, regular monitoring by Project PCO will be necessary to determine if the coral communities will be affected by resuspended sediments.

To protect marine habitat, construction of concrete anchor blocks for the pier facility is also recommended.

3.2.6 Avoiding the Disruption in Water Circulation Pattern and Sediment Deposition

While changes to the general marine water circulation pattern will be negligible, changes in the micro-circulation pattern are expected during construction due to the placement of the silt screen. The construction equipment will not cause changes in the micro-circulation pattern since they will be on floating platforms. Changes to the local microcirculation pattern will be minimized through the placement of a silt curtain, which will only enclose areas under construction when excessive

resuspended seabed sediments are observed to move toward the known coral communities. Once seabed works are completed, resuspended silt will be allowed to settle for some time until the water is clear. Only then will silt curtains be removed. However, if resuspended sediments are minimal and wind direction does not push the dispersed sediments to the coral areas, silt curtain placement will not be necessary. It will be noted that the area of the proposed jetty port and access trestle is underlain with sand.

3.2.7 Protection of Soil Capability to Support Vegetation Growth and Promote Habitat Rehabilitation

Given the poor natural soil fertility and Project plan to revegetate the benched slopes to further control soil erosion and for nitrogen emission sequestration purposes.

During construction phase, the Contractor will be required to carefully set aside all topsoil with organic materials, for restoration on top of slope benches and other areas designated for revegetation/regreening. They shall also comply with R.A. 9003, among others, for the composting of biodegradable wastes. The compost pit during Construction Phase will be a source of soil conditioners for Plant landscaping and revegetation.

To keep soil nutrients, the sloping land will be contoured, terraced and landscaped, to arrest soil erosion. With stabilized land surface gradient, soil will be enhanced with compost from kitchen waste and addition of mycorrhizae. Proponent will avail of commercially available mycorrhizae preparations produced from University of the Philippines Los Banos – Biotech Research. It is a sand-based pure culture of several species of mycorrhiza fungi particularly vesicular arbuscular mycorrhiza (VAM). The fungi infect the roots, form a close association with the plant when inoculated and assist the plant in the absorption of water and nutrients. The fungi can also prevent root infection by pathogens and increase the plant tolerance to drought.

The target soil fertility rating at the root zone should meet the "adequate" values in Table 3. 1 to ensure plant survival.

3.2.8 Prevention of Soil and Water Contamination

Oil spills during maintenance activities of heavy equipment are a possibility, thus, there may be a risk of soil contamination.

Significant soil contamination from fuel and oil spills during the construction phase is unlikely due to the relatively small volume of weekly fuel handled. Nevertheless, the management plan for avoiding soil contamination is proposed hereunder, considering the potential cross-cutting pollution potential of oil-spill to the marine ecosystem.

During Construction Phase, Cemphil Inc. will require the Contractor to:

1 . Properly secure the storage area of fuel and lubricants where it will be stored in DOE-approved containers; on flattish land, protected from the elements, with concrete flooring with

at least 0.5m concrete perimeter wall, the example shown in Figure 3. 7. The facility shall comply with the requirements under DENR DAO 1992-29. The average weekly diesel requirement during the construction phase is about 6,795 liters, while it is about 25,000 liters during the construction phase. For cost efficiency, the concrete flooring with lip and oil spill collection channel to serve the Operations phase shall be built at this time, the actual 25,000-liter storage tank may be installed later on, to be bolted-on pre-prepared locations fitted with female nuts on the concrete flooring. During preparation and earthworks while the fuel and lubricants depot is not yet available for use, the arrangement may be made with the fuel supplier to provide a refillable DOE-approved diesel fuel trailer tank to serve the purpose, Figure 3. 8 is provided for ready reference. The fuel and oil storage facility and container closures should also be able to resist damage/opening from ground shaking up to Ms 7.0.

2 Provided the refueling / fuel transfer area with concrete flooring, with perimeter lip and spilled oil collection channel. Transfer of fuel or oil on area with concrete flooring.

3 Consider an audit system for material utilization, verifying the fuel/oil volume loaded in particular equipment is commensurate with the number of hours worked. When more fuel or oil is given out than the work performed + amount in vehicle tanks, chances are these were transferred in areas outside of the permitted area. Transfer of fuel or oil outside of permitted area bears the risk of fuel or oil spill on soil, and soil contamination.

4 Label the fuel storage facilities in accordance with guidelines under DAO 199229, Implementing Rules and Regulations of Republic Act 6969, An Act to Control Toxic Substances and Hazardous Wastes.

5 Carefully handle used oil complying with the guidelines under DAO 1992-29. Haul-out used oil through accredited hazardous waste transport, storage, and disposal agents.

Figure 3. 7 Example of Concrete Flooring with Lip in Fuel Storage Depot

Figure 3. 8 Example of Portable, Refillable Diesel Fuel Storage Tank

Fuel and lubricants are important construction inputs that normally will be conserved and protected by the Contractor's site operating instructions. Loss of fuel and oil resources at the site means the Contractor's financial loss, which will be prevented as part of Project policy.

1 The proper handling, storage, and disposal of used oil are similarly important. The Contractor shall designate an area as an equipment depot, where a concrete platform shall be provided, is gently sloped (±2-3%) and provided with perimeter lip to contain any oil spill. Engine change oil will only be done on the concrete platform with lip, to avoid soil contamination with liquid petroleum hydrocarbons.

2 Used oil is to be carefully collected, stored, and properly sealed in the container supplied by its manufacturer, or similar-grade acceptable to the Environmental Management Bureau. Containers of used oil are to be secured from falling over, stored in a single layer at ground level to avoid oil spill in case of ground shaking.

3.2.9 Wildlife Protection

Vegetation removal will be done carefully, and gradually, to give time for any wildlife to transfer to nearby vegetated areas in Barangay Pedada. Gradual vegetation clearing to will also give time for preserve of planting materials that are viable replanting after construction (see Table 3. 5). Viable planting materials will first be identified, earth-balled, and transferred to the nursery before land grading, slope excavation, and other earthworks shall commence. Highlights how to protect the remaining wildlife and natural vegetation are as follows:

1. Minimize vegetation removal to what is utmost necessary
2. Establish nursery to receive viable removed vegetation, for later transplanting. These may serve as mother stock for replacement planting 4 materials. The advance nursery establishment will provide time for the plants 5 to stabilize before out-planting and give earlier regreening of project area.
3. Preservation and protection of topsoil with organic debris. Transfer these to stockpile and provide at least 3 layers of tightly laid sandbag ring barrier around toe of topsoil stockpile.
4. For work efficiency and less carbon footprint in transport, the topsoil stockpile must be located near the northeastern section of the property, where slope benches will be topped with enriched soil for revegetation.
5. Preferably use indigenous flora species in area regreening key result area for the Project effort in environmental management will be to showcase the sustainable, harmonious coexistence of a sound and vibrant environment and the industry within the Plant premises, evidenced by high biodiversity in the project site, over time. The abundant avian population observed at present, will be a good indicator of control of particulate emissions, as birds are sensitive to changes in air quality and changes in availability of food in the event of negative impact on plant photosynthesis due to dust blanketing of leaves. Work on ecosystem preservation is recommended to commence at the pre-construction stage through proper planning and implemented during construction phase.

    a. When the ECC is issued, detailed engineering design should include detail on landform design to minimize tree cutting and conserve wildlife habitat. The slope benches at the northeastern wall should be designed to preserve the maximum number of existing trees, as much as possible. Trees more than ten (10) cm in diameter at breast height will not survive a transfer. Thus, if feasible, they will be spared from the excavation.

    b. Within the Plant grounds, trees that may not be directly under the footprint of buildings or the main vehicle pathways should be spared, with the provision of earth easements five (5) meters radius from slope excavation. If the potentially affected trees are in a lower natural elevation, coarse gravel of 1 to 3 cm diameter should be loosely laid around them up to the target landfill elevation, and held in place by a temporary casing, such as fixed cyclone wire or bamboo matting, to hold the gravel in place while the backfilling work for land development is being undertaken. The coarse gravel filled in a three-meter radius will allow better rainfall infiltration for the tree to survive and grow. Over time, the tree will grow and adapt to the change provided water supply at root zone is not suddenly cut-off.

    c. Natural noise and heat buffer/natural perimeter around the noisy processes need to be included in the final facility layout planning. Concrete emits slight and almost imperceptibly elevated temperature compared to natural rock or shrubs and bushes. Native fruit-bearing trees are recommended for planting to help restore the natural abode of some wildlife as well as yield some food benefit and encourage vegetation maintenance workers.

d. The affected existing terrestrial vegetation species (trees, bushes, and shrubs) are to be sources of some planting materials for Plant landscaping. Affected trees with less than ten-centimeter diameter at breast height may be earth-balled and transferred to and nurtured in the nursery while awaiting the transplant to final post-construction locations. The tree transplanting is proposed to make use of rooting hormones and daily appropriate watering to help promote survival.

e. It is expected that disturbance during construction (movements, noise, and vibrations) may drive wildlife to the open, and cause temporary or permanent migration to nearby areas where disturbance is less. The Contractor shall be required to give orientation on Republic Act 9147 – Wildlife Resources Conservation and Protection and institute regulation among workers not to harm wildlife. The site will be disturbed during construction, thus wildlife that comes out in the open will be unharmed and shall be assisted to find cover in existing vegetation. Any injured wildlife should be protected and nurtured to health at the site if feasible, be included in the Self-Monitoring Report to EMB VI or turned over to CENRO Sara for caretaking/ treatment and release to the wild. The Contractor may need to remind workers of the penalties under R.A. 9147 as wildlife such as birds, bats, snakes, and monitor lizards are among the traditional food materials in the locality.

f. The avian species observed in Ajuy are precious assets that could enrich the tourism experience planned to be developed in Ajuy. The Project IEC will include the promotion of protection of existing species through habitat preservation. Annex V was prepared to assist the IEC in this regard.

3.2.10 Regreening

1. Habitat protection, soil quality protection, reforestation is all interrelated to sustain area environmental sustainability, valuable both to terrestrial and marine ecology which provide ecosystem services for humans making a living from the Plant and the communities surrounding the Plant.

2. The project reforestation, landscaping, and revegetation activities will protect the microclimate in the Plant, mitigate any increase in ambient temperature due to the temperature increase from cement milling operations. During construction phase, the planting materials for microclimate protection will be prepared to give time for the plants to stabilize before out-planting.

3. Areas for revegetation such as the benches on the northeastern wall and the general landscape design, will be staked-out and prepared by topping with shredded surface vegetation removed during land clearing. The areas will also be topped with loose soil, will be regularly watered, and if possible, covered with other leaves for the healthy bacterial decomposition of organic matter.

4. The spread of soil to adjacent areas designated for concreting may be prevented by providing: (1) a barrier or shield of stakes lined with bamboo matting (sawali); (2) carefully stacked stones; or (3)

a perimeter canal, to collect and infiltrate run-off. These are done to prevent the topped soil from being brought to adjacent areas by rain. Organic materials from land clearing may be topped on areas designated for revegetation (which will no longer be excavated or filled) and just be allowed to decompose. Eventually, the planted wide-rooting vegetation will keep the earth in place when the plants have stabilized. The preliminary reforestation/revegetation areas are indicated in Figure 3. 11. The building perimeter hedgerows are not shown due to its small scale.

5. A nursery for existing shrubs, brushes, and target tree species will be established to prepare for the restoration of natural vegetation communities and associations. The removal of vegetation for project land development will result in a temporary reduction in existing plant species in the area. The establishment of nurseries to receive viable plant materials removed during site clearing, and their maintenance during construction phase will serve to maintain wildlife habitats during construction and operation.

6. Species to be cultivated and prepared in the nursery are tree species listed in **Table 2.1.15** and Table 3. 2 which lists introduced but acclimatized common species proposed to be planted under the Project.

7. The plants recommended for erosion control must meet one or more of the following criteria:
   a) Can grow on degraded and eroded sites.
   b) Roots and above-ground parts can grow rapidly to provide protection.
   c) Possess deep and intensive root system for good anchorage in the subsoil.
   d) Can produce large amount of leaf litter.
   e) Can produce Nitrogen in soil.
   f) Can withstand the physical stress of falling stones.
   g) Produce edible fruit, leaves or other parts.
   h) Parts are known to have medicinal property/ies; and
   i) Draught resistant to some extent.

8. The nursery for beneficial species proposed to be prepared during Construction phase will ensure a thriving and productive nursery, ready for use in social extension work on for before the on-start of the Operating Phase. During this phase, species most suitable to the soil and climate will manifest good growth and will be selected for Plant regreening. The nursery is also proposed to supplement the workers' nutritional requirements / food security.

9. The Project will source quality planting materials from the Bureau of Plant Industry and propagate from existing vegetation within Bay-ang and Pedada for the mangrove species.

3.2.11 Dust Suppression

The air pollutants that will be generated during construction phase are the following:

1) Particulate emissions from earthworks, construction materials hauling and diesel particulates from fossil-fuel combustion.
2) Dust emission control will be implemented in dusty work areas through regular water sprinkling. As part of the Special Conditions of the Construction Contract, the Construction contractor will be required to implement a regular dust suppression measure through the sprinkling of haul roads and dusty work areas.

On a dry day, an average of five (5) liters of water per square meter is needed to prevent excessive dust re-suspension. Construction of the 2.5-hectare stockyard or a 2-hectare processing plant will be on a "per section" basis and not entirely simultaneous, thus, the daily dust suppression requirement does not require massive amounts of water. Groundwater extraction for dust suppression may be possible when water rights have been secured from the National Water Resources Board (NWRB). Other possible sources are springs and rivers in nearby Barangays.

Figure 3. 9 Example of intake head screen to prevent suction of biota into intake pipe

Sea water is an accessible resource. However, the Cemphil is advised to follow the following protective measures if springling water is withdrawn from the sea:

1. Use low pressure water pump to load the sprinkler trailer tank.

2. An intake pipe strainer (inset) should be attached to intake head of extraction pipe to prevent the suction of fish and another macro aquatic biota into the pile.

3. The pipe tip is to be operated hanging not more than 0.5m deep from the water surface, buoyed by an inflatable tube. Water extraction shall not be from depth of no less than four (4) meters from the seabed or three (3) meters from riverbed, to avoid disturbance of macrobenthos. Example on the left shows screen to be used on water intake tip. Drawing water from the sea shall be at least 1000 meters from the nearest coral community.

3.2.12 Control of Gaseous Emissions from Construction Equipment

Noxious gasses carbon monoxide (CO), carbon dioxide, hydrocarbons, sulfur dioxide, and nitrogen dioxide (NO2) will be among the fugitive emissions from burning of petroleum fuels to operate mobile construction and hauling equipment. The Contractor/s will be encouraged to:

(1) Use cleaner fuels such as low sulfur, low NOx, and if possible, increase the use of electric and battery vehicles.
(2) Remind machine operators to have sufficient engine warm-up before work operation.
(3) Cause proper machinery maintenance
(4) Ensure compliance with vehicle emission standards and have vehicles/heavy equipment undergo actual emission testing for annual vehicle registration renewal.
(5) Cemphil Project Pollution Control Officer is instructed to verify and cause the enforcement of individual fossil-fueled machinery compliance to vehicle emission standards; and
(6) Log /record the Project consumption of petroleum fuels, by the PCO. Actual fuel consumption shall be the basis for the project reforestation program to be implemented. The purpose of reforestation is to neutralize or absorb greenhouse gases produced from the use of petroleum fuels. If some heavy equipment is solar battery powered, the actual use of petroleum fuel will be reduced, and subsequently the target reforestation area. The formula for estimating the total greenhouse gas emissions will be as follows:

Emissions = Fuel Consumption Diesel Oil Emission Factor Diesel Oil

Source: IPCC

Greenhouse Gas Emission Factors Per Liter of Diesel Consumed

CO_2	NO_x	CH_4
74100	800	5

Note: BTU per liter diesel: 526,810
Equivalent Joules per liter diesel: 1,055.06

The formula for estimating the hectarage of target reforestation area prepared hereunder is based on a study "Ten Year Evaluation of Carbon Stock in Mangrove Plantation Reforested from an Abandoned Shrimp Pond" by N. Matsui, et.al., which indicates a tree of *Sonneratia alba* can store 0.417-ton carbon from root to tree structure, and that the soil organic carbon accumulation is 40.7 per hectare, both after ten years of mangrove planting. In a study, "The Ability of Mangrove Areas to Conserve Carbon Stock in a Semi-Arid Region" (Indonesia) by A.A. Almulqu, et. al., *Rhizophora macronata* stores 49.35 tons Carbon in one hectare. The proposed sequestration of greenhouse gas emissions released during construction and fifty years of operation through mangrove reforestation is presented in one planting schedule in Table 3. 11 below.

3.2.13 Noise impact control

While noise from construction site reaching nearby communities is expected to be within the limit allowed for residential areas, the Contractor will be encouraged to abate noise nuisance through work scheduling that avoid the simultaneous of noisy equipment close to each other and limit the regular work of noisy equipment between 7:00 am to 6:00 pm.

3.2.13.1 Maintaining Peaceful Relations with the Host Communities

The potentially negative impacts to the social environment are the following:

1. Displacement of 24 informal households from Cemphil property (Lot 23).
2. Potential health impacts due to increase in ambient dust and noise
3. Potential increase of road safety hazard along access roads due to passage of haul trucks and heavy equipment
4. Labor immigration

The positive project impacts during Plant Construction include the following:

1. Generation of employment /livelihood opportunities
2. Construction of Coastal Road cum shoreline protection from Bay-ang Barangay Hall to Punta Bay-ang
3. Assistance for the creation of Cemphil Employees' Cooperative (CEC), CEC capacity building – organizational development and financial management trainings
4. Financial assistance to CEC to provide services to Project construction
5. Support for the realization of concrete roads from Pedada to Bay-ang and road widening and concreting from Bay-ang Barangay Hall to East Capiz Coastal Road Junction Bay-ang.

The project environmental management plans to maintain peaceful relations and mitigate negative Project impacts and enhance positive impacts to the host communities are discussed in Chapter 5, Social Development Program.

3.3 Environmental Management During Operation Phase

3.3.1 Waste Management

Waste management during operation will comply with the guidelines under Republic Act 9003 – the Ecological Waste Management Act of 2000. Principles of waste minimization, material recovery, and re-use, and composting will be practiced.

All working areas will be provided with clearly labeled waste receptacles for recyclable, biodegradable, and hazardous waste. Recyclable and biodegradable materials are easily identifiable by people in Ajuy due to the strong LGU campaign regarding proper waste management. The definition of "Hazardous" will be relatively new to local residents. With reference to industrial waste, this will be defined as oil-soaked or oily rags, wastes from the medical clinic, busted light bulbs, spent vehicle batteries, wastes from the motor pool, office electronics, and reagents from the quality assurance testing laboratory.

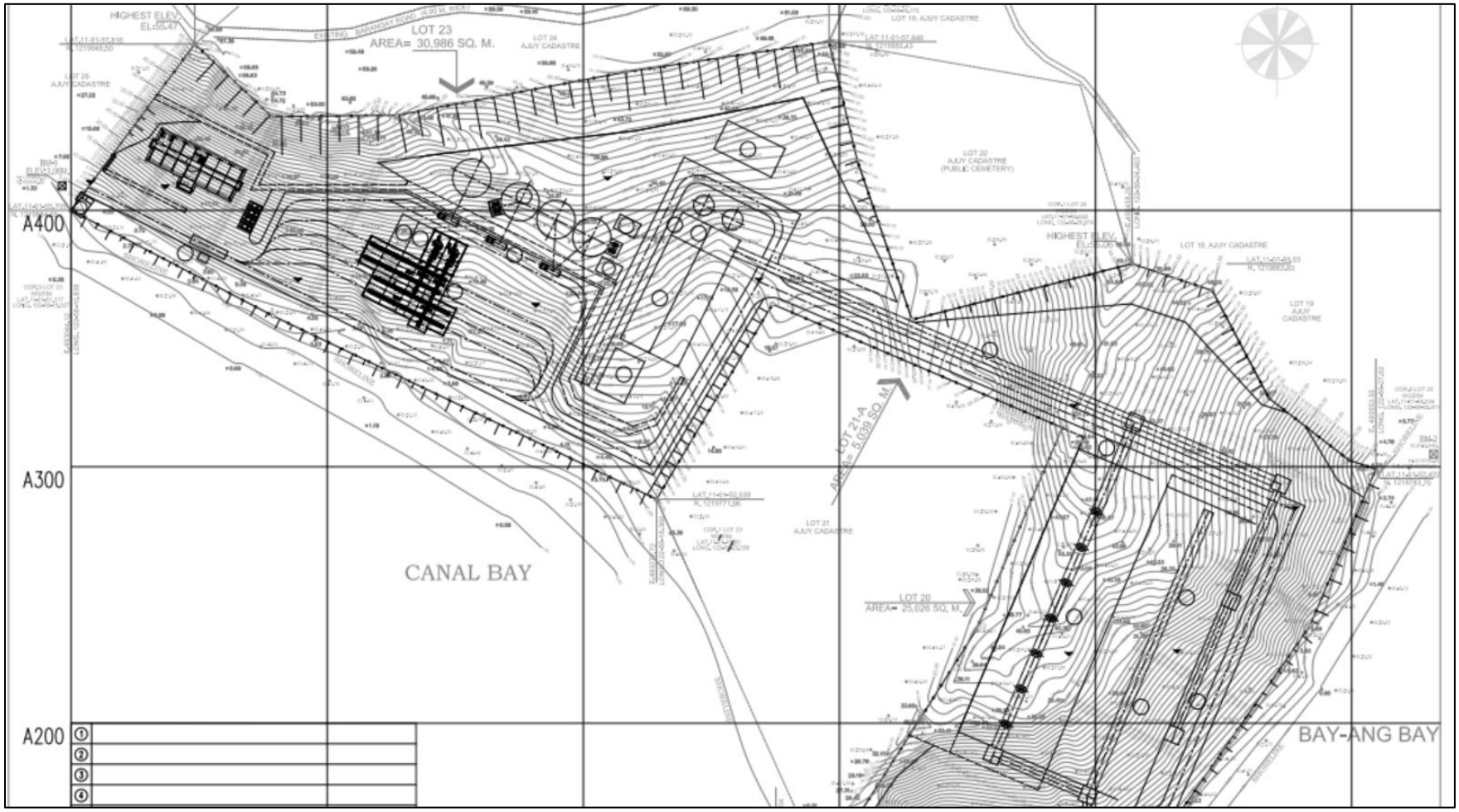

Figure 3. 10 Surplus Soil Stockpile Locations

A separate area at least 700 m^3 will be designated for construction waste management, with segregated sections and appropriate receptacles for recoverable/recyclable materials, and residual municipal wastes. Form works and other residual materials will be stockpiled properly for easy retrieval, re-use or repurposing. Residual waste will be hauled-out to the Municipal landfill on a weekly basis. The compost pit will be maintained with kitchen waste to produce soil conditioners for the Plant landscaping. Hazardous materials will be hauled out by accredited hazardous waste transporter and treater.

There will be about 5,000 m3 of surplus excavated soil from land development, intended to be backfilled / encapsulated into the embankment for the Bay-ang Pedada Coastal Road project to be constructed by Cemphil upon request of the LGU. As of writing, the requirements of ECC application for the bay-ang coastal road has been prepared, awaiting feedback on the FLA application for the same. While waiting for the availability of the Bay-ang Coastal Road to receive the surplus soil materials, Cemphil, Inc. will lease Lot 21 to hold the surplus soil stockpile area. Figure 3. 10 above shows the location of the soil stockpile areas.

If allowed, cut trees, shrubs and bushes from land clearing of the Plant site will be carefully laid across Lot 21 and supported with sandbags, to provide barrier against sediment run-off to sea. After removal of the soil stockpile, the cut trees will be donated to the Dna. Beatriz Tupas Memorial Elementary School and piled organic material from vegetation clearing will be allowed to decompose and later hauled to plant site for backfilling of areas for revegetation. The sandbags will be maintained while the organic materials are allowed to decompose to prevent sediment transport to sea.

3.3.2 Self-Sustaining Soil Erosion Control

The operations phase will start as soon as the equipment has been commissioned and the Permit to operate air pollution devices has been received from EMB-6. While the main focus of Plant activities is to start-up operations, it is recommended for the open soil areas, particularly the cut slopes, to be contoured, benched, re-surfaced with shredded plant materials earlier removed during land clearing, if this has not been done already, and replanted. Following best practices in area rehabilitation, Cemphil Inc. is advised to grow nitrogen-fixing leguminous species for hedgerows, such as pigeon peas (kadios) or peanuts to promote the withdrawal of nitrogen in the atmosphere.

To maintain effective vegetative erosion control, the landscape and replanted vegetation have to be maintained with regular watering and soil conditioning. Other crops recommended are nutritious suitable food crops, to assist in the food security of workers and vulnerable groups in Bay-ang. The target plantation area of two (2) hectares can produce substantial food if prepared and cultivated properly. The Municipal Agricultural Officer may be tapped for advice for the best planting and cultivation practices for the area. This could also reduce company costs in vegetation maintenance and replanting. Tending workers will get the benefit of harvesting and utilizing the produce. Tenders will only tend to the vegetation outside of their working hours and must observe safety protocols, such as the following: (1) informing supervisors they are doing vegetation caretaking; (2) utilizing only the pedestrian lanes and walkways provided for the purpose of maintaining the area vegetation; (3) using

safety vests for easy visibility by operators of heavy equipment; and (4) limiting vegetation tending hours to daylight hours. The Plant operations will provide for fertilizers for the vegetation plots.

Silt control during the operations phase will be implemented through the drainage trench that will likewise serve as a sediment catchment structure (Figure 3. 11) and the settling ponds which will be desilted on a weekly basis. The collected silt will be returned to the materials hopper.

3.3.3 Soil Quality Improvement

The natural soil quality in Project area is poor. However, improving the soil quality in the Plant site will benefit the workers as vegetation can easily thrive to provide microclimate protection, provide food sources and provide habitat for wildlife to contribute to the "showcase" or Project demonstration of harmonious coexistence of sustainable environment and industry, much like the environmental goals of many industries in developed countries.

The Project PCO will obtain soil samples from the compost pit and have these analyzed at the nearest laboratory of the Department of Agriculture. The soil quality Table 3. 1 will be endeavored to be attained. Any deficiency in soil nutrients may be supplemented with fertilizers.

Table 3. 1 Guideline for Fertility Rating of Soils

Soil Fertility Indicators	Fertility Rating		
	Adequate	Marginal	Deficient
pH (H_2O 1:1)	5.5 - 8.5	5.0 - 5.5	< 5.0
Base Saturation %	> 35	20 - 35	<20
Cation Exchange Capacity (meq /100g)	> 20	20-10	< 10
Organic Matter %	> 3	-	< 3
Electrical Conductivity (mmhos / cm)	< 4	4 - 8	> 8
Available N (ppm)	>25	25	<2
Exchangeable K (meq / 100g soil)	> 0.25	0.15- 0.24	< 0.15
Available P (ppm)	> 20	6 - 20	< 6
Fe (DTPA) ppm	> 405	2.5 -4.5	< 2.5

Data source: BSWM-DA

3.3.4 Schedule of Regreening of Designated Areas

One of the Value-Added goals of the Project is to contribute to the visual aesthetic values in Ajuy. Areas for aesthetic landscaping will be provided in Plant design. The area landscaping and regreening will be completed during the Operations Phase when areas to be revegetated are segregated and protected from industrial activity traffic and after traces of cement that may have fallen to the soil has been washed and decomposed by rain and soil bacteria.

Actual vegetation planting may proceed after the construction works are completed when buildings have been painted for the safety of planting personnel. Landscaping areas must be finalized, staked-out, and must include a 0.6m margins around the buildings with planting easement of about six (6) to 10 inches from the walls of painted buildings. For the planting areas beside finished and painted buildings, enough time must be given to neutralize the effects of rain wash from fresh concrete and other alkaline contaminants from concrete construction. The finishing of enriched earth (compost) and young plants in the nursery must also be ready.

Table 3. 2 Shrubs & Bushes Recommended for Aesthetic Landscaping

Zone A		
Species Name	Common Name	Advantages
Ixora Coccinea	Santan	Hardy, low maintenance, has medicinal properties
Hibiscus	Gumamela	Hardy, low maintenance, has medicinal properties
Areca ipot	Ipot Palm	Ornamental
Plumeria acuminata	Kalachuchi	Hardy, low maintenance, can be food ingredient
Bougainvillea spectabilis	Bougainvillea	Hardy, low maintenance
Gliricidia sepium	Kakawate / Madre de Kakao	Hardy, with blooming pink flowers. Soil Stabilizer, anti-rodent
Helianthus annuus	Sunflower	Good soil erosion control. Seeds can be eaten

Table 3. 3 Shrubs & Bushes Recommended for Food Mother Stock

Zone B			
Species Name	Common Name	Advantages	Alternative Use
Musa x paradisiaca	Bananas	Hardy, low maintenance, food materials	Leaves good as alternative food wrapping material
Citrus x microcarpa	Calamansi	Popular cooking and beverage and spice/ ingredient	Medicinal, Source of Vitamin C.
Plumbago indica	Laurel	An important spice for adobo	Studies suggest anti-tumor, antimicrobial, estrogenic, cytotoxic, macrofilaricidal, anti-influenza
Moringa oleifera	Malunggay	contains all the vitamins, minerals, most amino acids & antioxidants needed for human health	Has good diuretic, stimulant, purgative, antibiotic, antifungal, stimulant, purgative, antibiotic, antifungal properties, among others
Vigna radiata	Monggo	Good source of vegetable protein, drought tolerant, low input, having short crop cycle (70 days)	nitrogen-fixing, hypotensive (lowering of the blood pressure)
Arachis hypogaea	Peanuts	Good source of vegetable protein	Has antioxidant, anti-inflammatory, hypoglycemic, hypolipidemic, sedating properties.
Carica papaya	Papaya	Hardy, low maintenance	Stool softener, good source of Vitamin C & A
Capsicum annum	Sili	Common ingredient in Filipino dishes	A good analgesic has anti-inflammatory and anti-cancer properties. Contains a powerful phyto-chemical capsaicin. Traditionally used for toothache, arthritis, and rheumatism
Ipomoea batatas	Camote	Food. Good source of vitamins A, B and C, iron, calcium and phosphorus	Alternative carbohydrate source for diabetics. May be an industrial source for alcohol production
Solanum melongena	Eggplant/ Talong	Food	Folkloric reference indicate roots are considered antiasthmatic and stimulant. - Extract from leaves may be anodyne or mild pain-killer

Abelmoschus esculentus	Okra	Food. Fair source of iron, vitamin A and C; good source of calcium	Said to be Antioxidant /Hepatoprotective, Antidiabetic/Antihyperlipidemic
Cucurbita maxima	Squash	Food	Considered anti-inflammatory, antipyretic, diuretic, tonic, vermifuge. Studies suggest antimicrobial, anti-inflammatory, antipyretic, antidiabetic, antihyperlipidemic, antioxidant, immunomodulatory, anticarcinogenic, anthelmintic properties
Momordica charantia	Ampalaya	Food with medicinal value.	Enhances insulin secretion, supplemental food against Diabetes Meletus. Considered astringent, antirheumatic, parasiticide, anthelmintic, purgative, emetic, antipyretic
Psidium guajava	Bayabas/ Guava	Food. Good source of Vitamin C, good for erosion control	Antihypertensive, Antidiarrheal, Hypoglycemic, Microbicidal, Antimicrobial. Leaves, Anti-tumor by depressing Tr cells. Anti-oxidant, scavenging hydroxyl radicals and inhibiting lipid peroxidation
Persea americana	Avocado	Food. Leaves good as antidiarrheal tea	Hypolipidemic, Hypoglycemic, Cytotoxic, Antifungal, Anti-Viral leaves
Chrysophyllum cainito	Caimito, Star apple	Food. Leaves good as antidiarrheal tea. Anti-oxidant, radical scavenging	Wood is durable and straight-grained; used for construction. Cytotoxicity against prostate cancer cell lines / leaves
Corchorus olitorius	Saluyot / Tugabang	Leaves used as Food ingredient	Antibacterial / Antifungal / Leaves; Gastroprotective, Antioxidative / Leaves:
Zingiber officinale Roscoe	Ginger	Food material, has medicinal properties	Potent antioxidant, anti-inflammatory, antimutagenic, antimicrobial and potential anticancer activities.
Cajanus cajan	Kadios	Food	Studies suggest antihyperglycemic, anti-inflammatory, antiplasmodial, antihyperlipidemic, antimicrobial, anticancer, antioxidant, bio-sorbent, antiulcer, neuroprotective, hepatoprotective properties
Brassica rapa	Pechay	Food	Studies suggest anti-tumor, immune-modulating, antioxidant, phytoremediating properties
Andropogon citratus	Tanglad/ Lemon Grass	A favorite cooking ingredient	Leaves considered antimicrobial, anti-inflammatory, and sedative

Antidesma bunius	Bignay	Food. Ripe fruit is eaten outright	Souring agent may be made into wine. antidysenteric. Studies show cytotoxic, antioxidant, antidiabetic, pesticidal, hypolipidemic properties.
Syzygium cumini	Duhat	Food	May be made into wine, AntiDiabetic; Gastroprotective, Antioxidant; Studies indicate good antibacterial activity against E. coli, B subtilis, P. aeruginosa and S aureus. It is also suggested to be a potent inhibitor of glucoamylase and suggests a hypoglycemic function in type-2 diabetes that may be independent of functioning B-cells
Pennisetum purpureum	Napier Grass	Soil erosion control	Good fodder for goats, cattle
Artocarpus heterophyllus	Lanka	Fruit as food. Low input requirement	Anti-amoeba properties
Tamarindus indica	Sampaloc	Food, as a souring condiment.	Bark is astringent; pulp from fruit boiled considered as tonic, digestive, anti-asthmatic, reduces fever, carminative (relieving flatulence), antiscorbutic (preventing or curing scurvy), anti-bilious (excessive bile). - Bark is considered astringent and tonic. Pulp considered cooling and laxative when consumed. Seed and meat are astringent. Wood is highly prized for furniture, paneling, wheels, axles, home mill gears, planking, mallets, handles, walking sticks.

Table 3. 4 Shrubs & Bushes Recommended for Herbal Medicine Garden

Zone C		
Species Name	Common Name	Advantages
Peperomia pellucida	Pansit-pansitan	Clinically proven to be good for gout and arthritis
Plectranthus amboinicus	Oregano	Aromatic, carminative, emmenagogue, diaphoretic, tonic, stimulant.
Cymbopogon winterianus	Citronella	Analgesic; Has mosquito repellent properties
Mangifera indica	Mango	Food
Cocos nucifera	Coconut	Contains lauric acid, which is anti- bacterial, anti-viral and anti-fungal. *Coconut oil is the best frying oil since it does not create any free radicals when heated. *Virgin coconut oil is a very good skin moisturizer *VCO lowers bad cholesterol and increases good cholesterol. Juice of young coconut nut is good diuretic and support for treatment of Urinary Tract Infection
Pandanus amaryllifolius	Pandan	Good diuretic and support for treatment of Urinary Tract Infection
Mentha cordifolia	Herba buena	A very good analgesic. Excellent for headaches and body pains without the side effects on the kidney and liver
Cananga odorata	Ylang-ylang	Antioxidant, Antibacterial
Orthosiphon aristatus	Balbas pusa	Well known for its antihypertensive qualities due to its high percentage of potassium, orthosiphon and methyl pariochromene
Lagerstroema speciosa	Banaba	Essential oil considered as an antidepressant, antiseptic, and aphrodisiac, nerve soothing and sedative. Studies suggest antioxidant, antimicrobial, antibiofilm, anti-inflammatory, antivector, antidiabetic, cytotoxic, insecticidal properties.
Centella asiatica	Takip-Kohol	The W.H.O. recognizes its brain and nervous system protective powers; is a memory enhancer for both children and adults. *It is effective as an anti-dementia and anti-Alzheimer's, Potentially good for Parkinson's Disease and ALS amyotrophic lateral sclerosis.
Cassia alata	Akapulko	Traditionally used for treating insect bites, ring worm, wounds, as a laxative, against hypertension, skin diseases. Decoction of the leaves are used for cough and to get rid of intestinal worms
Aloe vera	Sabila	Studies indicate antimutagenic, antidiabetic, wound healing, antimicrobial, anti-ageing, hair repair and follicle health stimulant properties
Vitex negundo	Lagundi	Anti-tussive
Blumea balsamifera	Sambong	Good diuretic and anti-edema; said to dissolve kidney stones; can be used as an antihypertensive

Curcuma longa	Luyang Dilaw	Contains curcumin and curcuminoid well known for its anti-cancer properties
Lagerstroemia speciosa	Banaba	Well known for its anticholesterol properties and its use for urinary tract infection. Japan imports banaba leaves from the Philippines and markets it as an anti-diabetic and as a slimming herb due to its anti-cholesterol properties
Azadirachta indica	Neem	Considered biopesticide, antibacterial, hypoglycemic, antiulcer, anti-malarial, antitumor, immunomodulatory, hepatoprotective, antioxidant, antifungal, anti-inflammatory

Table 3. 5 Indicative Target Revegetation Area and Estimated Planting Material Requirement

Location	Species for Provenance Trial	Plot Width (meter)	Swath Length (m)	Area (m2)	Planting Interval (m)	Planting design	Planting Material Target (pcs.)
Greenbelt- Bench Hedgerows and slope faces	Shrubs / bushes	1	8,000	8,000	0.2	herring bone	80,000
Greenbelt- Bench Surfaces	Tree Species	2	5,000	10,000	5	linear	1,000
Ground Landscaping	Shrubs / bushes	1	1,000	1000	0.2	herring bone	5,000
Greenbelt- Buffer Zone at Stockyard	Tree Species	1	1,000	1000	5	herring bone	1,000
Perimeter of Buildings	Shrubs / bushes	0.6	558	335	0.2	linear	2,792
Property Shoreline	Mangrove	5	1,534	7672.3	1	herring bone	1,534

Please see Figure 3. 11

3.3.4.1 Wildlife Protection

1. Cemphil Inc. will include in its internal operations handbook, guidelines for wildlife protection, including penalties in accordance with R.A. 9147.
2. Cemphil Inc. will install highly visible billboards notifying the prohibition to harm wildlife and penalty provisions of R.A. 9147.
3. Occasionally, some wildlife may come out in the open and be vulnerable to humans. The internal operations handbook on environmental protection should include instructions/prohibitions on wildlife preying, and care in case of injury. The Plant Manager will designate a wildlife recovery shed and wildlife feeding. Care shall be the responsibility of the Pollution and Environmental Protection Officer until the wildlife is sufficiently well to return to its natural habitat. The wildlife case will be included in the Self-Monitoring Report to EMB VI.

Figure 3. 11 Location of Regreening Areas

3.3.4.2 Management of Hazardous Waste

The hazardous wastes that will be generated by the Project during construction phase include waste engine oils, waste lubricants from heavy equipment maintenance, spent equipment, alkali and cell batteries, spent rubber tires, damaged and replaced equipment and vehicle parts which may be coated with oil.

Cemphil, Inc. will:

1. Properly plan its project activities so as to minimize the generation of hazardous waste.
2. Implement waste recycling and reuse of hazardous waste
3. Handle hazardous waste in such a manner as not to cause or potentially cause pollution; or create danger to public health, welfare and safety, or create harm to animals, bird, wildlife, fish or other aquatic life; or harm to plants and vegetation; or cause a limitation in the beneficial use of project land surfaces
4. Construct a Material Recovery Facility where waste materials will be properly stored, according to category. The common hazardous waste material recovery shed will house spent batteries, busted lightbulbs, spent printer ink cartridges, and oily rags until a volume feasible for transport by EMB-accredited hazardous waste transporter, or Cemphil may submit application to transport the non-oil hazardous waste to the treater facilities.

An estimate of the non-oil hazardous waste material generation potential of Cemphil cement grinding project is given in Table 3. 6:

Table 3. 6 Estimated Non-Oil Hazardous Project Waste Generation Potential

Waste Type	Estimated Annual Quantity
Spent acid batteries 12 GSM or equivalent	3
Spent alkaline batteries (pcs)	200
Ink cartridges pcs	288
broken lightbulbs	200
oily rags (kg)	50
Laboratory chemical reagents (liters)	5
Containers previously containing engine oil	2 - 3

5. Cebu Common Treatment Facility, Inc. (CCTFI) with accreditation to treat/ dispose and treat Category A and Category F wastes will be contacted by Cemphil for possible transport, treatment and disposal of non-oil Project hazardous wastes.

i. Category E wastes from the Project:
   a acid wastes
   b alkali wastes
   c wastes with inorganic chemicals [busted fluorescent bulbs
   d contaminated empty containers

(ii) Category F wastes from the Project:
   a acid wastes [laboratory waste/other acid wastes]
   b inks, dyes, pigments, paints, latex, adhesives

Table 3. 7 Estimate of Floor Area Requirement for Non-Oil Hazardous Waste Storage Shed

Type of Waste	Annual Number	Year 3	Year 5	Unit size (m3)	3 year volume (m3)	5 year volume (m3)
Spent acid batteries (vehicles, cranes), forklifts (units)	4	12	20	0.125	1.5	2.5
Spend alkaline batteries (box of 100's)	200	600	1000	0.002	1.2	2
Ink cartridges pcs	288	864	1440	0.001	0.864	1.44
broken lightbulbs (pcs)	200	600	1000	0.00972	5.832	9.72
oily rags (kg)	50	150	250	0.048	7.2	12
Chemical Reagents (liters)	6	18	30	0.1	0.6	1.8
	Total (m3)				17.196	29.46
Floor area requirement at 2 meters stacking height (m2)					8.598	14.73

The low volume of Project hazardous waste materials may compel a feasible haul out of every three or five years. Given the estimated annual waste volume in Table 3. 8, a 40 m2 x 7m high shed will be sufficient storage area for non-oil hazardous waste materials in Table 3.7.

a. The shed shall be on level ground with good drainage, good ventilation, good lighting and electrical connection approved by the local Government engineering office.
b. It shall be provided with impermeable and raised flooring and containing perimeter walling to hold the volume of stored materials in the event of container breakage
c. It shall have fire- proof and leak-free roofing such as galvanized iron
d. It shall have strong wooden shelves to store and keep the properly packed and contained hazardous materials from falling, for manageability of storage
e. It shall be provided with warning sign "HAZARDOUS MATERIALS". UNAUTHORIZED PERSONS KEEP OUT". Only authorized persons shall be allowed access to the shed, for accountability.

The non-oil hazardous waste materials may be securely placed by the transporter in accredited 20 tonner container van and transported across land and sea through the FF-Cruz private port in Bay-ang to a private port in Victorias, Negros Occidental, cross to San Carlos City by land and cross to Cebu by roro to Balamban port.

3.3.4.2.1 Used Oil

Heeding the DAO 92-29 policy recycling and reuse of hazardous waste, Cemphil proposes to re-use its used /waste oil from regular engine and machinery maintenance, for lubricants in its mechanical equipment such as material reclaimers, gantry crane moving parts and conveyor belt systems.

An estimate of the annual waste oil generation is given in Table 3. 8:

Table 3. 8 Estimate of the Project Annual Waste Oil Generation Potential

Source	Type	No./Units	Annual Waste Oil Generation Potential (liters)	Waste Number
Service Vehicles	4x4 diesel fed pickup. Engine displacement 2800 cc	4	128	I101
Gantry cranes	3 HP engine	5	140	
TOTAL			268	
In 52-liter drums (number)			6	

A shed with floor area of twenty (10) square meters shall be sufficient to store the used oil as regular use will not require the entire annual waste volume to be stored. The monthly requirement for lubricants is about 52 liters (1 drum) while used oil generation is half this volume.

The USED OIL shed shall have the following features:

a. Away from areas with elevated temperature or sources of combustion or sparks such as the furnace, motor pool, machine shop or publicly accessible areas.
b. It shall be provided with warning sign and pictogram for "FLAMABLE".
c. It shall be provided with impermeable and raised flooring and containing perimeter walling to hold the volume of stored materials in the event of container breakage
d. It shall be stable against shakes and falls
e. It shall be made of fire- proof materials such as concrete flooring, metal door and galvanized iron roof.
f. It shall have free ventilation such upper walling using cyclone wire enclosure
g. The waste oil will be stored in upright drums within the shed and bound to each other with a common, wide, nylon belt to hold the drums together to have as further resistance from falling and rolling in an earthquake event.
h. The USED OIL SHED will be locked and accessed only trained and authorized persons, for accountability.

3.3.4.3 Management of Fuel and Lubricants

Minor fuel and oil leaks and spills are inevitable in industrial operation.

Fuel and lubricants need to be carefully handled and treated as having potential to generate hazardous impacts particularly to the marine environment.

Care to prevent major loss of fuel or lubricants shall be a standard operating instruction to workers. To further secure the prevention of soil and water contamination and transport of contaminants from spilled fuel and oil into the marine environment, the following measures will be taken by Cemphil Inc.:

1. Stable and secure fuel and lubricants depot, using DOE-approved tanks, which are laid on flattish land, protected from the elements, with concrete flooring with at least .5m concrete perimeter wall. The fuel storage facility and lubricant containers and closures should be able to resist damage/opening from falling due to ground shaking up to Ms 7.0.

2. Label the fuel storage facilities in accordance with guidelines under DAO 1992-29, Implementing Rules and Regulations of Republic Act 6969, An Act to Control Toxic Substances and Hazardous Wastes.

3. Fuel transfer area should be provided with concrete flooring, with perimeter lip and spilled oil collection channel, and only allow the transfer of fuel or oil on area with concrete flooring.

4. Consider an audit system for material utilization, verifying the fuel/oil volume loaded in their respective equipment is commensurate with the number of hours worked. When more fuel or oil is given out than the work performed + amount in vehicle tanks, chances are these were transferred in areas outside of the permitted area. Transfer of fuel or oil outside of permitted area bears the risk of fuel or oil spill on soil, and soil contamination.

5. Carefully handle used oil complying with the guidelines under DAO 1992-29. Haul-out used oil through accredited hazardous waste transport, storage, and disposal agents.

6. Use moderately fine loose earth or pulverized limestone to mop-up accidental oil spills. The saturated earth should be promptly removed and deposited in a separate concrete-lined pit, constructed for the bacterial decomposition of oil in saturated earth. Earth is preferred over sand or sawdust as it can better support bacteria to break-down oil than sand and is not flammable as sawdust. The use of sawdust, coir, or other organic material is not considered to avoid generating flammable waste due to possible sources of incidental sparks in the Plant, which may start a fire.

7. The oily compost pit will be maintained in a similar manner as the common compost-pit, regularly aerated by regular turning and light watering to maintain bacterial health. Materials unsuitable for adding to compost should not be added to the pit. The decomposed product may be periodically harvested and mixed with regular compost to be used as a soil conditioner for vegetation maintenance.

8. Oil pollution control will be implemented through the operation of oil and water separators listed in Table 1.9 and indicated in Figure 3. 12.

9. A Material Recovery Facility will be constructed during Construction Phase, to house properly contained used oil.

3.3.4.4 Maintaining Settling Ponds and Oil and Water Separators

A major drainage ditch at the perimeter of the Plant, and series of settling ponds will desilt run-off during the operations phase. Figure 3. 12 shows the location of the silt control facilities listed in **Table 1.8**. The drainage channel and settling ponds will be desilted on a weekly basis. Dredged silt will be brought to a designated material drying area and returned to the production process. The completed drainage design plans are intended to manage the surface run-off for the following purposes:

1. Keep the industrial operating area free from puddles, which eventually accumulate dust and dirt, and when dry, contribute to undesired dust resuspension.

2. To collect and store rainwater sufficient to meet Plant requirements for cleaning, dust suppression by overhead misting where necessary, tire wash watering, landscape irrigation, and possibly, roof cooling with recycling and electricity consumption reduction. The energy requirement for a water circulation pump may be provided from energy produced by the biogas digester system. Sediment filtration will be done by gravity using a series of limestone filter boxes, which will be regularly maintained by replacing the limestone material. Used limestone may be returned to material hoppers for cement grinding.

3. Once completed, the altered surface hydrology will be permanent for the duration of project life. It will be an improvement from the existing free-flow system, as it will benefit both industrial land use, area vegetation maintenance, and office Plant energy requirements for cooling while allowing the introduction of surplus rainfall and irrigation water to the underground.

3.3.4.5 Safeguard Silt and Oil Boom at the Jetty Port

During the jetty port operations, standby silt and oil boom will be provided for extreme conditions, as the sediment dispersion model showed nil sediment transport toward the coral communities when the Plant silt control facilities in **Table 1.8** are in place and functional.

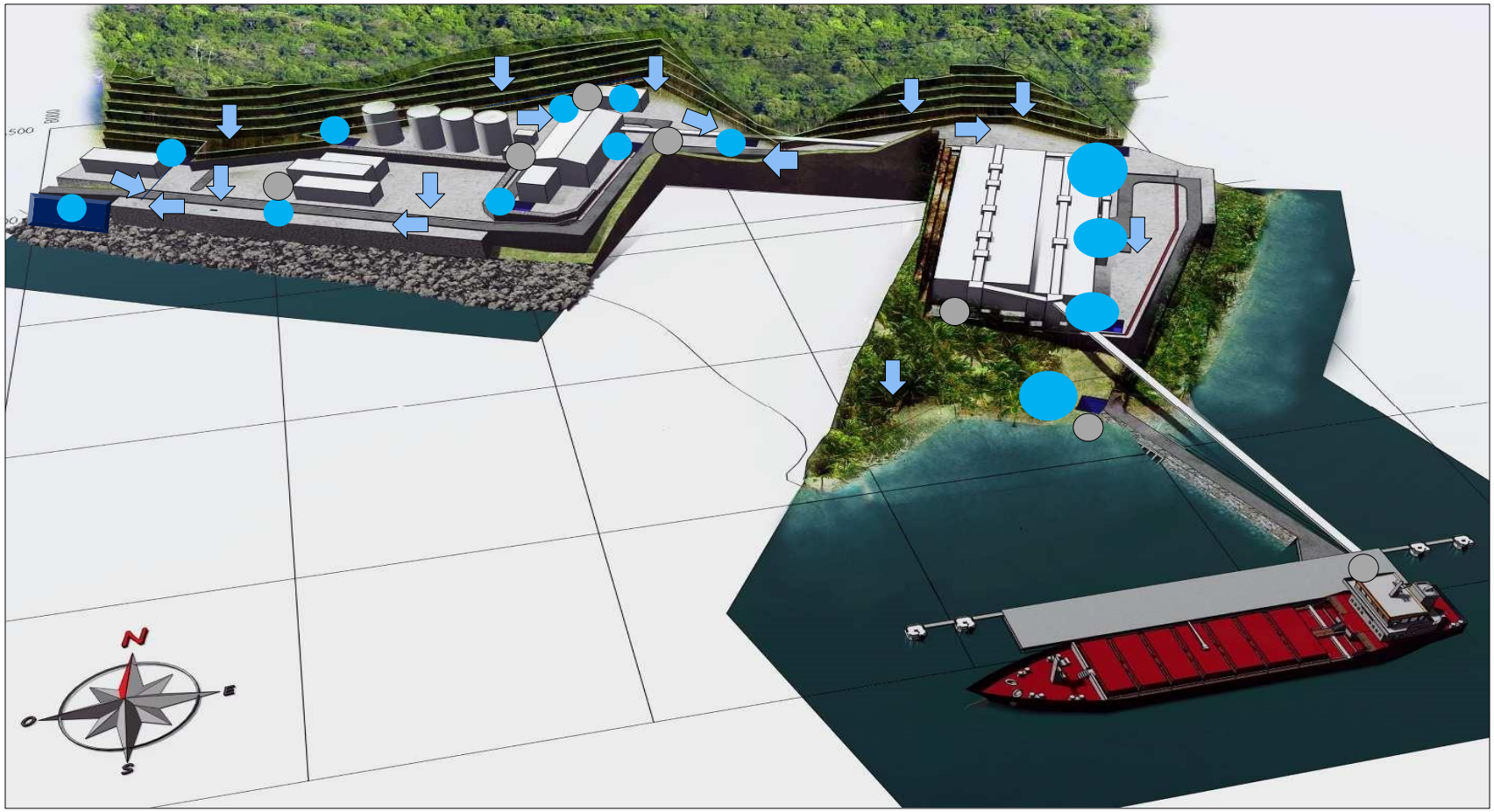

Figure 3. 12 Location of Settling Ponds / Drainage Channel / Run-off Detention Basin

3.1.1.1 Rain Harvesting

Rain harvesting will be part of the facility design to make use of rain as an important source of water supply. Given the drainage system cum cistern/water reservoir in Table 1.7, regular large volume groundwater extraction is expected only in the first year of operation and during the dry season to fill the gap in accumulated water supply from rainfall. Starting on the second year of operation, groundwater extraction will gradually reduce as rainfall will steadily fill the cistern/water reservoir under normal climate conditions. Groundwater extraction will only be for drinking and cooking. **Table 1.8** shows the planned rainwater containment capacity. As may be observed in **Table 2.2.3**, Water Balance Table, rainwater supply will be more than adequate for the Plant water requirements.

3.3.4.6 Coordination with the Coast Guard on Marine Pollution Control

Domestic waste, ballast water, or bilge water may be disposed of by calling ships anchored at the wharf. The introduction of invasive marine species and oil from ship engines will pollute and damage the local marine environment. Thus, Cemphil will coordinate with the Marina and Coast Guard on the enforcement of marine pollution control regulations. Among others, the technology for the exchange of ship engine waste heat treatment of ballast and bilge water, and domestic waste treatment units should be present and functioning, in compliance with the International Convention for the Prevention of Pollution from Ships. An in-ship wastewater treatment facilities will also be of interest to confirm.

Regular water quality sampling and analysis of Cemphil's receiving waters will be conducted to monitor and control water pollution.

3.3.5 Air Pollution Control

The sources of air pollution during operation phase are the following:

1. Particulate emissions from the crushing and milling of clinker, tuff and other earth materials, cement packing, and land transport of cement products through the Plant access roads.

2. Greenhouse gas emissions from the operation of diesel-fueled standby generator sets and cement hauling vehicles and cement haul trucks.

3. Greenhouse gas from waste decomposition

4. Noise from Plant process equipment operation, genset operation, and from land transport vehicles passing the Plant access roads.

3.3.5.1 Control of Excessive Dust Emissions

1. Cemphil Inc. will install air pollution control equipment listed in **Table 1.7**.

2. In compliance with DAO 2007-22 & DAO 2017-14, Proponent will install a Continuous Emissions Monitoring System as part of project production increase under Phase 2, when uncontrolled project emissions will be in the vicinity of 109 tons per year.

3. When ambient dust concentrations along haul roads exceed 300 µg/Ncm for one hour averaging or 230 µg/Ncm for 24-hour averaging, road watering for dust suppression at least twice daily, will be implemented during dry days between the hours 10:00 am to 2:00 pm when solar radiation is normally at its highest.

4. Coordination with the Local Land Transportation Office (LTO) for tail pipe particulate emissions testing.

3.3.5.2 Minimizing Noxious Gas Emissions and Offsetting the Project Carbon Footprint

1. Cemphil will use low sulfur industrial diesel fuel no. 2 for its generator sets, and low NOx diesel for its vehicles. Genset exhaust will pass through a Diesel Particulate Filter. Cemphil expects to meet the following air quality standard within the Plant and the adjacent communities in Bay-ang:

Table 3. 9 Selected National Ambient Air Quality Guideline Values

Pollutants	Averaging Time			
	8 hrs.	1 hour	24 hrs.	1 year
Suspended Particulate Matter TSP (µg/Ncm)	`	`300	230	90
PM10			150	60
Sulfur Dioxide (µg/Ncm)			180	80
Nitrogen Dioxide (µg/Ncm)			150	
Carbon Monoxide (mg/Ncm)	10	35		
Lead (µg/Ncm),			1.5*	

*Averaged three preceding moving calendar-months

2. The transport of cement products will be market-driven. Wholesale buyers send trucks, lorries, or cement mixers to the Plant for loading and deliver the cement to consumers. Being outside of the Cemphil scope of direct intervention, Cemphil will regularly monitor air quality at the impact receptor areas and relay EMB guidelines to all who operate gaseous emission sources for the purpose of encouraging air pollution control at source.

3. For the vehicles under its direct control and influence, Cemphil Inc. will oblige regular engine maintenance to facilitate compliance with the ambient air quality standards (Table 3. 9) along Project haul roads.

4. The 5,072,799.73 megagrams (Section 2.3.2.2) projected total carbon emission for the 50-year Project life is proposed to be redeemed through the planting of 10 hectares mangrove per year for 25 years.

5. Cemphil, Inc. will ensure that the reforestation areas are within historical mangrove forests. The planting of mangroves should not encroach to other coastal ecosystems (i.e., not historically mangrove areas).

6. Cemphil, Inc. will support the maintenance of all planted mangroves for fifty years, with 85% viability and eventually recreating a 250-hectare mangrove forest. Table 3. 10 columns 2 and 3 show the result of the "Ten Year Evaluation of Carbon Stock in Mangrove Plantation Reforested from an Abandoned Shrimp Pond" in Thailand, by N. Matsui, et.al., and the values applied in Table 3. 11.

Table 3. 10 Assumptions in Carbon Sequestration Calculation

Sources of carbon sink	Carbon Sink Potential as per studies (Mg/a)		Values used in Table 3. 11
	Year 1	Year 10	By Year 10
Sonneratia alba	53.46	2,183.46	641.54
Rhizophora macronata	2.47	49.35	14.81
Soil Organic Carbon	4.07	40.47	12.21
Total	60	2273.28	668.56

Source: N.Matsui, 2012

As found in the study by N. Matsui, et.al, the mangrove plantation site should be excavated resulting in reducing the elevation by 25 cm to attain about 10 cm lower than the mean seawater level to enable regular access and retention of tidal water into the area. This will improve nutrient deposition and soil enrichment. Planting materials should be prepared ahead for a half year, with an average height of 50 cm prior to replanting at the site, with a spacing of 1.5 × 1.5 m. In Table 3. 8, the ten-year value of C storage in mangrove plantation assumes only 30% of the C capture found in the study of Matsui, et.al. (2012) *Sonneratia alba* per hectare in Year 10 to be conservative. The Year 10 value is regressed to zero in planting year 0, with linear progression to Year 10.

Cemphil is amenable to committing to mangrove plantation of ten (10) hectares annually for twenty-five years for its fifty-year Project life because mangrove plantations draw more atmospheric carbon in its development and growth, higher than the average of five (5) tons per hectare required in the development of a new terrestrial forest plantation (Lasco, Pulhin, Banaticla, 2006). The members of the Cemphil Board of Directors are very well aware of the effects of climate change phenomena, having witnessed the strength of Typhoons Yolanda, Rolly and Ulysses in recent years. Cemphil, Inc. is willing to support mangrove forestation in Ajuy because it has major stakes in the development of Ajuy. They are aware mangroves will also help protect fishery resources in the area, the economic base and nutrition sources of many families in Ajuy. This contribution to the local economy helps stabilize the socio-economic base wherein the Plant will operate, and will provide Cemphil, Inc. a peaceful and stable socio-economic environment. The estimated cost of mangrove plantation in the EMP may still be reduced over time as community participation (school and LGU participation) and interest are expected to increase over time as fishery and marine food production increases around mangrove areas.

C Sink Potential (Mg C/ha/yr)		222.85	1,114.26	2,228.51	2,228.51	2,228.51	2,228.51	2,228.51	2,228.51	2,228.51	2,228.51	2,228.51	Carbon Sink
		Carbon Sink Potential (Mg CO_2/ha/yr)											
Year	Tree Plantation (has.)	Yr1	Yr5	Yr10	Yr15		20	25	30	35	40	45	50	Potential from Annual Plantation
1	10	2,229	11,143	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	1,013,973
2	10		8,914	20,057	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	991,688
3	10		6,686	17,828	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	969,403
4	10		4,457	15,600	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	947,117
5	10		2,229	13,371	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	924,832
6	10			11,143	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	902,547
7	10			8,914	20,057	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	880,262
8	10			6,686	17,828	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	857,977
9	10			4,457	15,600	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	835,692
10	10			2,229	13,371	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	813,407
12	10				11,143	22,285	22,285	22,285	22,285	22,285	22,285	22,285	22,285	791,122
13	10				8,914	20,057	22,285	22,285	22,285	22,285	22,285	22,285	22,285	768,836
14	10				6,686	17,828	22,285	22,285	22,285	22,285	22,285	22,285	22,285	746,551
15	10				4,457	15,600	22,285	22,285	22,285	22,285	22,285	22,285	22,285	724,266
16	10				2,229	13,371	22,285	22,285	22,285	22,285	22,285	22,285	22,285	701,981
17	10					11,143	22,285	22,285	22,285	22,285	22,285	22,285	22,285	679,696
18	10					8,914	20,057	22,285	22,285	22,285	22,285	22,285	22,285	657,411
19	10					6,686	17,828	22,285	22,285	22,285	22,285	22,285	22,285	635,126
20	10					4,457	15,600	22,285	22,285	22,285	22,285	22,285	22,285	612,841
21	10					2,229	13,371	22,285	22,285	22,285	22,285	22,285	22,285	590,556
22	10						11,143	22,285	22,285	22,285	22,285	22,285	22,285	568,270
23	10						8,914	20,057	22,285	22,285	22,285	22,285	22,285	545,985
24	10						6,686	17,828	22,285	22,285	22,285	22,285	22,285	523,700
Total 25	10						4,457	15,600	22,285	22,285	22,285	22,285	22,285	501,415
Annual C Depletion (Mg)	250	2,229	33,428	122,568	233,994	345,419	454,616	521,472	534,843	534,843	534,843	534,843	534,843	18,184,654
Diminishing C footprint (Mg)	5,146,993	5,144,764	5,068,995	4,656,720	3,709,603	2,205,357	146,213	(2,349,720)	(5,015,020)	(7,689,234)	(10,363,448)	(13,037,662)		

Table 3. 11 Estimate of Carbon Sequestration Potential from Proposed Mangrove Reforestation and Maintenance

3.3.5.3 Noise Pollution Mitigation

1. Cemphil Inc. will mount noisy equipment and engines on noise-absorbing industrial rubber pallets, consider the use of noise-absorbing panels within the buildings of noisy processes, and enclose noisy processes in noise enclosures if noise emissions during monitoring exceed the heavy industrial standard (see **Table 2.3.16**).

2. Workers in noisy processes will be issued with noise-canceling headphones with communication and personnel work in exceeding noisy areas will be limited to the following standards under the Occupational Health and Safety guidelines:

Duration per day, hours	Sound Levels, dBA, slow response
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4	115

* ceiling value: No exposure in excess of 115 dBa is allowed.

3. The operation of noisy processes (crushing, grinding, motor pool works) will be limited between 7:00 am and 6:00 pm when noise monitoring in residential areas without passing haul trucks exceed the noise standard.

4. As part of regular environmental compliance monitoring, noise readings will be made along project haul roads, and Cemphil Inc. will exert effort to comply with the noise standard for light industrial zones along the haul roads (**Table 2.3.16**).

5. As necessary, information dissemination and community education activities will be extended to the group of cement haulers to share the effects of long-term exposure to excessive noise, and ways of noise abatement. General procedures for truck noise abatement are: (a) identification of vehicle noise sources, (b) repair or replacement of noise-generating parts, (c) installation or improvement of noise muffler, (d) repair or sound technical provision of rubber sheet vehicle hood noise insulator, and (e) provision of rubber bushings or noise absorber-sheets to line the engine cavity where feasible, among others.

6. All transport vehicles will be required to comply with the noise standards for light industries.

7. Cemphil Inc. will exert effort to realize the concreting of access roads to the proposed Ajuy Ecozone.

3.3.10 Plant Personnel Protection from Air Pollution

Much of the expected increased ambient particulates from Project operations will be falling within the Cemphil Plant premises and primary impact receptor population are its personnel. Long term exposure to high level of ambient particulates triggers heightened sensitivity to dust which is a cause of various upper respiratory tract infections including frequent colds, cough, asthma, sinusitis, bronchitis and pneumonia, among others.

To protect its employees from excessive exposure to high ambient particulates, the following measures will be undertaken in addition to the installation, operation and maintenance of air pollution control equipment in Table 1.7:

1. Ensuring air-tight seals in windows and doors of its buildings
2. Notify employees about furnace maintenance downtime and cold start-up to be able to protect themselves by staying indoors
3. Provide and require plant employees / workers to wear particulate masks
4. Cause the conduct of regular compulsory medical check-up / health monitoring
5. Provide employees vitamin support to maintain / strengthen immunity
6. Require a ten-minute regular daily exercise before start of work, to boost immunity

3.3.11 Supporting the Social Development Program of the LGUs

Positive impacts to the local community during Project operations phase will outweigh the potential negative impacts. Utmost effort will be exerted by Cemphil, Inc. to mitigate the potential negative impacts such as health hazards and road safety risks.

The Project impacts during Operations Phase are the following:

1. Increase in ambient dust, noise and potential road safety hazard along access roads. Mitigation of air pollution from Plant operations and increased road dust will be similar to activities discussed in Section 3.2.11 above.

2. Generation of source for social development assistance and delivery of public services
   a. Support to the Educational Sector
   b. Support to the LGU for the establishment of Nursery for Highly Quality Food Planting Materials (Table 3. 3)
   c. Establishment and Maintenance of Nursery for Medicinal Species (Table 3. 4)
   d. Equipment and manpower assistance for Disaster Response and Rescue
   e. Support to the LGU for values development and cultural enhancement
   f. Support to the LGU for the provision of health services through donation of nebulizers, first aid kits to Barangay Health Centers of Bay-ang and Luca, first aid training for Barangay Health Workers, training on the application of Traditional Herbal Medicine as

endorsed by the Department of Health; quarterly medical and dental outreach, medicines and vitamins for children and senior citizens.

g. Assistance for the establishment of Community Medical Mutual Fund, which is discussed in Chapter 5, Social Development Program.
h. Training on accessible and sustainable food security
i. Support to mangrove reforestation in Barangay Bay-ang, Pedada and other needful coastal barangays

3. Generation of sources of employment, economic opportunities and livelihood
   a. Regular employment in Plant operations
   b. Subcontracts for Plant machine shop works, equipment maintenance, grounds cleaning and landscape maintenance, building maintenance, wastewater treatment facility maintenance, cement transport
   c. Cement marketing and retail distribution
   d. Community-based production of soap, household cleaning chemicals, cleaning implements, tailoring of employees' uniforms to supply Plant requirement
   e. Community-based production of food materials for Plant cafeteria
   f. Operation of Plant cafeteria / kitchen by employees' local cooperative

4. Assistance to LGU in enforcement of regulation for Marine Protected Area and "No Take Zone" at Pedada Bay
5. Improvement / Concreting of Access Roads to Bay-ang
6. Increase in real estate tax revenue for the LGU
7. Increase in income tax revenues for the National Government

3.3.5.4 Psycho-social Preparation for the End-of-Project life

The project social development program assistance will "begin with the end in mind". Cemphil Inc. will design the interventions to help enable self-sufficiency among participant beneficiaries. All interventions will be introduced given the perspective of developing each person's capability to be the solution to their need. The Project can only provide opportunities for the partner-beneficiaries to develop knowledge, skills and some experience that will help build his/her capabilities to meet his/her basic needs, and the deciding factor in each person's finding the solution to reach his/her aspirations will depend on his/her "can do, will do" attitude. At the base of the interventions shall be psychological preparation for each person to seek self-sufficiency, affirmations of each individual's intrinsic value, honor, and the good traditional Filipino values of industry, human dignity, honesty, family, and community, among others.

The Cemphil Human Resource Department will likewise implement an Employees Education Program on the establishment of an Employees' Cooperative (EC) to develop supplemental livelihood sources for members. The EC may also provide employee supplemental enterprise loans to loyal employees.

The discussion on negative impact mitigation and enhancement of favorable impacts are detailed in **Chapter 5, Social Development Program**.

3.4 Environmental Management Plan During Abandonment Phase

It will be the duty of Cemphil, Inc. or its Successor-in-Interest to render the Project site safe and ready for other beneficial uses upon turn-over or cessation of Project activities at abandonment phase. At the end of the project abandonment phase, the following conditions will be manifested at Project site:

1. Stable contoured, terraced and benched slopes, with low or almost no land slide potential. Slope faces will be planted with appropriate vegetation for slope stability or provided with engineered structures as deemed necessary by the Project engineers.
2. Area will have proper drainage design that prevents area flooding, ponding or inundation, with properly situated storm run-off open-bottom detention basins
3. Top slopes that at north wall are planted with forest tree species to promote soil cohesion and reduce soil erosion
5. Area is clean and free from debris from equipment and facility dismantling, free from all physical and chemical safety risks
6. All open spaces are covered with vegetation to buffer site microclimate and enhance visual aesthetics
7. Public safety signages are visible and maintained

The area will be closed to the public to avoid untoward incidents.

3.4.1 Waste Management

During the abandonment stage, a significant amount of solid waste is expected to be generated. A container van will be readied to receive waste materials for hauling out of the Plant.

1. All workers who will undertake equipment removal, facility dismantling and site cleanup will be properly trained for the job and provided with PPE. Workers' training may involve a program with accredited entities under the Department of Labor and Employment – Occupational Health and Safety Commission.

2. All industrial waste materials will be hauled out. Biodegradable materials will be shredded, added on to the compost pit, and covered with soil. Hazardous materials will be hauled out by accredited hazardous waste transporter and treater. Recyclable materials will be recovered and repurposed or disposed through accredited recyclers.

3. All Potential sources of public safety risks will be removed

4. The disposal of used oil will be carefully undertaken during the abandonment phase. All oil receptacles will be hauled out. Oil and water separator facilities will be emptied. Sand filters will

be replaced, and oily sand will be hauled out by an EMB-accredited hazardous waste handler and treater. This is to enable the water pollution facilities to function for the residual silt and oil that may remain in dismantled equipment surfaces that may be in uncovered status while waiting for transport.

5. Hauling of large equipment will be done at nighttime to minimize contribution to road traffic load

6. All haul trucks will be required to comply with LTO road safety requirement for oversized cargo and visibility markings

3.4.2 Protection of Soil Quality

Care will be taken that all revegetated areas will not be stripped or trampled upon, or have the vegetation damaged, during final facility dismantling activities.

3.4.3 Wildlife Protection

1. Wildlife may be disturbed by the increased noise and intensive human activities during equipment dismantling during the abandonment phase. The vegetation within the Plant is expected to flourish after fifty (50) years of operation and will provide cover for the wildlife. The dismantling and hauling subcontractors will be reminded, as part of a special provision in the contract referring to R.A. 9147, to avoid unnecessary, excessive noise, prohibit workers from preying on wildlife, report any injury to wildlife to CENRO in Sara, and if the injury is minor, assist the wildlife return to the habitat to recover.

2. The project rainwater harvesting facility will not be dismantled. Local wildlife is expected to be accustomed to use the cistern or rainfall collection basins for part of their water supply. It is expected to be able to serve the successor-in-interest as the natural water supply in the area, as the area is not expected to improve due to the area's hydrogeology, topography, and its tendency toward deforestation due to population pressure.

3. All water pollution control facilities in-place during the Operations Phase, such as the settling ponds, drainage trench, and oil and water separators, will not be dismantled in project abandonment as they serve a good purpose. Cemphil Inc. will inform the successor-in-interest regarding the function of these structures and the facility maintenance requirements.

4. All water pollution control facilities will be emptied prior to equipment removal or dismantling and transport or abandonment.

5. The pier will not be dismantled so as not to create a heap of waste materials that will cause disruption in the water circulation pattern, the littoral currents, cause coastal erosion or significant changes in sediment deposition.

6. The Port may be donated to the Local Government. For this purpose, an authorization from the Philippine Ports Authority (PPA) will be necessary and inspection will ensure, to authorize public use of the facility. It may also be turned over to a Private successor-in-interest after project abandonment.

3.4.4 Control of Dust Resuspension

1. During the abandonment phase, the cement production facilities will no longer be operating. Dust emission sources shall be the dismantling activities which will cause a lesser volume of ambient dust dispersion. Excessive ambient dust during facility dismantling will be suppressed through overheard water sprinkling using the mobile/portable water sprinkler.

2. Depending on the technology for powering heavy equipment by the year 2082, the sources of gaseous pollutive emissions may be significantly less than the current sources (**Table 1.14**). In view of the global awareness concerning climate change factors, there is very high probability that energy sources for heavy equipment and power-intensive industries will not be fossil-based toward year 2082, the planned end of project life.

3. In the event of an earlier period of project abandonment, Cemphil Inc. will submit an abandonment plan, including a gaseous emissions mitigation plan, to the Environmental Management Bureau at least one year before the abandonment schedule.

3.4.5 Control of Excessive Noise

Noise control during abandonment will include the use of less noisy equipment and the well-controlled dismantling of the facility. The buildings will not be dismantled, and this reduces the potential sources of loud noise due to dismantling.

3.4.6 Verification of Contribution to Carbon Sink

Due to the global impact of climate change and the Philippine's susceptibility to climate disasters, verification of Project-planted mangrove forests will be requested to the DENR Community Environment and Natural Resources Office with responsibility over Ajuy.

A survival rate of >85% of planted mangroves according to the schedule in Table 3.8 will be sufficient Project carbon sink contribution.

3.4.7 Psycho-social Preparation of Employees for Loss of employment

The current socioeconomic conditions wherein more than 50% of the population of Ajuy are food-insecure, creates a sensitive situation among many individuals on loss of employment, if ever one is secured.

1. Among the enhancement strategies of Cemphil are HR employees' education program regarding personal savings, retirement investment planning and creation of Employees Cooperative intended to be a self-sustaining entrepreneurial entity that will provide supplemental income sources for members, and through which the members may grow individual livelihood projects (see Section 3.3.13).

2. Cemphil, Inc. will provide employee separation pay as per DOLE regulations, including assistance to avail of unemployment benefit from the Social Security System

3.4.8 Final Cleaning of Settling Ponds and Oil and Grease Separators

The silt ponds and drainage trench will be desilted before final abandonment. The silt ponds and drainage trench are designed to accommodate at approximately 70% of peak storm runoff from within the Plant, and with regular desilting of the successor-in-interest Plant operator, it will indefinitely continue to perform the function of silt control.

3.4.9 Final Air, Water and Soil Quality sampling

A final air and water quality sampling will be undertaken, witnessed by the MMT and EMB6 or equivalent entities, to verify that environmental quality at abandonment complies with environmental regulation.

The EMP is summarized in Table 3. 9. Costs that normally fall within project construction budget and only require management policy, influence, or persuasion, such as proper waste management, housekeeping, coordination/ liaising, requirements of the Law, lobbying with the LGUs for passage of Ordinance/s, are presented as "included in ~ other pertinent budgets under the Project Cost (**Table 1.25**). Activities which may not be provided-for in **Table 1.25** are those ascribed with additional cost in Table 3.9. The EMP and ECC will be part of Project Bid Documents and the cost will be finalized in due course.

Table 3. 12 SUMMARY OF ENVIRONMENTAL MANAGEMENT PLAN

Project Phase / Environmental Aspect	Potentially Impacted Environmental Component	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Capital Cost* (PhP)	Guarantee / Financial Arrangements
Pre-Construction Phase While there are no project environmental impacts during pre-construction phase, provision for environmental management during construction and operation will be prepared by Cemphil during pre-construction phase. The required environmental impact control measures during construction phase will be specified in the Scope of Works for the Construction Contract. The environmental performance requirements for air and water pollution equipment shall be specified in the Invitation to Bid (ITB) which are issued during the pre-construction phase. These provisions in the Project design and construction contracts comprise an important part of guarantees for Project environmental compliance. The Project-affected Families (PAFs) may be resettled during pre-construction phase with the recently-announced availability of the NHA resettlement housing and awarding of housing rights for storm-surge-threatened shoreline residents available in the first quarter of 2021. The following activities also need to be undertaken during pre-construction phase:						
	The People	Displacement of 24 Informal Settler-families from Cemphil project site	Resettlement to formal NHA Housing Project; Provision of transportation facility to traditional livelihood sources.	LGU, Cemphil, Inc.	NHA housing cost for PAFs undisclosed. 1,200,000.00 for livelihood assistance	Certification from LGU on the Award of Housing Rights to shoreline residents in Lot 23.
	The Land	Potential devaluation of area visual aesthetics due to vegetation removal	Development of aesthetic landscaping design as part of project area plan	Cemphil, Inc.	Part of design contract cost	Part of Approved Scope of Work in Invitation to Bid for Plant Facility Design and Construct. To be funded by Cemphil, Inc.
Construction Phase						
Site Preparation Heavy equipment mobilization Vegetation clearing earthworks Land development Facility construction Equipment erection and installation	The Land	Habitat disturbance; wildlife species displacement; threat to abundance, frequency and distribution of important species, change in floral community structure, change in soil quality affecting capacity to support robust plant growth	Gradual implementation (small area, gradually expanding) of vegetation removal to give fauna ample opportunity to escape. Avoid immobilizing by loud noise. Minimize vegetation removal to what is utmost necessary Preservation and protection of removed topsoil, to be topped on excavated land to be revegetated. Provide at least 3 layers of tightly laid sandbagging barrier around toe of topsoil stockpile. Establish nursery to receive viable removed vegetation, for later transplanting Prepare replacement planting materials in nursery in advance, to provide time for the plants to stabilize before outplanting. Use indigenous flora species in area regreening	Cemphil, Inc.	100,000.00	Special condition in construction contract, compliance to Republic Act No. 9147, FCC condition, compliance to PD 1586. To be funded by Cemphil, Inc.
		Waste Generation: Construction waste (waste concrete, steel cuttings, packaging materials, waste form works. Generation of domestic solid waste	Carefully plan concrete delivery for zero waste. Carefully manage concrete pouring to avoid spills. Immediately clean-up cement spill while wet. Waste minimization, waste segregation, material recovery and recycling Provide for at least 200 m2 stockyard area to properly sort & store recyclable materials for easy & safe retrieval of recyclers Consider blending of selected shredded plastic to mortar for non-load-bearing panels, walling etc. in accordance with DPWH guidelines. Biodegradable materials (paper, carton, fiber) will be shredded and composted.			Part of Construction Contract. To be enforced by Cemphil through Contract provisions.

		Kitchen waste	Provide for portable biodegradable kitchen waste receptacles for vegetable wastes which go to the compost pit. Total estimated daily vegetable waste is 1.6 tons. Separation, safe containment and handling of estimated max. 228 kilos food waste per meal at peak season, as livestock feed amelioration, grown for Project kitchen. "Expired" food waste and other kitchen waste will be properly composted			To be funded by Cemphil.
		Hazardous waste generation: busted light bulbs, spent batteries, waste oil, clinic waste, broken equipment, waste oil, engine lubricant containers	Segregate hazardous waste (busted light bulbs, spent batteries, clinic waste, broken equipment with electronic components) Provide safe and sealed containers for each waste type Place placards with the symbol representing the hazard classification of the waste per (DAO 2004-36) Store hazardous waste in safe, dry, and well-ventilated shed if not hauled out immediately. Coordinate with EMB 6 how these will be disposed in the absence of a licensed hazardous waste transporter and disposal agent in Ajuy.		85,000.00	Condition in Construction Contract. compliance to: Republic Act No. 9003, Republic Act No. 6969, Republic Act No 9275 and the Sanitation Code of the Philippines. To be enforced by Cemphil through Contract provisions
		Wastewater generation Domestic wastewater, kitchen wastewater and septic waste from construction crew	Provide for 9 m3 kitchen grease trap that discharges to a dug-out ground infiltration basin at least 5.0 m 2 x 0.3 m eters Schedule the construction of Plant septic tank ahead so it serves the construction personnel, or Provide for at least 30 m 3 septic tank with 1.65 m 2 leaching area at least 3 m eters from bunkhouse & 4.5 m eters from water supply, for sanitation facilities of construction workers.			Condition in Construction Contract. To be funded by Cemphil, Inc.
		Potential soil contamination	Do not allow discharge of waste concrete in Plant site. Prevention of oil and lube spill through regular engine maintenance, proper handling and storage of fuels, oil and lubricants. Use of DOE-compliant fuel and lubricant containers and dispensers. Equipment maintenance only in authorized designated area with oil collection sump.	Cemphil, Inc.	20,000.00	Special condition in construction contract. Compliance to ECC Condition and PD 1586. To be enforced by Cemphil through Contract provisions.
	The Water	Resource use competition	Use of pre-mixed concrete delivered and injected by fitted cement mixer trucks Use delivered water supply from permitted water service provider Secure NWRB permit to operate project well Construct all facility roof and downspout connected to drainage /reservoir to harvest rainfall Build drainage/rainfall collection system with 8,035 m3 capacity	Cemphil, Inc.	2,000,000	Part of specifications in Invitation to Bid for Detailed Engineering Design. To be implemented by Cemphil, Inc. through Contract provisions.
		Marine water pollution Increased marine water turbidity Increased oil and grease sources	Install silt control measures (perimeter cut-off channel, adequate settling ponds) before implementing earthworks Course storm drainage discharge to sea through a 3-basin series settling pond. Schedule major earthworks and slope stabilization during dry season, if possible.		100,000.00	Special condition in contract of pier construction. Compliance to Republic Act No. 9275. and PD 1586. To be funded and enforced by Cemphil.

			Implement "cut-haul-lay-and-tamp" method for earthworks. Ensure slope stability and provision of run-off channel during slope excavation. Immediately plant open spaces including open bench faces right after construction. Prohibit washing of cement trucks at site. Equipment maintenance only in authorized designated area with oil collection sump.		500,000.00 100,000.00	
	The Air	Exceedance of ambient Total Suspended Particulates (TSP) along access roads	Water sprinkling along haul roads and active construction areas for dust suppression, at least 2x a day in dry season. Require contractor to maintain particulate filters in diesel-fed heavy equipment and, limit vehicle speed to 30 kph. Construct tire wash for incoming and outgoing vehicles. IEC for community participation in dust suppression. Mobilize when less people are out on the roads, i.e., evening or nighttime. Lobby with Local and National Government to implement access road support to Aguy economic zone	Cemphil, Inc.	100,000.00	Special condition in construction contract. Compliance to Republic Act No. 8749 and PD 1586. To be enforced by Cemphil.
		Exceedingly loud, disturbing noise	As much as possible, limit construction work between 6:00 am to 6:00 pm. Schedule heavy equipment operation between 7:00 am to 6:00. Plan the operation of noisy equipment use outside of 1:00 pm to 4:00 pm. Plan the work as to avoid proximate operation of more than two (2) noisy equipment at the same time. Advise / remind haulers on proper equipment maintenance.	Cemphil, Inc.	1.50,000.00. Part of Contractor's cost	Special condition in construction contract. Compliance to PD 1586. To be enforced by Cemphil.
		Unmitigated greenhouse gas emissions	Carbon offsetting through reforestation of 250 hectares mangrove areas over 25 years and maintenance for another 25 years with at least 85% survival rate.	Cemphil, Inc. and Local Government Units	Included in SDP budget	ECC condition. Compliance to Republic Act No. 9729, and PD 1586. To be funded by Cemphil
	The People	Road safety risks	Provide road safety / traffic aids in critically narrow or populated areas when heavy equipment and haul trucks passage. Heavy equipment to comply with LTO regulation on visibility of markings for large vehicles. As much as possible, mobilize heavy equipment when less people are out on the roads, i.e., evening or nighttime.	Cemphil, Inc.	Part of Construction Budget	Compliance to PD 1586. To be funded and enforced by Cemphil through Contract provisions
Jetty port construction	The Water	Marine water pollution: Increased marine water turbidity Increased oil and grease sources	Installation of silt curtain and oil boom around active jetty port construction area, as necessary	Cemphil, Inc.	Part of Construction Budget	ECC condition. To be funded by Cemphil.
		Marine habitat disturbance; wildlife species displacement; threat to abundance, frequency and distribution of important species	Use of natural rocks and stones to create rough surfaces on causeway and retaining walls below 2m meters above mean sea level, to recreate habitat for shellfish. Construction of 6 concrete and/or blocks for the pier facility	Cemphil, Inc.	Part of civil works cost	Part of specification in bid documents.

Project construction (cement grinding plant and jetty port)		Generation of employment and Competition for limited employment opportunities	Post job opportunities and required qualifications in highly visible places (Barangay and Municipal Halls) Preferential hiring for local labor Implement On-The-Job training programs for underprivileged undergraduate youth Comply with DOLE regulations regarding wages, occupational safety, and contract workers' benefits Requirements for semi-skilled, skilled and engineers will first be posted in Ajuy	Cemphil, Inc.	Part of Project Administration cost	Special condition in construction contract. Compliance to PD 442 (Labor Code of the Philippines) as amended and PD 1586. To be enforced by Cemphil, Inc.
		Health and safety hazards to workers	Construction Contract to include provision for DOLE requirements for occupational health and safety Conduct of workers' safety orientation Weekly safety meetings Construction Contract to include provision for DOLE requirements for occupational health and safety (of sufficient potable water in the workplace, safety training, obligatory wearing of Personal Protective Equipment, provision of Safety Officer, first aid clinic, full time health aid, emergency response procedure, emergency vehicle support) Daily safety checks for all operating equipment, suspended structures (scaffolding), electrical connections, oil storage and spills, passages, work areas Daily checking of correct stockpiling of materials and wastes	Cemphil, Inc	Integrated in Construction Contract Cost	Compliance to Republic Act 11058 and DOLE DO. 198-19 series of 2019. To be enforced by Cemphil through details in Contract.
		Generation of Benefits to the Community	Organization, training, and capacity building (mentoring, coaching) of the local Labor Service and Producers' Cooperative to avail of economic opportunity to supply services and materials to the Project. Promotion of school-based development of nurseries for high quality materials for food, herbal medicine, forest trees and mangrove cultivars	Cemphil, Inc	200,000.00	FCC requirement. Compliance to PD 1586. To be funded by Cemphil.
		Uncontrolled in-migration, proliferation of informal settlers	Assist in the control of proliferation of informal settlers by organizing a local women's cooperative, encourage and assist them to provide sundries supplies and construction workers' requirements, and encourage them to report to the LGU any transient/migrant/informal vendors/peddlers/settlers.	Cemphil, Inc. Project Site Engineer, Municipal and Barangay LGUs	15,000	Part of Cemphil Site Engineer Job Description. 100% Local labor hiring will be part of special condition in construction contract. Compliance to PD 1586
Total Estimate of Additional EMP Cost during Construction Phase					5,420,000.00	
Operation Phase						
Finish Grinding of Cement, Packing and Dispatch	The Land	Reduction of soil erosion potential	Plantation and maintenance of vegetation in the north east slope protection wall. Intensification of planting deep and widely rooting shrubs and bushes eroding areas, if any.	Cemphil, Inc.	100,000	Compliance to FCC condition and PD 1586. To be implemented by Cemphil.
		Change in soil quality and soil fertility	Re-soiling of open/vacant areas with compost-enriched topsoil, use of nitrogen-fixing shrubs and trees. Include nitrogen-fixing shrubs and tree species in Plant revegetation Soil amelioration using project compost	Cemphil, Inc.	50,000	Compliance to FCC condition and PD 1586. To be implemented by Cemphil.

		Habitat disturbance; wildlife species displacement; threat to abundance, frequency and distribution of important species	Company policy to prohibit predation or harm to wildlife. IEC to workers for protection of disturbed animals by assisting to habitat shelter and safety. Company compliance to Republic Act No. 9147, Philippine Wildlife Act IEC to workers for protection of disturbed animals by assisting to habitat shelter and safety.	Cemphil, Inc.	Part of Administrative cost. Included in IEC budget.	Compliance to Republic Act No. 9147 and PD 1586. To be implemented by Cemphil.
		Solid waste management	Proper composting of biodegradable waste Provision of separate waste bins for biodegradable, recyclable materials and residual waste. Material recovery, re-use and recycling Disposal of irrelevant recyclable waste to registered material recycling agents Weekly haul-out of residual waste to municipal waste management facility.	Cemphil, Inc.	100,000.00	Compliance to ECC condition and PD 1586. To be implemented by Cemphil.
		Hazardous waste management	Proper containment and storage of used oil, spent heavy equipment batteries, spent batteries, busted light bulbs, ink cartridges, oily wastes and laboratory reagents. Haul out of hazardous waste by accredited hazardous waste transporter and treater	Cemphil, Inc.	200,000.00	Compliance to ECC condition and PD 1586. To be implemented by Cemphil.
	The Water	Resource use competition	Rain harvesting from all Plant surfaces collected in drainage channel cum cistern. Groundwater extraction only for domestic use.	Cemphil, Inc.	200,000 for maintenance	Compliance to ECC condition and PD 1586. To be implemented by Cemphil.
		Water pollution from Plant and Stockyard Water pollution from port operations	Silt control through settling ponds (Table 1.8) and Oil and Water Separators (OWS) (Table 1.9). Cooperate with Coast guard on the implementation of Marine Pollution control guidelines by ships at port Post signboards in port disallowing discharge of raw bilge and ballast water, and solid domestic waste Coordinate with EMB 6 for TSD services for visiting ships	Cemphil, Inc.	1,300,000.00 for settling pond and OWS maintenance	Compliance to ECC condition and PD 1586. To be implemented by Cemphil.
		Disturbance of potential coral growth around jetty port area	Require docking ships to use anchor blocks. Advice regarding disallowance of random anchoring	Cemphil, Inc.	100,000.00	Included in Port construction contract. To be implemented by Cemphil.
Operation Phase						
	The Air	Increased ambient dust pollution from cement grinding and product transport	Install, operate and properly maintain air pollution control equipment (see Table 1.7) Limit project vehicle speed to 30kph Regular twice daily watering of unpaved access roads during dry days Daily road dust sweeping in concrete road sections. Return of collected road dust to Plant raw material bin to prevent dust re-suspension in air Ensure tire wash has sufficient water to function, and minimize spreading of dust from muddy vehicle tires, inside and outside of Plant Install signages for vehicle speed limit of 30kph	Cemphil, Inc.	360,000.00 for DPF 750,000 annually for road watering or salaries of street sweepers	Compliance to ECC condition and PD 1586. To be funded by Cemphil, Inc.

		Increased ambient carbonic particulates emitted by gensets	Provide genset exhaust with catalytic converter or diesel particulate filters			
		Increased noise Slight increased ambient temperature due to more concrete buildings in the Plant environment	Use of rubber pallets/platforms for, and enclosure of noisy equipment and processes, including gensets. Construct buildings for noisy processes with noise control walls. Planting of rows of thick-leaved shrubs and bushes around buildings of noisy processes to absorb noise Maximize planting and maintenance of leafy vegetation in all vacant spaces in the Plant to serve as heat and noise sink	Cemphil, Inc.	Part of Heavy Equipment Cost. Item 4, Table 1.25.	Compliance to ECC condition and PD 1586. To be funded by Cemphil, Inc
		Unmitigated greenhouse gas emissions	Carbon offsetting through mangrove reforestation and maintenance, ten (10) hectares annually for twenty-five years and maintenance for another twenty-five years for total fifty years of Plant operation Enter into MOA with LGU and CENRO for the protection and preservation of mangrove forest area. Lobby with LGU to pass Ordinance regarding mangrove area protection. Lobby with Government to provide incentive to improve renewable energy supply in the Province; Carbon offsetting through mangrove reforestation and maintenance, ten (10) hectares annually with 1.5m x 1.5m planting interval, for twenty-five years and maintenance for another twenty-five years for total fifty years of Plant operation Enter into MOA with DEPED for mangrove reforestation and maintenance, as planned above. Lobby with Government to provide incentive to improve renewable energy supply in Ajuy.	Cemphil, Inc. and Local Government Units	Included in SDP budget	Compliance to ECC condition and PD 1586. To be funded by Cemphil, Inc.
	The People	Employment generation	Comply with DOLE regulations regarding wages, occupational safety, and contract workers' benefits Cause/fund the delivery of the following trainings. Cooperative formation and development	Cemphil, Inc.	Part of Admin cost	Part of Company Hiring Policy, ECC condition, PD 1586. To be implemented by Cemphil, Inc.
Operation Phase						

			Enterprise development, financial management and sustainability, including simple livelihood project feasibility preparation -Livelihood skills development *Kitchen operations *food safety *livestock growing and health protection (chicken, swine, goat) *food processing (chicken and pork-based products) *snack food production *soap, cleaning materials (incl. ash cleansers) and implements production *tailoring *rag making . *Product packaging *Product marketing and market networking Organize, train, and enable local community cooperative partner to supply and operate Project Canteen, and supply it with own-grown food materials where feasible.			
		Threat to delivery of basic services	IEC on the importance of the following: * proper nutrition *composting, organic soil enrichment and home gardening *organic food production and its potential markets *climate change, mangrove reforestation and sustainable fishery Establishment and annual replenishment of a revolving livelihood assistance and mutual fund managed by the association of partner cooperatives Assist the establishment and operation of a common food processing facility identified based on "felt-need" basis. Supplement workers' nutritional source by supporting food gardens in vacant areas in Plant Promote the establishment of barangay- and school-based food and medicine mother stock nurseries and gardens, and mangrove nurseries.	Cemphil, Inc.	Part of SDP Budget	Compliance to ECC condition and PD 1586. To be implemented by Cemphil, Inc
			Implement school-based mangrove reforestation Support Bantay Dagat initiatives of local fishermen Video/keep reproducible record of all trainings, education and information materials for future replication.			
		Inmigration, proliferation of informal settlers	Post job opportunities and qualification requirement in highly visible places (Barangay and Municipal Halls) Requirements for semi-skilled, skilled and engineers will first be posted in Ajuy Municipal certification for 3-year Ajuy residency shall be a requirement for employment Hiring of non-resident worker only when the requirement is not locally available IEC with LGUs on the control of proliferation of informal shops, shanties, stalls and vendors/sellers	Cemphil, Inc.	1.5,000.00	Compliance to ECC condition and PD 1586. To be part of Company operating policy

		Road safety hazards, traffic congestion	Scheduling cement transport during off-peak hours. Road widening and concreting; provision of safety signages; provision of traffic aids. Lobby with DPWH and LGU for realization of access road support to Ajuy Economic Zone Provision of safety signages Provision of traffic aids in highly populated sections and at schools	Cemphil LGU DPWH-VI	20,000.00	Compliance to ECC condition and PD 1586. To be endeavored by Cemphil, Inc.
		Increased sources of occupational safety hazards	Regular safety meetings Provision of safety installations in plant machinery and structures Provision of workers PPE	Cemphil, Inc.	Part of project management cost normal	Compliance to Republic Act 11058 and DOLE DO. 198-19 series of 2019. To be part of Company operating policy.
		Increase in local tax revenues	78. Lobby for approval of land reclassification from agricultural to industrial use	Cemphil Sangguniang Bayan ng Ajuy	Part of EMP cost	Compliance to R.A. 7160, Memorandum Circular No. 54. Will be implemented by Cemphil, Inc.
		Ships encountering passage conflict with local fishing boats	Project ships are to follow LGU-provided navigational lane (Annex Z) Project ship arrivals and departures are posted in Bayang Barangay Hall Bulletin Board Project ships blow horn upon entry into Ajuy municipal waters and exit from Cemphil Port		50,000.00	Compliance to ECC condition and PD 1586. Will be part of Company operating policy.
Total Estimate of Recurring Annual Environmental Management Cost during Operation Phase Outside of normal Project Administration Cost					3,245,000	
Abandonment Phase						
	The Land	Waste Generation	Shredding of biodegradable waste and placing in compost All recoverable materials will be disposed through accredited material recyclers All residual wastes will be hauled out to municipal land fill	Cemphil, Inc.	500,000.00	Compliance to Republic Act No. 9003 and PD 1586 to be implemented by Cemphil, Inc.
		Hazardous waste management	Proper containment and storage of used oil, spent heavy equipment batteries, spent batteries, busted light bulbs, ink cartridges, oily wastes and laboratory reagents; Haul out of hazardous waste by accredited hazardous waste transporter and treater	Cemphil, Inc.	500,000.00	Compliance to Republic Act No. 9003 and PD 1586

		Potential public safety risks	The property will be closed to the public to avoid public safety risks All workers are trained for the job and provided with PPE. All structures and facilities that are public safety risks will be dismantled and removed. Hauling will be done at nighttime to minimize contributing to road traffic load All haul trucks will be required to comply with LTO road safety requirement for oversized cargo and visibility markings All settling ponds, drainage systems and oil and water separators will be cleaned out. All sources of environmental deterioration, if found, will be remediated by Cemphil. A final air and water quality sampling will be undertaken, witnessed by the MMT and EMB6 or equivalent entities, to verify that environmental quality at abandonment complies with environmental regulation.	Cemphil, Inc.	500,000.00	Compliance to PD 1586. To be endeavored by Cemphil, Inc. implemented through supply & hauling contracts
	The Water	Water pollution from Plant and Stockyard	Desilting of settling ponds and desludging of Oil and Water Separators by TSD agent.	Cemphil, Inc.	1,000,000.00	Compliance to Republic Act No. 9275 and PD 1586.
	The Air	Increased ambient dust from factory dismantling	Overhead sprinkling for dust suppression	Cemphil, Inc.	100,000.00	Compliance to Republic Act No. 8749 and PD 1586.
		Sequestration of Project carbon footprint & contribution to carbon sink	Ensure that planted mangrove forest is maintained with >85% survival rate	Cemphil, Inc., CENRO	20,000.00	Compliance to PD 1586.
	The People	Loss of Employment	Provide employee benefits as per DOLE regulations Early education of employees regarding personal savings and retirement investment planning Prepare employees to avail of unemployment benefit from the Social Security System Provide employee benefits as per DOLE regulations	Cemphil, Inc.	Pas rot normal project closure costs	Compliance to pertinent DOLE regulations

Cemphil Cement Grinding Project EIS

Environmental Risk Assessment & Emergency Response Policy

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4 . Environmental Risk Assessment and Emergency Response Policy and Guidelines

4.1 Introduction

4.2 Risk Screening Level

This Environmental Risk Assessment (ERA) is prepared for the Cemphil, Inc. grinding plant following the general guidelines and outline for an Environmental Risk Assessment (ERA) prescribed in Annex 2-7e of DAO 2003-30. This ERA also includes safety risk assessment for fire, explosion, the release of toxic substances, and physical risks in the event of facility structural failure.

A risk screening exercise pertaining to particular Cemphil Plant facilities or the use of certain materials and procedures that may pose important hazards to individuals and its surroundings is presented below.

Table 4. 1 Risk Screening as per Annex 2_7-7E-Precedural Guidelines for the Conduct of Environmental Risk Assessment

ACTIVITIES REQUIRING ENVIRONMENTAL RISK ASSESSMENT				APPLICABILITY TO THIS PROJECT
1) Facilities for the production or processing of organic/inorganic chemicals using:				The Project does not include any of these processes. N/A
Alkylation	Esterification	Polymerization	Distillation	
Amination	Halogenation	Sulphonation	Extraction	
Carbonylation	Hydrogenation	Desulphurization	Solvation	
Condensation	Hydrolysis	Nitration	Pesticides	
Dehydrogenation	Oxidation	Phosphorus production	pharmaceuti cal prod.	
2) Installations for distillation, refining, and other processing of petroleum products				Not Applicable
3) Installations for total or partial disposal of solid or liquid substances by incineration or chemical decomposition				Not Applicable
4) Installations for the production or processing of energy gases (e.g., LPG, LNG, SNG.)				Not Applicable
5) Installations for the dry distillation of coal or lignite				Not Applicable
6) Installations for the production of metals and non-metals by wet process or electrical energy				Not Applicable
7) Installations for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 1992-29)				Applicable
CONCLUSION				Risk screening level exercise is applicable.

The details for project diesel fuel requirements are shown below:

Table 4. 2 Risk Screening Level

CATEGORY	LEVEL 1 (tons)	LEVEL 2 (tons)	Project Use
Explosives	10	50	
Flammable substances	5,000	50,000	30 tons *
Highly flammable substances	50	200	
Extremely flammable substances	10	50	
Oxidizing substances	50	200	
Toxic substances (low)	50	200	
Toxic substances (medium)	10	50	
Toxic substances (high)	5	20	
Toxic substances (very high)	0.2	1	
Toxic substances (extreme)	0.001	0.1	
Unclassified (Type A)	100	500	
Unclassified (Type B)	50	200	

Table 4. 3 Project Storage of Diesel Fuel No. 2

Annual requirement, liters	1,436,768
Operating days per year	310
Daily Requirement, liters	4634.7355
Specific Density, Diesel No.2 (kg/1000)	849
At m3/ton	1.18
Weekly Requirement, Liters	32,443.15
Weekly Requirement, tons	27.54
Weekly delivery by 30 -ton oil tank trailer, in tons	30

As shown in**Table** 4. 3 and based on the Project diesel fuel storage capacity, the maximum diesel fuel volume that will be available at any single time at the Project site will be 30 tons. Operations using a functional 30-ton diesel storage facility will require Level 1 or Qualitative Risk Assessment.

The Risk Assessment Method used below adapts procedures from The Risk Register prescribed in the Australian/New Zealand Standard for Risk Management (AS/NZS 4360:1999). It covers the required assessment for fire, explosion, release of toxic substances, and physical risks in the event of facility structural failure.

The Risk Register has six (6) concerns with the following description.

1) The Risk: what can happen and how it can happen.
2) The consequences of an event happening.
3) Existing/proposed controls.
4) Consequence Rating.
5) Likelihood Rating; and
6) Level of Risk

4.3 Risk identification

The proposed Project entails risks that are natural, man-made, and a combination of both. Risks are damaging events that may or may not happen, contingent on the occurrence of uncertain factors while hazards, on the other hand, are potential sources of harm or damaging situations which are waiting to happen if no precaution or prevention are taken.

Natural risks are hazards resulting from events such as earthquakes, geological instability (e.g., landslides), and typhoons. Meanwhile, man-made risks are more of hazards that may likely cause accidents such as fires, structural/equipment failure, and spillages.

4.3.1 Natural Hazards

4.3.1.1 Earthquakes, Ground Shaking and Liquefaction

The project site is 63.8 kilometers from the West Panay Fault, the nearest earthquake generator. As may be observed from **Figure 2.1.11**, Seismic Map of Visayas, the majority of earthquake epicenters occur farther than 55 kilometers from the project site with average surface-wave magnitude (Ms) of 5.0. The proponent, due to the large project investment requirement, will design the facility to meet engineering requirements for facility safety. The Project facilities and workers will be covered by an insurance policy for damage caused by force majeure.

4.3.1.2 Typhoons and Flooding

The occurrence of strong typhoons does not pose significant risk to the environment due to the project due to the following reasons:

1. The project land surface will be elevated to eight (8) to 10 meters above sea level, higher than the recorded maximum storm surge height of four and a half (4.5) meters during Typhoon Yolanda. The elevated landform will be protected by retaining walls, which will also protect the shoreline from further erosion.
2. The stockyard will be covered (see **Figure 1.3**). The materials will be safe from rain-induced erosion that could bring eroded raw materials to the sea. Included in the project plans is sediment sumps strategically located around the stockyard for catching sediments that may have spilled and carried by run-off. This is to prevent sediment flowing to the sea.
3. The project engineering plans will comply with the Philippine Building Code and facilities are expected to be typhoon resistant. The Plant will include a storm drain system where flooding will not occur.

Risks related to flooding are not a concern due to the +10 masl elevation of Plant working deck and adequate adaptive drainage design.

4.3.1.3 Landslides

The natural condition of the project site is susceptible to rain-induced landslides. The project design includes the benching of the wall at the northeast project boundary (see **Figure 3.4**). The slope will be designed for stability, using a combination of retaining wall and appropriate bench height, width, and bioengineered slope face (coco coir netting to assist young root-dense vegetation to take root and survive).

Alternatively, the entire northeastern wall will be benched and concreted, for more stability. The project feasibility study is still on-going and the northwestern wall design, whether fully concreted or stabilized by a combination of retaining wall and bioengineered intervention, will be provided with stabilization intervention.

The risk of landslides is not a significant concern given that slope stabilization is part of project consideration.

4.3.2 Man-Made Hazards

4.3.2.1 Fire

Fire can be caused by excessive heat from machinery or cooking equipment, an irresponsibly disposed of a cigarette butt, a spark from the exhaust of an ill-maintained motor vehicle falling on spilled fuel, faulty material heater/burner, unattended electrical short short-circuit, or intended ignition.

4.3.2.2 Explosion

An explosion can occur when diesel fuel stored in a closed repository receives an ignited substance capable of maintaining 75°C temperature for the diesel to release flammable vapors and catch fire when given an ignition source. Diesel oil no. 2 will auto-ignite at 220°C. The rapid molecular expansion combustion will cause the fuel containment structure to explode. In open-air, diesel will not ignite when an ordinary fire is put into it; the fire will simply go out unless the fuel is preheated to at least 75°C. Under normal project operation, this is not expected to happen. An act of terrorism or arson can facilitate acts that will cause diesel fuel explosion, such as direct planting and detonation of explosive/s.

4.3.2.3 Release of Toxic Substances

Oil and grease spilled into the environment are toxic when they reach the aquatic ecosystem. Sources of possible oil spills include the Plant fuel tank, fuel delivery system, and the ships docking at the wharf. The fumes released from diesel fuel heated above its flash point will release carbon monoxide, carbon dioxide, nitrogen oxides, and hydrogen sulfides commensurate with the volume of heated diesel fuel. Carbon monoxide and hydrogen sulfides from the combustion of diesel fuel from electric generator sets and the hot air furnace operations are toxic when concentrated in closed unventilated premises.

4.3.2.4 Physical Risks in the Event of Structural Failure

The facilities holding sensitive materials are the fuel tank, the cement silo, and the material conveyor system. Physical risks in the event of structural failure include the release of diesel fuel, cement, clinker, limestone, and other raw materials to Plant platform surfaces.

4.3.2.5 Air Pollutants Hazards

Air pollutants emitted by the project are particulates from cement grinding and gaseous emissions from diesel fuel combustion. Without air pollution control measures, the level of project pollutant emissions may be hazardous to vegetation survival and human health.

4.3.2.6 Occupational Hazards

The project includes a range of machinery and facilities that could potentially harm personnel, if there are no machine guards. If handled or operated incorrectly, these machinery and facilities may be hazardous to workers' limb and/or life. Maintenance works on the conveyor system, silo, and hot air furnace, in the machine shop and at the packhouse are also hazardous if done without safety devices, proper training, or equipment. Other occupational hazards include too long working hours, too many workdays without rest days and too low light level in the workplace, too long workers' exposure to high noise level, too hot or poor or no air circulation in the workplace, and poor employee work training/orientation.

4.4 Consequence Rating

Consequence rating in Table 4. 4 is qualitative measures of Consequence or impact.

Table 4. 4 Qualitative Measures of Consequence

Level	Descriptor	Example of Description
1	Insignificant or Slight	No injuries, nil environmental damage, low financial loss
2	Minor	First aid treatment or stop-gap measure, minimal / recoverable environmental damage, problem can be readily resolved, medium financial loss (< PhP 10M)
3	Moderate	Medical treatment required or direct intervention required, on-site release contained with direct assistance, high financial loss (Range 10M to 40M)
4	Major	Extensive injuries, loss of production capability, off-site release with moderate environmental damage, major financial loss (41M-50M)
5	Catastrophic	Death, toxic release off-site with detrimental environmental effect, huge financial loss > 50M

4.5 Likelihood Rating

The qualitative measures of **"Likelihood"** (based on AS/NZS 4360:1999) can be categorized into 5 levels, with "Almost certain" as the highest and "rare" at the least. Table 4. 5 contains the quantitative measures for likelihood following the AS/NZS 4360:1999.

Table 4. 5 Likelihood Rating

Level	Descriptor	Description
A	Almost certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur at some time
D	Unlikely	Could occur at some time
E	Rare	May occur only in exceptional circumstances

4.6 Level of Risk

The level of risk can be classified into five (5) levels of likelihood, ranging from an "almost certain" event with an A ranking as the highest, and a "rare" likelihood with an E mark. Also, the consequences of such occurrence are also given a five-level classification per likelihood. The highest consequence level is given a "Catastrophic" classification with a score of five (5); whereas the least consequence has an "Insignificant" classification with a score of one (1). The Qualitative risk analysis matrix–level of risk (adapted from AS/NZS 4360:1999) is submitted in Table 4. 6 below.

Table 4. 6 Qualitative Risk Analysis Matrix

Likelihood	Consequences				
	Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
A (almost certain)	H	H	E	E	E
B (likely)	M	H	H	E	E
C (possible)	L	M	H	E	E
D (unlikely)	L	L	M	H	E
E (rare)	L	L	M	H	H

E	Extreme Risk	Immediate action required.
H	High Risk	Close coordination with government agency and management action required.
M	Moderate Risk	EHS Personnel attention required.
L	Low Risk	Manage by routine process

4.7 Risk Assessment Matrix

An assessment of the potential risks that may be caused by the project to the environment during the phases of construction and operation are presented in **Table 4. 7** and

Table 4. 8 respectively.

Table 4. 7 Analysis of Risks and Hazards During Construction Phase

Risk/Hazard	How It Can Happen	Consequence Event Occurring	Proposed Controls	Consequence Rating	Likelihood Rating	Risk Level
Fuel/Oil leak in sea water	Damage in working equipment causing fuel/oil leak	Some birds may have oil slick and be unable to fly, oil may cover some rocky habitats and shores where locals collect shellfish	Fuel and oil containers and dispensers in accordance with guidelines of the Department of Energy. Regular inspection of containers, dispensers, and storage conditions. Provision of oil boom around active construction area at sea	3	M	M
Too high concentration of suspended sediments dispersed in sea water	Seabed drilling for piers	Turbid water may reach and silt nearby coral communities	Provision of silt boom around piers under construction	4	C	M
Landslide during slope excavation	Very wet /extreme weather, unfinished slope stabilization work or work in progress, heavy equipment left in slope, a seismic event occurs	Injuries, possibly death, damage to property	No work in inclement weather, park heavy equipment away from slopes with high slide potential (areas with loose soil in disturbed steel slope with no vegetation)	3	C	L
Workers' exposure to excessive solar radiation / heat / Workers' exhaustion	Working too long under intense heat (10am to 3pm) without head and sufficient skin covering, without drinking water	Loss of consciousness, dehydration, heat stroke, risk of heart attack	Provision of appropriate personal covering require workers to take drinking bottles to workspace. Provide accessible potable water supply at work site. If possible, schedule continuous work directly under sun outside of 10am an 2pm.	3	C	M
Workers falling from heights	Working without harness	Body injuries	Provision of harness for work in heights	3	C	M
Workers' exposure to extremely high ambient dust concentration	Very dry weather, workers without PPE, no dust suppression effort	Chronic or fatal respiratory disease development	Compulsory dust suppression and wearing of PPE	3	B	M
Vehicle falling from unprotected bench during slope excavation	Heavy equipment backing up/ maneuvering in on-going slope excavation works	Injuries, possibly death, damage to property	Use appropriate--sized equipment, created adequate bench width, leave untouched 0.5mx0.5m earth bank at bench edge (see Figure 3.4)	3	D	M
Explosion in fuel depot	Implanting of explosive by saboteur	Worker injury or death; property damage;	Control of entry to construction site from all possible entry points; Strict security/control to project site; Constant coordination and open communications with local leaders to hear sentiments regarding the Project and the Government; Be pro-active in maintaining sincere friendly relations with the host community. Display regular police / military presence at project site entrance points	2	D	M

Table 4. 7 Analysis of Risks and Hazards During Construction Phase

Risk/Hazard	How It Can Happen	Consequence Event Occurring	Proposed Controls	Consequence Rating	Likelihood Rating	Risk Level
Fuel storage tanks break and spill oil on land, oil is carried to sea by run-off	Earthquake occurs, fuel storage tanks topple and breaks	Property damage, loss of resources, lost workdays	Secure fuel storage facility to resist ground shaking. Regular, frequent checking of integrity and closures of fuel and oil containers, replacing of damaged containers	2	D	M
Worker's metal fume fever	Resulting from unprotected exposure to meal welding	Worker illness, may result to death in the long term	Provision and enforcement of the use of industrial-grade gas mask	2	C	M
Falling from high elevation	Installation of conveyor system, mill facilities and silos without PPE or safety precautions by workers	Body injury, muscular stress	Provision of safety nets for work in high elevations; Regular, frequent checking of correct use of PPEs, regular toolbox meetings	2	C	L
Heavy equipment / facilities fall on workers	Inadequate support equipment, scaffolds, coinciding with earth shaking	Worker injury or death	Ensure adequate equipment and secure, stable, adequate scaffolding supports, weekly toolbox / safety/ work orientation / coordination talks	3	C	M
Workers suffocation while working in confined spaces	Installing air pollution control equipment in silo, pack house vents, etc.	Worker injury or death	Provision for air supply in case necessary	3	C	M
Workers electrocuted during electrical installations	Unexpected rain with wind and lightning destabilizing/ shaking/ moving the workmen's platforms	Worker injury or death; property damage;	No outdoor work during inclement weather	3	C	M

Table 4. 8 Analysis of Risks During Operation Phase

Risks/Hazards	How it can happen	Consequence of Event Happening	Proposed controls	Conse-quence rating	Likeli-hood rating	Risk Level
Ambient particulates exceed standards along access roads	No dust suppression in dry weather, several 40-tonner trucks simultaneously running through the access roads	Chronic or fatal respiratory disease development among sensitive populations in A, complaints, social disorder Cease and Desist Order vs. Project	Road concreting, hiring of workers along access roads for road watering, assistance to affected households to control dust from entering indoors	3	C	H
Noise levels in residential areas access roads persistently exceed standards	Several 40-tonner trucks simultaneously running through the access roads, no noise buffers installed	Nervous or irritable temperament among sensitive populations, complaints, social disorder Cease and Desist Order vs. Project	Spread the number of haul trucks to different routes to reduce noise sources; Encourage truckers to keep mufflers; road concreting, planting of noise buffering vegetation along roadsides; allow truck dispatch only during daytime	3	B	E
Noise levels in Plant persistently exceed standards	Failure to include noise mitigation in building design	Hearing loss among workers	Design the noise enclosure buildings with noise reduction features (rough gypsum board walling, etc, rubber/ rubberized equipment platforms, rubber enclosures over very noisy processes, etc); Planting of noise buffering vegetation around the machine shop and millhouse and around the processing Plant.	3	B	E
Explosion in the Plant	Implanting and detonation of explosive by saboteur/s	Worker injury or death; property damage;	Control of entry to construction site from all possible entry points; Strict security/control to project site; Constant coordination and open communications with local leaders to hear sentiments regarding the Project and the Government; Be pro-active in maintaining sincere friendly relations with the host community. Display regular police / military presence at project site entrance points	4	D	L
Worker's metal fume fever	Resulting from unprotected exposure to meal welding	Worker illness, may result to death in the long term	Provision and enforcement of the use of industrial-grade gas mask	2	C	M
The conveyor system breaks and spill materials to sea	Material movement caught in the middle of storm, water and wind stress not factored in conveyor design structural supports	Property damage, material loss, environmental pollution	No material transport during inclement weather	3	L	L

Table 4. 8 Analysis of Risks During Operation Phase

Risks/Hazards	How it can happen	Consequence of Event Happening	Proposed controls	Conse-quence rating	Likeli-hood rating	Risk Level
Ships berthing in pier release bilge and ballast water	Ship captain disregard marine pollution regulations	Environmental pollution, invasive species proliferating to upset balance of marine ecosystem in Guimaras Strait	Encourage shippers to comply with Marine Pollution regulations, secure license for Hazardous Waste Transport, Storage and Disposal service provider for ships	4	B	H
Pier facility collapse	Unexpected stress level from wind and currents brought by extraordinarily strong storm	Damage to nearby coral reef	Facility engineering design to consider stress loads from extreme weather and ground shaking	4	D	M
Ship run aground and hit nearby coral reef	Extraordinarily strong currents push anchored ship toward coral reef	Damage to coral reef	Design the anchor blocks to resist pressure from extreme currents	4	C	M
A worker's extremities or parts get caught in operating machinery	Worker is overworked, judgement fails	Worker injury or death; property damage;	Avoid too long working hours			
Worker/s falling from high elevation	Maintenance work on conveyor system, silo, mill house parts	Worker injury or death	Provision of safety installation, railings, secure catwalks, appropriate worker orientation /regular toolbox meetings, workers' PPE	3	C	M
Worker/a burns from hot air furnace	Unexpected damage to furnace or its safety mechanisms, suddenly releasing hot air	Worker injury or death	Provision of safety installation, adequate ventilation, signages and warnings, appropriate worker training, /regular toolbox meetings, workers' PPE	3	C	M
Accidents in the millhouse and in the machine shop (major wound, broken bones, severe bleeding)	Inappropriate equipment used, oil on floor, failed bolts, clamps, frameworks, overworked personnel	Worker injury or death; property damage;	Provision of machinery guards and safety installations, rough flooring surface with channels for oil collection, adequate ventilation, signages and warnings, appropriate worker training, /regular toolbox meetings, workers' PPE	3	C	M
Workers losing hearing from too long exposure to high noise level	No PPE, no noise deadeners in noisy equipment, no workers' exposure management	Workers' hearing loss	Provision of noise cancelling earmuffs with communication facility for workers in noisy processes, limit workers' daily maximum daily duty in noisy work areas to six hours	3	B	M
Workers suddenly losing jobs due to sudden unexpected closure, or change in management	Force majeure causing project viability failure	Social issues related with sudden, unprepared unemployment, increase in crime, social disobedience, and domestic violence	Arrangement / provision of unemployment insurance fund equivalent to six month's salary while employees look for next employment	3	C	L

4.8 Safety, Health and Emergency Preparedness and Response Program

Cement processing or manufacturing is among the industries with hazardous workplaces identified under Rule 1013 of the Occupational Health and Safety Standards (OHSS), (DOLE 2017) where "the workers use or are exposed to power-driven ~ tools". Additionally, the Project will likewise involve dock work and working in heights in the maintenance of conveyor systems and therefore require an occupational safety and health program. The Proponent, in the process of preparing for project implementation, may register with the International Standards Organization (ISO) for its Occupational Health and Safety program and refining the provisional Safety and Health Program culled from the OHSS – DOLE 2017.

4.8.1 Company Safety Policy

Cemphil, Inc. values workers' safety and will seek to establish work environments compliant with the guidelines of the Department of Labor and Employment (DOLE). It shall be a basic company policy that no work shall be so essential that an employee has to risk injury/illness or violate a security rule. Active participation in security procedures will be required in order to create the area a safe place to work. Every worker will have the responsibility to be cautious and be vigilant for always checking their own and their co-worker's safety conditions. Additionally, supervisors or accountable managers are responsible for monitoring employees' actions and taking timely measures to eliminate unsafe workplace practices and dangers.

Cemphil shall conduct its activities in compliance with all applicable environmental and occupational health and safety regulations through:

- Organized and systematic environmental, health and safety maintenance and improvement activities including the continuous reduction/elimination of risks.
- Conduct regular awareness training to enhance the safety behavior of employees and all other stakeholders.
- Continuous energy/material conservation efforts through efficient operations.
- Continual improvement of processes to maintain if not exceeds cement standards for customer satisfaction.
- Responsible pollution/incident control and prevention programs.
- Cooperation with governmental, public, and private organizations in seeking solutions to environmental, safety and health problems.

4.8.2 Objectives of the Safety, Health, Emergency Preparedness and Response Program (SHEPRP)

- To provide sufficient information defining the SHEPRP of the company, to serve as a foundation in the implementation, maintenance, and continual improvement of the system.
- To communicate to all employees the Company's safety and health objectives and commitment to improving health and safety performance.
- To serve as a basis for internal/external audits and management reviews.
- To demonstrate conformance with standards and all applicable regulations.

4.8.3 Safety, Health and Emergency Program Registration

The Company's Safety, Health, and Emergency Program shall be submitted for approval to the Regional Labor Office of the Department of Labor and Employment (OHS), in accordance with Rule 1020 of DOLE OHSS 2017.

4.8.4 Organization

During Construction Phase, the Construction Contractor shall be responsible for the organization and operation of the safety, health, emergency preparedness, and emergency response committee.

Within one month from the date the business starts operating, the Proponent shall organize a health and safety committee which shall be comprised of:

Chairman	-	Plant Manager or his authorized representative
Members	-	Port Operations Manager
	-	Finance Officer
	-	Company Nurse
	-	Outsource/ Service Provider's Representative
Secretary	-	Safety Officer

An Emergency Response Team (ERT) will be organized to respond to different kinds of incidents or emergency situations. The main purpose is to render immediate action, protect property, save lives, and safeguard the environment.

The composition of the ERT will be finalized within the first semester of operation. The members of the ERT shall be physically qualified for the job and properly trained on firefighting use of hose, line, and ventilation of buildings, salvage operations, rescue operations, first aid, and other related activities. The ERT shall have the following sub-groups:

1. First Aider- Response Team
2. Ambulance Response Team
3. Paramedic Team
4. Fire Brigade Team
5. Electrical Response Team
6. Eng. I Heavy Equipment Team
7. Oil Spill Response Team
8. Security Group/Bomb Treat Response Team
9. Logistic & Supply Team
10. Group in Charge for Continuous Operation

4.8.5 Training

The Proponent will train personnel that will be designated to carry out, monitor, and be the point person in overseeing compliance with Government regulations pertaining to Occupancy Health and Safety Standards.

Employee training will include modules on Safety, Health, and Emergency Preparedness.

Special training for Emergency Preparedness and Emergency Response will be conducted after the Health and Safety Committee and the Emergency Response Team are organized.

The emergency preparedness trainings will be conducted involving all employees. Specific emergency trainings will cover the development of knowledge, attitudes, and skills to respond to emergencies related to:

- Plant Safety Operating Procedures

- Confined Space Entry
- Industrial Accidents
- Occupational Safety and Health Course
- Health Emergencies and First Aid
- Oil Spills and Environment-related seminars
- Storm-related Disaster Response and Rescue
- Earthquake and Landslides
- Fire Prevention and Control
- Fire Brigade Seminar and Drill
- Terrorism

A trained medical professional will conduct health training/seminars. The Human Resource Manager will conduct trainings regarding multi-skill competency for all employees. As per the OSH Standards, these occupational safety and health trainings must be staffed by persons recognized/ certified by the Bureau of Working Conditions or may be conducted by persons accredited by the Secretary of Labor and Employment.

1. Managerial employees will attend seminars and lectures regarding environmental health and safety whenever necessary upon the discretion of management.
2. The Safety and Environment Unit (SEU) Manager shall brief and orient newly hired employees during the orientation phase, briefly discuss important topics to make the person aware/understand safety awareness/consciousness.
3. A fire drill and emergency drill shall be conducted at least twice a year to familiarize employees with emergency procedures when there are fire and major emergencies.
4. Unit Managers/Department Heads shall coordinate with the SEU to allow their personnel to undergo basic safety courses.
5. Employers installing new machinery, machine parts, or other working equipment, and persons or firms in charge of the installation of such machinery or parts of machinery and other working equipment shall see to it that these are properly guarded in conformity with existing safety standards.

4.8.6 Meetings

The SHERR Committee and its subcommittees will hold regular meetings to keep safety and emergency preparedness in the consciousness of employees.

Each department should hold a Safety, Environment, and Health (SEH) meeting at least once a month, at convenient schedules. The following topics will be discussed in the meetings:

1. Waste management
2. Unsafe conditions and work practices
3. Monthly Compliance to Regulatory Standards and Monitoring Reports
4. Working environment conditions/ Safety Patrol Results
5. Incidents that happened recently in the area
6. Hazardous Substances/ Materials (Handling and Disposal)
7. Plant Standard Operating Procedures/ Control Operating Procedures
8. Personal Protective Equipment
9. The conduct of Hazard/ Risk Prediction prior to work activity and conspicuously posted at the workplace for safety awareness and guidance.

Supervisor/Foreman SEH Contact and Toolbox Meetings will be held weekly. Each supervisor/foreman is responsible for conducting SHE contacts and toolbox meetings with his subordinates to discuss SHE topics and establish a system whereby one-on-one safety training and motivation occur between supervisor/foreman and workers.

4.8.7 Regular Inspections

To control and maintain work areas effectively that are conducive to the environment, it is necessary to observe and assess these conditions periodically. This is done through pre-planned and purposefully conducted inspections.

Area Inspections will be conducted weekly and monthly (after SEH meeting) by the Safety Patrol. The Safety Patrol will be carried out to perform environmental and safety inspections in the area.

The Safety Patrol will be a composite team composed of the Safety Officer, a representative from the Office of the Plant Manager, the Port Operations Office, the Machine Shop Manager, the Warehouse Manager, and the Pollution Control Officer.

The items to be subject to regular inspection are the following:

1) Communication Equipment Availability
2) Work Area Environment
3) Equipment Machinery
4) Facilities
5) Safe Working Procedures
6) Welding and Cutting Activities
7) Work Activities I Facility Hazards
8) Fire Fighting Equipment
9) Welding Machines
10) Warehousing
11) Safety Signage
12) Canals, Silt Ponds, Oil Traps
13) Hazardous Materials Storage
14) Waste Segregation / Disposal
15) Workers PPE's Provision
16) Drinking Fountains/Eyewash/Shower

4.8.8 Incident Investigation and Reporting

The supervisors/section heads and managers concerned shall be responsible to investigate internal incidents. All incident investigations must be accurately and completely reported and filed promptly at the Safety and Environment Unit (SEU).

The ESD Staff, in coordination with unit managers, section heads, supervisors concerned shall initiate an investigation of the accident/incident to determine not who is guilty, but how to ensure against similar occurrence in the future. A HIRARC (Hazard Identification Risk Assessment/ Risk Control) exercise shall be conducted after the Initial Incident Report.

For incidents involving minor physical injuries, the injured employee concerned shall report the event to his immediate superiors immediately after the incident.

For serious or fatal accidents, any witness to the accident shall report the event to his superiors or any managerial employee present. SEU Manager shall, within 24 hours, immediately by the quickest means available and give notice thereof to the Company President, Plant Manager, DOLE Regional Director, or their duly authorized representative(s). The section head, supervisor, or foreman who, at the time of the incident, was present in that area prepares the incident report, using the DOLE Incident Reporting and Investigation Forms. These forms shall be available in all departments. The Initial Incident Report should be done the soonest possible time and forwarded to SEU copy furnished the Plant Manager and all department managers. A HIRARC meeting will convene for immediate actions to be taken and discuss reports during the CSEHC meeting.

The SEU monitors/ensures that corrective actions being stipulated in the report are appropriately implemented by the concerned department at the given time. All cases will then be reported to DOLE VI at the end of each month using the prescribed DOLE forms.

4.8.9 Working Conditions

1. A discussion of matters pertaining to the correction of unsafe conditions will be done during inspections with the intention to correct it at once. If the corrective action based on the inspection is not taken, the inspection will lose its importance in incident prevention.
2. If the problem can be resolved at the section level, the Section Head will assign personnel to correct it immediately or on schedule. On the other hand, for matters that cannot be resolved at this level, these should be addressed to the appropriate Department Heads concerned.
3. The SEU Staff coordinates with the concerned Department Heads to initiate corrective actions. Unresolved matters will be discussed during the meetings of the SHERR Committee at its monthly regular meetings.
4. Corrective action should be done at the shortest time possible.

4.8.10 Incident Analysis

Comparative Safety Performance Statistics on the present versus the previous will be collected and plotted, evaluated, and concluded for continual improvement. Statistical data indicating the frequency rate, severity rate, incidence rate, and combined Frequency-Severity rate is furnished as a basis or reference and assessment in addressing a particular accident to minimize its recurrence. All relevant information for evaluation and continual improvement is accomplished in Forms in accordance with DOLE guidelines.

The details of the provisional Safety, Health, Emergency Preparedness and Response Program is in **Annex S**.

Cemphil Cement Grinding Project EIS

SOCIAL DEVELOPMENT PLAN & IEC

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5. Social Development Framework, Plan, and IEC Framework

5.1 Social Development Program (SDP)

The Social Development Program (SDP) of the Cemphil Cement Grinding Project will be part of its Corporate Social Responsibility (CSR) program. The CSR aims to augment the delivery of basic services of the Local Government of Ajuy where needed, to improve the quality of life of the local populace, within the framework of developing local capacity for self-reliance.

The indicative Social Development Program (SDP) submitted hereunder is developed from the aspirations expressed by stakeholders during public information, from education and communication activities, which evolved into community consultations to obtain public opinion and suggestions for the Project, from the project public scoping activity, and from the analysis of socio-economic indicators from the available Census of Population and Household (CPH) in 2015 and Barangay Development Profiles of Barangay Bay-ang and Barangay Pedada.

Special attention is given to the direct impact population, which will be relocated from the Cemphil Project site for humanitarian considerations because they represent a very vulnerable group and all of whom fall below the poverty line. Accommodating the request of the Barangay Chairpersons from other areas of Ajuy, the invitation to participate in the social development programs is open to all residents of Ajuy, on "as requested" basis and for urgent humanitarian services in times of disaster.

The SDP, however, will be limited to the capacity of the Project to extend social assistance according to the company financial performance. Cemphil, Inc. trusts that the Government, through taxes paid by the Private Sector will be the primary mover of social stability and well-being.

The components of the indicative Social Development Plan are discussed below and summarized in **Table 5. 2.**

1. Relocation of 24 Informal Settler-Households within the Cemphil Project Site

   The 24 informal settler households have agreed to be resettled peacefully, with assistance from the Municipal Government of Ajuy and the Proponent, to an NHA housing project in Barangay intended for the population in coastal areas that are at-risk during storm surges. The NHA housing project in will be available to accept awardees for relocation in the first quarter of 2021.

   The PAF will be given assistance by the LGU to transport their belongings to the relocation site. Cemphil will also provide PhP 50,000.00 for each family livelihood assistance, such purchase of pedal-cycle which can be used as a mode of transportation to the coastal areas where they may fish, and use for daily income as registered pedicabs serving local personal transport needs.

   During the Construction Phase, the PAF will also have priority in hiring.

2. Livelihood and Employment

   a. Regular employment in Plant operations

The work applicants from Bay-ang, Pedada will have the first crack at project employment opportunities, both for the Construction and Operation Phases. Cemphil will post the list of job vacancies in the highly visible areas at the Barangay Halls. The remaining opportunities will be made available to the rest of the residents of Ajuy and Barangay Santiago of Barotac Viejo for which the available vacancies will be posted in the lobby of the Municipal Hall. The objective is to minimize labor in-migration to reduce potential additional sources of increase in municipal and human wastes, and the subsequent additional requirement for sewerage infrastructures. An uncontrolled increase in the resident population will likewise increase the competition for food, raise food prices, and worsen the plight of families below the poverty line. Labor migrants also compete with the unemployed and underemployed residents of Ajuy.

Cemphil will require its Contractors and Subcontractors to employ 70% of labor, primarily from Barangays Bay-ang and Pedada. When the requirement remains unfilled, they may search among applicants from other Barangays of Ajuy. Among the employment qualification requirement will be any proof of long-term permanent residence in Ajuy to eliminate red tape in this regard.

b. Subcontracts for Plant machine shop work, equipment maintenance, grounds cleaning and landscape maintenance, building maintenance, wastewater treatment facility maintenance, cement transport, etc.

The Proponent is being encouraged to utilize existing businesses in Ajuy to supply goods and services for its requirements. The project Administrative Officer is encouraged to keep a record of the Contracts/Subcontractors with remarks on project experience, whether favorable or otherwise, for the purpose of improving local sources of goods and services.

c. Cement marketing and retail distribution

The Project will give preferential pricing for cement products to residents of Ajuy to create economic opportunity for reselling & dealership.

d. Community-based/ home scale production of soap, household cleaning chemicals, cleaning implements, tailoring of employees' uniforms to supply Plant requirement.

e. The Project Construction and Operation will require the operation of a kitchen/cafeteria for the workers. A Project kitchen/cafeteria operated by the Production Cooperative is recommended over random food supply from local vendors as grease interceptor may be provided in the Project kitchen. The Project will provide for the training of the kitchen staff, including food safety and economy. The structure and facilities for the Project kitchen. The Production Cooperative will earn from the operation of the Project kitchen.

Cemphil will assist the development of local livelihoods by:

- **Training**

  Providing training to interested participants for the production of beauty soaps for which there is a robust market, household, and bath soaps

for which there are stable markets, kitchen cleaning agents such as ash cleansers, cleaning implements such as brooms and rags, and tailoring for employee uniforms, among others. Other trainings that can support the livelihood activities that can thrive with the presence of Cemphil economic activities such as knowledge in commercial kitchen operations, livestock growing and health protection (chicken, swine, goat), food safety, food processing (chicken and pork-based products), snack food production livelihood, market-attractive product packaging, product marketing and networking. The Department of Trade and Industry, Department of Agriculture and TESDA have several training programs and outreaches for these modules. Cemphil will coordinate with requisite Government agencies to bring these needed trainings to Ajuy.

- Providing assistance for the organization, registration, training, and capacity building of a Production Cooperative comprised of interested and able residents of Ajuy.
- Providing assistance in the purchase of materials for the production of soap, kitchen cleansers, cleaning implements, and clothing for employees' uniforms, among others, to be used by the Production Cooperative to produce commodities required in Project operations.
- Cemphil will purchase the products of the Production Cooperative. Hence, the project ComRel will closely coordinate with the Administrative Officer and the Purchasing Officer to help define quality requirements for the Cemphil purchase, so these may be relayed to the livelihood trainers, to teach trainers of the Production Cooperative.
- The Production Cooperative will select member-leaders with the potential to repeat/echo the training to future members. The training modules will also be documented, including an inexpensive video recording, for use in future re-training or member lesson review.

3. Health and Nutrition

a. Support to the LGU for the provision of health services

Barangay Bay-ang and Pedada of Ajuy have nil health services. The following assistance will be provided to Barangay Bay-ang, Barangay Pedada and Barangay Santiago of Barotac Viejo, and other Barangays of Ajuy upon request, and subject to annual scheduling of projects:

- Improvement of Health Center.
- Donation of needed Health Center furniture, first aid equipment, and nebulizers, portable Blood Pressure apparatus, blood oxygen meter, portable infant weighing scale, thermometer, and others.
- Provision of quarterly Medical and Dental outreach and donation of medicines and vitamins for children and senior citizens.
- Support to the training for Barangay Health Workers for first aid and Traditional Medicine by way of transportation allowance
- Support for teaching tools for home nutrition and the use of Traditional Herbal Medicine; and

- Modest allowance.

b. Assistance for the establishment of Community Medical Mutual Fund

All Cemphil employees and employees of Cemphil subcontractors will be given an orientation regarding a Community Medical Mutual Fund (CMMF). The CMMF is a pool medical cash insurance fund for members. This will be a facility that will initially be established by Cemphil and eventually co-managed with the Cooperatives representatives as they manifest organizational maturity. The majority of the fishermen interviewed indicated that their livelihood and savings are often wiped-out when there is an illness in the family. While the recently passed Universal Healthcare, Law indicates a "No Balance Billing" policy for hospital admission, one cannot always expect hospital supplies and medicines to always be adequate. Thus, there is a need for available cash to defray the cost of medical supplies and medicines that are not available in public hospitals and are required to be supplied by the patient.

The CMMF will be used to secure group medical insurance covering medicines, and cash expenses during illness. The CMMF itself will have cash savings for members' use. The cooperative under which the CMMF will be established will replenish the fund from claims against the health insurance.

Cemphil will organize the CMMF and provide a modest seed fund, which will be grown through "savings" by Cemphil employees and employees of all Cemphil subcontractors. The savings will be equivalent to PHP 10.00 per person per day, deducted from salary every payday. Like a mutual fund, employees may "loan" from it, to be repaid from succeeding salaries. The Employees Cooperative, with the assistance of the Cemphil Human Resource Manager, Accountant, and Budget Officer will draw the guidelines regarding this Mutual Fund. Employees' savings will earn interest from the Mutual Fund. The time given by Cemphil Accountant and Bookkeeper working on the Mutual Fund will be shouldered by Cemphil.

c. Encouragement of the Contractor to comply with IATF guidelines for its employees, namely:
   - Advocating frequent hand washing
   - Wearing of facemasks and face shields
   - Social distancing.

d. Assistance to Employees on compliance to IATF recommendations

The Local Government Units in Ajuy monitor and enforce compliance to IATF guidelines, namely:
- Advocating frequent hand washing
- Wearing of facemasks and face shields
- Social distancing.

Cemphil will encourage its employees to be vaccinated under the Government vaccination program, allow paid down-time while the employee recovers from the side-effects of vaccination and provide Vitamin C support.

4. Support to the Educational Sector

The current Ajuy Municipal Government ascribes high importance to education, evidenced by 71% of the school-age population attending school and 99% literacy rate. However, just like in many Provinces in the Philippines, the top two (2) highest educational levels completed by among the population of Ajuy are Elementary level and High School Level (**Table 2.4.14**).

Among the reasons for the low educational attainment rate obtained from informal interviews of teachers in Ajuy are: (a) a developing child inferiority complex due to poverty and lack of family finances for transportation and food while in school; and (b) need to help in family livelihood.

In coordination with the Department of Health (DOH), the Department of Education (DepEd), Department of Agriculture (DA), and the Municipal Government, the Cemphil Community Relations Officer (ComRel) will facilitate the "teach-ins" of resource persons from DOH and DA on a holistic view of health education, nutrition education, the DOH "Pinggang Pinoy" balanced diet program, traditional herbal medicine, and nursery establishment and maintenance, and other relevant topics that will address popular needs as may be identified through further coordination with the teachers in Ajuy.

To encourage students to continue to attend classes and complete at least High School Education, Cemphil will provide assistance for the preparation of supplemental snacks and meals for elementary and high school levels. Through this, students with no meal allowance will not feel inferior during snack time or mealtime.

- The partner schools will be assisted with seedlings for nutritious food, which will later be harvested for school snacks and meals. The usual school curriculum involving gardening, health, nutrition, and home economics will discuss topics to prepare the students for gardening and cooking projects. This opportunity will also be taken to supplement education on environmental quality protection.
- Special care will be taken not to stratify the students by economic capacity, and to encourage participation in the program, COMMUNITY BUILDING for a BRIGHTER TOMORROW. Participating students who want to volunteer to give extra time to tend to the nursery/garden maintenance will have extra credits to avail of food in the Cemphil School-based Nutrition and Health Support Program. Some mothers may also wish to volunteer to cook for the School Nutrition Program. The school principal may designate beneficiary students to keep record of the information below, which will be useful in evaluating the program:
    - Planting materials received and planted, location of planting, date planted, soil amelioration if any.
    - Names of participant community builders tending to which plots.
    - Estimated volume of daily harvest per plot.
    - For the seedling outreach: Names of Recipients of seedlings/planting materials produced, number of seedlings donated, location of planting by recipient; and
    - Volunteers spending hours in the Program per day.

- The participating school principal will also be requested to note any changes in the number of enrollees against the previous year's number of enrollees and any changes in the student drop-out rate. It might be useful for the teachers to interview students who dropped schooling or interview the parents regarding the main reason for dropping. Teachers may keep a record of these for future reference to improving student educational attainment.
- The Cemphil, Inc. will provide the following for the School-based Nutrition and Health Support Program:
    - Resource persons to teach, either as part of a special class within the school curriculum or in week-end seminars, in cooperation with DepEd, DOH, and the LGU, for the following:
        - achieving local food security.
        - home-based nutritional improvement for enhancing student learning and retention and maintaining family health.
        - traditional herbal medicine for supplemental health support.
        - gardening and simplified integrated pest management.
        - nursery establishment and maintenance.
        - tree planting and maintenance, as health input for air quality, micro-climate management and ground water supply security; and
        - Composting and vermiculture.
    - Budget for the purchase of high quality/certified seedlings for food crops (from the Bureau of Plant Industry, Department of Agriculture), for traditional herbal medicine, and for Cemphil tree planting
    - Budget for necessary fertilizers
    - Budget for food materials to start the program, assistance to the school for lacking cooking implements, and cooking fuel. The Cemphil ComRel will discuss the matter of budgeting and fund with the school principal and a Memorandum of Agreement will be executed accordingly
    - Budget for the transport and honoraria for resource persons
    - Budget for a modest monthly allowance for participant Community Builders. It is expected that the number will be high; a higher number will mean more persons involved. If the number of interested Community Builders is more than the requirement for the school-based food program, they may be assigned to nursery development for the Cemphil reforestation program.
- The Project will request the Mayor for the assistance of the Municipal Agriculturist in regularly monitoring and mentoring the development and growth of the nurseries and crop gardens. The overall goals are:
    - Produce food materials for the School-based Nutrition and Health Support Program. It is expected that, at the onset, the program subsidy for food materials will be large, but eventually, the program would gain some degree of self-sufficiency. The following school may be assisted by Cemphil, improving on the learnings from the pilot model.
    - Produce planting materials for food, traditional medicine, and tree species to assist them and other families in growing nutritious foods and sources of traditional medicine in their backyards or nearby idle land.
- At the end of each year, Cemphil will give recognition honors and award to:

- Community builders with the most productive plots will be manifested as the highest source of seedling donation to the community. Cemphil will pay the community builders a certain amount for each seedling donated to the community. The amount is proposed to assist the student to defray the cost of materials for projects and the purchase of school supplies.
- Community builder-mothers who cook for the food program will be given a daily allowance. The objective is to help in the unemployment concern of the locality.

- Teaching materials, handouts and posters, and other documentation will be collected from the Resource Persons by Cemphil ComRel, to be compiled for ready for reproduction upon request from members of the Education Sector.

5. Peace, Order and Safety

a. Playgrounds

To keep children safe from playing in the public roads, which will also be traversed by project haul trucks, during the pre-construction phase, Cemphil will provide for playgrounds in Bay-ang, Pedada, and .

Initial ideas regarding the playgrounds include the following:

- Land to be provided by LGU
- Play equipment will be fabricated locally using safe, locally available materials, hand-crafted recycled vehicle/heavy equipment tires, and painted nicely. Expected play equipment include:
  - Bahay Kubo Playhouse.
  - Slide.
  - Swing.
  - See-saw.
  - Jungle Gym; and/or
  - Rubber tires safety barrier /"fence".

b. Road safety hazard will be managed through:

- Widening of road easements to the extent possible under the Revised Philippine Highway Act.
- Provision of concrete barrier between the haul road and houses within 10 meters of the access road; and
- Support to Barangay Tanod to assist in traffic flow management at narrow road sections and in front of schools and Barangay Centers.

c. Assistance in the control of in-migration and proliferation of informal settlers

- The Project liaison officer will conduct information activities and coordination with the Local Government Units to pass Ordinances regarding the control of the proliferation of informal settlers and to post notices prohibiting informal structures and sellers. An uncontrolled influx of informal settlers generates sources of increased local pollution, resource

competition, job competition, peace and order concerns, and doubtful cultural influence.

6. Environment

a. *Control of ambient dust and noise with community participation*

Cemphil will opt to control ambient road dust and increased vehicle noise along the Project haul roads, with community participation. This option has a lesser carbon footprint compared to the regular operation of the water sprinkler truck or the sprinkler trailer truck.

Cemphil will donate pails, dipper, and water storage drums for dust suppression along dusty haul roads and will deliver water to participating households for community use in dust suppression. Cemphil will also provide an allowance for community members active in dust control.

There may be a sensitive population that will experience and complain about severe health reactions to the increased ambient dust. The Project will evaluate the situation and find ways to further reduce its dust emissions.

Noise is expected to be a concern among households within ten meters of the access road edge. In cooperation with the affected households, the Project will support the planting of copious-leaved brush vegetation by local out-of-school youth, for noise control.

Cemphil will also supplement road water sprinkling by water truck, from 10am to 11:00 a.m. and 2:00 to 3:00 p.m. daily during dry season. Road dustiness may also occur during traditionally rainy months but have long dry days due to climate change. In these abnormally dry days, Cemphil, Inc. will also undertake water sprinkling at least twice a day. The Pollution Control Officer and Environmental Compliance Manager will regularly monitor the level of road dustiness and give instruction for the Cemphil water trucks to conduct water sprinkling.

b. *Support to mangrove reforestation in Barangay Bay-ang, Pedada and other needful coastal barangays*

Cemphil will assist Ajuy municipality in its mangrove reforestation activities. The Coastal Resource Management Program of Ajuy indicates mangrove reforestation as among its key projects. Cemphil's Greenhouse Gas sequestration program will be implemented in cooperation with the Municipal Government of Ajuy. The program plans to mitigate 50 years of emissions by progressively planting and maintaining 10 ha of mangrove forest per year with a spacing of at 1.5m x 1.5m for 25 years and maintaining the same at at-least 80% survival rate.

Cemphil will provide funding for the preparation of the planting materials, the excavation of the planting sites (by 25cm lower than the surrounding ground), the planting efforts, and for necessary re-stocking efforts when the planted mangroves die out.

Proper site assessment and selection, in cooperation with the Environmental Research and Development Bureau of the DENR, will ensure optimal conditions for mangrove reforestation and success. The attainment of the planned mangrove reforestation program will significantly strengthen the coastal erosion control of Ajuy, improve the coastal communities, enrich food material sources, reinforce the sustainability of livelihood sources, and aid in Cemphil's Greenhouse Gas mitigation (which will require only a 10-hectare annual target instead of 19,000. ha regular upland reforestation). The difference is due to a more intensive planting interval (1.3x 1.3 meters spacing) viable for mangrove plantation against the 10 meters x 10 m meters interval recommended for low-maintenance terrestrial forest plantation to avoid nutrition competition among the trees in usually depauperate upland /sloping land soils.

c. *Assistance to LGU in enforcement of regulation for Marine Protected Area and "No Take Zone" at Pedada Bay*

Due to overfishing, Barangays Bay-ang, Pedada, , and the primary and secondary impact barangays of the Cemphil Cement Grinding Project are included in the Municipal Coastal Marine Resource Management Plan (CRMP) as "No Take Zones". Cemphil will help in the enforcement of the prevention of fish harvesting from its Buffer Zone (**Figure 2.1.3**).

7. **Infrastructure** Cemphil will assist Barangay Bay-ang to realize its long-sought shoreline protection cum access road from Bay-ang community center to Purok 6, the last Purok of Bay-ang, by building it.

The Proponent will also provide assistance in the lobby with the Government for the early construction of all-weather roads to the Ajuy Economic Zone (see **Figure 2.1.1**), where the Cemphil cement grinding project is a centerpiece.

8. Spiritual/Cultural Development

a. Support to community groups on matters related to religious practice and propagation of faith which result in social peace.

b. Support to the LGU for values development and cultural enhancement:

The operation of Cemphil is expected to generate employment and with it, increase the purchasing power in the municipality over time. The increase in disposable income may find some family resources going towards increased consumption of alcohol and tobacco, which could pose health hazards.

Too much time spent on economic activities do take away from family time. Quality family time helps nurture strong individuals who would be the successors of the present generation in the evolving Philippine society. It could not be discounted that individuals who experienced severe unmet needs in their younger years will have a searing drive to overcome the harrowing experience. Moreover, it is important that holistic education through short modules for family and fulfilling personhood likewise be given.

Financial stewardship modules will likewise contribute to the strengthening of the socio-economy of Ajuy. In summary, the values-formation, guided-learning group sessions, and respective resource institutions are the following:

Table 5. 1 Human Resources Needed to Assist in the Implementation of Values Development to Maximize Project Social Development Impact

Module	Resource Person/Institution
Family Development and Developing Quality Family Time	Psychologist
Human Qualities that Help to Succeed in Work and Life	Psychologist
Developing Healthy Attitudes Toward Tobacco, Alcohol & Drugs	Department of Health
Traditional Filipino Values: Significance of Keeping Good Values in a Rapidly Urbanizing Setting	Sociologist-Educator
Financial Stewardship	Cooperative Development Authority

c. Pride to the people of Ajuy, to be the host of the first modern cement Plant in Panay Island.

Table 5. 2 Summary of Indicative Social Development Plan

CONCERN	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NONGOVERNMENT AGENCY AND SERVICES	PROPONENT IN-CHARGE	INDICATIVE TIMELINE	SOURCE OF FUND	MONITORING INDICATOR	ESTIMATED BUDGET, Year 1 to 5
Relocation	24 households in informal settlement within Project site	Ajuy Municipal Government	Project Community Relations Officer	Pre-construction in Phase 1 Stage 2 area	LGU-NHA/ Proponent	Peaceful, humane resettlement of Direct Impact Households to safe, decent, and permanent dwelling structures provided with access road, sanitation facilities, water, and power supply	LGU-NHA funding existing Proponent 1,200,000.00* *one time
Livelihood Capacity Building	Representatives of 24 Direct Impact Households Bay-ang, Pedada and Barangay Development Council Chairpersons and Members Unemployed members of the host community particularly: • Women • Out-of-school youth	Barangay Development Council Chairpersons and Members of Barangays Bay-ang, Pedada and Municipal Planning and Development Officer Cooperative Development Authority Region VI Office TESDA	Project Community Relations Officer	Construction Phase	LGU/ Proponent /TESDA /DTI	Representatives of Direct Impact Households and other interested residents of Ajuy gain knowledge and skills in a sustainable livelihood activity	300,000

CONCERN	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NONGOVERNMENT AGENCY AND SERVICES	PROPONENT IN-CHARGE	INDICATIVE TIMELINE	SOURCE OF FUND	MONITORING INDICATOR	ESTIMATED BUDGET, Year 1 to 5
	Representatives of Barangay Santiago of Barotac Viejo						
Livelihood Capacity Building	Same as above	Same as above	Project Community Relations Officer	Construction Phase	Proponent	Local (Ajuy) Cooperative partner of Cemphil is established, and trained	300,000
Livelihood Capacity Building	Same as above	Same as above	Project Community Relations Officer	Constructions Phase, Operations Phase	Proponent	Local cooperative is provided livelihood assistance by Cemphil	500,000
Livelihood Capacity Building	Same as above	Same as above	Project Community Relations Officer	Constructions Phase, Operations Phase	Proponent	Local cooperative is monitored and mentored by CDA to sustainable status	
Livelihood and Employment	Interested and capable residents of Ajuy and Barangay Santiago of Barotac Viejo	• Ajuy LGU • Bay-ang LGU	Project Community Relations Officer Project Manager Cemphil Management	Constructions Phase, Operations Phase	Proponent	Existence of contracts for the supply of goods and services with Ajuy-based legitimate businesses At least one member of all displaced families can gain employment	0
						Existence of viable community livelihood cooperative At least 75% of employed labor are from Ajuy, with priority for Bay-ang residents	300,000 Part of Project Operating Cost

CONCERN	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NONGOVERNMENT AGENCY AND SERVICES	PROPONENT IN-CHARGE	INDICATIVE TIMELINE	SOURCE OF FUND	MONITORING INDICATOR	ESTIMATED BUDGET, Year 1 to 5
Health and Nutrition	Representatives of 24 Direct Impact Households Bay-ang, Pedada and Barangay Development Council Chairpersons and Members Unemployed, interested members of the host municipality • Women • Out-of-school youth Representatives of Barangay Santiago of Barotac Viejo	• DOH Region VI • MHO	Project Community Relations Officer	• Construction • Operation	Proponent	Existence of nursery for high quality traditional/ herbal medicine and nutritious food species. Copy of training materials on health and nutrition awareness; copy of attendance sheets and pictures of health and nutrition trainings; no. of seedlings donated donation of nebulizers, first aid kits, medicines and vitamins for children and senior citizens	500,000
						Existence of a sustainable community medical mutual fund (group savings fund)	
Support to the Education Sector	Representatives of 24 Direct Impact Households	Beatriz M. Tupas Memorial Elementary School Elementary, High School and	Project Community Relations Officer	• Operation	Cemphil, Inc.	Donation of laptop computer and white sheets as projection wall Support to portable internet service	1,000,000

CONCERN	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NONGOVERNMENT AGENCY AND SERVICES	PROPONENT IN-CHARGE	INDICATIVE TIMELINE	SOURCE OF FUND	MONITORING INDICATOR	ESTIMATED BUDGET, Year 1 to 5
	Beatriz M. Tupas Memorial Elementary School Elementary, High School and Vocational Schools of Ajuy	Vocational Schools of Ajuy				Assistance to school feeding program	
Peace, Order and Safety	Barangay Tanods of Bay-ang, and Pedada	Barangay Governments of Bay-ang, and Pedada	Project Community Relations Officer	Pre-construction Construction • Operation	Municipal LGU Cemphil, Inc.	Existence of areas identified and set aside for children's playground Existence of playground facilities Minutes of Meeting with Municipal Mayor and Barangay Chairpersons regarding future control of in-migration, proliferation of squatters, sidewalk vendors, garbage from street hawkers etc. Presence of pedestrian crossing Presence of areas designated for safe pedestrian walkways and bike lanes Presence of pedestrian safety barriers and signs	500,000

CONCERN	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NONGOVERNMENT AGENCY AND SERVICES	PROPONENT IN-CHARGE	INDICATIVE TIMELINE	SOURCE OF FUND	MONITORING INDICATOR	ESTIMATED BUDGET, Year 1 to 5
						Donation of safety vests, whistle, and "stop/go" traffic sign placards.	
Environment	Barangays Bay-ang, and Pedada and Barangay Santiago of Barotac Viejo	Barangay Governments of Bay-ang, and Pedada	Project Community Relations Officer .	Construction • Operation	Cemphil, Inc.	Donation of pails, dipper, drums for dust suppression Donation of thick plastic sheets, fasteners, tapes, and electric fans to families of sensitive population Existence of agreements with the Municipal and Barangay LGU, DEPED and community associations regarding tree and mangrove planting and maintenance Existence of 10 hectares annual mangrove plantation maintained with at least 85% survival.	150,000 2,000,000
Infrastructure	Barangay Bay-ang	Municipal LGU, Bay-ang Barangay LGU	Cemphil Project Manager	Pre-Construction Phase	Cemphil, Inc	Existence of a safe access road	8,000,000

CONCERN	RESPONSIBLE COMMUNITY MEMBER/ BENEFICIARY	GOVERNMENT AGENCY/ NONGOVERNMENT AGENCY AND SERVICES	PROPONENT IN-CHARGE	INDICATIVE TIMELINE	SOURCE OF FUND	MONITORING INDICATOR	ESTIMATED BUDGET, Year 1 to 5
Spiritual /Cultural Development	Host municipality	Resident Priest, Planning and Development Office	Project Community Relations Officer	Operation	Cemphil, Inc.	Documentation of values development seminars (dignity of labor, value of integrity, family development, the importance of education, etc.)	200,000.00
				Estimated 5-year SDP Budget			8,200,000

Based on the Revised Procedural Manual for DAO 2003-30

5.2 Information and Education Campaign (IEC)

The Information, Education, and Communication (IEC) campaign for the proposed project will have the following objectives:

1. To prepare the host and neighboring communities regarding project implementation.
2. To facilitate a better public understanding of the Project, its environmental impacts, the community development, and economic opportunities it will generate, so as to establish the cooperation needed by the project from its host and neighboring communities.
3. To coordinate with affected or potentially affected persons regarding project activities including relocation preparation and schedule, and job interview schedule.
4. To harmoniously flesh-out of the details of Social Development Plan implementation and schedule; and
5. To keep an open line of communication with the host and neighboring communities and promote continuing cooperation and social relevance.

6. To provide information regarding the Multipartite Monitoring Team, its meeting schedule, and the project mechanism for addressing grievance and effecting redress, as warranted.

The IEC will be conducted in all phases of the Project and will allow regular feedback/grievance expression.

Table 5. 3 presents the indicative IEC plan, which can be further improved after the project Community Relations Officer gathers more information on how to better approach a successful implementation of the Social Development Program. A successful SDP will speak for itself to covey to the population of Ajuy the project intension of cooperating with the Government to achieve inclusive development.

Table 5. 3 Matrix of Indicative IEC Plan

TARGET SECTOR IDENTIFIED AS NEEDING PROJECT IEC	MAJOR TOPIC/S OF CONCERN IN RELATION TO PROJECT	IEC SCHEME / STRATEGY / METHODS	INFORMATION MEDIUM	INDICATIVE TIMELINES AND FREQUENCY	INDICATIVE ANNUAL COST (PHP)
Direct Impact Population	Relocation activities and schedule, Documentation for property transfer of Title Planning for alternative livelihood	Focus Group Discussions	Invitation letter	Pre-construction	Part of Project Management Cost
Residents of Brgy. Bay-ang, Pedada and , Chairpersons of other Barangays of Ajuy, Barangay Santiago of Barotac Viejo	Project information, project impacts, mitigating measures, SDP, MMT & GRM	Focus Group Discussions	Invitation letter Hand-outs Overhead presentation	Pre-construction Construction Operation	30,000.00
Local Chief Executives and Development Councils	Ordinance/s prohibiting the proliferation of informal settlers/ ambulant vendors / peddlers	Meetings Presentation to the Sanggunian Bayan and Barangay Units	Overhead presentation Hand-outs	Pre-construction Construction	15,000.00
Residents of Brgy. Bay-ang, Pedada and and Barangay Santiago of Barotac Viejo	Presentation of construction works/activities Potential impacts and proposed mitigation measures during construction works	Focus Group Discussions	Invitation letter Hand-outs Personal Computer with Overhead presentation	Pre-construction Construction	40,000.00
Residents of Municipality of Ajuy, Residents of Brgy. Bay-	School-based approach to improving health and nutrition	Focus Group Discussions	Invitation letters Audio-visual presentations	Construction	50,000.00

TARGET SECTOR IDENTIFIED AS NEEDING PROJECT IEC	MAJOR TOPIC/S OF CONCERN IN RELATION TO PROJECT	IEC SCHEME / STRATEGY / METHODS	INFORMATION MEDIUM	INDICATIVE TIMELINES AND FREQUENCY	INDICATIVE ANNUAL COST (PHP)
ang, Barangay Santiago of Barotac Viejo	Cemphil Mangrove reforestation program, protection, and benefits. Treasure in Composting		Hand outs YouTube Material Case studies of successful mangrove forestation projects		
Haul operators and drivers	Vehicle maintenance for control of gaseous emissions, ambient dust dispersion and noise pollution control	Focus Group Discussions	Invitation letters Audio-visual presentations Hand outs	Pre-construction Construction Operation Abandonment	Part of Project Management Cost
Sangguniang Bayan of Ajuy	▪Report on project's compliance to ECC and EMP	Public Presentation	Audio-visual presentations	Construction Operation Abandonment	Part of Project Management Cost
National Economic and Development Authority Region VI Office	Project progress reporting, in relation to progress on Ajuy Economic Zone/ Industrial Estate	Public Presentation	Audio-visual presentations Hand-outs	Construction Phase	Part of Project Management Cost
Municipality of Ajuy Brgy. Bay-ang, NGOs	Highlight of the project's environmental control measures Compliance to ECC conditionality and the EMP Actual impacts during construction and control measures implemented	Focus Group Discussions	Audio-visual presentations Hand-outs Posters	Construction Operation	30,000.00

TARGET SECTOR IDENTIFIED AS NEEDING PROJECT IEC	MAJOR TOPIC/S OF CONCERN IN RELATION TO PROJECT	IEC SCHEME / STRATEGY / METHODS	INFORMATION MEDIUM	INDICATIVE TIMELINES AND FREQUENCY	INDICATIVE ANNUAL COST (PHP)
Cemphil Inc. employees	Safety Awareness Organizing and capacitating Emergency Response Teams Hazard identification and risk assessment training First aid training	Training -Seminars	Audio-visual presentations Handbooks Practical drills	Once a year	50,000.00
Schools NGOs LGUs	Plant tour and highlight of project's environmental control measures, SDP, and environmental projects	Multi-media	Educational tour of project site	Throughout the operation phase	30,000.00
Ajuy Elementary and Secondary schools, Schools in Barangay Santiago of Barotac Viejo	Climate Change awareness and adaptation Cemphil Tree planting program Protection / preservation of existing bird species of Ajuy	Group Consultation Multi-media	Audio-visual presentations	Once a year	30,000.00

Average recurring annual IEC budget = P 300,000.00

CEMPHIL CEMENT GRINDING PROJECT EIS

ENVIRONMENTAL COMPLIANCE MONITORING

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6. Environmental Compliance Monitoring

6.1 Environmental Compliance Monitoring Plan

The Environmental Monitoring Plan (EMoP) presents a set of critical environmental parameters that will allow Cemphil, Inc. to ensure environmental compliance and sustainability of the cement grinding facility operations. The EMoP allows monitoring, verification, and performance of the necessary corrective measures towards the mitigation of the identified environmental impacts. Information obtained during the EMoP implementation can be used in examining the short and long-term effects of the proposed Project's various environmental aspects, from which future strategies on environmental enhancement measures can be formulated.

Table 6. 1 presents the proposed EMoP that will be implemented by the Proponent during the different phases of the proposed Project implementation. Shown in the matrix are the concerns, parameters to be monitored, as well as the corresponding sampling, and measurement plan (method, frequency, location), lead person, annual estimated cost, and environmental quality performance level (EQPL) range (i.e., Alert, Action, Limit).

The project impact monitoring plan shall refer to established environmental standards and performance indicators set forth under the following:

1) Clean Air Act (RA 8749)
2) Clean Water Act (RA 9275)
3) Hazardous, Nuclear and Chemical Waste Management Act (RA 6969)
4) Ecological Solid Waste Management Act (RA 9003)
5) Submitted and approved Environmental Management Plan and
6) Project ECC conditions.

Table 6. 1 Summarizes the environmental compliance monitoring plan for Cemphil Cement Grinding Project.

Table 6. 1 Summary of Environmental Compliance Monitoring Plan

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
PRE-CONSTRUCTION PHASE								N.A	N.A	N.A	N.A	N.A	N.A
The Water	Deterioration of water quality	TSS	Grab sampling at 1 meter below surface, Gravimetric analysis	Quarterly	Marine waters. Water Quality Sampling stations in Figure 6. 1	PCO	PHP 15,000 per quarter	>60 mg/L	>65 mg/L	>70 mg/L	Investigate, identify sources, improve canal system. Audit the implementation of activities declared in Section 2.3.2. Audit septic tank performance and correct.	Increase capacity of settling ponds, improve drainage courses leading to settling ponds.	Provide sandbags at inner side of retaining wall, tighten lay and increase height of cupping sandbags
		Fecal Coliform	Surface grab sampling, multiple tube fermentation					>1500 MPN/100 mL	>2000MPN/100mL	>3000 MPN/100 mL			
		Oil & Grease	Surface grab sampling, Petroleum ether extract										
		pH	In-situ meter and probe					>3.0 mg/L	>4.0 mg/L	5.0 mg/L			
								8.5	>9	9.5			
The Air	Deterioration of water quality	TSP	High Volume Sampling – Gravimetric analysis, USEPA 40 CFR, Part 50	Quarterly		MMT	PHP 150,000 per quarter	>210 µg/Ncm	>220µg/ µg/Ncm	230 µg/Ncm	Increase frequency of area watering.	Increase volume of water in sprinkling. minimize the use of noisy equipment in the afternoon. Schedule noisy work in the morning and after mid-afternoon.	Increase frequency and volume of water sprinkling. Desist from night-time work schedule.
		PM_{10}	High Volume sampling with 10 micron particle-size inlet; Gravimetric analysis, USEPA 40 CFR, Part 50		Air Quality Monitoring Stations in Figure 6. 1			>125 µg/Ncm	>140 µg/Ncm	>150 µg/Ncm	Check diesel particulate filters of gensets. Check and correct the schedule, coverage and volume of water sprinkling (2x daily) Encourage haul trucks have catalytic converters exhaust /ceramic filters		
		NO_2	Gas Bubbler Griess-Saltzman, or Chemiluminescence Method, USEPA 40 CFR, Part 50		Air Quality Monitoring Stations in Figure 6. 1			>135µg/ µg/Ncm	>140µg/Ncm	150 µg/Ncm		Coordinate with LTO to implement and enforce vehicle emissions monitoring in Cemphil access roads.	Secure agreement with LTO on issuance of violation tickets to errant vehicle owners.
		SO_2	Gas Bubbler and Pararosaniline Method (West and Gaeke Method), or Flame Photometric Detector, USEPA 40CFR, Part 50					>160µg/ Ncm	>170 µg/ Ncm	180µg/ Ncm			
		Noise at evening	Noise sound level meter reading					>40 db(A)	>45 db(A	50 dbA			
		Noise at nighttime						>40 db(A)	>40 db(A)	>45 db(A)			

Table 6. 1 Summary of Environmental Compliance Monitoring Plan

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
	Deterioration of surface water quality	TSS	Grab sampling 1 meter below surface, Gravimetric analysis	Quarterly	Refer to Figure 6. 1, Water Quality Sampling stations	PCO with MMT	PHP 15,000 per quarter	>60 mg/L	>65 mg/L	70 mg/L	Investigate, identify sources, increase frequency of desilting, OWS maintenance, undertake septic tank desludging.	Investigate, identify sources, increase frequency of desilting, OWS maintenanc e. Audit the implementa tion of activities declared in Section 2.3.2. undertake septic tank desludging	Improve the control the pollutants from source, increase frequency of desilting, OWS maintenance, undertake septic tank desludging. Change work methodology to less pollutive.
		Fecal Coliform	Surface grab sampling, multiple tube fermentation					>180 MPN/100 mL	>190 MPN/100 mL	200 MPN/100 mL			
		Oil & Grease	Surface grab sampling, Petroleum ether extract					>3.0 mg/L	>4.0 mg/L	5.0 mg/L			
		5.Cadmium	Surface grab sampling, Flame AAS	In first year of operation. If no heavy metal pollution from project is confirmed , terminate after Year 1.	Refer to Figure 6. 1, Water Quality Sampling stations	PCO with MMT	PHP 30,000 per quarter	>.01	>.01mg/L	.01 mg/L	Investigate source of exceedance and report to EMB	If source of exceedance is from Project, institute control	Improve control to negate project source
		6.Chromium	Surface grab sampling, Flame AAS					> .006 mg/L	>.008 mg/L	.01 mg/L			
		7.Arsenic	Surface grab sampling, Gaseous hydride AAS					.02 mg/L	>.02 mg/L	.02 mg/L			
		8.Lead	Surface grab sampling, Flame AAS					>.02 mg/L	>.02 mg/L	.05 mg/L			
	Impact on marine ecosystem - invasive alien species, status fishery stock	Population and Biodiversity indices of zooplankton, phytoplankton, corals, and fish including shellfish Population	Marine investigation through marine biologist	Annual	Refer to Figure 6. 1	PCO with MMT	150,000	N/A	N/A	N/A	N/A	N/A	N/A

Table 6. 1 Summary of Environmental Compliance Monitoring Plan

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
The Air	Deterioration of air quality	TSP	High Volume Sampling and High Volume sampling with 10 micron particle-size inlet; Gravimetric analysis, USEPA 40 CFR, Part 50	Quarterly	Refer to Figure 6. 1	Cemphil, Inc.	PHP 20,000 per station per parameter	>220 µg/Ncm	>225µg/ µg/Ncm	230 µg/Ncm	Investigate pollution source equipment, check and do maintenance work on pollution control equipment when needed	Repair air pollution control equipment if poorly malfunctioning .	Replace or add air pollution control equipment Report APCE failure to EMB6 and request approval to replace damaged equipment
		PM_{10}						>125 µg/Ncm	>140 µg/Ncm	150 µg/Ncm			
		NO_2	Gas Bubbler Griess-Saltzman, or Chemiluminescence Method, USEPA 40 CFR, Part 50	Quarterly for 1 year. When potential as non-impact parameter is confirmed , terminate after Year 1.				>130µg/ µg/Ncm	>140 µg/Ncm	150 µg/Ncm			
		SO_2	Gas Bubbler and Pararosaniline Method (West and Gaeke Method), or Flame Photometric Detector, USEPA					>150 µg/Ncm	>160 µg/Ncm	180µg/ Ncm			
		Noise at evening	Noise sound level meter reading					>40 db(A)	>45 db(A	50 dbA			
		Noise at nighttime						>35 db(A)					
	Offsetting of carbon footprint	No. of hectares under MOA with LGU and planted with mangrove No. of thriving mangrove trees Species planted	Verification by CENRO photo documentation	Annually	Coastal areas of Ajuy identified by MPDC for mangrove reforestation	PCO	Part of Environmental Monitoring Fund						
	Road safety hazards, traffic congestion	Road accidents, public complaints	Site observation, key informant interview	Quarterly	Project site	PCO with MMT	Part of administration cost						
ABANDONMENT PHASE													
The Land	Soil contamination by oil spills	Petroleum oil in soil	TPH Carbon chain C10 to C14 THP Carbon chain C15 to C28	Upon request for exit from monitoring due									
The Water	Marine surface water quality	TSS	Grab sampling 1 meter below surface, Gravimetric analysis							70 mg/L			Undertake remediation and retest

Table 6. 1 Summary of Environmental Compliance Monitoring Plan

KEY ENVIRONMENTAL ASPECTS PER PROJECT PHASE	POTENTIAL IMPACTS PER ENVIRONMENTAL SECTOR	PARAMETER TO BE MONITORED	SAMPLING AND MEASUREMENT PLAN			LEAD PERSON	ANNUAL ESTIMATED COST	EQPL MANAGEMENT SCHEME					
								EQPL Range			Management Measures		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
				to project closure									until standard limit is met
		Fecal Coliform	Surface grab sampling, multiple tube fermentation		Refer to Figure 6. 1, Water	PCO with MMT	100,000			200 MPN/100 mL			Undertake remediation and retest until standard limit is met
		Oil & Grease	Surface grab sampling, Petroleum ether extract		Quality Sampling stations					5.0 mg/L			
The Air	Ambient air quality	TSP	24-hour sampling High Volume Sampling and High Volume sampling with 10 micron particle-size inlet; Gravimetric analysis, USEPA 40 CFR, Part 50	Upon project closure	AQ Stations A3 A4, see Figure 6. 1	PCO	PHP 150,000 2021 prices			230 µg/Ncm			
		PM_{10}								150 µg/Ncm			Identify sources of exceedance, if any. Conclude testing when non-project source cause the exceedance
Notes: EQPL = Environmental Quality Performance Level													
• Alert or Red Flag: early warning													
• Action Level: point where management measures must be employed so as not to reach the regulated threshold or limit level, or to reduce deterioration of affected environmental component to pre-impact or optimum environmental quality													

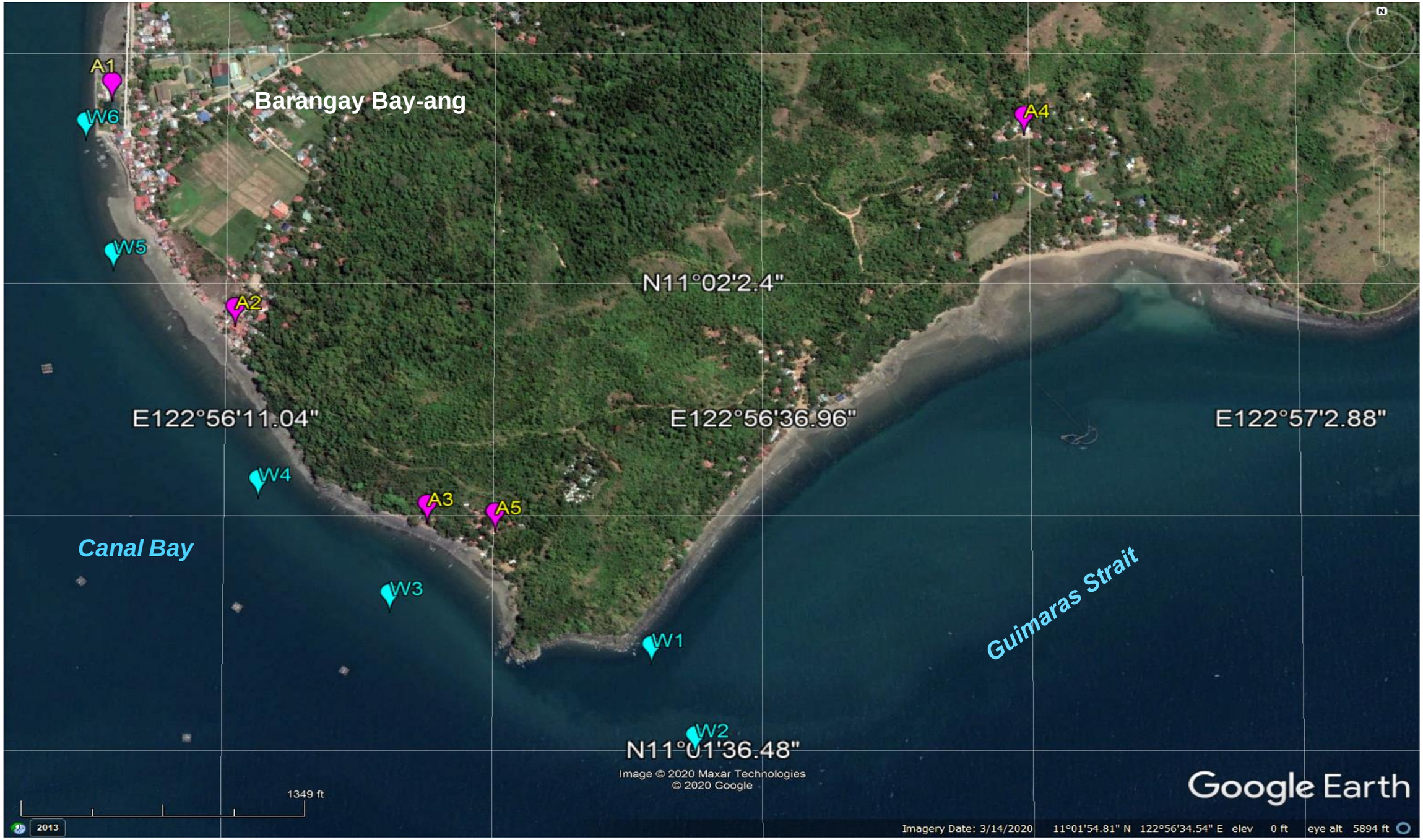

Figure 6. 1 Air and Water Quality Monitoring Stations

The water quality monitoring locations coincide with the locations of coral communities near the Project site.

Table 6. 2 Location of Water Quality Monitoring Stations

Label	Geographical Position
W1	N11° 01.700' E122° 56.524'
W2	N11° 01.638' E122° 56.574'
W3	N11° 01.740' E122° 56.350'
W4	N11° 01.829' E122° 56.251'
W5	N11° 02.036' E122° 56.110'
W6	N11° 02.239' E122° 56.056'

The air quality monitoring locations coincide with the nearest communities.

Table 6. 3 Location of Air Quality Monitoring Stations

ASRs	Location	Longitude	Latitude
ASR1	Pedada	122° 56' 43.559"	11° 3' 13.7556"
ASR2	Pedada Purok	122° 56' 10.374"	11° 2' 44.8692"
ASR3 A1	Bay-ang Purok	122° 56' 7.382"	11° 2' 11.0076"
ASR4 A2	Bay-ang Purok 4	122° 56' 11.868"	11° 2' 0.4272"
ASR5	Bay-ang Sitio Nipa	122° 56' 38.497"	11° 1' 55.3872"
ASR6	Bay-ang Purok 1	122° 56' 53.228"	11° 2' 6.0684"
A5	Cemphil Processing Plant		

6.2 Self-Monitoring

Cemphil, Inc. will monitor its environmental compliance and submit Self-Monitoring Reports (SMR) and Compliance Monitoring Report (CMR) on a quarterly and bi-annual basis, respectively, to the Environmental Management Bureau. The SMR will be submitted manually to the EMB Region 6 Office, and the CMR through the EMB Compliance Monitoring (CMR) Online. The SMR will include a reporting of the following information:

a) Compliance with pertinent conditions under R.A. 6969, An Act to Control Toxic Substances and Hazardous and Nuclear Wastes
b) Compliance with pertinent conditions under Presidential Degree (P.D.) 984, The Pollution Control Law
c) Compliance with pertinent conditions under R.A. 8749 the Philippine Clean Air Act.
d) Compliance with P.D. 1586, particularly:
    a. Ambient Air Quality Monitoring
    b. Ambient Water Quality Monitoring
    c. ECC conditions
    d. Environmental Management Plan commitments
    e. Solid Waste Characterization
    f. Accidents & Emergency Records
    g. Personnel/Staff Training
e) List of Complaints Received and Action Taken, from the operation of the Cemphil Grievance and Redress Management System (see page 1-53).
f) Environmental Quality Performance Level

Cemphil, Inc. duly notes the following main project environmental impacts and respective Environmental Quality Performance Levels required under existing regulations

stated above and during its Self-Monitoring Activities, will implement internal controls to comply with regulations:

Table 6. 4 Required Environmental Quality Performance Level (EQPL)

Activity	Environmental Impact	EQPL
Equipment mobilization, material transport, earthworks, cement grinding, product transport	Increased ambient dust (Total Suspended Particulates (TSP) and Particulate Matter less than 10microns (PM_{10}) in residential areas beside access roads Increased noise perceived at residential areas	TSP 300 ug/Ncm at 1 hour averaging or 230 ug/Ncm@24 hrs. averaging PM10 150 ug/Ncm at 24 hours averaging Noise limit 50 db(A) evening, 45 db(A) nighttime
Earthworks, construction of jetty port, Project operations	Increased marine water siltation Increased Oil and Grease in marine receiving water Potential increase in Biological Oxygen Demand (BOD) and Fecal Coliform due to discharge of domestic wastes or waste mortar to sea	Total Suspended Solids (TSS) in project receiving waters <70 mg/L O&G <5 mg/L BOD <30 mg/L Fecal Coliform 200 MPN/100 mL pH 8.5 to 9.5

6.3 Multi-sectoral Monitoring Framework

The DENR Department Administrative Order 2017-15 encourages broader public participation, promotes greater stakeholder vigilance, and provides a check and balance mechanism for an environmentally compliant project. DAO 2017-15 provides the following guidelines in the formation of the Multipartite Monitoring Team (MMT) to involve public participation in project compliance monitoring. The MMT shall be organized within the same month as the start of Project construction works.

6.3.1 MMT Composition and Leadership

1. It shall have, among its members which shall not exceed ten (10), the following:
    a. the Municipal Environment and Natural Resource Officer (MENRO)
    b. DENR Community Environment and Natural Resources Officer (CENRO)
    c. DENR Provincial Environment and Natural Resources Officer (PENRO)
    d. the Rural Health Unit Chief; and
    e. the Barangay Captains of Bay-ang, Luca and Pedada
    f. Leaders or representatives from a maximum of two (2) locally organized and accredited vulnerable sector-groups such as Women and Senior Citizens, and the Academe.
    g. Maximum of three (3) representatives from Government agencies with a mandate related to the project type and its impacts such as DTI, DOLE, etc.
2. The Environmental Management Bureau (EMB) and the Cemphil are not part of the MMT membership.
3. As a rule, the MENRO or the representative from the lead government agency (e.g. Department of Trade and Industry) shall serve as the MMT Chair. In case the MENRO will not accept the chairmanship, the members of the MMT shall elect the Chairperson among themselves. The manner of selecting the Chairperson shall be specified in the Manual of Operations (MOO) which will be agreed-upon by the body culled from a generic template for its operations. For the reason of non-acceptance of the MMT chairmanship by the MENRO

or DTI Region 6 representative, the MOO template of EMB may be discussed by the body to decide on the selection of MMT Chairmanship and how to involve the concerned national Government agency, as intended by DAO 2017-16.

4. Based on DAO 2018-18, the DENR Provincial Environment and Natural Resources Officer and the DENR Community Environment and Natural Resources Officer with jurisdiction over Ajuy municipality will participate in the MMT process and activities. DAO 2018-18 also authorizes, among others, the PENRO and CENRO to :
    (a) enter any premises or to have access to documents and relevant materials.
    (b) inspect any pollution or waste source, control device, monitoring equipment or method required; and
    (c) test any discharge.

6.3.2 Duties of the Proponent

The Proponent's role shall be limited to the preparation and submission of the quarterly Self-Monitoring Report and Semestral Compliance Monitoring Report to the MMT, copy furnish the EMB, and the provision of the Environmental Monitoring Fund.

6.3.3 Duties of the EMB

The EMB shall conduct periodic monitoring of the proponent's compliance with the ECC and other commitments and requirements of projects under the Philippine EIS System based on the environmental risk-based prioritization scheme (PEMAPS).

6.3.4 Duties and Functions of the MMT

The MMT shall conduct quarterly ocular inspections and meetings to validate the proponent's compliance with ECC conditions and the Environmental Management and Monitoring Plan. In the conduct of its quarterly site visit, the MMT shall implement the usual procedures, including a closing meeting where the MMT findings are discussed with the representative of the project proponent. They shall submit a Compliance Monitoring Verification Report to the EMB Central Office and EMB Regional Office on a semestral basis using the EMB-prescribed format, not later than July 30 for the first-semester report and January 30 for the 2nd-semester report. During the site visit, the MMT shall discuss its findings with the Proponent, for the purpose of finding solutions to environmental issues that may have been observed, and traceable to the Project.

Cemphil, Inc. will invite the MMT to observe/witness the air and water quality sampling activities that it shall conduct as part of its self-monitoring activities.

6.3.5 Operationalization

A Memorandum of Agreement (MOA) between the EMB-Central Office and Proponent shall be executed in the creation of the MMT, within one year of ECC issuance. The EGF provisions as earlier mentioned shall be integrated into the MOA with the EMB CO Director as Chairperson of the EGF Committee. The Pro-forma MOA shall be provided by EMB after the Project ECC is issued.

An MMT Manual of Operations (MOO) is available online from the EMB website, for reference of the MMT in its organization and activity planning. The MOO shall guide the MMT in operationalizing its functions and managing its performance. It should contain at least the following:

- Membership: selection process, code of ethics, suspension/removal, resignation/replacement process
- Organization : structure, leadership, roles & responsibilities
- Fund Administration & Management
- Activities: meetings, monitoring activities, records keeping, public disclosure, operations & performance enhancement

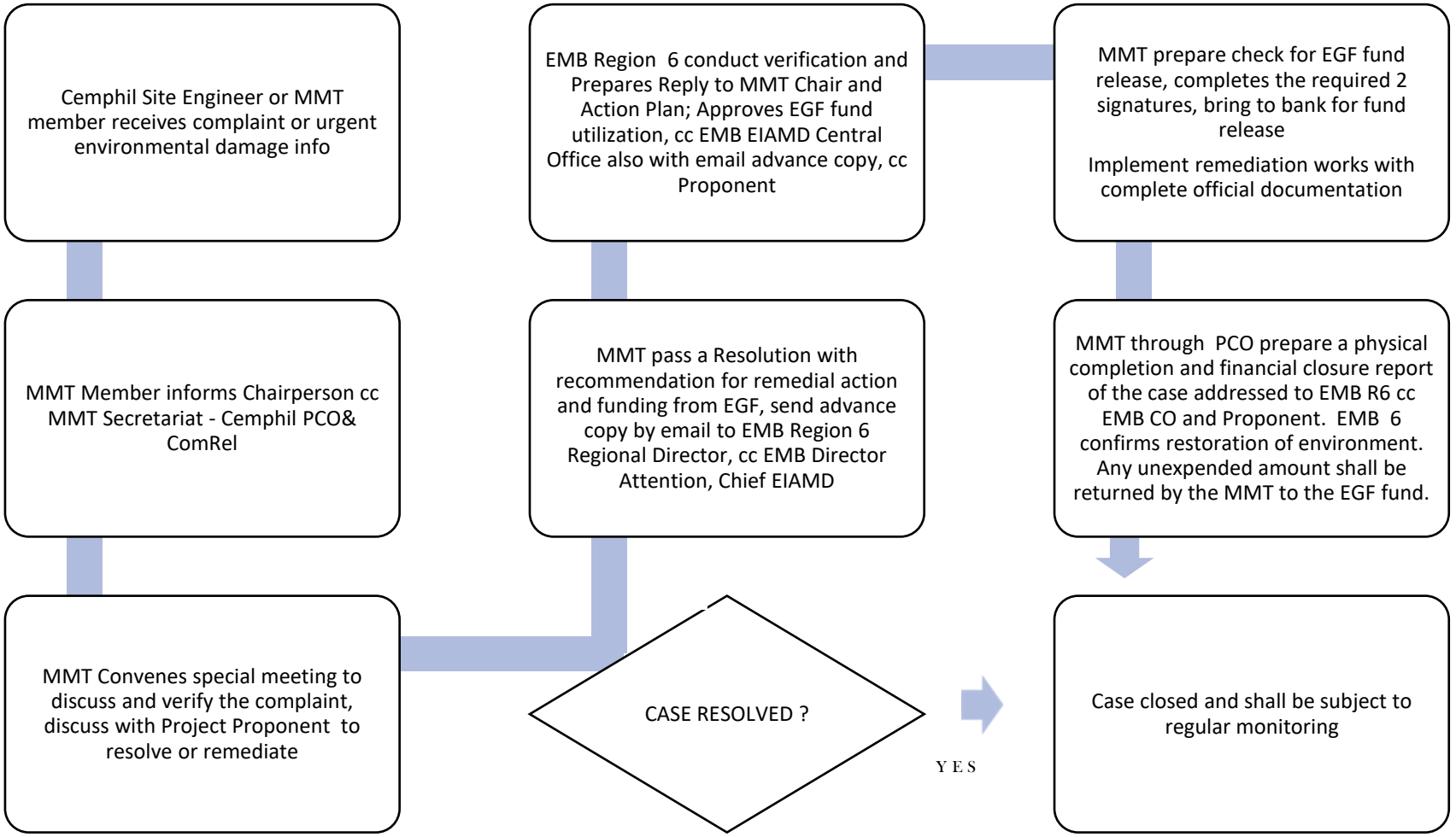

Figure 6. 2 Emergency, Grievance and Redress Management Mechanism

An MMT without an agreed MOO submitted within a year from the signing of the MOA by DENR shall be suspended until such time that the requirement is submitted and approved by EMB.

The MMT MOA will include agreements on the Establishment of the Fund Management Committee, hereinafter referred to as the EGF Committee. The MMTs Executive Committee shall serve as the Environmental Guarantee Fund Committee, discussed below.

6.3.6 Grievance and Redress Mechanism (GRM)

Cemphil, Inc. will establish a Grievance and Redress Mechanism (GRM) to handle public concerns which residents may need to raise to the company, one time or another (see page 1-53). The GRM operation will be under the office of the Cemphil President and supervised by the VP for Safety and Administration. All complaints received and action taken will be faithfully recorded by the Community Relations Officer (CRO) in a Complaints Logbook and filed Complaints forms will be maintained in a Complaints folder. Attached in Annex X is a form for documenting the grievances and complaints brought to the Project, whether in writing or verbally. The Cemphil, Inc. GRM process flow is illustrated in Figure 6. 2 above.

The MMT may work with Cemphil in the operationalization of the GRM, for purposes of quickly resolving public complaints and preventing environmental degradation. **Figure 6. 2**, the Cemphil GRM will be submitted to the MMT for consideration/ discussion/ possible revision or adoption as part of its normal operating procedure. The Cemphil Environment Division, specifically the Community Relations Officer will serve as Secretariat to the MMT to safekeep the records of received grievances and complaints, and report to the MMT on the actions taken on the complaints received.

The members of the MMT may also receive public complaints regarding the Project and /or accompany or assist the complainant bring the matter to the Cemphil Project Engineer who handles the GRM at site, to officially file the complaint to Project Management. The GR form (Annex X) shall also be part of the orientation for the MMT members operationalization. The MMT member assisting the complainant will ensure that the complainant has a copy of the signed Cemphil GR form. On case-to-case basis depending on the nature or the complaint, the MMT in plenary will decide on unresolved complaint/s as to who shall serve as case point person, whether it shall be the ComRel, PCO or MMT member who shall follow-up the case, provide regular updates to the complainant regarding the resolution of the complaint received by the MMT or Cemphil.

Complaints that are not or will not be addressed by the Cemphil within reasonable time may be endorsed to the EMB Regional Office by MMT Resolution to prevent exacerbating adverse environmental impacts.

The provisions for the emergency communication and complaints/grievance and redress management mechanism shall be incorporated in the draft Memorandum of Agreement organizing the MMT.

6.3.7 The Environmental Guarantee Fund (EGF)

A significant public risk is presumed by the DENR-EMB when any of the following conditions exist:

a) Presence of toxic chemicals and hazardous wastes as defined in Republic Act No. 6969 under the PCL or CCO system.
b) Extraction of natural resources that requires rehabilitation or restoration.
c) Presence of structures that could endanger life, property, and the environment in case of failure; or
d) Presence of processes that may pose a significant pollution risk as defined under pollution laws.

For projects that bear significant public risk, commensurate EGF is established for possible application in the following risk-management related purposes:

1) The immediate rehabilitation of areas affected by damage to the environment and the resulting deterioration of environmental quality as a direct consequence of project construction, operation, and abandonment.
2) The just compensation of parties and communities affected by the negative impacts of the project.
3) The conduct of scientific or research studies that will aid in the prevention or rehabilitation of accidents and/or risk-related environmental damages; or
4) For contingency clean-up activities, environmental enhancement measures, damage prevention program including the necessary IEC and capability building activities to significantly minimize or buffer environmental risk- related impacts.

The EGF is determined based, among others, on the following:

1) The EIS committed programs.
2) The degree of environmental risk involved (based on the number and extent of potential damage.
3) Valuation of resources that would be most likely to be affected; and
4) The proponent's ability to provide funds for the EGF.

In case the available fund in the EGF is not sufficient to pay for compensable claims due to environmental damage caused by the Project, the proponent shall provide additional funds to cover the cost of rehabilitation, restoration, or other activities for which the EGF was established. As such, the proponent shall replenish the EGF whenever the amount falls below 50% of the agreed level.

Toward the end of the project life, a sufficient amount should be left in the EGF to ensure that rehabilitation, restoration, decommissioning, or abandonment shall be adequately financed. Such amount may be increased at any time during the project life span when warranted, to ensure that the fund balance shall be sufficient in the event that the Proponent fails to manifest environmental responsibility in the course of project implementation for the abandonment phase. In such a case, the EGF Committee may require an adjustment of such amount to cover inflation and other factors.

Unused EGF shall be returned to the Proponent at the end of project life.

For the Cemphil Cement Grinding Project, Cemphil undertakes to provide compensation for environmental damages which may be above and beyond the amounts committed below, as may be resolved by the MMT.

The EGF shall have two (2) major components:

6.3.7.1 Trust Fund

The trust fund is a form of guarantee instrument which will be used to compensate aggrieved parties for any damages to life or property, undertake community-based environmental programs, and conduct environmental research aimed at strengthening measures to prevent environmental damage and to finance restoration and rehabilitation of environmental quality caused by the project. This could be in the form of insurance, letters of credit, trust fund, other financial instruments, and other similar guarantee instruments.

In view of the insignificant public risk borne by the Project, the Project will establish a Trust Fund amounting to **One Million Pesos (PhP 1,000,000.00),** following guidelines provided under Annex 3-6 of RPM for DAO 2003-30.

6.3.7.2 Environmental Guarantee Cash Fund

This component of the EGF shall be earmarked for immediate rehabilitation and compensation of affected communities in case of damage or accidents. It shall also be used to cover the administrative costs of managing the fund by the MMT-authorized fund manager. The part of the fund for emergency response may be placed in a government bank guarantee, withdrawable within a 24-hour or other short-term notice by the proponent or the MMT. The rest of the Cash Fund may be placed in an interest-bearing account. The interest shall accrue to the Cash Fund. The funds shall be replenished when it reaches a certain level agreed upon by the MMT, which should not be lower than 50%. The Project will establish an Emergency Cash Fund of Two Hundred Thousand Pesos (PhP 200,000.00) replenishable when it reaches One Hundred Thousand Pesos (PhP 100,000.00). The Regular Cash Fund which shall be in an escrow account and shall be maintained at Three Hundred Thousand Pesos (PhP 300,000.00).

6.3.7.2.1 Procedure for the Disbursement from the EGF

1) The Chairman of the EGF Committee shall not vote on any matters except to break a tie. Any determination or approval by the EGF Committee shall require a majority vote, provided there is a quorum. A quorum shall require the presence of more than half of the members including, at all times, the representative/s of DENR and Cemphil. Elected officials shall serve in the Committee only during their terms of office. The lead government agency that has a direct mandate over the project may be invited as a member of the Committee, such as DOLE, as deemed necessary.
2) In case the project area and its corresponding impact area is significant, the manner of representation to the EGF committee members shall be determined on a case-to-case basis. It should be noted that sectoral representation in the EGF shall be based on the key issues and risks against which the EGF is being set up. Delays in the appointment or selection of representatives to the EGF committee shall not impair the basic objective of the EGF to provide timely and quick relief for environmental repair activities.

6.3.7.2.2 Functions of the EGF Committee

The Committee shall have the following functions:

1) Manage, control, and operate the EGF in accordance with agreed internal procedures established regarding the mechanisms for fund disbursement, processing, validation, accounting, and documentation.

2) Resolve issues involving rehabilitation and compensation for damages that may be brought before it.

3) Decide issues on complaints/questions involving the implementation of the rehabilitation program between the proponent and the aggrieved party.

4) Designate entities or individuals if an independent body must resolve the issues and cases.

5) Hire credible experts to conduct independent studies and research on the environmental and socio-cultural impacts of the project to assist the EGF in making judicious decisions about environmental issues related to the project.

6) Undertake damage control or preventive measures.

6.3.7.2.3 Fund Management

6.3.7.2.3.1 Claims/Withdrawals to the EGF

Claims to the EGF shall be classified into emergency; compensatory; and/or operating costs:

1) **Emergency Claim**. A claim is considered for emergency purposes if it is intended to:
   a. Prevent loss of life or serious damage to property and environment; immediate rehabilitation of affected areas; provide immediate correction of or prevention against the spread of accident or disaster or the effect thereof; evacuate and temporarily relocate affected residents.
   b. The causes of the above should be due to the pollution and/or environmental degradation arising from the activity(ies) of or violation(s) environmental laws and regulations by the project. The failure of the proponent to comply with obligations set forth in the EIS and the ECC is another ground for such claim.

2) **Compensatory Claim**. A claim is considered compensatory if it is intended to pay for pecuniary loss or damage suffered by a party, person, or entity, resulting from project actions. The EGF Committee should come out with guidelines to be approved by its members on how to access the EGF for compensatory claims. The guidelines should specify the following:
   a. Procedures for filing a claim for compensatory damages.
   b. Required (valid) proofs or evidence to support claim for compensation Basis for computation of compensatory damages

3) **Claim for Operating Costs**. This is a claim whose purpose is to support the operations of the EGF Committee. The EMF guidelines on allowable expenses and other such provisions shall be adopted for such purposes. Claim for operating costs shall likewise include expenses for preventive activities, environmental education, scientific or research studies, training, and other activities duly provided for in the MOA or as approved by the EGF Committee.

6.3.7.2.3.2 Withdrawals by the Proponent from the EGF

The cash fund may be drawn in the following instances:

a. Respond to an event of emergency in accordance with the guidelines to be approved by all members of the EGF Committee.
b. Claims for compensatory damages subject to written approval by the EGF Committee and concurrence of the proponent; or
c. Operating costs incurred or approved by the EGF Committee.

6.3.7.2.3.3 Withdrawal of the Proponent from the Trust/Guarantee Fund

The trust fund can only be drawn upon:

a. Approval in writing by the EGF Committee for emergency claims that can no longer be accommodated by the cash fund.
b. In cases where the cash fund is insufficient to pay for duly approved/concurred compensatory claims by the EGF Committee; or
c. In cases where preventive or control measures have to be done by the proponent that were not identified in the EMP.

6.3.7.2.3.4 Processing of Claims

a. Written complaints or claims must be filed with the EMB-Regional Office with accompanying evidence within one (1) month after damages have occurred, after which no other complaints may be entertained.

b. Written complaints or claims must be filed with accompanying evidence. Complaints for compensation filed with the EMB-RO are subject to verification and certification by EMB-RO.

The claimant's request for compensation must include the following:

a. Evidence of livelihood source.
b. Evidence of ownership or stewardship and location of the property; or
c. Nature/extent of the damages based on assessment by the claimant

In cases where such supporting documents or evidence/s are not applicable (e.g., claims for damages while fishing in municipal waters), other similar evidence or supporting documents must be included.

The proponent shall exercise due diligence and prudence in validating or assessing compensation for such claims. The EGF Committee shall affirm such validation taking into consideration issues on social equity, health, opportunity costs, and other such factors. If necessary, field evaluation or investigation may be conducted by the MMT, by the DENR, or by the lead agency with a direct mandate on the project.

Any claims approved by the EGF committee and certified by the EMB or EMB regional office are paid to the claimant within thirty (30) days after the receipt of notice by the proponent.

Interest charges are assessed, as agreed in the MOA, for late payment. In the absence of specific provisions in the MOA on interest charges, the most recent published T-bills rate (for 90 days) shall be used as a guide.

The EGF committee arbitrates any dispute between the claimant and the proponent. Their decision is final and executory. Interested parties (including proponents) may only resort to court on issues involving abuse of discretion or authority.

6.3.8 Environmental Monitoring Fund

An external Monitoring Fund of 150,000 per quarter shall be provided by the Project, to be established in accordance with pertinent guidelines under DAO 2017-15.

7. Decommissioning / Abandonment / Rehabilitation Policy

The Cemphil land and facilities are privately owned and as an economic asset, will not be abandoned without regard to maintaining conditions suitable for a successor in economic interest. In view of the expected long-term continuing demand for cement, there is no plan in the foreseeable future, for project termination. At the end of project economic life or when cement grinding operations are decided to be terminated, the project or equipment may either be sold or the area, repurposed.

Agricultural production is not among the options to aim for in land rehabilitation due to poor natural land suitability for agriculture. The property may generate more benefits in industrial, residential, or ecotourism land use, in the event of cessation of cement manufacturing operations.

At the end of project economic life, and in the transition period for other land uses, the plant decommissioning and abandonment plan will aim to meet the following conditions:

1. Facilities are safely and carefully dismantled. Reusable or recoverable materials will be segregated and hauled out though accredited third-party material recovery groups. The area will be cordoned off for public safety.
2. Land and facilities shall be rendered free of physical hazards and chemical contamination.
3. Land slope is stable, sloping areas are revegetated and Project facilities that will not be hauled out by material recovery groups or turned over to the Local Governments shall be segregated and secured.
4. Air and water quality in the impact receptor zones comply with applicable environmental standards.

A full decommissioning plan shall be submitted to the Environmental Management Bureau when Project decommissioning and abandonment of cement manufacturing operations shall be in the project planning horizon.

The project's Abandonment Plan will have a corresponding funding commitment to its implementation and shall be subject to the approval of the DENR-EMB or the lead government agency with direct approving authority on the Abandonment/Decommissioning Plan of the project, e.g., DOLE, etc.

8. Institutional Plan for EMP Implementation

8.1 Pre-Construction and Construction Phase

1) Cemphil, Inc. will include under the Section "Special Conditions" in the Terms of Reference for Invitation to Bid for the (i) Civil Works for Project Detailed Engineering Design, (ii) Equipment Design and Manufacturing/ Fabrication and (iii) Project Construction, pertinent sections of the Project Environmental Management Plan (EMP) and the Project Environmental Compliance Certificate, for these to be considered and incorporated appropriately in the detailed design for civil works, equipment and in actual construction. In all project contracts, Cemphil, Inc. will charge the respective Contracting Partner with the responsibility for the implementation of activities required to comply with environmental laws and regulations and the project EMP.
2) During construction phase, Cemphil Inc. will assign a Site Engineer to monitor and supervise project implementation, receive public complaints as may arise, investigate the alleged environmental violation, liaise with the Contractor's Project Manager to enforce contract provision on environmental compliance to address the complaint received or report to Cemphil Inc. President any outstanding issue for the purpose of facilitating redress to any verified transgression. In the process, s/he will coordinate with the concerned member of the MMT regarding the matter for information and support.

8.2 Construction Phase

Cemphil, Inc. will establish an Environment Department to be headed by a Compliance Manager who directly reports to the President. The organizational structure for project implementation is in Figure 8. 1. The positions with responsibility for the implementation of activities leading to and ensuring environmental compliance and their respective duties, are the following:

8.2.1 Cemphil, Inc. President

The Cemphil, Inc. President shall have command responsibility for the implementation of activities necessary for compliance to environmental regulations, including the Environmental Management Plan in this EIS. He will ensure that the Project equipment, civil works and operating systems will be designed, established and operated to comply with environmental regulations as committed by the Company under the EMP and with the acceptance of the Project ECC, confirms, in behalf of the Company, commitment comply with environmental regulations.

He may designate the oversight of environmental compliance on respective concerns, to the Vice President for Safety and Administration and the Vice President for Technical Concerns.

8.2.2 Environmental Compliance Manager (ECM)

The Environmental Compliance Officer shall be responsible for the day-to-day activities leading to project compliance to environmental regulations and the implementation of the project EMP. He shall monitor project operations for the purpose of troubleshooting or identifying the pollution source, identifying remedial measures to control the pollution and implement necessary pollution control measures. As an ECM, s/he shall keep himself abreast with the requirements of EMB and the latest available technology on prevention, control, and abatement of project pollution. Whenever needed, s/he shall recommend to the management the installation and operation of additional equipment for the pollution abatement.

The Environmental Compliance Manager directly reports to the Cemphil President and as issues arise, shall coordinate and discusses operational concerns with respective Department Heads as these relate to finance, production, port operations, safety and general administration, for the

purpose of arriving at consensus or obtaining cooperation for the implementation of EMP and environmental compliance measures.

8.2.3 Duties of the Pollution Control Officer (PCO)

The PCO will be employed prior to the actual start of Operations Phase to take care of securing permits to install and operate pollution control facilities such as the Permit to Operate Pollution Source Equipment and Permits to install and operate wastewater treatment facilities.

The duties of the PCO during operations phase shall include the following:

1) Renewal of pollution permits.
2) Monitor activities pertaining the installation, construction and operation of pollution source and control facilities for the purpose to attaining compliance with the air, noise, and water quality standards.
3) Assist the Environmental Compliance Manager (ECM) to monitor project operations for the purpose of troubleshooting or identifying the pollution source, identifying remedial measures to control pollution and comply with environmental laws and regulations.
4) Supervise the proper operation and maintenance of all project pollution control facilities.
5) Immediately report to the ECM the breakdown of any pollution control facility, coordinate with the concerned department head for equipment repair, obtain estimated date of repair completion and operation.
6) Prepare the necessary reports to EMB at each case of specific pollution facility failure, the cause of failure, and dates of repair. After successful repair and maintenance, s/he shall prepare appropriate report to EMB on pollution control facility restoration. All reports shall be signed and countersigned by the Compliance Manager and by the Plant Manager, otherwise the report shall not be accepted as evidence in pollution case.
7) Liaise with the EMB and maintain liaison with the provincial/municipal organization of pollution control officers to keep abreast of best practices in pollution control.
8) Prepare the quarterly Self-Monitoring Reports (SMR) and bi-annual Compliance Monitoring Reports (CMR), secure authorized signatures and submit these to EMB either through physical or electronic modes, as accepted by EMB. Compile copies with acknowledgement received by EMB.
9) Facilitate Project compliance to other requirements of EMB and DENR that are issued /prescribed from time to time.
10) Attend meetings for Pollution Control Officers which may from time to time be called by the EMB; and
11) Handle other matters of environmental concerns as required by the ECM or Plant Manager.

8.2.4 Duties of the Community Relations Officer

The Community Relations Officer shall build rapport and maintain relationships with individuals, organizations and the LGU that can support Project goals of peaceful and efficient production. S/he will facilitate the successful implementation of the Project Social Management Program and Information, Education and Communication activities.

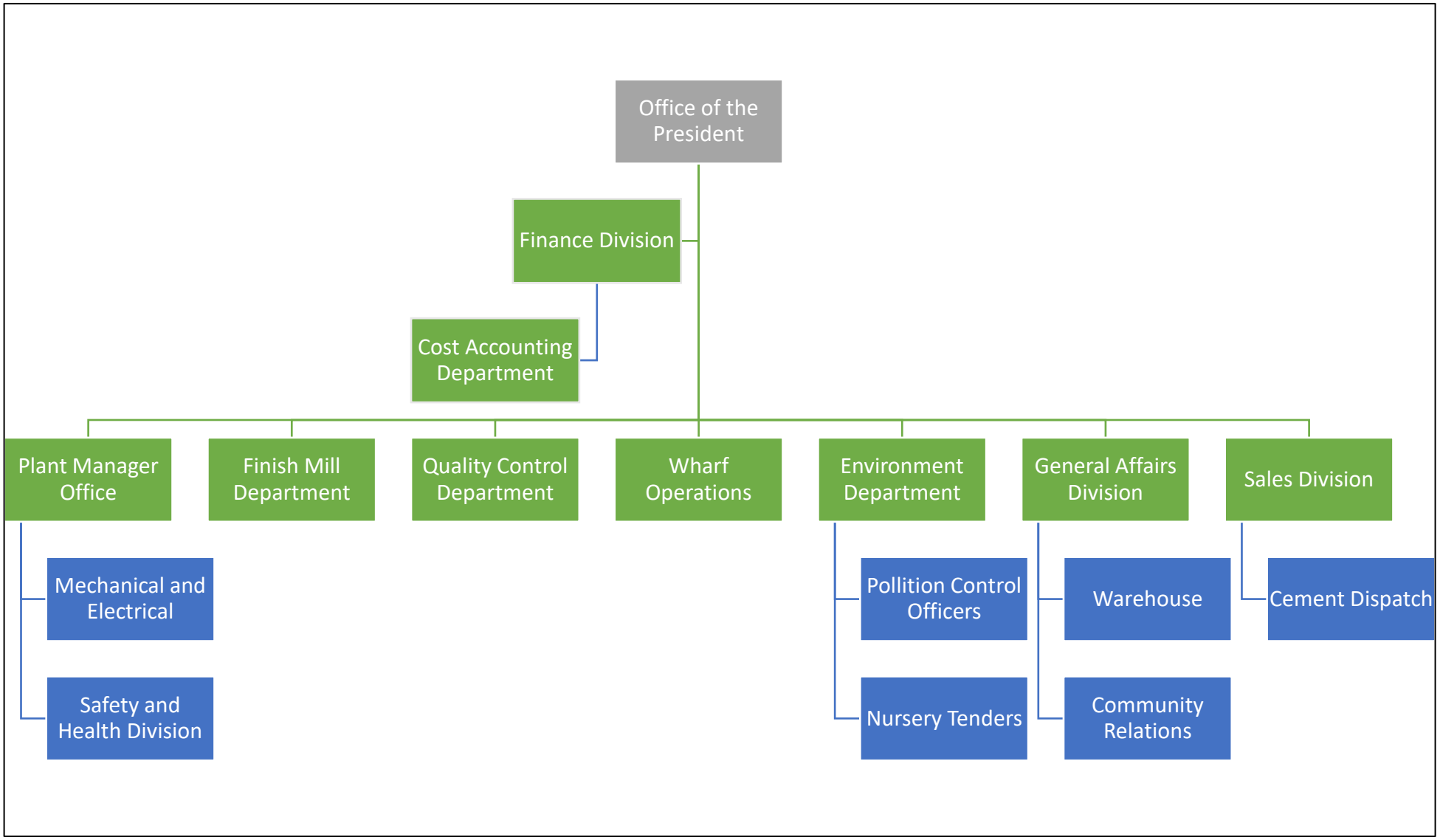

Figure 8. 1 Project Organizational Structure

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