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ABBREVIATIONS

APCF	Air Pollution Control Facilities
APELL	Awareness and Preparedness for Emergency at the Local Level
APSE	Air Pollution Source Equipment
BHW	Barangay Health Worker
BNS	Barangay Nutrition Scholar
BOD	Biological Oxygen Demand
BTEX	Benzene, toluene, and xylene
CAA	Clean Air Act
CAP	Community Assistance Program
CCO	Chemical Control Order
CDM	Clean Development Mechanism
CENRO	City Environment and Natural Resources Office
CEPALCO	Cagayan Electric Power and Light Company
CFW	Constant feed weighers
CH_4	Methane
CLUP	Comprehensive Land Use Plan
cm	Centimeter
Cm/s	Centimeter per second
CMF	Central Mindanao Fault
CMR	Compliance Monitoring Report
CMVR	Compliance Monitoring and Validation Report
CO	Carbon monoxide
CO_2	Carbon dioxide
COD	Chemical Oxygen Demand
COMS	Customer Online Management System
COPD	Chronic Obstructive Pulmonary Disease
COT	Classroom Observation Tool
CPECS	Control Precursors and Essential Chemicals
CSHC	Central Safety/Health Committee
CSR	Corporate Social Responsibility
Cu	Copper
Cr	Chromium
Cr^{+6}	Hexavalent Chromium
DA	Department of Agriculture
DAHS	Data Acquisition and Handling System
DAO	Department Administrative Order
DCS	Distributed Control System
dBA	A-weighted decibels
DCS	Distributed Control System
DENR	Department of Environment and Natural Resources
DO	Dissolve Oxygen
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology

DOTr-OTS	Department of Transportation – Office for Transportation Security
DP	Discharge Permit
DRM	Direct Rainfall Model
DRRMO	Disaster Risk Reduction and Management Office
DSWD	Department of Social Welfare and Development
DWT	Dead Weight Ton
ECC	Environmental Compliance Certificate
EGF	Environmental Guarantee Fund
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMB	Environmental Management Bureau
EMB-EIAMD	Environmental Management Bureau – Environmental Impact Assessment Management Division
EMF	Environmental Monitoring Fund
EMP	Environmental Management Plan
EMR	Environmental Management Representative
EMoP	Environmental Monitoring Program
EMS	Environmental Management System
EP	Electrostatic Precipitator
EPP	Environmentally Preferable Purchasing
EPRMP	Environmental Performance Report and Management Plan
ESH	Environmental Safety and Health
EQPL	Environmental Quality and Performance Level
ERA	Environmental Risk Assessment
ERP	Emergency Response Plan
ERPDPP	Emergency Response Plan and Disaster Preparedness Program
Fe	Iron
FGD	Focus Group Discussion
FLTA	Fatal Lost Time Accident
FMB	Forest Management Bureau
FTAA	Financial or Technical Assistance Agreement
FTP	File Transfer Protocol
FVC	Fish Visual Census
g	Peak acceleration
GHG	Greenhouse Gas
GIS	Geographic Information System
GLC	Ground Level Concentration
ha	hectare
Hg	Mercury
HRB	Heat Recovery Boiler
HW	Hazardous waste
Hz	Hertz
IEC	Information, Education and Communication
IEE	Initial Environmental Examination
IIEE	Institute of Integrated Electrical Engineers

IMP	Impact Management Plan
IRA	Individual Retirement Account
IRR	Implementing Rules and Regulations
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
IV	Importance Value
JVA	Joint Venture Agreement
K	Potassium
$KMnO_4$	Potassium permanganate
KIIs	Key Informant Interviews
kg	Kilogram
kg/hr	Kilogram per hour
kg/TJ	Kilogram per terajoules
kg/m^3	Kilogram per cubic meter
kg/Ts	Kilogram per total solids
kL	Kiloliter
km	Kilometer
kT	Kiloton
kW	Kilowatt
kWh	Kilowatt hour
kVA	Kilovolt-ampere
L	Liter
LED	Light-emitting diode
LFS	Lanao Fault System
LGU	Local Government Unit
L/mo	Liters per month
LT	Lost Time
LIT	Line Intercept
M	Million
MBAS	Methylene Blue Active Substance
m	Meter
mm	millimeter
mm Aq	Millimeters of aqua
m/s	Meters per second
Mcal/tp	Megacalorie per ton of pig iron
mm Hg	Millimeters of mercury
m^2	Square meter
m^3	Cubic meter
m^3/day	Cubic meter per day
m^3/hr	Cubic meter per hour
m^3/min	Cubic meter per minute
MDRRMO	Municipal Disaster Risk Reduction Management Officer
MGB	Mines and Geosciences Bureau
mg/L	Milligram per liter
MMT	Multipartite Monitoring Team

MOA	Memorandum of Agreement
MPP	Mineral Processing Permit
MPDO	Municipal Planning and Development Office
MpaG	Megapascal (gauge)
MRF	Materials Recovery Facility
MMT	Million Metric Ton
MT	Metric Ton
$MTCO_2e$	Metric Ton of carbon dioxide
MTPH	Metric Tons Per Hour
MTPY	Metric Tons Per Year
MW	Megawatt
NAAQGV	National Ambient Air Quality Guidelines Values
NAAQSSSAPIS/O	National Ambient Air Quality Standards for Source Specific Air Pollutants from Industrial Sources/Operations
NAMRIA	National Mapping and Resource Information Authority
NCMB	National Conciliation and Mediation Board
NF-LTA	Non-Fatal Lost Time Accidents
NGO	Non-Government Organizations
N_2	Nitrogen
NO_x	Nitrogen dioxide
NSP	North Settling Pond
NWRB	National Water Resources Board
OM	Organic matter
O_2	Oxygen
OSH	Occupational Safety and Health
P	Phosphorus
PAGASA	Philippine Atmospheric Geophysical Astronomical Services Administration
PAST	Paleontology Statistics
Pb	Lead
PEISs	Philippine Environmental Impact Statement System (PEISS)
PCL	Priority Chemical List
PCB	Polychlorinated biphenyls
PCG	Philippine Coast Guard
PCNC	Philippine Council for NGO Certification
PCO	Pollution Control Officer
PCRMC	Philippine Coastal Resource Management Corporation
pcs	pieces
PD	Presidential Decree
PDEA	Philippine Drug Enforcement Agency
PFZ	Philippine Fault Zone
PNP	Philippine National Police
PENRO	Provincial Environment and Natural Resources Office
pH	Potential of Hydrogen
PHILVOCS	Philippine Institute of Volcanology and Seismology
PhP	Philippine Peso

PIA	Philippine Industrial Authority
PICCS	Philippine Inventory of Chemicals and Chemical Substances
PLC	Programmable Logic Controller
PLDT	Philippine Long Distance Telecommunications Company
PM	Particulate Matter
PMPIN	Pre-Manufacture Pre-Importation Notification
PMS	Preventive Maintenance Servicing
PNSDW	Philippine National Standards for Drinking Water
PPA	Programs, Programs, and Activities
PPE	Personal Protection Equipment
PSA	Philippine Statistics Authority
PSC	Philippine Sinter Corporation
PSCFI	PSC Foundation, Inc.
PWD	Persons with Disabilities
QMS	Quality Management System
PTO	Permit to Operate
RA	Republic Act
RHU	Rural Health Unit
rpm	Revolution per minute
SCBA	Self-Contained Breathing Apparatus
SDP	Social Development Plan
SHP	Safety and Health Program
SHR	Sinter Heat Recovery
SMR	Self-Monitoring Report
SOPI	Safety Organization of the Philippines, Inc
SO_x	Sulfur dioxide
SQI	Small Quantity Importation
SSPTO	Shutdown Safety Patrol Table of Organization
TESDA	Technical Education and Skills Development Authority
TOR	Terms of Reference
TSS	Total Suspended Solids
TPH	Tonne Per Hour
TSD	Treatment, Storage, and Disposal
TSP	Total Suspended Particles
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USTP	University of Science and Technology of Southern Philippines
V	Volt
VU	Vulnerable Species
WMT	Wet metric ton
WP	Water Permit
Zn	Zinc
ºC	Degree Celsius
ug/Ncm	Microgram per normal cubic meter

EXECUTIVE SUMMARY

1.0 PROJECT FACT SHEET

1.1 Background of the Project

Project Name:	**PSC Expansion Project (Ore Blend Facility and New Berth Facility)**
Nature of Project:	**Manufacturing**
Total Area and Production Capacity:	**133 hectares** **9 MMTPY (Blend ore)** **5 MMTPY (Sintered Ore)** **7 MMTPY (Iron Pellet)**
Site Location:	**Phividec Industrial Authority, Municipality of Villanueva, Province of Misamis Oriental**

1.2 Profile of the Proponent

Name of Proponent:	**Philippine Sinter Corporation**
Office Address:	**23F Oledan Square** **6788 Ayala Avenue, Makati City**
Contact Person:	**Mr. Nilo C. Sagrado** **VP & Resident Manager – Sinter Plant**
Tel No./Fax No.:	**(02) 8886-7421/ (02) 85670083 or 86**

1.3 Profile of the EIS Preparer

EIS Preparer:	**Gaia South, Inc., *Environmental Consultants***
OfficeAddress:	**7th Floor Montepino Bldg., Adelantado cor. Gamboa St., Legaspi Village, Makati City**
Contact Person:	**Ebert T. Bautista** **Project Director**
Tel. No./ Fax No.:	**+63 2 88935661 (tel.) / +63 2 88935657 (fax)**

1.4 Project Size

The whole project will have a total area of 133 hectares and will have an annual production capacity of:

- 9 MMTPY (Blend Ore)
- 5 MMTPY (Sintered Ore)
- 7 MMTPY (Iron Pellet)

1.5 Project Components

The proposed ore blending facility is expected to produce approximately 9MMTPY of blend ore. The facility will be composed of various components including the establishment of a new berth facility with a total length of 324m and with a maximum barge capacity of 200kT and loading volume of approximately 14.4 MMTPY. Likewise, four (4) new yards each with a total length of 900m and width of 55m will be developed; three (3) yards beside the existing yard facility and another one in the east side, between the settling pond extending towards the eastside boundary. Other components include three (3) new stack reclaimers with a total capacity of 3,600T/H for stacking and 3,800T/H for reclaiming, a blending stacker with a capacity of 3,800 T/H, two (2) blending reclaimers with each having a capacity of 2,600T/H, and three (3) surge hopper each with a capacity of 80m^3. **Table ES1** summarizes the inclusive components of the existing and the proposed expansion of PSC. Please refer also to **Attachment 1** for the copy of the current ECC of PSC.

Table ES1. Summary of project components of the existing and proposed facilities of PSC

Descriptor	Current Operation (ECC No. 0807-021-2711)	Proposed Expansion
Capacity	12 MMTPY	9 MMTPY
Project Area	133 ha	Ore yard: 19.8ha New berth: 324m
ECC issued (Consolidated)	**ECC Ref. Code 0807-021-2711** Expansion of the Iron Ore Sintering Facility and Consolidation of ECC of the Existing Operations of the Philippine Sinter Corporation Plant	
Production Process	Downdraft Dwight Lloyd Sintering Process (Process flow in ***Figure 3.3-1***) Grate Kiln Method (Process flow in ***Figure 3.2-1*** and Process block diagram in ***Figure 3.4-4***)	Use of ore blend reclaimer and stacker
Utilities Requirement	**Water** – 2,705m^3/day **Electricity**: For Sintering CEPALCO – 24MW (less generation of SSHR & Generators (usually >10MW) Self generated – Design: 18.6 Actual: 13 MW (max) Sintering – 21.5 MW Power plant – 3 MW For Iron Ore Pellet 23.2 MWH (additional)	**Water -** 574m^3/day **Electricity**: New Berth – 270,000kWh New Common Berth – 160,000 kWh New Yard – 220,000 kWh
Raw Materials/Inputs	**Fuel (monthly) for Sintering** 806,245.22 liters Bunker C 147,964.58 liters Diesel	**Fuel during construction:** New Berth – 520,000 L Existing Berth Facility – 720,000L

	3,617.58 liters Gasoline **Fuel (monthly) for Iron Ore Pellet** Soft (Bituminous) coal: 14.1 kg Heavy oil: 3.8 kg Diesel: 4.7 kg [*note:* GK method is chosen due to its energy efficiency. It's estimated that the heat requirement for the GK method will be as low as 292 Mcal/tp as compared to current level of 493 Mcal/tp] **Raw Materials for Sintering (per ton sintered ore) :** 1,029 kg of main iron blend including dolomite 112 kg of limestone; 67.3 kg of carbon source; and 0.76 L of fuel oil/ton SO Typical blend of iron ore: 65% Rio Doce 28% Carajas 7% Dolomite **Raw Materials for Iron Ore Pellet (per ton sintered ore):** 957.5 kg of iron 7.5 kg of bentonite 45.8 kg of limestone; 12 kg of dolomite 16.5 kg of Anthracite Coal [*note*: in addition to the fine ore that can be processed using the current facility/process, the proposed expansion will also be able to process *super* fine ores]	New Yard – 880,000L *Same raw materials*
Manpower requirement	200 – permanent 640 – contractual	Permanent – 24 Contractual – 30
Discharges/Emissions	**Raw material handling** – Suspended particulates **Windbox** – iron oxides, sulfur oxides, carbonaceous compounds, aliphatic hydrocarbons, and chlorides **Sinter Plant** – Suspended particulates, CO, NO_x, SO_x and heat, Petroleum products container and contaminated materials **Limekiln Operations** – Heat, suspended particulates and noise, Petroleum products container and contaminated materials **Power generation** – Thermal water, sludge from demineralization, Petroleum products container and contaminated materials **Administration office** – Papers, packaging, office wastes **Laboratory** – Spent acids, organic and inorganic washings and spills **Canteen** – Food wastes, packaging .materials, contaminated water from oil and grease **Motorpool** – Petroleum products container and contaminated materials, spent acids, battery	

Main plant components	Current Operation		Proposed Expansion	
	Annual Production rate	Area	Components	Area
Iron Ore Pelletizing Facility (enhanced port, ore yard, sintering facility of 12 MTPY)	7 MMPTY	Yard: 22 ha Jetty: 100 m long Plant: 10.965 ha	No change	
Sintering Equipment and facility\ies ○ 14 blending hopper (600 m^3 capacity)	5 MMPTY	133,445.75	No change	

○ 1 Dwight Lloyd type sinter machine (715 m^2 grate area) ○ 1 circular type sinter cooler with 457 m^2 bed area and 15,000 m^3/min capacity ○ 2 mainblower with double suction type with 20,000 m^3/min capacity			
Burnt Lime Facility ○ 3 Chisaki kiln ○ 11 sets of belt conveyor ○ 1 burnt lime hopper ○ 1 cage mill type burnt lime crusher ○ 3 sets bucket elevator ○ 2 vibrating feeder ○ 1 screw feeder	140 MTPD	442.00 m^2	No change
Project Components	**Current Operation**		**Proposed Expansion**
	Components	**Area**	**Components** / **Area**
	Port/Berth ○ 2 rail mounted bulk unloaders (1800 MTPH with an automatic recovery conveyor) ○ Pump and pipeline system ○ Rail mounted shiploaded with movable trimming chute ○ Main berth (351m with 300,000 DWT capacity ○ Berth No. 2 (230m)	11,005.00m^2	○ Four (4) yards (900m x 55m) — 198,000m^2 ○ Surge hoppers — 2,000m^2 ○ Main berth expansion of 4 m (total of 355 m) — 10,044m^2 ○ New berth (324m x 31m) — 13,868m^2 ○ Conveyors (8,711 total length)
Project Components	Sinter Cooler Waste Heat Recovery ○ 1 forced circulation type heat recovery boiler ○ 1 condensing type steam turbine (18,600 kW rated output; 5,100rpm speed; 1.96 Mpa pressure; 345ºCtemperature (valve inlet); 700mm Hg exhaust steam vacuum at 84,700 kg/hr rated outlet) ○ 1 totally enclosed generator (air	1,174.60m^2	No change

	cooled, brushless synchronous generator was installed. It has a rated capacity (output) of 23,250 kVA (18,600 kW) and voltage of 11,000V with a frequency of 60Hz and rotating speed of 1,800rpm) ○ 1 water treatment plant (200 m^3 feedwater and 5m^3/hr make-up water)		
	Administration Building, Gate and Garage/Terminal	5,971.70m^2	No change
	Recreational (park and courts)	13,905.01m^2	No change
	Uniflow kitchen	235.00m^2	No change
	Laboratory	1,178.50m^2	No change
	Warehouse	9,511.30m^2	No change
	Maintenance Building and Shops	4,649.90m^2	No change
	Waste Holding Station	164.00m^2	No change
	Electrical facilities	19,052.26m^2	No change
	Hydrated lime plant	125.00m^2	No change
	Material Handling Offices/Customs	1,729.92m^2	No change
	Cargo Berth Area and Storage Facilities	16,595.70m^2	No change
	Roads	67,537.00m^2	No change
	Settling ponds (total area including walkway)	66,387.23m^2	No change
	Others(fabrication areas/scrap yards)	30,631.00m^2	No change
	Ore yard (including conveyors) ○ 2 stacker (800TPH potable) ○ 1 rail mounted stack reclaimer (1,800/3,600MTPH)	265,264.20m^2	No change

2.0 PROCESS DOCUMENTATION

2.1 The Environmental Impact Assessment (EIA) Report

As defined in the Revised Procedural Manual of DAO 03-30, EIA is a "*process that involves predicting and evaluating the likely impacts of a project on the environment during construction, commissioning, operation and abandonment*". EMB Memorandum Circular 2005-14 "*The Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System*" classifies the proposed project as Category A or Environmentally Critical Projects (ECP) based on the threshold for annual production capacity for a manufacturing project applying for amendment.

The sinter facility was covered by ECC No. 9807-004-120, the Hydrated and Burnt Lime Kiln with ECC No. 01-01-028-120, the Sinter Cooler Waste Heat Recovery with ECC No. 10 (43)

06-08 4262-41100, and ECC No. 9207-006-120A for the 5.5 MW stand-by generator set. In 2009, PSC was granted an amended ECC (ECC No. 0807-021-2711) incorporating all of the existing operations including the Iron Ore Pellet Facility. The ECC of PSC was processed and approved by the EMB CO. Thus, this proposed amendment shall be applied at the same office, submitting an EPRMP.

The EPRMP shall contain the following:

- Project Description
- Analysis of Environmental Impacts
- Environmental Management Plan
- Environmental Risk Assessment & Emergency Response Policy and Guidelines
- Social Development Plan & Information, Education, and Communication Framework
- Environmental Compliance Monitoring
- Decommissioning/Abandonment/Rehabilitation Policy
- Institutional Plan for EMP Implementation

Gaia South Inc. a third-party environmental consultancy firm was contracted by PSC to prepare this EPRMP report. Pre-scoping activities such as Information, Education, and Communication (IEC) (**Annex ES1**), Key Informant Interview (KII), and Focus Group Discussion (FGD) were conducted. A Public Scoping Meeting was also held via online on April 12, 2021 (**Annex ES2**). To guide both the Proponent and its EIS Preparer in the conduct of the Environmental Impact Assessment (EIA), a Technical Scoping meeting was also conducted online last April 29, 2021. The EMB Casehandlers, Review Committee members, PSC, and Gaia South Inc. representatives agreed on the coverage of the Technical Scoping Checklist (**Annex ES3**), which will serve as a guide in the preparation of the EPRMP report.

2.2 Limitations of the Study

The preparation of this EPRMP was timed during the pandemic which generally restricted the overall movement of the consultants on site and within the host community. As much as possible, request for data and follow-ups from the barangay and City Government were done online or via phone call to prevent any possible cause of health problems among the Consultants, community participants, and resource persons.

The coverage of the EIA was based on the Technical Scoping Checklist which was agreed by the EMB, PSC, and Gaia South, Inc during the Technical Scoping Meeting. The Checklist enumerates all the parameters and the recommended methodologies; however, some of the information may not be available Experts from different fields of interest prepared this EIS based on the primary data gathered through the actual fieldwork and secondary data sourced from the barangays, LGU, and government agencies such as the National Mapping and Resource Information Authority (NAMRIA), Philippine Institute of Volcanology and Seismology (PHIVOLCS), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), and Mines and Geosciences Bureau (MGB), among others.

2.3 The Project Team

Table ES2 summarizes the experts involved in this EIA. The Accountability Statements of PSC and Gaia South, Inc are attached as **Annexes ES4** and **5** are the Accountability Statements, respectively.

Table ES2. List of EIA team members and their respective field of expertise

Consultant/Researchers	Expertise
Ebert T. Bautista	Project Director/Technical Reviewer
Ernesto dela Cruz, PhD	Technical Team Leader/Water Quality
Liezyl S. Liton-Relleta	Senior Environmental Consultant/ Project Manager
Neil James E. Duran	Senior Environmental Consultant/ Terrestrial Fauna/Land Use
John Michael Galindon, MSc	Terrestrial Flora
Pancho Caculitan	Geology/Geological Risk Assessment
Erwin Kim Mercado	Physical Oceanography/Hydrology/Flood Modeling
Katherine Escalona, PhD	Freshwater and Marine Ecology
Danica Dela Rosa	Senior Technical Associate
Patricia Erika Lim, EnP	Meteorology, Noise and Air Quality
Merlyn Carmelita Rivera, PhD	Socio-economics and Public Health
Thelma Dela Cruz, MSc	Environmental Risk Assessment
Alfredo Guab III	Mapping Specialist
Carla Grace Canaña	Research Assistant

2.4 The EIA Study Schedule and Area

The proposed PSC Ore Blend and New Berth Facilities project will be situated within the existing complex of PSC located within the Phividec Industrial Authority (PIA) in the Municipality of Villanueva, Province of Misamis Oriental.

Table ES3. EIA study schedule

Activity	Period
Pre-scoping study (including IEC, KII, FGD, and pre-scoping household survey)	January to February 22, 2021
Public Scoping Meeting	April 12, 2021
Technical Scoping Meeting	April 29, 2021
Environmental and social fieldwork	May 6-20 and June 3-11, 2021
Draft EIS Report writing	June to August 2021
Submission of EIS to EMB for 1st Procedural Screening	August 2021
Acceptance of the EIA Report for Substantive Review by the EMB	November 29, 2021
1st Review Committee Meeting	February 2022

2.5 The EIA Methodology

Various studies for land, water, air as well as the social aspects were conducted in such a way that all the technical, environmental and regulatory requirements dictated in the Technical Scoping Checklist were satisfied. Furthermore, this report is a product of the professional and scientifically acceptable methodologies and procedures by the DENR. **Table ES5** provides the summary of the EIA methodology.

Table ES4. The EIA methodology

Module	Description
Land Use	• Use of Comprehensive Land Use Plan (CLUP) of Municipality of Villanueva.
Geology and Geomorphology	• Conduct of field survey and use of available reports, geology literature and information to describe site's existing condition; Use of geological and seismological data lifted from publicly available international and local sources.
Pedology	• Use of secondary profile from the municipal data. Primary sample collection for physico-chemical analysis.
Terrestrial Flora	• A 100 percent tree inventory was conducted at the proposed yard facility. The species were photographed using high resolution digital camera to ascertain and validate their genus and/or species. • The conservation status of all identified species was determined/ confirmed using DENR Administrative Order 2017-11 (DAO 2017-11) and 2017 International Union for the Conservation of Nature (IUCN) Red List of Threatened Species.
Terrestrial Fauna	• Survey for terrestrial fauna was also conducted together with the study on terrestrial vegetation. Wildlife transects were established to confirm other species existing along other habitats. In cases where the species cannot be identified in the field, pictures were taken using high resolution digital camera to ascertain and validate their genus and/or species.
Hydrology/Flood Modelling	• Use of data from the National Mapping and Research Information Authority (NAMRIA), Philippine Atmospheric, Geophysical and Astronomical Service Administration (PAGASA), and Mines and Geosciences Bureau (MGB). • Use of meteorological data sourced from the PAGASA Science Garden. • Flood modeling was conducted using Direct Rainfall Model (DRM) an integrated hydrological and hydraulic modeling computation that directly applies rainfall on the catchment to generate runoff which is simultaneously routed downstream across the topographic 2D grid.
Physical Oceanography	• Numerical modelling was employed to assess the coastal currents and water movement for different wind speed and directions, as well as different tidal conditions (spring and neap tides), and potential impact on the water quality of the project, specifically changes in the ambient water temperature due to the release of warm water at the outfall. • Post-processing of the interpolated bathymetry of the areas covering the project site was conducted using GIS.
Water Quality	• The assessment made use of the EPRMP 2008 report, Self-Monitoring Reports (SMR for the recent 5 years), Compliance Monitoring Reports (CMR for the recent 5 years), and primary water sampling (5 effluent water, 6 marine water, and 2 groundwater). • Used DAO 2016-08 as standard reference.
Marine Ecology	• For benthic profile, Line Intercept (LIT) method by English et al. (1997). Transects were laid haphazardly on the reef flat by divers in SCUBA. Total length of the transect was set at 100m or until a sand patch is hit. Category of lifeforms under the transect were determined by collecting a series of photos of the transect line with underwater camera set at continuous shooting. • Using the same transect, fish community was determined using Fish Visual Census (FVC). • For each of the sampling site, 30L of water was collected at the surface using bucket. The collected water was passed through a 250µm plankton net and collected filtrate at the cod end of the net was transferred to sample bottles, treated with 1% formalin.
Meteorology	• Use of meteorological data sourced from PAGASA Science Garden. • Other relevant information gathered from PAGASA is the climate and

Module	Description
	typhoon frequency maps and the 2020 and 2050 climate projection (Climate Change in the Philippines, 2011).
Air Quality	• Two sets of air quality sampling were done to cover both the wet and dry seasons in five (5) stations. 24-hour sampling of Total Suspended Particulates (TSP), NO_x, SO_x, and PM_{10} and 1-hour sampling for trace metals were employed. • The ambient air quality at the Project site was assessed according to the DENR Administrative Order (DAO) 2000-81 or the Implementing Rules and Regulations (IRR) of the Clean Air Act of 1999.
Noise	• Noise levels were measured in each of the five (5) ambient air stations using a non-integrating type 2 sound level meter. • Sixty-four instantaneous noise readings were taken at each station. The minimum, maximum, mean, and median noise values were determined from the readings. The median noise level at each station was compared to applicable noise standards.
People	• Use of Barangay-level data based on recent barangay profiles and municipal-level data from CLUP of Villanueva and desktop researches. • Conduct of Household Perception Survey, Focus Group Discussions (FGD), and Key Informant Interview (KII).

2.6 Public Participation

DAO 2017-15 or the "*Guidelines on Public Participation Under the Philippine Environmental Impact Statement (EIS) System*" entail projects under the Philippine Environmental Impact Statement System (PEISS) to conduct meaningful public participation in the various stages of the EIA process. The EIA was participated by stakeholders from the host communities of Barangays Katipunan, San Martin, and Poblacion I and leaders of some local organizations.

Pre-scoping activities started in October 2019. The activities include the initial stakeholder identification, conduct of Information, Education, and Communication (IEC), and pre-scoping survey which were conducted in each of the affected areas to determine the level of awareness of the stakeholders about the proposed project.

On April 12, 2021 from 10:00am to 12:00nn at the San Martin Covered Court, Villanueva Misamis Oriental.

The Public Scoping Meeting was held at the San Martin Covered Court, in the Municipality of Villanueva while members of the EMB and Gaia South joined via Zoom. Interest groups invited for the Public Scoping were identified following DAO 2017-15. The meeting documented the issues and concerns of the proposed project by sector: Land, Water, Air, and People. **Annex ES2** includes the Public Scoping Report indicating the analysis of the issues raised during the meeting.

2.7 Delineation of Impact Areas

Based on the proposed site development plan of PSC and its projected operation, the impact area of the proposed Ore Blend and New Berth Facility Project is confined only within the existing site located in Phividec Industrial Estate in the Municipality of Villanueva, Province of Misamis Oriental, Mindanao Island.

3.0 EIA SUMMARY

3.1 Summary of Baseline Characterization

Table ES5 below presents the baseline characterization of the proposed project area and its community.

Table ES5. Summary of the environmental and socio-economic profile

Module	Description
Land Use	• Based on the CLUP of the Municipality of Villanueva, the propsed project site is within the designated industrial zone, thus there is no conflict in land use.
Pedology	• Within the PSC project area only one (1) soil type exist - the San Manuel Loam. San Manuel Loam is characterized as a slightly acidic soil with moderate to high fertility but has low organic matter content. • Soil reaction is medium acid (pH 6.1). Nitrogen is medium (0.1-0.2%), Organic matter is low (1.96-2.96%), Phosphorus and Potassium is low (0.020-0.026%) and (0.08-0.09%) respectively. The natural fertility of this soil is low to moderate. • The analyzed Hg and Cd are below the detection limit. Hexavalent Chromium of the soil is only <0.10 which is way below the contamination level of 2 mg/kg.
Geology/ Geomorphology	• Five rock units underlie the project area: Upper Miocene Opol Formation, the Pliocene Indahag Limestone, the Pleistocene Bukidnon Formation, and the Recent Cagayan Terrace Gravel and Quarternary Alluvium. • The main structural features in the area are two (2) northwest-trending faults along the course of the Tagoloan River.The northern fault is shorter and cuts through rocks of the Cagayan Terrace Gravel that bound the river to the north. The longer, southern fault is referred to in more recent literature as the Cabanglasan Fault. • The major landforms that dominate the area: deltaic plain, alluvial terrace and hilly to rigged terrain.
Terrestrial Flora	• Overall, the diversity within the project site was considered low. • The vegetation within the proposed Ore Yards 5, 6 & 7 is generally considered as secondary forest. • The proposed new berth facility area is generally open with only about seven (7) trees. • The tree inventory revealed a total of 2,272 individuals belonging to 28 species from 14 families. In terms of frequency, the most abundant was alim (*Melanolepis multiglandulosa*) with 783 counts. The estimated stand volume is 3,454.10 m^3. • The generated overall Shannon-Weiner (*H'*) diversity value of 2.03 was computed (Fernando Classification, 1998), and is considered low. • There were 22 indigenous species recorded in the area. • In terms of importance value, antipolo (*Artocarpus blancoi)* was the most ecologically important species within the proposed ore yards.
Terrestrial Fauna	• The total number of wildlife recorded is 71 constituting one (1) species of amphibian, 56 avian fauna, five (5) mammals, and nine (9) species of reptiles, including bird species observed outside the transects but within or adjacent to the study area. • Low species count in the area can be attributed to the existence of a gravel road used by locals and nearby industries. • Notable species of bird observed in the area are the Philippine Duck and Wandering Whistling Duck that were observed in the marshy area on the other side of the PSC fence, protected by the adjoining STEAG. • The total number of mammalian fauna recorded is five (5), belonging to

Module	Description
	two (2) families constituting five (5) genera. The number of Volant mammals observed consisted of only four (4) species of fruit bat – the rousette fruit bat, greater musky fruit bat (most abundant), short nosed fruit and the lesser musky fruit bat. • Only one (1) species of frogs/toads were noted. The number of reptilian species documented during the survey is only nine (9). • The diversity value (H') of all the transects ranges from 2.42 to 2.68. Low values of dominance index among the transects illustrate improved diverseness along transect sites. • Out of the 71 species of wildlife recorded, about 23% of the wildlife species are endemic to the Philippines, most of which are species of birds. • All the species recorded indicated IUCN conservation status of least concern except fr the Philippine Duck, Philippine Collared Dove, and Philippine Sailfin Lizard, which have vulnerable status.
Hydrology	• Four drainage systems flow in the vicinity of the project site in a dendritic patterns and discharge at Macalajar Bay – Taganga Creek, Tagbalitang Creek, Pugaan River and Tagoloan River. • With a catchment area covering 168,843 has, the Tagoloan River constitutes the largest river system in the vicinity. • A total of 12 wells were identified. PSC owns Wells 1 to 6, which are located within their premises. • The water-bearing formations in the areas consist of the highly permeable sand and gravel layers within the Quarternary Alluvium and Cagayan Terrace Gravel. These are prolific aquifers capable of producing more than 40 L/s water. • The groundwater level in the deltaic plain, coastal plain and flood plain is generally shallow. The well inventory shows static water levels of less than 10 mbgs, which is substantiated by the shallow depths of the wells.
Physical Oceanography	• The model runs revealed that the general trend is that the depth-averaged currents inside the Bay splits into two (2) directions in the areas near the mouth of Tagoloan River. A greater portion of water movement flows southwards following the coastal configuration towards the innermost portion of the Bay then continued along the coasts of Cagayan de Oro, into the area of Laguindingan and back into the open area of Bohol Sea. • Point sources of tracers were continuously released in the coastal vicinity of the proposed jetty port of the project with a discharge rate of 1,000 m^3 per hour with concentrations of 10,000mg/L for a one-month period (for both summer and wet season scenarios). • For the *amihan* wind conditions, the model predicts that the tracer plume propagates in an elliptical pattern with its major axis directing towards the northeast and southwest of the release point. • The spreading of low-concentrated tracer plumes is mainly directed towards the northeastern coastal area of the project.
Water Quality	• The results show that none of the heavy metals were detectable in the effluents released to the bay. • Organic pollutants represented by BOD and COD were within the guide values, with the latter only showing a range of 9 to 25mg/L. • The TSS were below the guide value of 100mg/L, ranging only from 3 to 8mg/L. • Benzene, toluene, and xylene (BTEX), and cyanide were not detected in the effluents. • Overall, PSC's monitoring results show that pollutant parameters which were monitored from January 2017 to March 2021 did not exceed the guideline values for discharge into Class SC water as provided by DAO

Module	Description
	2016-08. • For marine water quality, the results indicate that none of the heavy metals analyzed were present in the samples. All other parameters were within the Class SC guide values with exception of fecal coliform which were found to be above 200 MPN/100 ml in most of the stations. • For groundwater quality, presence of heavy metals such as Pb, As, and Hg were not detected. All other parameters such as pH, fecal coliform, TSS, and O&G were within the standards.
Marine Ecology	• Total coral cover of MW1 is at 55.24% dominated by massive lifeforms. • The pillar recruits mostly the massive *Porites* but is also covered almost entirely of algal assemblage and other invertebrates. Although sparse, the recruitment of corals on the pillar indicates presence of viable reproducing coral colonies. • Algal assemblage and abiotic factors occur at the same rate from MW3 with only 24.66% coral cover. • Much of the reef is covered with sediment covered algal assemblage indicating the site is impacted anthropologically. • MW1 has the highest number of fish species among the sites having 36 species in 14 families. • From all sites, there is a limited occurrence of commercially important or target species. These are three (3) species of Scaridae (parrotfish) and a species of Siganidae (rabbitfish). • The Villanueva municipal waters has a reported fish catch of 7.3 tons in 2021. The level went down from 7.5 tons in 2020 and 8.5 tons in 2019. • Looc MPA is the only declared protected area in the municipal waters. • The total abundance of plankton ranges from 80,000 to more than 140,000 cells per liter with about 90% of the abundance being due to Chaetoceros.
Meteorology	• Based on PAGASA Lumbia Airport monitoring station, the project site received the greatest amount of rainfall in the months of June of October with about 200mm of rainfall per month. • The normal temperature at the project site ranges from about 21ºC to 33 ºC. • The normal wind speed at the site is 1 to 4 mps 99% of the time. Wind at the project site comes from the South 45.5% of the time at speed range of 1 to 4 m/s and from the north 30.3% of the time at wind speed range of 1 to 4 m/s. • In the average, the province of Misamis Oriental experiences only one cyclone per annum.
Air Quality and Noise	• All results are within the CAA standards for both one-hour and 24-hour averaging time for TSP and PM_{10}. • For 1-hr sampling NO_2 is present in relatively low concentrations while SO_2 was almost undetected with <0.29 µg/Ncm in all stations except for AQ1 during the second sampling while for 24-hour averaging time, SO_2 concentrations in AQ1, AQ2, and AQ3 range from 2 to 5 µg/ncm. • Most of the heavy metals were not detected to very low values. The concentration of Pb was detected ranging from 0.08 to 0.12ug/ncm, As from <0.09 to 0.07ug/ncm, Cr^{+6} from <0.1 to 0.04ug/ncm, Cd from <0.02 to 0.20ug/ncm, and Hg from <0.01 to 0.004ug/ncm. • For noise, AQ1 and AQ5 have exceeded the maximum allowable noise levels for Class A areas in all time periods. While the dominant noise sources are pedestrians and passing vehicles which are common to all stations, AQ1 and AQ5 are identified to be particularly areas with high activities (e.g., construction and Zumba activities in AQ1 during the monitoring period. AQ2, AQ3, and AQ4 are within the allowed daytime levels.

Module	Description
	• Based on the monitoring data of PSC, monitored criteria pollutants and heavy metals are within the prescribed standards for ambient air quality. • For the monitored Heavy metals (Cu, Cr^{6+}, Ni, Pb, Zn, Fe, and Cd), mostly undetected with the exception of some heavy metals. Cu was detected in 3Q-2016 at the station near the ore yard. Zn was detected in both perimeter boundary and residential monitoring stations during 3Q-2019 and 1Q-2020. Fe was also detected 1Q and 3Q-2016 and 1Q-2020 while Cd was detected 3Q-2019. • For the monitored noise level, the last five (5) years shows that the noise levels at the perimeter is below the maximum allowed levels.
People	*Municipality of Villanueva* • In a population projection made by the PSA 2015 data, the population of Villanueva will increase to 45,109 by the year 2025. • The Municipality has a 58.84% working population. • Water in the municipality was sourced by the households from their own use faucet community water system (46%) and standard faucet community water system (34%). • The predominant causes of morbidity were bites followed by wounds and acute respiratory infection. The other causes of morbidity were hypertension, cystitis, boils urinary tract infection, impetigo, and tuberculosis. • In 2020, the most common cause of death in the Municipality was the undetermined natural death. Other documented cases are cardiovascular disease, chronic hypertensive vascular disease, and hypertensive vascular disease. • About 97% of the households were served with safe water based on the 2020 data of the RHU every household has access to sanitary toilets. • The crime incidence of Villanueva has gone down from 2013-2017. • The creation of the Phividec Industrial Estate paved the way for allocating almost one third of the land areas of Barangay Tambobong, Balacanas, San Martin, Dayawan and Katipunan for the establishment of industries and businesses. • The LGU operates a Level III local waterworks system which has a total of 3,088 connections with 97% of these as domestic consumers, 2% as commercial and less than 1% as individual users. *Barangay Katipunan* • The IRA of Brgy. Katipunan exhibited an increasing trend in the years 2017. In 2017, the IRA which was reported to be PhP3,676,000 increased to PhP5,959,368 within a five-year period in 2021. • The 2021 profile showed that there are about 1,883 households in the area with 2,586 families. • The major means of transportation in the barangay are through public utility jeepneys, motorized “sikad” and motorcycle. • The common causes of mortality in the barangay include cardio respiratory arrest, chronic obstructive pulmonary disease (COPD), diabetes mellitus, and accidents. *Barangay San Martin* • The IRA for 2021 is P6,988,000 while the share they get from real property taxes is PhP1.4M. • The population in 2021 is 5,568. • About 1,565 families are being served by the Cagayan Electric Power and Light Company, Inc (CEPALCO). • The leading causes of morbidity in 2021 include fever, cough, colds and skin lesions among others. • The leading causes of death include acute cardio-respiratory arrest, COPD, and diabetes.

Module	Description
	Barangay Poblacion I • Based on the 2020 profile, the barangay's population was 3,750. • About 3% of the population were recipients of 4Ps; 6% belonged to senior citizen, and 2% were classified as PWD. • The means of transportation used by the barangay include jeepney, motorcycle, bus and Bajaj or the three-wheel motorcycle. Result of the Perception Survey • Majority of the respondents from Poblacion 1 (55.56%) and Katipunan (59.46%) were identified as the household heads. • About 68% of the respondents are female. • Sixty-two percent of the respondents belonged to 35-59 years old and are mostly married. • Thirteen percent of the respondents were able to graduate from college. • About 98% of the interviews were Higaonon. • Income source was highest in Brgy. Poblacion I (83.33%). • Majority (16%) reported that they get income from being employed in the barangay or government offices, 10% from businesses, 8% from being employed as professionals. • The monthly income ranges from P7,251 to 10,000 for the majority of the respondents. • The highest expense was for food of more than PhP10,000 (5% of the respondents) and P3,0001-5,000 (for 35% of the respondents). • About 51% of the respondents abstracted water from their faucets connected from the local government supply while 9% fetched water from community faucets. • About 85% reported that they were connected to a power source while 15% was not. • Approximately 67% from Poblacion 1, 9% in San Martin , and 11% in Katipunan have flush type toilets. • Ninety-two percent stated that they owned their houses. • About 59% of the respondents stated that the lack of job opportunities in their locality was a concern they faced while 19% mentioned that they did not encounter problems in their barangays. • Majority if the respondents highlighted the good governance of the leaders in their respective communities most especially for San Martin (51.11%) and Katipunan (75.68%). • About 78% of the women in the three (3) barangays were into selling or vending consumer items, 8% from sewing or dress-making, while 5% were employed, and 0.9% in farming activities. • Lack of income opportunities is one of the issues of women in the community. About 52% did not experience any issue or concern. • The possible activities for women as stated during the survey include participation in livelihood programs (43%) while 36% mentioned provision of community service. • The most common causes of mortality in the past five (5) years include hypertension, heart attack, and diabetes. • Majority of the respondents had their waste collected by garbage trucks of the LGU unit. The method of disposal includes burying the trash in the soil (3%), piled or composted (1%) and burned (4%). Segregation is being practiced by 96% of the respondents. • Majority of the respondents mentioned that there were no observed changes in the environment in the last five (5) years. • The changes which have been observed on water resources focused on poor water quality, low water pressure and occurrence of floods; on air,

Module	Description
	foul smelling atmosphere, skin allergies, illnesses and warm air temperature. • About 44% of the respondents from Poblacion 1 felt contentment with the current attributes of the environment. • Majority of the respondents (91%) were aware about PSC.

3.2 Summary of Alternatives

Table ES6 shows the summary of the of project alternatives.

Table ES6. Project alternatives of the proposed PSC Expansion Project

Aspect	Standard Criteria	Options Considered	Assessment
Siting	• Location • Availability • Land use • Susceptibility to natural occurrences	The proposed project shall be situated within Phividec Industrial Estate in the Municipality of Villanueva, Province of Misamis Oriental. No other alternative site in Mindanao was chosen.	In spite of the on-going pandemic, the demand on sintered ore is still coping with the requirements of economic development. The existing PSC plant within Phividec is considered superior in terms of location as documented by in the JFE Technical Report[1]. The following salient features of the site are: a) Location on shipping routes to Japan for overseas iron ore resources, contributing to excellent transportation efficiency. b) Deep water port, enabling reduction of freight costs by use of large ships. c) Mild weather year-round, with virtually no typhoons or other bad weather conditions. d) Availability of sub-raw materials (limestone, dolomite) from nearby islands. e) Relationship of trust based on long history with the Philippine government. The current location of PSC is located within an economic zone and have no issues in terms of land ownership or compatibility on the use of land. The project area is predicted to be moderately vulnerable to storm surges and high water levels especially since the Bay is exposed and with large wind fetch due to the large surface area of Bohol sea. The project site is however

[1] *JFE Technical Report 2009*

Aspect	Standard Criteria	Options Considered	Assessment
			far from areas with moderate to steep slopes and is therefore not under the threat of landslides. The project site may experience respective peak acceleration amplitudes of about 0.35g, 0.25g and 0.20g in soft soil, medium soil and rock conditions. This indicates that slight to moderate ground motion may be expected in the area in the event of an earthquake with magnitude greater than 5.0. <u>People</u> Based on the FGDs and KIIs conducted, majority of the respondents perceived that the proposed project will not cause any harm to the communities and its immediate environment. Moreover, they also perceived the need for additional opportunities for the locals including manpower and social projects.
Project type, components, and size	• Applicability • Process • Safety	Blending operation as it is independent from the sinter operation shall produce approximately 9MTPY. <u>Blending yard</u> The ore blending will be set-up in four (4) yards, three (3) of which are located right beside the existing yard of PSC. All the necessary measures to ensure safety of workers will be administered. Using computerized system of process monitoring and period maintenance, efficiency and agile response to any mechanical errors will be addressed thus accident and mechanical failure will be avoided. <u>New berth facility</u> The existing pier yard will be utilized for the development of the new berth facility. PSC will not construct a new pier area as there is still space to accommodate the new berth.	The proposed project is entirely the development of the ore yard which will only use conveyor systems and its auxillary facilities from the port area, establishment of a new berth facility which will just perk up the capacity of the existing berth operation as well as the improvement of the existing berth for the same purpose. In general, the establishment of the ore blending facility and new berth shall augment the efficiency of the entire operation of PSC.
Process/ Technology		PSC considers the conventional use of conveyor, stacker, and reclaimer. The process from the unloading of raw materials to the yard will be supported mechanically by these equipment. To ensure that fugitive dust will be suppressed in the entire process, a fully-covered conveyor system will be installed.	PSC invests on technological advancement leading to constant efficiency of plant operation. The need to acknowledge and adopt an advanced technological system guarantees high quality output. Since the proposed expansion

Aspect	Standard Criteria	Options Considered	Assessment
		PSC will use a Distributed Control System (DCS) for monitoring and controlling weight in Weighers along the BC line. On the other hand, Programmable Logic Controller (PLC) will be utilized for sequential running of motors to drive conveyors. The stacker, reclaimers, unloader and shiploader will have its own in dependent PLC system. The existing radar system of PSC will be utilized to monitor vessel movements not only the Main Berth but also the new berth. PSC maintains a Holding Station (Material Recovery Facility or MRF) used as temporary storage area for recyclable solid waste and a hazardous solid waste storage/disposal area. Hazardous wastes are temporarily stored for treatment by an EMB-accredited treater. Thus, the technical life of the temporary waste disposal facility, which is essentially for asbestos and mercury bulbs only, is approximately 25 years.	includes only the construction of a new additional berth, improvement of the existing berth, and development of the ore yard facility, discharges of chemical wastes will be mainly generated from the motorpool during the construction and offices during the operations phase. These are mainly asbestos and mercury bulb. Thus, regular waste collection and treatment shall address its proper disposal. <u>Hazardous wastes</u> The following are expected to be generated during the operation of the entire facility: Busted fluorescent lamp tubes, empty paint cans, lead-acid-batteries of vehicles, waste Oil generated during change oil of motorcycles, heavy equipment and service vehicles, and empty vulcanizing material during belt installation. <u>Electronic wastes</u> Empty cartridge of printer ink used at office and batteries used in cameras are the major electronic wastes in the operation.
Supply of raw materials	• Source	The materials will be imported from Brazil, Canada, India, and Australia. PSC is still open to source from other countries such as the Ukraine. The Company is also searching for new source of raw materials but still with uncertainty.	These countries are long time source of raw materials for PSC and will continue to supply the Company as it provides the specifications required by the plant. PSC may consider future options depending on the economy and quality of materials, among others. Due to the very specific requirements of PSC on the raw materials, careful selection must be done to ensure that the same good quality of ore will be produced.
Source of power	• Availability • Total power requirement • Source	PSC generates part of its power requirement mainly through its Sinter Heat Recovery Facility and supplemented by its diesel and dual-fuel generators. The remaining requirement is sourced from power utility company CEPALCO (Cagayan Electric Power and Light Company). For this expansion project, a total of 1,400 kW/day of power will be consumed during the operation. During the construction phase, about 1,594,000 kW of electricity will be utilized.	The existing local supplier is capable of supplying the required power of the new facilities using its current load. Issue on power interruption even at PSC's full operation is not seen to occur.

Aspect	Standard Criteria	Options Considered	Assessment
Water management system	• Availability • Total water requirement • Source	PSC has three (3) functional deep wells within the plant. DW4 and DW6 are used for general plant operation while DW3 is only used during sintered ore loading operation. For this expansion project, the sources of water will only be Deep wells No. 4 and 6. The proposed project will entail a total of 17,220 m^3 of water per month enough to be utilized for general cleaning works, dust control, and equipment cooling. Currently, PSC has the following pollution control facilities: • Main gas handling equipment • Room dedusting equipment • 1 unit of Electrostatic Precipitator (39,000 m^3/min) Lurgi Type • 1 unit of Electrostatic Precipitator (18,000 m^3/min) Lurgi Type • Drainage System • Pavement under belt conveyor • Pavement around sinter area • Unloader water spray system • Belt conveyor cover, chute • Main blower silencer • Ignition fan silencer • Water circulating system • Waste Disposal Facility • Hazardous waste storage/disposal area To maximize and ensure that the proposed ore blending and new berth project will cause no significant impacts to the people and environment, a conveyor system shall be installed from the ore blending yard to the berth facility. The main conveyor system will be covered to prevent fugitive dust. PSC will allocate about PhP21.9M for the installation of belt covers to ensure further environmental protection.	Deep wells 4 and 6 will be able to provide the needed water of the additional facility from construction to operation phase. As minimal usage for general maintenance of the ground and equipment, including domestic use, the existing water source will be adequate. Moreover, issue on water competition may be one of the concerns that may be raised by the surrounding communities, which need to be addressed by PSC by ensuring that adequate supply of water will be available in the impact areas even at plant's full operation. Careful study on water availability including discharges must be implemented.
Manpower	• Method of hiring • Available positions	During the operation period, the additional workers for the ore blending and new berth facilities will be hired directly by the Company while others will be engaged thru a manpower agency. There will be a total of 22,476 man-months for various workers consisting of mechanical, electrical and civil workers during the construction period. During the operations phase, additional positions such as administrative, maintenance, and engineering,	One of the most pressing issues in any kind of development is the need for manpower and benefits of the local community from the project in terms of employment. Especially during the construction period, both skilled and non-skilled workers will be needed, PSC must ensure that local dwellers who are qualified to do the job will be properly screened and accepted to do the job. The use of a manpower agency as also considered by the Company must be a venue

Aspect	Standard Criteria	Options Considered	Assessment
		among others will be opened to qualified individuals giving priority to local dwellers.	to guarantee that workers from other areas will be the least priority.

No Project Option

Without the proposed project, PSC will continue with its current operation but with limited capacity and bound to lose the opportunity to improve its competitiveness against domestic sinter plants in Japan resulting to decline of its business operation and activities here in Philippines.

3.3 Summary of Impacts and Mitigation

The potential impacts of the projects and the corresponding mitigating measures based on the result of analysis are presented in *Chapter 2* of this EPRMP report. The proposed mitigating measures were integrated into an Impacts Management Plan (IMP) presented in *Chapter 3* as **Table 3.2.1** as well as the findings on residual impacts, defined as impacts that remain after the proposed mitigation measures are implemented is presented as **Table 3.2.2**. An Environmental Monitoring Plan (EMoP) was formulated and presented in Chapter 6 as **Table 6.1.8.** The Project Environmental Monitoring and Audit Prioritization Scheme (PEMAPS) Questionnaire is included as **Annex ES6**. **Table ES7** depicts the impact management plan of PSC.

3.4 Summary of Risks and Uncertainties

The operation of PSC including the proposed expansion, ore blend facility and new berth facility is not expected to cause significant risk to land, air, water and surrounding communities. In fact, the proposed expansion is an enhancement of the existing amenities of PSC to maximize its operations and improve the condition of the berth facilities that will accommodate maximum high volume efficiency for raw materials to the site and delivery of products to other countries.

In terms of geological characteristics, the great distances between the project site and the active volcanoes – Mount Hibok-hibok in the Province of Camiguin (67 to 120km), only the ashfall hazard is discussed herein. At these distances, it is judged that the proposed project site would be within the **low risk zone** when the ash column, in case of violent eruptions, is about 10,000 meters high, in which case the zone may receive less than 1 centimeter thick of ashfall. The thickness of the ashfall over the proposed project site, however, would be dependent on the prevailing wind direction or regional wind circulation pattern at the time of eruption, the height of ash column, as well as the duration of violent eruption.

Records show that Zones 1 to 4 of Katipunan are most likely situated near the river channel northeast and east of PSC compound where Moderate-, High- and Very High flood susceptibility potentials based on the detailed landslide and flood hazards map of Villanueva (MGB 2015). Moreover, the same reference reflected that PSC Compound is generally classified with low landslide susceptibility and is far from areas with moderate to steep slopes therefore low chances of flooding is expected to occur within the complex.

Emission of particulate matter is expected due to loading/unloading of raw materials and sintered products during the operation phase due to fugitive dust emission from the conveyor belt. However, proper mitigating measures including regular spraying in the area, arc roofing of the conveyor system and maintenance of green corridors in the area will help suppress dust.

Table ES7. Impact management plan of PSC

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
Pre-construction							
• Application of permits/licenses/ clearances from LGUs and national government agencies	PEOPLE	• Continuing partnership and coordination with host barangays and LGU of Villanueva	• PSC shall continue its IEC efforts and inform/ update respective the barangay councils of the host barangays and the LGU of Villanueva regarding the project and requirements for permits and/or clearances.	100% compliance to local and national requirements	ComRel PSC HRGA ComRel	Part of the permit application cost	IEC Plan
• Site clearing of the proposed ore blend yard area including leveling and surveying • /Site preparation for new berth facility area	PEOPLE	• Safety of the workers/staff within the premises of PSC	• Fences shall be installed around the perimeter of the project area. • Notice should be placed to inform about the workers/staff on the dangers of falling debris. • Security guards shall be stationed at the entry/exit to prevent unauthorized people from entering the construction site.	100% compliance to PSC's existing Safety Management Protocol – zero LTA and Fatal Accident	PSC Safety	Part of the construction cost	Construction Agreement
Construction							
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system	LAND	• Removal of vegetation cover *-a total of 2,421 trees is expected to be felled* • Change in habitat	• A 100% tree inventory within the developable areas was already conducted and PSC will secure tree cutting permit for the trees that will be felled. • PSC shall replace a maximum total of 242,100 seedlings in compliance to the provision of DENR DMO 2012-02 that a total of 100 seedlings shall be replaced for every naturally grown tree that is felled. • Seedlings will be planted along the remaining open areas within the PSC and along reforestation areas in agreement with DENR's National Greening Program. • Restocking and supplementary planting of endemic trees along existing green belts and corridors of PSC. • Earthballing and transplanting of Narra trees observed at the proposed ore blending area. • Collaboration with other Phividec locators such as STEAG for the continued protection of adjoining forested areas and marsh habitats to serve as refuge for displaced wildlife.	100% compliance to PD 705 and tree cutting permit conditions	PSC Laboratory & Envi Dept PCO	Part of the construction cost	• Include in TOR of contractor • Tree cutting permit • MOA by and between PSC, PHIVIDEC, Province of Misamis Oriental, Villanueva LGU and DENR Region X, PENRO and CENRO and other stakeholders including adjoining municipalities for participation in NGP
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system (*Continuation…*)	LAND	• Loss of topsoil and occurrence of soil erosion • Soil compaction	• Preferential scheduling of clearing and excavations works during the drier months (Low rainfall in Type IV areas is during the months of March to May). • Maximize cut-and-fill method of site preparation and road construction. Minimal topsoil spoils will be generated since excavation will be limited to structural foundations mainly isolated footings. • Spoils shall be hauled to designated run-off- controlled temporary spoil holding/storage area located North northwest of the proposed ore blending facility (N8°34'32.06", E124°45'32.77") with an approximate area of 6,000 m^2. • Immediate re-vegetation of exposed areas, which will not be utilized in subsequent development. • Establishment of appropriate erosion control measure such as concreting or use of gabions specifically along the drainage channel (approximately 1,250m in length with a width of 3m and a depth of 2 meters) southwest of the proposed ore blending yard. • Limiting the spoil height to 5m and covering the spoils with sacoline or tarpaulin especially during rainy months (June to September in Type IV areas).	100% compliance to the EMP	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in the TOR of the contractor • Topsoil storage and management plan • SMR
• Site clearing and leveling including removal of	LAND	• Loss of topsoil and occurrence of soil erosion	• Utilization of dredged materials from the new berth for backfilling and leveling of the ore blending yard.	100% compliance to the EMP	• PSC Lab & Envi Dept • PCO	Part of the construction	• Include in the TOR of the contractor

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system (*Continuation…*)		• Soil compaction			• PSC Planning Department • Contractor	cost	• Topsoil storage and management plan • SMR
		• Generation of construction debris	• Construction spoils such as waste concrete/mortar will be brought to the 6,000 m^2 temporary spoil holding/storage area (N8°34'32.06", E124°45'32.77"). • PSC shall look for contractors/entities willing to accommodate the debris for backfilling purposes or other end use. • Woodwastes materials, waste rubber and plastic scraps shall be brought to the existing 40m^2 PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • The sorting facility shall classify the waste materials for recycling or for proper disposal. • Scrap metals shall be brought to the existing 4,600 m^2 PSC scrapyard (N8°34'24.93", E124°46'5.14") for temporary storage • PSC shall look for third-party scrapyard to broker scrap metals for recycling.	100% compliance to the EMP	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in the TOR of the contractor • Construction debris management plan • SMR
		• Solid waste generation	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the new project/work area similar to the waste segregated bins set in the existing area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73") (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the solid waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP and integrated manual in compliance to RA 9003	• PSC Lab & Envi Dept • PCO	Part of the construction cost	• PSC Integrated Manual EMP-07 (IM-APX-003-07)
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system (*Continuation…*)	LAND	• Generation of hazardous wastes – busted bulbs – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – lead and lead compounds (vehicle batteries, spent battery packs) – assorted compounds (dry battery cell) – welding butts – pathogenic wastes	• Set-up of additional hazwaste container bins in identified areas where hazwaste generation is likely to occur such as the temporary facility of contractors. • Regular collection of hazardous waste generated during construction to be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01") (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the hazardous waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP and integrated manual in compliance to RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-03 (IM-APX-003-03) • Hazardous Wastes Management, Treatment and Disposal Program • Hazwaste Generator ID • Hazwaste Treater and EMB Certificate of Treatment including Hazwaste Transport Permit
	WATER	• Increase in surface run-off and silt deposition	• Construction of a 1.6 hectares (4-chambered) new south settling pond (N8°34'28.68", E124°45'29.71") with an approximate water holding capacity of 66.58m^3 prior to the start of site grading and leveling of the area intended for the ore blending yard. • Improvement of southern drainage channel (approximately	100% compliance to PSCs EMP in compliance to RA 9275	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in TOR of contractor • PSC Run-off Water and drainage Mgmt. Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			1,250 meters in length with a width of 3m and a depth of 2m) and run-off canals within the periphery of the construction area for ore blending area (Yard 5,6&7). • Construction of a new drainage channel (approximately 900 min length with a width of 3m and a depth of 2m) in the northern side to collect run-off emanating from the proposed Yard 8. • The southern drainage channel will eventually be connected by PSC to the proposed new south settling pond as the existing south settling pond will be condemned once ore blending yard is established while the new northern drainage channel will be connected to the existing northern settling pond (N8°34'41.10", E124°45'51.01"). • Establishment of peripheral berm within the ore yard to prevent run-off from directly discharging to the nearest discharge channel. • Construction of slightly slope ore blending yard with the inclination towards the center to collect run-off allowing the flow towards southeast first to the drainage channel to give ample time for the run-off laden with soil and ore particles to settle and diverted to a sump pit (N8°34'3.49", E124°45'53.44") thereby collecting silt materials and particles thereby before meandering the drainage channel. • In the northern drainage channel, sump pit will be established prior to confluence with the 1st chamber of the northern settling pond (N8°34'34.82", E124°45'59.01"). • PSC is encouraged to consider construction of additional collector sumps or silt fences especially during the construction phase of the ore blending yards. • Secure the necessary discharge permit for the development of the new south settling pond.				
	WATER	• Water Pollution	• New workers, laborers and contractors shall be oriented on PSC's existing wastewater management program (EMP 04 (IM-APX-003-04). • Set-up of three (3) portalets for the contractors and laborers temporary facility near the construction area for the ore blending yards and conveyor system • For sanitary purposes, civil contractors shall be tasked to maintain cleanliness and ensure that accumulated wastewater shall be collected and treated before it reaches full capacity. • Wastewater that will be generated from the said portalets will be hauled and treated by a third party pozo negro siphoning service provider. • The service provider will be monitored as to the treatment and disposal and will be compelled to follow PSC Wastewater Mgmt Plan Protocol. • PSC also has several existing toilets connected to septic tanks that were located the vicinity. The said toilets can be utilized by workers and employees involved in the construction. • Aquatic plants and reeds were allowed to grow in the existing northern settling pond to facilitate phytoremediation. This practice shall also be introduced in the new southern settling pond once established. • The existing material handling area has two (2) existing oil and water separator with a total holding capacity of 5.88m^3 sufficient to trap oil that may spill near the construction area. • PSC also has an installed oil and water separator with a	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			total holding capacity of 4.52m^3 at the Motorpool Facility in Material Handling Dept. where PMS and repair for vehicles is done. The facility shall also be utilized during the construction of the ore yard and conveyor system. • Oil and water separators are regularly monitored and maintained by PSC to ensure its effectivity and functionality. • PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of soil. • PSC also practices lining of limestone and HDPE in the final discharge of the northern settling pond and this shall also be implemented in the new southern settling pond. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented during the construction of the ore blending yard and conveyor system. • PSC also has procured universal spill kits and sorbents such as polypropelene as well as oil containment boom that can be utilized for any untoward oil spillage.				
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system • (*Continuation…*)	AIR	• Dust Generation	• Regulation of vehicle speed to 40km/hr within the construction areas. • Strict implementation of tarpaulin covering for delivery and haul trucks within and outside the construction area. • Wind barriers or covering of tarpaulin or sacoline materials shall be installed over excavated and dredged spoils. • Sprinkling of water along exposed areas especially during dry seasons. • PSC has two (2) water trucks to perform this activity with a capacity of 5.5kL per water truck. Water spraying activity will be done once in the early morning and once in the mid-afternoon. During drier days, additional spraying can be done before noon. The expected water requirement for the activity is 22,000 to a maximum of 33,000L per day. • The deepwell pumps of PSC have a capacity of 176,000L per day. PSC however has an option to utilize the impounded water at the settling ponds to lessen abstraction of water from their deepwell.	100% compliance to PSCs EMP in accordance with RA 8749	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-01 (IM-APX-003-01), EMP-01A (IM-APX-003-01A), EMP-02 (IM-APX-003-02) • Include in TOR of contractor
	AIR	• Increase in gaseous emission	• Regular maintenance of vehicles and construction equipment. • Designating a PSC envi staff and security guards to monitor and record heavy equipment during construction for smoke belchers • Identified smoke belchers shall be brought to the Motorpool Maintenance Facility for immediate overhaul of vehicles and heavy equipment. • Conduct of periodical smoke emission testing for vehicles and construction equipment. • Orientation of new employees and contractors regarding air quality management program included in EMP 01A (IM-APX-003-1A). • PSC shall require contractor that vehicles and heavy equipment that will be used on site are Euro 4 or Euro 5 compliant machine.	100% compliance to PSCs EMP in accordance with RA 8749	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-01 (IM-APX-003-01), EMP-01A (IM-APX-003-01A), EMP-02 (IM-APX-003-02) • SMR • EMB Permit to Operate • Include in TOR of contractor
		• Increase in noise level	• Maintain equipment deployment schedule. • Regular maintenance of vehicles and construction equipment. • Use of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the warehouse for all vehicles emitting severe noise.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • Include in TOR of contractor

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			• Orientation of new employees and contractors regarding noise management program included in EMP 08 (IM-APX-003-08).				
• Pile driving and dredging at the new berth facility • Construction of new berth • Installation of material handling equipment • Installation of rubber dock fenders, bollards, signages etc	LAND	• Generation of solid waste, dredged materials and hazardous wastes – busted bulbs – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the new berth construction area similar to the waste segregated bins set in the existing area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the solid waste and hazardous waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID • Phil Coast Guard approved Oil Spill Contingency Plan
	WATER	• Wastewater generation	• New workers, laborers and contractors shall be oriented on PSC's existing wastewater management program (EMP 04 (IM-APX-003-04). • Set-up of one (1) portalet for the contractors and laborers temporary facility near the construction area for the new berth. • For sanitary purposes, civil contractors shall be tasked to maintain cleanliness and ensure that accumulated wastewater shall be collected and treated before it reaches full capacity. • Wastewater that will be generated from the said portalet will be hauled and treated by a third party pozo negro siphoning service provider including the three (3) portalets at the construction area for the ore blending facility. • The service provider will be monitored as to the treatment and disposal and will be compelled to follow PSC Wastewater Mgmt Plan Protocol (PSC EMP-04 (IM-APX-003-04). • PSC also has existing toilets connected to septic tanks that were located near the existing berth and BBASI Office. The said toilets can be utilized by workers and employees involved in the construction.	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan
	WATER	Marine Ecology • Marine habitat disturbance • Increased turbidity of adjacent marine waters due to possible deposition of debris and silt from construction • Dredging activities stir up fine sediment which increases turbidity. This reduces light penetration which in turn reduces photosynthetic rates lowering DO concentration in the water column • Resuspension of heavy	• Proper delineation of construction boundaries for the new berth ensures that construction shall be confined to that area alone and will not damage the adjoining marine habitat. • PSC shall use silt or turbidity curtains to contain water suspended silt within the dredging/piling area. • The silt curtain can be made of vinyl barrier with float above and chain ballast below and shall be anchored in the benthic zone or the marine bottom. • Dredging shall be done in two phases enclosing it in a 300 to 400-m silt curtain (perimeter), the said protective measure will be transferred to the second phase once piling and dredging is done in the first phase. • Dredged materials shall be brought to a temporary spoil holding/storage area (N8°34'32.06", E124°45'32.77"). approximately 450m southwest of the proposed new berth	100% compliance to PSCs EMP in compliance to RA 9275	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Silt Curtain Deployment Plan • PCG approved Oil Spill Contingency Plan • PSC Silt and Dredged Materials Management Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
		metals and other persistent pollutants trapped in sediments; may also result to algal blooms as a result of nutrient release due to silt suspension.	• Monitoring of turbidity outside the dredging area using Secchi disk to check the effectiveness of silt curtain. • PSC shall also consider establishing a temporary settling pond (N8°34'40.77", E124°45'40.48") to pump out and collect settled silts in case of heavy turbidity. This will ensure that re-suspended silt, heavy metals and persistent pollutant are arrested and transferred to the storage area. • Mitigation measures to minimize siltation (cited above) will also reduce the impact on dissolved oxygen. Wave action also naturally increases the DO in the marine water. • Since the silt curtain has an installed float/pontoon above the water and enclosing the whole dredging/piling area, the float can effectively contain oil slick and sheen from accidental spillage and prevent it from spreading into adjoining areas. • A staff from the PSC Laboratory & Envi Dept shall be tasked to monitor the environmental condition within and adjacent to the dredging/piling area. • PSC already have universal spill kits, oil recovery equipment and sorbent dispersants that they can immediately use in case of oil spillage. • PSC is on the process of securing an approval from the Philippine Coast Guard (PCG) for their Oil Spill Contingency Plan. • PSC shall limit activities on pillar thrusting to daytime to allow settlement of organisms within the adjacent area. This will also build behavioral response among mobile species to seek refuge in the area at night and move out during the day.				
	AIR	• Increase in gaseous emissions	• New workers, laborers and contractors shall be oriented on PSC's existing air quality management program (EMP 01A (IM-APX-003-01A). • Regular maintenance of tug boats, vehicles and construction equipment. • Prior to deployment of dredger and pile driving machine, PSC will inspect the pile driving machine and will secure certificate of assurance from the contractor that the machine is in good working condition. • Maintain equipment deployment schedule. • Proper operation of pile driving machine, dredger, tugboat and heavy equipment/vehicle. • PSC shall require contractor that vehicles and heavy equipment that will be used on site are Euro 4 or Euro 5 compliant machine.	100% compliance to PSCs EMP in accordance with RA 8749	• PSC Lab & Envi Dept • PCO • PSC Material Handling • PSC Mechanical Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-01 (IM-APX-003-01), EMP-01A (IM-APX-003-01A), EMP-02 (IM-APX-003-02) • SMR • EMB Permit to Operate • Include in TOR of contractor
		• Increase in noise level	• Maintain equipment deployment schedule. • Regular maintenance of vehicles and construction equipment. • Use of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the mechanical repair shop for all vehicles emitting severe noise. • Orientation of new employees and contractors regarding noise management program included in EMP 08 (IM-APX-003-08).	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Mechanical Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of contractor
	PEOPLE	• Occupational awareness	• Promote training/Orientation of new employees, laborers and contractors.	100% compliance to PSCs OHS	• PSC Safety Office	Part of the construction cost	• Include in TOR of contractor • PSC OHS Manual
		• Occupational risk	• Posting of safety warning and danger signs in strategic locations within the construction site.				
		• Health Risk in relation to	• Regular testing of workers from Covid-19.	100% compliance	• PSC Safety Office, Security and	Part of the	• Include in TOR of

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
		Covid-19	• Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.	to PSCs Covid Action Plan	Clinic	construction cost	contractor • IATF approve Covid Safety Protocol Manual
		• Increase in local employment	• Prioritization of local hiring.	100% compliance to PSCs Hiring Plan	PSC	Part of the construction cost	• HR Hiring Procedure Manual
		• Generation of government taxes	• Prompt payment of correct and proper taxes and appropriate of necessary permits.	100% compliance based on applicable local and national laws	PSC	Part of the construction cost	• Proof of Tax payment
		• Increased traffic due to hauling trucks, vehicles and equipment going to and from the site	• Installation of safety barriers (e.g. fence) and signages. • Drafting and implementation of Traffic management plan(including ingress/egress of vehicles at construction site), including properly trained personnel to manage traffic flow. • Implement pedestrian walkways near the construction site. • Ensure that contractor's vehicles, trucks and equipment are of good working condition through timely inspections. • Ensure that the contactor employs properly trained crew and operators, especially drivers of large equipment like cranes and earth moving vehicles.	100% compliance to PSCs traffic management plan	PSC Safety Office and Security	Part of the construction cost	• Compliance Monitoring Report • Traffic Management Plan
Operation							
Operation of the following: • Existing Berth • New Berth facility • Ore Stockyard (Existing 1 to 4) • Ore-blending Yard (5 to 8) • Conveyor Systems (Existing and new)	LAND	• Generation of solid waste, raw material spoil, lumpy ores and pellets	• Strict implementation of PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07). • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 07 (IM-APX-003-07) for proper waste segregation and handling of generated solid waste in the berthing facility, raw material yard, ore blending area and contractors facility. • PSC Lab & Envi Dept has put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in each work area. • Regular inspection of collection bins and replacement of worn-out solid waste collection drums to fiber glass containers. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the solid waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*) • Installation of diverter plates with automatic recovery conveyor on the uploaders. • Manual gathering of accumulated spillage materials after completion of unloading. • Installation of strainers at discharge end to filter spilled solids. • Provision of revetments and embankments at raw material yard (1-4) and ore blending (5-8). • Manual collection of spillage at the conveyor route.	100% compliance to PSCs EMP in compliance to RA 9003	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-07 (IM-APX-003-07) • Include in TOR of contractor
	LAND	• Generation of Hazardous Wastes	• Regular collection of hazardous waste generated in the daily operation to be brought to the PSC sorting facility. • Hazardous wastes shall be classified and sorted according	100% compliance to PSCs EMP in compliance to RA	• PSC Lab & Envi Dept • PCO • PSC Planning Department	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
		– busted bulbs – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts	to its classification and shall be temporarily stored in the 260m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). (*Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	9275 and RA 6969	• Contractor		05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • SMR • Hazwaste Generators ID • Include in TOR of contractor
	WATER	• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the berthing facility, raw material yard , ore blending area and contractors facility. • Periodic inspection of drainage and collector's sump pit in the existing berth facility. • Installation of drainage and collector's sump pit in the new berth facility to collect silt and divert run-off water. • Periodic inspection of two (2) oil/water separator with a total holding capacity of 5.88m^3 at the raw material handling station. • Installation of an additional oil/water separator with a total holding capacity of 2.94m^3 at the new berth facility. • All run-off water emanating from Yard 8 shall be diverted to North Settling Pond. • While all run-off water emanating from Yards 1-7 shall be diverted to the new South Settling Pond. • Periodic inspection of north and south settling pond for its condition including water depth, access road, influent and effluent canals, filtering weir material replacement. • Quarterly monitoring of essential effluent parameters (relative to the operation of PSC) discharging from the North Settling Pond and New South Settling Pond shall be monitored monthly. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Use of floats and pontoons to contain oil slick and sheen in case of accidental spillage and prevent it from spreading into adjoining areas. • A staff from the PSC Envi Dept shall be tasked to monitor the environmental condition within and adjacent to the berth facilities. • PSC already have universal spill kits, oil recovery equipment and sorbent dispersants that they can immediately use in case of oil spillage, additional procurement of such kits for the new berth facility. • PSC also has existing toilets connected to septic tanks that were located near the existing berth and BBASI Office that can be also be utilized by the workers assigned at the new berth facility. • PSC shall require all berthing vessels that in case of offloading sewage waters, the chartered vessel will coordinate with PSC for tapping an accredited wastewater treater. • Since majority of the vessels are delivering raw materials, de-ballasting will not take place in the berth facility but instead they will intake ballast water. • For chartered vessels that will deliver the sintered ore, pellets and blended ores, PSC may request the chartered vessel to conduct partial de-ballasting at the international	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			waters prior to entry at the country's maritime waters in accordance with the IMO protocol. • PSC shall collate information on the chartered vessel ballast water treatment system and request for record of de-ballasting activity in accordance with the IMO protocol. • In the event of de-ballasting at the berth facilities, PSC shall monitor the activity provided that the chartered vessel has an installed ballast water treatment system. For vessels that have chemical ballast treatment system, PSC may require information on the chemicals used for treatment and ensure that the chemicals are included in the PCL list. PSC may request in advance information on such prior to the chartering date.				
	AIR	• Air Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • Operation of unloader water spray system (10m^3 per hour) during unloading activity. • Installation of another unloader water spray system (10m^3 per hour) at the new berth facility. • PSC has an existing 85 conveying lines, 79 of which are covered by arc roofing. PSC emphasizes on covering the conveyors that are used for transporting dry and fine materials. • PSC shall also install arc roofing for all the conveying route of the conveying system for ore blending as it is projected to convey dry and fine materials to and from the chartered vessels. • Covering of tarpaulins or sacoline of raw materials, ore blended stockpiles and lumpy ores and pellets during drier months. • Periodic inspection of/survey/replacement of defective/worn out conveyor belt rubber hood curtain plate to ensure that it is functioning properly and prevent spillage that may generate fugitive dust. • Regular maintenance of belt conveyor tip cleaner /head scraper. • Use of non-stick belt conveyor to reduce raw material mix spillage. • Paving of conveying route for easy maintenance especially during collection of unwarranted spillage. • Manual collection in case of spillage for all the conveying lines. • Periodic washing and spraying along paved and unpaved roads and grounds especially during dry season. • Continued use of industrial mobile vacuum cleaner. • Periodic inspection/ survey/ replacement of damaged water spray. • Quarterly monitoring of PM_{10}. • Use of low sulfur fuel oil for tugboats. • Use of Euro 4 or Euro 5 fuel for service vehicles. • Conduct of Ringelmann test for emission of all vehicles utilized in the operation of berthing facilities and conveyor system. • Immediate overhaul of smoke belching vehicles at the mechanical area.	100% compliance to PSCs EMP in compliance to RA 8749	• PSC Lab & Envi Dept • PSC Material Handling • PSC Mechanical Department ←	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Permit to operate
	AIR	• Noise generation	• Periodic re-orientation of workers, laborers and contractors	100% compliance to PSCs EMP in	• PSC Lab & Envi Dept	Part of the operation cost	• PSC Integrated

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			on PSC's EMP 08 (IM-APX-003-08) for noise management program including use of ear muffs in noise prone areas. • Regular maintenance of vehicles and heavy equipment. • Installation of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the mechanical repair shop for all vehicles emitting severe noise.	accordance with NEPC standard	• PCO • PSC Material Handling Dept. • PSC Mechanical Department • Contractor		Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of contractor
	PEOPLE	• Occupational awareness • Occupational risk • Health risk in relation to Covid-19	• Promote Training/Orientation of new workers and employees. • Posting of safety warning and danger signs. • Prioritization of local hiring. • Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.	100% compliance to PSCs OHS	PSC Safety PSC HRGA	Part of operation cost	• EMS • SMR • IEC • IATF approved Covid 19 safety Protocol
Operation of the following: • Sintering Facility • Burnt Lime Facility • Pelletizing Ore Facility (for development)	LAND	• Generation of solid waste and hazardous wastes	• Strict implementation of PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07). • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 07 (IM-APX-003-07) for proper waste segregation and handling of generated solid waste in the sintering facility, burnt lime facility and the proposed pelletizing ore facility. • PSC has put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in each work area. • Regular inspection of collection bins and replacement of worn-out solid waste collection drums to fiber glass containers. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated in the daily operation to be brought to the PSC sorting facility. • Hazardous wastes shall be classified and sorted according to its classification and shall be temporarily stored in the 260 sq.m. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)*	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID • Phil Coast Guard approved Oil Spill Contingency Plan
		Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the Sintering Facility, Burnt Lime Facility and Pelletizing Ore Facility (for development). • Periodic inspection of drainage and collector's sump pit in the perimeters of the existing Sintering Facility and Burnt Lime Facility and for the Pelletizing Ore Facility once established. • Periodic inspection and cleaning of the following oil/water separator. • Sintering facility with 1.13m^3 capacity • Burnt lime facility with 0.20m^3 capacity. • All run-off water emanating from sintering facility and burnt lime facility shall be diverted to North Settling Pond to allow	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			run-off laden with silt to settle. • Periodic inspection of north and south settling pond for its condition including water depth, access road, influent and effluent canals, filtering weir material replacement. • Annual desilting of the north settling pond. • Silt and spoils shall be deposited temporarily near the first compartment of the North Settling Pond (N8°34'33.56", E124°45'59.13"). • Quarterly monitoring of essential effluent parameters (relative to the operation of PSC) discharging from the North Settling Pond and New South Settling Pond shall be monitored monthly. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Periodic inspection and maintenance including siphoning of sludge of septic tanks in the sintering facility and the burnt lime facility. • PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of soil in work areas. • PSC also practices lining of limestone and HDPE in the final discharge of the north settling pond. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented. • PSC also has procured universal spill kits and sorbents such as polypropelene as well as oil containment boom that can be utilized for any untoward oil spillage.				
		Air pollution - Point Source Dust - Gaseous Emission - Ambient Dust	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • Continuous monitoring of Sintering machine bed surface condition. • Regular cleaning of burner guns • Monitoring on the improvement of sintering process operation with emphasis on complete combustion of bunker oil • Continuous operation, rehabilitation and maintenance of the following air pollution control measures - Main gas handling equipment ➢ Waste gas main duct ➢ Waste Gas Cyclone ➢ Main Blower ➢ Double damper - Room dedusting cyclone (Cooler dedusting) ➢ Room dedusting equipment (8 multi cyclones) ➢ Cooler dedusting equipment (4 units dry type) ➢ Vertical double dampers for room dedusting cyclone (12 sets) - 1 unit electrostatic precipitator (Main) - 2 units electrostatic precipitator (Room EP) - stack - Main EP Smoke Stack (70 meters) • Periodic declogging of VDDs, dedusting cyclones dust chamber. • Patching of holes and replacement of deteriorated ducts. • Periodic inspection/survey/replacement of defective room dedusting system dust dropper damper/seals.	100% compliance to PSCs EMP in compliance to RA 8749	• PSC SNT Mgr • PSC Envi Dept PCO • PSC Production Dept (QA/QC) • PSC Mechanical Department	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Permit to operate • PSC Rehabilitation Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			• Periodic replacement of Bag Filter of Kiln # 1, #2 and #3. • Standardize automatic operation of REP Hopper Auto Vibrator Control. • Periodic monitoring of rapping insulator at MEP and REP. • Installation of level indicator alarm at dust hopper. • Installation of sampling point at Sinter Pot Machine Stack. • Installation of three (3) sets of multi cyclone and 3 sets of electrostatic precipitator for the process emission control of the proposed pelletizing plant. • Installation of hoods and suction ducts in Room EP for the proposed pelletizing plant. • Use of low sulfur BFO (Sinter, Kilns) and Carbon (Sinter, Kilns). • Continued use of burnt lime in sintering for SO_2 gas removal in flue gas. • Continued use of Fuel Catalyst at BLM Kiln/ SM IF. • Use of fuel catalyst for PSC tugboats & heavy mobile equipment. • Performance test of ORSAT Gas Analyzer @ main stack. • Measurement of Sulfur & FC content for Anthracite Coal. • Periodic conduct of stack sampling with RATA. • Periodic repair/rehabilitation of SM Ignition Furnace Hood. • Continued crushing of burnt lime in enclosed area. • Reduction of gas temperature using a heat exchanger in the burnt lime facility prior to release into the atmosphere. • Periodic monitoring of bag filters in the burnt lime facility to capture dust carried by the emitted gas. • Quarterly monitoring of ambient air concentration (PM_{10}, SO_2, NO_x and CO). • Regular conduct of studies and research that could optimize operation of sintering, burnt lime and pelletizing. • Manual collection in case of spillage in the sintering in burnt lime facility . • Periodic washing and spraying along paved and unpaved roads and grounds especially during dry season. • Continued use of industrial mobile vacuum cleaner. • Periodic inspection/ survey/ replacement of damaged water spray. • Use of Euro 4 or Euro 5 fuel for service vehicles. • Conduct of Ringelmann test for emission of all vehicles utilized in the operation of berthing facilities and conveyor system. • Immediate overhaul of smoke belching vehicles at the mechanical area.				
		• Noise Generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08) for noise management program including use of ear muffs in noise prone areas. • Continued maintenance of main blower and ignition fan silencer for noise attenuation that effectively reduce to <80dB. • Cleaning of CLF during preventive maintenance shutdown. • Regular maintenance of vehicles and heavy equipment. • Installation of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the mechanical repair shop for all vehicles emitting severe noise.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Mechanical Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of contractor
	PEOPLE	• Occupational awareness • Occupational risk • Health risk in relation to	• Periodic re-orientation of workers, employees and contractors. • Posting of safety warning and danger signs.	100% compliance to PSCs OHS	PSC Safety	Part of operation cost	• EMS • SMR • IEC

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
		Covid-19	• Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.				• IATF approved Covid 19 safety Protocol
Operation of Heat Recovery Boiler, Steam Turbine, Generator Set and Tank farm		• Generation of solid waste and hazardous wastes	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the SHR and back up genset area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated during construction to be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)*	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • PSC Mechanical Dept • PSC ELE Dept • WHSE • Powerplant Dept • Sinter Dept. • Material Handling • Administration • Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID
		• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the SHR Facility and back-up generator sets powerhouse work area. • Periodic inspection and cleaning of the following oil/water separator: - WHSE Tank Farm #1 with 1.29 m^3 capacity - WHSE Tank Farm #2 with 1.28 m^3capacity - WHSE Tank Farm #3 with 0.96 m^3 capacity - Diesel Storage with 0.34 m^3 capacity • Recycling of used oil, filtering and blending with heavy fuel oil at sinter day tank for use at the sinter plant. • All run-off water emanating from SHR Facility and back-up generator sets powerhouse work area shall be diverted to North Settling Pond. • Quarterly monitoring of essential effluent parameters (relative to the operation of PSC) discharging from the North Settling Pond and New South Settling Pond shall be monitored monthly. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Periodic inspection and maintenance including siphoning of sludge of septic tanks in the SHR Facility and back-up generator sets powerhouse. • PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of soil specifically in back-up diesel genset powerhouse. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented. • PSC has procured universal spill kits and sorbents such as	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • PSC Mechanical Dept • PSC ELE Dept • WHSE • Powerplant Dept • Sinter Dept. • Material Handling • Administration Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			polypropelene as well as oil containment boom that can be utilized for any untoward oil spillage. • Regular monitoring of thermal water not to exceed the 3 degrees Celsius allowed in the DAO 2016-08. • Periodic inspection of HFO storage facilities including the issuing and receiving pipelines.				
		• Increase in gaseous emission	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • The sinter waste heat recovery plant is a positive innovation of PSC operation as it utilizes the heat from the sintering process operation to be converted into electrical energy instead of releasing the waste heat directly into the atmosphere. • Periodic maintenance of the SHR and back-up genset to ensure efficiency. • Use of low sulphur fuel for the back-up diesel genset.	100% compliance to PSCs EMP in compliance to RA 8749	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • PSC ELE Dept • Material Handling Dept Sub-Contractor	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Permit to operate • PSC Rehabilitation Plan
		• Noise Generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08)for noise management program including use of ear muffs in noise prone areas. • Installation of silencer and noise attenuators in the SHR facility. • Regular maintenance of SHR facility and diesel gensets. • Installation of mufflers for the diesel genset. • Conduct of periodic preventive maintenance . • Cleaning of CLF primarily during preventive maintenance shutdown.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • Material Handling Dept • PSC ELE Dept Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of sub-contractor
	PEOPLE	• Occupational awareness • Occupational risk • Health risk in relation to Covid-19	• Periodic re-orientation of workers, employees and contractors. • Posting of safety warning and danger signs. • Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.	100% compliance to PSCs OHS	PSC Safety	Part of operation cost	• EMS • SMR • IEC • IATF approved Covid 19 safety Protocol
Operation of mechanical maintenance shop, electrical building and warehouse	LAND	• Generation of solid and hazardous wastes – busted bulbs – Lead and lead compounds (vehicle batteries, UPS, spent battery packs) – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts – WEEEs – Assorted compounds (dry cell batteries)	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07)) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the new berth construction area similar to the waste segregated bins set in the existing area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated during construction to be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 sq.m. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of*	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • PSC ELE Dept • Material Handling Dept • Administration Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)				
	WATER	• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the mechanical maintenance facility, warehouse and ELE work area. • Periodic inspection and cleaning of the following oil/water separator: - 4 units of same dimension (1.0mx1.0mx1.13m) with a total capacity of 4.52m^3 - ELE with a total capacity of 0.74m^3 - Garage with a total capacity of 3.22m^3 • Recycling of used oil including those scooped from the oil and water separator by filtering and blending with heavy fuel oil at sinter day tank for use at the sinter plant. • All run-off water emanating from warehouse shall be diverted to North Settling Pond. • Quarterly monitoring of essential effluent parameters discharging from the oil & water separator specifically oil & grease parameter. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Periodic inspection and maintenance including siphoning of sludge of septic tanks in the mechanical maintenance shop and warehouse and ELE. •PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of oil. A lot of this were observed in the Mechanical maintenance shop. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented • PSC has procured universal spill kits and sorbents such as polypropelene and a dedicated kit is supplied in the Mechanical maintenance shop. • Implementation of waste exchange program with a cement plant to be used as fuel feed for the cement kilns • Strict implementation of car and service vehicle designated at the mechanical maintenance area to ensure that accidental spillage of oil or grease shall be captured by the oil&water separator • Periodic monitoring on the effectiveness of the oil and water separator as well as cleaning and maintenance	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • PSC ELE Dept • Material Handling Dept • Administration Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan
	AIR	• Increase in gaseous emission	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • Strict conduct of Ringelmann test for emission of all vehicles entered in the facility for repair. • Routine conduct of mechanical check-up and maintenance of all PSC vehicles, trucks, heavy equipment and diesel generator sets. • Immediate overhaul of smoke belching vehicles at the mechanical area.	100% compliance to PSCs EMP in compliance to RA 8749	• PSC Lab & Envi Dept headed by PCO • PSC Planning Department • PSC Mechanical Dept • PSC Electrical Dept • Material Handling Dept • Sub-Contractor	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Emission test
		• Noise generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08) for noise management program including use of ear muffs in noise prone areas. • Installation of mufflers for the heavy equipment, trucks and	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Planning Department	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			service vehicles.		• PSC Mechanical Dept • PSC ELE • Material Handling Sub-Contractor		• PSC OHS
Operation of Admin Building, Kitchen (Uniflow), clinic and other offices		• Generation of solid and hazardous wastes – busted bulbs – Lead and lead compounds (UPS, spent battery packs) – containers previously containing toxic chemical substances – WEEEs – Assorted compounds (dry cell batteries)	• Re-orientation of workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07)) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the admin area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated in the regular operation shall be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)* • PSC shall continue to practice Environmentally Preferable Purchasing (EPP) via Procurement Department in coordination with the Envi Dept. • PSC shall also continue to implement Product Stewardship Program as part of its ISO 14001compliance.	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Admin • Clinic • PSC Lab & Envi Dept • PCO • PSC Planning Department • Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID
		• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the SHR Facility and back-up generator sets powerhouse work area. • Periodic inspection and cleaning of the oil & grease separator at the Uniflow kitchen with a total capacity of 6.48 m^3. • The admin building has a septic tank capable of accommodating all the wastewater emanating from the admin building including the water from Uniflow kitchen. • Regular conduct of wastewater analysis of Uniflow kitchen drainage including surfactant, ammonia, nitrate and phosphate to ensure that no exceedance will come from the kitchen wastewater. • Periodic dredging of drainage canals of uniflow kitchen to remove accumulated grease and siphoning of sludge from the septic tank by a third party wastewater and sludge treater.	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Admin • Clinic • PSC Envi Dept headed by PCO • PSC Engineering Dept • Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit
Operation of PSC Envi Dept Office, Laboratory, Solid waste management sorting facility and hazardous waste storage area	LAND	• Generation of solid waste	• Envi dept shall spearhead the re-orientation of workers, laborers and contractors on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07)) for proper waste segregation of solid waste. • The dept shall ensure that all work places shall have trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste).	100% compliance to PSCs EMP in compliance to RA 9003	• PSC Envi Dept headed by PCO	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			• Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • The envi dept has dedicated workers trained to classify waste accordingly and recover recyclable materials as well as handle hazardous wastes. • Biodegradables are sorted, brought to the existing PSC compost pit located adjacent to the sorting facility. • Non-biodegradables are temporarily stored but are regularly collected by a third-party solid waste collector and transport it to their MRF for further sorting prior to disposal at a landfill facility. • PSC shall continue to practice Environmentally Preferable Purchasing (EPP) in coordination with the procurement department. • PSC shall also continue to implement Product Stewardship Program as part of its ISO 14001compliance. • Provision of training for solid waste sorters on new techniques and technology of composting such as vermiculture. • Utilization of compost and vermicast as fertilizer additive for PSC reforestation program.				contractor • Hazardous Waste Generators ID
		• Generation storage of hazardous wastes and storage of hazardous wastes – Barium from laboratory wastes – Mercury compound COD/SO2 gas analysis waste – busted bulbs – Lead and lead compounds (vehicle batteries, UPS, spent battery packs) – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts – WEEEs – Assorted compounds (dry cell batteries) – Asbestos compound from the dismantling and rehabilitation of sintering facility in year 2000	• Regular collection of hazardous waste generated during operation shall be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). • Recycling of used oil including those scooped from the oil and water separator by filtering and blending with heavy fuel oil at sinter day tank for use at the sinter plant. • Pathogenic wastes such as RBS strips, sharps, contaminated cottons, needles, syringe and lancet shall be disinfected and deposited in the PSC chambered underground entombment facility. • Asbestos compound were also entombed in the underground facility in a separate compartment. The added safeguard is that the chamber is lined with limestone while the asbestos materials are inside a container covered by HDPE. • Mercury wastes are also entombed enclosed in specialized containers and covered by HDPE. • Used facemask shall also be disinfected prior to disposal • PSC has an existing agreement with a DENR-accredited waste treater for hazardous waste transporting, treatment and disposal. • PSC shall ensure that disposal of accumulated hazardous shall not exceed 6 months as prescribed in RA 6969 and its IRR. • Compilation off Certificate of Treatment for every batch of hazardous waste that were hauled and treated and regular reporting in the SMR submitted to EMB.	100% compliance to PSCs EMP in compliance to RA 6969	• PSC Lab & Envi Dept • PCO • Warehouse • HRGA	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit
	WATER	• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the SHR Facility and back-up generator sets powerhouse work area. • The laboratory has a septic tank capable of accommodating	100% compliance to PSCs EMP in compliance to RA 9275	• PSC Lab Envi Dept • PCO • HRGA	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) • Include in TOR of contractor

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			all the wastewater emanating from the laboratory with acid and organics waste pit. • Regular conduct of wastewater analysis of laboratory waste shall be conducted with implementation on neautralization of laboratory wastes before it is discarded. • Periodic dredging of drainage canals of uniflow kitchen to remove accumulated grease and siphoning of sludge from the septic tank by a third party wastewater and sludge treater.				• Discharge Permit
Abandonment Phase							
• Abandonment of all buildings including offices, plant facilities, port facilities • Demolition of buildings or dismantling of facilities	LAND	• Devaluation of land value as result of improper solid and hazardous waste management and other related impacts	• PSC should include in the TOR of the contractor the collection, hauling and proper disposal of debris, solid waste and hazardous wastes generated. • Rehabilitation of the area until its safe and acceptable for the construction of a new building/facilities.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan
	WATER	• Sedimentation / siltation of drainage or waterways during dismantling activities or demolition activities	• PSC should include in the TOR of the contractor the protection of the drainage or waterways within or nearby the site.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan
	AIR	• Generation of dust • Degradation of air quality due to use of heavy equipment	• Set-up fences around the site to act as wind barrier . • Hauling trucks should be covered with canvass. • Proper maintenance of equipment and vehicles.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan
	PEOPLE	• Occupational health and safety of workers hired by the contractors • Risk to the safety of workers/staff and community	• Set-up fences around the site to prevent unauthorized person near the site. • Placing visible warning signs.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan

1 PROJECT DESCRIPTION

This chapter presents the specific details of the proposed expansion project of Philippine Sinter Corporation (PSC). Among the significant information discussed in this section include the project location, accessibility, impact area, rationale, components/facilities, activities during project phases, manpower, and project investment cost.

1.1 PROJECT BACKGROUND

1.1.1 Background of the Project

Project Name:	**PSC Expansion Project (Ore Blend Facility and New Berth Facility)**
Nature of Project:	**Manufacturing**
Total Area and Production Capacity:	**131.90 hectares** **9 MMTPY (Blend ore)** **5 MMTPY (Sintered Ore)** **7 MMTPY (Iron Pellet)**
Site Location:	**Phividec Industrial Authority, Municipality of Villanueva, Province of Misamis Oriental**

1.1.2 Profile of the Proponent

Name of Proponent:	**Philippine Sinter Corporation**
Office Address:	**23F Oledan Square** **6788 Ayala Avenue, Makati City**
Contact Person:	**Mr. Nilo C. Sagrado** **VP & Resident Manager – Sinter Plant**
Tel No./Fax No.:	**(02) 8886-7421/ (02) 85670083 or 86**

1.1.3. Historical Background of the Project

Table 1.1.1 depicts the five (5) ECCs issued to PSC from 1992 to 2009. In 14 April 2009, a consolidated ECC was granted by the EMB Central Office for its existing facilities including the 5MMTPY sintering plant, 17.9MW sinter cooler waste heat recovery, 5.5MW diesel generator, 2-burnt lime facility with an aggregated capacity of 200MTPD and 100MTPD hydrated lime facilities, and the 7MMTPY iron ore pellet facility.

Table 1.1.1. Summary of ECCs issued to PSC, facilities and its capacity

Issued ECCs	Date Issued	Components and Capacity
ECC No. 9207-006-120A	10 August 1992	5.5 MW stand-by generator set
ECC No. 9807-004-120	4 May 1999	• 5MMTPY Sinter Facility • Ore yard (22.5ha) • Port (352m)
ECC No. 01-01-028-120	16 September 2002	• Additional two (2) additional burnt lime kilns and facilities with aggregated capacity of 200MTPD • One (1) hydrated lime plant and facilities with a capacity of 100MTPD
10 (43)06-08 4262-41100	08 August 2006	17.9MW Sinter Cooler Waste Heat Recovery including: ○ Heat recovery boiler ○ Steam turbine ○ Generator ○ Water treatment plant ○ Cooling waste system
Consolidated ECC ECC No. 0807-021-2711	14 April 2009	• 7MMTPY Iron Ore Pellet facility • 5MMTPY PSC Sintering Plant; ➢ Port; ➢ Ore Yard; ➢ Burnt Lime Facility; and ➢ Sintering Facility • 17.9MW Sinter Cooler Waste Heat Recovery Operation; ➢ Heat Recovery Boiler; ➢ Steam Turbine; ➢ Generator; ➢ Water Treatment Plant; and ➢ Cooling Water System • 5.5 Diesel Generator • Additional Facilities; ➢ 200 MTPD 2-Burnt Lime Facilities ➢ 100 MTPD Hydrated Lime Facilities

1.2 PROJECT LOCATION AND AREA

1.2.1 Location and Accessibility

The Philippine Sinter Corporation plant is located within the PHIVIDEC Industrial Estates in the Municipality of Villanueva, Province of Misamis Oriental within the geographic coordinates 8°34'32" N; 124°45'44" E. The PSC complex covers some 133 ha located within Barangay Katipunan. **Figures 1.2.1** and **1.2.2** respectively present the location and vicinity maps of the project site. **Figure 1.2.3** shows the relative location of the project site to the PHIVIDEC Industrial Authority (PIA) while **Figure 1.2.4** depicts the lot area of PSC. **Figure 1.2.5** shows that access route within and around the PSC complex.

From the Capital City of Manila, the project site can be reached through a 90-minute commercial flight to Laguindingan Airport in Misamis Oriental and a 2-hour land travel. Various land transportation modes (e.g., buses, jeepneys, cars) are readily available in the area.

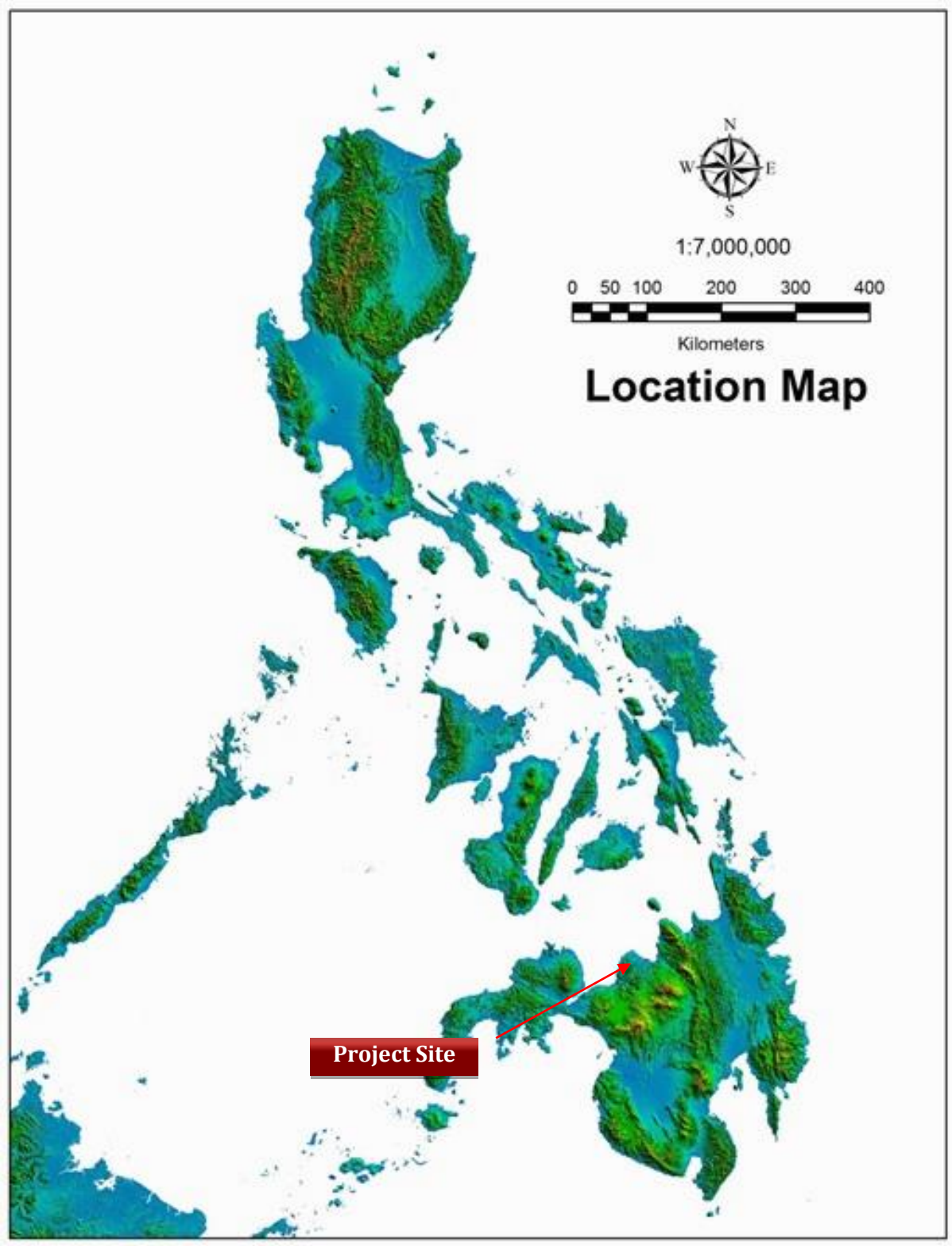


Figure 1.2.1. Location map of the proposed PSC Expansion Project

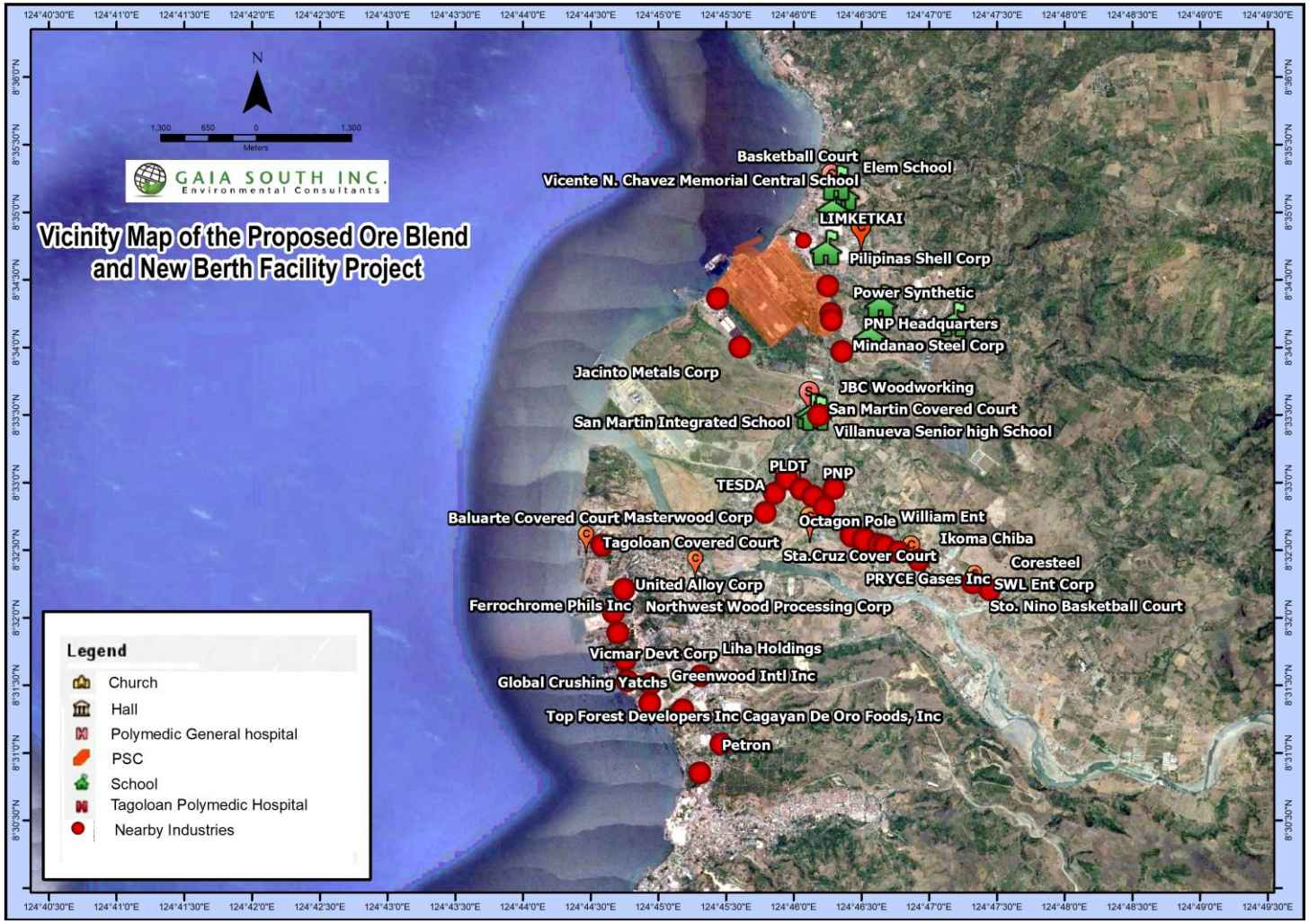


Figure 1.2.2. Vicinity map of the proposed Ore Blend and New Berth Facility Project of PSC

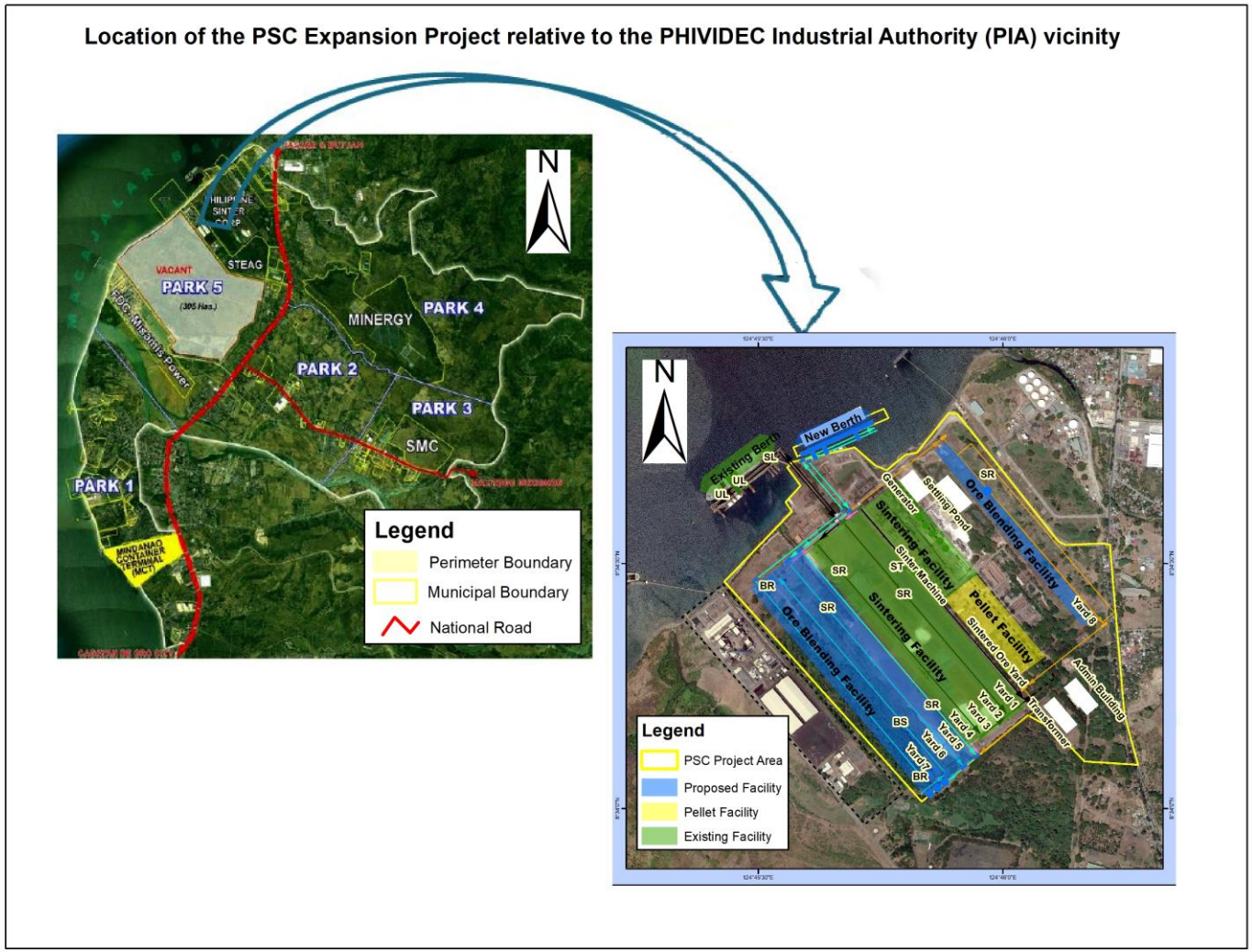


Figure 1.2.3. Location of the PSC Expansion Project relative to the PHIVIDEC Industrial Authority (PIA) vicinity

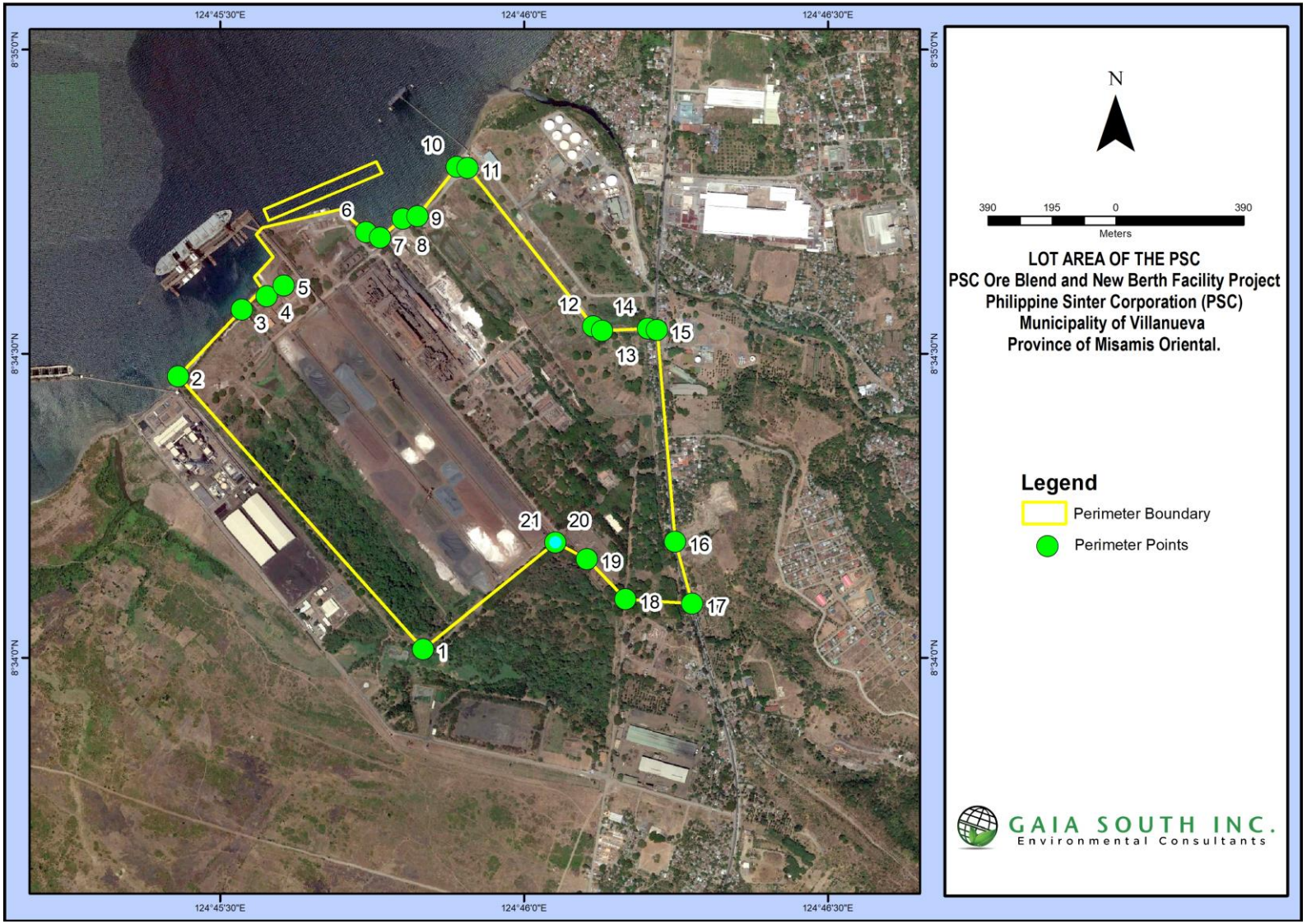


Figure 1.2.4. Lot area of the PSC

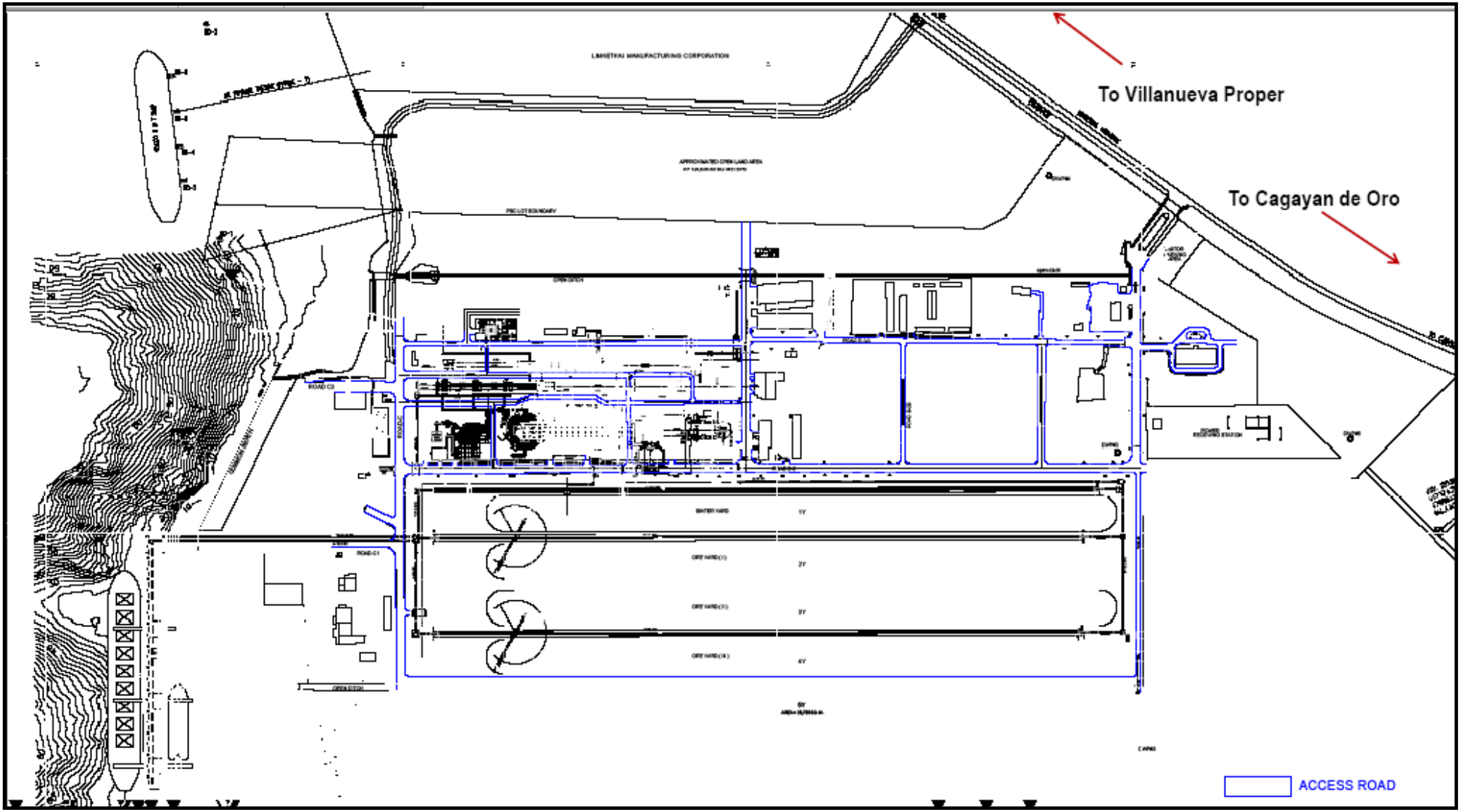


Figure 1.2.5. Access route within and around the PSC Complex

Table 1.2.1. Geographic coordinates of PSC's existing project

Perimeter/Boundary points (based on OCT/TCT/etc)	Latitude	Longitude
Corner 1	8°33'59.40"N	124°45'48.96"E
Corner 2	8°34'27.48"N	124°45'25.92"E
Corner 3	8°34'34.32"N	124°45'32.04"E
Corner 4	8°34'35.40"N	124°45'34.56"E
Corner 5	8°33'36.48"N	124°45'36.00"E
Corner 6	8°34'37.56"N	124°45'38.52"E
Corner 7	8°34'41.52"N	124°45'43.92"E
Corner 8	8°34'40.08"N	124°45'45.00"E
Corner 9	8°33'43.68"N	124°45'48.96"E
Corner 10	8°34'43.68"N	124°45'50.76"E
Corner 11	8°34'47.64"N	124°45'54.36"E
Corner 12	8°34'47.28"N	124°45'55.44"E
Corner 13	8°33'32.88"N	124°45'06.96"E
Corner 14	8°34'32.52"N	124°45'08.04"E
Corner 15	8°34'32.52"N	124°45'11.64"E
Corner 16	8°34'31.80"N	124°45'12.36"E
Corner 17	8°33'11.64"N	124°45'14.52"E
Corner 18	8°34'04.44"N	124°45'16.32"E
Corner 19	8°34'04.80"N	124°45'10.20"E
Corner 20	8°33'09.12"N	124°45'06.60"E
Corner 21	8°33'10.20"N	124°45'02.64"E

1.2.2 Proof of Authority over the Project Site

PSC has an existing Contract Lease with the Philippine Industrial Authority (PIA). Please refer to **Annexes 1.1** and **1.2. Annex 1.3** also includes the Phividec Industrial Authority (PIA) Certification to PSC as locator. The Letter of Intent to Lease submitted by PSC to Phividec for the use of the foreshore area is attached as **Annex 1.4.**

1.2.3 Predicted Impact Area

Based on the proposed site development plan of PSC (**Figure 1.2.6**) and its projected operation, the impact area of the proposed Ore Blend and New Berth Facility Project is confined only within the existing site located in Phividec Industrial Estate in the Municipality of Villanueva, Province of Misamis Oriental, Mindanao Island.

Figures 1.2.7 to **1.2.9** show the satellite image of the existing proposed project area from Google Earth, aerial photo of the project site, and selected drone images of the existing PSC operation.

Figures 1.2.10 shows the primary and secondary impact maps of PSC overlaid on Google Map while **Figure 1.2.11** depicts the impact map on the current land use of the Municipality of Villanueva including the 10km zone from PSC Complex. These maps used the existing land use of Villanueva depicting further the political boundaries.

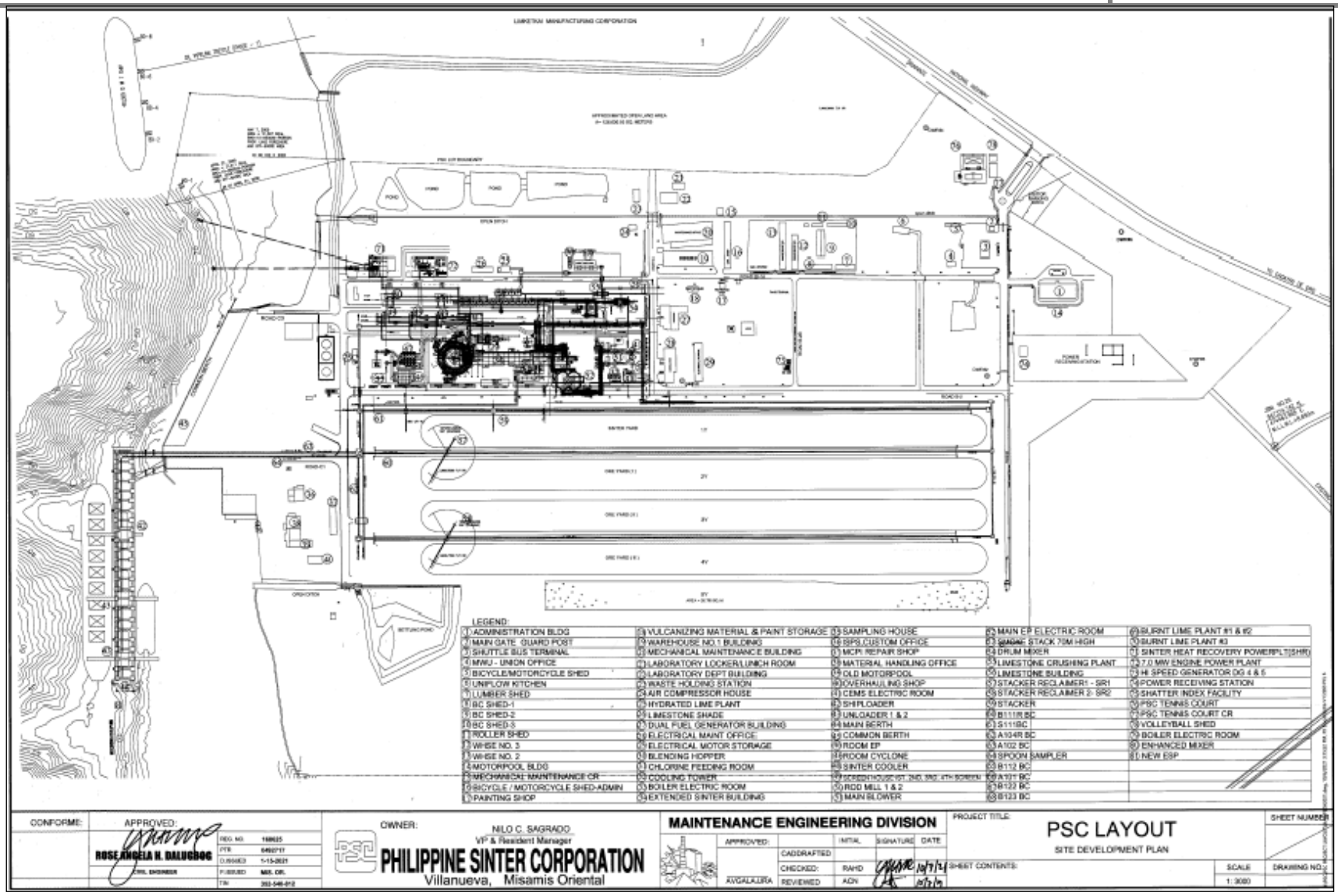


Figure 1.2.6. Site development plan of PSC

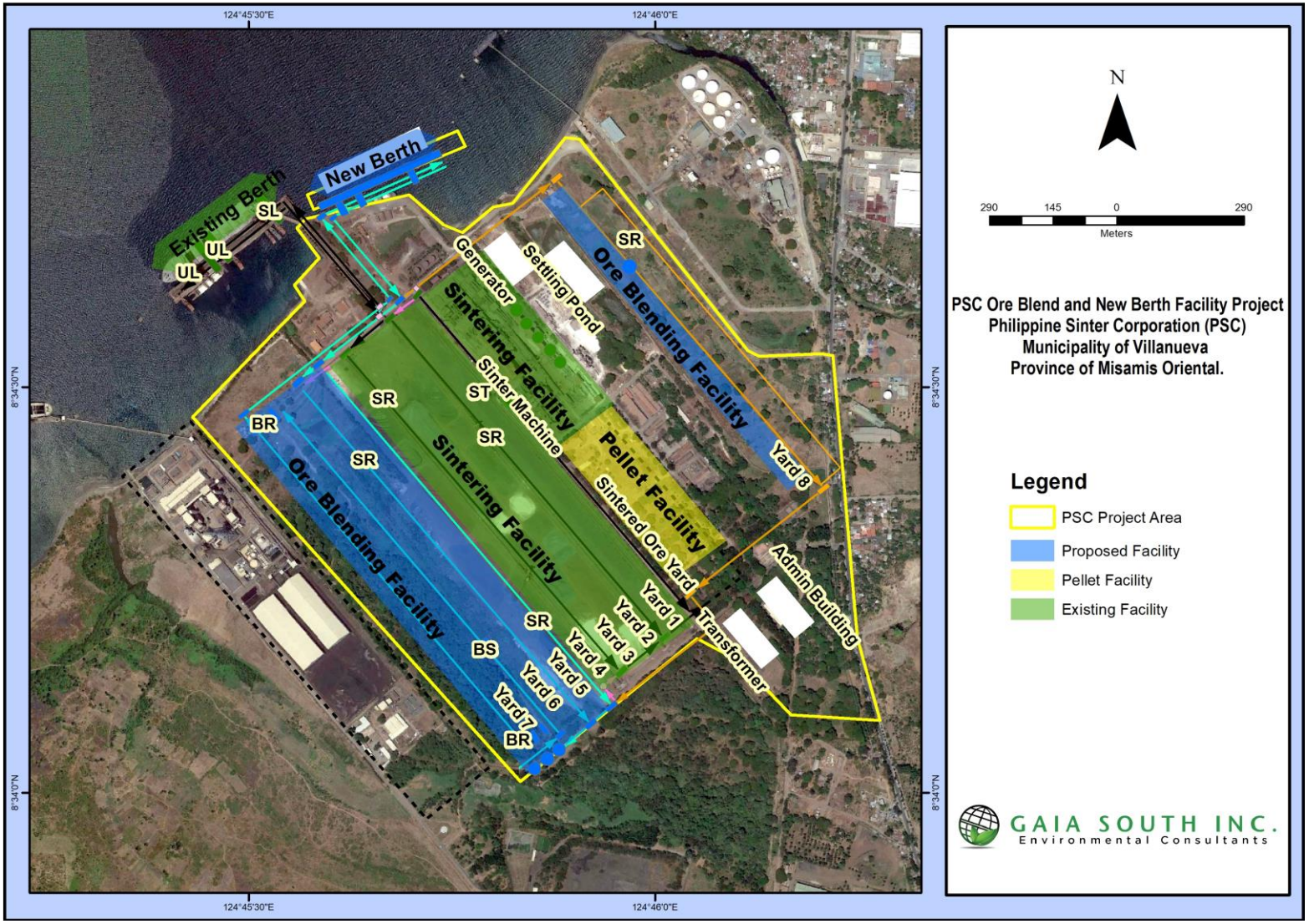


Figure 1.2.7. Projection of the existing and proposed Ore Blend and New Berth Facility Project of PSC

Figure 1.2.8. Aerial image of the host community of the proposed project area

Figure 1.2.9. Drone images of selected areas within the PSC Complex (yard, sintering facility and portion of pier area)

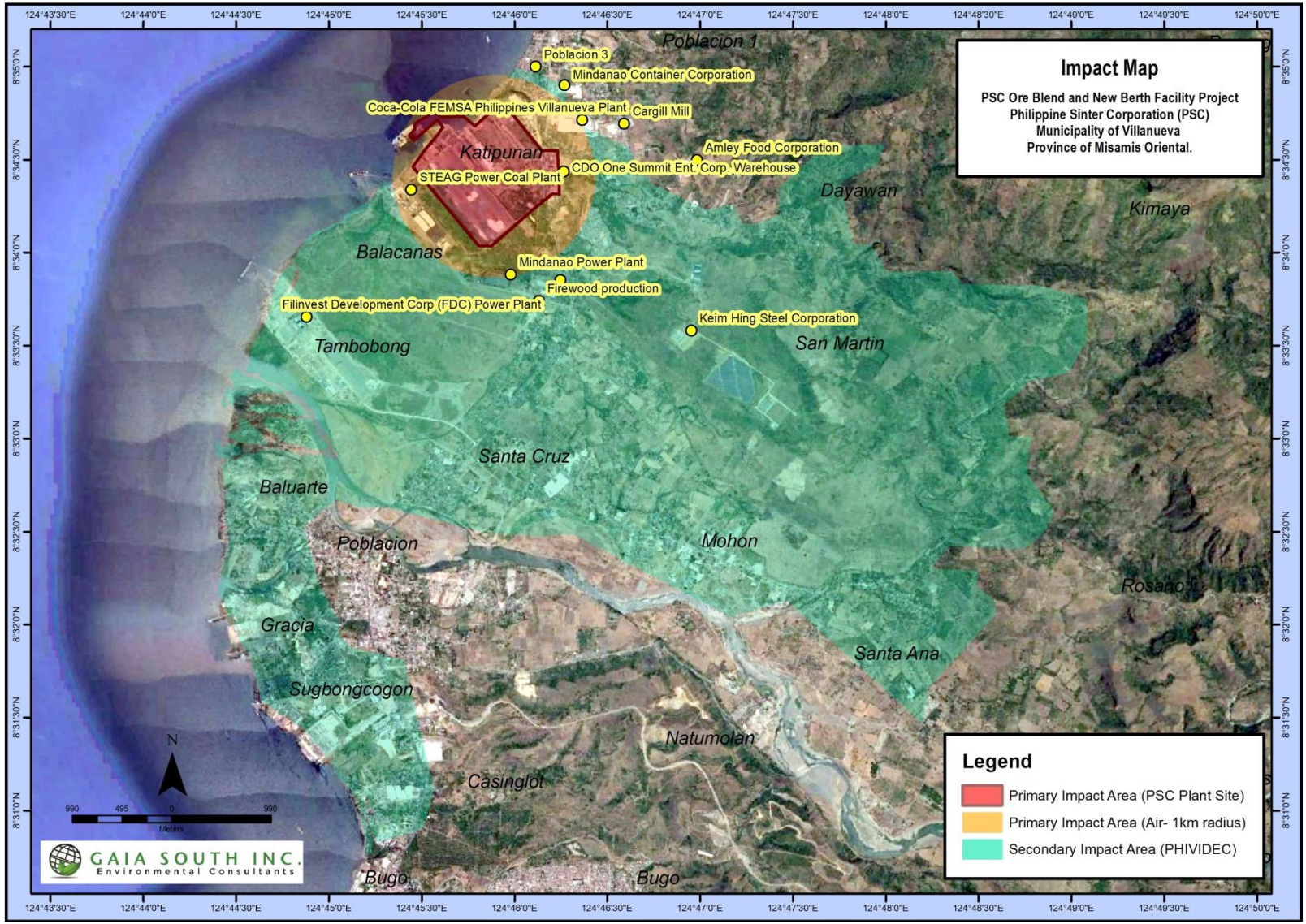


Figure 1.2.10. Impact map of PSC

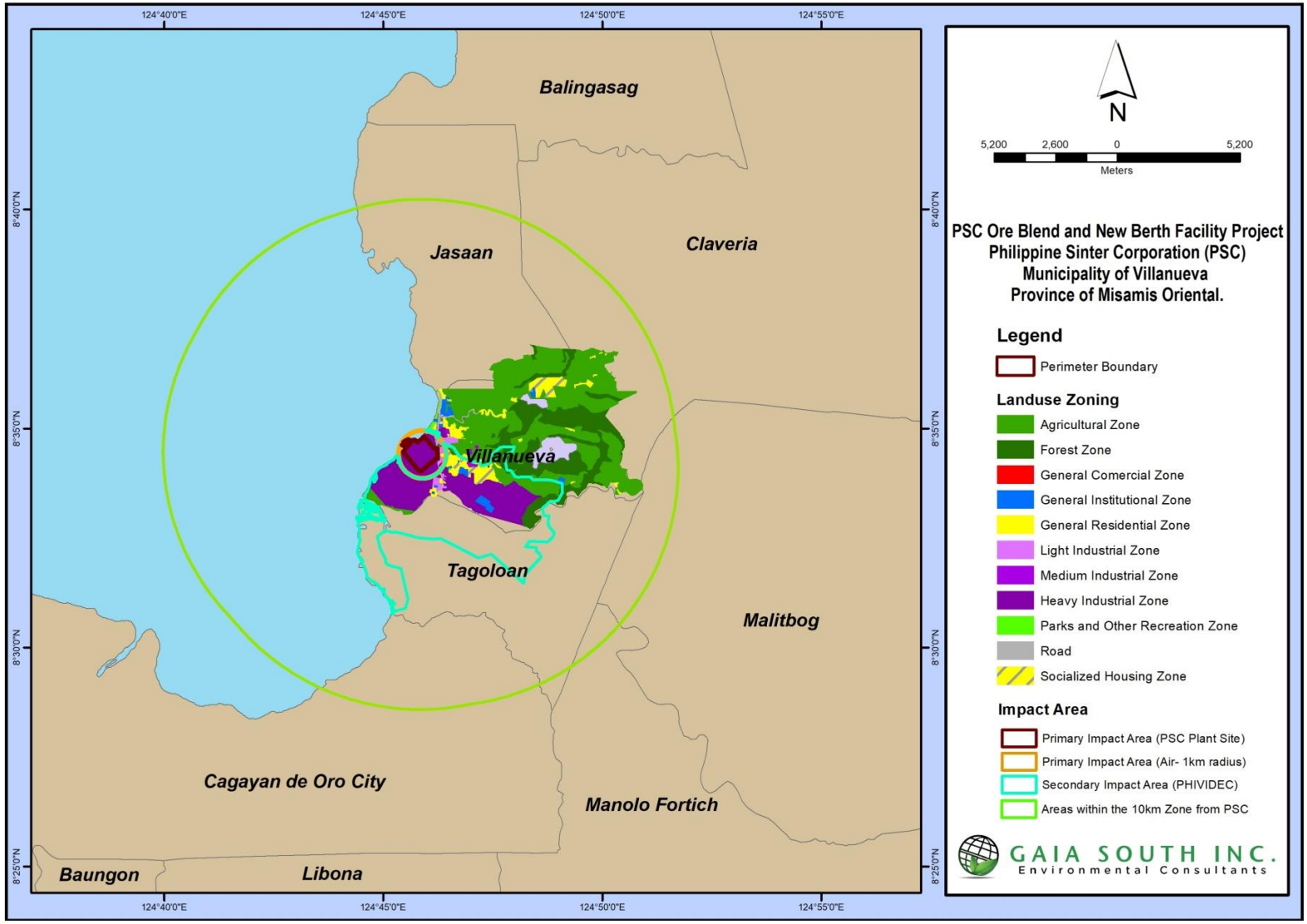
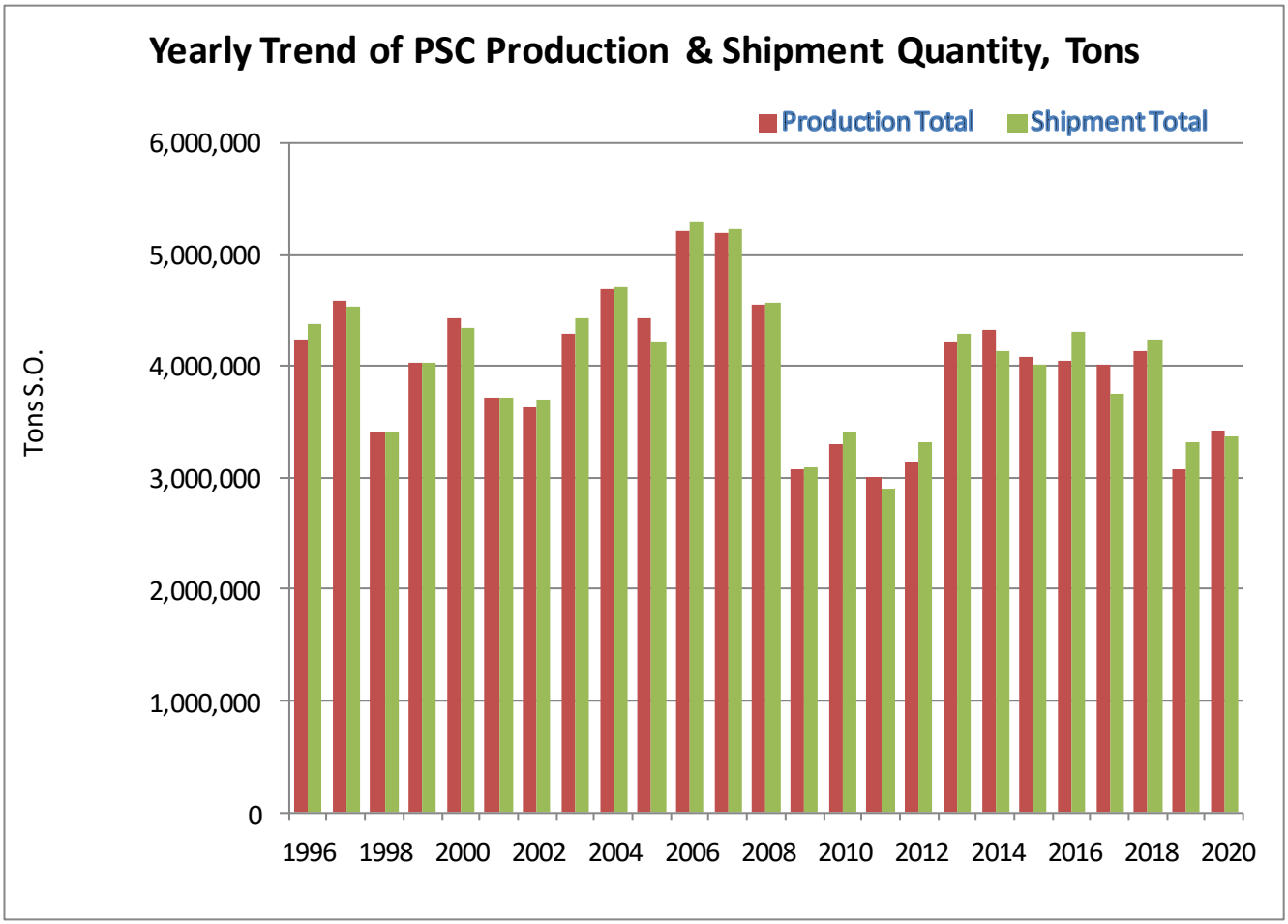


Figure 1.2.11. Impact map of PSC including the 10km zone from PSC Complex overlaid on the Land Use Map of the Municipality of Villanueva

1.3 PROJECT RATIONALE

Japan's JFE Steel Corporation, PSC's mother company produces steel using various iron ores sourced out from foreign countries. As to the current operation, the existing berth of PSC, utilization ratio is already high due to increase in production and shipment after the Sinter Machine Extension in year 2019. For cost competitiveness, PSC accommodates huge vessels (>200,000 MT capacity) which cannot be docked in Japan ports due to the shallow depth of its ports. As such, PSC plans to receive various raw iron ore by large vessel, blend them and then distribute to each Japanese steel plant. For this project, PSC shall develop part of the existing port to maximize its efficiency and operation in accommodating the raw materials. The Main Berth serves the existing Sinter Plant. It is where all the raw materials for sintering are unloaded and where sinter products are loaded. With the expected volume of blended ore of 9.0 MMT/year, the existing berth is no longer enough to handle the additional ore volume required. The proposed expansion project will ensure that the shipment of the blended ore will not affect the supply and availability of the required iron ore volume for the Sinter Plant.



The demand of traditional PSC product, sintered ore, has reduced significantly since its peak in year 2006. It is necessary for PSC to diversify its product portfolio to address changes in the demands of the international steel industry for it to remain competitive.

In the overall perspective, there is a need for the project to proceed to improve the accommodation capacity of the berth by allowing the added blended ore product of PSC. Moreover, PSC also aims to develop the ore yard facility of the PSC for blending of the ore materials which will eventually require additional workforce from the local community. The huge investment associated with the proposed Ore Blending Project will benefit the national economy and is also expected to generate local and national business activities during the construction and operation stage of the plant. This is expected to largely contribute to the overall stability of the labor environment, increased in volume of trade, and generate taxes and revenues in the country.

1.4 PROJECT ALTERNATIVES

The summary of the project alternatives considered in the planning of the proposed project is provided in **Table 1.4.1.**

Table 1.4.1. Project alternatives of the proposed PSC Expansion Project

Aspect	Standard Criteria	Options Considered	Assessment
Siting	• Location • Availability • Land use • Susceptibility to natural occurrences	The proposed project shall be situated within Phividec Industrial Estate in the Municipality of Villanueva, Province of Misamis Oriental. No other alternative site in Mindanao was chosen.	In spite of the on-going pandemic, the demand on sintered ore is still coping with the requirements of economic development. The existing PSC plant within Phividec is considered superior in terms of location as documented by in the JFE Technical Report[1]. The following salient features of the site are: a) Location on shipping routes to Japan for overseas iron ore resources, contributing to excellent transportation efficiency. b) Deep water port, enabling reduction of freight costs by use of large ships. c) Mild weather year-round, with virtually no typhoons or other bad weather conditions. d) Availability of sub-raw materials (limestone, dolomite) from nearby islands. e) Relationship of trust based on long history with the Philippine government. The current location of PSC is located within an economic zone and have no issues in terms of land ownership or compatibility on the use of land. The project area is predicted to be moderately vulnerable to storm surges and high water

[1] *JFE Technical Report 2009*

Aspect	Standard Criteria	Options Considered	Assessment
			levels especially since the Bay is exposed and with large wind fetch due to the large surface area of Bohol sea. The project site is however far from areas with moderate to steep slopes and is therefore not under the threat of landslides. The project site may experience respective peak acceleration amplitudes of about 0.35g, 0.25g and 0.20g in soft soil, medium soil and rock conditions. This indicates that slight to moderate ground motion may be expected in the area in the event of an earthquake with magnitude greater than 5.0. <u>People</u> Based on the FGDs and KIIs conducted, majority of the respondents perceived that the proposed project will not cause any harm to the communities and its immediate environment. Moreover, they also perceived the need for additional opportunities for the locals including manpower and social projects.
Project type, components, and size	• Applicability • Process • Safety	Blending operation as it is independent from the sinter operation shall produce approximately 9MTPY. <u>Blending yard</u> The ore blending will be set-up in four (4) yards, three (3) of which are located right beside the existing yard of PSC. All the necessary measures to ensure safety of workers will be administered. Using computerized system of process monitoring and period maintenance, efficiency and agile response to any mechanical errors will be addressed thus accident and mechanical failure will be avoided. <u>New berth facility</u> The existing pier yard will be utilized for the development of the new berth facility. PSC will not construct a new pier area as there is still space to accommodate the new berth.	The proposed project is entirely the development of the ore yard which will only use conveyor systems and its auxillary facilities from the port area, establishment of a new berth facility which will just perk up the capacity of the existing berth operation as well as the improvement of the existing berth for the same purpose. In general, the establishment of the ore blending facility and new berth shall augment the efficiency of the entire operation of PSC.
Process/ Technology		PSC considers the conventional use of conveyor, stacker, and reclaimer. The process from the unloading of	PSC invests on technological advancement leading to constant efficiency of plant

Aspect	Standard Criteria	Options Considered	Assessment
		raw materials to the yard will be supported mechanically by these equipment. To ensure that fugitive dust will be suppressed in the entire process, a fully-covered conveyor system will be installed. PSC will use a Distributed Control System (DCS) for monitoring and controlling weight in Weighers along the BC line. On the other hand, Programmable Logic Controller (PLC) will be utilized for sequential running of motors to drive conveyors. The stacker, reclaimers, unloader and shiploader will have its own in dependent PLC system. The existing radar system of PSC will be utilized to monitor vessel movements not only the Main Berth but also the new berth. PSC maintains a Holding Station (Material Recovery Facility or MRF) used as temporary storage area for recyclable solid waste and a hazardous solid waste storage/disposal area. Hazardous wastes are temporarily stored for treatment by an EMB-accredited treater. Thus, the technical life of the temporary waste disposal facility, which is essentially for asbestos and mercury bulbs only, is approximately 25 years.	operation. The need to acknowledge and adopt an advanced technological system guarantees high quality output. Since the proposed expansion includes only the construction of a new additional berth, improvement of the existing berth, and development of the ore yard facility, discharges of chemical wastes will be mainly generated from the motorpool during the construction and offices during the operations phase. These are mainly asbestos and mercury bulb. Thus, regular waste collection and treatment shall address its proper disposal. <u>Hazardous wastes</u> The following are expected to be generated during the operation of the entire facility: Busted fluorescent lamp tubes, empty paint cans, lead-acid-batteries of vehicles, waste Oil generated during change oil of motorcycles, heavy equipment and service vehicles, and empty vulcanizing material during belt installation. <u>Electronic wastes</u> Empty cartridge of printer ink used at office and batteries used in cameras are the major electronic wastes in the operation.
Supply of raw materials	• Source	The materials will be imported from Brazil, Canada, India, and Australia. PSC is still open to source from other countries such as the Ukraine. The Company is also searching for new source of raw materials but still with uncertainty.	These countries are long time source of raw materials for PSC and will continue to supply the Company as it provides the specifications required by the plant. PSC may consider future options depending on the economy and quality of materials, among others. Due to the very specific requirements of PSC on the raw materials, careful selection must be done to ensure that the same good quality of ore will be produced.
Source of power	• Availability • Total power requirement • Source	PSC generates part of its power requirement mainly through its Sinter Heat Recovery Facility and supplemented by its diesel and dual-fuel generators. The remaining requirement is sourced from power utility company CEPALCO (Cagayan Electric Power and Light	The existing local supplier is capable of supplying the required power of the new facilities using its current load. Issue on power interruption even at PSC's full operation is not seen to occur.

Aspect	Standard Criteria	Options Considered	Assessment
		Company). For this expansion project, a total of 1,400 kW/day of power will be consumed during the operation. During the construction phase, about 1,594,000 kW of electricity will be utilized.	
Water management system	• Availability • Total water requirement • Source	PSC has three (3) functional deep wells within the plant. DW4 and DW6 are used for general plant operation while DW3 is only used during sintered ore loading operation. For this expansion project, the sources of water will only be Deep wells No. 4 and 6. The proposed project will entail a total of 17,220 m^3 of water per month enough to be utilized for general cleaning works, dust control, and equipment cooling. Currently, PSC has the following pollution control facilities: • Main gas handling equipment • Room dedusting equipment • 1 unit of Electrostatic Precipitator (39,000 m^3/min) Lurgi Type • 1 unit of Electrostatic Precipitator (18,000 m^3/min) Lurgi Type • Drainage System • Pavement under belt conveyor • Pavement around sinter area • Unloader water spray system • Belt conveyor cover, chute • Main blower silencer • Ignition fan silencer • Water circulating system • Waste Disposal Facility • Hazardous waste storage/disposal area To maximize and ensure that the proposed ore blending and new berth project will cause no significant impacts to the people and environment, a conveyor system shall be installed from the ore blending yard to the berth facility. The main conveyor system will be covered to prevent fugitive dust. PSC will allocate about PhP21.9M for the installation of belt covers to ensure further environmental protection.	Deep wells 4 and 6 will be able to provide the needed water of the additional facility from construction to operation phase. As minimal usage for general maintenance of the ground and equipment, including domestic use, the existing water source will be adequate. Moreover, issue on water competition may be one of the concerns that may be raised by the surrounding communities, which need to be addressed by PSC by ensuring that adequate supply of water will be available in the impact areas even at plant's full operation. Careful study on water availability including discharges must be implemented.
Manpower	• Method of hiring • Available positions	During the operation period, the additional workers for the ore blending and new berth facilities will be hired directly by the Company while others will be engaged thru a manpower agency. There will be a total of 22,476 man-months for various workers	One of the most pressing issues in any kind of development is the need for manpower and benefits of the local community from the project in terms of employment. Especially during the construction period, both skilled and non-skilled workers will be needed, PSC must ensure that

Aspect	Standard Criteria	Options Considered	Assessment
		consisting of mechanical, electrical and civil workers during the construction period. During the operations phase, additional positions such as administrative, maintenance, and engineering, among others will be opened to qualified individuals giving priority to local dwellers.	local dwellers who are qualified to do the job will be properly screened and accepted to do the job. The use of a manpower agency as also considered by the Company must be a venue to guarantee that workers from other areas will be the least priority.

No Project Option

Without the proposed project, PSC will continue with its current operation but with limited capacity and bound to lose the opportunity to improve its competitiveness against domestic sinter plants in Japan resulting to decline of its business operation and activities here in Philippines.

1.5 PROJECT COMPONENTS

1.5.1 Existing Sinter Manufacturing Process

1.5.1.1 Project Components

The current PSC operations have four (4) major components. These are discussed in the succeeding sections. The geotagged photos of the facilities are attached as **Annex 1.5**.

a. The Port

The PSC port measures some 355 m with a mooring depth of 25m. It has two (2) berths. The main berth can accommodate up to 400,000 Dead Weight Ton (DWT) vessels and a smaller cargo berth with a net length of 230m and 6m mooring depth.

The main berth is used for the delivery of raw materials such as fine iron ore, limestone, dolomite, and carbon materials using bulk carriers ranging in size from 40,000DWT to 400,000DWT vessels (**Plates 1.5.1** and **1.5.2**). The smaller cargo berth is used for receiving delivery of industrial fuel oil using 1M liter capacity tanker vessels.

Plate 1.5.1. Side view of the existing berth facility

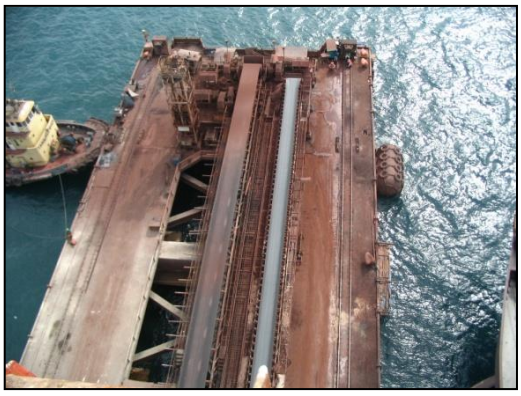


Plate 1.5.2. Another view of the existing berth facility

The following facilities are available on the port:

- Two (2) units of rail mounted bulk unloaders (1,800MTPH) with an automatic recovery conveyor.
- A pump and pipeline system to convey industrial fuel oil from delivery vessels to the storage tanks.
- Rail mounted shiploader with movable trimming chute (6,000MTPH).

Support systems include two (2) barges of 6,000DWT capacity each. The tugging /pushing services are currently being sourced out from a contractor.

b. The Ore Yard

Material unloaded from the cargo ships are stockpiled in designated places at the ore yard (**Plates 1.5.3** and **1.5.4**).

- One (1) unit rail-mounted single wing 800MTPH stacker
- One (1) unit rail mounted 1,800/3,600MTPH stacker reclaimers
- One (1) unit rail mounted 1,800/6,000MTPH stacker reclaimers
- Two (2) units 800 TPH Portable Stacker

Plate 1.5.3. Far view of the ore stockyard

Plate 1.5.4. Closer view of the ore

Support systems include the following:

- Five (5) units bulldozers
- Four (4) mobile truck cranes

c. The Burnt Lime Facility

The major equipment present in the burnt lime facility are:

- Three (3) units Chisaki kiln;
- Eleven (11) sets of belt conveyor;
- One (1) unit burnt lime hopper;
- One (1) unit fine hopper;
- One (1) unit burnt lime crusher (cage mill type);
- Three (3) sets bucket elevator;
- Two (2) units vibrating feeder; and
- One (1) unit screw feeder.

d. The Sintering Facility

The raw materials such as iron ore, coke, and limestone are reclaimed and delivered by belt conveyors to the individual blending hoppers. The mixture is spread in a uniform bed

thickness of about 56cm to 65cm on palettes and sintered. The product is then crushed into 150 mm size lumps. The components of the sinter plant are:

- 17 units blending hopper: 15 units with >600m^3 capacity as per design; one (1) unit with 400m^3 capacity; and one (1) with 136m^3 capacity;
- One (1) unit 136m^3 capacity blending hopper;
- One (1) Dwight Lloyd type sinter machine with 715m^2 grate area;
- One (1) unit Rotary Drum Mixer with 1,600TPH capacity;
- One (1) unit High Speed Mixer, EIRICH DW40 with 1,000 tons per hour capacity;
- One (1) unit circular type sinter cooler with 457m^2 bed area and 15,000m^3/min capacity;
- Three (3) cooling fans each 1,500m^3/min capacity; and
- Two (2) units double suction type main blower with 20,000m^3/min capacity.

Sinter Cooler Waste Heat Recovery Operations

PSC embarked on the Sinter Cooler Waste Heat Recovery Project to maximize resource use by tapping of heat generated by the sintering operations to produce power. Improvement in the current technology and the implementation of the CDM mechanism of the Kyoto Protocol[2] allows PSC and JFE to tap this resource for power generation. This heat recovery project is covered by ECC No. 10 (43)06-08 4262-41100.

Project Components

The power generation operations of the sintering plant have five (5) major components. These are:

Heat Recovery Boiler (HRB)

One unit of a forced circulation type heat recovery boiler was installed. It has an evaporating ratio of approximately 85ton/hr and generate steam pressure of 2.13MpaG at temperatures 380^{o}C. The system has been precisely designed using the airflow rates and temperatures and the contact time required to meet the steam evaporation rate and temperatures required at the steam turbine.

Steam Turbine

One unit condensing type steam turbine with installed speed reduction gear. It has a rated output of 18,600 kW. It operates at a speed of 5,100rpm, using steam at a pressure of 1.96 Mpa and temperature at 345^{o}C (valve inlet). Exhaust steam vacuum is 700mm Hg and steam flow at rated outlet is 84,700kg/hr.

Generator

One unit totally enclosed, air cooled, brushless synchronous generator was installed. It has a rated capacity (output) of 23,250kVA (18,600kW) and voltage of 11,000V with a frequency of 60Hz and rotating speed of 1,800rpm.

Water Treatment Plant

The water treatment plant produces demineralized water for use in the boiler. Initial feed water was estimated at 200m^3 and make-up water of 5m^3/hr. The facility utilizes ion exchanger for the demineralization process of water softening.

[2] *The KYOTO Protocol is the operational procedure of the United Nations Framework Convention on Climate Change (UNFCC) to help reduce the amount of greenhouse gases (GHG) in the atmosphere in order to arrest global warming.*

Cooling Water System

The primary cooling water circuit consists of a once-through seawater cooling system at a constant flow rate of 6,500 m^3/hour (maximum). After passing through the condenser, the seawater goes to the discharge channel and is discharged back to the sea.

Power Generation Process

The Sinter Cooler Waste Heat Recovery Power Generation Project utilizes the waste heat carried by the sinter cooling gases, which were previously lost (by dissipation) to the atmosphere to generate electricity. The process involves the recovery of the hot air from the sinter cooler which are then passed through the Heat Recovery Boiler (HRB). At the HRB, pure water is turned into superheated steam by heat transfer from the hot air. Superheated steam is expanded at the turbine and thus, generating electrical power. Using the turbine which is connected to a generator, 18,600kW of electricity is generated. The simplified diagram of the power generation process is presented in **Figure 1.5.1**.

Table 1.5.1. Summary of the existing PSC facilities

Facilities/Equipment	Number	Specifications/Remarks
Port/Berth		
Rail mounted bulk unloaders	2	1800MTPH with an automatic recovery conveyor;
Pump and pipeline system		to convey industrial fuel oil from delivery vessels to the storage tanks
Rail mounted shiploader with movable trimming chute		6,000MTPH
Berth	2	Main Berth (355m); 300,000DWT capacity Berth No. 2 (230m)
Support systems		
Barges	2	6,000 DWT capacity each
Ore Yard		
Stacker	2	800 TPH portable stacker
Stack reclaimer	1	rail mounted 1,800/3,600MTPH
Support systems	1	
Bulldozers	5	
Mobile trucks	4	
Sintering		
Blending hopper	14	600m^3 capacity each
Sinter machine	1	Dwight Lloyd type with 715m^2 grate area
Sinter Cooler	1	circular type with 457m^2 bed area and 15,000 m^3/min capacity
main blower	2	double suction type with 20,000m^3/min capacity
Burnt Lime		
Chisaki kiln	3	
Belt conveyor	11 sets	
Burnt lime hopper	1	
fine hopper	1	
burnt lime crusher	1	cage mill type
bucket elevator	3 sets	
vibrating feeder	2	
screw feeder	1	
Sinter Cooler Waste Heat Recovery Operations		
Heat Recovery Boiler	1	Forced circulation type
Steam turbine	1	Condensing type; 18,600kW rated output; 5,100 rpm speed; 1.96 Mpa pressure; 345ºC temperature (valve inlet); 700 mm Hg exhaust steam vacuum at 84,700 kg/hr rated outlet
Generator	1	totally enclosed, air cooled, brushless synchronous generator was installed. It has a

		rated capacity (output) of 23,250kVA (18,600 kW) and voltage of 11,000V with a frequency of 60Hz and rotating speed of 1,800rpm.
Water Treatment Plant	1	200m^3 feedwater and 5m^3/hr make-up water

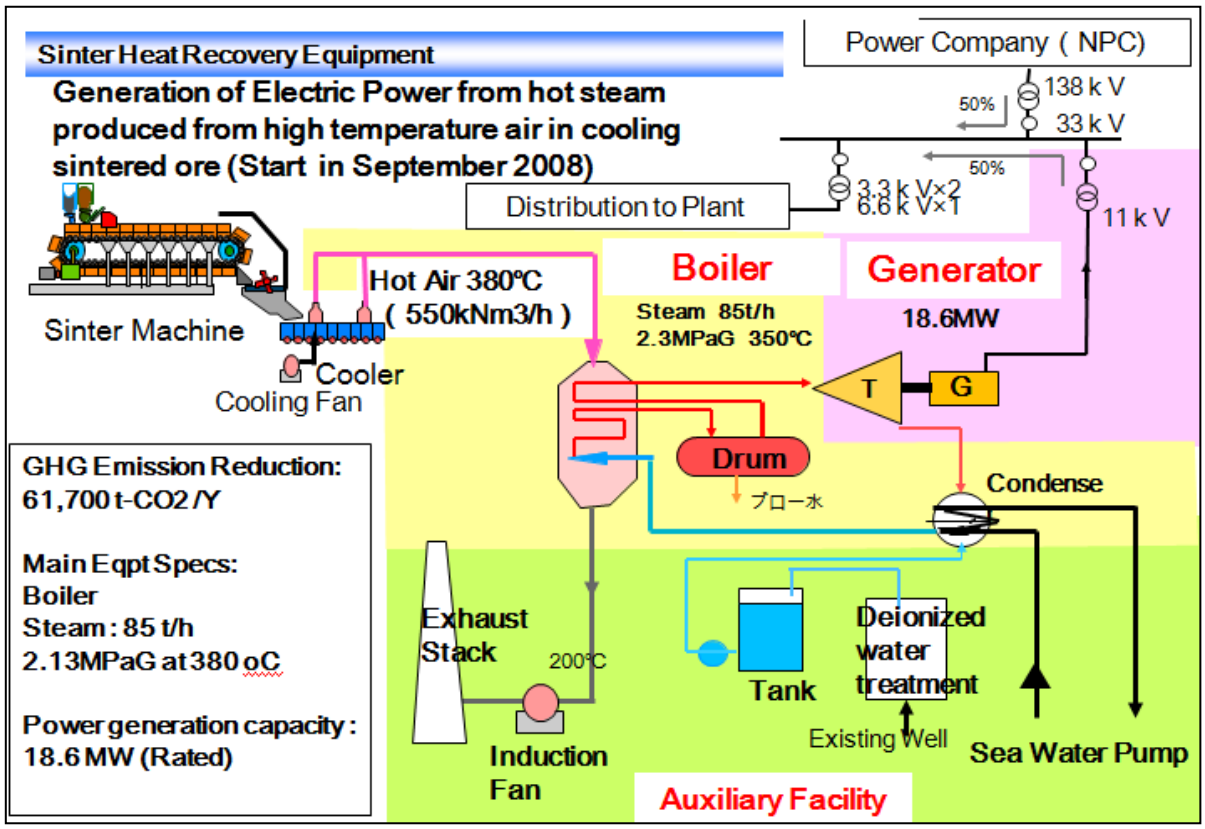


Figure 1.5.1. Power generation process diagram

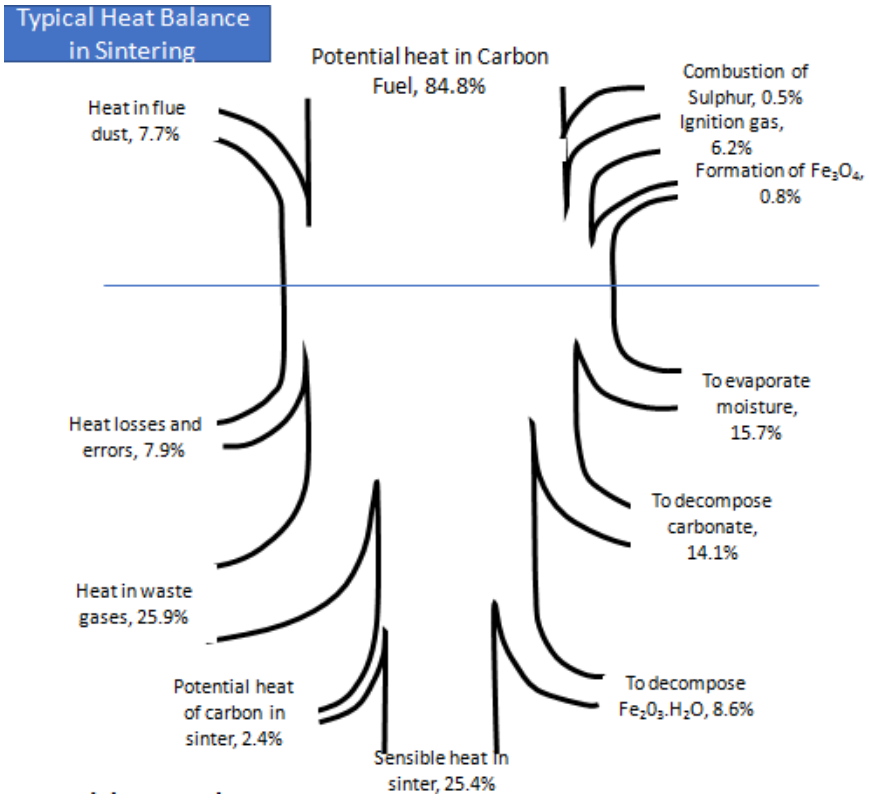


Figure 1.5.2. Typical heat balance in sintering (Heat Balance)[3]

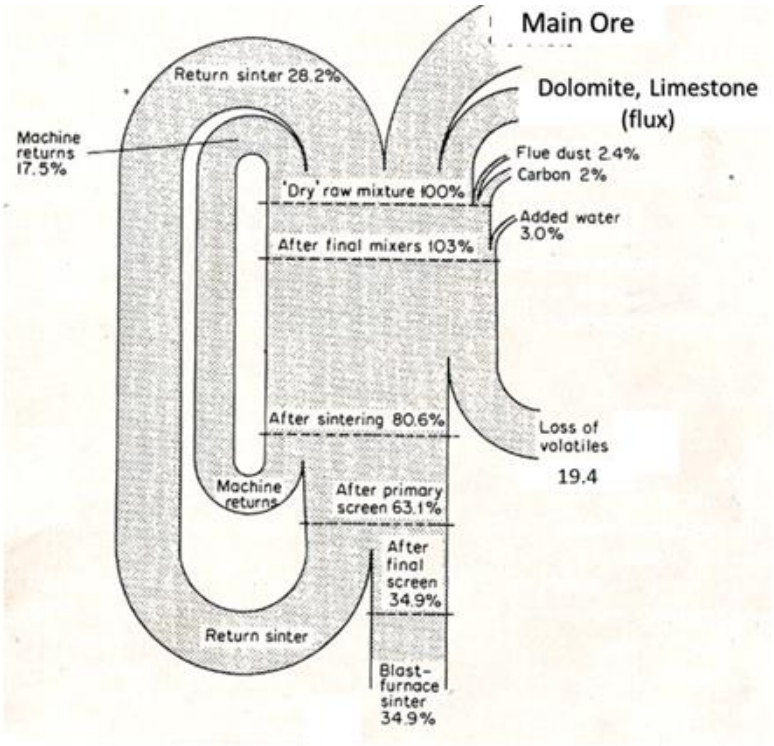
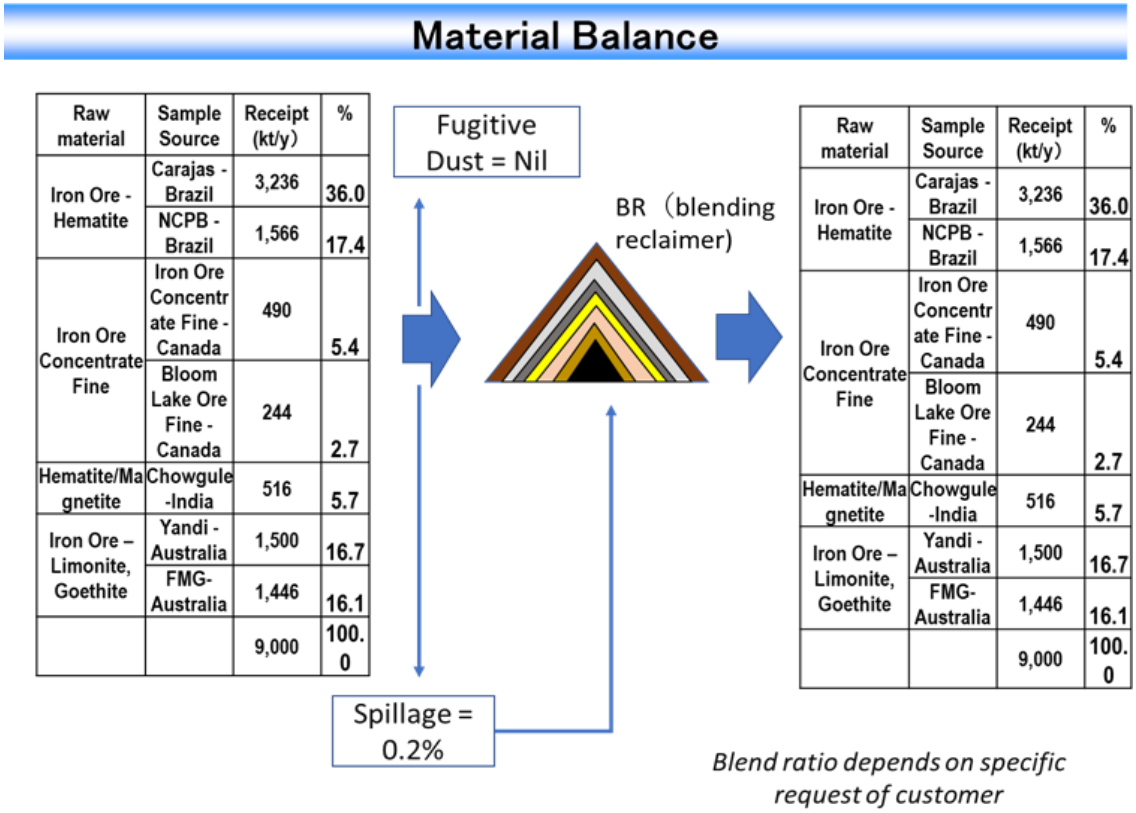


Figure 1.5.3. Typical material balance in sintering[3]

[3] *Source: Sintering Technology Handbook*

Quality of Raw Material



Raw material	Sample Source	Receipt (kt/y)	%
Iron Ore - Hematite	Carajas - Brazil	3,236	36.0
	NCPB - Brazil	1,566	17.4
Iron Ore Concentrate Fine	Iron Ore Concentrate Fine - Canada	490	5.4
	Bloom Lake Ore Fine - Canada	244	2.7
Hematite/Magnetite	Chowgule -India	516	5.7
Iron Ore – Limonite, Goethite	Yandi - Australia	1,500	16.7
	FMG- Australia	1,446	16.1
		9,000	100.0

Raw material	Sample Source	Receipt (kt/y)	%
Iron Ore - Hematite	Carajas - Brazil	3,236	36.0
	NCPB - Brazil	1,566	17.4
Iron Ore Concentrate Fine	Iron Ore Concentrate Fine - Canada	490	5.4
	Bloom Lake Ore Fine - Canada	244	2.7
Hematite/Magnetite	Chowgule -India	516	5.7
Iron Ore – Limonite, Goethite	Yandi - Australia	1,500	16.7
	FMG- Australia	1,446	16.1
		9,000	100.0

Water Requirements

The current operations of PSC for the combined operations of sinter and power plant consume approximately 69,350m^3 annually at 90% utilization. It sources its supply from the existing Deepwells No. 4 and 6 within the PSC complex.

Figure 1.5.4 presents the water balance based on the 2018 data of PSC. From 2015-2018, the average total daily water drawn from the deep well was approximately 136m^3/day. From this, about 59.35m^3/day was used for domestic purposes while about 76.31m^3/day was utilized for industrial purposes. **Table 1.5.3** shows the water balance for industrial usage.

Table 1.5.2. Water requirement for the sinter and power plant operations, (m^3/day)

Water Usage	Details	Volume
Sintering Operations		
Domestic		
Supply to vessels		30.0
Office, shops and laboratory, community Support, others		1,070.0
Sub-total		**1,100.0**
Industrial (make up water to supply basin)		
Equipment washing, B.C Spray and Sprinklers		800.0
Cooling		480.0
Evaporation, Losses, etc		100.0
Excess/overflow		20.0
Sub-total		**1,400.0**
Power Plant Operations		
Power Plant HRB		
Initial feed	Approximate	*200.0

Make-up	5 m^3/hr	120.0
Sub-total		**120.0**
TOTAL		**2,620.0**
Boiler	Seawater 6,500 m^3/hr	**156,000.0

Source: PSC, 2006
Note: *initial feed only, not included in the computation for total requirement
****seawater, not included in the computation for total requirement**

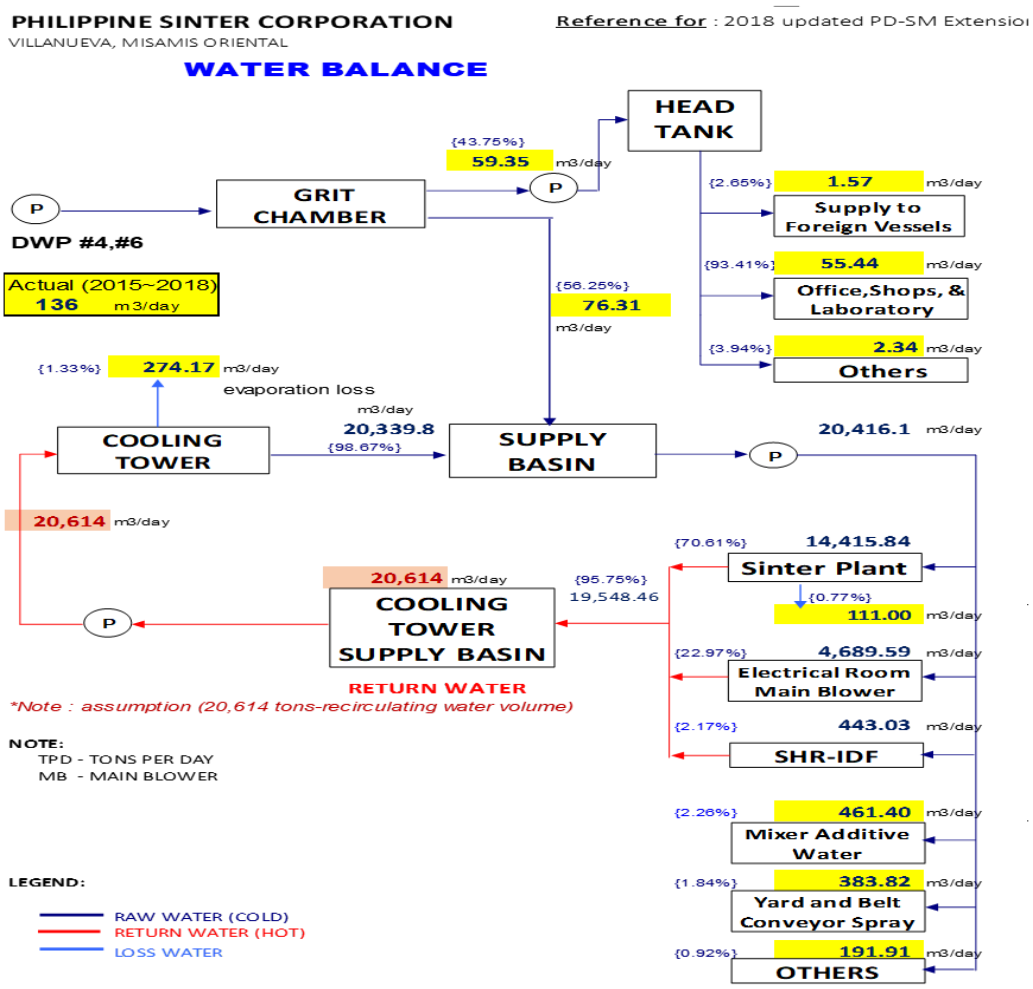


Figure 1.5.4. PSC Water Balance (2015-2018 PSC data)

Table 1.5.3. Water balance for industrial usage, PSC 2018 data

Particular	Volume, m^3/day	
Initial: recirculation Water	76.31	1,166.00
Add: Make-up Water	1,0989.69	
Less: Loss Water Loss		1,148.14
Unaccounted Volume		17.86

Power Requirements

In 2007 and prior years, power was directly and exclusively sourced from the National Power Corporation (NPC). With the full operationalization of the power generation facility in 2008 with a rated output of 18.6 MW, the (net) remaining power requirement sourced from NPC is reduced to roughly around 52%.

Beginning 2017, Cagayan Electric Power and Light Co., Inc. (CEPALCO) acquired the sub-transmission assets that supplied outside power to PSC. In order for easier consolidation and management of outside power sources, PSC assigned its NPC and other IPP contracts to CEPALCO.

In 2020, the Sinter Heat Recovery Power Plant supplied 19,650 MWH or 12% of total PSC energy for that year, 100,870 MWH or 70% is sourced from NPC, while the rest of 25,200 MWH or 18% is supplied by CEPALCO.

Fuel Requirements
The average monthly fuel consumption in 2020 for the current PSC operations is:

- 499,461 liters Bunker C
- 64,809.27 liters Diesel
- 2,017.11 liters Gasoline

The diesel and gasoline fuels are being delivered via Lorry Tank Trucks with a maximum capacity of 40kL for bunker fuel and combined maximum capacity of 20kL for gasoline/diesel. The maximum bunker oil volume is 2,200m^3. The maximum bund wall capacity is about 1,872m^3. **Figure 1.5.5** depicts the heavy oil storage tank design.

Annex 1.6 includes the Oil Spill Containment, Recovery and Clean-Up Program incorporated in the Integrated Manual of PSC. The Program depicts the necessary action plan, responsible person, schedule, performance indicator, monitoring/measurement mechanism in the event of oil spill in the area. Attached as **Annex 1.7** is the Petroleum Product Waste Management Program of PSC.

Waste Generation and Management
The major environmental impacts of sintering are emissions from the different processes. Emissions from sinter plants are generated from raw material handling, burnt lime operations, windbox exhaust, discharge end (associated sinter crushers and hot screens), and sinter cooling. The table below presents a general list of pollutants generated by the existing manufacturing process. **Table 1.5.5** presents the pollution control facilities of PSC which will also be utilize in the proposed development.

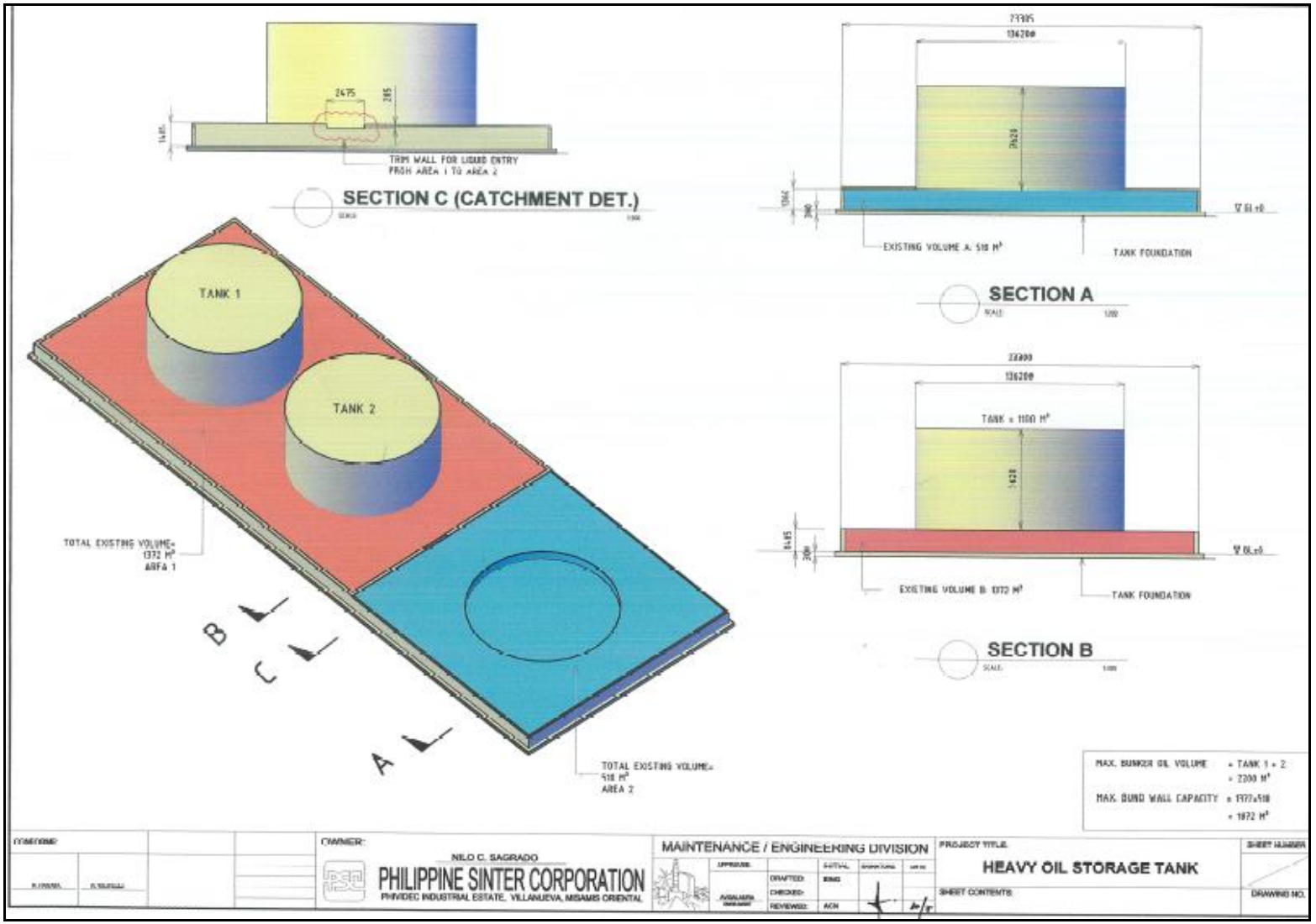


Figure 1.5.5. Heavy oil storage tank of PSC

Table 1.5.4. List of wastes material generated from the PSC operations

Source	Pollutants	Pollution control equipment/device
Raw material handling	Suspended particulates	Belt conveyor cover, chute Water sprays Deducting ducts & Dust droppers Material Covers
Windbox	Iron oxides, sulfur oxides, carbonaceous compounds, aliphatic hydrocarbons (CO, NO_x, SO_x)	Main blower Vertical Double Dampers for Dust Removal Main Electrostatic Precipitator Ignition fan silencer, Continuous Emission Monitoring System
Sinter Plant	Suspended particulates, CO, NO_x, SO_x and heat, Petroleum products container and contaminated materials	Electrostatic precipitator (EP), Waste gas main duct, Main blower (with silencer) Vertical Double damper, Water sprays in belts Room dedusting cyclone, Bag filters MRF Hazardous Waste Holding Station Regular Water spraying by water truck Regular spillage gathering & Removal Oil/ Water Separator Fuel tank containment Regular spillage gathering & Removal Chemical
Limekiln Operations	Heat, suspended particulates and noise, petroleum products container and contaminated materials	Blower (with silencer) MRF Bag Filter
Power generation	Thermal water, sludge from demineralization, petroleum products container and contaminated materials	MRF, Oil Tank Farm Chemical Storage separating Acids & Bases
Administration office	Papers, packaging, office wastes	MRF
Laboratory	Spent acids, organic and inorganic washings and spills	MRF
Canteen	Food wastes, packaging .materials, contaminated water from oil and grease	Oil-water separator
Motorpool	Petroleum products container and contaminated materials, spent acids, battery	Oil-water separator

Table 1.5.5. Pollution control facilities of PSC

Pollution Control Facility	No. of Units	Capacity/Area
Land		
Oil and Grease separator		
• Material Handling	• 1 unit – Primary • 1 unit – Secondary	• 2.94 m^3 (1.27m x 1.26 x1.84) • 2.94 m^3 (1.27m x 1.26 x1.84)
• Burnt Lime	• 1 unit	• 0.20 m^3 (0.68 x 0.68 x 0.43)
• Mechanical	• 4 units	• 4.52 m^3 (1.0 x 1.0 x 1.13)
• Sinter	• 1 unit	• 1.13 m^3 (1.0m x 1.0m x 1.13m)
• ELE	• 1 unit	• 0.74 m^3 (1.45m x 1.22m x 0.42m)
• Uniflow / oil-water separator	• 1 unit	• 6. 48 m^3 (1.8m x 1.8m x 2.0m)
• Garage	• 1 unit	• 3.22 m^3 (1.32m x 1.32m x 1.85m)
• WHSE – Tank Farm #1	• 1 unit	• 1.29 m^3 (1.32m x 1.22m x 0.8m)
• WHSE – Tank Farm #2	• 1 unit	• 1.28 m^3 (1.60m x 1.0m x 0.8m)
• WHSE – Tank Farm #3	• 1 unit	• 0.96 m^3 (1.20 x 1.0m x 0.8m)

• Holding Station	• 1 unit	• 0.36 m^3 (1.15m x 0.35 x 0.9m)
• Diesel Storage	• 1 unit	• 0.34 m^3 (0.7m x 0.7 m x 0.7 m)
• Oil Drums Storage	• 1 unit	• 0.34 m^3 (0.7m x 0.8m x 0.6 m)
Septic Tank		
Offices		
• Septic tank	• 1 unit MTH • 1 unit Fairwind Bldg • 1 unit Turbine Area • 1 unit MECH Bldg • 1 unit WHSE • 1 unit Laboratory • 1 unit Field CR • 1 unit Uniflow Kitchen • 1 unit Main Guard House • 1 unit Union Office • 1 unit BBASI Field Office • 1 unit Sampling House • 1 unit Cargo Berth Area • 1 unit Burnt Lime Plant • 1 unit Sinter Bldg	Each unit measures 5mx2mx1.8m ($18m^3$)
	• 1 unit Admin Bldg	Each unit measures 8mx4mx2m ($64m^3$)
Air		
Main gas handling equipment		
• Waste gas main duct	68-sets wind legs 1 waste gas main duct	1.0m diameter
• Main blower	2 units	double suction type main blower gas suction volume of 39,000m^3/min (19,500m^3/min) with silencer
• Double damper	80	Vertical Double Dampers (VDD) for Waste Gas Main Duct 8min cycle , Working Air Pressure of Cylinder : Max : 7kg/cm^3 G Min : 3kg/cm^3 G
Room dedusting equipment (cooler dedusting)		
• Room Dedusting Cyclone	8 units 4 units 12-sets	multicyclones;16,000 m^3/min.capacity;3.5m Ø x 14m Height dry type multicyclones;8,000 m^3/min. capacity; 3.5m Ø x 14m Height VDD for Room dedusting multi-cyclone
Electrostatic precipitator (Main)	1 unit	New 1-unit,Lurgi Type E.P ; Mitsubishi Horizontal Flow 39,000m^3/min. capacity at 130 ºC -1600mmAq. Collecting Electode : CL Type Discharge Electrode : DF-10R Type
Electrostatic precipitator (Room EP)	1 unit	LURGI dry type ; 16,000m^3 /min. capacity at 75 degC ,-380mm Aq. VDD for REP Chain Conveyor

	4-sets 1-Unit	Room Dedusting Fan 16,000m^3/min double suction Area P0werPack: 3 (GI 2000) Collecting Electode : CSH Type Discharge Electrode : B5+W15+Star
Belt conveyor cover, chute	85 conveyors comprising more than 85% of all conveying lines	Belt width: Minimum = 500mm Maximum = 1,600mm A total of 79 conveying lines spanning a total of 5.342 kms in total length is fully covered by arc roofing. These covered conveying lines are used for transporting dry, fine materials while the non-covered ones are mainly for handling lumpy, non-dusty materials
Water		
Drainage system	35,634m	
Unloader water spray system	Ordinary water spray in vessel hold	10m^3/hr
Water circulating system	1-unit Cooling Tower	20,614 m^3/day
Noise		
Main blower silencer	Noise Level lagging : Rock wool : 125mm and metal plate: 3mm	Noise Insulation lagging : 120 kg/m^3 Noise Level after lagging <80 dB
Ignition fan silencer	Lagging of Rock wool material for noise control	
Others		
Pavement under belt conveyor	Total area = 11,652.15 m^2	Total area of Pavement underneath belt conveyor 11,652.15 m^2 Conveying lines in the yard are the only lines which do not have concrete pavements underneath
Pavement around sinter area	Total length = 14,605 m Volume = 11,392 m^3	
Drainage system	Total length = 35,634m	
Materials Recovery Facility (MRF)	Approx : 1000m^2	Located adjacent the MRF. Temporary storage of wooden crates, plastic, cellophanes prior to recycling or disposal
Hazardous Waste Storage Facility	Total Floor Area = 70.9	• Electronic Waste – 53 m^3 • Empty Containers – 53 m^3 • Waste in Drums – 53 m^3 • ULAB - 18 m^3 • ULAB - 18 m^3 • Waste Rags - 18 m^3 • Pathogenic Waste – 2.940 m^3 • Mercury Bulbs – 5.45 m^3 • Asbestos – 19.845 m^3 • Others – 214.0 m^3

Solid Waste

There is a separate bin dedicated for recyclable and non-hazardous wastes such as dry materials which are sold to solid wastes haulers. Hauling of non-hazardous waste does not require permit from EMB prior to transport and disposal.

Solid wastes from the daily domestic activities and operations of the plant in general (paper, toilet disposals, office materials and supplies, scraps, etc.) are generated with a daily average volume of 3,125kg. PSC implements a product stewardship program as part of its ISO 14001. Under this program, empty containers (returnables) are returned to factory/seller/origin. Note that the significant volume of metal scrap is generated from repair works, civil engineering repair of existing buildings and new projects like the new EP and sinter machine extension.

Table 1.5.6. Quantification of solid wastes

Type of Industrial Solid Wastes/ Category		Volume, annual	Management Options
Industrial non-hazardous wastes			
Compostable Waste	Food refuse, food remnants, leaves and cut grasses	7.90 tons	Solid Waste Management (EMP -07)
Paper	Carton boxes, paper, cardboards,	3.52 tons	Solid Waste Management (EMP -07)
Plastic	Damaged canvas / flecon bags, assorted cellophane and Styrofoam, plastic bottles and other plastic materials	7.40 tons	Solid Waste Management (EMP -07)
Rubber Materials	Assorted scrap rubber materials, vehicle tires and tubes	19.64 tons	Solid Waste Management (EMP -07)
Wooden Materials	Used lumber, wooden spools and wooden crates	19.62 tons	Solid Waste Management (EMP -07)
Metal	Scraps, chips, trimmings, liners, castings	2.966 tons	Solid Waste Management (EMP -07)
Mixed	Laboratory equipment		Solid Waste Management (EMP -07)

Plate 1.5.5. Properly labeled garbage bins

Oil Tank Farm

The oil tank farm consists of two (2) tanks containing bunker fuel oil and served with appropriate bunds. This bund prevents the accidental releases of fuel oil in the event of spills or leaks coming from the tanks.

Plate 1.5.6 shows tank farm. Drain valves are always closed to ensure that no oil flows into the nearby body of water. Such drain valve (lower portion of the picture below) is always closed. It is opened only during draining of rainwater collected inside the tank farm and subsequently closed thereafter.

Plate 1.5.6. PSC tank farm and its drain valve

Hazardous Waste

PSC also maintains a hazardous waste storage/disposal area (**Plate 1.5.7**). PSC implements a product stewardship program as part of its ISO 14001, same with solid wastes handling. Thus, the technical life of the hazardous waste disposal facility, which is essentially for asbestos and mercury bulbs only, is approximately 25 years.

Plate 1.5.7. General view of the Hazardous Waste Storage area

Plates 1.5.8 to **1.5.10** shows the storage facilities for hazardous wastes generated by PSC.

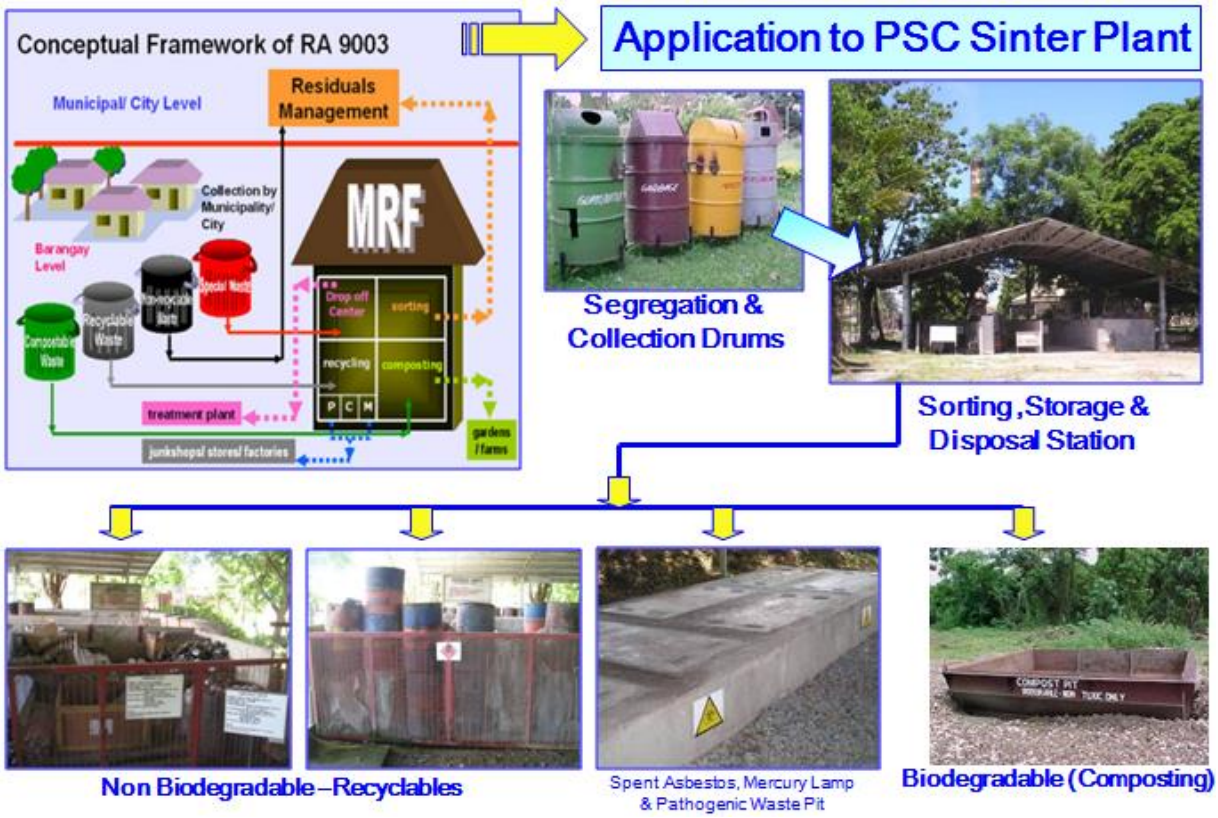


Plate 1.5.8. Storage facility for Asbestos, Hg lamp, and pathogenic wastes

Plate 1.5.9. Handling and management of hazardous wastes

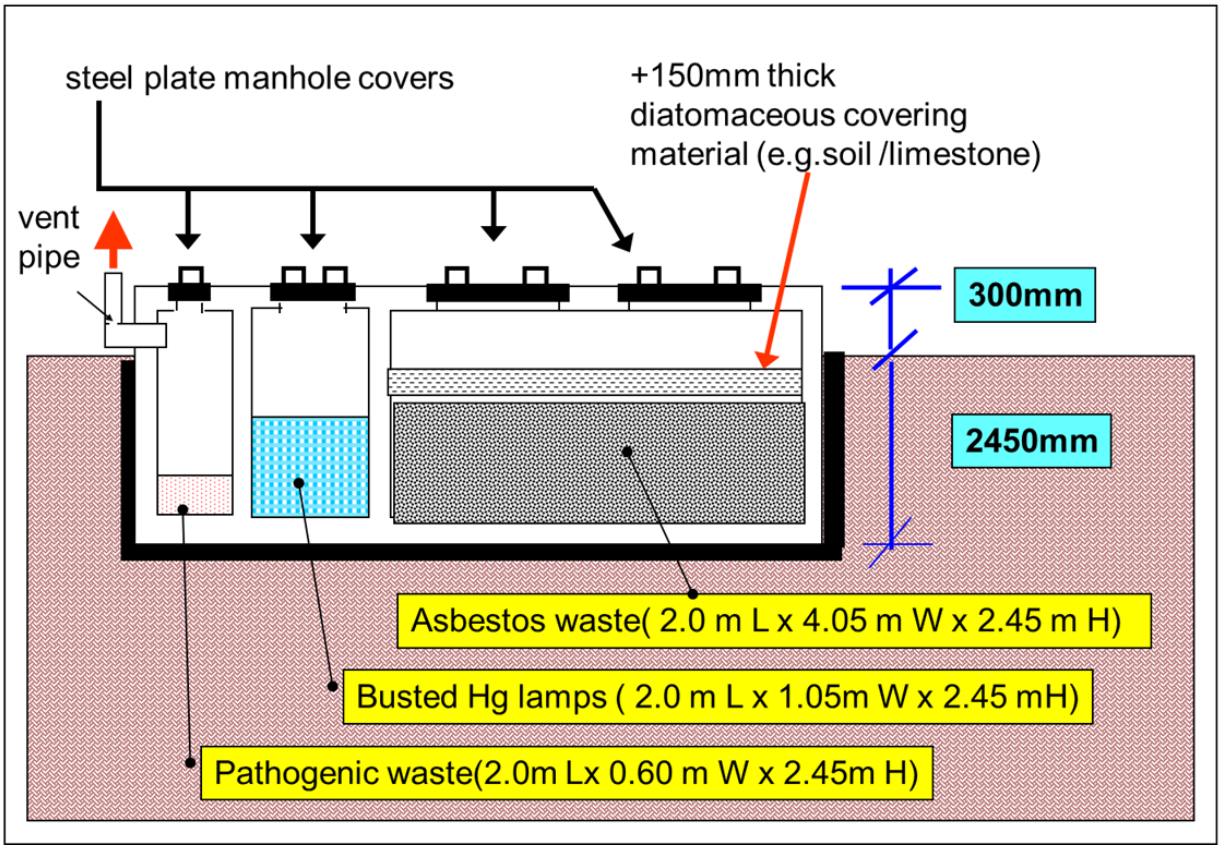


Plate 1.5.10. Underground tank for spent Asbestos, busted fluorescent tubes and bulbs, and pathogenic wastes

Based on the records, **Table 1.5.7** depicts the hazardous wastes generated by PSC. The types of hazardous wastes are listed from laboratory uses and maintenance, among others. Duly accredited treaters collect these wastes periodically.

Table 1.5.7. Hazardous wastes generated by PSC

Type of HW	HW Nature	Average Amount generated in 2020, kg/Ts
Barium Wastes	laboratory analysis wastes	20.2
Mercury Wastes	COD/SO_2 gas analysis waste	243.6
	Busted mercury lamps	30
Lead and Lead Compounds	Vehicle batteries, UPS, spent battery packs	312.8
Assorted Compounds	dry cell batteries	0.3
Lubrication wastes	lubricant grease from shops, vehicles and equipment	32,389
Waste oil	used fuel and engine oil	2,844.4
Oil contaminated wastes	cloth/rags/gloves	2.126
	damaged oil filters, hydraulic hoses	
Containers previously containing toxic chemical substances	lube drums	5,040
	paint/thinner cans	100
	freon containers	21
	assorted containers	77
Waste electrical and electronic equipment	Damaged electrical equipment (CB, ballast, switch, computer parts and accessories, electronic appliances, LED lamps)	1,615

Pathogenic wastes	Infectious wastes (includes used cotton, RBS strips, contaminated with body fluid)	1.1
	syringes	7.7
	contaminated sharps (needles, syringe, lancets)	0.6

Source: PSC, 2020

Prior to hauling for treatment, a Holding Station for temporary storage of various hazardous wastes is being maintained by PSC. Segregation of wastes generated from the daily operation of the plant is required. These are contained in Areas 1 to 6 prior to a scheduled treatment, which is every six (6) months. Based on the management program of PSC, wastes which were uniquely generated due to a) phase-out or restriction and b) requirement of specialized handling (asbestos, broken mercury-based lamps and pathogenic wastes are temporarily stored through an underground tanks as shown in **Plate 1.5.10** awaiting for treatment.

To prevent contamination and ensure traceability, each of the wastes – asbestos, busted Hg lamps, and pathogenic wastes are placed in different chambers as shown in **Plate 1.5.10** which has a maximum combined capacity of 27.93m^3 (Hg-Lamp = 5.145m^3, asbestos = 19.845m^3, pathogenic waste = 2.940m^3)**.** Spent Asbestos wastes which were old insulation materials of the Sinter plant decommissioned in 2000's were placed in heavy-duty polyethylene bags, then covered with soil and limestone upon storage inside the UGT. The same process is done for the M502 wastes which are primarily broken busted lamps. The pathogenic wastes are initially treated with disinfectant solution prior to storage inside the underground tanks. Proper hazardous waste labeling is being followed using a system that prevents tampering and weathering, maintains traceability, and visibility. **Annex 6.5** includes the Storage Management Program of PSC.

Port facility waste management and treatment

Waste generated in the berth facility includes solid and hazardous wastes from vessels and barges, and spillage at the berth during unloading of raw materials.

The Vessel Agent nominated by the vessel owners arranges for DENR-accredited waste transporters and treaters for the hauling of its solid and hazardous wastes out of the vessel and out of PSC for appropriate treatment.

For PSC, potential pollution sources include possible oil spills from vessels and water contamination by material spillage falling directly to the sea during unloading. It conducts a daily seaborne patrol to monitor condition in the sea, while security guard posts were put up in at least five (5) locations to monitor the condition of the sea and operation of the berth. All incidences of pollution particularly oil spills and discoloration are reflected in the logbook and reported directly to the management. The first guard post is in the seacoast, west of PSC just beside the STEAG perimeter fence. The main guard post is in the main berth, the third in the cargo berth, and the fourth and the fifth are facing the sea near the Limketkai Plant, east of PSC. These guard post are manned 24 hours a day, seven (7) days a week. Another post is constructed facing the Main berth which serves as the docking area of the motorized banca used in the daily seaborne Patrol.

For spillage management, daily stevedoring and spillage gathering is conducted to remove spillage in the Main Berth. A procedure was established (WI-ECC-062) specifically to prevent spillage material to contaminate the seawater.

For the oil spill, an oil spill management was already put up (**Annex 1.8**). Oil spill simulations/ oil spill drills were conducted in coordination with Petron and Phividec as well as the Philippine Coast Guard. Appropriate oil booms, the specification of which are approved by the PCG, are available for use in an event of an oil spill.

1.5.2 Proposed Expansion Project

Project Components

a. Ore Blending

The proposed ore blending facility is expected to produce approximately 9MMTPY of blend ore. The facility will be composed of various components including the establishment of a new berth facility with a total length of 324m and with a maximum barge capacity of 200kT and loading volume of approximately 14.4 MMTPY. Likewise, four (4) new yards each with a total length of 900m and width of 55m will be developed; three (3) yards beside the existing yard facility and another one in the east side, between the settling pond extending towards the eastside boundary. Other components include three (3) new stack reclaimers with a total capacity of 3,600T/H for stacking and 3,800 T/H for reclaiming, a blending stacker with a capacity of 3,800T/H, two (2) blending reclaimers with each having a capacity of 2,600T/H, and three (3) surge hopper each with a capacity of 80m^3.

b. Berth Construction and Enhancement

PSC plans to construct a 324m facility that can accommodate 200kt vessels and be able to load about 14.4MMT materials and unload an additional 5.0MMT raw materials.

Likewise, the existing 351m berth facility will also be developed and enhanced to increase the maximum capacity from 300kt to 400kt with a loading volume of 11.2MMTPY. Please see **Table 1.5.8** for the specifics. Among the improvements in the existing berth includes the enhancement of beam above sea, fender renewal for 400kT barge), light weight grab bucket, increasing equipment availability, increasing, and installation of berth corridors) (**Figure 1.5.6**).

Table 1.5.8. Specifications of berth

Berth	Specifications				
	Length, *m*	Volume of Material, *Mt/Y*	UL, *T/H*	SL, *T/H*	BC, *T/H*
New	324	Unloading: 5.0 Loading: 14.4 (Sintered Ore + Blended Ore)	1,800 x 2 units	6,000 x 1 unit	UL: 1,800 x 2 units SL: 6,000 x 1 unit
Existing	351	Unloading: 11.2 (Raw Materials)	1,800 x 2 units	6,000 x 1 unit	6,000 x 1 unit UL: 1,800 x 2 units SL: 6,000 x 1 unit

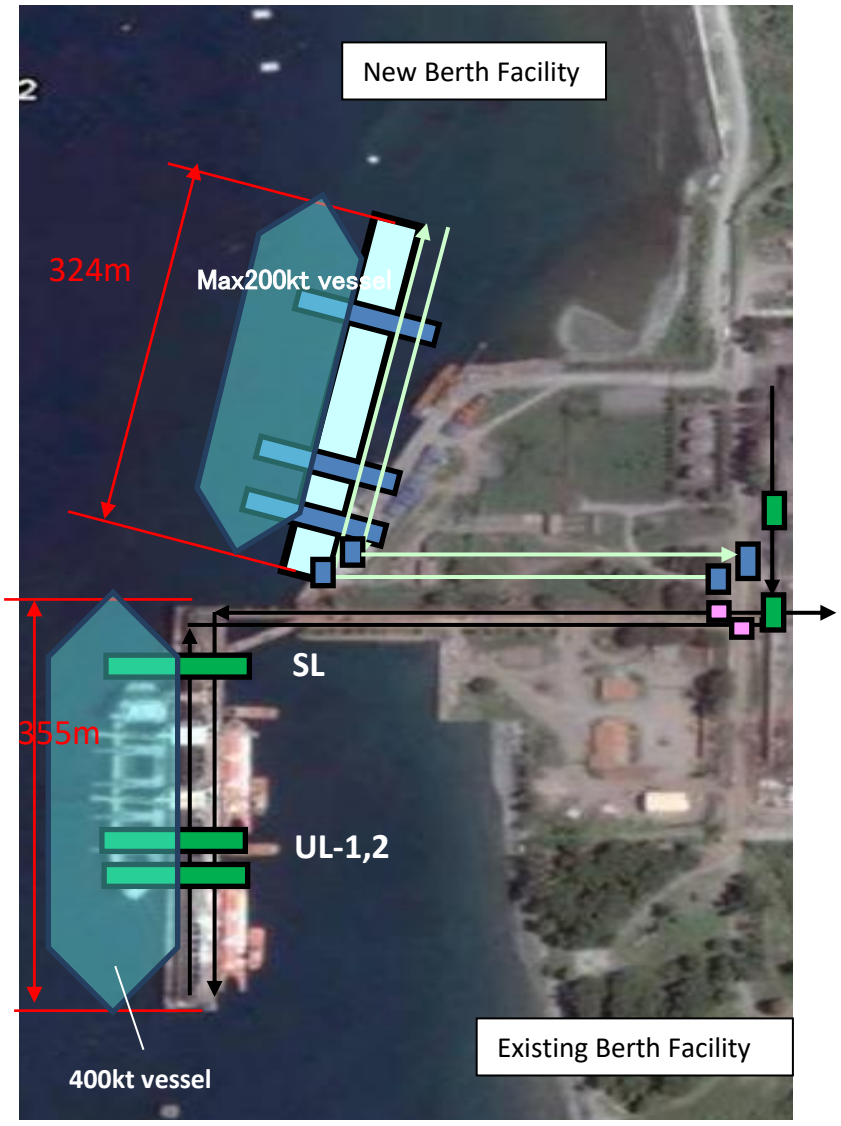


Figure 1.5.6. Berth construction and enhancement

c. Power Requirements

Approximately 1,594,000kWh of power will be used during the construction phase. These include lighting at the site office, workshop, and warehouse, site lighting, welding, and power

tool operations **Table 1.5.9** summarizes the temporary facilities to be constructed, tools to be used during the construction phase and the corresponding power requirements.

Table 1.5.9. Summary of power requirements during the construction period

Temporary facilities or tools	Capacity, kW	Operating Time, h/day	Load Factor, (-)	Duration, day/mo	Duration, month	Power Consumption, kWh
Mechanical						
Site Office/Workshop/ Warehouse	30.0	8	0.80	26	120	599,040
Site lighting	1.0	4	1.00	26	705	73,320
Welder	15.0	4	0.17	26	45	11,700
Power tool	1.0	4	0.17	26	660	11,400
Total	**47.0**					**695,500**
Electrical						

Temporary facilities or tools	Quantity, (-)	Capacity, kW	Operating Time, h/day	Load Factor, (-)	Duration, day/mo	Duration , month	Power Consumption, kWh
Site Office/Workshop/ Warehouse	4	30.0	8	0.80	26	9.0	179,712
Site lighting	80	1.0	4	1.00	26	6.0	49,920
Welder	20	15.0	4	0.17	26	3.0	15,600
Power tool	40	1.0	4	0.17	26	3.0	2,080
Total		**47.0**					**247,312**
Civil works	Including activities at the new berth, common berth and civil works						**650,000**

During the operation, the following will be required for the full operation of the new facilities:

- New berth - 270,000kWh
- New common berth - 160,000kWh
- New yard - 220,000kWh

d. Water Requirements

Majority of water use during construction shall be for domestic purposes, and cleaning of vehicles and equipment. It is estimated that approximately 800~1000m^3/day of water will be utilized during the construction phase.

During the operation phase, approximately 574m^3/day will use used for domestic, mechanical, and maintenance works. PSC shall facilitate proper flow of domestic water and discharge during the ore blending operation (**Figure 1.5.7**).

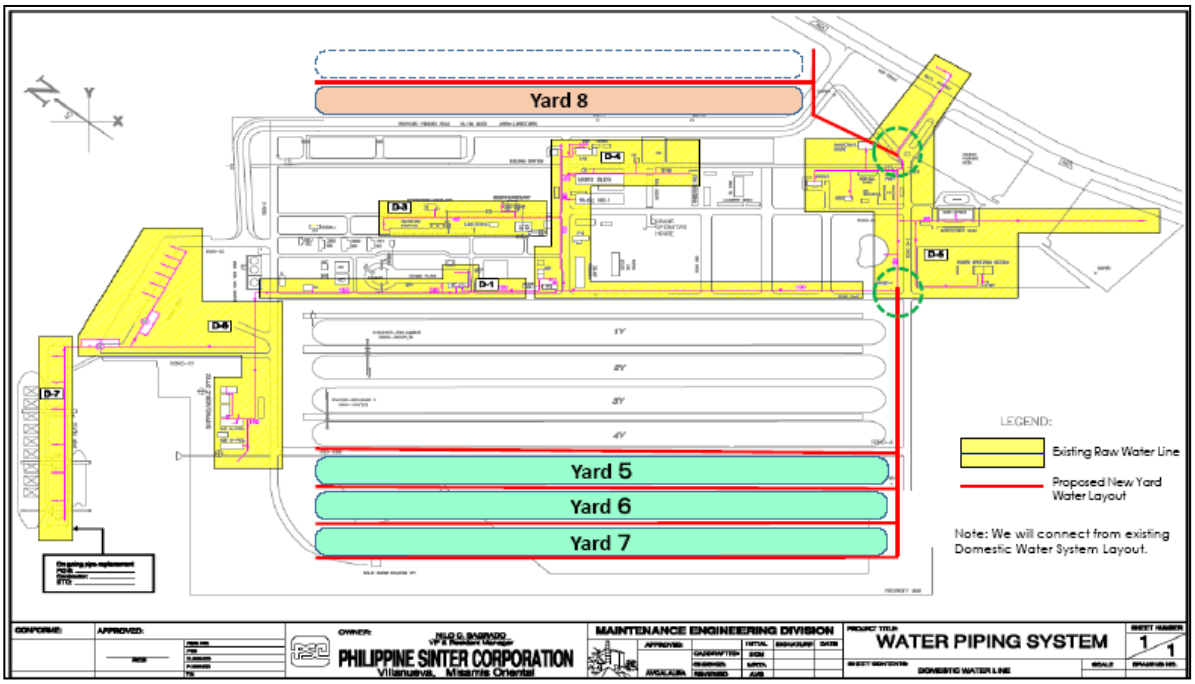


Figure 1.5.7. Waterline lay-out of domestic water during ore blending process

e. Fuel Requirements

During the construction phase, the use of cranes (65T rough terrain, 120T crawler, and 200T crawler) will have a total consumption of 218.4m^3 while the use of engine welder will consume about 7.8m^3 during the entire construction period. An additional 2,120,000L will be used for civil works. The diesel and gasoline fuels will be delivered via Lorry Tank Trucks. During the operation period, gasoline and diesel will be used mainly as fuel for utility motorcycles of inspectors, sampling vehicles for laboratory and maintenance, and services of the Material Handling Department and Mechanical and Electrical Departments.

Table 1.5.10. Fuel consumption during the construction phase

Capacity	Fuel	Tank Capacity	Operating time (hrs/day)	Unit consumption (L/h)	Usage ratio/term	Working days per month	Usage per month (m^3)
Crane							
65T rough terrain crane	Diesel	300	1	30	180	26	140.4
120T crawler crane		450		45	30	26	35.1
200T crawler crane		500		50	33	26	42.9
Remarks			Equivalent full load operation time (assumption)	10% tank capacity in case of full load (assumption)			
						Total	**218.4**

Table 1.5.10. *Continuation...*

Capacity	Fuel	Tank Capacity	Operating time (hrs/day)	Unit consumption (L/h)	Usage ratio/term	Working days per month	Usage per month (m^3)
Engine Welder							
5kW	Gasoline	15	8	1.67	0.5	26	7.8
Remarks				9 hours in case of 50% usage ratio			
						Total	**7.8**
Civil Works							
						Total	**2,120,000 L**

Since there will be no combustion process during the operation of the ore blending facility, fuel requirements is nil. Fuel consumption will only be for the use of service vehicle and operation of generator sets. Annually, about 480L of gasoline and 970L of diesel are being consumed for such use for the current operation. Moreover, the berth facilities and the new yard will consume the following:

- New berth - 520,000L
- Existing berth - 720,000L
- New Yard - 880,000L

f. Waste Generation

Solid Waste

During the construction phase that will run within 36 months, the estimated solid wastes to be generated from the yard and BC is approximately 801.04T. This is composed of approximately 175.98T of domestic wastes, which are mainly from waste paper/cardboards, kitchen wastes, and about 625.06T from civil works including waste wood, waste rubber, scrap metals, concrete waste/mortar, and plastics. Moreover, solid wastes will also be generated from the development of the berth facility, which is estimated to be about 2,169T of squanders from civil works. As currently being practiced by PSC, these wastes will be regularly collected by an accredited hauler for proper disposal at a designated facility.

At full project operation, PSC is expected to generate a total of about 7,000kg of squanders, mostly biodegradable and plastic wastes. Minimal wastes from the new facilities operation is expected and is mostly from domestic activities.

Hazardous Wastes

With the construction of the yard and new berth, hazardous wastes both from domestic and civil works will be generated (**Table 1.5.11**). Among the expected domestic wastes include used oil from transport vehicles, lead acid batteries, computer ink cartridge, and busted fluorescent lamps from office works. Squanders such as empty paint containers, used oil from heavy equipment, empty vulcanizing materials, welding butts, Hg lamps/busted fluorescent lamps, and lubricant drums are expected to be produced from civil works.

Table 1.5.11. Hazardous wastes generation during the construction phase

Source of wastes	Yard and BC	Berth	Total
Domestic			
Used oil from transport vehicles, *L*	789	382	1,171
Lead acid battery for transport vehicle, *pcs*	29	34	63
Empty computer ink cartridge, *pcs*	189	204	393
Busted fluorescent lamps from office, *pcs*	154	34	188
Civil			
Empty paint containers, *pcs*	58	15	73
Paint brushes and rollers, *pcs*	76	30	106
Used oil from heavy equipment, *L*	11,480	2,708	14,188
Lead acid battery from heavy equipment, *pcs*	64	45	109
Empty vulcanizing materials, *pcs*	306	76	382
Welding butts, *kg*	1,804	936	2,740
Hg lamps/ busted fluorescent lamps from construction area, *pcs*	110	64	174
Lubrication drums, *pcs*	36	8	44

Table 1.5.12 shows the estimated hazardous wastes generation during the operation. The expected wastes will come from the laboratory while other wastes such as electrical, used oil and other assorted compounds are expected.

Table 1.5.12. Estimated hazardous wastes generation during the operation

Wastes	Nature, unit	Total
Barium wastes, l	Laboratory analysis wastes, l	20.2
Mercury wastes, L	COD/SO_2 gas analysis waste, *L*	243.6
	Busted mercury lamps, kg	30
Lead and lead compounds	Vehicle batteries, UPS, spent battery packs, *pcs*	312
Assorted compounds	Dry cell batteries, *pcs*	0.3
Lubrication wastes	Lubricant grease from shops, vehicles and equipment, *L*	32,389
Waste oil	Used fuel and engine oil, *L*	2,844.4
Oil contaminated wastes	Cloth/rags/gloves, tons	2.126
Containers previously containing toxic chemical substances	Lube drums	5,040
	Paint/thinner cans	100
	Freon containers	21
	Assorted containers	77
Waste electrical and electronic equipment	damaged electrical equipment (CB, ballast, switch, computer parts and accessories, electronic appliances, LED lamps), *pcs*	1,615
Infectious Wastes (includes used cotton, RBS strips, contaminated with body fluid), *pcs*		1.1
Syringes, *pcs*		7.7
Contaminated Sharps (needles, syringe, lancets), *pcs*		0.6

The existing waste management measures of PSC will be adopted althroughout the project operation as priorly discussed in this chapter.

g. Frequency and Volume of Shipment

Table 1.5.13 presents the data on the capacity and vessel operation at the port facility. Currently there is an increase in the operation/shipment of vessels with higher tonnage capacity and this is projected to augment in the future operation. Shipments of PSC are through the operation of four (4) types of vessels including Handimax, Panamax, Cape Size,

and VLOC with the highest capacity of 300,000 DWT. In year 2021, the total number of shipment operations reached 107.

Table 1.5.13. Data on vessels capacity and shipment operation

No. of Incoming		2006 (year of highest production record)	2021 (latest year)
Vessel Size	Capacity		
Handimax	40,000 – 60,000 DWT	17	14
Panamax	60,000 – 125,000 DWT	44	60
Cape Size	125,000 – 220,000 DWT	40	28
VLOC	300,000 DWT	0	5
Total		**101**	**107**

During the full operation of PSC including that of the ore blending, about 45 deliveries of raw material by ship per year are expected. Each ship vessel carries approximately 200,000 WMT of raw materials or 9MMT per year.

Table 1.5.14. Data on shipment capacity and frequency

Vessel Type	Actual Based on Highest Production Year	Pellet Project EPRMP	SM Extension Project Description (No change in capacity)	Ore Blending EPRMP
Capacity	5 MMTY	7 MMTY	Same (5 MMTY)	9 MMTY
Handimax	17		Same	-
Panamax	44		Same	-
Cape Size	40	+35 (200kT)	Same	+45 (200kT)
VLOC	0		Same	-

1.6 PROCESS/TECHNOLOGY

1.6.1. The Existing Facility

The sintering operation (as being done by PSC) is the second step after mining, in iron-making process. Basically, the sintering operations involved the preparation of ore for the smelting process. The process involves the mixing of iron ore with coke breeze and limestone to produce sintered ore. The sinter facility was covered by ECC No. 9807-004-120, the Hydrated and Burnt Lime Kiln with ECC No. 0101-028-120 the Sinter Cooler Waste Heat Recovery with ECC No. 10(43)0608-084262-41100 and ECC No. 9207-006-120A for the 5.5MW stand-by generator set. In 2009, PSC was granted an amended ECC (ECC No. 0807-021-2711) incorporating all of the existing operations including the Iron Ore Pellet Facility. As consistently and duly reported in the 2nd half Compliance Monitoring and Verification Report (CMVR) in 2021, the proposed expansion to 12MMTPY which is attributed to the construction of a pelletizing iron ore facility has not yet been implemented considering the global situation of the steel industry affecting JFE steel production being the customer of PSC as well as the proposed installation of one (1) burnt lime kiln with a capacity of 100TPD. All other existing facilities as presented in **Table 1.1.1** are operational and capacities are within the approved limits.

From July to December 2021, PSC has produced about 1.927MT of sintered ore and burnt lime kiln production is marked at 21,447T.

1.6.1.1 The Burnt Lime Facility

The PSC operations use different types of material including limonite ore. To improve the sinter machine productivity, burnt lime is used. Using Bunker C, limestone is heated to produce burnt lime and stored in a hopper.

1.6.1.2 The Sintering Facility

The whole sintering operation is composed of four (4) major steps. These are:

- Receiving of ores from bulk shipment;
- Stockpiling of ores at the yard;
- Feeding to the hoppers and sintering; and
- Stockpiling of final product for shipment.

Sintering consists of mixing fine iron ore with solid fuel and flux such as limestone and burning the mixture under controlled condition to produce hard but permeable lumps, which are ideal blast furnace feed. This mixture is spread evenly over a continuous train of pallets of the sintering machine in a uniform bed of thickness and then ignited with oil burners. The entire strand is under induced pressure provided by huge blowers. The blended materials are then subjected to high temperature indurations and agglomerated into big blocks of sintered ore. A crusher breaks these blocks into lumps below 150-mm size which are then cooled.

The sintered ore is brought to the cooler from the sinter machine at temperature approximately 650^{o}C. At the sinter cooler, ore is cooled down to below 100^{o}C by cooling air. Cooling air is heated when passed through the sintered ore layer and blown off to the atmosphere and hot gas at temperature from 400^{o} to 450^{o}C is extracted by the Sinter Heat Recovery Facility's Induced Draft Fan (IDF) to the Boiler for super-heated steam generation and consequently, power generation. The current production process is shown as **Figures 1.6.1** to **1.6.4**. The final product is bought to the stockyard to await shipment. The sintered iron ore is used in iron and steel making process using blast furnace.

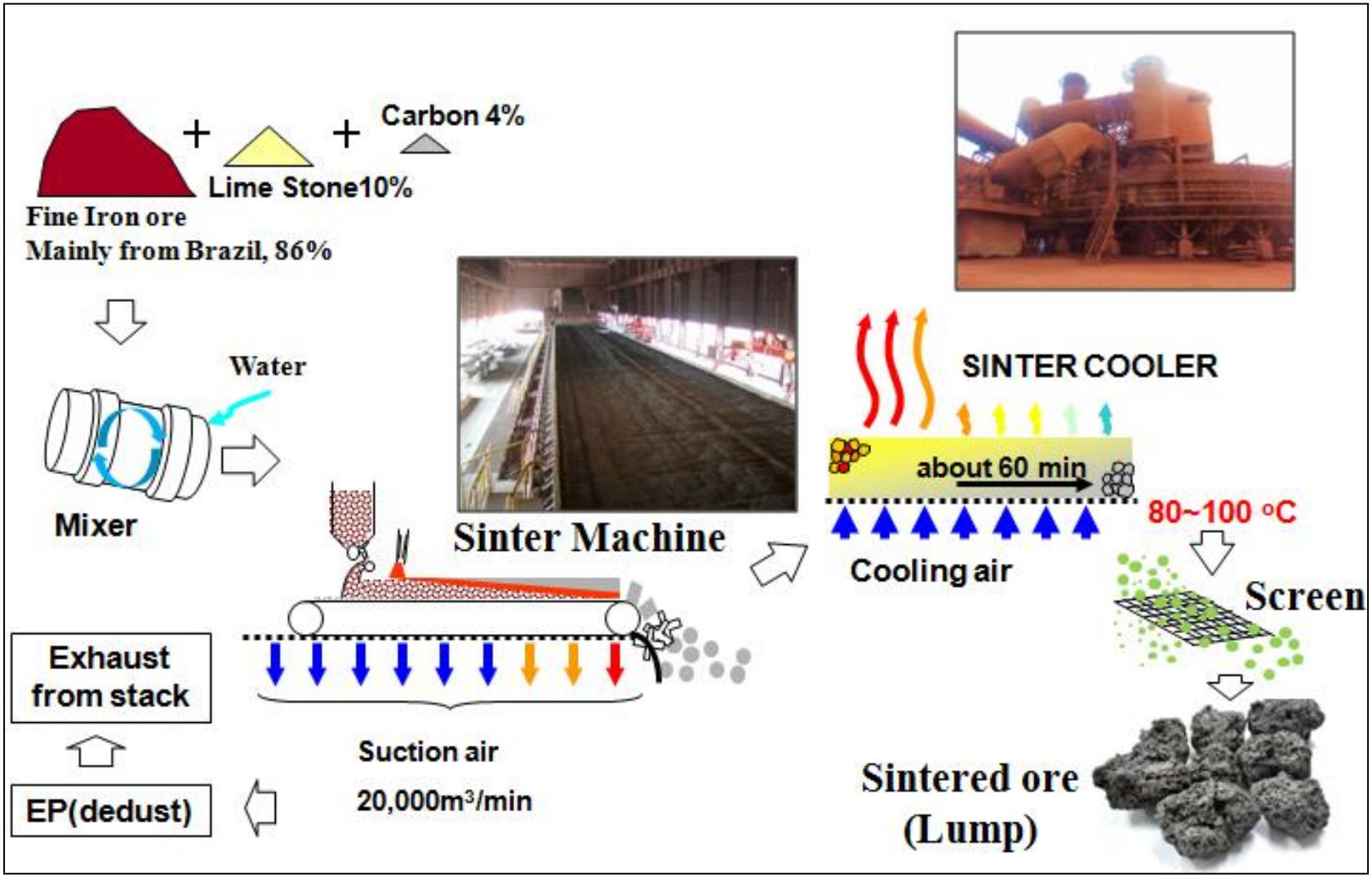


Figure 1.6.1. The PSC sintering process

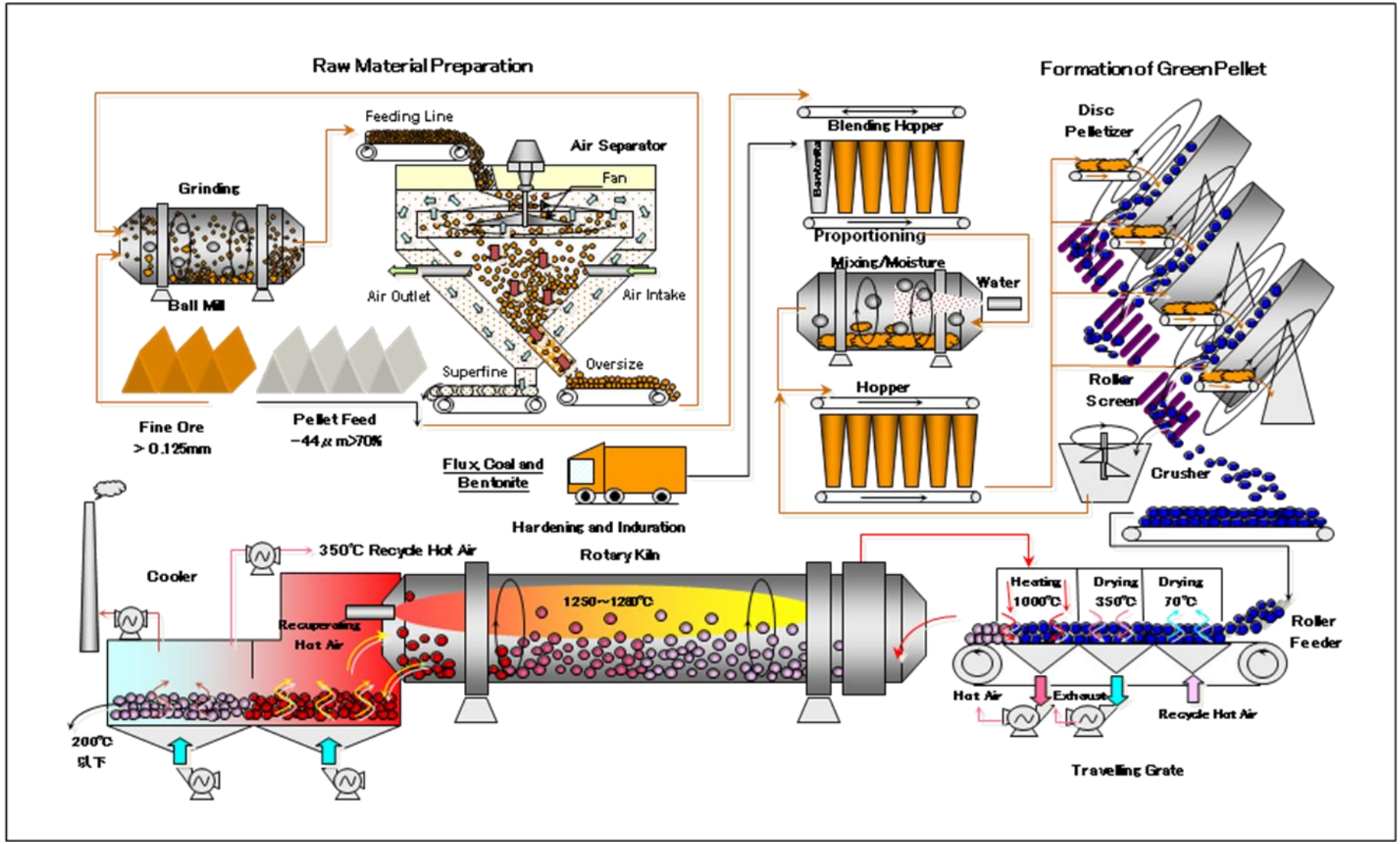


Figure 1.6.2. Grate kiln process flow diagram

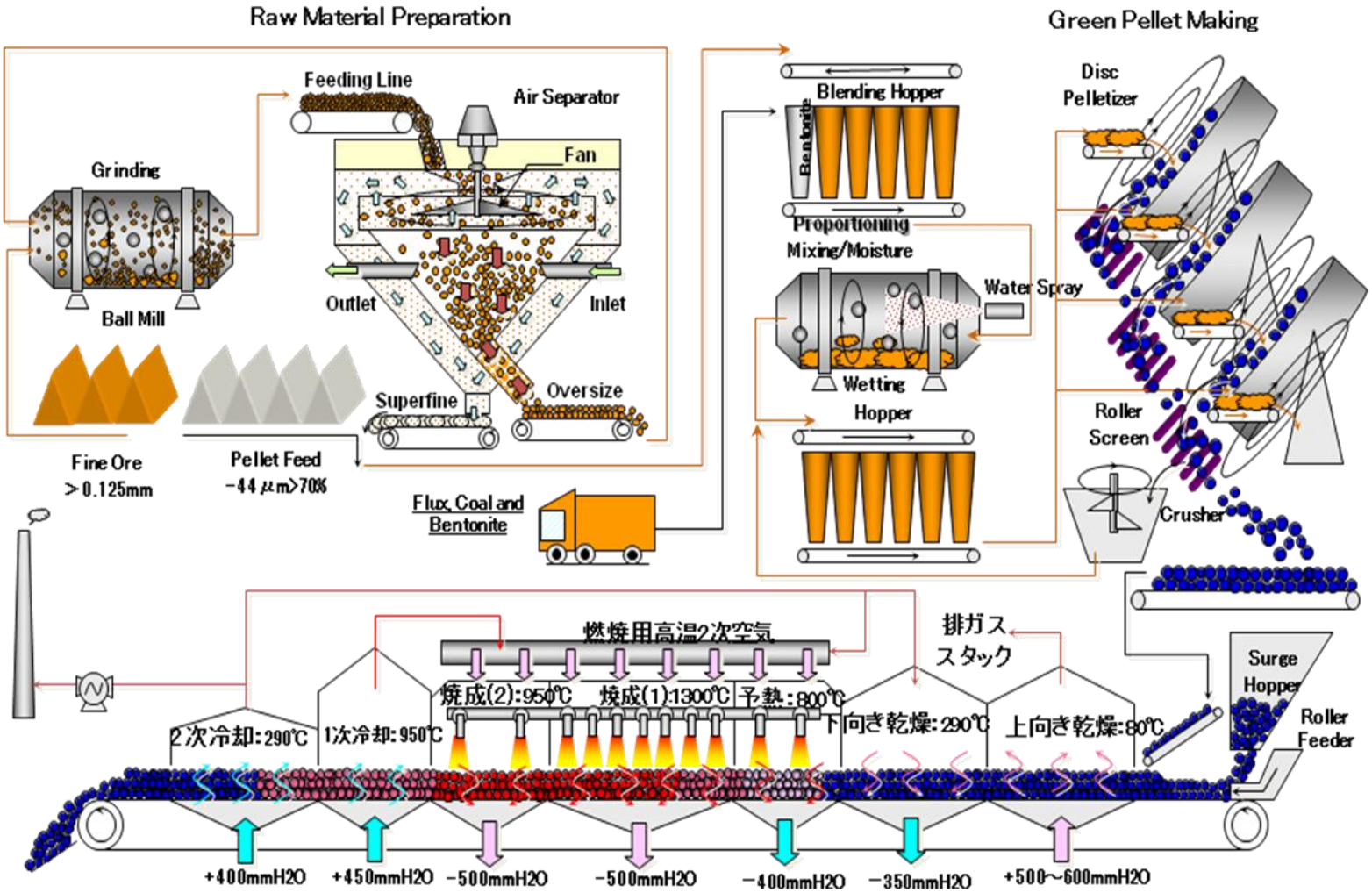


Figure 1.6.3. Downdraft Dwight Lloyd Sintering Process diagram

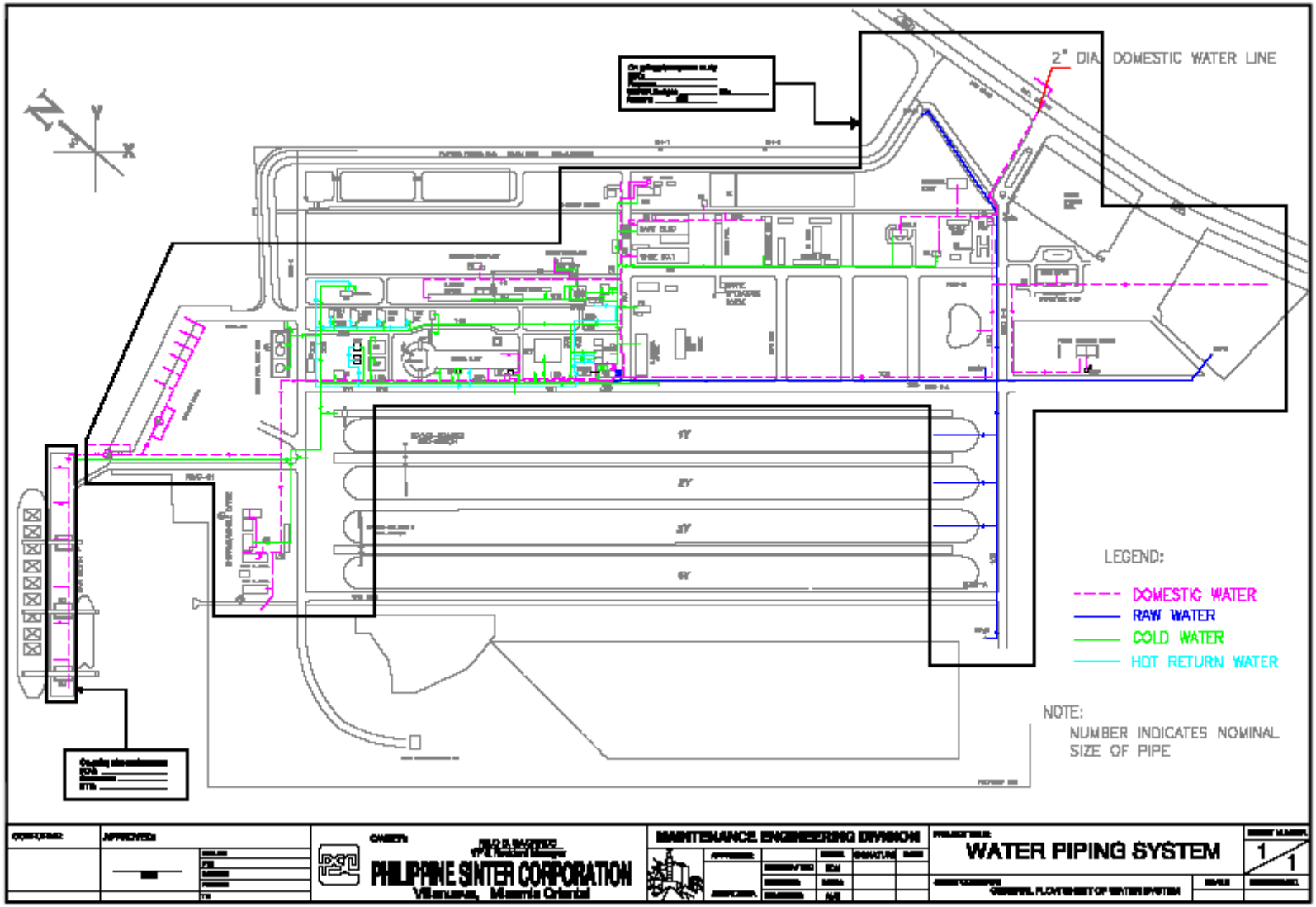


Figure 1.6.4. Water intake and pipeline systems

1.6.1.3 Sinter Cooler Waste Heat Recovery Operations

PSC embarked on the Sinter Cooler Waste Heat Recovery Project to maximize resource use by tapping of heat generated by the sintering operations to produce power. Improvement in the current technology and the implementation of the CDM mechanism of the Kyoto Protocol[4] allows PSC and JFE to tap this resource for power generation. This heat recovery project is covered by ECC No. 10 (43)06-08 4262-41100.

The Sinter Cooler Waste Heat Recovery Power Generation Project utilizes the waste heat carried by the sinter cooling gases, which were previously lost (by dissipation) to the atmosphere to generate electricity. The process involves the recovery of the hot air from the sinter cooler which are then passed through the Heat Recovery Boiler (HRB). At the HRB, pure water is turned into superheated steam by heat transfer from the hot air. Superheated steam is expanded at the turbine and thus, generating electrical power. Using the turbine which is connected to a generator, 18,600 KW of electricity is generated. The simplified diagram of the power generation process is presented in **Figure 1.6.5**.

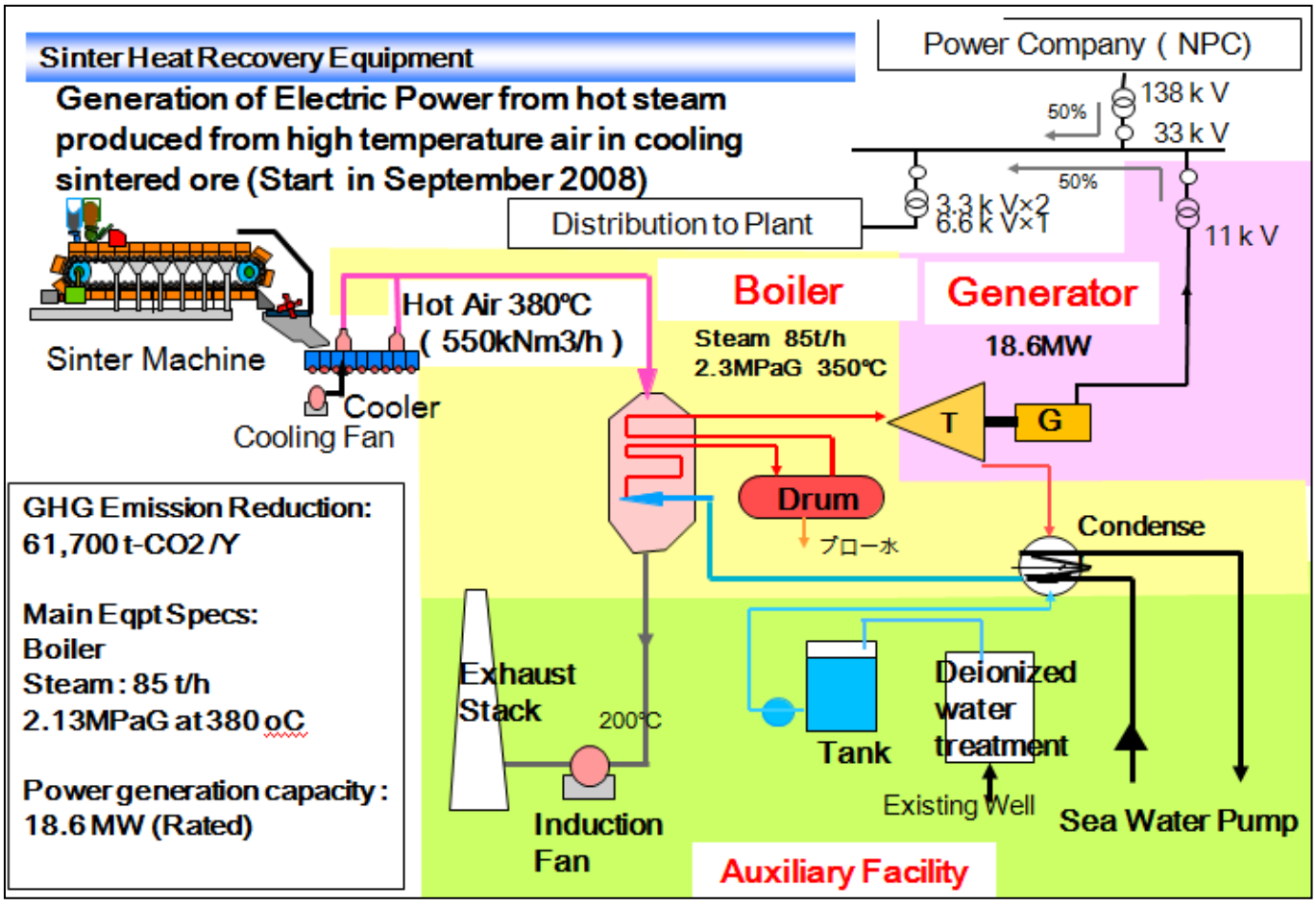


Figure 1.6.5. Power generation process diagram

[4] *The KYOTO Protocol is the operational procedure of the United Nations Framework Convention on Climate Change (UNFCC) to help reduce the amount of greenhouse gases (GHG) in the atmosphere in order to arrest global warming.*

1.6.2 The Proposed Expansion

1.6.2.1 Ore Blend Facility

Iron ore from countries such as Brazil and Australia will unload in PSC's unloading facility and unloaded ores will be stacked separately by brand in the ore yard. When used for blending, the ores will be reclaimed by a reclaimer and will be fed into one of the three hoppers through belt conveyors. One brand of ore shall be fed in one hopper. To proceed with the blending, the blending ratio of the different ores is first determined. Each ore will then be discharged in each hopper and the quantity of each ore shall be controlled by constant feed weighers (CFWs). Finally, the material discharged in the CFWs is carried by a single belt towards the blending yard where it is uniformly discharged by a moving stacker to create a 240-m mixed ore pile (about 220-kT). As soon as a 220-kT blended pile is created, the stacker then moves to create another blending pile in the same yard, adjacent the newly-created pile. The pile is then reclaimed for loading in the berth through conveyor belts and a loading equipment in the berth.

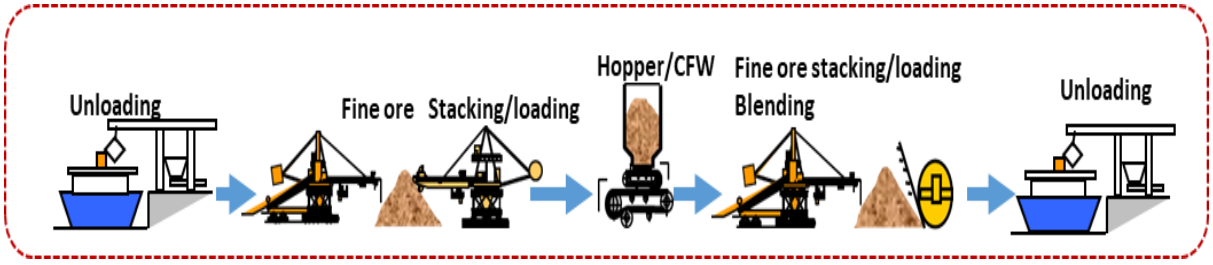


Figure 1.6.6. Process flow diagram of ore blending

The same pollution control facilities at the current operation of PSC will also be utilized once the proposed project commences. **Table 1.5.5** lists the complete inventory and specifications of the pollution devices.

1.7 PROJECT SIZE

1.7.1 Summary of Area based on the ECC

As discussed in presented in *Section 1.1.3,* PSC was granted ECC 0807-021-2711 in 14 April 2009 covering all the existing facilities and the proposed iron ore pellet plant facility of PSC, superseding all the ECCs granted to PSC. For reference, **Table 1.7.1** summarizes the area covered by the entire operation of PSC.

Table 1.7.1 Summary of PSC area based on ECC

Documents	Area	Area, ha
PHIVIDEC Lease	Land	131.90
	Foreshore/ offshore	16.06
	Total	147.96
Pellet Project EPRMP	Land	133
Sinter Machine Extension	Land	119
	Entire PSC Complex	133
	ECC. No.	144

Documents	Area	Area, ha
	0807-021-2711	
Ore Blending Project EPRMP	Land	131.90

Table 1.7.2 summarizes the history of area breakdown of PSC including offshore and land development. In total, PSC utilizes about 147.96 ha for its operation including 131.90ha of inland facilities and 16.06ha offshore facilities including the main berth and additional area for SHR.

Table 1.7.2. Breakdown of foreshore/offshore area allocation of PSC

Status of Lease Agreements	Location	Project component	Area, m^2	Hectare	Total	Coverage	Expiry
Expired	Land + offshore	Sinter Plant	1,380,000	138.0	143.3	Aug. 13, 1974	Dec. 31, 1999
		Sinter Plant (additional)	53,083	5.3		Apr. 11, 1975	Apr. 10, 2000
		Existing because it is mentioned specifically in lease renewal	84,256	8.4		Jan. 1, 1981	Dec. 31, 1999
Existing	Land	Sinter Plant	1,185,375	118.5375	131.90	Jan. 1, 2000	Dec. 31, 2049
		SHR	133,625	13.3625		Aug. 22, 2007	Aug. 23, 2032
	Offshore	Main Berth	116,793	11.68	16.056	Jan. 1, 2020	Dec. 31. 2049
		Additional (SHR)	43,767	4.377		Jan. 30, 2008	Jan. 31, 2033
TOTAL Existing (Land and offshore)					**147.956**		

Table 1.7.3. PSC Support facilities

Support facilities	General Description
Current Operation	
Parking lots	Main Parking Terminal: 3,585.05m^2 Visitors' Parking Area: 673.68m^2 beside Administration Building Bicycle motor shed: 86m^2 Bike Motor Shed – Admin Building: 76m^2
Access Roads/Walkways	67,537.01m^2
Landscaping/Garden	Japanese Garden: 1,643.88m^2 "Jurrasic Park": 7,100.11609m^2
Electrical Room	Electrical motor storage: 360m^2 Receiving Station Supervisor Room: 198m^2
Maintenance Building	2,132m^2
Guardhouse	72m^2 Main Guardhouse in the Entrance with strategic guard post along the PSC perimeter
Canteen	235m^2 separate building where lunch of employees are prepared
Storage rooms	WHSE NO.1 building - 1,600m^2 WHSE NO.2 : 625m^2 WHSE NO 3: 490m^2 WHSE NO 3 storage area: 6,518.27644m^2 records warehouse: 68m^2 LUMBER SHED: 360m^2 Conveyor Shed : 720m^2 Roller Shed: 174m^2 Vulcanizing Material and Paint Storage: 96m^2
Clinic	Clinic is part of the 1120m2 Admin Building. It is located in the Basement and

	manned 24/7 by nurses, dentist and doctors of Polymedic General Hospital in Cagayan de Oro City Typical Floor Area of Field toilet Facility = 70m^2
Toilet facilities	Toilet facilities are integrated in all Filed offices and in every floors of the Administration Building. Separate CR for men and women in all toilet facilities
Motorpool	Overhauling Shop : 280m^2 New Motor Pool: 819 m2 (in Material Handling Department)
Repair shop/facilities	MCPI Repair Facility: 318.72m^2 Painting Shop: 48m^2
Proposed Expansion	
Guard house	Will utilize existing guard house as new project is within PSC complex
Toilet facilities	Will utilize existing CR facilities but at the construction area, portable CRs will be rented and placed at strategic locations
Field Office	Will utilize existing but unused field offices located in Mechanical Department and Material Handling Department
Equipment Parking	Existing Heavy Equipment Parking Area/ Motorpool will be utilized including during construction for the following equipments: 25ton Crane, Backhoe (0.35m^3), Backhoe (0.7m^3), Bulldozer (15t), Pay loader (1.2m^3), Road roller (8t), Dump truck (10t) and others

1.7.2 Comparison of the Existing and Proposed Project

Table 1.7.4. Comparison of the existing and proposed project

Descriptor	Current Operation (ECC No. 0807-021-2711)	Proposed Expansion
Capacity	12 MMTPY	9 MMTPY
Project Area	133 ha	Ore yard: 19.8ha New berth: 324m
ECC issued (Consolidated)	**ECC Ref. Code 0807-021-2711** Expansion of the Iron Ore Sintering Facility and Consolidation of ECC of the Existing Operations of the Philippine Sinter Corporation Plant	
Production Process	Downdraft Dwight Lloyd Sintering Process (Process flow in ***Figure 3.3-1***) Grate Kiln Method (Process flow in ***Figure 3.2-1*** and Process block diagram in ***Figure 3.4-4***)	Use of ore blend reclaimer and stacker
Utilities Requirement	**Water** – 2,705m^3/day **Electricity**: For Sintering CEPALCO – 24MW (less generation of SSHR & Generators (usually >10MW) Self generated – Design: 18.6 Actual: 13 MW (max) Sintering – 21.5 MW Power plant – 3 MW For Iron Ore Pellet 23.2 MWH (additional)	**Water -** 574m^3/day **Electricity**: New Berth – 270,000kWh New Common Berth – 160,000 kWh New Yard – 220,000 kWh
Raw Materials/Inputs	**Fuel (monthly) for Sintering** 806,245.22 liters Bunker C 147,964.58 liters Diesel 3,617.58 liters Gasoline **Fuel (monthly) for Iron Ore Pellet** Soft (Bituminous) coal: 14.1 kg Heavy oil: 3.8 kg Diesel: 4.7 kg [*note:* GK method is chosen due to its energy	**Fuel during construction:** New Berth – 520,000 L Existing Berth Facility – 720,000L New Yard – 880,000L

	efficiency. It's estimated that the heat requirement for the GK method will be as low as 292 Mcal/tp as compared to current level of 493 Mcal/tp] **Raw Materials for Sintering (per ton sintered ore) :** 1,029 kg of main iron blend including dolomite 112 kg of limestone; 67.3 kg of carbon source; and 0.76 L of fuel oil/ton SO Typical blend of iron ore: 65% Rio Doce 28% Carajas 7% Dolomite **Raw Materials for Iron Ore Pellet (per ton sintered ore):** 957.5 kg of iron 7.5 kg of bentonite 45.8 kg of limestone; 12 kg of dolomite 16.5 kg of Anthracite Coal [*note*: in addition to the fine ore that can be processed using the current facility/process, the proposed expansion will also be able to process *super* fine ores]	*Same raw materials*
Manpower requirement	200 – permanent 640 – contractual	Permanent – 24 Contractual – 30
Discharges/Emissions	**Raw material handling** – Suspended particulates **Windbox** – iron oxides, sulfur oxides, carbonaceous compounds, aliphatic hydrocarbons, and chlorides **Sinter Plant** – Suspended particulates, CO, NO_x, SO_x and heat, Petroleum products container and contaminated materials **Limekiln Operations** – Heat, suspended particulates and noise, Petroleum products container and contaminated materials **Power generation** – Thermal water, sludge from demineralization, Petroleum products container and contaminated materials **Administration office** – Papers, packaging, office wastes **Laboratory** – Spent acids, organic and inorganic washings and spills **Canteen** – Food wastes, packaging .materials, contaminated water from oil and grease **Motorpool** – Petroleum products container and contaminated materials, spent acids, battery	

Main plant components	Current Operation		Proposed Expansion	
	Annual Production rate	Area	Components	Area
Iron Ore Pelletizing Facility (enhanced port, ore yard, sintering facility of 12 MTPY)	7 MMPTY	Yard: 22 ha Jetty: 100 m long Plant: 10.965 ha	No change	
Sintering Equipment and facility\ies ○ 14 blending hopper (600 m^3 capacity) ○ 1 Dwight Lloyd type sinter machine (715 m^2 grate area) ○ 1 circular type sinter cooler with 457 m^2 bed area and 15,000 m^3/min	5 MMPTY	133,445.75	No change	

<table>
<tr><td>capacity
○ 2 mainblower with double suction type with 20,000 m^3/min capacity</td><td></td><td></td><td></td></tr>
<tr><td>Burnt Lime Facility
○ 3 Chisaki kiln
○ 11 sets of belt conveyor
○ 1 burnt lime hopper
○ 1 cage mill type burnt lime crusher
○ 3 sets bucket elevator
○ 2 vibrating feeder
○ 1 screw feeder</td><td>140 MTPD</td><td>442.00 m^2</td><td>No change</td></tr>
<tr><td>Project Components</td><td colspan="2">Current Operation</td><td colspan="2">Proposed Expansion</td></tr>
<tr><td></td><td>Components</td><td>Area</td><td>Components</td><td>Area</td></tr>
<tr><td></td><td>Port/Berth
○ 2 rail mounted bulk unloaders (1800 MTPH with an automatic recovery conveyor)
○ Pump and pipeline system
○ Rail mounted shiploaded with movable trimming chute
○ Main berth (355m with 400,000 DWT capacity
○ Berth No. 2 (230m)</td><td>11,005.00m^2</td><td>○ Four (4) yards (900m x 55m)
○ Surge hoppers
○ New berth (324m x 31m)
○ Conveyors (8,711 total length)</td><td>198,000m^2
2,000m^2
10,044m^2
13,868m^2</td></tr>
<tr><td>Project Components</td><td>Sinter Cooler Waste Heat Recovery
○ 1 forced circulation type heat recovery boiler
○ 1 condensing type steam turbine (18,600 kW rated output; 5,100rpm speed; 1.96 Mpa pressure; 345ºCtemperature (valve inlet); 700mm Hg exhaust steam vacuum at 84,700 kg/hr rated outlet)
○ 1 totally enclosed generator (air cooled, brushless synchronous generator was installed. It has a rated capacity (output) of 23,250 kVA (18,600 kW) and voltage of 11,000V with a frequency of 60Hz and rotating speed of 1,800rpm)
○ 1 water treatment</td><td>1,174.60m^2</td><td colspan="2">No change</td></tr>
</table>

	plant (200 m^3 feedwater and 5m^3/hr make-up water)		
	Administration Building, Gate and Garage/Terminal	5,971.70m^2	No change
	Recreational (park and courts)	13,905.01m^2	No change
	Uniflow kitchen	235.00m^2	No change
	Laboratory	1,178.50m^2	No change
	Warehouse	9,511.30m^2	No change
	Maintenance Building and Shops	4,649.90m^2	No change
	Waste Holding Station	164.00m^2	No change
	Electrical facilities	19,052.26m^2	No change
	Hydrated lime plant	125.00m^2	No change
	Material Handling Offices/Customs	1,729.92m^2	No change
	Cargo Berth Area and Storage Facilities	16,595.70m^2	No change
	Roads	67,537.00m^2	No change
	Settling ponds (total area including walkway)	66,387.23m^2	No change
	Others(fabrication areas/scrap yards)	30,631.00m^2	No change
	Ore yard (including conveyors) ○ 2 stacker (800TPH potable) ○ 1 rail mounted stack reclaimer (1,800/3,600MTPH)	265,264.20m^2	No change

Table 1.7.5. Summary footprint of PSC's existing and proposed facilities

EXISTING FACILITIES	Area (m^2)
Land	
Yard	265,264.20
Sintering Equipment and Facilities	133,445.75
Burnt Lime Facility	442.00
Sinter Cooler Heat Recovery	1,174.60
Administration building, gate and garage/terminal	5,971.70
Recreational (park and court)	13,905.01
Uniflow kitchen	235.00
Laboratory	1,178.50
Warehouse	9,511.30
Maintenance building and shops	4,649.90
Waste holding station	164.00
Electrical facilities	19,052.26
Hydrated lime plant	125.00
Material handling offices/customs	1,729.92
Cargo berth area and storage facilities	16,595.70
Roads	67,537.00
Settling ponds (including walkway)	66,387.23
Others (fabrication areas/scrap yards)	30,631.00
Acquired property East of PSC	80,500.00
Other Open Areas/ Greenbelts	260,750.00
Sub-total	*979,250.00*
Offshore	
Port/Berth	11,005.00
Open Sea Area	105,788.00
Lease # Main Berth	116,793.00
SHR	43,767.00
Total Offshore Lease	*160,560.00*

FACILITIES FOR DEVELOPMENT (covered in the current ECC)	
Land	
Pellet Facility	114,750
PROPOSED FACILITIES	
Land	
Ore yard	198,000.00
others (Conveying facilities leading to Berth, others)	27,000.00
Sub-total	*225,000.00*
Offshore	
Cargo Berth	10,044.00
Open Sea Area	29,657.00
Total Offshore area to be leased	*39,701.00*
TOTAL Leased Area (Land and offshore)	**1,519,261.00**

Table 1.7.6 details the specifications of the existing berth facility and the proposed expansion.

Table 1.7.6. Specifications of the berth facilities

Berth	Original plan	Existing	Ore Blending EPRMP (Current application)
The Main Port	351m	351m (+100m for the pelletizing facility)	355m (+4m extension as part of the port enhancement)
Main Berth	Can accommodate 300,000 DWT vessel	same	Can accommodate 400,000 DWT vessel
Mooring Dept	25 m	same	same
Cargo Berth	230 m	Same	324m and with a maximum barge capacity of 200 kT and loading volume of approx. 14.4 MMTPY
Mooring Dept	6 m	same	25 m

Water Balance

The sinter plant's daily requirement for freshwater will increase from 2,600m^3 to 5,143 m^3. Deepwell No. 4 and 6 will be the source of freshwater supply for the proposed expansion project. From the 3,696m^3 available freshwater supply for the sinter plant, PSC still has 522m^3 excess supply even after accounting for consumption for the Ore Blending facility. Freshwater supply from Deepwell No. 3 will be used for SO loading and emergency needs of the sinter plant operation. **Figure 1.7.1** presents the integrated water balance diagram for the existing and proposed expansion project of PSC. Refer also to **Table 1.7.6** for the water balance matrix.

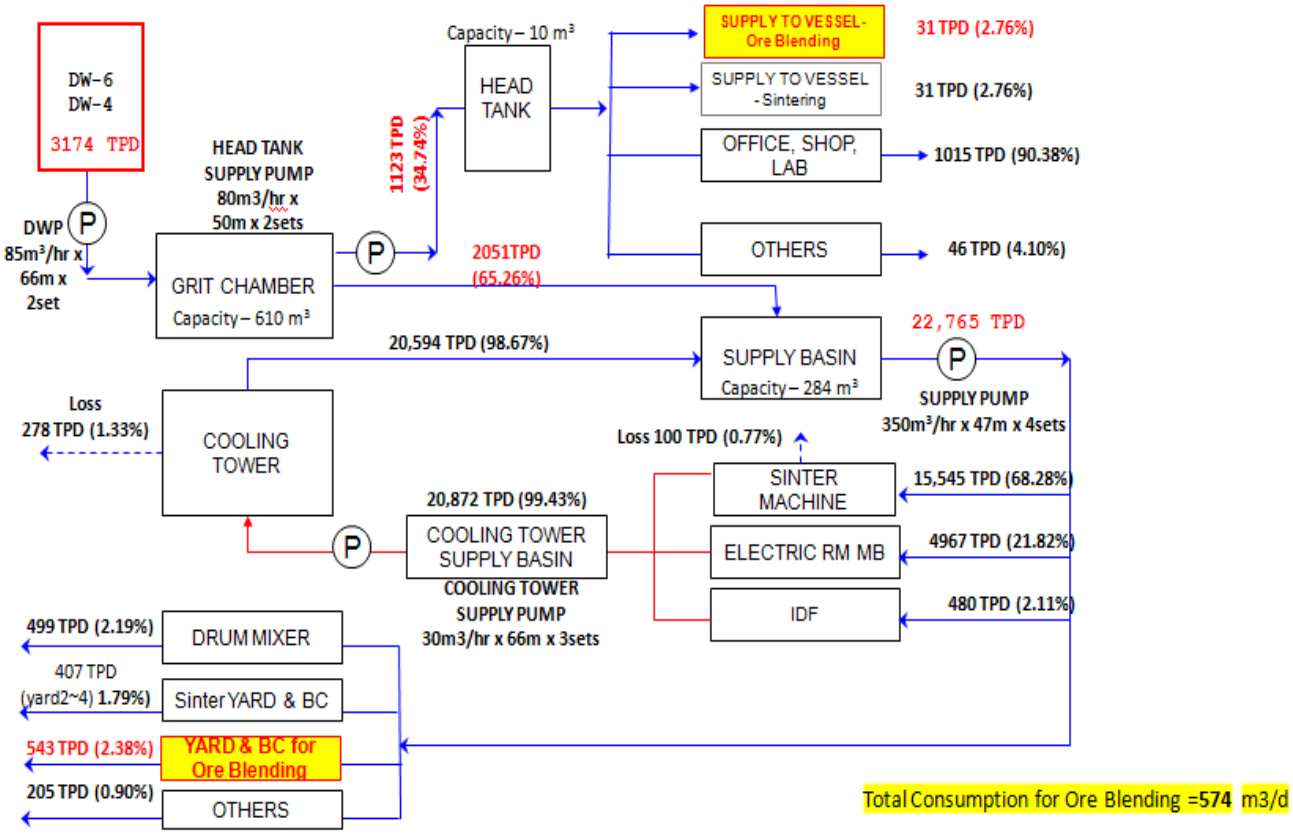


Figure 1.7.1. Integrated water balance of the existing and proposed expansion project of PSC

Table 1.7.7 Water balance matrix for the existing and proposed operations of PSC

Supply						
Source	**Rating, m³/hr**	**Actual**	**Utilization**	**Inside PSC, m³**	**Outside PSC, m³**	**Total**
DW4	85	74	24	1,776	-	1,776
DW6	85	80	24	1,920	-	1,920
Tagoloan River (for Pelletizing facility – *to be constructed*)	Average draw-out volume			-	1,342	1,342
Mapopong Spring				-	105	105
	Sub-total			*3,696*	*1,447*	*5,143*
Consumption						
Original	Supply to Vessel			30	-	30
	Office shops			1,070	-	1,070
	Make-up to Cooling Towers			1,400	-	1,400
	Loss			100	-	100
	SHR			-	105	105
	Pelletizing *(to be constructed)*			-	1,342	1,342
Additional	Ore blending			574	-	574
	Sub-total			*3,174*	*1,447*	*4,621*
Balance				**522**	**0**	**522**

From the above table, note that the pelletizing facility is yet to be constructed. Upon commencement, it will distinctively source its water from Tagoloan River. PSC will also develop a water pipeline to extract 1,342m^3/day water in nearby Tagoloan River. On the otherhand, PSC will maintain an excess capacity of water from the existing deepwells. In any case that the company decides not to pursue with the construction of the pelletizing facility due to economic downbeats, the total water available from deepwells and Mapopong Spring will be 3,801m^3/day while the total consumption will be 3,279m^3/day, giving an excess available water of 522m^3/day.

1.8 DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAME

1.8.1 Pre-Construction Phase

During the pre-construction period, among the significant activities include site surveying preliminary project area assessment. This is followed by the preparation of the Environmental Performance Report and Management Plan (EPRMP) for the ECC application. The EPRMP includes the assessment and documentation of performance of the PSC operations through time and the potential impacts and necessary mitigation and enhancement measures of the proposed expansion project.

1.8.2 Construction Phase

The construction phase involves various activities including site clearing and preparation, backfilling and applicable civil works, equipment installation, and testing and pre-commissioning. PSC shall abide by the standards and regulations pertaining to safety and quality of construction works to ensure structural integrity of the proposed expansion project. It is estimated that the construction of the new facilities will be accomplished within 36 months.

1.8.2.1 Clearing and Site Preparation

The proposed site area will be cleared and leveled according to the technical specifications. Minimal excavation, filling, compaction, and backfilling shall be done if necessary. A thorough geotechnical investigation will also be done on-site to ensure geotechnical stability of the ground where the foundation structures for the proposed new berth facility and conveyor system will be laid-out. Safety signages will be set-up in strategic locations to ensure safety of workers.

1.8.2.2 Backfilling and Foundation Establishment

Conveyor Systems

For the construction of the conveyor system foundation, site grading will be done. The elevation of Yard 5-8 shall be the same as that of yard 1-4. As of now, the elevation of the proposed yard 5-8 is of the same level as yards 1-4. Therefore, backfilling is not necessary. For foundations, excavated material will be used for backfilling. In case there is need for backfilling, PSC will source it from accredited aggregates supplier in the province. Excavation for isolated footing foundation will be established along the strategic areas based on the technical plans. Reinforcing bars for the foundation will be installed to reinforce the concrete. Foundations, once erected, will be left for some time for concrete curing. The construction of the conveyor belt system is expected to be completed within approximately 22 months.

New Berth Facility

It is estimated that the construction of the new berth facility will be finished within 27 months while the enhancement of the common berth facility is expected to be accomplished within 23 months.

Activities such as soil boring, hydrogeographic survey, dredging, pile driving, concrete works, and rail, anode and fender installation are the major works during the construction of the new berth facility.

Stackers and Reclaimers

Among the civil work activities that will be involved in the development of the yard facility include works for conveyor foundation, retaining wall, drainage system, ballast for yard equipment, trench for electrical cable, electrical room, foundation of hopper, and transformer.

1.8.2.3 General Civil Works

The overall construction works for the project is expected to be completed within 27 months.

Civil works is divided into two (2) phases: earthworks and main civil works. During the earthworks, the following activities shall be employed:

- Construction of staging areas and temporary facilities for the labor force;
- Installation of provisional site utilities such as water, electricity, illumination, and waste disposal;
- Site drainage construction;
- Mobilization of major construction equipment and tools (e.g., bulldozers, cranes, dump trucks, vehicles) and manpower levels to accomplish the sequence of establishment activity;
- Establish main site logistics and transport requirements; and
- Delivery of construction materials and supplies that will be used.

During the main civil works, the following activities will be done:

- Excavation of the main foundation areas (conveyor system, silos and bulk loading facility) for consolidation;
- Forming and pouring of the foundations for equipment and construction of other major components;
- Civil works; and
- Finishing works.

1.8.2.4 Equipment Installation

After the main civil works, the installation of stackers, reclaimers, and conveyor system, will be done.

Drive motors of the conveyor system will be installed at the loading and transfer points together with the rollers and cleaners along the conveyor belt. Self-alignment rollers and safety equipment are included in the system that will ensure continuous delivery of cement from unloading facility to the cement silos.

At the berth facility, iron cast for mooring and side rubber stoppers for vessels/barge protection will also be installed.

1.8.2.5 Testing and Pre-Commissioning

The Pre-start up and test operation (commissioning) are expected to begin by October 2024. These activities will primarily involve the inspection and pre-operational check-up of all major equipment/components including control logic. Many of these pre-operational checks are conducted in parallel with other construction activities. Generally, pre-operational activities are expected to be completed also the by October 2024 when installation of all equipment is also completed. Furthermore, these activities must be accompanied by completion of other related activities, such as proponent's operating staff on site for training.

1.8.2.6 Construction Schedule

The Gantt Chart for the entire construction phase is depicted as **Figure 1.8.1**.

1.8.3 Operation Phase

The construction of the proposed project is expected to be completed after 33 months. However, it will take about three (3) months for PSC to perform the commissioning phase once all the components are in place. The testing of the entire expansion project will be done within three (3) months. Commercial operation is therefore expected in the 36th month.

Iron ore will be unloaded from ore vessels in the either old and New Berth and will be conveyed in yards 5 to 8. From these four (4) raw material yard, PSC will reclaim the ores using Stacker Reclaimers for feeding to surge hopper. By feeding the material to the hoppers, fixed amount of each material will be discharged constantly. PSC will use a Distributed Control System (DCS) for monitoring and controlling weight in Weighers along the BC line. On the other hand, Programmable Logic Controller (PLC) will be utilized for sequential running of motors to drive conveyors.

In the blending yard, raw material on will be stacked in multiple layer. There will be two (2) piles: One is the Blending Pile while the other one is the Reclaiming Pile where blended ore is reclaimed for shipment. As soon as all the materials in the Reclaiming Pile are reclaimed, it now converts into a Blending Pile. A 200kt-capacity vessel will be used for loading and unloading.

During the full operation of the plant, he materials will be imported from Brazil, Canada, India, and Australia. PSC is still open to source from other countries such as the Ukraine.

It terms of fuel utilization, it is expected that the proposed operation of the ore blending facility will only require minimal fuel for service vehicle and operation of the generator sets. By estimates, the new berth facility will annually consume about 520,000L, the existing berth about 720,000L and 880,000L of fuel for the new yard facility to be delivered through lorry tank trucks.

Solid wastes generation during the operation of the ore yard and berth facilities is about 7,000kg of squanders, mostly biodegradable and plastic wastes from domestic activities. Various hazardous wastes will also be generated including laboratory wastes, busted

mercury lamps, vehicle batteries, UPS, spent battery packs, dry cell batteries, lubricant grease from shops, vehicles and equipment, used fuel and engine oil, oil contaminated cloth/rags/gloves, lube drums, paint/thinner cans, infectious wastes, syringes, contaminated sharps, and electrical wastes, among others (see **Table 1.5.12**). PSC will be implementing the existing management measures for solid and hazardous wastes disposal. Essentially, solid wastes will be segregated and regularly collected for proper disposal by an accredited hauler. Among others, PSC also adopts the product stewardship program includes returning of empty containers to the factory/seller/origin.

PSC will maintain proper handling of hazardous wastes storage/disposal area as presented in the prior section. Asbestos, busted mercury lamps, and pathogenic wastes will be contained in different chambers prior to the scheduled hauling by an accredited treater. Proper hazardous waste labeling, as being practiced by PSC will be done continuously upon the project operation.

Moreover, the proposed project will have shutdown period of about 50 days (at 0.95 utilization ratio) annually including 45-day preventive maintenance servicing (PMS) to ensure efficient and reliable operation of the equipment. In order to uphold a dependable and efficient operation, the equipment will have a customary preventive safeguarding program based on the running hours to prevent any catastrophic damages.

Environmental safety mechanisms will be installed in strategic areas within the project site. To prevent fugitive dust emissions, the following will be implemented:

- Water spray system will be installed in unloading lines to spray water directly to material in case the unloaded material is very dry;
- Conveying lines will be covered with arc roofing with a total length of 4.136km;
- Green belt zone planted with fast growing native species and bamboo will be maintained along the PSC perimeter;
- Regular water spraying by water truck will be conducted especially during dry season; and
- Drain water during heavy rain will be catered by the existing settling pond to reduce suspended solids in the water and should be within the acceptable standard prior to discharging to the effluent channel.

Figure 1.8.2 is the process flow diagram of the ore blend project.

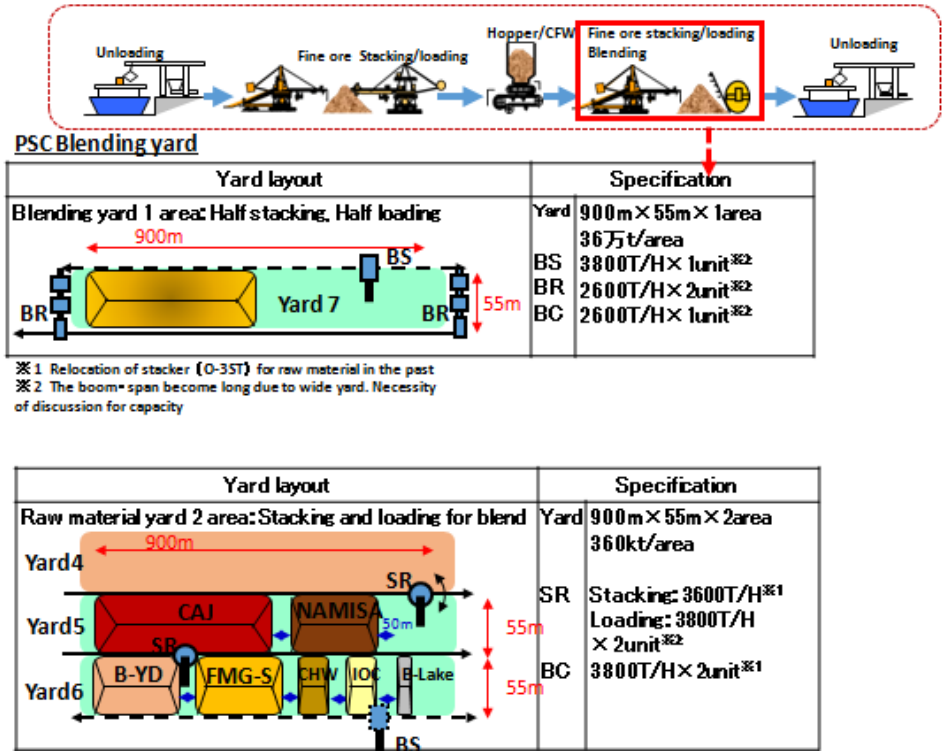


Figure 1.8.2. Process flow diagram of the proposed Ore Blending Operation

1.8.4 Abandonment Phase

The existing operation of PSC has an estimated commercial life of 50 years. Before the projected end of commercial period, the performance of PSC will be re-evaluated in consideration with the economic status. All business aspects including market aspects and business settings will be assessed accordingly. In case of a need for decommissioning, PSC will prepare a Decommissioning/Abandonment and Rehabilitation Plan in accordance with applicable statutory and regulatory requirements.

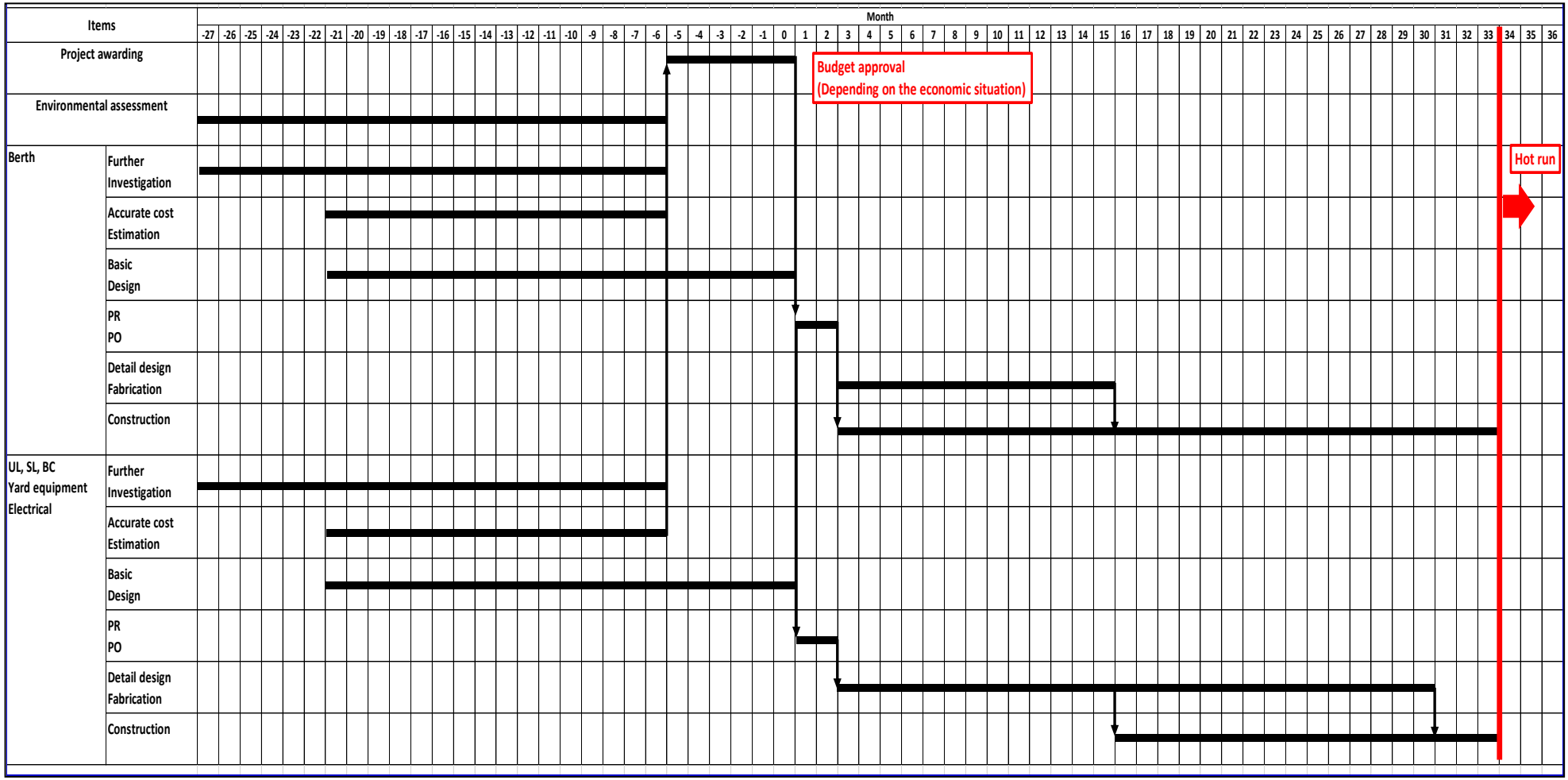


Figure 1.8.1. Gantt chart of the proposed Ore Blend and New Berth Facility Project of PSC

1.9 MANPOWER REQUIREMENT

Majority of the workers will be unskilled workers during the initial phase of construction involving site preparation, earth works, and civil construction. The estimated manpower requirement during the development of the PSC Expansion Project will have a total of 702 workers with an estimated collective man-months of 22,476. Please refer to **Table 1.9.1.**

Table 1.9.1. Manpower requirements for the development of the proposed Ore Blend and New Berth Facility

Manpower Requirement		Total man-months	Scope of Work
Mechanical	581	10,056	Crane Operation (200t, 120t, 60t), Welders, Power Tool Operators, Site Light operators, Office staff & Support and general maintenance & fabrication workers)
Civil Works		9,200	(Dredging Work, Pile Driving Work, Pile Fabrication Work, Earth Works, Concrete Work)
Electrical	105	3,220	General Electricians, Aircon-Technicians, assistants in installation of programmable logic/automation controls, Cable Lay-outing, etc
Support staff	16	-	General work assistants
Total	**702**	**22,476**	

During the operation phase, it is projected that the manpower requirement of the proposed project will be 24 regular staff and laborers. PSC will also involve 18 contracted workers for stevedoring and spillage gathering. **Table 1.9.2** shows the tabulated manpower requirement of the project.

Table 1.9.2. Manpower requirements for the operation of the proposed Ore Blend and New Berth Facility

Manpower Requirement	Minimum Skill/Competency	Total
Regular		
Berth operations (engineering, maintenance)	Graduate of Electro-Mechanical Trade Course	6
Ore blend facility (engineering, maintenance)	Graduate of Electro-Mechanical Trade Course	16
Administration	Graduate of IT/HR and Business-related Course	2
	Total	**24**
Contracted		
Stevedoring	Elementary or Highschool Graduate	10
Spillage gathering	Elementary or Highschool Graduate	8
	Total	**18**

1.10 PROJECT INVESTMENT COST

The projected capital expenses needed for the development of the proposed Ore Blend and New Berth Facility of PSC including mechanical, electrical, and civil works is approximately Twenty-Three Billion Pesos (PhP23 Billion).

2 ASSESSMENT OF ENVIRONMENTAL IMPACTS

The proposed Ore Blend and New Berth Facilities Project of Philippine Sinter Corporation (PSC) will be located within its existing complex in the Municipality of Villanueva, Province of Misamis Oriental. This *Chapter* discusses the baseline condition of the proposed project site including the analysis of various aspects of the environment such as land, water, noise, and the surrounding community. The assessment also considered the results of PSC's monitoring in recent years of operation. Moreover, the potential impacts of the proposed project to the environment and people are likewise presented.

2.1 THE LAND

2.1.1 Land Use and Classification

2.1.1.1 Methodology

The study and assessment on land use covered the review of existing literature and maps of the project area. Existing land uses and vegetation units were identified, described, and represented on a map. The identification of the different vegetation/land uses was done with the aid of Google Earth imagery interpretation.

2.1.1.2 Baseline Conditions

The plant site of PSC is located in the Municipality of Villanueva, and is 25 km away from the City of Cagayan de Oro. Villanueva is a coastal town with Macalajar Bay on the west. It is bordered by the Municipalities of Claveria, Jasaan, and Tagoloan on the east, north and south, respectively.

Based on the Comprehensive Land Use Plan (CLUP) of the Municipality of Villanueva, a total land area of 3,824.99 ha is devoted for agricultural production of which 3,720.99 ha is reserved for production while about 104.0 ha is reserved for protection. Forestlands account for 130.25 ha, built-up area around 123.2 ha, and industrial 144.0 ha.

The CLUP of the Municipality of Villanueva increased the allotted areas for built-up and industrial use. Built-up areas were increased by 224 ha and the industrial areas to 157.5 ha. The agricultural area devoted to production will decrease in area by around 114 ha. Majority of the area currently allocated for industrial use is occupied mainly by PSC. Of the total 133 ha total PSC property, only 63.8 ha were currently utilized by the sintering plant and its related activities. For the proposed expansion, a total of 224 ha will be utilized while the remaining areas of the property will still be set aside for open space/green areas. The expansion area is already located within the designated industrial area thus, there is no conflict in land use. **Figure 2.1.1** shows the Land-Use Map of the municipality.

2.1.1.3 Impact Assessment and Environmental Performance

Table 2.1.1. Predicted impacts of/on land use and classification to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Change/ Inconsistency in land use					This impact is not significant since the total area currently possessed by PSC were already set aside by the municipality as Industrial Area as part of the Phividec Industrial Authority (PIA).
Encroachment in Environmentally Critical Areas (ECA's)		☑	☑		Among the categorically defined Environmentally Critical Areas (ECA) in Memorandum Circular 2014-005, there are two (2) technical definitions of ECA that fits the project area: areas frequently visited and or hard hit by natural calamities and water bodies as an ECA. Villanueva and the rest of Misamis Oriental are frequently visited by typhoon. The nearest water body in the area is the Macajalar Bay which is classified by the DENR as Class SB/SC although the portion of the Bay fronting the PSC is considered as Class SC.
Possible Tenurial/Land Issue					The project area is part of the 3,000 ha set aside by the government for Industrial Use in Misamis Oriental more commonly known as the Philippine Industrial Estate under Presidential Decree No. 538. Phividec is governed and managed by the Phividec Industrial Authority (PIA). Being set aside by the government mainly for industrial use, with PSC leasing the project area from PIA, there is no possible tenurial or land issue.

2.1.2 Geology/Geomorphology

2.1.2.1 Methodology

The geological data of the project site were sourced from various published reports from the Mines and Geosciences Bureau (MGB), Philippine Institute of Volcanology and Seismology (PHIVOLCS), and from the various geologic studies conducted within the project area.

2.1.2.2 Baseline Conditions

Geology

Figure 2.1.2 shows the geologic map of portions of the Municipalities of Villanueva and Tagoloan taken from Pacis (1962) with minor modifications on the contacts of rock units based on field observations. The map reveals that five (5) rock units underlie the area. They are from oldest to youngest the Upper Miocene Opol Formation, the Pliocene Indahag Limestone, the Pleistocene Bukidnon Formation, and the Recent Cagayan Terrace Gravel and Quaternary Alluvium.

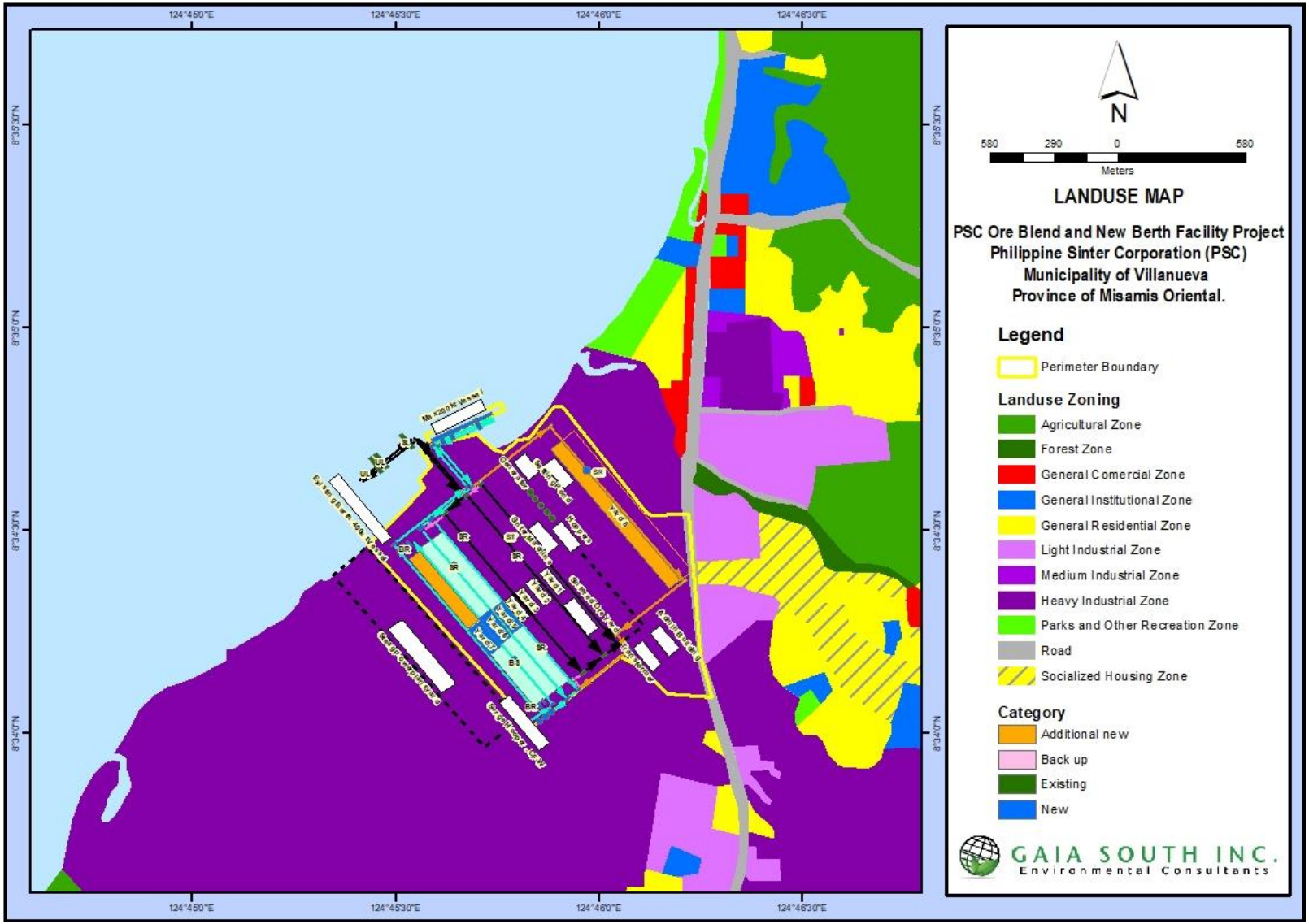


Figure 2.1.1. Land Use Map of Villanueva, Misamis Oriental showing that the project site is within the industrial zone

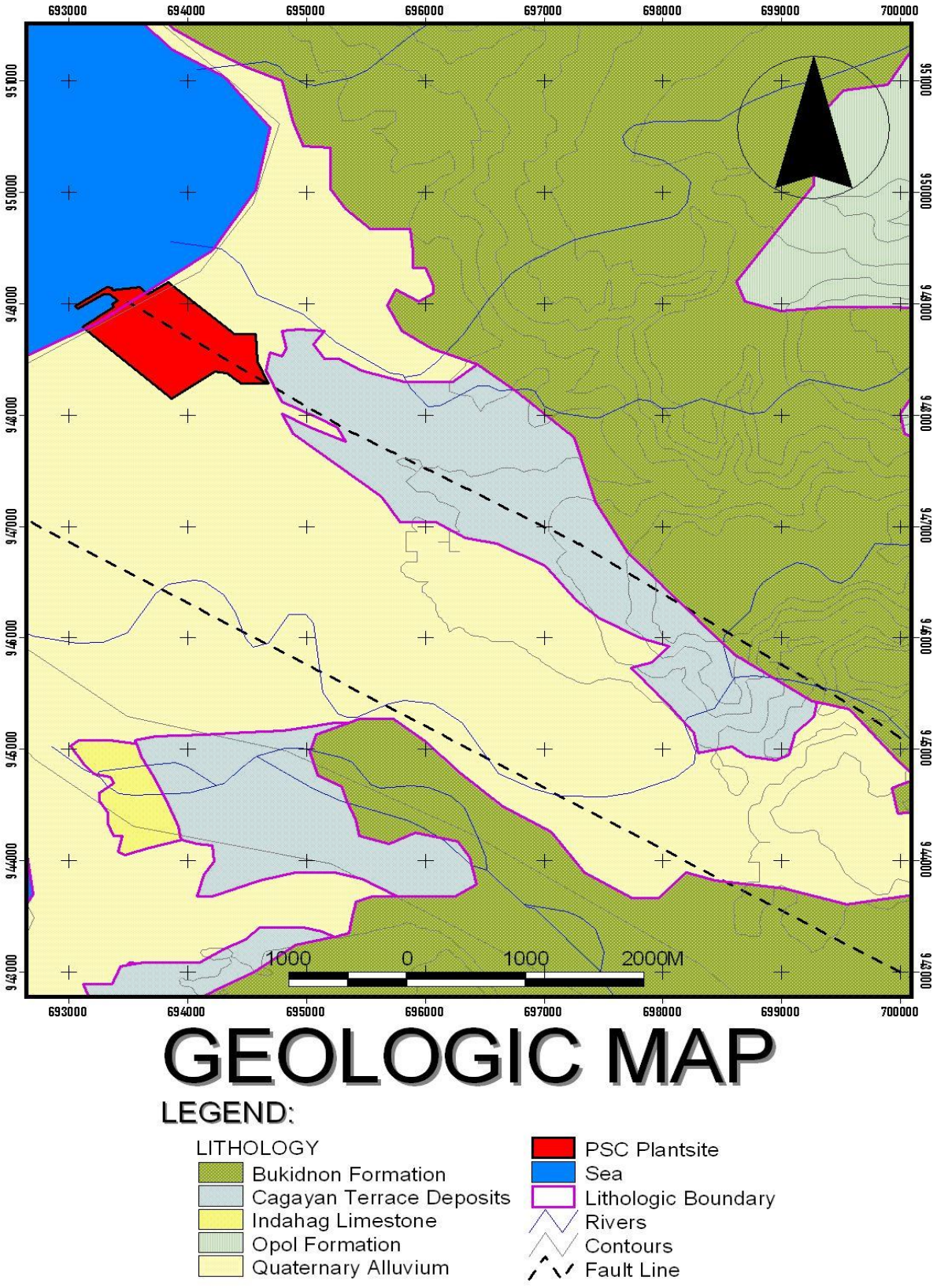


Figure 2.1.2. Geologic map of PSC project area

The Opol Formation occupies the high, rolling to rugged terrain to the east of Villanueva town proper. The formation consists of bedded and slightly folded conglomerate, pebbly sandstone, tuffaceous sandstone, agglomerate, and tuff. Pebble to boulder sized clasts of basalt, chert, diorite and metamorphic rocks comprise the conglomerate which, like the pebbly sandstone and tuffaceous sandstone, is well-cemented and poorly sorted. The agglomerate is composed mainly of volcanic rock fragments while the tuff is light to dark brown. The sandstone and tuff members constitute a greater part of the formation.

The lone exposure of the Indahag Limestone in the map area occurs in an erosional window north of Bugo, Cagayan de Oro. The limestone outcrops amidst younger deposits and forms a low cliff that faces Macajalar Bay. Typical exposures of the limestone farther south exhibit three (3) horizons, namely: a lower, poorly bedded coralline section that is friable and chalky in some places, a middle section made up of rubble and coral fingers and an upper section that that consists of well bedded coralline limestone, calcareous sandstone and limy tuff.

The Bukidnon Formation predominantly underlies the hills and rolling plateaus to the north and south of Villanueva town proper. Intercalated tuffaceous siltstone, pebbly sandstone and conglomerate and agglomerates, with occasional carbonaceous shale make up this rock unit. The agglomerates consist of subangular to subrounded pebbles and cobbles of black vesicular basalt set in a sandstone matrix. The lower sections of the formation contain occasional basalt and schist fragments. The physical and chemical characteristics of this formation indicate that its provenance is Mount Kitanglad to the south.

The Cagayan Terrace Gravel consists of alluvial terrace deposits that border the flanks of the plateaus; particularly those facing Macajalar Bay. This formation is made up of well-rounded pebbles and cobbles of igneous rocks with silt and sand that are unconsolidated to loosely consolidated. Clay and tuffaceous silt and sand often occur as interbeds. Occasional coralline and shell fragments indicate that this formation was deposited partly under a marine environment. The estimated thickness of these deposits is slightly more than 100 meters.

The Quaternary Alluvium occupies the coastline along Macajalar Bay and the deltaic plain and floodplains of Tagoloan and Pugaan rivers. Unconsolidated to loosely consolidated sand, silt, clay and gravel derived from the weathering of the older rock units comprise this formation. The PSC plant site rests entirely on these deposits.

Tectonic Setting

The Island of Mindanao is located in the southern portion of the Philippines. It is defined by three active trenches: the Philippine Trench to the east, the Cotabato Trench to the southwest, and the Sulu-Negros Trench-arc system to the northwest. Two main fault systems: the Philippine Fault and Mindanao Fault and hundreds of fault splay and lineaments criss-cross the region (**Figure 2.1.3**).

Structural Geology

The main structural features in the area are two (2) northwest-trending faults along the course of the Tagoloan River. The northern fault is shorter and cuts through rocks of the Cagayan Terrace Gravel that bound the river to the north. The longer, southern fault is referred to in more recent literature as the Cabanglasan Fault. This fault controls the course

of the Tagoloan River and stretches from Macajalar Bay to Cabanglasan, Bukidnon. It is steeply dipping with left-lateral strike slip displacement and is possibly related to the Central Mindanao Fault that cuts across eastern Mindanao. The Philippine Institute of Volcanology and Seismology (PHIVOLCS) classified this fault as active.

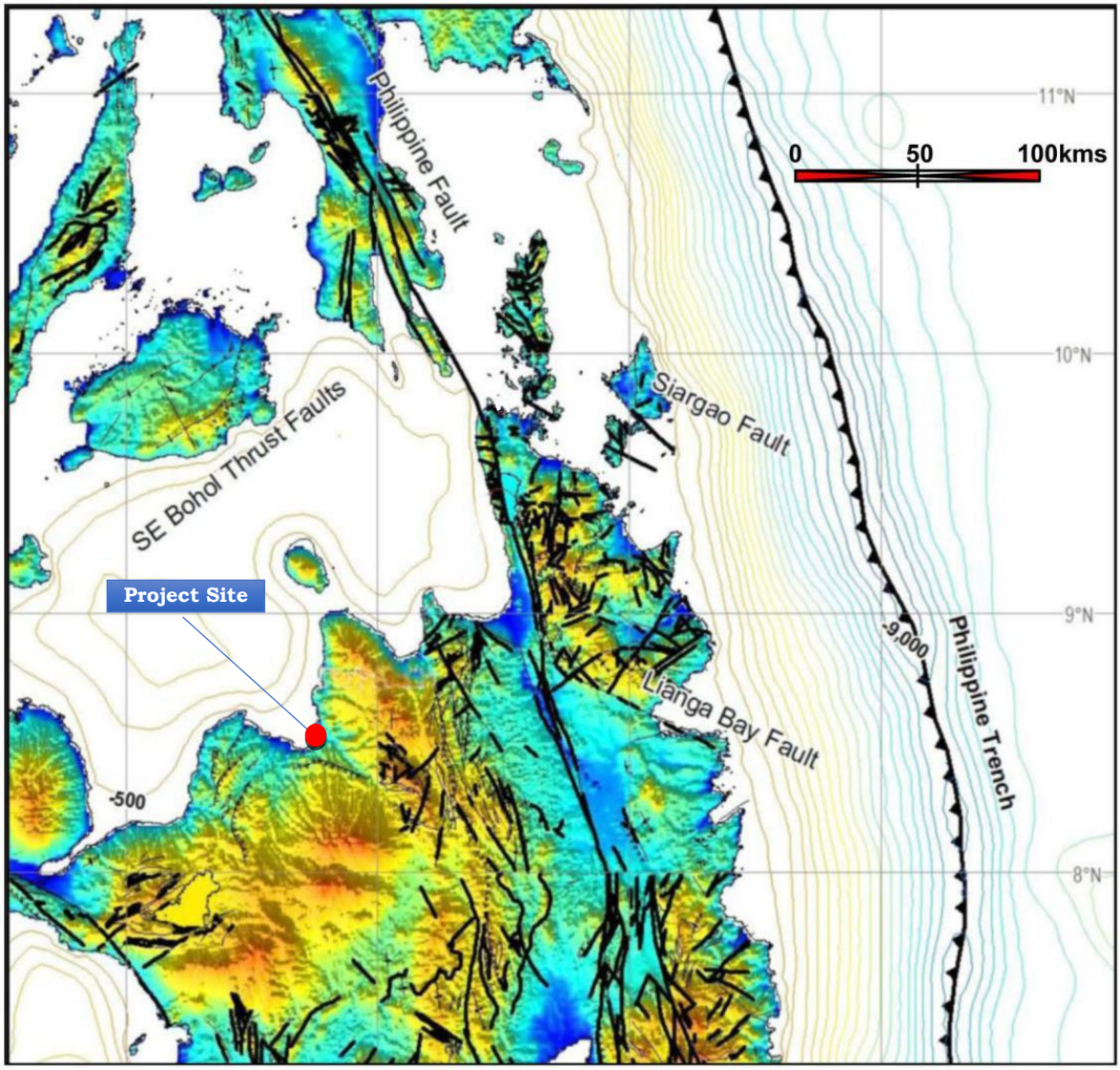


Figure 2.1.3. Regional tectonic setting in the southern portion of the Philippines

There are several active faults and trenches that are capable of generating large magnitude earthquakes. Arranged from nearest to farthest, the active structures that are likely to exert impacts to the project area and vicinities are as follows:

a) Tagoloan River Fault, 4.2km to the south;
b) Cabanglasan Fault, 19km to the northeast
c) Central Mindanao Fault, 46km to the east;
d) Lanao Fault system, 66.2km to southwest
e) PFZ: Eastern Mindanao Fault, 106.6km to the east;
f) PFZ: Llanga Fault, 113km to the northeast;
g) MF: Western Mindanao Fault, 152.7km to southwest
h) Cotabato Trench, 190km to the northwest;

i) MF: Daguma Ext., 194 km to the southwest; and
j) Philippine Trench, 226 km to the east.

The geologic structures mentioned above are briefly described below chronologically in accordance to their distances from the subject site as follows:

Tagoloan River Fault

The Tagoloan River Fault is a NW-SE trending fault traversing the course of Tagoloan River in the Municipality of Tagoloan, Misamis Oriental. It is approximately 31km long with its northwest termination located about 4.2km south of the proposed project site.

Cabanglasan Fault

The Cabanglasan Fault is a NW-SE trending fault traversing Balingasag town. It is approximately 31.1km long with its nearest trace located about 15.5 km north of the proposed project site

The Central Mindanao Fault:

The Central Mindanao Fault (CMF) is approximately 150 km long, NW-SE trending structure indicated on **Figure 2.1.4** as heavy red dashed line. Apparently, its southern projection skirts the northeastern bayhead of Davao Gulf. In general, the nearest distance of the Central Mindanao Fault is about **46 km** northeast of the proposed project site.

Lanao Fault System

The Lanao Fault System (LFS) is a swarm of about seven (7) sub-parallel faults trending northeast. Individual fault traces are about 23km long each. These are found southwest of the proposed project site. The nearest distance between the LFS and the proposed project site is approximately 66.20km.

PFZ: Eastern Mindanao Fault

The Philippine Fault Zone (**PFZ**) is about 1,250km long geologic structure traceable from Luzon to Mindanao. The main trace of the PFZ in Mindanao mainland was named by PHIVOLCS as the "PFZ: Eastern Mindanao Fault". This segment of the PFZ has a total length of approximately 350 km long. However, Perez *et a*l., using geometric segmentation criteria, have identified nine geometric segments separated by discontinuities, such as echelon steps, bends, changes in strike, gaps, steps and bifurcationing the surface trace. They found out that fault segments range in length from 20 to 100km.

The nearest distance from the project site to the Eastern Mindanao Fault is approximately 106.6 km to the northeast. It is the most active fault traversing the landmass of Mindanao.

PFZ: Llanga Fault

The Llanga Fault is a northwest-southeast trending splay of the PFZ in Llanga municipality, Agusan del Sur. It has a length of approximately 87km. The nearest distance between this fault and the subject site is about 113 km.

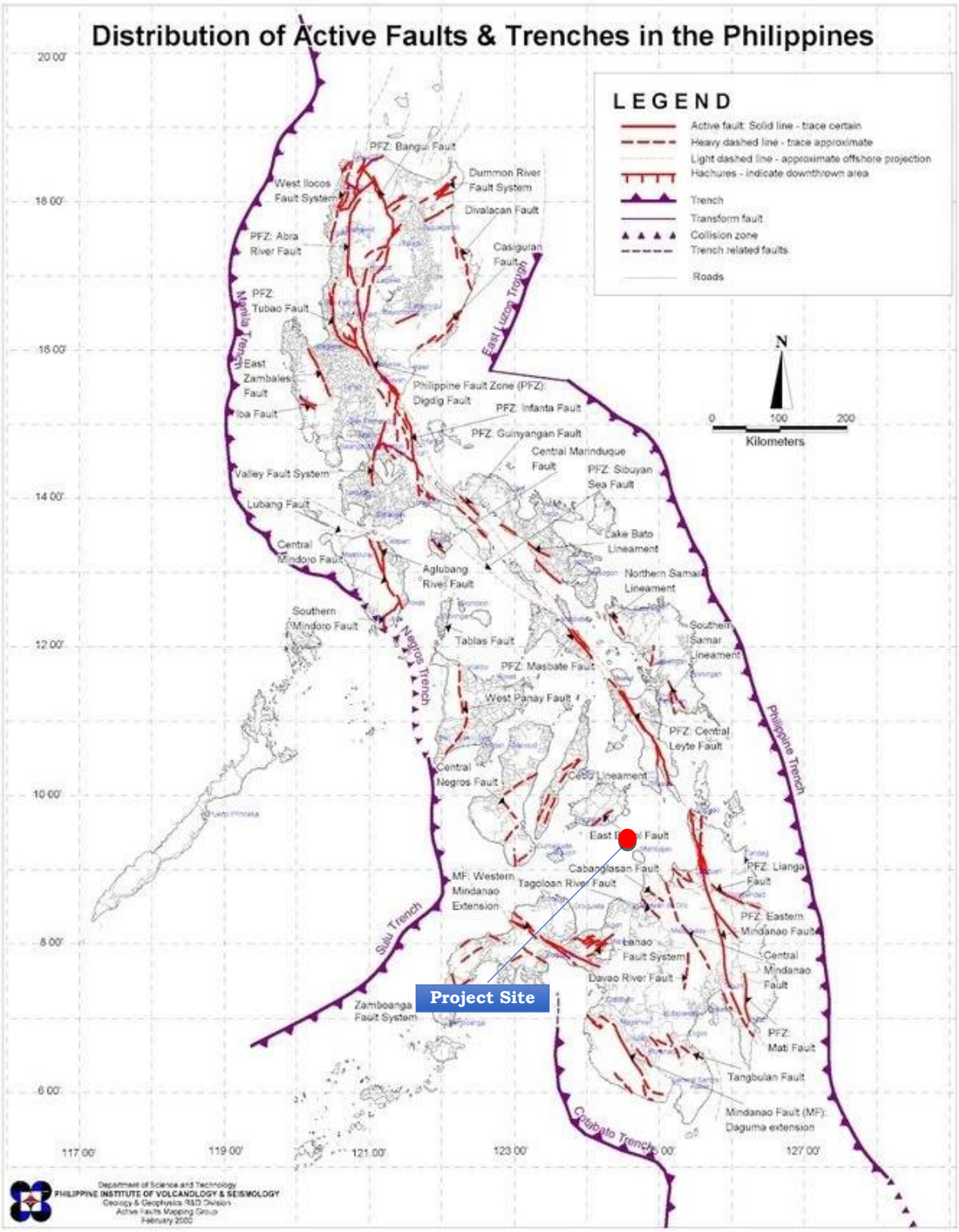


Figure 2.1.4. Map showing active faults and trenches in the Philippines, Tagoloan River Fault and Cabanglasan Fault are the nearest faultline in the PSC project area.

MF: Western Mindanao Extension

The MF: Western Mindanao Extension is approximately 150km long, NW-SE trending fault that traverses the northeastern-most part of Zamboanga peninsula. Its nearest trace is approximately 152.7 km to the project site.

Cotabato Trench

The Cotabato Trench is an arcuate, east-dipping zone of subduction in Moro Gulf that roughly parallels the coast of Maguindanao – Sarangani region. It is approximately 350 km long and the nearest distance between this trench and the project site is 190 km, more or less.

A catastrophic 9-meter high tsunami wave was generated by a Ms8.1 earthquake when it ruptured on 17 August 1976 and caused heavy tolls on lives and properties in the coastal areas surrounding the gulf. Phivolcs recorded the epicenter at 06.3° N, 124.0E

Phivolcs summarized the tsunami event as follows: "A few minutes after the last stroke of midnight on August 17, 1976, a violent earthquake occurred in the island of Mindanao spawning a tsunami that devastated more than 700 kms of coastline bordering Moro Gulf in the North Celebes Sea. This offshore event generated by Cotabato trench, a less prominent trench system in the Philippines, was the largest tsunamigenic earthquake to have occurred in Mindanao in the last two (2) decades. It was an earthquake that resulted in massive destruction of properties and great loss of lives. The tsunami generated contributed immensely to the devastation. The cities and provinces of Cotabato took the brunt of the earthquake while the tsunami generated cast its doom on the provinces bordering Moro Gulf especially on the shores of Pagadian City. According to surveys during the event, the tsunami was responsible for 85% of deaths, 65% of injuries and 95% of those missing. After the sea spent its fury and rolled back to its natural flow, thousands of people were left dead, others homeless or missing and millions of pesos lost with the damages of properties. Properties lost not only include establishments for residential and commercial use, but also bancas that, as a whole, represents the livelihood of hundreds of families."

At a later date on March 6, 2002, an M7.5 powerful tsunamigenic earthquake struck the southern Philippines. It originated near the Cotabato rench, near the epicenters of the 1976 Moro gulf earthquake and the 1918 Celebes Sea earthquake (**Figure 2.1.5**).

Earlier, the **1918 Celebes Sea earthquake** occurred on 15 August at 12:18 UTC near the Moro Gulf coast of Mindanao. It had a magnitude of 8.3 on the moment magnitude scale and a maximum perceived intensity of X (*Extreme*) on the Mercalli intensity scale.

This event in the southern Philippines triggered a large tsunami, with a maximum run-up of 7.2m, which affected the coasts of the Celebes Sea, causing widespread damage. The combined effects of the earthquake and the tsunami caused 52 casualties.

The earthquake has been associated with the Cotabato Trench, the surface expression of an active east-dipping subduction zone beneath Mindanao.

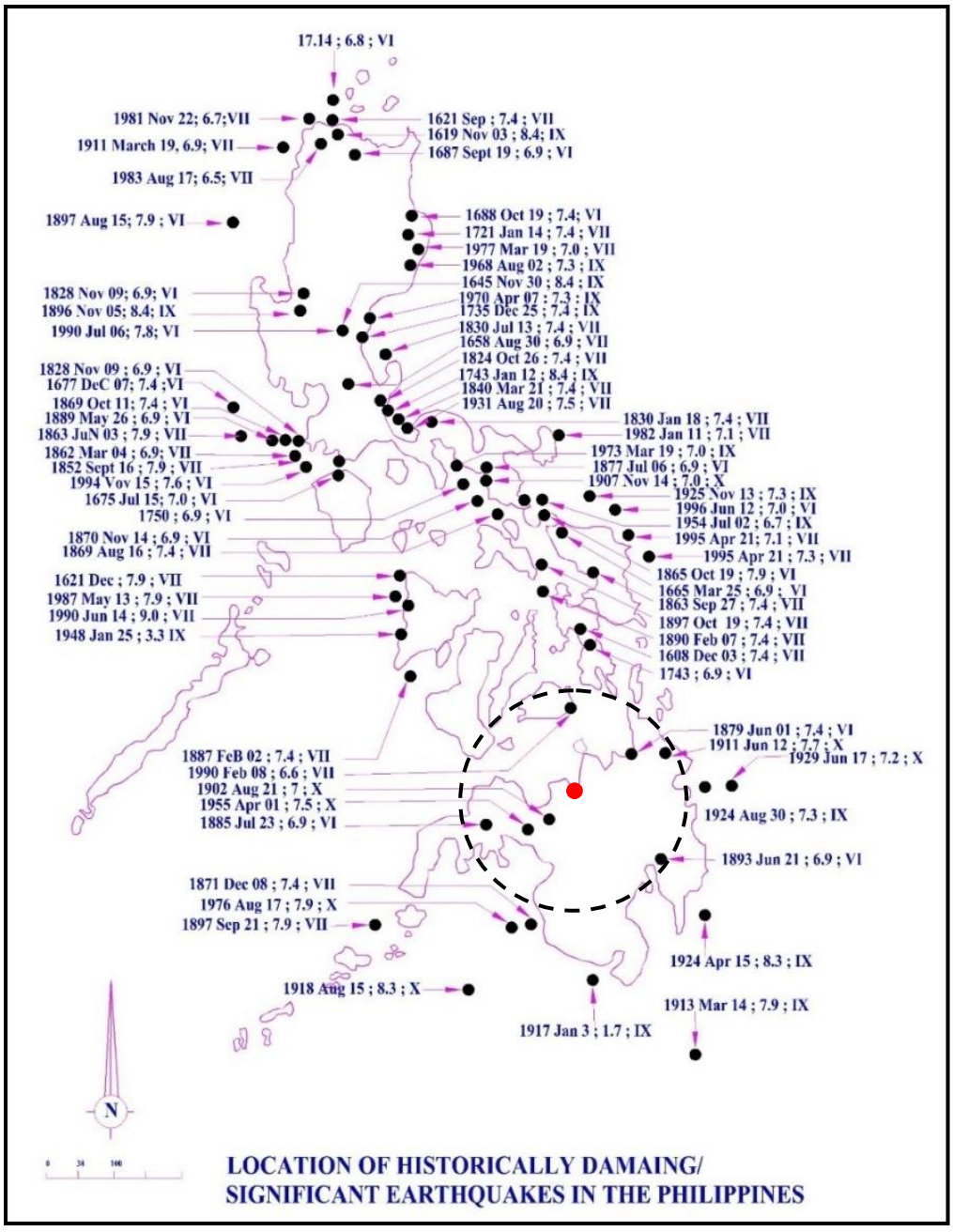


Figure 2.1.5. Epicenters of historically damaging earthquake in the Philippines

MF: Daguma Extension

The MF: Daguma Extension is approximately 155 km long, NW-SE trending structure located about 194 km southwest of the proposed project site.

Philippine Trench

The Philippine Trench is about 1,100 km long, generally NNW-trending subduction zone east of the Philippine landmass from the southeast of southern Mindanao up north to about latitude 15°N. Citing various previous authors, Aurelio (2010) re-emphasized that the Philippine Trench is the morphological expression of the westward subduction of the Philippine Sea Plate under the eastern Philippine Arc. This subduction process produced a multitude of earthquakes with epicenters along the Philippine Trench. The nearest distance between the project site and this trench is 226 km, more or less.

When they move, the PGA values that may be produced by the seismogenic structures mentioned above corresponding to the hypothetical magtitudes used in the estimates are presented on **Annex 2.1.1.**

In a worst-case scenario, and under the Soft Soil subsurface conditions, it would be most prudent to adopt a PGA value of **0.732278969g** attendant to an M7 Tagoloan River Fault-related earthquake for any civil structure that requires the integration of seismic load in the overall design.

The equivalents of the different PGA values to the Rossi-Forel Intensity Scale are indicated on **Annex 2.1.1.** For example, a PGA value of **0.732278969g** would be equivalent to an Intensity VIII, or Very Strong Shock. On the Revised Philippine Earthquake Intensity Scale (**Annex 2.1.2**), however, an Intensity VIII earthquake is described as Very Destructive. Owing to the soft soil condition therein, however, it could climb to a “Devastating” category.

Figure 2.1.5 also shows that 10 major earthquakes occurred between 1976 and 1811 in Mindanao within a 200-km radius from the project site, or 10 earthquakes in a span of 165 years. This implies that the average recurrence interval that damaging earthquakes would occur within such radius from various seismic source zones is about 1 earthquake in every 16.5 years.

All these documented secondary data indicate that the project site is susceptible to both low and high magnitude earthquakes.

Recent “destructive to very destructive” earthquakes that affected parts of Mindanao include the following:

- A magnitude of 6.3 earthquake struck Tulunan, Cotabato on October 16, 2019 around 7:37 pm.[94] Seven people were reported dead and more than 200 others injured. Most of the houses in Brgy. Malawanit Magsaysay, Davao del Sur, were destroyed. The aftermath left frequent aftershocks extended to over a week on random cycles
- A magnitude of 6.6 earthquake again struck in Tulunan, Cotabato on October 29, 2019, with some reports stating that this earthquake felt much devastating as the previous earthquake that took place on October 16, 2019.[96] Nearby towns such as those in Kidapawan, North Cotabato and Davao city were also affected.

- A magnitude 6.5 earthquake struck Tulunan, Cotabato for the third time on October 31, 2019, Death toll amongst towns and cities nearby has increased; CNN Philippines reporting increased fatal casualties risen to 10 during live news broadcast. Revised body count reports 24 fatal casualties in total including the numbers from the two consecutive earthquakes that took place on October 29 and 31, with more than 500 people being injured and three reported missing.

Geomorphology

Three major landforms dominate the area. These are the deltaic plain, the alluvial terrace and the hilly to rugged terrain. The deltaic plain comprises the flat land formed by heavy deposition along the flanks and mouths of the rivers particularly the Tagoloan and Pugaan rivers. Recent alluvial deposits underlie these areas, which are often swampy and do not rise to more than 20 meters above sea level (masl). The PSC plantsite and most of the locators in the Phividec Industrial Estate are situated in the deltaic plain.

The alluvial terraces bound the deltaic plain and appear as benches with steep sides usually standing at less than 100 masl. These areas are underlain by rocks of the Cagayan Terrace Gravel and represent alluvial deposits that have been uplifted. They are loosely compacted and deeply incised by rivers and creeks that pass through it. Hilly to rugged land adjoin the deltaic plain and alluvial to the east, north and south. They consist of undulating ridges and plateaus with steep slopes and deep valleys that attain a maximum height of over 500 masl in the vicinity. Gently to steeply dipping and folded rocks of the Bukidnon and Opol formations underlie these areas, which are likewise dissected by deeply incised river valleys.

Elevation/Topography

The Elevation Map of Villanueva and adjacent areas is shown on **Figure 2.1.6.** It was taken from the publication of *topographic_map.com* (Villanueva topographic map, elevation, relief) in the internet. Relatedly, the elevation of Katipunan range from 0 to 9 meters above mean sea level.

The Relief Map of Villanueva (**Figure 2.1.7**), was also taken from the same publication cited above. It shows the plains, river courses, mountains and deep gorges.

The topographic map of the project area and its vicinities (**Figure 2.1.8**), which was cropped from the Claveria quadrangle Sheet 3945-I of NAMRIA, shows the iso-contours of elevations at 20 meters intervals, with intermediate contour at 10 meters elevation. Obviously, Barangay Katipunan, where the proposed project site is located, has ground surface elevations of 0 to below approximately10 meters above mean sea level.

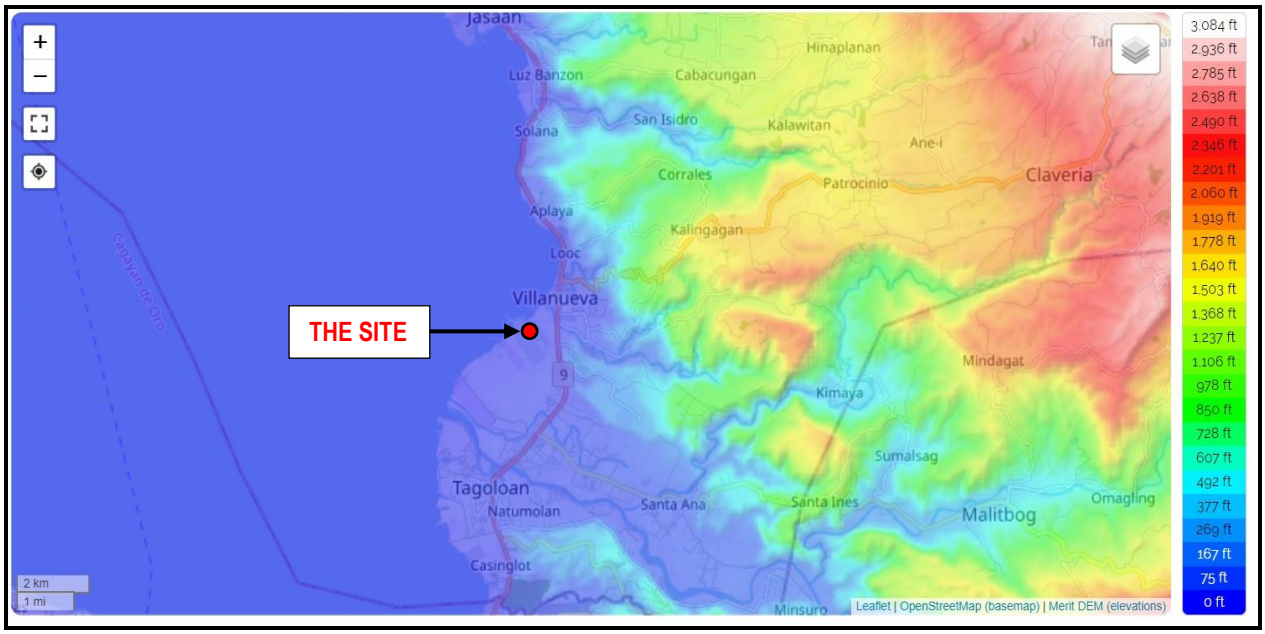


Figure 2.1.6. Elevation map of Villanueva, Misamis Oriental
(Source: https://en-ph.topographic-map.com/maps/jvwg/Villanueva/)

Figure 2.1.7. Relief map of Villanueva and vicinities

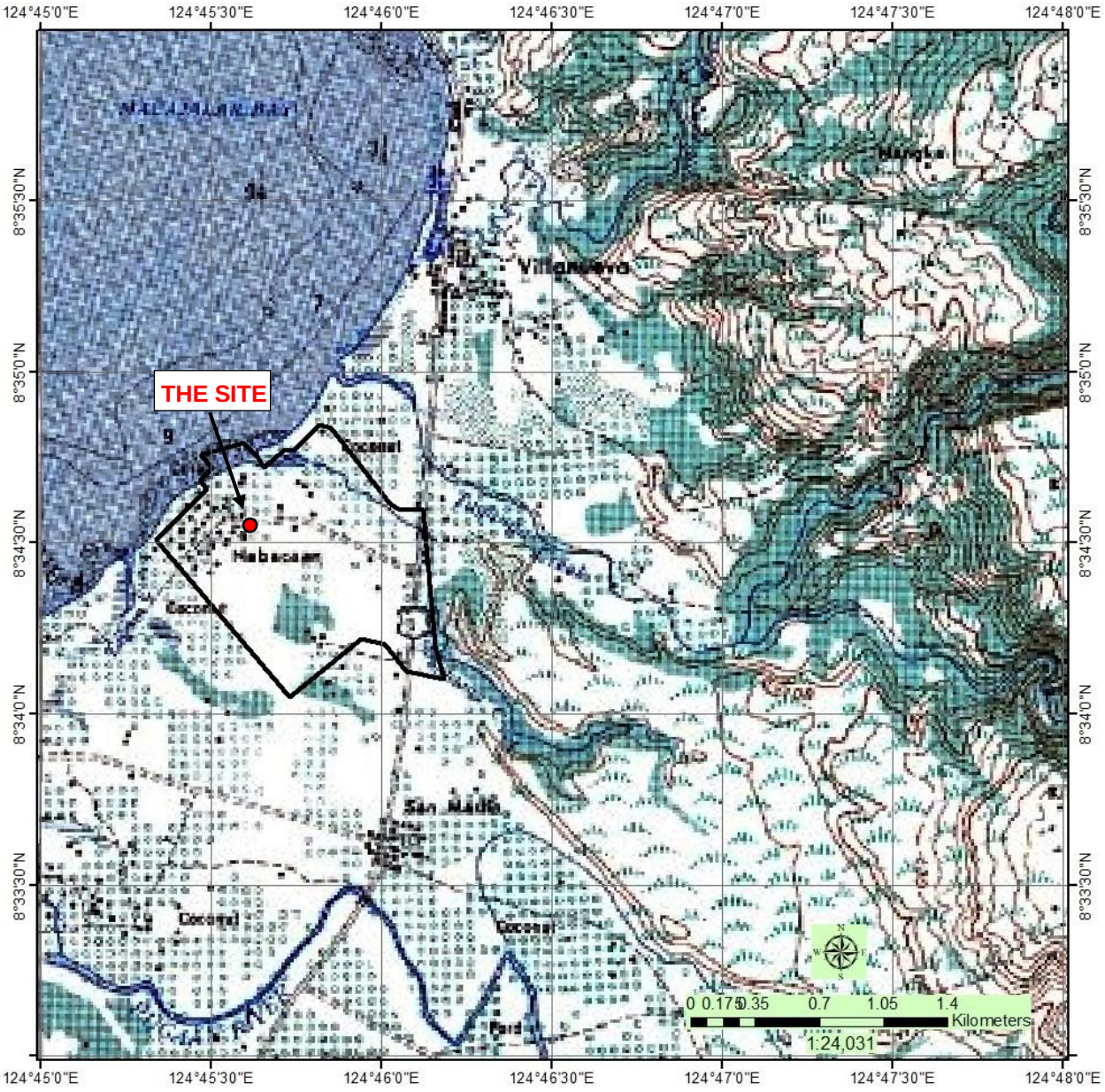


Figure 2.1.8. Topographic map of the project area and its vicinities

2.1.2.3 Impact Assessment and Environmental Performance

Table 2.1.2. Predicted impacts of/on geology to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Change in surface landform		☑			The project area including the proposed expansion site is already flat thus there is no significant impact in terms of change in surface landform.
Change in sub-surface/ underground morphology					There is no significant impact on sub-surface/underground morphology since the ore blend facility will only utilize above surface and foundation excavation will utilize isolated footings whenever necessary.
Inducement of subsidence, liquefaction, landslides, mud/debris flow, etc.		☑	☑	☑	**Seismic Hazards** The distribution of active faults and trenches in the Philippines (**Figure 2.1.4**) reveals that the whole Mindanao Island is a tectonically active area. The Cabanglasan Fault, which is about 2km south of the project site and controls the course of the Tagoloan River, is active. The seismicity map prepared by the Philippine Institute of Volcanology and Seismology (PHIVOLCS) in **Figure 2.1.9** displays the epicenters of earthquakes that have occurred in Misamis Oriental. Aside from indicating a minor level of seismicity in the vicinity of the project site, the map also shows that the project area is far from the epicenters of destructive earthquakes (Magnitude >7). The accompanying earthquake database of PHIVOLCS reveals that an earthquake with a magnitude of 4.1 occurred southeast of the plantsite on July 6, 1991. Another earthquake with a magnitude of 4.0 struck on January 26, 2003, about nine (9) kilometers to the north at the town Jasaan. This earthquake was felt at Intensity III at Cagayan de Oro City. It was probably felt also at the same intensity in the project area. **Ground Rupture** The intensity of ground shaking that result from a seismic event is measured by the horizontal acceleration. It depends on the earthquake magnitude, distance of the site to the earthquake generator, and the soil condition. Thenhaus et al. (1994) estimated peak horizontal ground acceleration that has a 10% probability of being exceeded in 50 years for various ground conditions throughout the Philippines. The probabilities were computed using a return period of 474 years and a model of 21 seismic source zones that describe the geographic extent and frequency of earthquake occurrence for major tectonic elements in the Philippines. Earthquakes with magnitudes that are smaller than 5.0, which do not cause significant damage, were not considered in the assessment. **Figure 2.1.9** depicts the estimates in terms of the acceleration

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
					of gravity (g). According to the figure, the project site may experience respective peak acceleration amplitudes of about 0.35g, 0.25g and 0.20g in soft soil, medium soil and rock conditions. This indicates that slight to moderate ground motion may be expected in the area in the event of an earthquake with magnitude greater than 5.0. **Liquefaction** Liquefaction occurs in seismically active areas that are underlain by thick, saturated deposits of unconsolidated sand and silt. When the ground shakes, the sediments are rearranged in a more compact manner and the pore water is forced upwards. The ground loses its shear strength and behaves like a liquid. This results in the settlement of structures into the soil. Since alluvial deposits occupy the area and the depth to the water table is generally shallow, the area may be prone to liquefaction in the event of a strong earthquake. **Volcanic Hazards** The project site is far from direct danger of volcanic eruption. The nearest active volcanoes are Mount Hibok-Hibok in Camiguin Island about 70km north of the project site and Mount Ragang in North Cotabato, about 95 km to the south-southwest. Considering the prevailing north and south wind directions in the region and the relative locations of the volcanoes to the project site, ash cloud and ash fall may be the only hazards that the project site may experience should these volcanoes erupt, however far from areas with moderate to steep slopes and is therefore not under the threat of landslides. **Ashfall hazard** Owing to the great distances between the proposed project site and the active volcanoes (67 to 120km), only the ashfall hazard is discussed herein. At these distances, it is judged that the proposed project site would be within the **LOW RISK ZONE** when the ash column, in case of violent eruptions, is about 10,000m high, in which case the zone may receive less than 1cm thick of ashfall. The thickness of the ashfall over the proposed project site, however, would be dependent on the prevailing wind direction or regional wind circulation pattern at the time of eruption, the height of ash column, as well as the duration of violent eruption. **Rain-inducced Landslides and Flooding** Heavy and prolonged rainfall may increase the pore pressure within the rocks of the Cagayan Terrace Gravel and Bukidnon Formation. The increase in pore pressure causes a corresponding decrease in shear strength which, depending

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
					on the slope angle and the weight of the overlying material, may trigger landslides. The project site is however far from areas with moderate to steep slopes and is therefore not under the threat of landslides. Zones 1 to 4 of Katipunan are most likely situated near the river channel northeast and east of PSC compound where Moderate-, High- and Very High flood susceptibility potentials are indicated on **Figure 2.1.11**. Moderate Flood Susceptibility is described as *"Areas likely to experience flood heights of greater than 0.5 to 1 meter and/or flood duration of 1 to 3 days. The areas are subject to widespread inundation during prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and in-filled valleys are areas moderately subjected to flooding"*. Moreover, areas having High Flood Susceptibility are described as "*Areas likely to experience flood heights of greater than 1 to 2 meters and/or flood duration of more than 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows, such as active river channels, abandoned river channels, and areas along river banks are prone to flash floods".* And, finally, areas of Very High Flood Susceptibility are described as "*Areas likely to experience flood heights of greater than 2m and/or flood duration of 3 days. These areas are immediately flooded during heavy rains of several hours; include landforms of topographic lows, such as active river channels, abandoned river channels, and areas along river banks are prone to flash floods".* **Tsunami Hazards** Although there are no recorded tsunami events in the area (CESM, 1996), the seismicity map reveals the possible occurrence of minor to moderate earthquakes directly offshore of Macajalar Bay. The project site is therefore exposed to the threat of a tsunami.

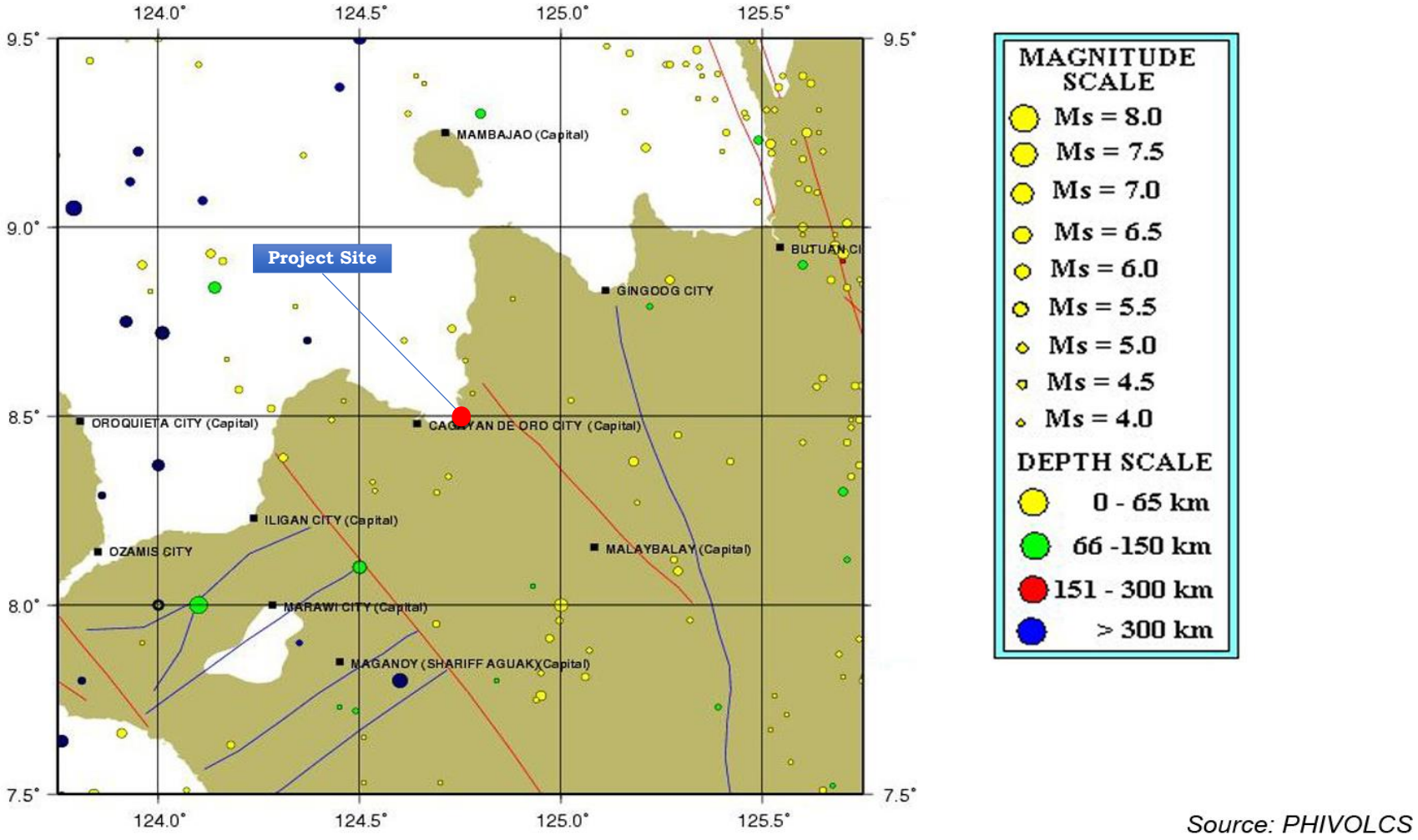
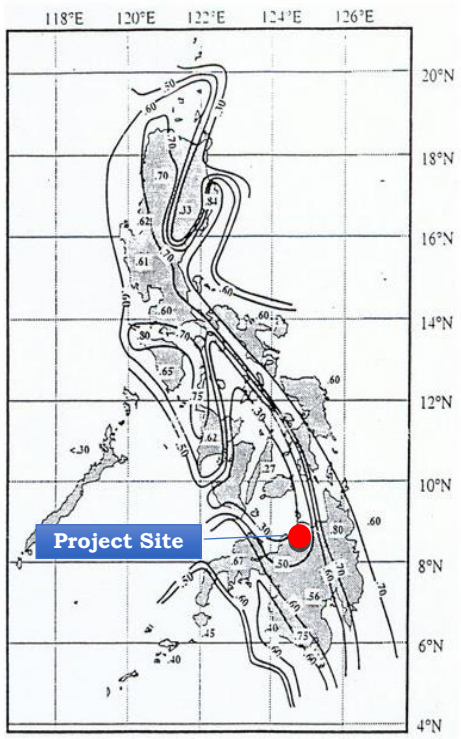
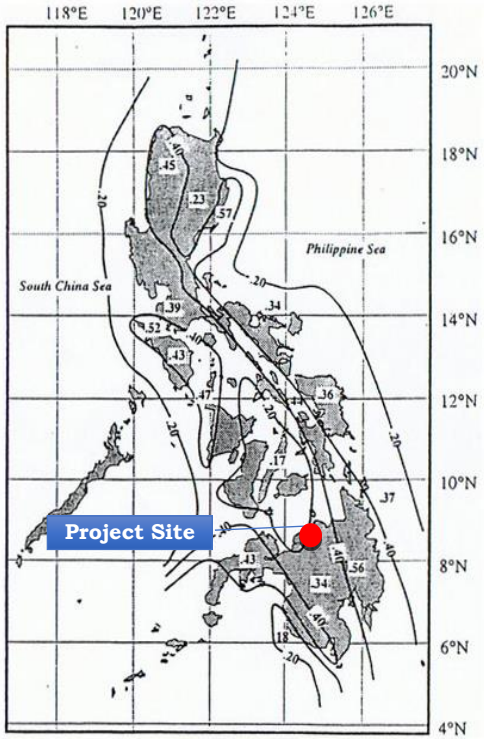


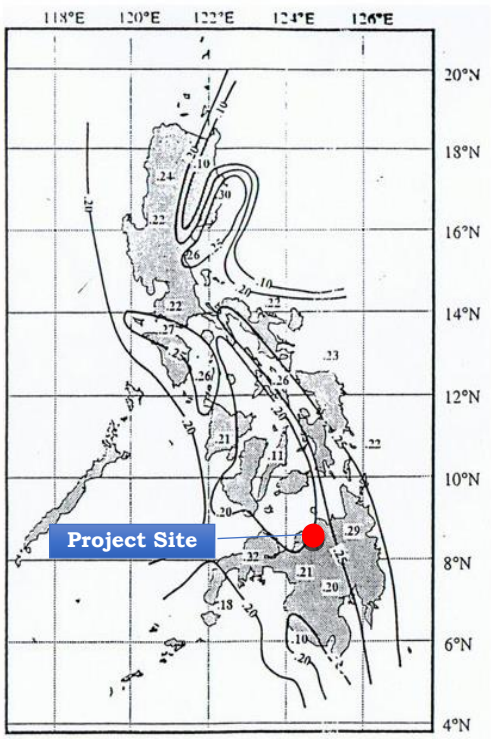
Figure 2.1.9. Seismicity map map of the project area and vicinity



Map showing peak horizontal acceleration amplitudes in soft soil for the Philippine region. Acceleration values have a 10% probability of exceedance in 50 years. Contours are in terms of the acceleration of gravity (g).



Map showing peak horizontal acceleration amplitudes in medium soil for the Philippine region. Acceleration values have a 10% probability of exceedance in 50 years. Contours are in terms of the acceleration of gravity (g).



Map showing peak horizontal acceleration amplitudes in rock for the Philippine region. Acceleration values have a 10% probability of exceedance in 50 years. Contours are in terms of the acceleration of gravity (g).

Source: Thenhaus, et al. 1994

Figure 2.1.10. Peak Ground Acceleration Contour Map for soft soil, medium soil and rock (after Thenhaus et al., 1994)

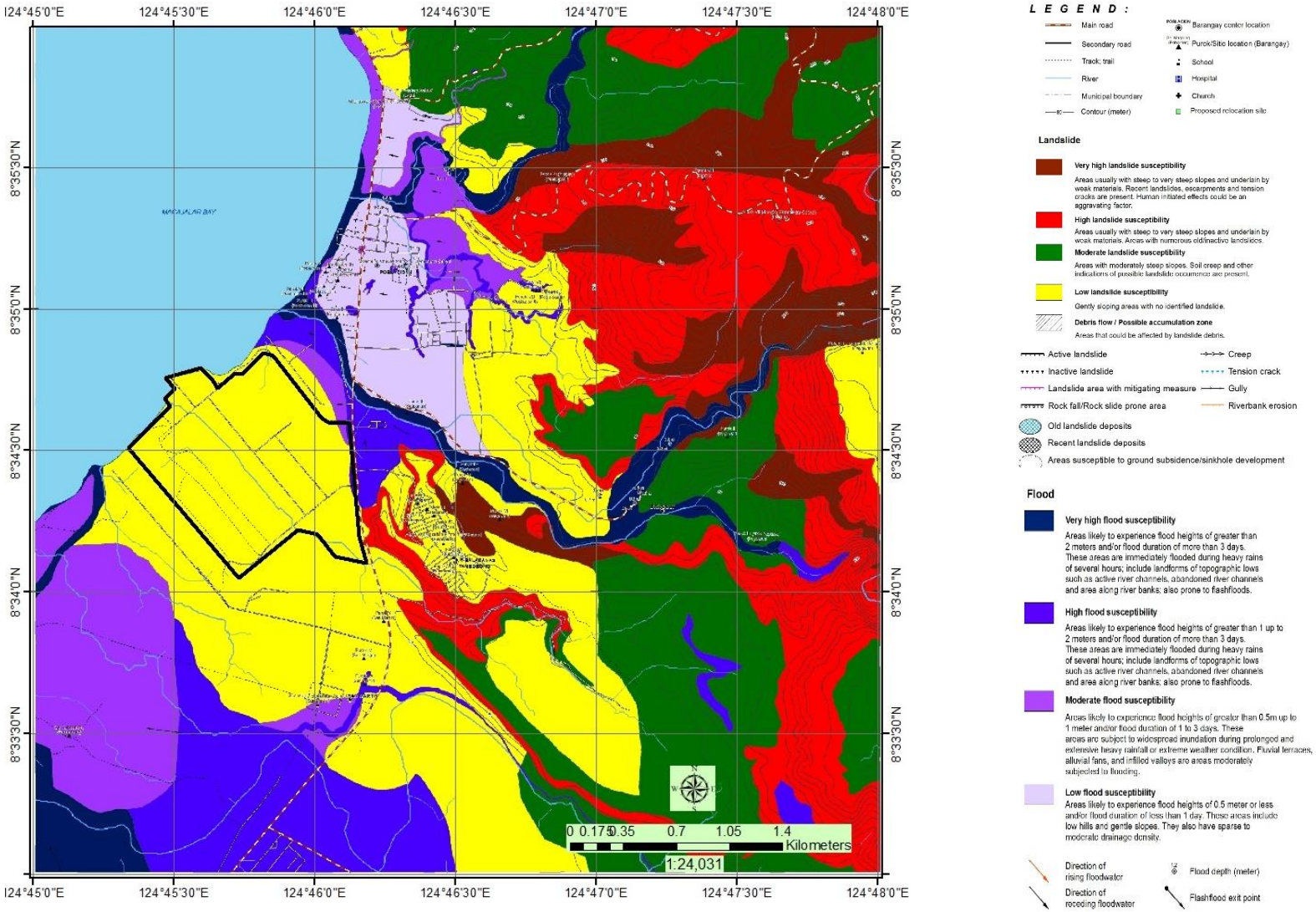


Figure 2.1.11. Detailed landslide and flood hazards map of Villanueva
(Source: MGB, 2015)

2.1.3 Pedology

2.1.3.1 Methodology

The study on soils covered the review of existing literature and maps of the project area. This was followed by a fieldwork last May, 2021.

Soil Characterization and Sampling

Soil characterization was made in the representative sites of the soil mapping units of the soil type within the project area. Geographical position of each observation/sampling location was recorded using a GPS. The soil sampling sites are plotted on the soil map, and the locations and geographic coordinates are shown in **Table 2.1.3**. **Figure 2.1.12** is the location map of sampling stations for soil assessment.

Table 2.1.3. Soil sampling stations within PSC project area

Sampling Station	Coordinates	Location
Stn.1	8º 34' 4.60" N 124 º 45' 49.17" E	Proposed Ore Yard 5, 6, 7 location, PSC Project Area, Brgy. Katipunan, Villanueva, Misamis Oriental
Stn.2	8º 34' 19.12" N 124 º 45' 36.24" E	Dominador Castillo farm, Bgy.Napaod, Labo, Cam. Norte

Soil samples were collected for physico-chemical analyses (pH, N, P, K and OM) and heavy metal analysis (Hg, Cr^{+6}, Cd, As and Pb). The analysis was done at Ostrea Mineral Laboratories, Inc., at Binan, Laguna.

2.1.3.2 Baseline Conditions

Four soil types exist in the Municipality of Villanueva, Misamis Oriental: San Manuel Loam, Jasaan-Bolinao Complex, Jasaan Clay Stony Phase and Mountain Soil (Undifferentiated). Within the PSC project area only one (1) soil type exist - the San Manuel Loam. San Manuel Loam is characterized as a slightly acidic soil with moderate to high fertility but has low organic matter content. It is considered as soil of the alluvial plain with moderate water retention, drainage and permeability characteristics.

San Manuel sandy loam's physical and chemical characteristics (**Table 2.1.4**) are observed in both sampling stations.

Table 2.1.4. Physical and chemical properties of soil observed within PSC project area

Soil Properties	San Manuel Loam	
	Stn.1	Stn.4
Drainage	Well drained	Well drained
pH	6.1(MA	6.1(MA)
Nitrogen (%)	0.2(M)	0.1(L)
Organic Matter(%)	1.956(M)	2.956(M)
Phosphorus(%)	0.026(VL)	0.020(VL)
Potassium(%)	0.08(VL)	0.09(VL)
Mercury	<0.8	<0.8
Chromium Hexavalent	<0.10	<0.10
Cadmium	<0.03	<0.03
Arsenic	1.59	2.32
Lead	<0.10	<0.10

Notes: for pH reading MA is mildly acidic; for other chemical properties M is moderate, L is low, VL is very low

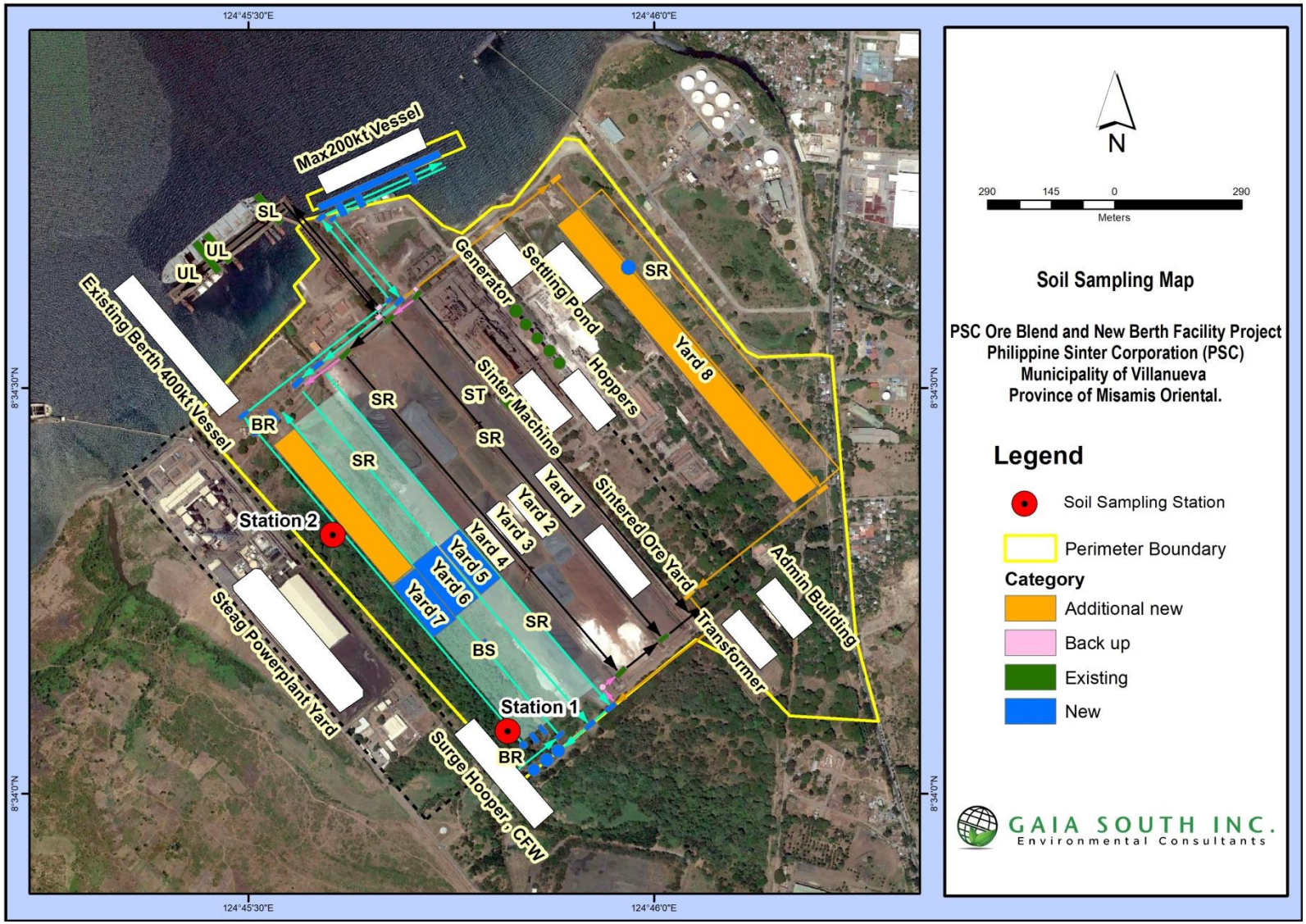


Figure 2.1.12. Map showing the PSC soil sampling location

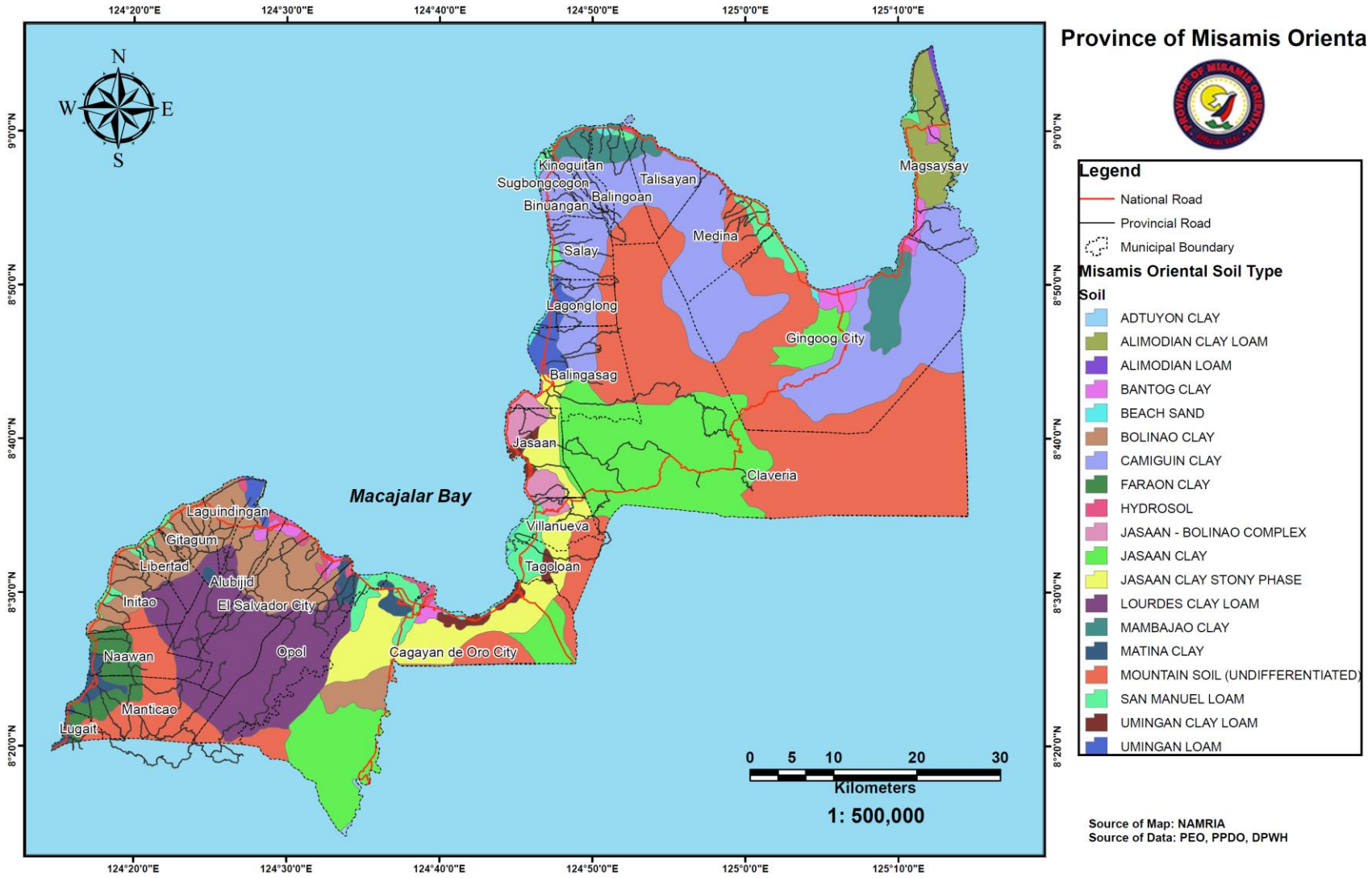


Figure 2.1.13. Soil map of Misamis Oriental showing the soil type within the project area of PSC

Soil reaction is medium acid (pH 6.1). Nitrogen is medium (0.1-0.2%), Organic matter is low (1.96-2.96%), Phosphorus and Potassium is low (0.020-0.026%) and (0.08-0.09%) respectively. The natural fertility of this soil is low to moderate.

The heavy metals in San Manuel loam such as Mercury with <0.8mg/kg (below detection limit); Cadmium with <0.03mg/kg (below detection limit); Arsenic with 1.59-2.32 mg/kg and Lead with < 0.10 mg\kg are all below the contamination levels as prescribed by the Taiwanese standard for Mercury (2mg/kg); Copper (200mg/kg); Cadmium (5mg/kg); Arsenic (40mg/kg); and Lead (500mg/kg). Hexavalent Chromium of the soil is only <0.10 which is way below the contamination level of 2mg/kg.

Annex 2.1.3 is the certificate of laboratory result for the analysis of soil within PSC project area.

2.1.3.1 Impact Assessment

Table 2.1.5. Predicted impacts of/on pedology to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Soil erosion/ loss of topsoil/ overburden		☑			This phenomenon is typically occurring in most of the bare areas the fact that top soil is very thick in the area being an alluvial plain. Erosion may occur particularly during the construction of isolated footings and drainage canals. However, this will be mitigated by adopting soil conservation techniques and implementing engineering measures such as embankment stabilization, use of cocomats or gabions along areas prone to erosion or soil collapse.
Change in soil quality/ fertility					Change in soil quality will occur during the clearing and scrapping of topsoil/ overburden during the establishment of ore yard. In the soil stockpile, mixing of the topsoil and subsoil occur which may cause the change in soil quality and fertility. This impact however is insignificant since the area was set aside as an industrial since 1975 thus the site will not be used as an agricultural area in the near future.

2.1.4 Terrestrial Flora

2.1.4.1 Methodology

Sampling design

A 100% tree inventory was conducted in the proposed Ore Blending Facilities (Yards 5, 6, 7 and 8). All trees with diameter at breast height (DBH) of at least 10cm were recorded and measured (**Plate 2.1.1**). In the New Berth Facility, a general observation was conducted since there is no apparent vegetation that will be affected by the proposed development.

Line transects were also established in different areas to further describe the existing vegetation within the PSC. Each transect is 100m long wherein all trees with DBH 1cm and above within 1m from both side of the transect line were recorded and measured. Canopy trees (DBH 20cm and above) within 5m from both side of the transect line were also recorded to further characterize the existing vegetation. The sampling was conducted from 28 April 2021 to 01 May 2021.

Plate 2.1.1. DBH measurement using diameter tapes as part of data collection

Sampling location

The location of the sampling sites is shown in **Table 2.1.6**; **Figure 2.1.14**. The proposed Ore Yard 5, 6 and 7 (Plot 1; P1) is located at the southern side of the PSC while the proposed Ore Yard 8 (Plot 2; P2) is at the northern side. Line transect 1 (T1) was established across the existing vegetation on the eastern side of ore yards 1 and 2, line transect 2 (T2) was established towards the south eastern side of the administration building; line transect 3 (T3) was established along the PSC Mango orchard towards the Japanese garden.

Table 2.1.6. Relative locations of terrestrial flora sampling sites

Plot/ Transect No.	Sampling Sites	Coordinates	
		Latitude	Longitude
P1	Proposed Ore Yard 5, 6 and 7	N8°34'13.45"	E124°45'41.75"
P2	Proposed Ore Yard 8	N8°34'30.98"	E124°46'03.07"
T1	Across the existing ore yard facilities	N8°34'10.56"	E124°46'02.66"
T2	Adjacent the southern side of the PSC Power Receiving Station	N8°34'06.43"	E124°46'08.00"
T3	Within the existing PSC Mango Orchard	N8°34'21.48"	E124°45'59.65"

Figure 2.1.14. Map showing the PSC terrestrial vegetation sampling locations

Measuring species diversity

The diversity indices such as species richness, relative abundance, Shannon-Weiner diversity index, Simpson's diversity index, and evenness were calculated using the Paleontological Statistical Software Package (PAST) version 3.20 developed by Hammer et al. (2001). The diversity values for Shannon-Weiner were classified based on a scale developed by Fernando (1998), as shown in **Table 2.1.7**.

Table 2.1.7. Modified Fernando Biodiversity Scale

Relative values	Shannon-Wiener index (H')	Pielou's evenness index (J')
Very High	3.5 – 4.0	0.75 – 1.00
High	3.0 – 3.49	0.50 – 0.74
Moderate	2.5 – 2.99	0.25 – 0.49
Low	2.0 – 2.49	0.15 – 0.24
Very Low	1.99 and below	0.14 and below

Estimation of species importance value (IV)

To characterize floral composition of the study area, Importance Value (IV), a standard measurement in forest ecology to determine the rank relationships of species in a given area, shall be computed by obtaining the relative density, relative dominance and relative frequency values of each species. IV shall be determined using the formulae shown in the **Table 2.1.8**.

Table 2.1.8. Biodiversity indices calculated for the data analysis of the terrestrial vegetation

Biodiversity Indices	Definition
Frequency	the number of observation of a given species
Density	the number of individuals of a given species per unit area
Basal Area	$\pi \times DBH^2 / 40000$
Relative Frequency	the number of observation of a given species divided by the total number of observations
Relative Density	density of a species as percentage of the total density for all species
Relative Dominance	basal area of a species as percentage of the total basal area for all species
Importance Value (IV)	Relative Frequency + Relative Density + Relative Dominance

Determination of endemism and ecological status

Both endemism and ecological (or conservation) status of the different species was assessed. The online database, Co's Digital Floral of the Philippines (www.philippineplants.org), and other published literature (Enumeration of Philippine Flowering Plants; Revised Lexicon of Philippine Trees) were used to determine the places of distribution of each species. On the other hand, in order to evaluate the ecological status of each species, DENR Administrative Order 2017-11 (Updated National List of Threatened Philippine Plants and their Categories) was used as a reference. In addition, the 2018 International Union for the Conservation of Nature (IUCN) Red List of Threatened Species was also used. It is widely recognized as the most comprehensive database that provides a global assessment of the conservation status of different vegetation and wildlife species. It also provides information on the population trends and threats specific to species. It should be noted that there are threatened vegetation species in IUCN that are not threatened under DAO 2017-11 and vice versa.

In order to quantify CO_2 emissions for the removal of terrestrial vegetation, forest biomass was estimated.

Aboveground biomass (AGB)

The AGB of individual trees (DBH ≥ 10 cm) in the plots was estimated using the allometric regression model used was based on Chave et al. (2005), using the formula below. The model was derived from destructively sampled trees (direct measurement) and easily measured biometric variables such as diameter (DBH). The resulting AGB is the total AGB of the tree (including stem, branches, twigs, leaves and fruit/flowers, if any) in dry weight (expressed in kilograms [kg]). The total aboveground tree biomass for each plot was then quantified by summing aboveground biomass estimates for all trees on the plots in dry weight (expressed in megagrams (Mg) or tonnes (t)).

Wood density is based on Tree Functional Attributes and Ecological Database (http://db.worldagroforestry.org/) and the Appendix 1 – List of wood densities for tree species from Tropical America, Africa and Asia (http://www.fao.org/3/w4095e/w4095e0c.htm), whichever is available.

A default value of 45% was used to determine the carbon stored in tree biomass, which is an average carbon content of wood samples collected from secondary forests from several locations in the Philippines (Lasco & Pulhin 2000).

$$AGB_{est} = 0.112 (rD^2H)^{0.916}$$

where,

r = wood density, g cm^{-3}
D = DBH, cm
H = tree height, m

Belowground biomass (BGB)

The estimates of BGB was calculated following Mokany et al. (2006):

$$BGB_{est} = AGB\ (tC/ha) \times 0.235$$

Litter

Litter consists of remaining dead plant material (fruits, leaves, flowers) on the forest floor. A proportion of 3.5% was used for secondary dryland forest (Brown et al., 1995; Hashimoto et al., 2004).

Woody debris

Woody debris consists of all dead woody materials including standing dead trees, fallen trees, and part of trees (stems, branches, twigs) on the ground. This pool may be equivalent to 10– 40% of aboveground biomass. The biomass contained in woody debris was estimated to be 18% of aboveground tree biomass for primary dryland forest and 33% for secondary dryland forest (derived from various sources as used in Krisnawati et al. (2014).

2.1.3.2 Baseline Conditions

General Terrestrial Vegetation Profile

Overall, the diversity within the project site was considered low based on this terrestrial vegetation assessment.

The vegetation within the proposed Ore Yard 5, 6 and 7 is generally considered as secondary forest; wherein, because of the absence of human disturbance over a long period, large diameter trees has regrown and occupied the canopy layer (**Plate 2.1.2**). Towering trees of antipolo (*Artocarpus blancoi*) and igyo (*Dysoxylum gaudichaudianum*) form the canopy layer at 25 to 30m tall. Its forest edge was dominated with paper mulberry (*Broussonetia papyrifera*).

On the other hand, the proposed Ore Yard 8 although an industrial area but currently used as an agricultural area cultivated by local communities with cash crops as permitted by PSC (**Plate 2.1.3**). Trees are sporadically present. Most of the recorded trees were located inside the PSC's perimeter fence particularly at the south eastern side of the proposed yard.

The three additional transects further characterize the general vegetation within the PSC, which was considered a planted vegetation (**Plates 2.1.4** to **2.1.6**). The canopies of T1 and T2 were dominated by rain tree (*Albizia saman*) while T3 is composed of mangga (*Mangifera indica*). Across all transects, Alim (*Melanolepis multiglandulosa*) was abundant at the understorey. Paper mulberry was also abundant in T1 and T2.

The proposed new berth facility is generally open with only about seven (7) trees, which can be affected during the construction phase of the expansion project.

A total of 34 morphospecies, belonging to 28 genera and 15 families were recorded (see **Annex 2.1.1**). Except for the three (3) species that were identified up to genus level only, all species were identified up to species level. Twenty-two out from the 31 species identified up to species level are classified as indigenous species, while 9 species are introduced.

The most speciose family encountered is Moraceae (fig family) with nine (9) species, followed by Fabaceae (legume family) with five (5) species, and Euphorbiaceae (spurge family) and Meliaceae (mahogany family) represented by three (3) species each.

In terms of genus, *Ficus* is the most speciose with six (6) species. Collectively known as fig trees, *Ficus* species occupy a wide variety of forest habitats, from beach forests to higher elevations. They are critically important as keystone species in forest ecosystems as the fruit is considered as key diet to various fauna species, especially bats.

Based on historical records, there was no incidence of pest infestation or abnormal tree/plant death within and around the vicinity of PSC as well as grass fire, and acid rain (deposition) that may affect the vegetation in the project site.

Biodiversity indices

The 100% tree inventory within the proposed Ore Yards 5, 6 and 7 has recorded 2,272 individual trees belonging to 28 species from 14 families. In terms of frequency, alim (*Melanolepis multiglandulosa*) is the most abundant with 783 individuals, followed by igyo with 641 individuals, antipolo with 312 individuals, paper mulberry (*Broussonetia papyrifera*) with 170 individuals, and rain tree (*Albizia saman*) with 102 individuals. The estimated stand volume is 3,454.10m^3.

Plate 2.1.2. Periphery of the forest patch within the proposed ore yards 5, 6 and 7 (P1)

Plate 2.1.3. Trees are scattered within the proposed ore yard 8 (P2)

Plate 2.1.4. Existing vegetation within transect 1 (T1)

Plate 2.1.5. Existing vegetation within the transect 2 (T2)

Plate 2.1.6. Existing vegetation within the transect 3 (T3)

The proposed Ore Yard 8, meanwhile, has recorded 149 trees belonging to 18 species from 10 families. The most abundant in terms of number of individuals present is paper mulberry with 26 individuals, followed by narra (*Pterocarpus indicus*) and rain tree with 22 individuals each. The estimated stand volume is 262.89m^3.

As for the line transects, T1 has recorded 52 trees belonging to seven (7) species from five (5) families; T2 has recorded 61 trees belonging to 10 species from eight (8) families; and T3 has recorded 62 individuals belonging to five (5) species from three (3) families.

Species richness, Shannon-Weiner diversity index, Simpson's diversity index, and evenness of the surveyed vegetation sites within the PSC is shown in **Table 2.1.9**. The generated overall Shannon-Weiner (*H'*) diversity value of 2.03, based on the classification of Fernando (1998), is considered low. For the two (2) proposed ore yards using a 100% inventory, the generated *H'* value is 2.00.

Table 2.1.9. Diversity indices of the terrestrial vegetation within PSC

Diversity indices	100% tree inventory			Transect lines				Overall
	P1	P2	Sub Overall	T1	T2	T3	Sub Overall	
Species richness (S)	28	18	34	7	10	5	15	35
Individuals	2272	149	2421	52	61	62	175	2596
Simpson's diversity index (D)	0.77	0.89	0.79	0.68	0.78	0.43	0.72	0.80
Shannon-Weiner's diversity index (H')	1.83	2.47	2.00	1.33	1.76	0.92	1.69	2.03
Evenness	0.22	0.65	0.22	0.54	0.58	0.50	0.36	0.22

Species of ecological importance

Threatened and endemic species

As basis for the protection, conservation and monitoring of the species, assessment of the status was necessary. An endangered species is defined as species that are threatened by disturbance, such that the population of the species may become extinct in the immediate future if the disturbance remains unchecked.

Only narra (*Pterocarpus indicus*) is categorized as 'vulnerable' based on the local assessment using DAO 2017-11 and 'endangered' based on the global assessment of IUCN. This threatened status is based on the premise that mature individuals of this species in its natural habitat is decreasing due to excessive timber poaching. This species was recorded in the proposed Ore Yard 8, particularly inside the PSC's perimeter fence at the south eastern side of the proposed yard. Apparently, these trees were planted by PSC as part of their reforestation program. There were 22 indigenous species recorded. However, none were Philippine endemic.

Species Importance Value

In terms of importance value, antipolo (Artocarpus blancoi) was the most ecologically important species within the proposed ore yards, followed by alim (*Melanolepis multiglandulosa*) and igyo (*Dysoxylum gaudichaudianum*) (**Table 2.1.10**). Apparently, these species are the most abundant and dominant, in terms of basal area, particularly in the proposed Ore Yards 5, 6 and 7, forming almost entirely the canopy of the existing vegetation.

Table 2.1.10. Quantitative analysis of top five (5) species within the proposed ore yards based on SIV

No.	Species	Den	Rel Den	Dom	Rel Dom	Freq	Rel Freq	SIV
1	*Artocarpus blancoi*	0.00191	12.970	0.000704	43.467	1.00	4.348	60.78
2	*Melanolepis multiglandulosa*	0.00481	32.714	0.000138	8.539	1.00	4.348	45.60
3	*Dysoxylum gaudichaudianum*	0.00390	26.518	0.000216	13.302	1.00	4.348	44.17
4	*Albizia saman*	0.00075	5.122	0.000265	16.355	1.00	4.348	25.82
5	*Broussonetia papyrifera*	0.00119	8.096	0.000082	5.041	1.00	4.348	17.48

Den = Density, Rel Den = Relative Density, Dom = Dominance, Rel Dom = Relative Dominance, Freq = Frequency, Rel Freq = Relative Frequency, SIV = Species Importance Value

In general, however, the existing vegetation surrounding the PSC is dominated by rain tree (*Albizia saman*), being the most ecologically important species, followed by alim, mangga (*Mangifera indica*), paper mulberry and binunga (*Macaranga tanarius*) (**Table 2.1.11**). Mahogany (*Swietenia macrophylla*) is also abundant especially along roadsides of the PSC compound.

Table 2.1.11. Quantitative analysis of top five (5) species within the line transects based on SIV

No.	Species	Den	Rel Den	Dom	Rel Dom	Freq	Rel Freq	SIV
1	*Albizia saman*	0.0200	0.1714	0.0065	79.606	1.000	13.636	93.41
2	*Melanolepis multiglandulosa*	0.0527	0.4514	0.0002	2.203	1.000	13.636	16.29
3	*Mangifera indica*	0.0040	0.0343	0.0009	11.569	0.333	4.546	16.15
4	*Broussonetia papyrifera*	0.0233	0.2000	0.0001	0.637	0.667	9.091	9.93
5	*Macaranga tanarius*	0.0027	0.0229	0.0000	0.021	0.667	9.091	9.14

2.1.4.2 Impact Assessment and Environmental Performance

Table 2.1.12. Predicted impacts of/on the terrestrial flora to/by the proposed expansion of PSC for its ore blend and new berth facilities

List of Key Impacts	Phase Occurrence				Discussion
	Pre-	Construction	Operation	Abandonment	
Vegetation removal and loss of habitat		☑	☑	☑	The project will require the clearing/removal of natural forests, particularly in the case of the proposed ore yards, which will potentially result to further disturbance of wildlife and their associated habitats. Clearing will likewise increase fragmentation of forest habitats which could further diminish the low terrestrial vegetation diversity within the PSC. The threatened vegetation species will also be directly affected during vegetation removal. In effect, it will reduce the local abundance of selected threatened plant species. In terms of vegetation communities, it will cause the destruction of certain areas that are potential habitat for indigenous and/or threatened wildlife species. For the Narra species that was recorded in Yard 8, cutting of tree is not recommended. However, if tree cutting is unavoidable, option to conduct earth balling can be done or compliance to the DENR regulatory scheme of planting 100 seedlings to every cut tree must be considered. For the proposed new berth facility, since the area is generally open, there is no immediate impact in terms of vegetation removal. Trees that are present in the area include pioneer species of binunga (*Macaranga*
Threat to existence and/ or loss of important local species		☑	☑	☑	
Threat to abundance, frequency and distribution of important species		☑	☑		

List of Key Impacts	Phase Occurrence				Discussion
	Pre-	Construction	Operation	Abandonment	
					tanarius), ipil-ipil (*Leucaena leucocephala*), alim, and some planted trees of mangga (*Mangifera indica*), rain tree (*Samane saman*), and gmelina (*Gmelina arborea*). The removal of vegetation within the proposed Ore yards 7 and 8 would result to carbon emission of 45,592.72 tC/ha. **Result for each biomass class** *Carbon Pool* / *Mean (tC/ha)* 1. Trees a. Above Ground Biomass: 28,495.45 b. Below Ground Biomass: 6,696.43 2. Debris a. Litter: 997.34 b. Woody debris: 9,403.50 Total: 45,592.72

2.1.5 Terrestrial Fauna

2.1.5.1 Methodology

Sampling Location

Two wildlife transects were established within the identified impact area of the proposed expansion of PSC. Each transect is located along the existing trails. Wildlife observation (WO) areas were also established to confirm other species existing along other habitats found within area. **Figure 2.1.15** depicts the location of the terrestrial fauna transect stations while **Table 2.1.13** show the monitoring station description and their respective coordinates.

Table 2.1.13. Relative locations of terrestrial fauna transects at PSC expansion area

Transect Station	Description		Coordinates	
			Latitude	Longitude
T1 – Ore Blend Facility	Located along the existing trail parallel at the western perimeter fence of PSC. The transect is only used by the roving PSC guard during patrol (**Plate 2.1.7**)	Start	N8°34'2.50"	E124°45'51.21"
		End	N8°34'23.92"	E124°45'29.31"
T2 – Yard 8 location	Established along a gravel access road adjacent to the proposed Ore Yard 8. The transect starting point is near the proposed new wharf of PSC (**Plate 2.1.8**)	Start	N8°34'46.56"	E124°45'52.27"
		End	N 8°34'32.51"	E124°46'11.40"
WO1 – New Wharf	Located near the proposed new berth of PSC sintering facility and east of the existing pier		N8°34'43.23"	E124°45'47.52"
WO2 – PSC Admin Area	Located in front of PSC admin area planted with lots of trees		N8°34'12.68"	E124°46'9.98"
WO3 – PSC guardhouse	Located near the western perimeter fence of fence adjacent to Ore Blend Facility		N 8°34'0.51"	E124°45'51.39"

Plate 2.1.7. PSC Wildlife Transect 1

Plate 2.1.8. PSC Wildlife Transect 2

Sampling Method

In ascertaining the existing faunal diversity in a particular area, site selection is very essential since it will serve as basis for the identification of potential impacts of the project to the existing wildlife. For site selection and transect establishment, the type of habitat existent in the project site was noted. The transect location was also considered relevant to the active operational areas, and vegetated/reforested areas. Such locations have impacts (direct or indirect) to the existing wildlife.

Figure 2.1.15. Map showing the terrestrial fauna transect and wildlife observation area locations

A Garmin GPS was used in determining the coordinates for each transect/wildlife observation area. All the wildlife species observed, heard and encountered at each transect walk were recorded quantitatively.

Direct and indirect methods of identification were used in the wildlife monitoring. The direct method is the actual sighting of faunal species either by the naked eye or with the use of binoculars and cameras. For amphibians, reptiles and non-volant mammals, opportunistic sampling was employed due to their reclusive nature in the wild. On the other hand, indirect method employs the use of bioacoustics, the identification of species through its calls. This method has been more useful in avifaunal species identification. Fecal droppings, burrowings, tracks, dropped feathers, scratches and marks were also noted. Other methods used to ascertain the faunal composition in the area were the following: a) mist netting for birds and volant mammals such as bats; b) live cage traps for non-volant mammals; c) ethnobiology; and; d) use of supplementary materials and pertinent data available.

The biodiversity parameters used to determine the diversity of birds and species similarity of two habitats for each transect are the following:

Shannon-Wiener Index of Diversity (H'):

$H' = \Sigma [(n_i/N) \ln(n_i/N)]$ where (n_i/N) is the probability of the taxon with respect to the total importance value of all taxa.

Simpson's Dominance Index (D):

$D = \Sigma \{[n_i*(n_i-1)]/[N*(N-1)]\}$

Evenness Index (E):

$E = H'/\ln S$ where S is the number of species or taxa

2.1.5.2 Baseline Conditions

Species Composition

The total number of wildlife recorded during this assessment is 71 species of wildlife constituting one (1) species of amphibian, 56 avian fauna, five (5) mammals, and nine (9) species of reptiles, including bird species observed outside the transects but within or adjacent to the study area. Mammals and reptiles that are still occurring in the area as claimed by residents/guides were also included in the list.

Birds

A total of 56 bird species were recorded in the in the recent terrestrial fauna assessment and the data also includes bird species observed outside the transect areas. The avifauna encountered belongs to 31 families constituting 54 genera. **Table 2.1.10** shows the list of birds observed and recorded during the assessment. Avian species richness within the transect walk constitutes 27 species while the rest were observed outside of the transect areas or at designated wildlife observation areas. The study area and its adjoining lots still has plenty of good vegetation and habitat differentiation with big trees thus food resource is plenty aside from the fact that is adjacent to a protected marsh habitat which serves as good

habitat for wildlife. **Plates 2.1.9** to **2.1.16** are some of the birds observed at the study area during the conduct of the assessment.

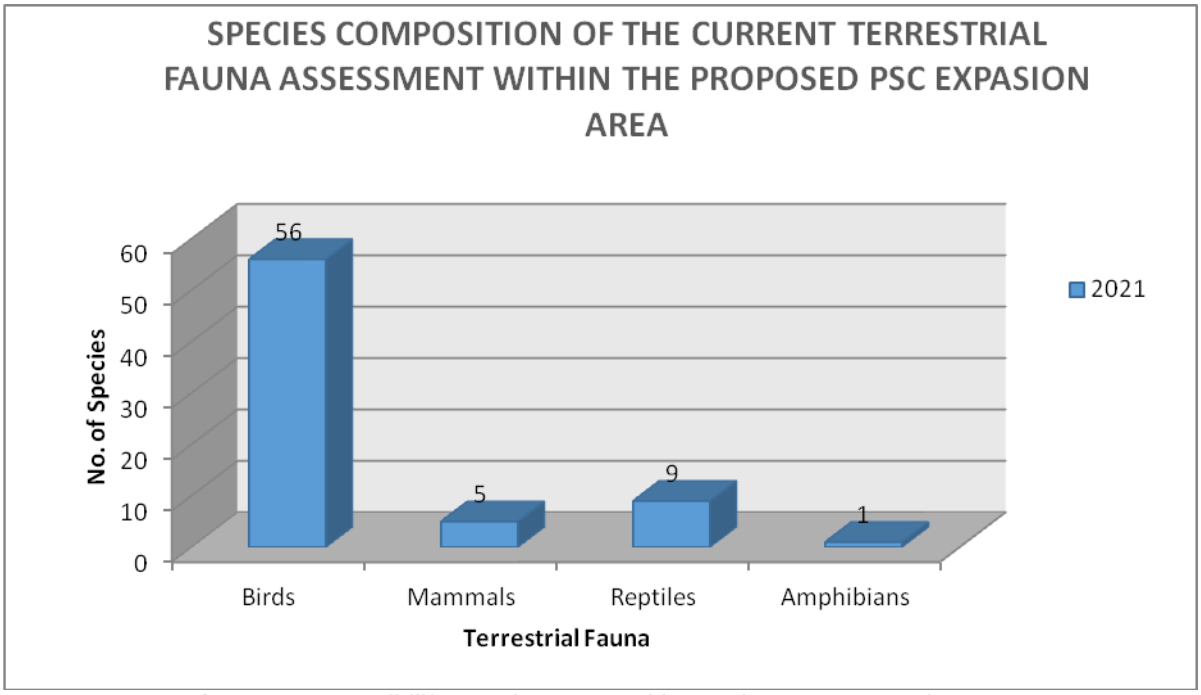


Figure 2.1.16. Wildlife species composition at the PSC expansion area

In terms of avian species richness within the two (2) transect walks assessed for this event, T1 along the proposed ore blend facility had the most number of species recorded, with 23 bird species. The transect along the proposed Yard 8 has the lowest with only 18 species. Low species count in the area can be attributed to the existence of a gravel road used by locals and nearby industries. In terms of species abundance for birds, the assessment only recorded 254 individuals. Species abundance may however vary which can be attributed to several factors including weather, significant increase in food availability (i.e harvest/fruiting season, presence of disturbance, migration season, habitat change etc). For this assessment, lower abundance can be attributed to the disturbance and reduced food availability considering that the area within an industrial area.

Plate 2.1.9. Emerald Dove

Plate 2.1.10. Black-naped Oriole

Plate 2.1.11. Zebra Dove

Plate 2.1.12. Glossy Swiftlet

Plate 2.1.13. Collared Kingfisher

Plate 2.1.14. Chestnut Munia

Plate 2.1.15. Brahminy Kite

Plate 2.1.16. Blue-throated Bee-eater

Commonly observed species of birds along the transects were Yellow-vented Bulbul, Eurasian Tree Sparrow, Blue-throated Bee-eater, and Asian glossy starling (**Plates 2.1.17** to **2.1.20**). This species of birds were almost present in all the transect areas and wildlife observation areas.

Plate 2.1.17. Yellow-vented Bulbul

Plate 2.1.18. Eurasian Tree Sparrow

Plate 2.1.19. Blue-tailed Bee-eater

Plate 2.1.20. Asian Glossy Starling

Notable species of bird observed in the area are the Philippine Duck and Wandering Whistling Duck (**Plates 2.1.21** and **2.1.22**) that were observed in the marshy area on the other side of the PSC fence, protected by the adjoining company STEAG. Shorebirds like little ringed plover and pied stilt were also observed during the assessment (**Plates 2.1.23** and **2.1.24**).

Plate 2.1.21. Philippine Duck

Plate 2.1.22. Wandering Whistling Duck

Plate 2.1.23. Little-ringed Plover

Plate 2.1.24. Pied Stilt

Mammals

The total number of mammalian fauna recorded in the study area is five (5) species, belonging to two (2) families (**Table 2.1.11**) constituting five (5) genera. The number of volant mammals observed consisted of only four (4) species of fruit bat – the rousette fruit bat, greater musky fruit bat, short nosed fruit and the lesser musky fruit bat. An insect bat – the lesser Asiatic yellow bat was also captured in the mist net.

In terms of species abundance, the two (2) species of musky fruit bats were the most abundant in the project area as well as the short-nosed fruit bat. A total of 25 individuals were caught in the mist net conducted for three (3) trapping nights most of which were the musky fruit bats. **Plates 2.1.25** to **2.1.28** were pictures of the bats caught. The caught individuals were subsequently released after the pictures were taken. Trapping for rats was conducted but no rats were captured by the traps set for two (2) trapping days.

Herpetofauna

Only one (1) species of frogs/toads were observed during the wildlife assessment and survey (**Table 2.1.12**) which is the marine toad. More than 10 individuals were estimated along the drainage canals of PSC. Absence of other species of frogs in the area could not be generalized yet since frogging is limited during daytime.

The number of reptilian species documented during the survey is only nine (9) (**Table 2.1.13**). Most of the reptiles observed were lizards belonging to five (5) families and two (2) snakes belonging to two (2) families. Almost all the reptiles observed were common resident species, monitor lizard is very common especially in the fenced property of PSC where it was protected and not subject to hunting pressure.

Biodiversity Indices

The diversity value (H') of all the transects ranges from 2.42 to 2.68. Of the two (2) transects, T1 in the proposed area for ore blend facility is the most diverse with an H' value of 2.68 (Moderate Diversity), while T2 in the proposed area for Yard 8 has an H' value of 2.42 (Low Divrsity). T2's lower diversity can be attributed to the increased disturbance in the transect area. At the time of transect walk in the area, there are occasional vehicles and motorcycles that passes nearby. High species diversity value in T1 transect is attributable to the kind of vegetation and the absence of anthropogenic disturbance.

Plate 2.1.25. Greater Musky Fruit Bat

Plate 2.1.26. Lesser Musky Fruit Bat

Plate 2.1.27. Common Rousette Fruit Bat

Plate 2.1.28. Lesser Asian Yellow Bat

Plate 2.1.29. Marine Toad

Plate 2.1.30. Monitor Lizard

Plate 2.1.31. Green-crested Lizard

Plate 2.1.32. Brown Mabuya or BrownSkink

The result of the dominance value computation for the wildlife assessment shows the inverse relationship of diversity and dominance index. Having low to medium species diversity values, the two (2) transect sites show very low to low dominance index value. Low values of dominance index among the transects illustrate improved diverseness along transect sites.

Evenness index is directly proportional with species diversity index and inversely proportional with dominance index. When the proportion among all species is similar, the evenness value is equivalent to one. On the other hand, when abundance among species is very dissimilar, the value decreases. All the transect sites have medium to high evenness value because the abundance of each species is not similar with one another as there were species that has greater number of individuals as compared to the rest. Avian diversity in the area is relatively high if compared to this parameter.

Ecological Importance, Conservation Status and Distribution

Out of the 71 species of wildlife recorded, about 23 % of the wildlife species are endemic to the Philippines, most of which are species of birds. Only two (2) species of endemic mammal and two (2) endemic reptiles was recorded during the recent wildlife monitoring and no endemic amphibian was observed. **Plates 2.1.33** to **2.1.35** are some of the endemic species of birds observed in the project area. See **Tables 2.1.14** to **2.1.17** for the wildlife endemicity within the area.

In terms of ecological role, most of the bird species observed during the wildlife survey and assessment were omnivores and insectivores. Only few species of frugivores, omnivores and graminivores were observed during the survey. See **Tables 2.1.14** to **2.1.17** for the complete list of the ecological roles of bird species observed.

Nectarivores like flowerpeckers and frugivores like doves, bulbuls and orioles are essential in maintaining an equilibrium and continuity within the forest ecosystem. Such species occupies an ecological niche that facilitates pollination and fertilization of flowering forest trees as well as seed dispersion. Carnivores such as kites and insectivores such as magpie-robin and fantail also occupy a significant role in maintaining insect and pest population. Extirpation or loss of wildlife within an ecosystem would have a significant effect on the balance of ecosystem.

Table 2.1.14. List of avian species recorded during the terrestrial fauna assessment at PSC in Villanueva, Misamis Oriental, April 2021

Species	Common Name	Occurrence					Mode of Observation	Distribution Category	Conservation Status (IUCN)	Feeding Role
		T1	T2	WO1	WO2	WO3				
Family Accipitridae – Buzzard, Kites, Hawks, Eagles										
Haliastur indus	Brahminy Kite	x^{OT}			x	x	D	Resident	LC	Carnivore
Family Anatidae – Ducks, Geese and Swans										
Anas luzonica	Philippine Duck					x	D	Endemic	VU	Omnivore
Dendrocygna arcuata	Wandering Whistling Duck					x	D	Resident	LC	Omnivore
Family Alcedinidae – Dwarf Kingfishers										
Alcedo atthis	Common Kingfisher	x^{OT}				x	D,H	Migratory	LC	Piscivore
Family Apodidae – Swifts, Needletails										
Apus pacificus	Pacific Swift	x	x				D	Migratory	LC	Insectivore
Collocalia esculenta	Glossy Swiftlet	x	x	x	x	x	D,MNC	Resident	LC	Insectivore
Collocalia troglodytes	Pygmy Swiftlet	x					D	Endemic	LC	Insectivore
Cypsiurus balasiensis	Asian Palm Swift	x	x	x	x	x	D	Migratory	LC	Insectivore
Family Ardeidae – Herons, Egrets, Bitterns										
Ardeia alba	Greater Egret					x	D	Resident	LC	Omnivore
Ardeia intermedia	Intermediate Egret			x			D	Resident	LC	Omnivore
Ardeola speciosa	Javan Pond Heron		x^{OT}			x	D	Migratory	LC	Omnivore
Egretta garzetta	Little Egret			x			D	Resident	LC	Omnivore
Ixobrychus cinnamomeus	Cinnamon Bittern		x^{OT}			x	D	Resident	LC	Omnivore
Ixobrychus sinensis	Yellow Bittern		x^{OT}				D	Resident	LC	Omnivore
Family Artamidae – Wood-swallows										
Artamus leucorynchus	White-breasted Wood-swallow	x	x				D,H	Resident	LC	Insectivore
Family Campephagidae – Trillers										
Lalage nigra	Pied Triller	x	x				D	Resident	LC	Insectivore
Family Charadriidae – Plovers, Dotterels and Lapwings										
Charadrius dubius	Little Ringed Plover		x^{OT}	x			D	Resident	LC	Omnivore
Himantopus leucocephalus	Pied Stilt		x^{OT}				D	Migratory	LC	Omnivore
Family Cisticolidae – Small Passerine Birds										
Orthotomus derbianus	Grey-backed Tailorbird	x					H	Endemic	LC	Insectivore
Family Columbidae – Doves, Pigeons										
Chalcophaps indica	Emerald Dove	x			x	x	D,MNC	Resident	LC	Frugivore
Geopelia striata	Zebra Dove	x	x		x	x	D,MNC	Resident	LC	Graminivore
Macrophygia tenuirostris	Philippine Cuckoo Dove					x	D	Near-Endemic	LC	Frugivore
Phapitreron leucotis	White-eared Brown Dove	x					D,H,MNC	Endemic	LC	Frugivore
Ptilinopus leclancheri	Black-chinned Fruit Dove				x		D	Endemic	LC	Frugivore
Spilopelia chinensis	Spotted Dove	x	x				D	Resident	LC	Graminivore
Streptopilia dusumieri	Phil. Collared Dove	x	x		x		D,MNC	Endemic	VU	Graminivore

Species	Common Name	Occurrence					Mode of Observation	Distribution Category	Conservation Status (IUCN)	Feeding Role
		T1	T2	WO1	WO2	WO3				
Family Cuculidae – Cuckoos, Malkohas, Coucals										
Cacomantis merulinus	Plaintive Cuckoo				x		D,H	Migratory	LC	Insectivore
Centropus viridis	Philippine Coucal				x	x	D,H	Endemic	LC	Insectivore
Family Dicaeidae – Flowerpeckers										
Dicaeum australe	Red-keeled Flowerpecker					x	D,H	Endemic	LC	Nectarivore
Prionichilus olivaceus	Olive-backed Flowerpecker					x	D,H	Endemic	LC	Nectarivore
Family Estrildidae – Avadavats, Parrotfinches, Munias										
Lonchura atricapilla	Chestnut Munia		x			x	D	Resident	LC	Graminivore
Lonchura leucogstra	White-bellied Munia	x^{OT}					MNC	Resident	LC	Graminivore
Family Halcyonidae – Tree Kingfishers										
Alcedo atthis	Common Kingfisher	x^{OT}				x	D,H	Migratory	LC	Piscivore
Todiramphus chloris	Collared Kingfisher	x	x	x	x		D,H	Resident	LC	Piscivore
Family Hirundinidae – Martins, Swallows										
Hirundo tahitica	Pacific Swallow		x^{OT}	x			D	Migratory	LC	Insectivore
Family Lariidae – Terns										
Sterna hirundo	Common Tern			x			D	Migratory	LC	Piscivore
Family Laniidae – Shrikes										
Lanius cristatus	Brown Shrike	x					D,H	Migratory	LC	Carnivore
Family Locustellidae – Insectivorous Songbirds										
Megalurus palustris	Striated Grassbird		x				D,H	Resident	LC	Insectivore
Family Meropidae – Bee-eaters										
Merops philippinus	Blue-tailed Bee-eater	x	x		x		D	Resident	LC	Insectivore
Merops viridis	Blue-throated Bee-eater	x					D	Resident	LC	Insectivore
Family Motacillidae – Wagtails, Pipits										
Anthus rufulus	Paddyfield Pipit	x^{OT}					D	Resident	LC	Insectivore
Motacilla cinerea	Grey Wagtail					x	D	Migratory	LC	Insectivore
Family Muscicapidae – Flycatchers										
Copsychus mindanensis	Philippine Magie-Robin	x				x	D,H	Endemic	LC	Insectivore
Saxicola caprata	Pied Bush Chat	x^{OT}				x	D	Resident	LC	Insectivore
Family Nectariniidae – Sunbirds, Spiderhunters										
Nectarinia jugularis	Olive-backed Sunbird	x	x	x	x	x	D,H	Resident	LC	Nectarivore
Family Oriolidae – Orioles										
Oriolus chinensis	Black-naped Oriole	x					D,MNC	Resident	LC	Frugivore
Family Psittacidae – Lorikeets, Cockatoos, Parrots, Racquet-tails, Hanging Parrots										
Loriculus philippensis	Philippine Hanging Parrot	x^{OT}					D,H	Endemic	LC	Frugivore
Family Ploceidae – Old World Sparrows, Weavers										
Passer montanus	Eurasian Tree Sparrow	x	x	x	x	x	D,H	Resident	LC	Graminivore

Species	Common Name	Occurrence					Mode of Observation	Distribution Category	Conservation Status (IUCN)	Feeding Role
		T1	T2	WO1	WO2	WO3				
Family Pycnonotidae – Bulbuls										
Pycnonotus goiavier	Yellow-vented Bulbul	x	x		x	x	D,H,MNC	Resident	LC	Frugivore
Family Rallidae – Rails, Crakes, Coots, Gallinules										
Amaurornis olivaceus	Plain Bush Hen	x^{OT}				x	D	Endemic	LC	Omnivore
Gallinula chloropus	Common Moorhen					x	D	Resident	LC	Omnivore
Hyptaenidia torquata	Barred Rail		x		x	x	D,H	Resident	LC	Graminivore
Family Rhipiduridae – Fantails										
Rhipidura nigritorquis	Philippine Pied Fantail	x	x		x		D,H,MNC	Endemic	LC	Insectivore
Family Sturnidae – Starlings										
Aplonis panayensis	Asian Glossy Starling	x	x	x	x	x	D,H,MNC	Resident	LC	Frugivore
Family Sylviidae – Old World Warblers										
Gerygone sulphurea	Golden-bellied Fly-eater				x	x	H	Resident	LC	Insectivore
Family Tytonidae – Grass Owls										
Tyto longimembris	Eastern Grass Owl					x	D	Resident	LC	Carnivore
Family Zosteropidae – White-eye										
Zosterops everetti	Everett's White-eye		x^{OT}			x	D,H	Resident	LC	Nectarivore

Note: x – Observed within transect or wildlife observation area; x^{OT} - observed in the area but encountered outside the transect
D – Direct Observation; H – Heard only; MNC – Mist Net Captured
LC – Least Concern; VU - Vulnerable

Table 2.1.15. List of mammalian species recorded during the terrestrial fauna assessment at PSC in Villanueva, Misamis Oriental, April 2021

Species	Common Name	Occurrence	Number of Individuals	Distribution Category	Conservation Status	Feeding Role
Family Pteropodidae – Fruit Bats						
Cynopterus brachyotis	Short-nosed Fruit Bat	Mist net caught at proposed ore blend facility area	15	Resident	Least Concern	Frugivore
Haplonycteris fischeri	Fischer's Pygmy Fruit Bat	Mist net caught at proposed ore blend facility area	1	Resident	Least Concern	Nectarivore
Ptenochirus jagori	Greater Musky Fruit Bat	Mist net caught at proposed ore blend facility area	8	Endemic	Least Concern	Frugivore
Ptenochirus minor	Lesser Musky Fruit Bat	Mist net caught at proposed ore blend facility area	2	Endemic	Least Concern	Frugivore
Rousettus amplexicaudatus	Common Rousette	Mist net caught at proposed ore blend facility area	2	Resident	Least Concern	Frugivore
Family Vespertilionidae – Microbats						
Scotophilus kuhlii	Lesser Asian Yellow Bat	Mist net caught at proposed ore blend facility area	1	Resident	Least Concern	Insectivore

Table 2.1.16. List of amphibian species recorded during the terrestrial fauna assessment at PSC in Villanueva, Misamis Oriental, April 2021

Species	Common Name	Occurrence	Number of Individuals	Residency Status	Conservation Status	Feeding Role
Family Bufonidae – True Toad						
Rhinella marina	South American Toad	Observed along PSC drainage canals	10+	Non-native	Least Concern	Insectivore

Table 2.1.17 List of reptilian species recorded during the terrestrial fauna assessment at the PSC in Villanueva, Misamis Oriental, April 2021

Species	Common Name	Occurrence	Mode of Observation	Residency Status	Conservation Status	Feeding Role
Family Agamidae – Dragon Lizards						
Broncochela cristatella	Green-crested Lizard	Observed along the proposed area for yard 8	D	Resident	LC	Insectivore
Hydrosaurus pustulatus	Philippine Sailfin Lizard	Indicated by guides to occur inside the PSC area	E	Endemic	VU	Omnivore
Family Elapidae – Venomous Snakes						
Naja samarensis	Southern Philippine Cobra	Indicated by guides to occur inside the PSC area	E	Endemic	LC	Carnivore
Family Gekkonidae – Geckos and House Lizards						
Gekko gecco	Tockay Gekko					
Hemidactylus frenatus	Common House Gecko	Observed along PSC Admin Area and PSC Laboratory	D	Resident	LC	Insectivore
Family Phytonidae – Phytons						
Phyton reticulatus	Reticulated Phyton	Indicated by guides to occur inside the PSC area	E	Resident	LC	Carnivore
Family Scincidae – Skinks						
Eutropis multifasciata	Common Ground Skink	Observed along the proposed area for ore blend facility	D	Resident	LC	Insectivore
Lamprolepis smaragdina	Green Tree Skink	Observed along the proposed area for ore blend facility	D	Resident	LC	Insectivore
Family Varanidae – Monitor Lizards						
Varanus salvator	Monitor Lizard	Observed along the proposed area for ore blend facility	D	Resident	LC	Omnivore

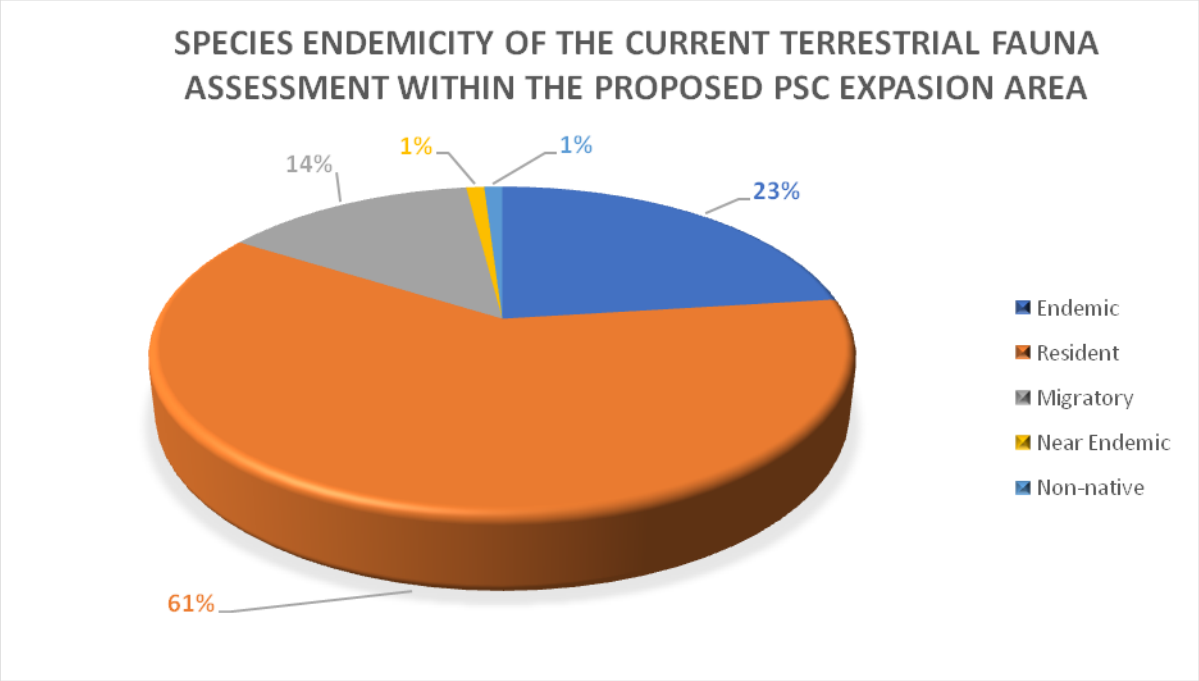


Figure 2.1.17. Endemicity of wildlife recorder at the PSC expansion area

Plate 2.1.33. White-eared Brown Dove

Plate 2.1.34. A juvenile Philippine Collared Dove

Plate 2.1.35. Philippine Pied Fantail

Plate 2.1.36. Philippine Magpie Robin

All the species recorded during the current monitoring event has IUCN conservation status of least concern except for the Philippine Duck, Philippine Collared Dove and Philippine Sailfin Lizard which has vulnerable status.

2.1.5.3 Impact Assessment and Environmental Performance

Table 2.1.18. Predicted impacts of/on the terrestrial fauna to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Threat to existence and/ or loss of important local species		☑	☑	☑	Threat to abundance and species richness is a significant impact of the project expansion considering that the existing forest vegetation will be removed for the construction of ore blend facility. However, most of the wildlife species observed were generalists, capable of adapting to disturbance or relocating to adjacent habitats. The existing habitat in the area is vast and contiguous capable of accommodating displaced wildlife from the tenement. However, the proponent shall set aside and protect buffer areas such as the remaining open area that is capable of supporting the niches of wildlife. It is also suggested that PSC shall coordinate with STEAG in protecting the marsh habitat that is an important habitat for wild ducks and other wildlife species in the area especially during construction phase. It is also recommended that before the old ore stockpile is removed, PSC is highly encouraged to recreate a mound that can be utilized by bee-eater once their nesting area is removed (**Plate 2.37**).
Threat to abundance, frequency and distribution of important species		☑	☑	☑	
Hindrance to wildlife access		☑	☑		

Plate 2.1.37. Ore stockpile that became a nesting site of bee-eaters

2.2 THE WATER

2.2.1 Hydrology/Hydrogeology

2.2.1.1 Methodology

The hydrological features of the project site were determined from on-site observations and relevant secondary information such as the previous EIS and EPRMP of PSC. Relevant information was also gathered from the National Mapping and Research Information Authority (NAMRIA), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), and Mines and Geosciences Bureau (MGB).

2.2.1.2 Baseline Conditions

Drainage Systems

Four drainage systems flow in the vicinity of the project site in a dendritic pattern and discharge at Macajalar Bay (**Figure 2.2.1**). They are, from north to south, the Taganga Creek, the Tagbalitang Creek, the Pugaan River, and the Tagoloan River.

The Taganga Creek lies directly north of the project site. It originates at Claveria town proper to the northeast flows in a southwest direction. It drains a catchment area of 3,288 has. People in the vicinity use the creek primarily for washing and bathing.

The Tagbalitang Creek is an intermittent creek that drains a catchment area of just 669 hectares. It begins about 5km southeast of the PSC plant site and flows in a northwest direction. The creek used to discharge at the northern end of the PSC compound. However, its channel has been diverted to skirt the project site and empty immediately south. The creek was dry at the time of the previous survey and residents say that it remains waterless for most of the dry season. Aside from its small catchment area, the creek's intermittent nature may also be due to the good internal drainage of its watershed, which causes runoff water to readily infiltrate into the ground. The PSC plant site lies within this catchment.

The Pugaan River is a large river having a watershed area of 8,378 hectares. The river originates from the high, rugged land northeast of Claveria and flows southwest. Upon reaching the floodplain, it shifts northwest and meanders towards Macajalar Bay.

With a catchment area covering 168,843 has, the Tagoloan River constitutes the largest river system in the vicinity. The river spans the provinces of Misamis Oriental and Bukidnon. Its headwaters originate at Mount Kitanglad and Malaybalay to the south and southeast and the mountainous area farther east of Claveria. The tributaries converge about 10km from Tagoloan town proper to form a braided channel that flows northwest along a 2km-wide floodplain. High sedimentation from both Tagoloan and Pugaan rivers resulted in the formation of a deltaic plain where the Tagoloan town proper is located. The PSC plant site lies at the northern section of this delta.

The former Bureau of Public Works used to operate the Sta. Cruz Gauging Station about 1.5 km upstream from the Tagoloan Bridge. The station embraced a drainage area of 1,656km^2 at this point. Its 1960-1980 record is incomplete and erratic (NWRC, 1980) and yielded streamflows that are higher than what could be supplied by the rainfall.

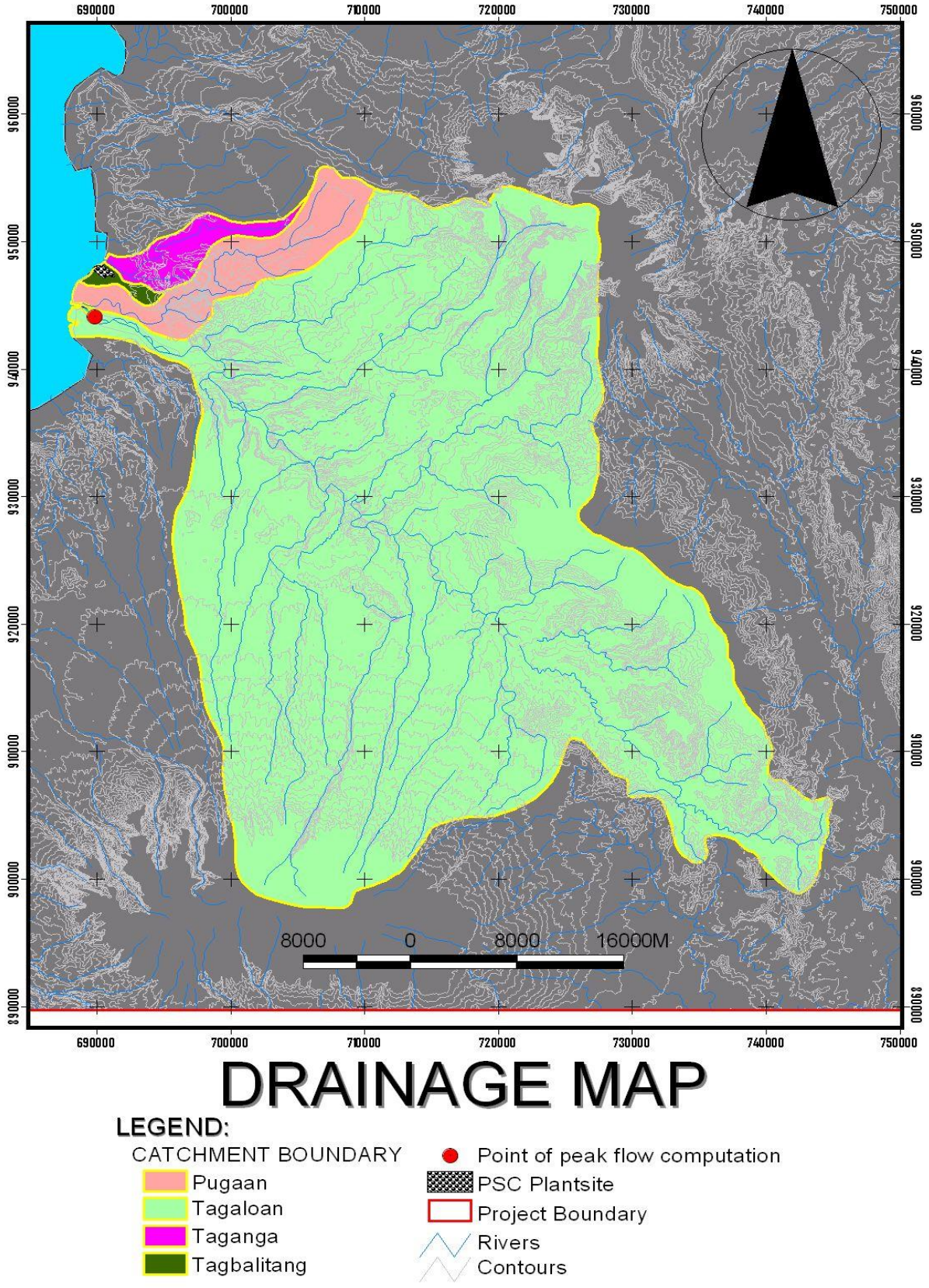


Figure 2.2.1. Drainage map of PSC project area

Streamflow

Reasonable streamflow estimates covering the years 1961 to 2000 were modeled by Hatch for the EIA of the coal-fired power plant of State Power Development Corporation. **Table 2.2.1** shows the monthly and annual discharge of the Tagoloan River according to these estimates and the monthly and annual discharge of the Tagbalitang River computed from the analogue method (Sokolov & Chapman, 1974).

Table 2.2.1. Monthly and annual streamflow

Period	Tagbalitang Catchment	Tagoloan Catchment
	Streamflow (m^3/sec)	
January	0.16	38.53
February	0.12	28.78
March	0.10	25.31
April	0.10	24.24
May	0.12	29.44
June	0.25	61.39
July	0.33	81.23
August	0.34	85.30
September	0.37	90.69
October	0.37	92.73
November	0.22	54.70
December	0.15	37.73
Annual	**2.63**	**650.07**

Source: Hatch, 2000

It is significant to note that there is no updated monthly and annual streamflow data on the Tagoloan River and other rivers in the vicinity inasmuch as there are no operational gauging stations along these rivers. The nearest river with updated records is located in Agusan del Norte.

Groundwater

Water Point Inventory

Several wells were identified during the previous studies. **Table 2.2.2** summarizes the PSC well data.

Table 2.2.2. Summary of well data of PSC

Well No.	Owner / Name	Location	Depth (m)	Casing (mm)	Max Capacity (m^3/h)	Remark
W1	PSC	Villanueva	116	300	--	Retired in 1980
W2	PSC	Villanueva	116	300	85	Retired in 1980
W3	PSC	Villanueva	116	300	85	Operational but seldom used (Elevated Chlorine)
W4	PSC	Villanueva	116	300	85	Operational
W5	PSC	Villanueva	75.0	250	85	Damaged Pump (Elevated Chlorine)
W6	PSC	Villanueva	120.0	300	85	Operational

PSC owns Wells 1 to 6, which are located within their premises. These wells were drilled to depths of 43 to 60m and utilize 300mm-diameter steel casings. They apparently tapped into unconfined aquifers in the alluvial deposits and are capable of producing more than 20L/s of water. Wells 1 and 2 are however abandoned and inactive respectively because of saltwater contamination, while Well 3 presently yields water with elevated chloride content.

Other wells occurring in the area based on the previous studies is a 7-m dug well used for domestic water in several homes in Bgy. Katipunan, Villanueva.

PIA also owns wells. These wells draw water from alluvial aquifers in the Tagoloan-Pugaan floodplain and provide water for the hospital at the old Phividec Compound, the Sacramento Steel Corporation and Southern Industrial Gases, Inc. Both wells produce approximately 7L/s of water, but pumping tests from a previous study suggest that their yields may be increased to more than 20L/s.

Other wells supply other locators in the Phividec estate. These also extract water from the alluvial aquifers in the floodplain. The wells produce varying amounts of water depending on the size of the submersible pumps in them.

Several shallow wells were also observed in the area, which have not been located on the map. These provide domestic water for homes and are usually 6 to 12m deep. They are fitted with jack pumps that yield around 0.3L/s of water.

Aquifer Characteristics

The water-bearing formations in the areas consist of the highly permeable sand and gravel layers within the Quaternary Alluvium and Cagayan Terrace Gravel. These are prolific aquifers capable of producing more than 40L/s of water. Their highly permeable nature however becomes a disadvantage to wells located near the shoreline as heavy groundwater extracting makes them prone to saltwater intrusion.

The sandy and gravelly deposits in the Bukidnon Formation are also known to yield appreciable amounts of water. Many wells in Cagayan de Oro draw water from this formation.

The aquifers in the area are replenished from direct rainfall infiltration and surface water contribution from rivers particularly the Tagoloan and Pugaan rivers.

The area may be divided into two (2) hydrogeologic units according to the lithologic and textural characteristics of the underlying rock formations, which are: 1) areas underlain by loose to poorly consolidated silty to gravelly deposits with widespread aquifers and 2) areas underlain by moderately compacted sedimentary and tuffaceous rocks with local, disconnected aquifers.

Areas occupied by the Quaternary Alluvium and Cagayan Terrace Gravel make up the first hydrogeologic unit while areas underlain by the Bukidnon Formation constitute the second hydrogeologic unit. The first unit is highly permeable while the second unit is relatively less permeable.

Figure 2.2.5 displays the hydrogeologic map of the area prepared according to the abovementioned scheme.

Groundwater Levels and Flow Directions

The groundwater level in the deltaic plain, coastal plain and flood plain is generally shallow. The well inventory shows static water levels of less than 10mbgs, which is substantiated by the shallow depths of the wells. The water level is expected to be deeper in higher areas.

Groundwater moves from high to low elevation head. Thus, the flow of groundwater in the area will follow the topographic gradient and generally move westward towards the flood plain, deltaic plain and coastal plains.

Groundwater Recharge

Groundwater in the area receives recharge directly from rainfall and from infiltration of surface water into the aquifers particularly the Tagoloan and Pugaan Rivers.

2.2.1.3 Impact Assessment and Environmental Performance

Table 2.2.3. Predicted impacts of/on hydrology/hydrogeology to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Change in drainage morphology/ inducement of flooding/ reduction in stream volumetric flow		☑	☑	☑	The expansion project involves stripping of vegetation and excavation of land for the construction of ore blend and new yard facilities. Increased surface runoff and erosion will ensue and a corresponding rise in the sediment load, PSC however has an existing siltation ponds that can arrest the storm run-off laden with silt materials and soil particles. This impact is less significant especially the reduction in stream volumetric streamflow since there are no freshwater surface water bodies within the project site and the expansion areas.
Change in stream depth					There are no freshwater surface water bodies within the project site and the expansion areas thus the likely occurrence of this predicted impact is insignificant.
Depletion of water resources/ competition in water use			☑	☑	Groundwater well has been used as water supply from the very first time that PSC operated in the area.

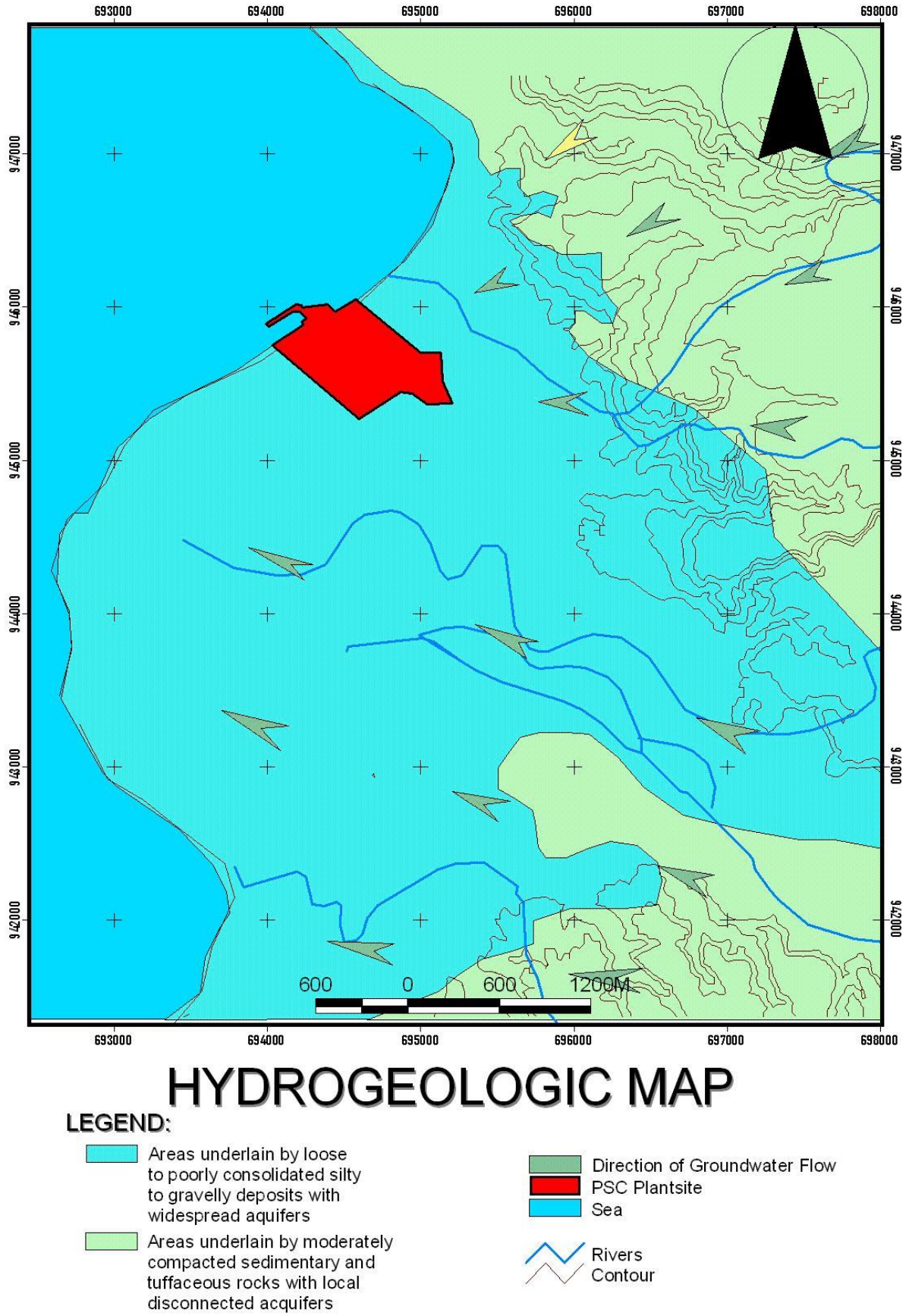


Figure 2.2.2. Hydrogeologic map of PSC project area

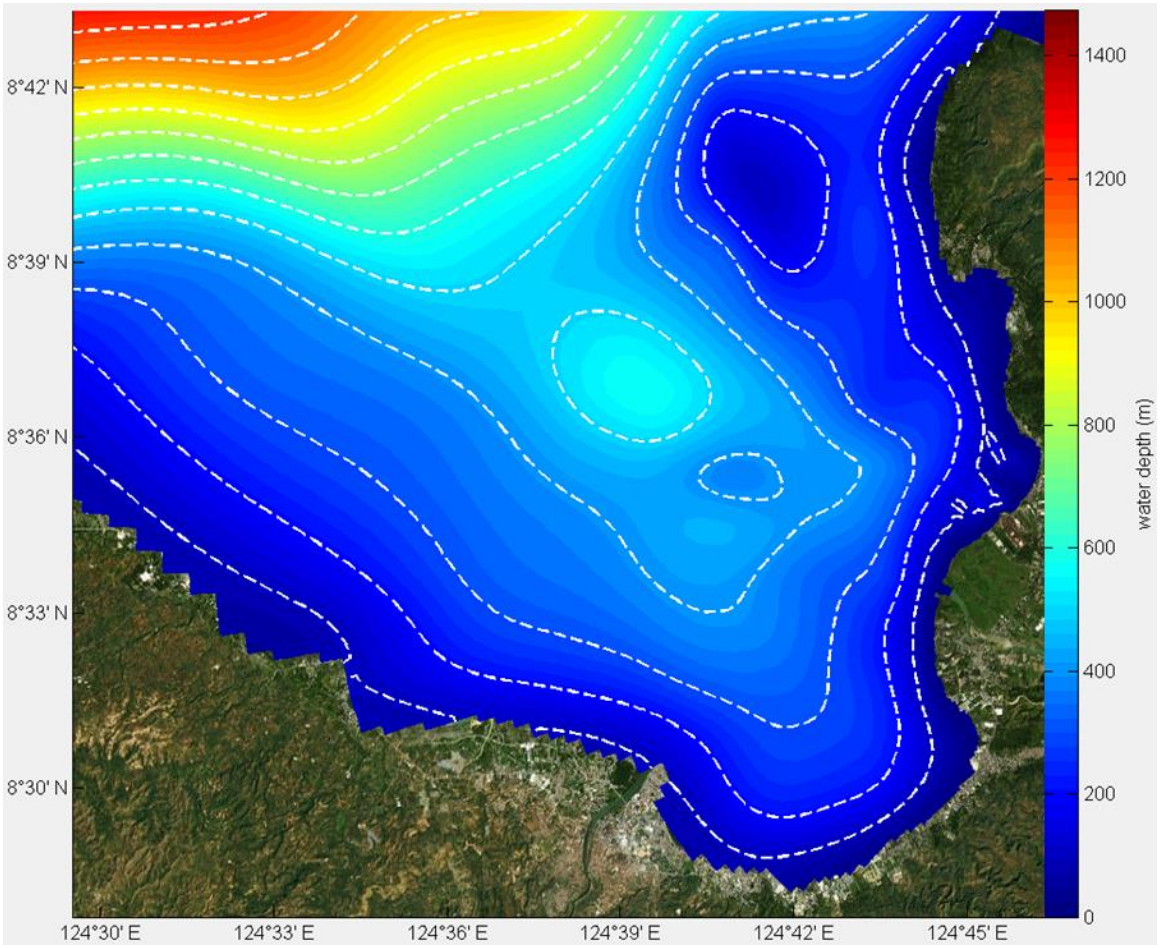


Figure 2.2.3. Generated bathymetry map of Macajalar Bay and the Project's surrounding area; also shown is the 100-m contour intervals (in dashed lines).

2.2.2 Oceanography

2.2.2.1 Methodology

In order to quantify the physical processes and provide insights as to the coastal circulation, water movement, tidal fluctuations offshore of PSC's project in the Municipality of Villanueva, Province of Misamis Oriental, field surveys and measurement was conducted from May 8 - 9, 2021 to gather field data such as bathymetry, water surface flow measurement, under-water current observations, water level fluctuations, and photo documentation in the coastal areas of Macajalar Bay where the proposed Expansion and Construction of New Berthing Facility Project of PSC will be situated.

Numerical modeling is likewise employed to complement the field measurement due to the limited information available to fully describe the natural coastal processes within the project area. Using the field data, numerical model is used to assess the coastal currents and water movement for different wind speed and directions, as well as different tidal conditions (spring and neap tides), as well as the potential impact on the water quality of the project, specifically changes in the ambient water temperature due to the release of warm water at the outfall.

Bathymetry - Baseline and Impact Assessment

To determine the topographic configurations of the sea bed (known as bathymetry), available topographic map covering the offshore areas of Villanueva, Misamis Oriental from NAMRIA were digitized and merged with the depth surveys conducted in the project area. Using the echo-sounder mounted on a boat, water depths, coordinates, and temperature were recorded at regular interval while traversing the area.

Post-processing of the interpolated bathymetry of the areas covering this area were conducted using GIS. From this analysis, under the pre-development condition, the total 'wet' surface area covering 635.44km^2 offshore areas of PSC in Villanueva, Misamis Oriental (using the areal extent shown in the bathymetry map below), the total water volume is about 231.08bcm with a maximum depth of more than 1,440m and an average depth of about 363.65m. The bathymetry map of the area using the coupled NAMRIA bathymetry and depth surveys is shown in the next figure. This data was also used in the hydrodynamic and tracer plume modeling conducted as part of impact assessment which is discussed in the following sections.

Water Circulation - Baseline and Impact Assessment

An assessment of the water movement, flow velocities, and tidal fluctuations was made to provide a perspective of the actual flow patterns and tidal levels which can be used as inputs, as well as in calibrating the hydrodynamic model to be set up and used for this study. The survey activities were conducted from May 8-9, 2021 to gather field data such as bathymetry, water surface flow, under-water current observations, water level fluctuations, and photo documentation.

Methodologies of the field surveys and data gathered are summarized below:

Field Observations

a) Tidal Water Levels

An automatic water level logger was set up along one of the PSC's berthing facility, approximately 200 meters west from the coast with the following geographic coordinates: 8°34'44.08"N and 124°45'41.68"E. The logger was set to record tidal levels from 11:50 AM of May 08 to 1:40 PM of May 9, 2021 submerged about two and a half meters (2.5m) below the water surface. The set-up automatically recorded the fluctuations of the water level every 5 minutes. The raw data of the tidal pattern observed and recorded over the 25-hour observation period was then adjusted into a mean sea level datum as reference and used for comparative analysis and calibration of the tidal water levels predicted during the same period from the results of the hydrodynamic model.

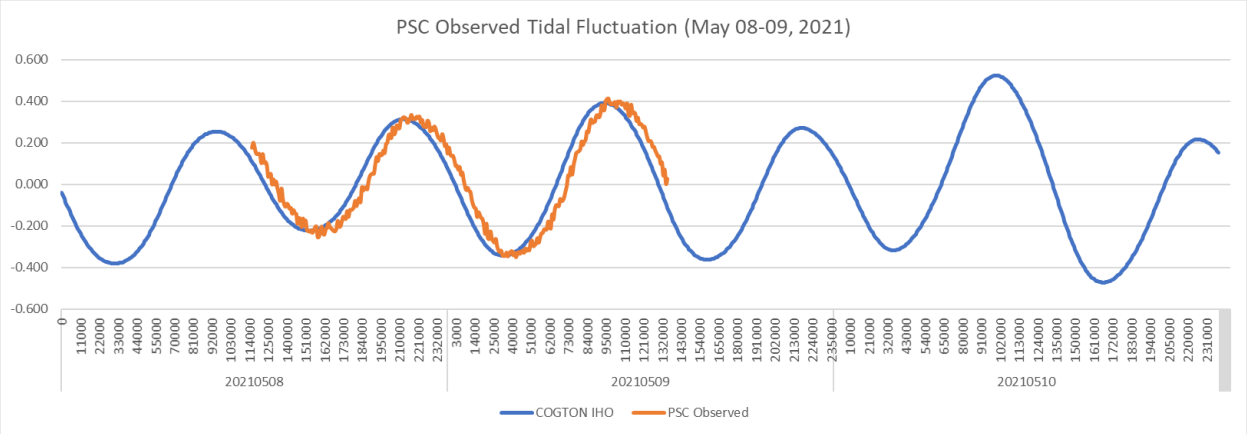


Figure 2.2.4. Tide level observation near the Project Area from May 8-9, 2021 (in orange line), as well as the predicted tides for the same periods in Cogton IHO (blue line) Tide Station.

Predicted tide signals (using Delft Dashboard) from the nearest gauging station (Cogton IHO) were used as reference for the tidal influence on site. As there are no adequate long-term water level observations that can be used for subsequent analysis, and with tidal levels based on tide prediction tool are in good agreement despite the distance of this tidal station location, the major tidal constituents of this station can be used as representative values for the project area.

Table 2.2.4. Summary of Tidal Constituents for Cogton IHO

Tidal Constituent	COGTON IHO	
	Amplitude	Phase (deg)
Semi-diurnal species		
M2 (principal lunar)	0.281	76.927
S2 (principal solar)	0.163	116.000
N2 (elliptical lunar)	0.049	60.982
K2 (declination lunar-solar)	0.044	115.943
Diurnal species		
K1 (declination lunar-solar)	0.273	209.471
O1 (principal lunar)	0.263	173.456
P1 (principal solar)	0.091	209.529
Q1 (elliptical solar)	0.051	155.511

To determine the type of tide in the area, the recorded actual water levels were plotted and compared with that of the time series of the predicted tidal water levels of Cogton IHO patterns were subjected to harmonic analysis to quantify the equivalent representative tidal constituents.

The Form Number (F) or the amplitude ratio, is a convenient way to determine the type of tide (diurnal, semi-diurnal, or some combination of the two). It is computed as the sum of the main two diurnal amplitudes (K1+O1) divided by the sum of the main two (2) semidiurnal amplitudes (M2+S2). Based on the values of tidal harmonics derived from predicted tidal levels, the computed Form Number of Cogton IHO is 1.21. This value can be interpreted as an indication that the area is experiencing mixed semidiurnal tide cycle, since the computed Form Number falls between 0.25 to 1.50 (i.e. characterized as having two high and two low tides of different heights in a given lunar day), see **Figure 2.2.5** below for reference.

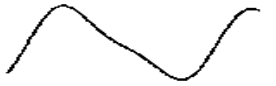
Tidal Type	Form Number	Typical Form
Semidiurnal Tides	Less than 0.25	
Mixed, Semidiurnal	0.25 – 1.5	
Mixed, Diurnal	1.5 – 3.0	
Diurnal Tides	More than 3.0	

Figure 2.2.5. Typical tidal types defined by form number

b) Observed Wind Patterns and Surface and Sub-surface Water Movement

Wind as one of the principal driving forces influencing most coastal processes, constitutes vital information for physical oceanography and was therefore included in the field observations. A portable digital anemometer and the compass function of a GPS were used to measure wind speed and direction respectively. Based on observation, mean wind velocities ranged from 2.0 to 2.4m/s and came from the North and WNW directions.

Table 2.2.5. Summary of wind influence observed from three (3) stations

Station	Time Stamp	Location (DMS)		Wind Direction	Min Wind Velocity (m/s)	Max Wind Velocity (m/s)	Ave Wind Velocity (m/s)
01	5/9/21 8:56 AM	8°35'51.1"N	124°45'26.8"E	N	1.80	2.20	2.00
02	5/9/21 10:22 AM	8°34'34.7"N	124°44'31.2"E	WNW	1.50	2.50	2.00
03	5/9/21 11:22 AM	8°35'22.1"N	124°44'50.4"E	WNW	2.20	2.60	2.40

Measurements of the magnitude of water surface flows were also made during this observation period using a digital flow meter. The directions of the prevailing surface flows were determined using the compass function of the GPS. The average surface flow observed ranged from 0.5 to 1.35m/s generally towards the southeast direction. It can be noted that the water surface flows were highly influenced by the prevailing wind (**Figure 2.2.6**).

Table 2.2.6. Summary of water surface flow observed from the three (3) stations

Station	Time Stamp	Location (DMS)		Water Surface Flow Direction	Min Flow Velocity (m/s)	Max Flow Velocity (m/s)	Ave Flow Velocity (m/s)
01	5/9/21 8:56 AM	8°35'51.1"N	124°45'26.8"E	SE	0.20	2.50	1.35
02	5/9/21 10:22 AM	8°34'34.7"N	124°44'31.2"E	SSE	0.60	0.80	0.70
03	5/9/21 11:22 AM	8°35'22.1"N	124°44'50.4"E	SE	0.40	0.60	0.50

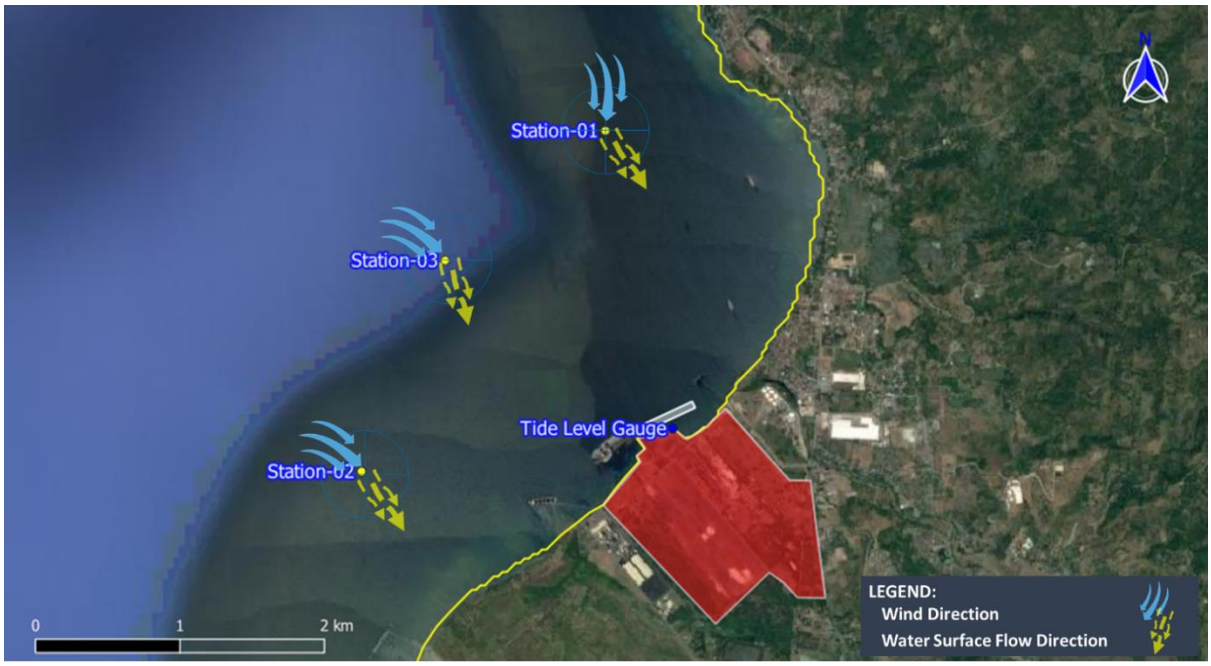


Figure 2.2.6. Graphical representation of wind and water surface flow directions as observed from the four (4) stations.

Sub-surface water currents were observed on four locations (see consolidated map below showing the drift tracks) in the coastal waters of the proposed site. A drifter was assembled using a float board, mounted with an air-tight compartment for the GPS receiver on the top and a stainless cross-bladed fin hitched at the bottom of the board with a 1.5-meter long retractable stainless-steel tail. The drifter board was designed to be driven by sub-surface water current with the least influence of wind. As the sub-surface flow strikes the underwater fin of the drifter while left adrift on open waters, the position of the drifter is recorded automatically using the GPS every three (3) seconds interval. Using the position of the drifter at every specified time interval, the length of the segment traversed by drifter can be computed. The speeds of the drift (subsurface) currents were then computed by dividing the distance travelled over the specified time interval. The prevailing direction of subsurface currents was likewise computed using trigonometric functions to determine the angle between two known positions. The trajectory of the drift currents can also be viewed as a map when the recorded coordinates are loaded in a GIS software (see succeeding tables and figures below).

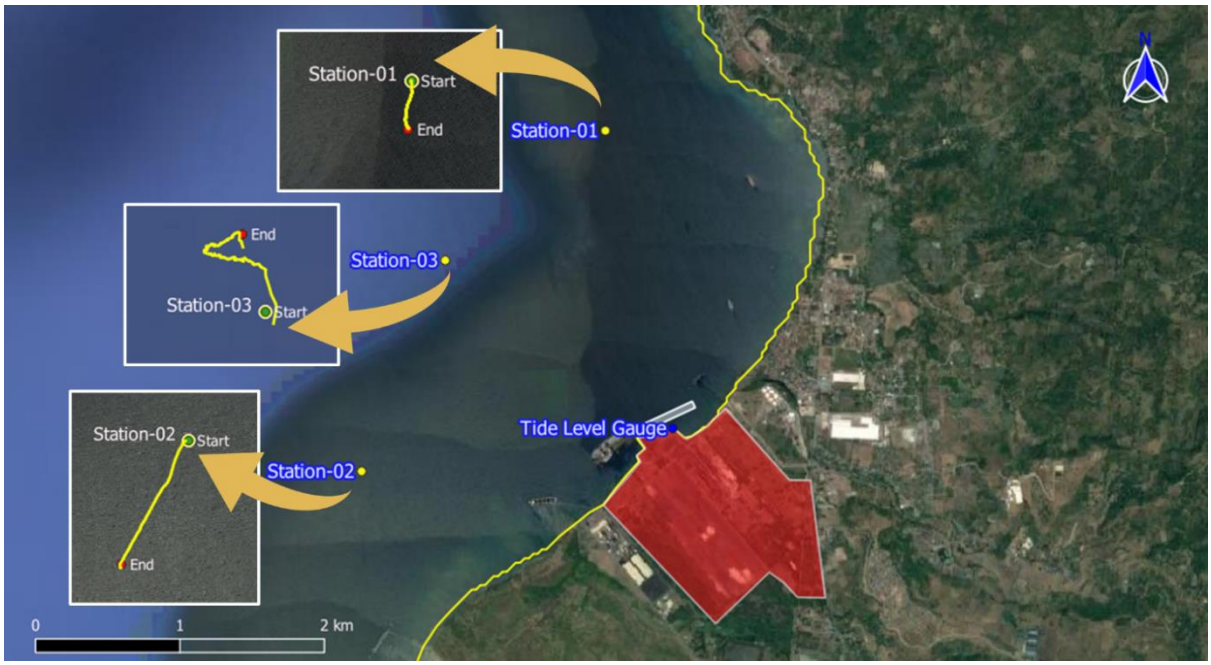


Figure 2.2.7. Sub-Surface flow trajectories observed from the three stations considered in the survey.

Based on drift observations during field survey, the subsurface currents in Stations 01 and 03 were 0.09m/s and moving towards the south and northeast directions respectively, while subsurface current observed from Station 02 was 0.39 m/s distinctively towards the southwest direction.

Table 2.2.7. Summary of Sub-surface flow trajectories observed from the three (3) stations (Coordinates in DMS)

Drift Track	Time Stamp		Location (DMS)				Total Time Elapsed	Total Track Distance	Drift Velocity	General Trajectory
	Start	End	Start		End		(sec)	(m)	(m/s)	
01	5/9/21 8:56 AM	5/9/21 9:27 AM	N8°35' 51.1"	E124°4 5'26.8"	N8°35' 47.5"	E124°4 5' 26.4"	1815	158.93	0.09	S
02	5/9/21 10:22 AM	5/9/21 10:40 AM	N8°34' 34.7"	E124°4 4'31.2"	N 8°34' 24.9"	E124°4 4' 25.8"	1066	410.95	0.39	SW
03	5/9/21 11:22 AM	5/9/21 11:40 AM	N8°35' 22.1"	E124°4 4'50.4"	N 8°35' 22.8"	E124°4 4' 50.1"	1096	94.14	0.09	NE

The following set of photos show the activities of data gathering taken during the deployment and use of various instruments in conducting the oceanographic survey in the project's impact area.

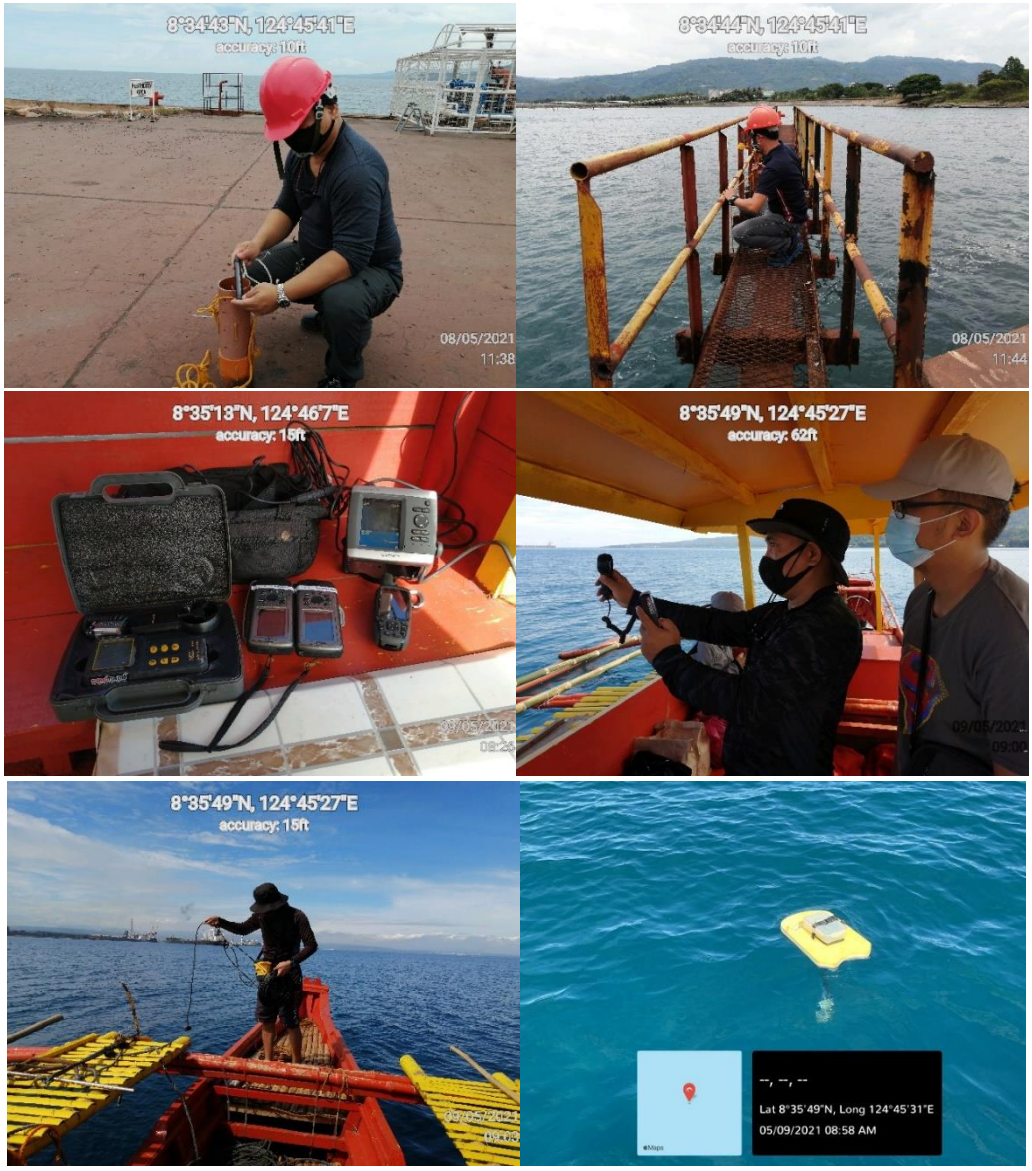


Plate 2.2.1(a-e). Photo documentation of the oceanographic survey conducted in the area: (top row, L-R) setting up and deployment of an automatic water level logger; (2nd row, L-R) echo sounder with built-in GPS; hand-held GPS units and navigational device; wind velocity and direction measurement; (bottom row, L-R) water surface flow measurement and sub-surface current and GPS track recording.

2.2.2.2 Baseline Conditions

To help quantify the baseline coastal circulation and tracer plume dispersion on the coastal study area, the hydrodynamic model was used, to simulate the effect of the representative tidal events occurred from May 1 to June 5, 2021[1] representing summer months with *amihan* winds, and from October 1 to November 5, 2021[2] for the wet season with *habagat* wind fields. The first 5 days of these simulations were used to ensure that the model reaches its steady state thus preventing the effect of numerical oscillations as a result of the initial conditions of the model run. The numerical simulation started from the 5th of the month until

[1] simulated based on historical data
[2] simulated based on historical data

the 5th of next month, using the first 5-days of hydrodynamic simulation as the initial condition in the computations. Due to computer memory limitations, the duration of modelling performed is limited to one-month, while also acknowledging that long-term, comprehensive data set in order to fully model in detail the complex coastal circulation was not available at the time of preparing this report.

Predicted Water Circulation under the Baseline Condition

The Delft3D-Flow simulations were used to analyze the spatial distribution of current and water movement of the coastal areas of Macajalar Bay. The next sets of figures below show the predicted depth-average current for *amihan* wind conditions (gentle wind breeze with speed of 4m/s from the northeast) during tidal flooding and ebbing, for the summer month of May 2021. The right panels show the predicted current speeds as a function of time. The direction axis indicates the direction the current is heading towards.

Generally, the model runs revealed that the general trend is that the depth-averaged currents inside the Bay splits into two directions in the areas near the mouth of Tagoloan River. A greater portion of water movement flows southwards following the coastal configuration towards the innermost portion of the Bay then continued along the coasts of Cagayan de Oro, into the area of Laguindingan and back into the open area of Bohol Sea. The other part of water moves northeast towards the project area, then further up north to the coastal area of Jasaan and back into the open sea.

Because of the complicated geometry and the interaction of winds and tidal fluctuations, a number of circular gyres were formed inside the Bay. For wind driven flow, using a gentle wind breeze blowing from the northeast (the so-called *amihan* wind), the velocity field in the Bay is in the range of 5-20cm per second which is within the range of sub-surface currents observed during the field monitoring activities. Also, as the Bay is rather deep, the flow patterns seemed to be unaffected by tidal fluctuation, and the general direction of flows tend to be the same regardless of tidal conditions.

Figure 2.28 shows the depth-averaged currents in the Bay for high tidal events but for different time periods. As shown, the flow pattern is more or less similar especially near the coast, although there is a visible change in the shape of large eddies formed in the middle of the Bay.

During low tidal events, where the water is at its lowest levels, the flow magnitudes, as well as the general direction of flow, is almost the same as that predicted during high tidal events.

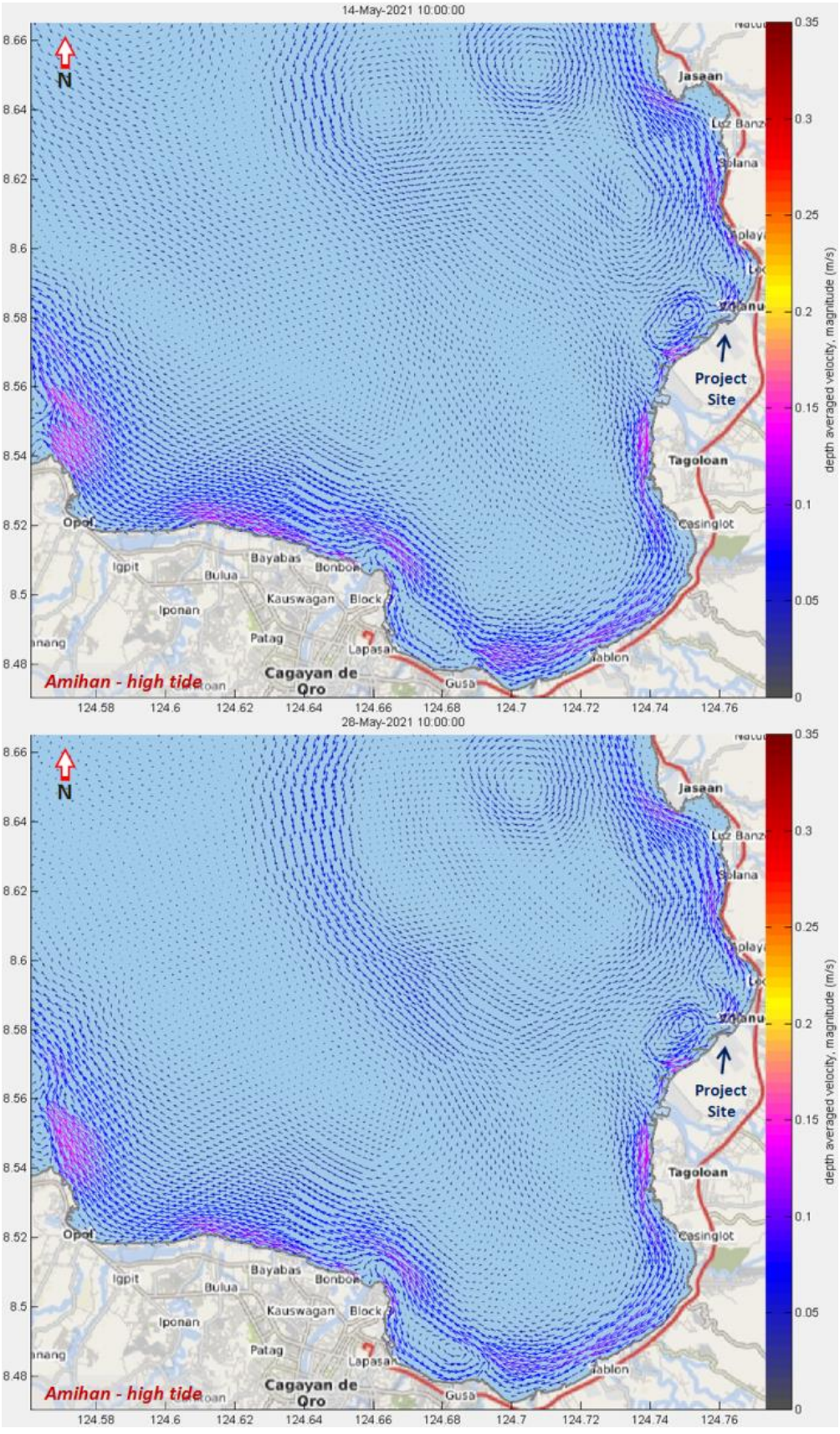


Figure 2.2.8. Predicted currents in the project area during tidal flooding (*amihan* wind condition).

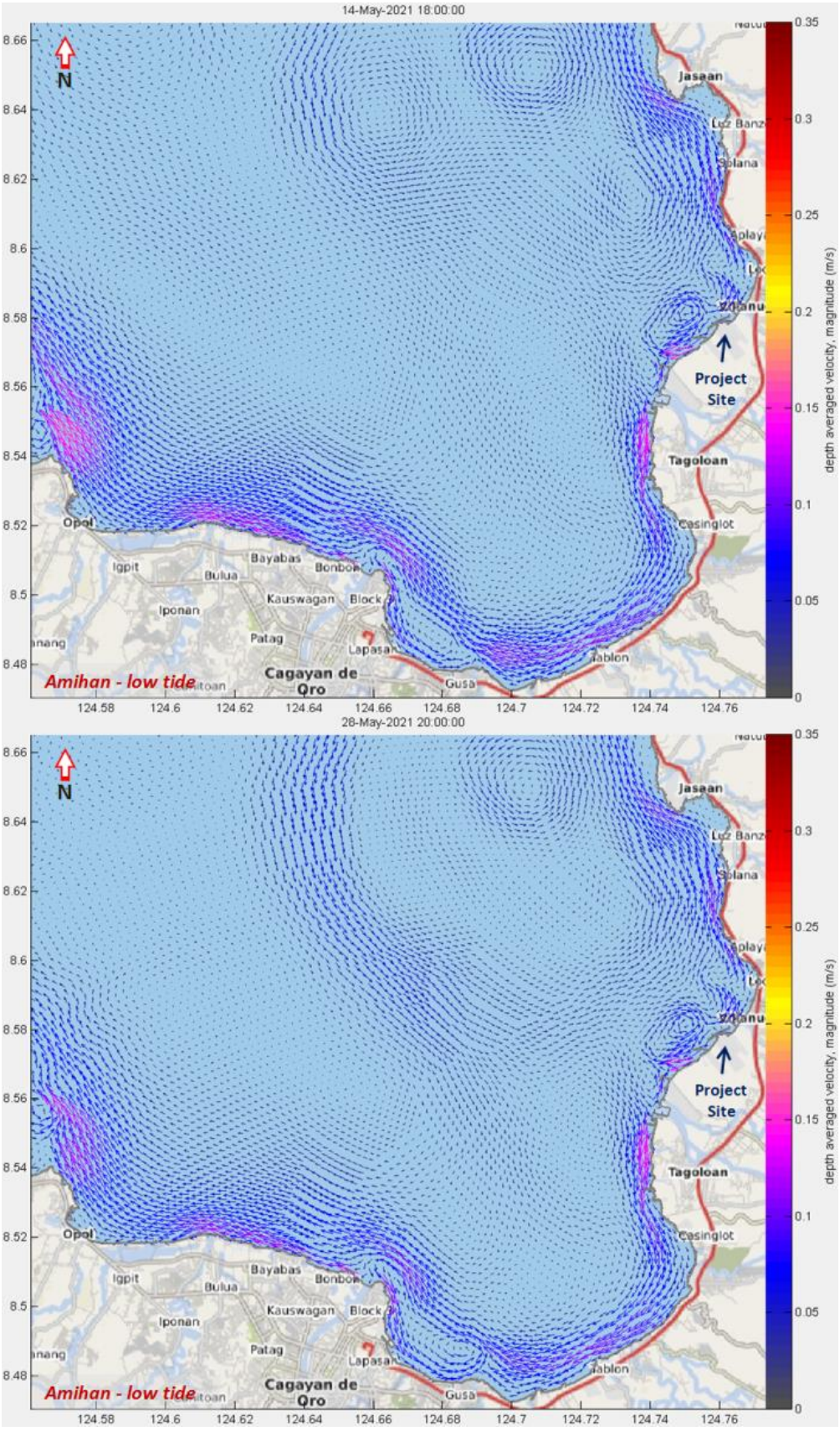


Figure 2.2.9. Predicted currents in the Bay during low tidal event (*amihan* wind condition).

In the **Figures 2.2.8** to **2.2.9**, the visible difference is the large eddies formed in the middle of the Bay, with flow separations of tidal and wind-driven currents near Tagoloan River mouth maintained regardless of tidal conditions.

Using predicted tidal events of the month of October 2021, and under *habagat* wind conditions scenario for moderate wind velocity input of 4m/s and blowing from the southwestern direction, the model results revealed that the general direction of the flow in the Bay is somewhat the same as that predicted during *amihan* wind. This means that the flow inside Macajalar Bay is tidal-dominated. At the middle of the Bay, flow velocity fields are in the range of 5 to 20cm/s, while near the project are, the depth-averaged flow is somewhat sustained to less than 10cm/s. The wind-induced flow is predicted to manifest along the coast, while numerous circular gyres and large eddies are formed in various parts of the bay.

The next two figures below show the depth-averaged currents in the Bay for high tide and low tidal events for different time periods. As can be seen in these figures, as the Bay is rather deep and exposed to the open sea, the flow patterns are more or less similar regardless of tidal (and wind) conditions.

For tidal ebbing under the influence of *habagat* wind, similar to *amihan* wind scenario, the model predicts that the range of flow magnitudes is almost the same as to what was predicted during high tides

The next succeeding figures show the close-up view of the flow patterns near the project area. Comparing the results of *amihan* and *habagat* scenarios, as well as tidal flooding and ebbing, the time series maps show that the numerous eddies and circular gyres offshore of the project are maintained, and small scale changes in flow magnitudes and directions visible in the concave portion of the coast northeast of the project area. The resulting magnitudes in the project area is in the range of 5 to 15cm/s and tidal fluctuation for the summer and wet months, it follows that prevailing wind fields hardly influence the direction of currents inside Macalajar Bay (and near the project area). Coupled with the exposure to the larger Bohol Sea and the rather deep waters inside the Bay, this means that the flow inside the Bay is tidal dominated.

In the area where the project is located, the predicted currents are generally about 5 to 15cm/s for both *amihan* and *habagat* wind conditions for a wind speed of 4m/s. For higher wind magnitude, it is expected that high flow velocities would occur, but for a more conservative tracer plume dispersal prediction, for which this tide and wind-generated flows are needed, low magnitude winds are used.

Predicted Change in Water Circulation due to the Project

With the proposed project, there is no major physical development such as reclamation works that will be introduced to alter the prevailing water circulation and movement in the coastal area of Macajalar Bay, While there may be some construction works near the coast, and proposed new berth to be constructed on stilts, these activities are temporary in nature and therefore deemed to be too insignificant and will not alter the natural water movement and transport patterns in the Bay.

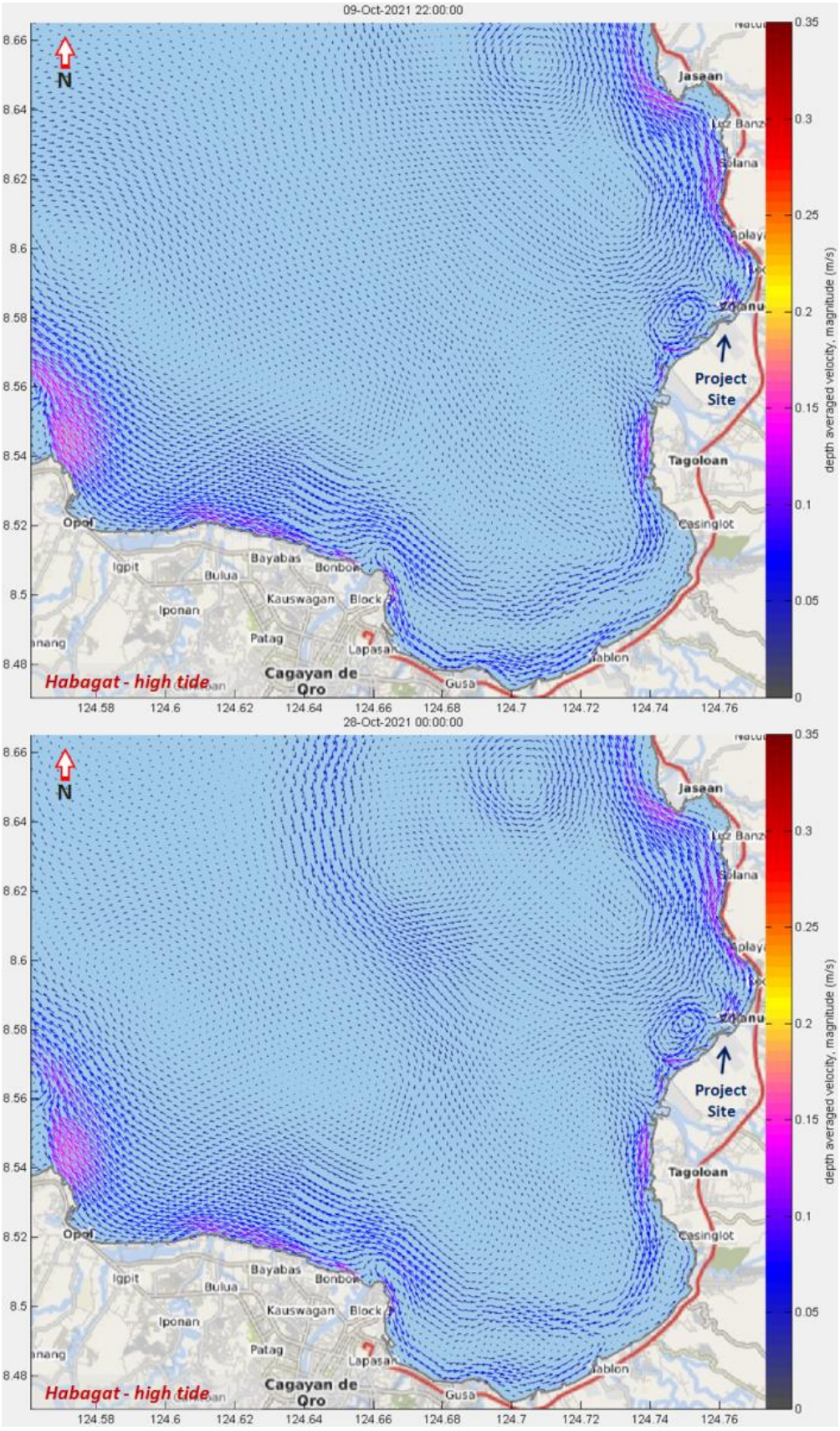


Figure 2.2.10. Predicted currents in the Bay during high tidal event for *habagat* wind condition (wind speed of 4m/s blowing from the southwest).

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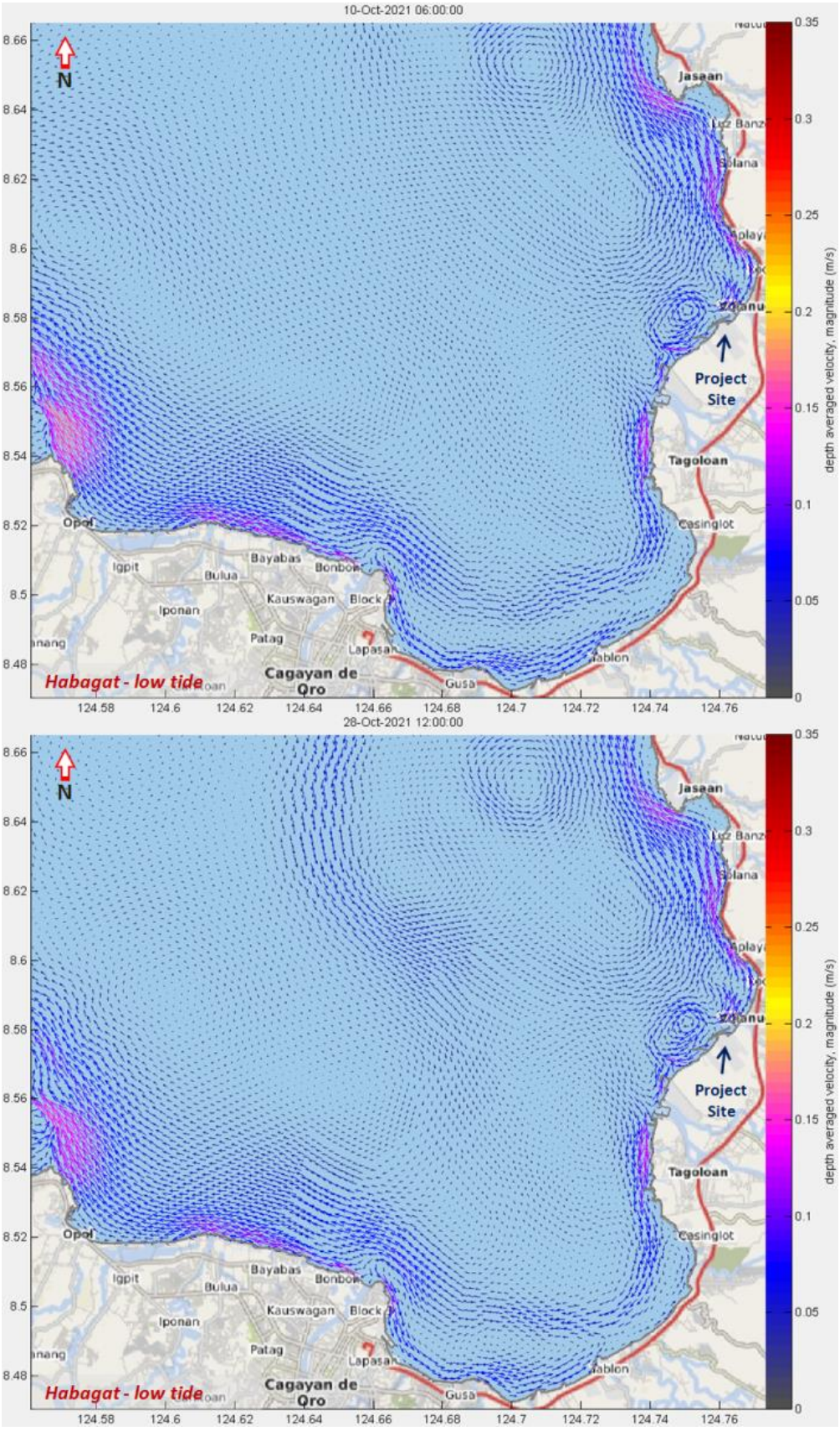


Figure 2.2.11. Predicted currents in the Bay during low tidal event for *habagat* wind condition.

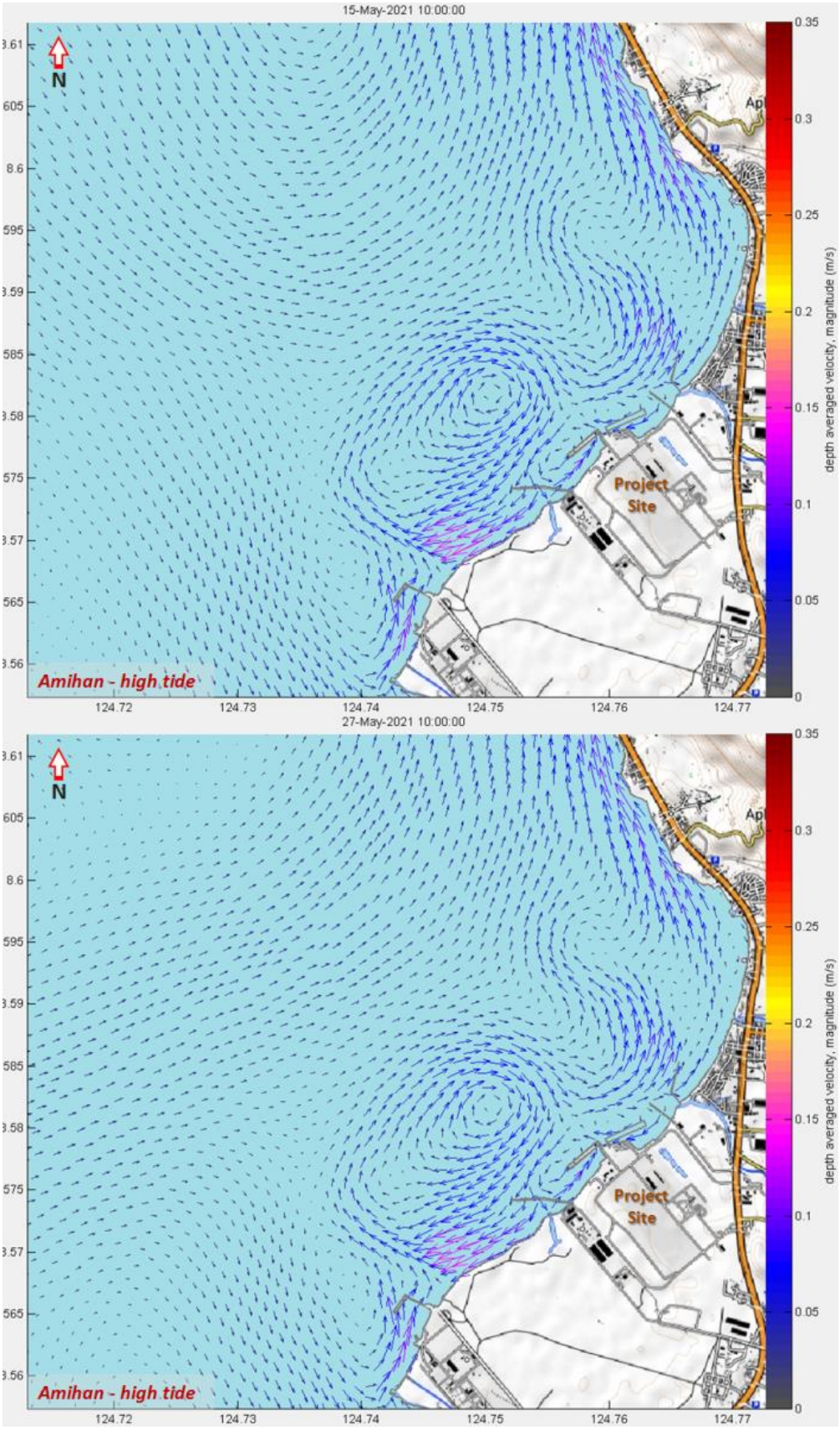


Figure 2.2.12. Close-up view of predicted currents in the Bay during high tidal event for *amihan* wind condition.

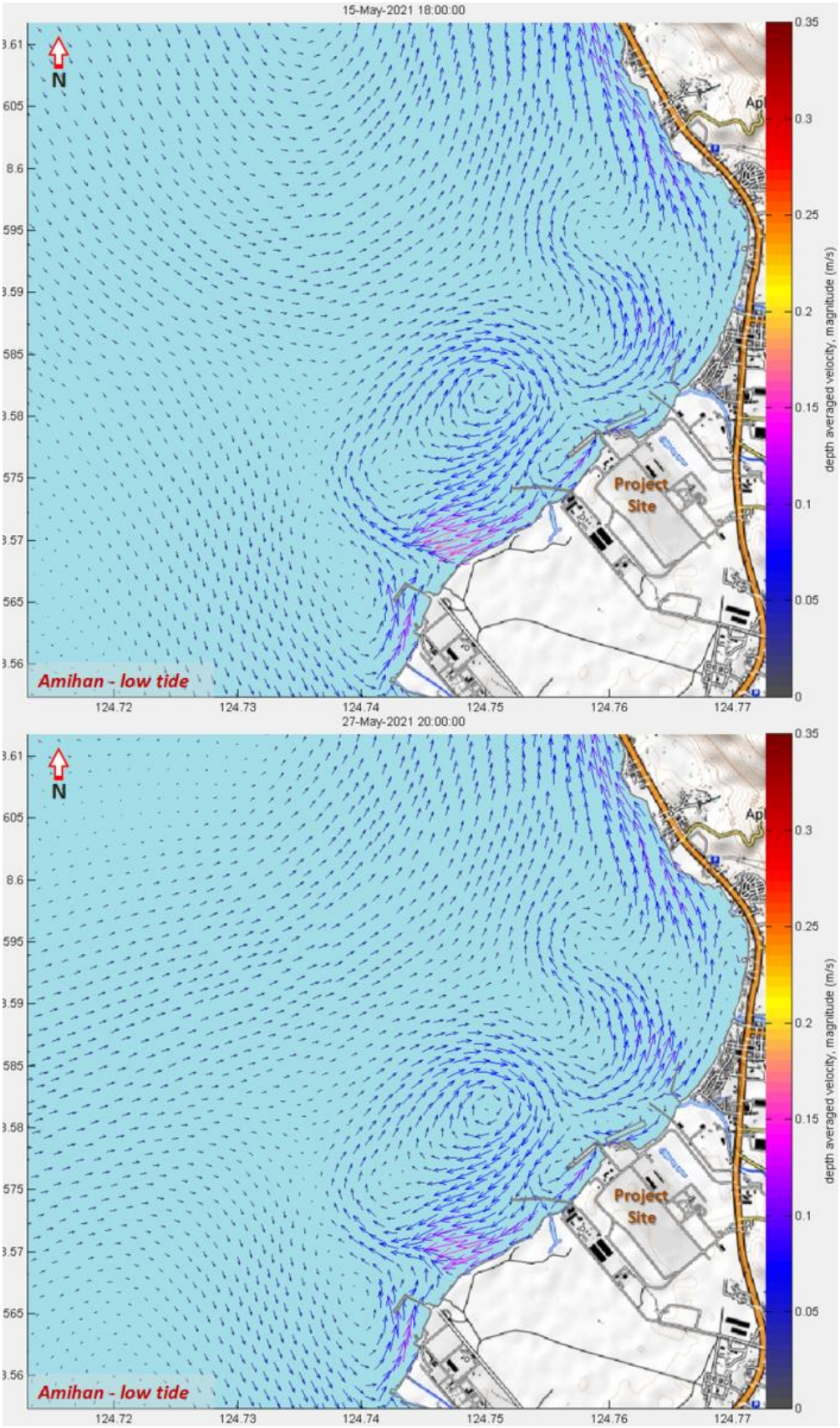


Figure 2.2.13. Close-up view of predicted currents in the Bay during low tidal event for *amihan* wind condition.

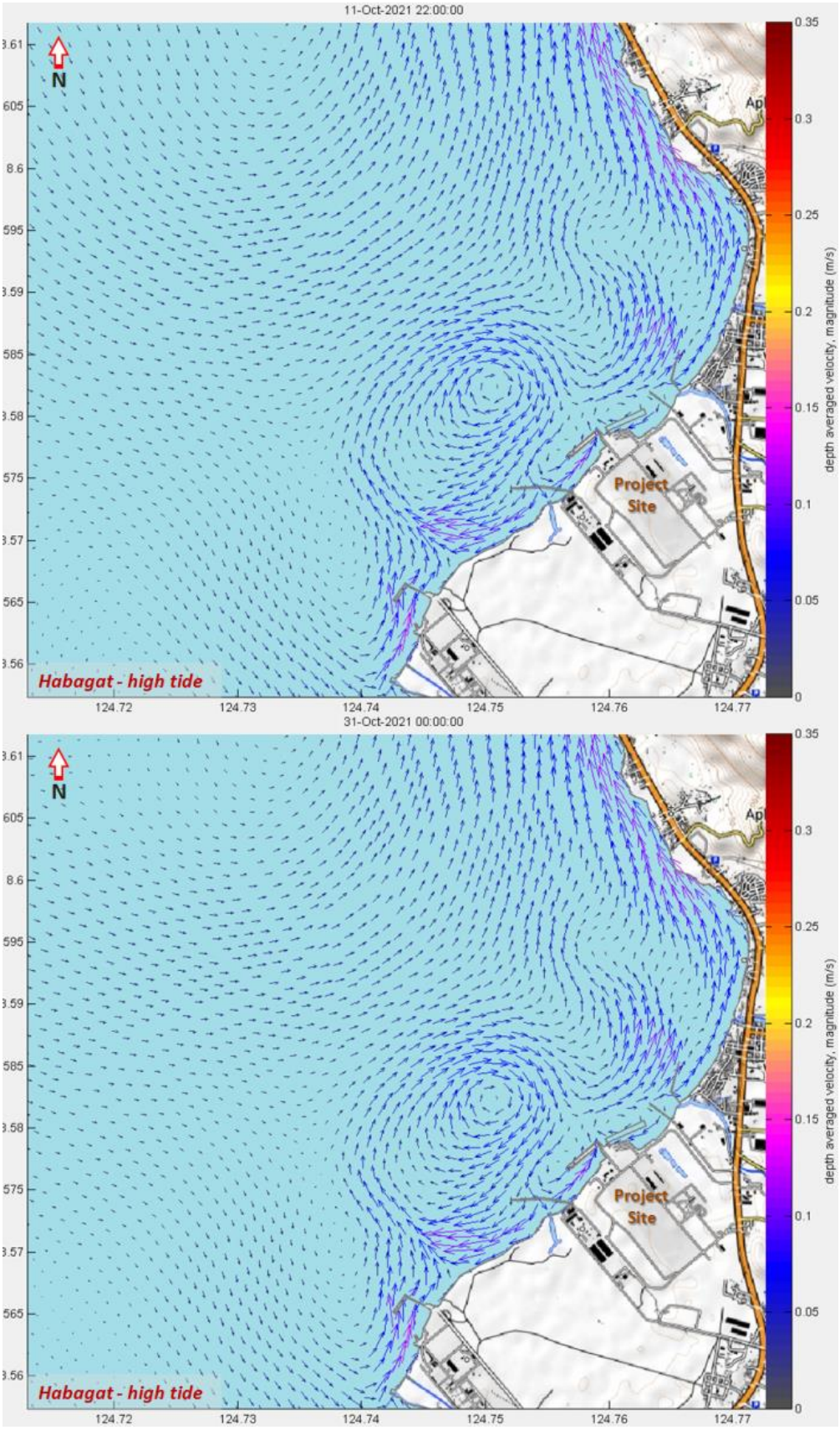


Figure 2.2.14. Close-up view of predicted currents in the Bay during high tidal event for *habagat* wind condition.

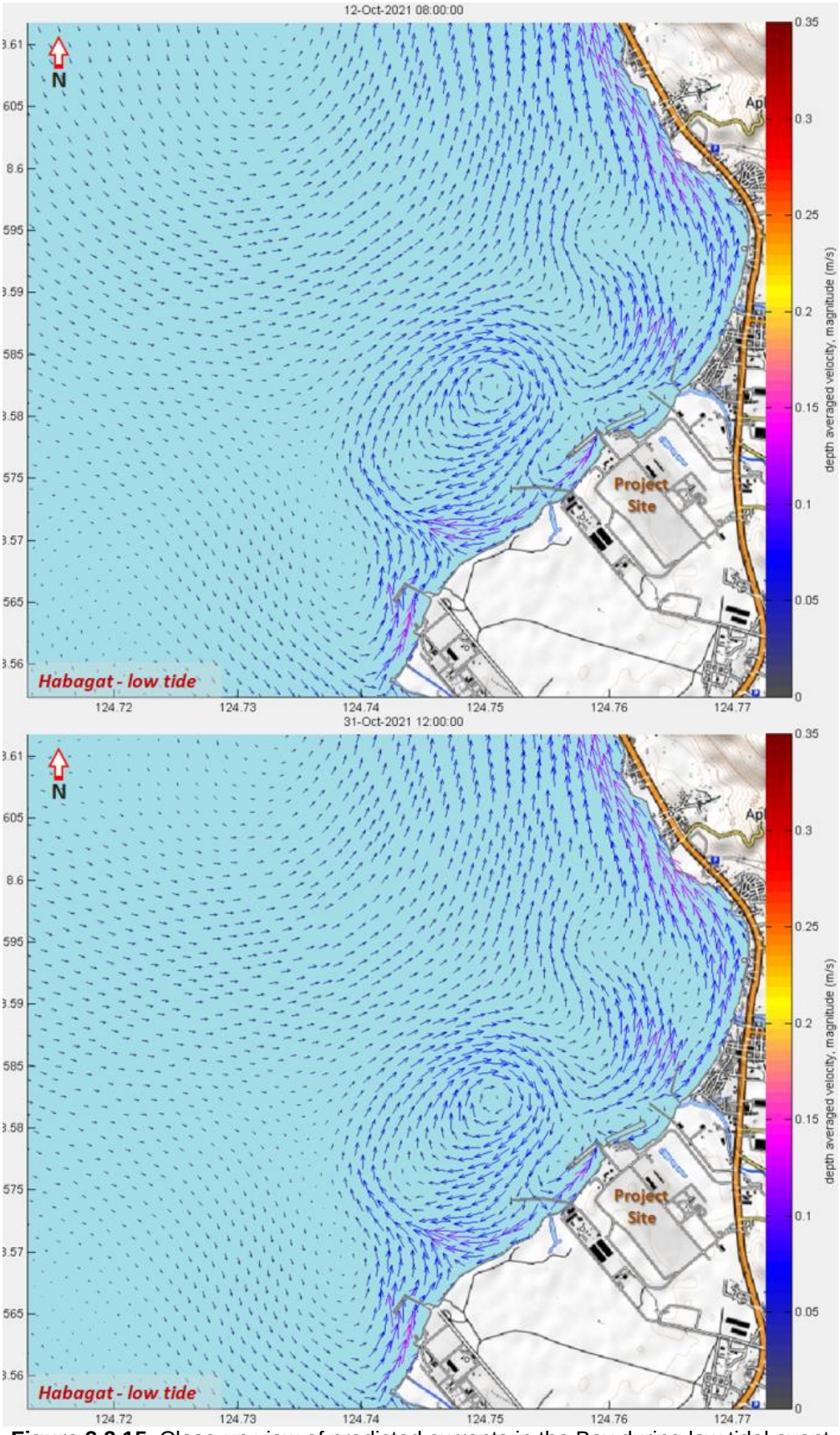


Figure 2.2.15. Close-up view of predicted currents in the Bay during low tidal event for *habagat* wind condition.

Pollution Dispersal and Transport thru Tracer Plume Modelling

This section assesses the transport and fate of water quality pollutants, in this case represented by a tracer, released at the proposed location of its port. In particular, dispersal, dilution and accumulation patterns of tracer plume as it is transported by the ambient current circulations were investigated. The tracer plume modeling is similar to the release of a coloured dye in the water to determine the extent of transport and mixing of the dye as it moves with the flow.

The model considers the release of tracer in the vicinity of the proposed new berth, which represents the continuous discharge of say, polluted waters or accidental spillages, to visualize and quantify the dispersion patterns in the area. Aside from tidal fluctuations, scenarios incorporating the effect of north-easterly (*amihan*) and south-westerly (*habagat*), to investigate the propagation and dispersal of the tracer plume as current is forced by wind, particularly near the surface. The dispersal patterns of the released tracer were assessed with the end in view of determining how the project will potentially impact the existing coastal water quality process.

Point sources of tracers were continuously released in the coastal vicinity of the proposed new berth of the project with a discharge rate of 1,000m^3/hr with concentrations of 10,000mg/L for a one-month period (for both summer and wet season scenarios). This assumed discharge rate (and concentration) is arbitrarily set to visualize the dispersal and dilution patterns inside the Bay. The hydrodynamic data necessary for the analysis of the dispersion of tracer plume were generated with the detailed hydrodynamic model set-up as discussed in the preceding sections. The transport and dilution of continuous release of tracer in the proposed new berth or loading/unloading station within the coastal vicinity of the project were simulated for 31 days in the model, to allow buildup of the far field tracer concentrations over many tidal cycles. Results were examined over a spring and neap cycle using tidal data from May 5 to June 5, 2021 (representing *amihan* wind) and from October 5 to November 5, 2021 for *habagat* wind scenario.

The results of the model runs are shown in the next succeeding figures. Some of the results of the 31-day simulation of tracer plume incorporating the effects of surface winds, and the rise and fall of tides are presented. Therefore, the snapshots cover most of the interesting patterns that may be expected during flooding and ebbing and also during slack water.

a) Scenario A – North-easterly (Amihan) Wind Condition

This scenario incorporated the influence of wind on coastal current circulation and transport and movement of tracer plume in the study area. This was accomplished with the use of a north-easterly wind, with a moderate speed of 4m/s, representative of the summer monsoon conditions.

From the results of the model runs, it appears that for the first few hours of release of tracer plume, the patch is relatively small and the mixing is caused by small-scale turbulence effects only. However, after some time, the tracer plume will have spread sufficiently such that larger-scale eddies and water circulations will contribute to the mixing effect.

For *amihan* wind conditions, the model predicts that at the start of tracer release, the tracer plume is propagating in an elliptical pattern with its major axis directing towards the northeast and southwest of the release point. After a couple of days, an equilibrium state has been reached and that the spreading of the plume follows more or less the flow of current. The extent of the maximum change in tracer concentration (see differences in colors, with units of mg/L in the figures), after a few hours of continuous tracer releases are already noticeable. Higher than 10mg/L near the release point are likewise visible (shown as yellowish to red area), of which its coverage area is maintained despite the rise and fall of the tide. As the flow within the project area is tidal-dominated, coupled with the influence of wind drag, the tracer plume moved towards the northern portion towards the concave part of the Bay and flow northwards in the coastal area of Jasaan. A lesser volume of tracer flows westward but the eastward flow prevented it from dispersing further into the innermost portion of the Bay south of the project. Although the concentration of the tracer is 10,000 mg/L at the release point, tracer concentrations exceeding 5mg/L only covers the immediate area of the release point. With the surrounding waters relatively deep, low concentrated-plumes that disperses farther into the coastal area shows effective natural mixing and transport in the area.

The next series of figures illustrate the propagation of the tracer plume for 31 days of continuous releases for the various time steps to illustrate how the tracer plume responds to dynamic temporal changes in the water movement as influenced by tidal fluctuations and moderate *amihan* wind breeze.

b) Scenario B – South-westerly (Habagat) Wind Condition

All the input parameters of the previous one is made similar to this present scenario except for wind direction which incorporate the influence of habagat wind, and the tidal fluctuations representative of the wet season (October 2021 tidal event), on coastal current circulation and tracer plume transport and movement in the study area. A uniform wind forcing (southwesterly wind, ranging from 170 to 260 degrees from the north, with a speed of 4m/s), representative of the southwest monsoon conditions is used as one of the model inputs to simulate hydrodynamic and tracer plume dispersion in the coastal area of the proposed project.

Unlike the case of *amihan* wind, the influence of winds blowing at the same direction as the general direction of the currents prevented the dispersion of tracer plume westwards. Because of that, the spreading of low-concentrated tracer plumes is mainly directed towards the northeastern coastal area of the project.

The next series of figures illustrate the propagation of the tracer plume for 31 days of continuous tracer releases for the various time steps to illustrate how the tracer plume responds to dynamic temporal changes in the water movement as influenced by tidal fluctuations and gentle southwesterly wind breeze.

2.2.2.3 Impact Assessment and Environmental Performance

The numerical modeling study investigated the circulation and transport features of the project's coastal environments with scenario analysis on the possible impacts of continuous releases of water pollutant (represented by a tracer) in the vicinity of the proposed new berth facility of PSC.

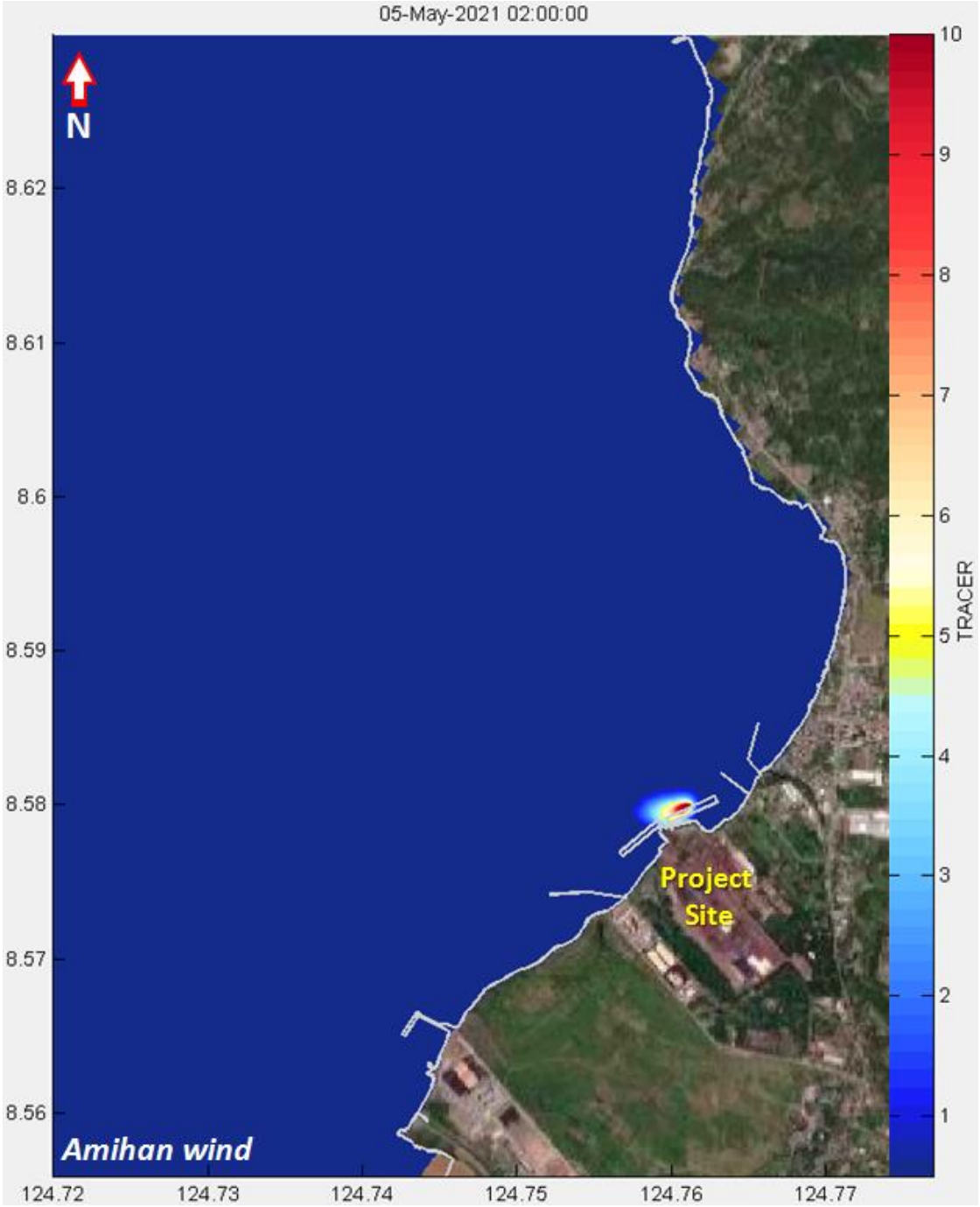


Figure 2.2.16. Predicted trajectory of tracer plume after 2 hours of continuous releases near the proposed new berth under *amihan* wind condition.

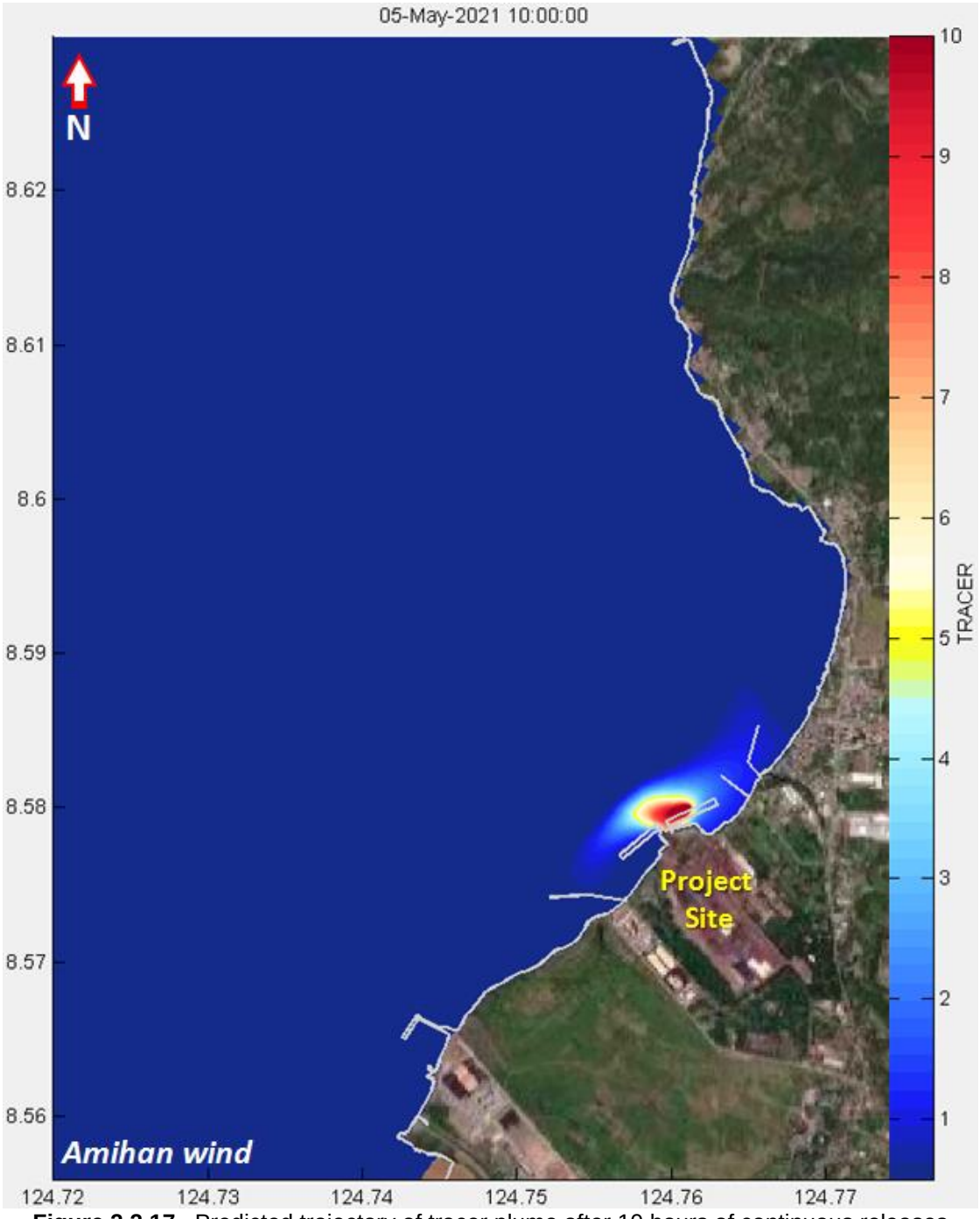


Figure 2.2.17. Predicted trajectory of tracer plume after 10 hours of continuous releases near the proposed new berth under *amihan* wind condition.

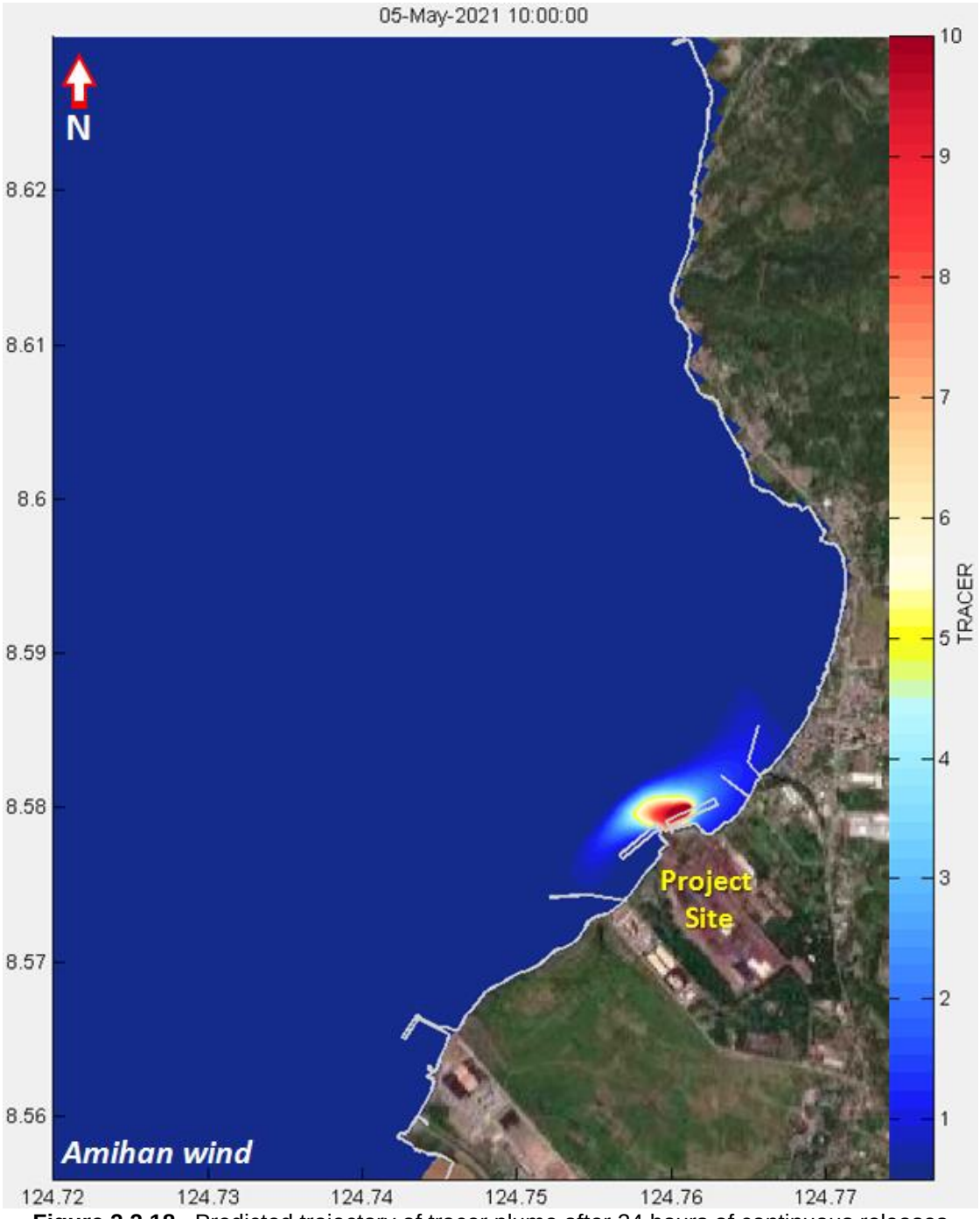


Figure 2.2.18. Predicted trajectory of tracer plume after 24 hours of continuous releases near the proposed new berth under *amihan* wind condition.

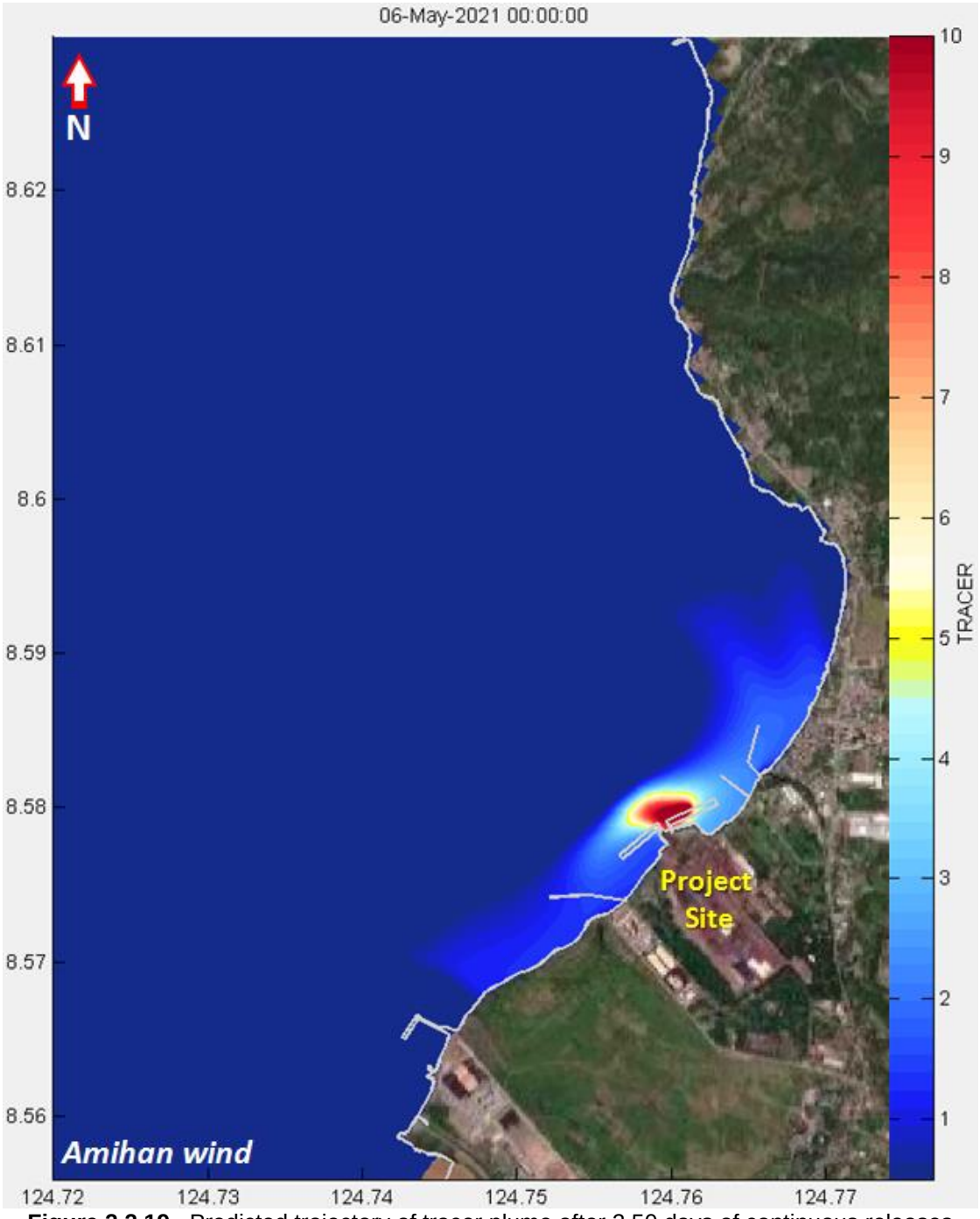


Figure 2.2.19. Predicted trajectory of tracer plume after 2.50 days of continuous releases near the proposed new berth under *amihan* wind condition.

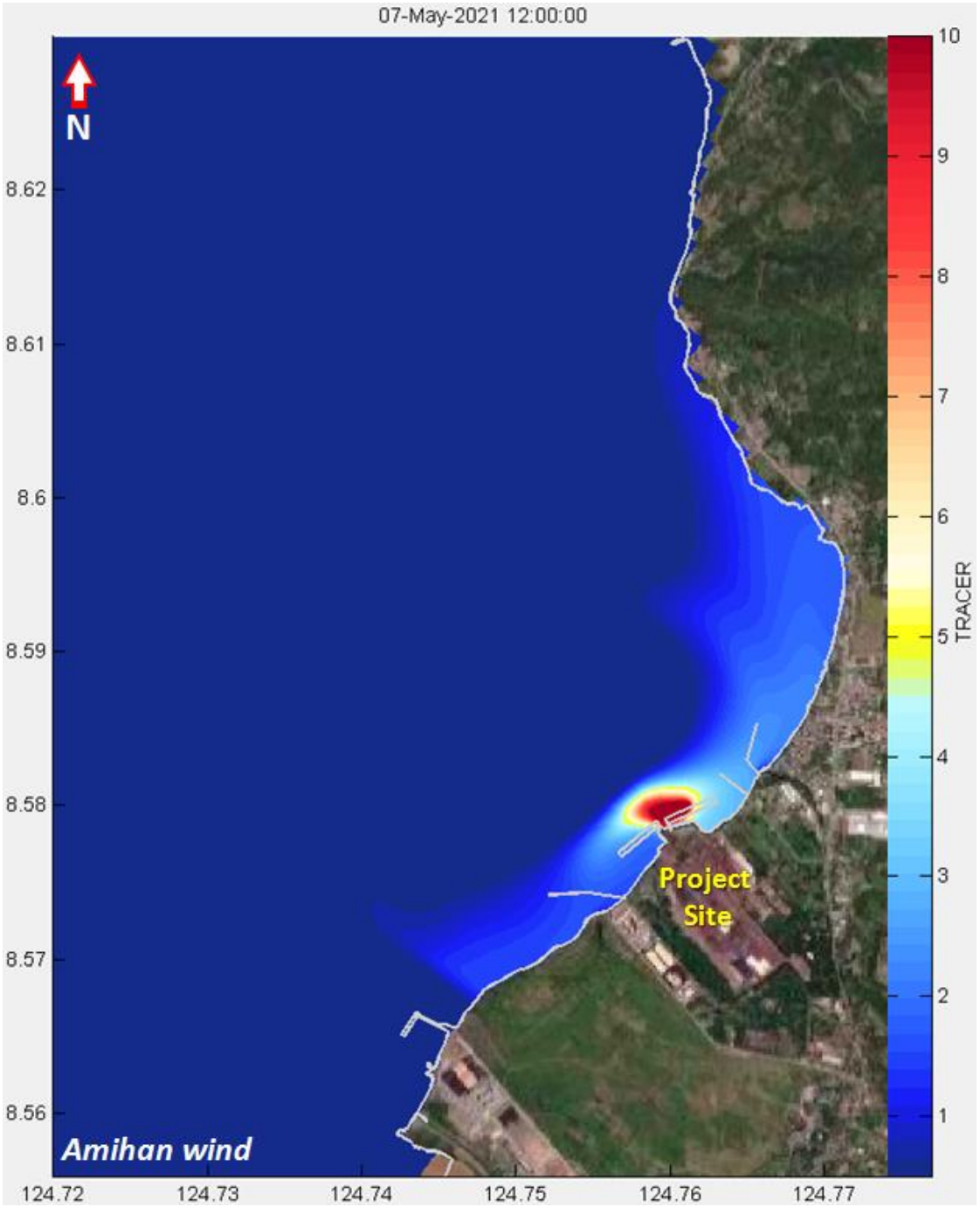


Figure 2.2.20. Predicted trajectory of tracer plume after 3.583 days of continuous releases near the proposed new berth under *amihan* wind condition.

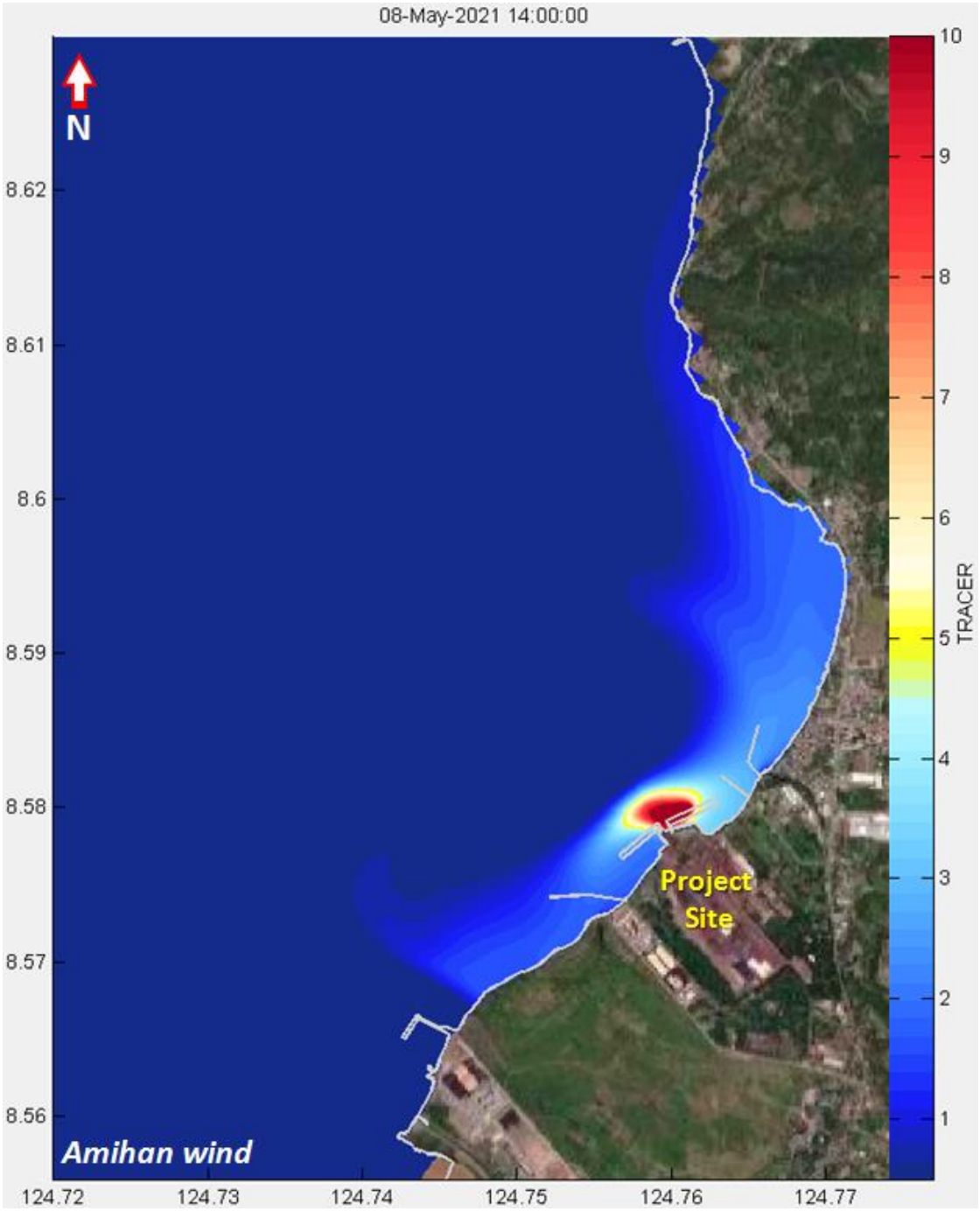


Figure 2.2.21. Predicted trajectory of tracer plume after 9.167 days of continuous releases near the proposed new berth under *amihan* wind condition.

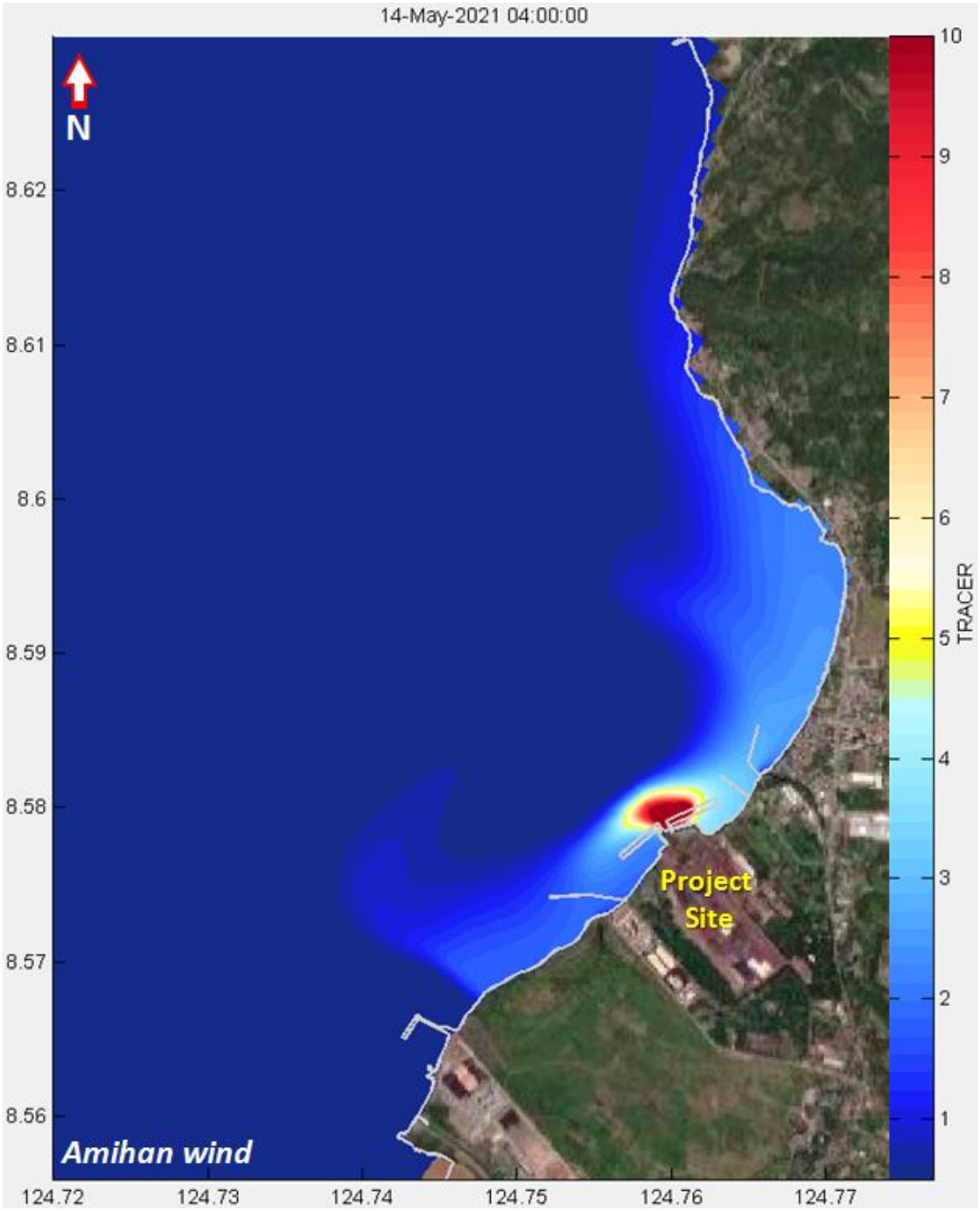


Figure 2.2.22. Predicted trajectory of tracer plume after 18.333 days of continuous releases near the proposed new berth under *amihan* wind condition.

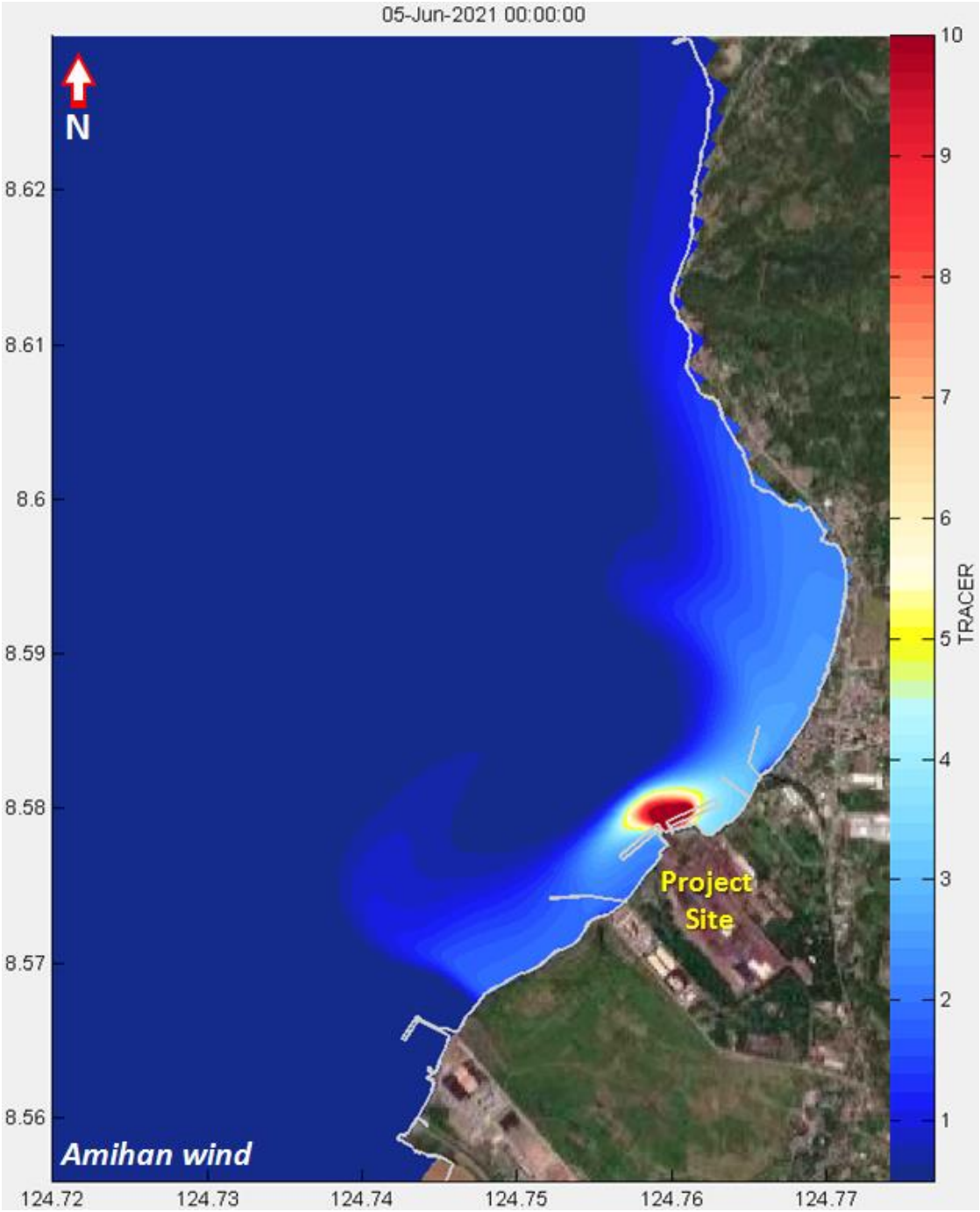


Figure 2.2.23. Predicted trajectory of tracer plume after 31 days of continuous releases near the proposed new berth under *amihan* wind condition.

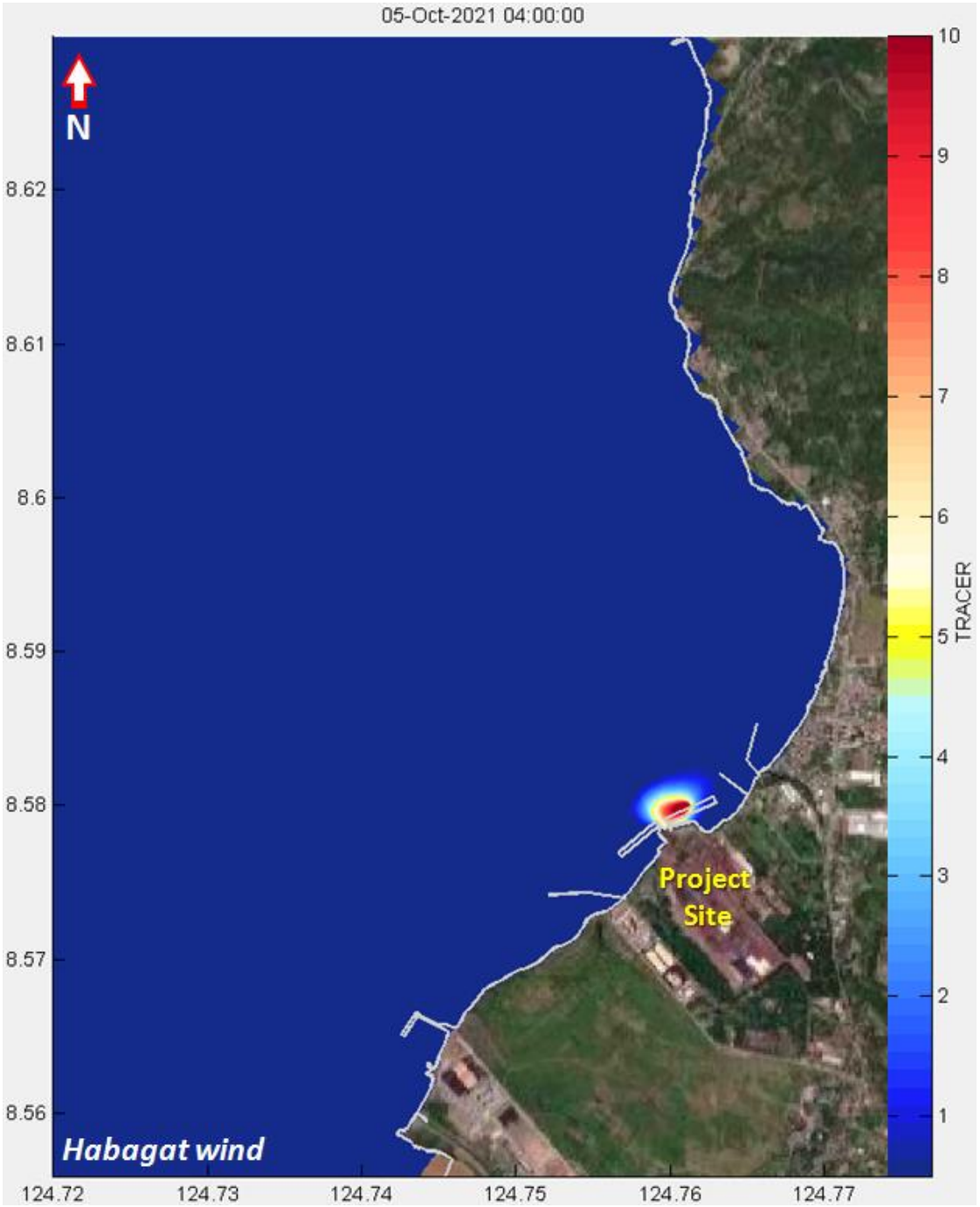


Figure 2.2.24. Predicted trajectory of tracer plume after 4 hours of continuous releases near the proposed new berth under *habagat* wind condition.

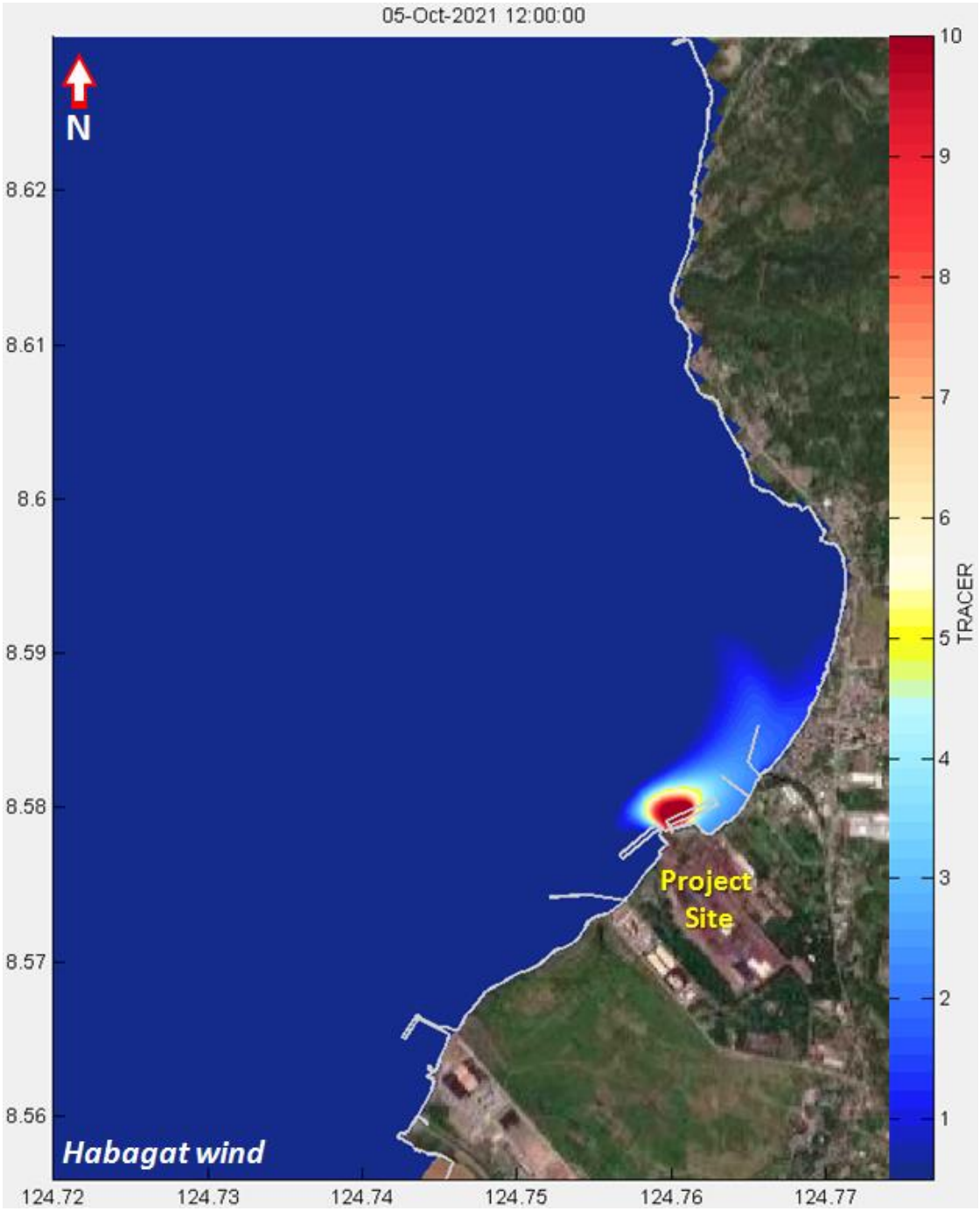


Figure 2.2.25. Predicted trajectory of tracer plume after 12 hours of continuous releases near the proposed new berth under *habagat* wind condition.

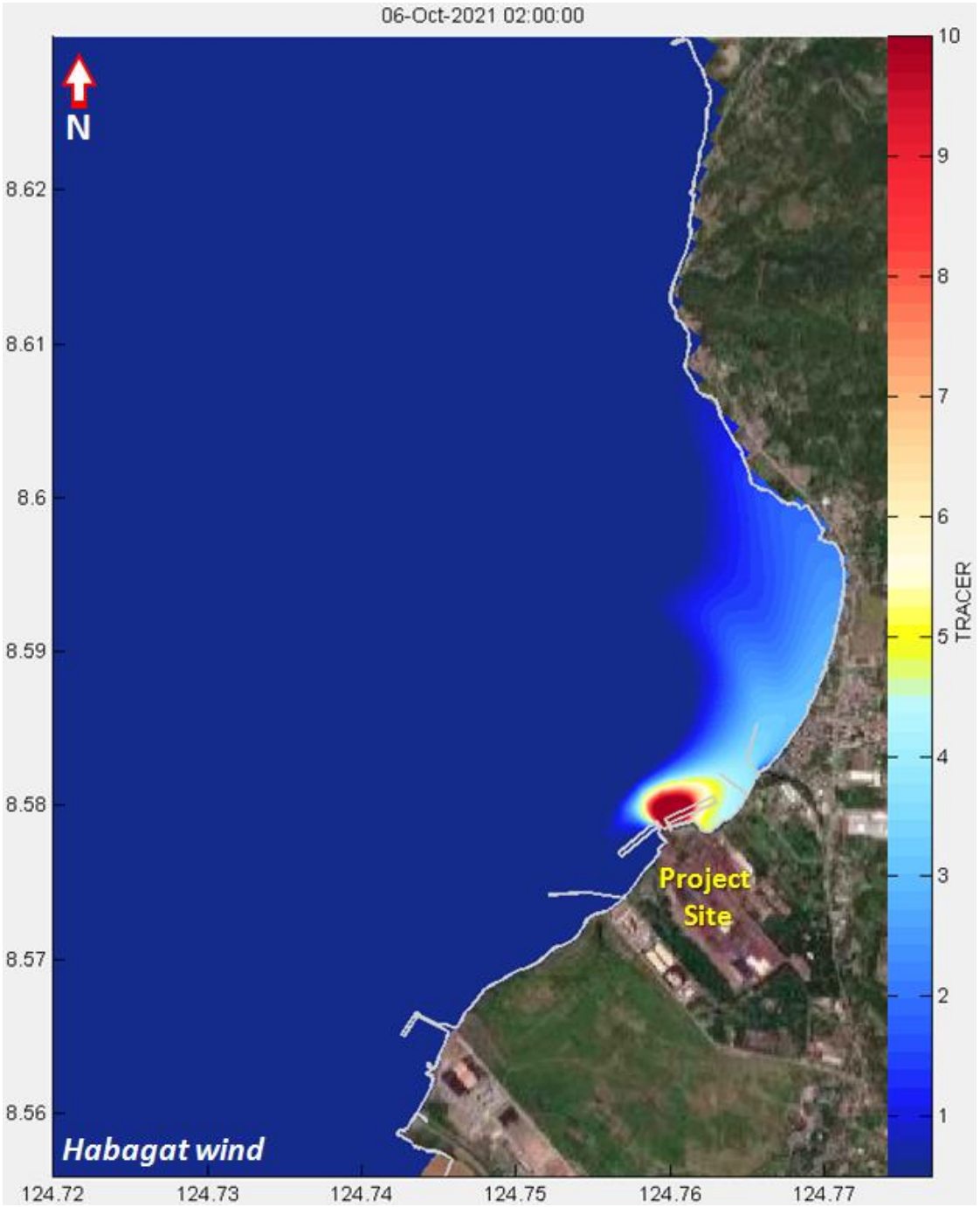


Figure 2.2.26. Predicted trajectory of tracer plume after 1.083 days of continuous releases near the proposed new berth under habagat wind condition.

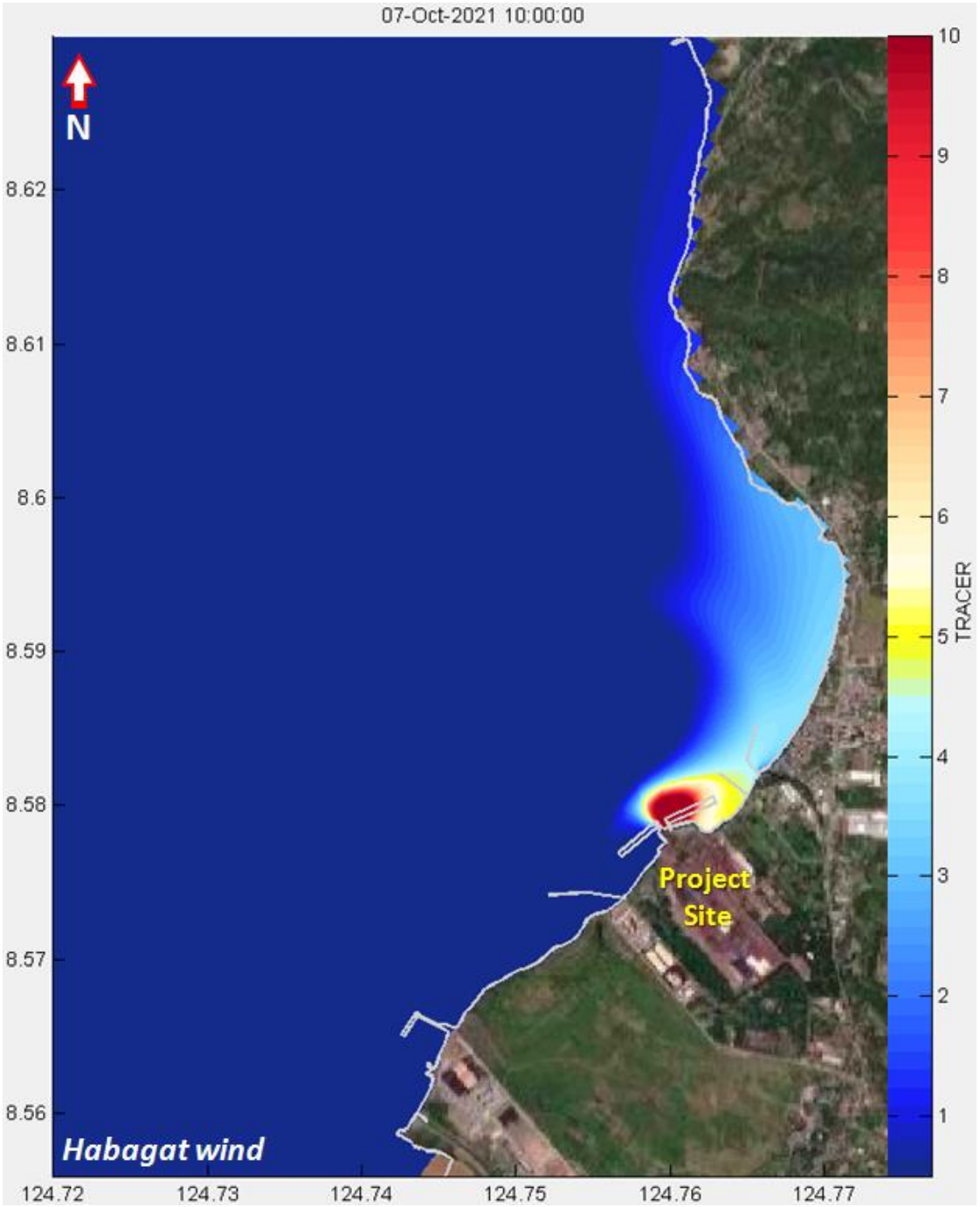


Figure 2.2.27. Predicted trajectory of tracer plume after 2.417 days of continuous releases near the proposed new berth under *habagat* wind condition.

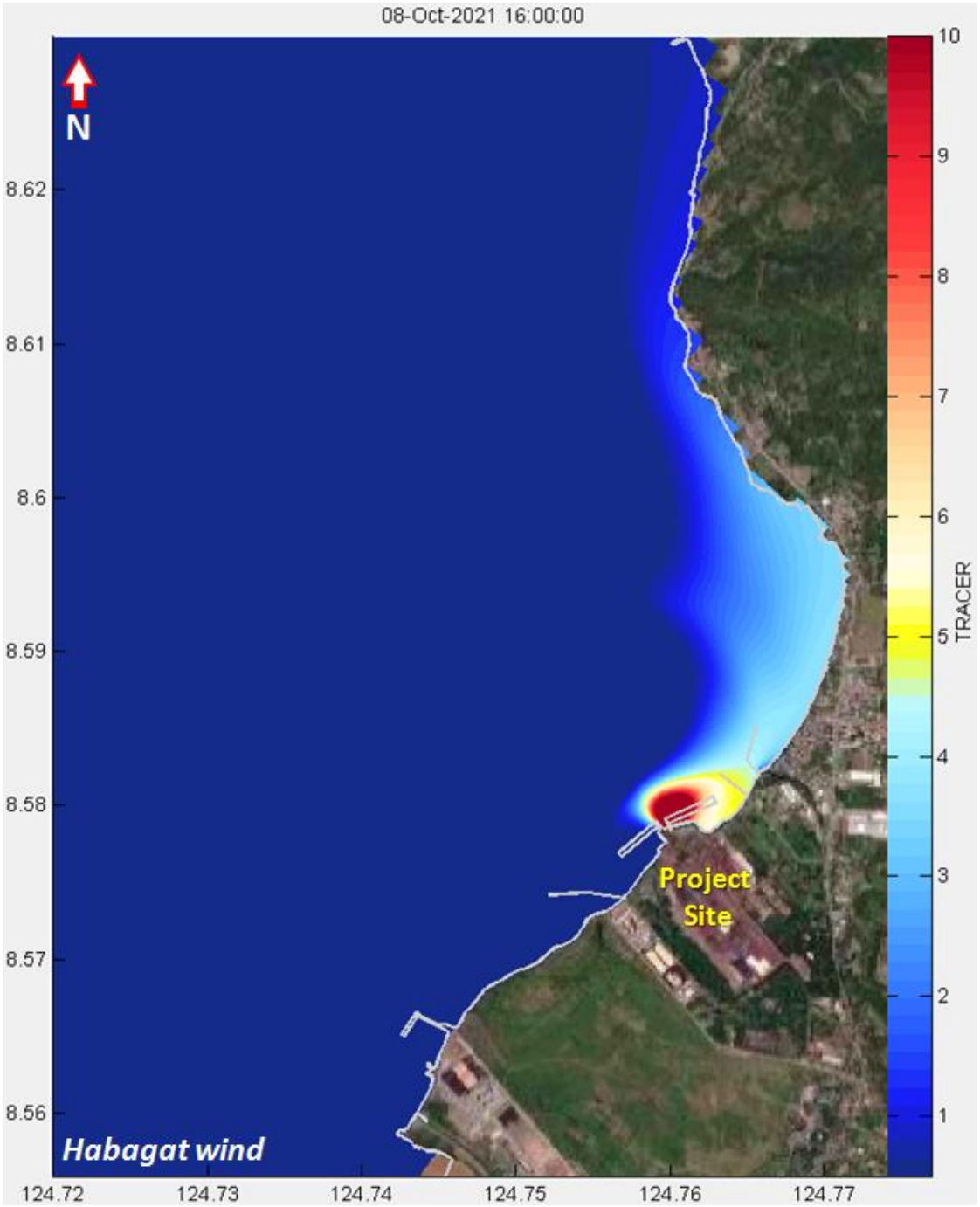


Figure 2.2.28. Predicted trajectory of tracer plume after 3.667 days of continuous releases near the proposed new berth under *habagat* wind condition.

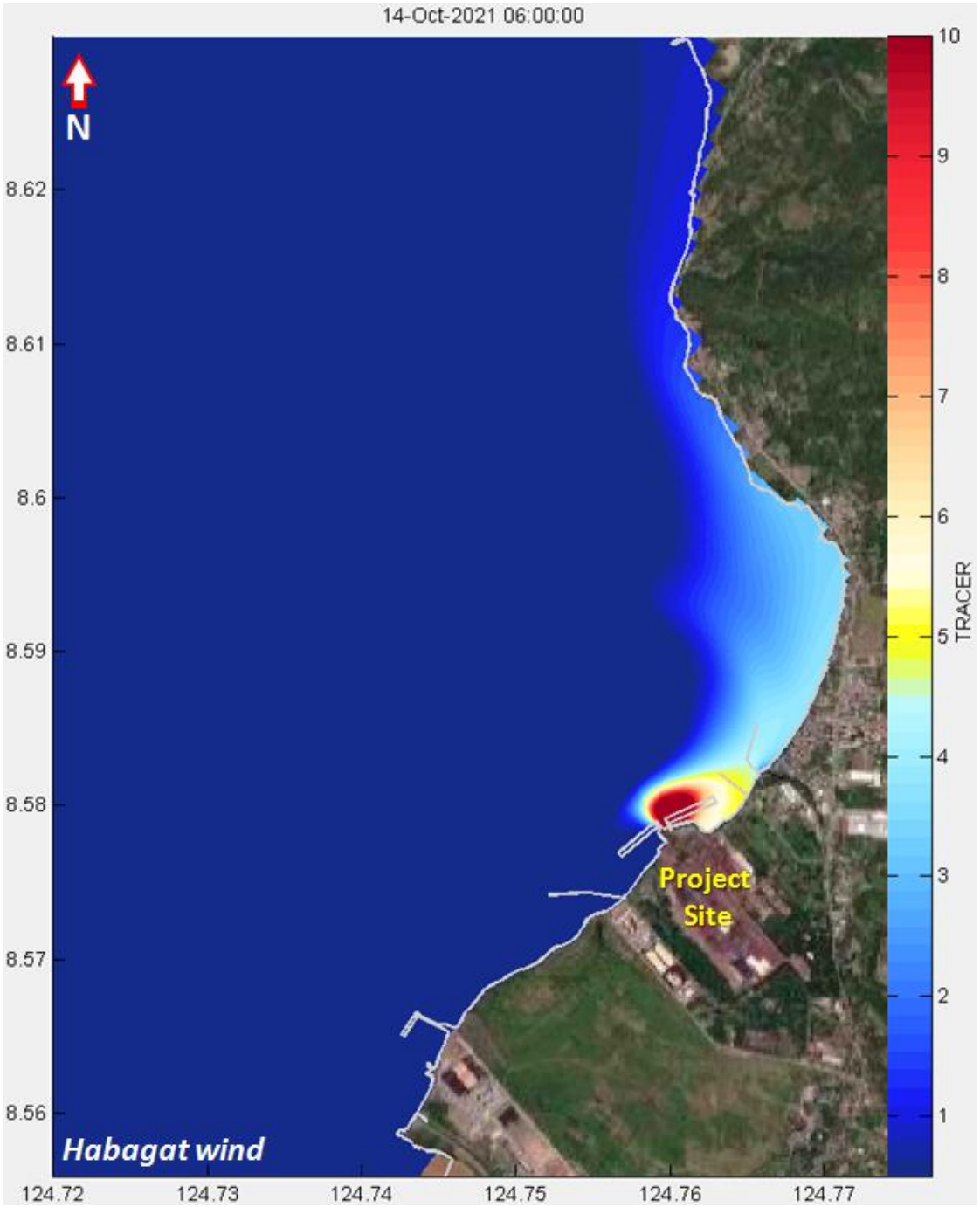


Figure 2.2.29. Predicted trajectory of tracer plume after 9.25 days of continuous releases near the proposed new berth under *habagat* wind condition.

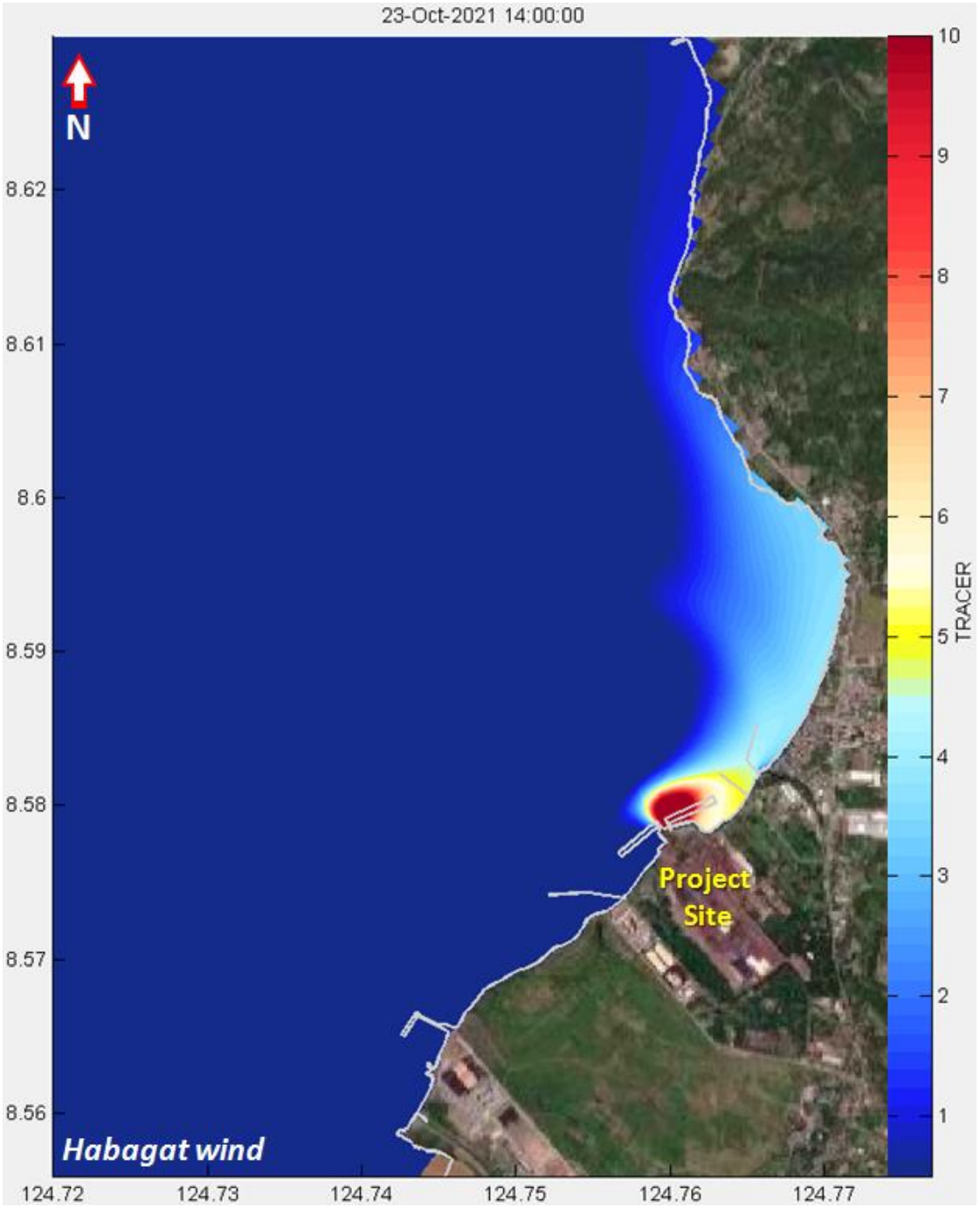


Figure 2.2.30. Predicted trajectory of tracer plume after 318.583 days of continuous releases near the proposed new berth under *habagat* wind condition.

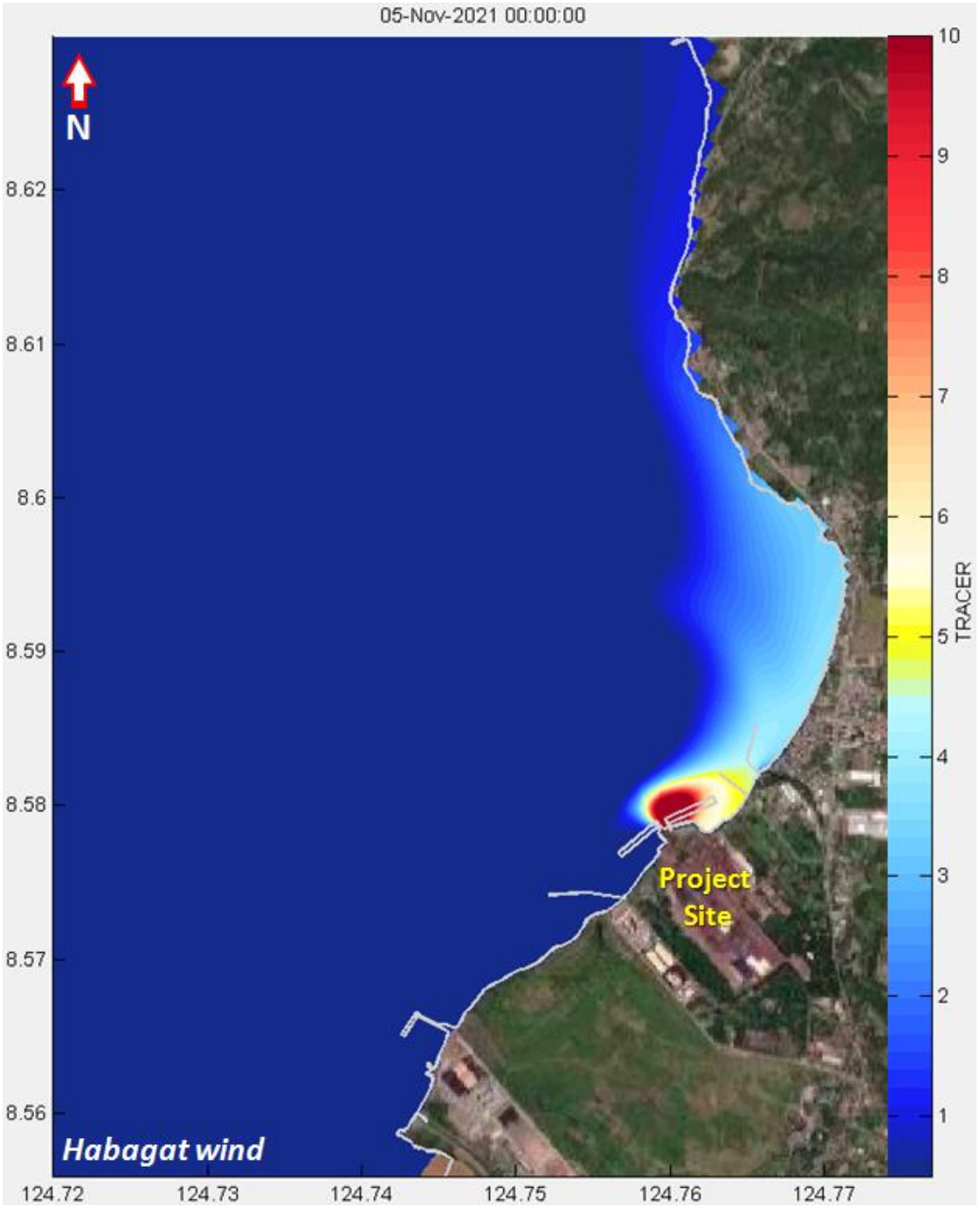


Figure 2.2.31. Predicted trajectory of tracer plume after 31 days of continuous releases near the proposed new berth under *habagat* wind condition.

Scenario simulations revealed that the continuous release of tracer plume in the proposed new berth were transported and covers the majority of the northeastern portion of surrounding costal area, and small area southwest, albeit with low concentrations regardless of wind and tidal conditions.

Also, the predicted tracer concentration is based on the moderate wind breeze of 4 m/s regardless of wind directions (*amihan* and *habagat*) which is imposed for the whole 31-day simulation period. The fact that high concentration tracer is mainly in the area of the release point, with tracer continuously releasing for 31-days which is highly unlikely, therefore, the extent of plume presented in the map may be lower than what is to be expected during the actual accidental releases of water pollutant. Gentle winds to strong gale may provide significant mixing which may significantly reduce the concentration (and areal extent) of the tracer plume predicted by this study.

As a mitigating option, given that the location of the proposed new berth or loading/unloading station is at or near the shore, with potential sources of pollutants from ships and barges that will dock in the area, the project proponent may wish to consider during the operational phase of the project to provide standby spill boom (for oil spills) or silt curtains (for accidental spillages of fine materials) to prevent spreading of such plumes in the nearby areas.

Storm Surge Inundation Modelling

Storm surge is an important issue because our country is located at the typhoon prone area and surrounded by the Pacific Ocean and the West Philippine Sea. Coastal development, as well as people living near the coast need to pay attention to the damages of storm surge, especially the inundation during typhoon's duration. Therefore, storm surge modeling is required for this proposed Project to provide not only the information of storm-induced water elevations but also potential inundation areas.

Tropical Storm Bopha was the strongest tropical cyclone on record to ever affect the southern island of Mindanao, and is one of the most recent typhoons that traversed north of the project area. Locally named Typhoon Pablo, it was said to be one of the strongest tropical cyclone occurred in 2012, making its first landfall in the evening of December 3, 2012, a Category 5 super typhoon with winds of 175mph. The characteristics and path of this storm were considered and reconstructed as its path traverses very near the project area during that time.

Using Delft Dashboard (DDB) Tropical Cyclone Tool, spatially varying wind and pressure fields of a hypothetical typhoon with similar characteristics as typhoon Pablo where derived, although the actual path of storm positions were modified to ensure that the modelled storm will pass near the project area to make the tide and storm-induced water levels predicted by the model is at its peak. Time series of spider web parameters of the center of typhoon were provided as input of DDB. DDB Tropical Cyclone Tool generates surface wind and pressure fields on a moving circular spider web grid for the given track information data, based on the Wind Enhancement Scheme of Holland (Holland, 1980). Shown below is the snapshot of the modified typhoon track used for typhoon surge modeling.

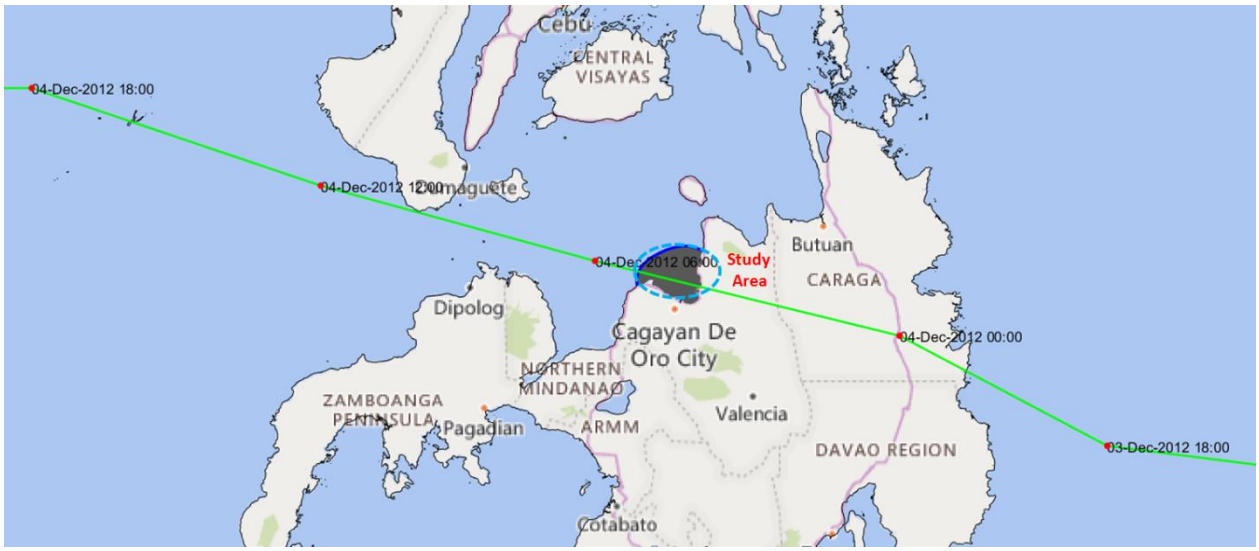


Figure 2.2.32. Hypothetical typhoon track (patterned after typhoon Pablo) used in storm surge modelling.

In Delft3D Flow model, in which calculations are based on the shallow water assumption, was used to simulate the hydrodynamic effects caused by wind, atmospheric changes and tidal forces. TPXO 7.2 Global Tide Model data was used as input for tidal boundaries of the modelled area. By using the wind and pressure fields reproduced by DDB Cyclone Tool as well as Delft3D-Flow, the hypothetical storm was simulated for 5 days, using tidal data of December 1 to 5, 2012 (the first few days were used to ensure stability of the model runs).

The series of figures show the results of predicted water levels due to typhoon (i.e. storm surges). The arrows overlaid in the figures represent the prevailing wind directions due to storm, while the maximum predicted high water levels (about 1m to more than 2masl) are represented by dark red areas while low water levels are in dark blue (in the range of 1.0mbsl).

Figures 2.2.33 to **2.2.34** show the predicted water levels a few hours before the passage of the eye of the storm in the project area where the wind direction transitioned coming from the south then to the southeast. The water levels predicted during this period fluctuates less than one meter below the mean sea level (low tide levels), with the hypothetical storm is now starting to influence the water movement as the eye approaches the project area.

The southward direction of the sustained storm wind during these periods forces the waters from the open sea towards the inside of the Bay.

Figure 2.2.35 shows the predicted water levels as the eye of the storm approaches the project area. For the modified typhoon track, on December 3, 2012 at 7:50 AM, the eye of the hypothetical storm starts to appear at the eastern coast of Macajalar Bay. Storm-induced high-water levels starts to appear in the high seas, with surges of more than 1m high as shown by the dark red areas in the following figures. Notice also the counter-clockwise wind field influencing the heights of water levels in the area.

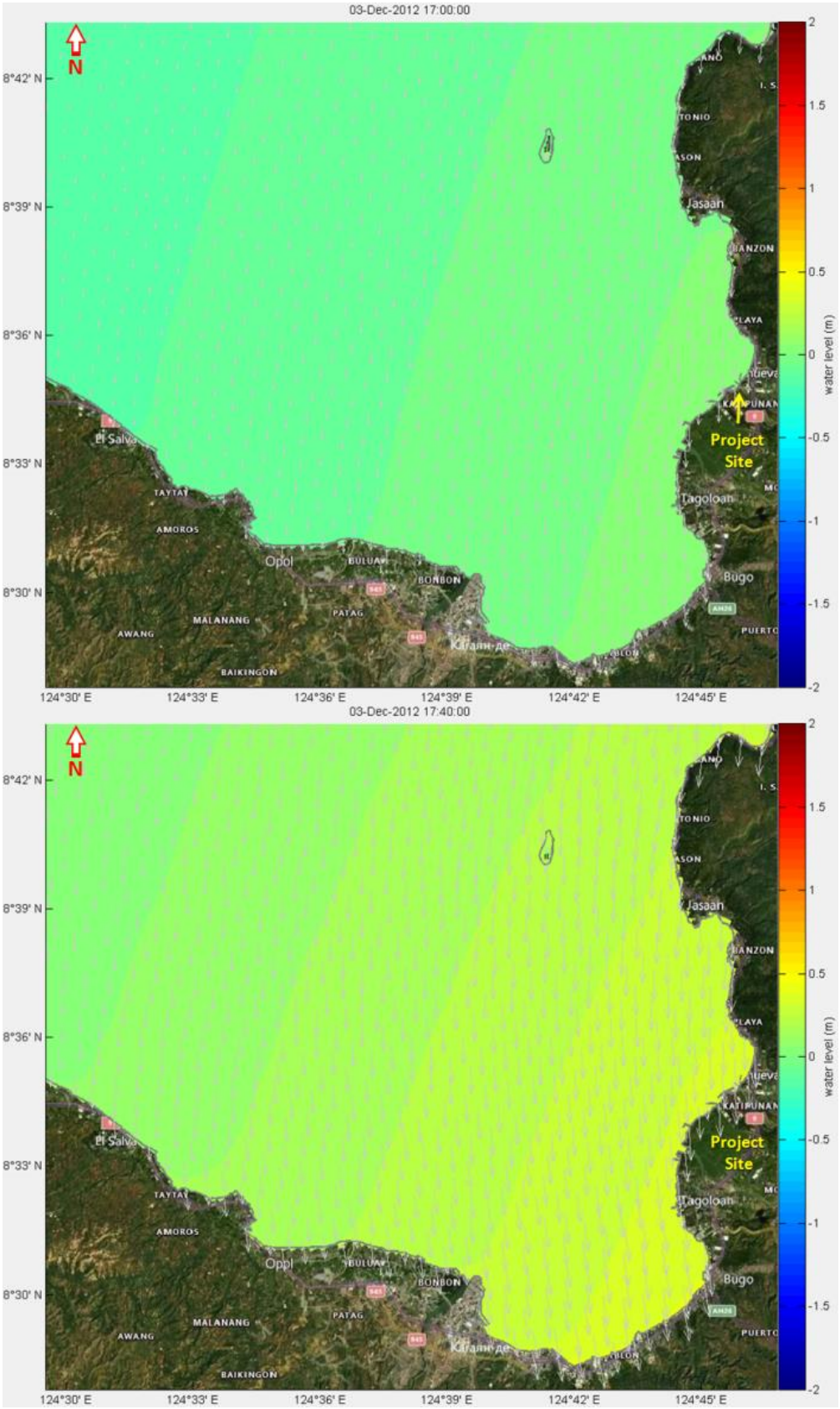


Figure 2.2.33. Predicted water levels before the passage of storm starting at simulation time of 5:40 PM and 5:40 PM of December 3, 2012.

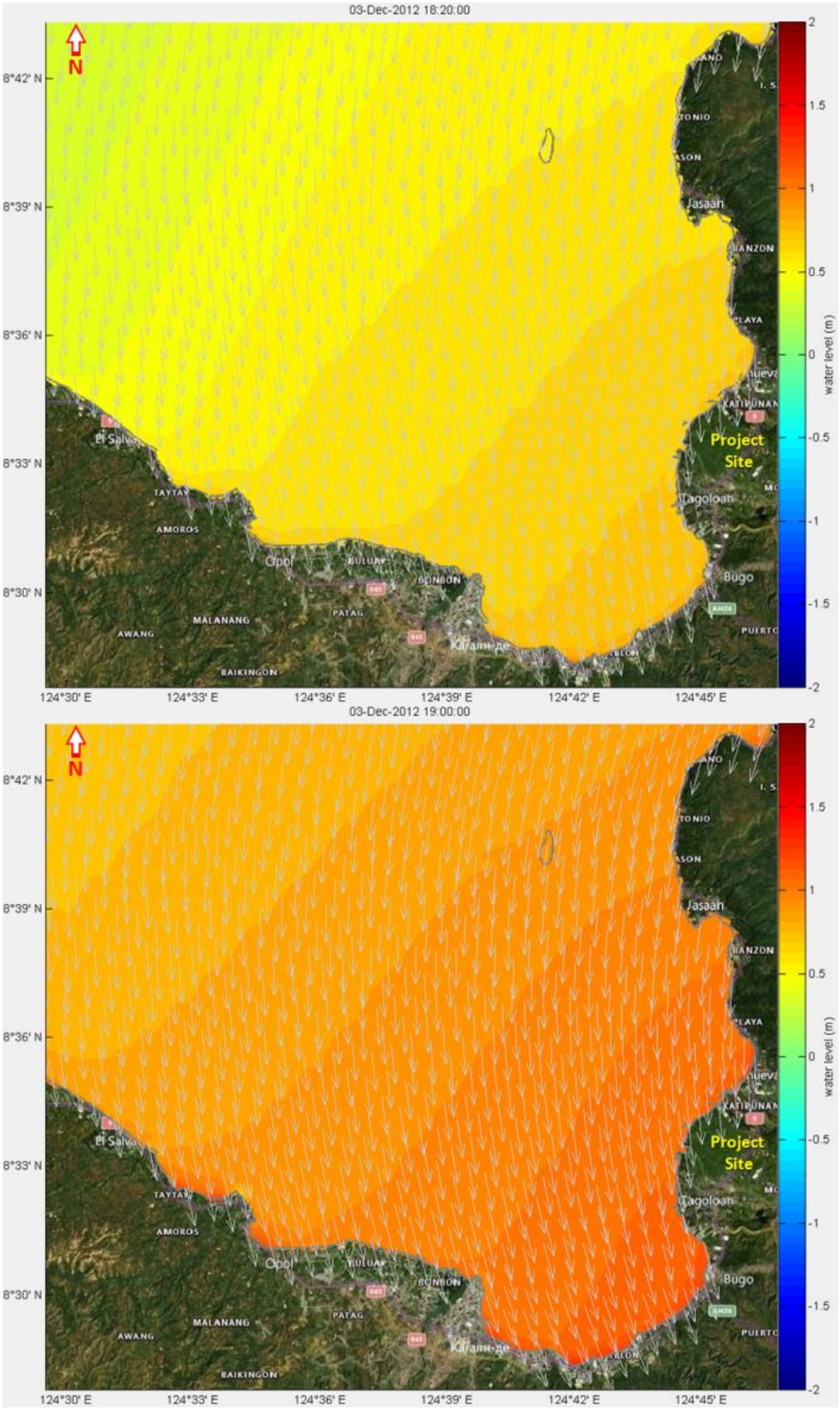


Figure 2.2.34. Predicted water levels before the passage of storm starting at 6:20 PM and 7:00 PM of December 3, 2012.

For example, when the eye of storm is at west of the project area, the storm wind is from the south in the coast of the project area, where piling up and drying up of water in its coast is predicted due to the storm-induced push of water in the Bay.

As the wind shifted its direction as the eye of the storm moves into and further west of the project, the coastal area near the project and adjacent area continue to experience storm surges where the water level peak exceeds more than 1m due to the large wind fetch. Wind fetch is the distance the wind has travelled over open waters.

Figure 2.2.36 is the close-up view of the predicted water levels with the eye of the hypothetical storm makes its landfall in the project area located just north of Tagoloan River, with the wind field showing a counter-clockwise pattern. The storm wind direction is to the northwest and to the east in areas north and south of the project, respectively. This causes the piling up of water especially at the southern coast, with more than 1 m high storm surges predicted as shown by the dark red areas.

From this figure, it can be deduced that the project area is predicted to be moderately vulnerable to storm surges and high-water levels specially since the Bay is exposed and with large wind fetch due to the large surface area of Bohol Sea. Based on the simulation made, storm surges are possible when the wind is blowing from the east. Also, storm simulations showed that the coastal area of the project is vulnerable to storm surges, regardless of whether the project is in place or not.

The next sets of figures (**Figure 2.2.37**) show the comparison of water levels a couple of hours after the eye of storm passes the project area. As shown, the time snapshots of predicted water levels gradually changes until it becomes more or less of the same magnitude as the effect of wind-influenced water circulation and movement decreases.

Time series plot of simulated water levels near the proposed berthing facility of the Project is shown in the next figure. The predicted tidal fluctuations in the area were simulated under normal with condition (i.e., without typhoon wind inputs) is shown as a blue line, which were then compared with the hypothetical storm scenario to assess the impact of wind-induced water levels or potential storm surge event in the project area (shown as red line in the graph).

Form this graph, it is clear that as the eye of the storm passes offshore and directly south of the project area, the water levels inside the Bay started to pile up as the wind shifted its direction eastwards thereby pushing the water from the open sea against the coastal area of the project. As the eye of the storm makes its landfall in the project area, the water level maintains its increasing height as the waters from the open sea pushes and piled up towards the area. This sudden rise of water level constitutes the storm surge event. At the opposite side of the sea however, specifically in the coastal areas near the mouth of Macajalar Bay, the sudden fall in water level may be expected due to the wind-induced push of water from the coast towards the inner portion of the Bay. Reversal of wind direction after passage of the eye of the storm will then push the water from the opposite direction and into the other side.

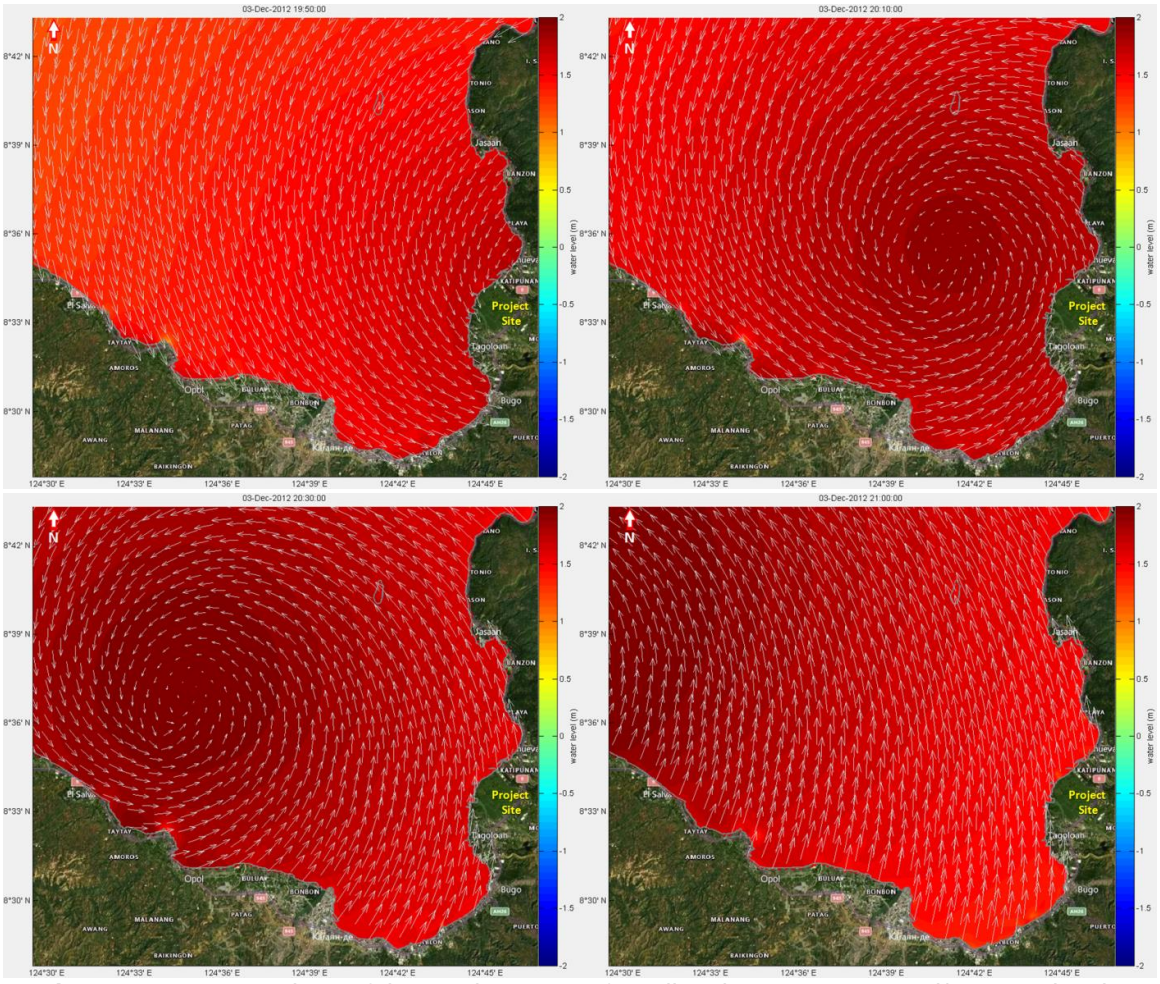


Figure 2.2.35. Snapshots of time series maps of predicted storm surges and/or water levels as the eye of the storm passes south of the project area.

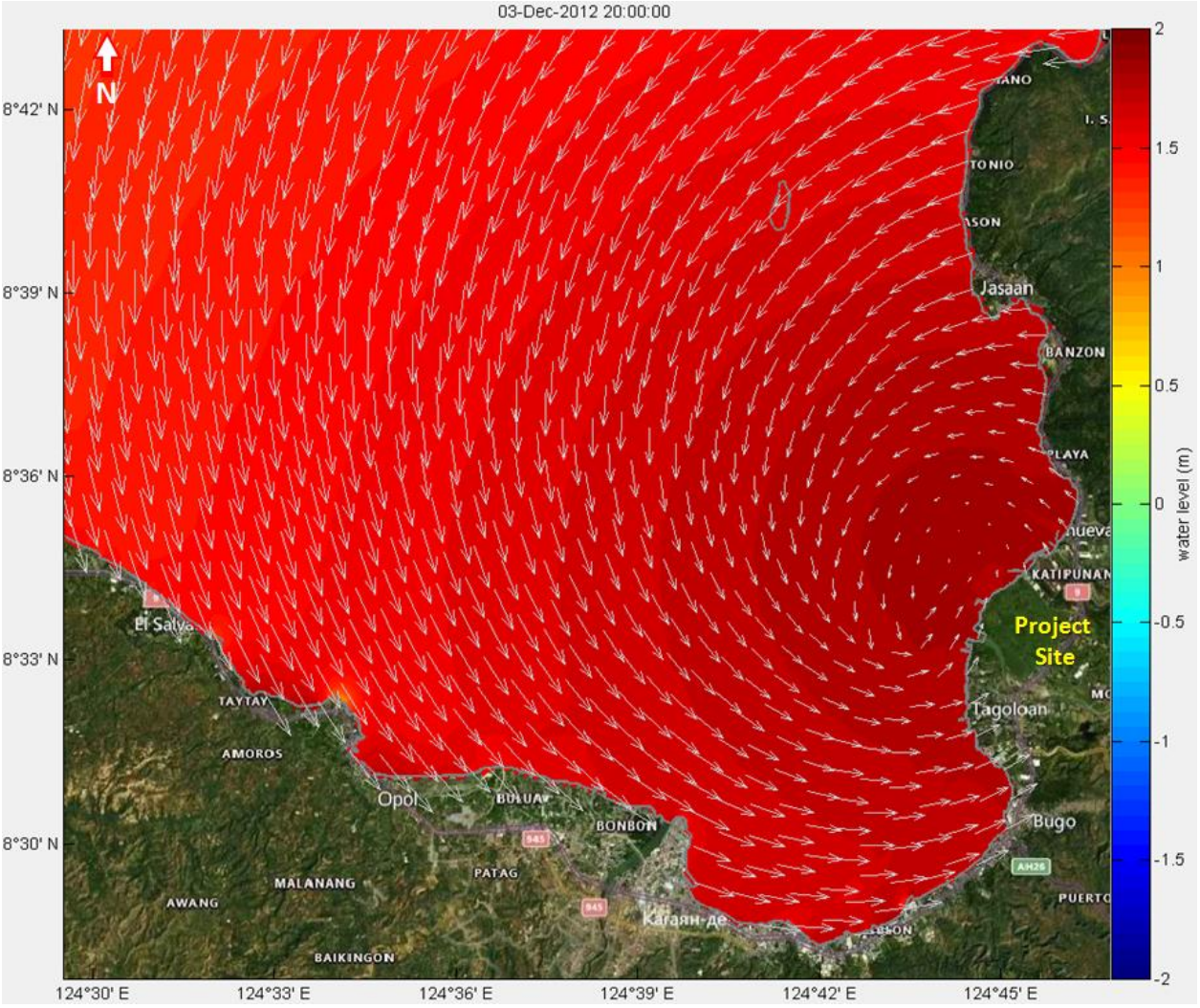


Figure 2.2.36. Predicted storm surges and/or water levels during the passage of the storm offshore of the vicinity of the project area. Notice the increase in water levels (red areas of the project area) indicating the increase in water levels compared to surrounding areas of the Bay.

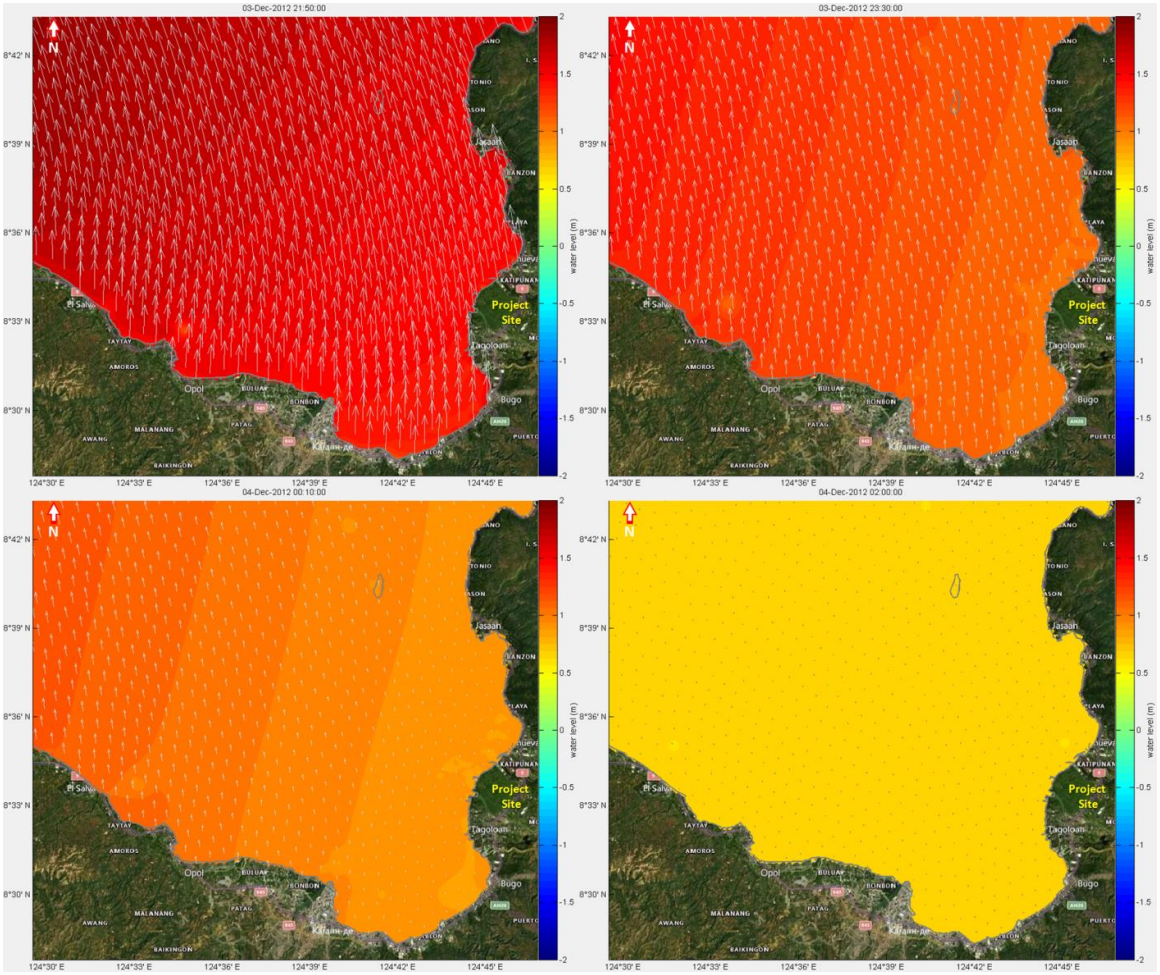


Figure 2.2.37. Snapshots of maps of predicted storm surges and/or water levels after the passage of the storm.

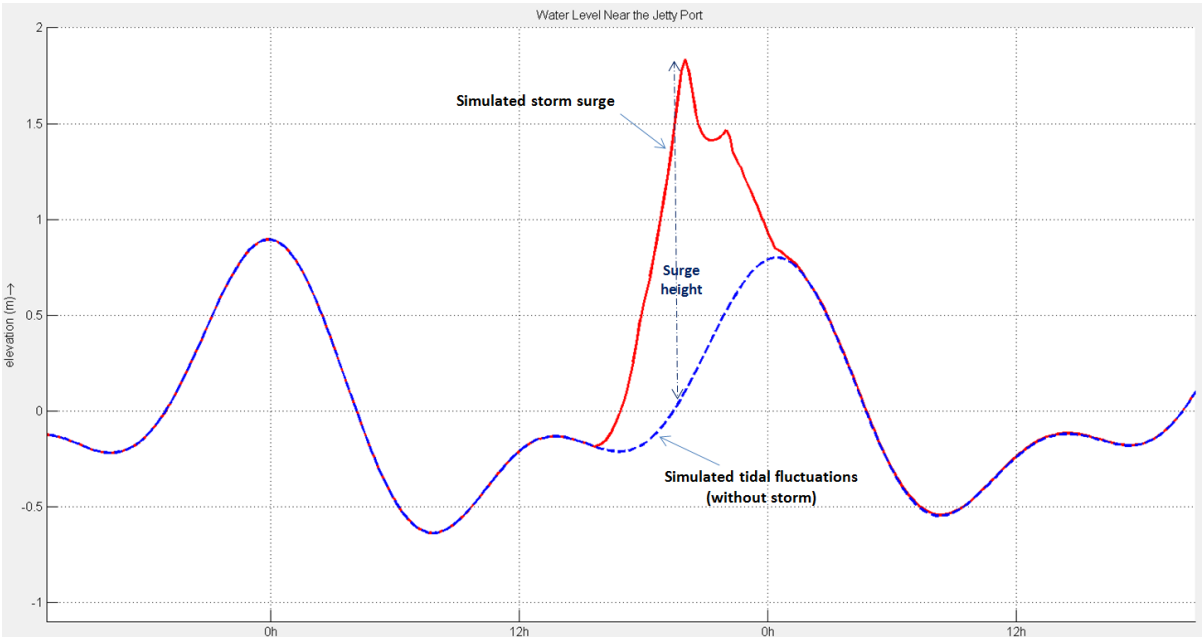


Figure 2.2.38. Time series of predicted storm surge (red line) and the simulated tidal fluctuation under normal wind condition (blue line).

In summary, the project area is moderately vulnerable to storm surges due to its natural topography, especially when the wind is blowing from the west or northwest. The water that would otherwise flow freely to other areas may piled up in the coast due to the enclosed area of the Bay, where the wind-induced water movement from the open sea rushes and pushes towards the coastal areas of the project, causing storm surges. As there is no major physical alteration of the coast during implementation and operation of the Plant, it will not exacerbate the potential storm surge inundation of the adjoining coastal area and that this storm surge phenomenon may occur in these areas, regardless whether the project is in place or not.

2.2.3 Water Quality

2.2.3.1 Methodology

The Water Quality baseline assessment made use of the EPRMP 2008 report and the SMR's and CMR's submitted over the past three years. Primary data was collected to provide verification for the reports submitted by PSC to EMB. Water sampling was conducted on May 10, 2021 by the team of Gaia. The preliminary location of the sampling stations was laid out on a map and verified during the site observation. **Table 2.2.8** presents the water quality parameters for the samples that were analyzed.

Table 2.2.8. Water quality parameters

Constituent	Parameter
Groundwater	pH, TSS, O&G, Pb, Hg, As, Cd, Cr+6, Fecal Coliform
Marine Water	pH, BOD5, COD, DO, O&G, TSS, Pb, Hg, As, Cd, Cr6, Fecal coliform, temperature
Effluent	COD, Temp, pH, TSS, DO, O&G, Chlorides, Cd, Cyanide, Cr, Ni, Pb, Zn, Fe, BOD, Benzene, Toluene, Hg, As, Ammonia, Nitrate, Sulfate, Phosphate, Ethylbenzene, ortho-Xylene, meta-Xylene, para-Xylene, Ba, Mn, Total Coliform, Fluoride

Water samples were compared to their respective DENR standard specified in DAO 2016-08.

Description of Sampling Locations

The 2008 EPRMP reported four drainage systems (rivers and creeks) in the vicinity of the project site. None of them, however, were in the impact zone of PSC. Hence, the baseline study for this proposed expansion covered only the water quality of groundwater wells in the Project Site and the receiving marine water body which is Macajalar Bay (classified as Class SC). The condition of effluents discharged to the bay will also be assessed.

PSC maintains two (2) settling ponds that serve as the collection area for wastewater from the plant operations. Domestic wastewater, cooling water and wastewater from equipment and vehicle washing all constitute the total influent of the North Settling Pond, while the influent of the South Settling Pond consist of washings and run-off from Raw Material Stockyard. There are two (2) exit canals from the ponds that discharge wastewater into the Macajalar Bay making it the terminal receiving body of all possible pollutants. Monitoring wastewater quality of the ponds would contextualize any contamination of Macajalar Bay regarding the existing plant operations. In addition, the cooling water from the Sinter Heat Recovery Power Plant (SHRP) is also monitored (Outlet 3).

PSC monitors its wastewater in two areas: (1) North Settling Pond (NSP) Effluent Discharge (Outlet 1 in SMR) and (2) South Settling Pond (SSP) Effluent Discharge (Outlet 2). PSC

reported its effluent discharges into Macalajar Bay in its SMRs. The sampling stations have been established and approved during the past EIA Reports and monitoring was conducted with the Multisectoral Monitoring Team providing oversight. The PSC Station ID are described in the table below, and the correspondence to the sampling stations conducted in this 2021 sampling are indicated. **Table 2.2.9** presents the coordinates and details of the sampling points while **Figure 2.2.39** shows the sampling location map while **Figure 2.2.40** presents the location of the water source.

Table 2.2.9. Sampling stations for the water quality assessment

No.	Station ID	Coordinates	Classification	PSC Station ID	Description
1	EWQ1	N8°34'42.0" E124°45'35.0"	Effluent	Outlet Number 1	North Settling Pond Effluent Discharge
2	EWQ2	N8°34'31.00" E124°45'35.0"	Effluent	Outlet Number 2/ Outlet Number 3	South Settling Pond Effluent Discharge/ MTH Motor Pool Area
3	EWQ3	N8°34'46.0" E124°45'45.0"	Effluent	SHR Point A	Sinter Heat Recovery Power Plant Cooling System Discharge Marine outfall
4	EWQ4	N8°34'46.0" E124°45'51.0"	Effluent	NSP Mix zone - N-100m E	100 m east of NSP
5	EWQ5	N8°34'32.0" E124°45'30.0"	Effluent	SSP Discharge Mizing Zone - S-100m W	100 m west of SSP
6	MWQ1	N8°34'42.0" E124°45'46.0"	Receiving Body of Water (RBW)	NSP Mixing Zone	NSP Mix Zone N-100 W
7	MWQ2	N8°34'34.0" E124°45'32.0"	Receiving Body of Water (RBW)	SSP Mixing Zone Area	South Settling Pond Discharge Mixing Zone S-10m N
8	MWQ3	N8°34'44.0" E124°45'26.0"	Receiving Body of Water (RBW)	Near existing Cargo Berth	Macajalar Bay
9	MWQ4	N8°34'46.0" E124°45'34.0"	Receiving Body of Water (RBW)	Near proposed berth	Macajalar Bay
10	MWQ5	N8°34'48.0" E124°45'45.0"	Receiving Body of Water (RBW)	SHR Cooling Water Discharge to Sea (Point C-50 m from SHR)	Macajalar Bay
11	MWQ6	N8°34'33.6" E124°45'27.6"	Receiving Body of Water (RBW)	Between existing Cargo Berth and shore	Macajalar Bay
12	GWQ1	inside PSC	GW	Deep well	Deepwell no. 3
13	GWQ2	inside PSC	GW	Deep well	Deepwell no. 4

The quality of the receiving water body (Macajalar Bay) was also monitored at various locations as shown in the sampling stations in the table. Quality of groundwater is assessed through the existing wells of the plant.

Figure 2.2.39. Map showing the sampling stations for ambient and effluent water quality monitoring of PSC

Figure 2.2.40. Location map of PSC's water sources

2.2.3.2 Baseline Conditions

Effluent Water Quality

The results of the 2021 laboratory analysis of effluent water quality assessment as compared to DAO 2016-08 **Table 2.2.10** (effluent) are shown in **Table 2.2.10**. The actual laboratory reports are in **Annex 2.2.1**.

The results show that none of the heavy metals were detectable in the effluents released to the bay. Organic pollutants represented by biological oxygen demand (BOD) and chemical oxygen demand (COD) were also within the guide values, with the latter only showing a range of 9 to 25 mg/L. Likewise, the total suspended solids (TSS) were also below the guide value of 100mg/L, ranging only from 3 to 8 mg/L.

For this sampling, the presence of benzene, toluene, and xylenes (BTEX) were also assessed but were not detected in the effluents. Cyanide was also not detected in the samples.

Table 2.2.10. Results of effluent water sampling (May 2021)

Parameters	Test Method	DAO 2016-08 Class SC	EWQ1	EWQ2	EWQ3	EWQ4	EWQ5
pH	Electrometric	6.0 to 9.0	7.83	7.9	7.96	7.98	7.81
Temperature, C° change	Electrometric	3	22.9	22.6	22.8	22.7	22.8
BOD	5-Day BOD test	100	8	13	5	5	5
COD	Modified Open Reflux	200	17	25	9	11	10
Dissolved Oxygen (DO)	Iodometric Method	n/a	4.5	5.2	6.6	6.5	6.7
TSS	Gravimetric (dried at 103 – 105 oC)	100	3	6	8	6	8
Oil & Grease	Petroleum Ether Extraction	10	3	1	<1	<1	<1
Phosphate	Stannous Chloride Method	1	0.1	0.14	<0.02	<0.02	<0.02
Nitrate as NO3-N, mg/L	Colorimetric, Brucine	20	0.3	0.9	<0.05	<0.05	0.1
Ammonia as NH3-N	Phenate Method	0.5	0.04	<0.002	<0.002	0.12	<0.002
Sulfate		550	48.5	97.7	2459	2432	2355
Chloride	Argentometry	n/a	212	160	18641	18554	22109
Total coliform, MPN/100ml	Multiple Tube Fermentation	10000	780	2000	1300	450	200
Arsenic (As)	SDDC, Spectrophotometry	0.04	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury		0.004	<0.001	<0.001	<0.001	<0.001	<0.001
Lead (Pb)	Flame AAS	0.1	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (Ni)	Flame AAS	0.3	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)	Flame AAS	0.01	<0.002	<0.002	<0.002	<0.002	<0.002
Iron	Flame AAS	7.5	0.5	1.1	0.2	0.1	0.1
Zinc	Flame AAS	1.5	<0.005	<0.005	<0.005	<0.005	<0.005
Manganese	Flame AAS	4	<0.04	<0.04	<0.04	<0.04	<0.04
Chromium (a)	Flame AAS	0.1	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoride	Ion-Selective Electrode	3	0.22	0.25	0.91	0.91	0.93
Barium	ICP-OES	2	0.02	0.029	0.008	0.007	0.006
Cyanide as free CN	Cyanide-Selective	0.2	<0.01	<0.01	<0.01	<0.01	<0.01

Parameters	Test Method	DAO 2016-08 Class SC	EWQ1	EWQ2	EWQ3	EWQ4	EWQ5
	Electrode (w/o dist)						
Benzene	GC-MS	0.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	GC-MS	20	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ethylbenzene	GC-MS	7.5	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
meta & para Xylene*	GC-MS	15	<0.001	<0.001	<0.001	<0.001	<0.001
ortho-Xylene*	GC-MS	15	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

The monitoring results for the past 4.25 years (from Jan 2017 to Q1 2021) were plotted for the effluents of PSC. Discharges from Outlet 1(NSP) and Outlet 2 (SSP) have decreased after 2017.

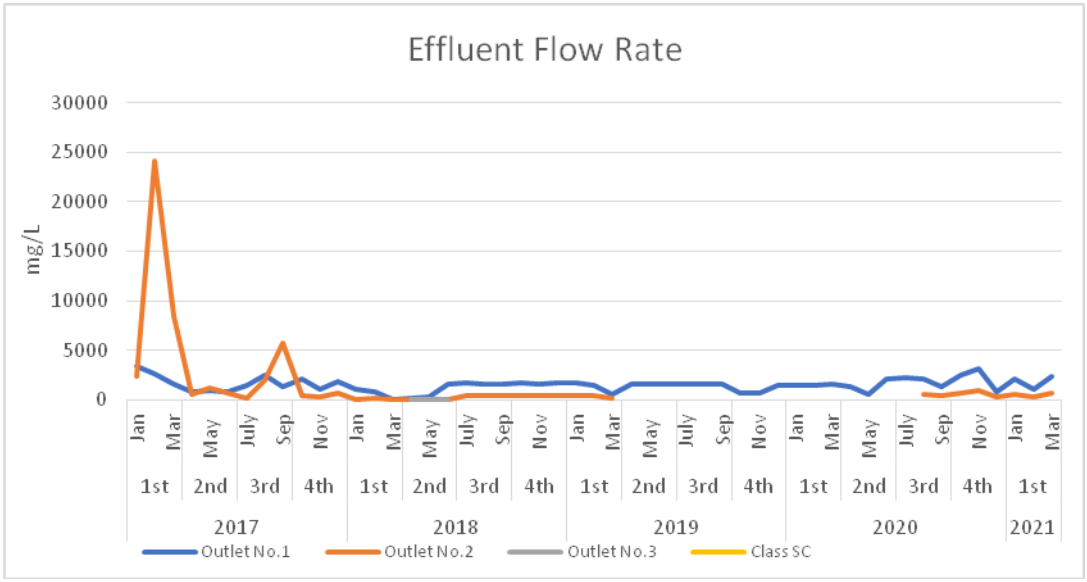


Figure 2.2.41. Result of PSC Effluent flow rate monitoring

The trends for significant pollutant parameters monitored in the SMR are discussed below. The COD for the past period averaged around 22mg/L for Outlet 1 and 14.5mg/L for Outlet 2 (vs Class SC = 200mg/L).

For BOD5, the three outlet stations had averaged between 12-14mg/L. The highest value of 39 mg/L was recorded in March 2017 for Outlet 1.

For TSS, the average for Outlet 1 was 7.3mg/L, Outlet 2 was 9.5mg/L and Outlet 3 has the highest average with 30mg/L. Highest single value for Outlet 3 was 73mg/L during November 2018. None of the measured values exceeded the 100mg/L guide value.

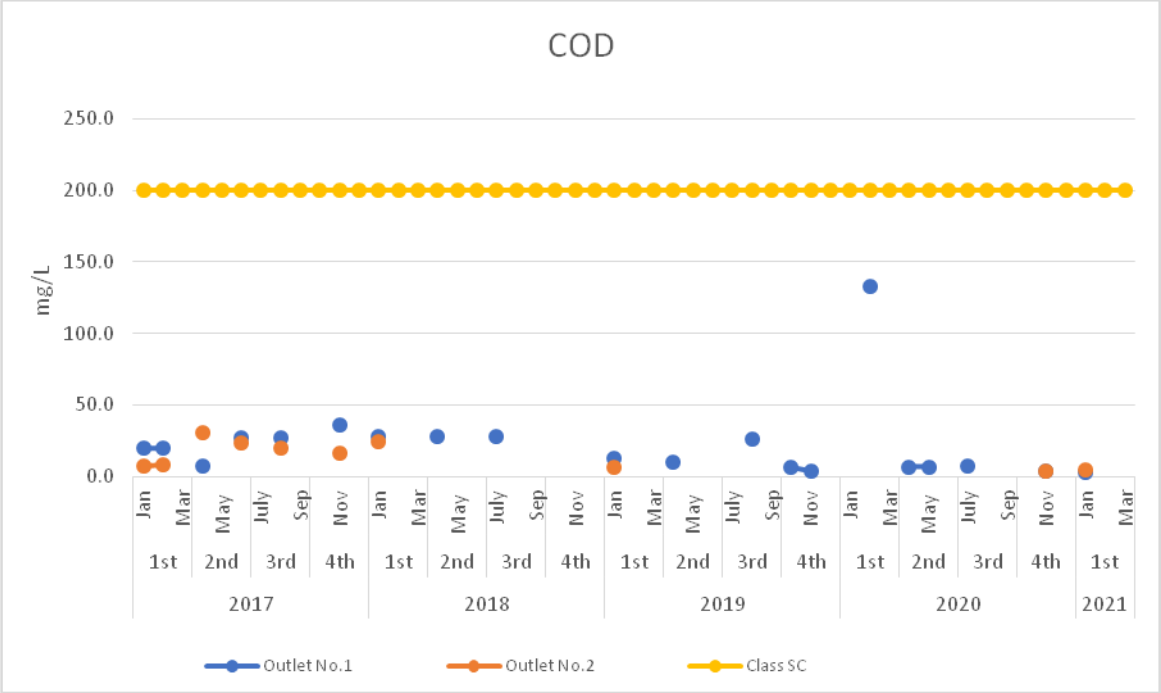


Figure 2.2.42. Result of PSC COD effluent water quality monitoring

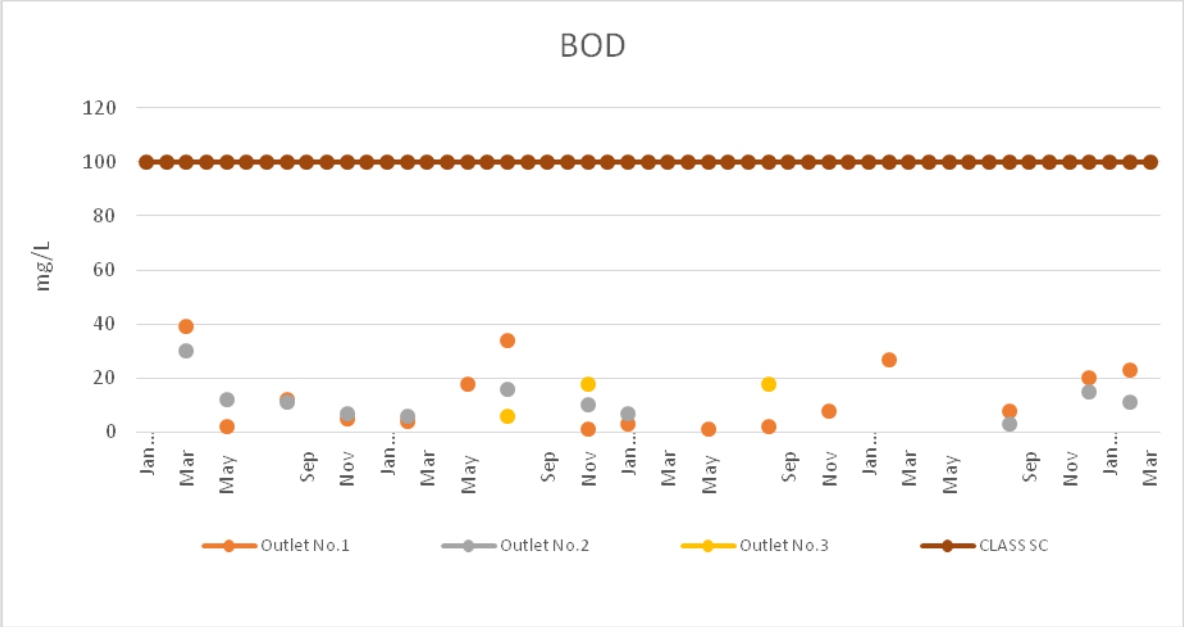


Figure 2.2.43. Result of PSC BOD effluent water quality monitoring

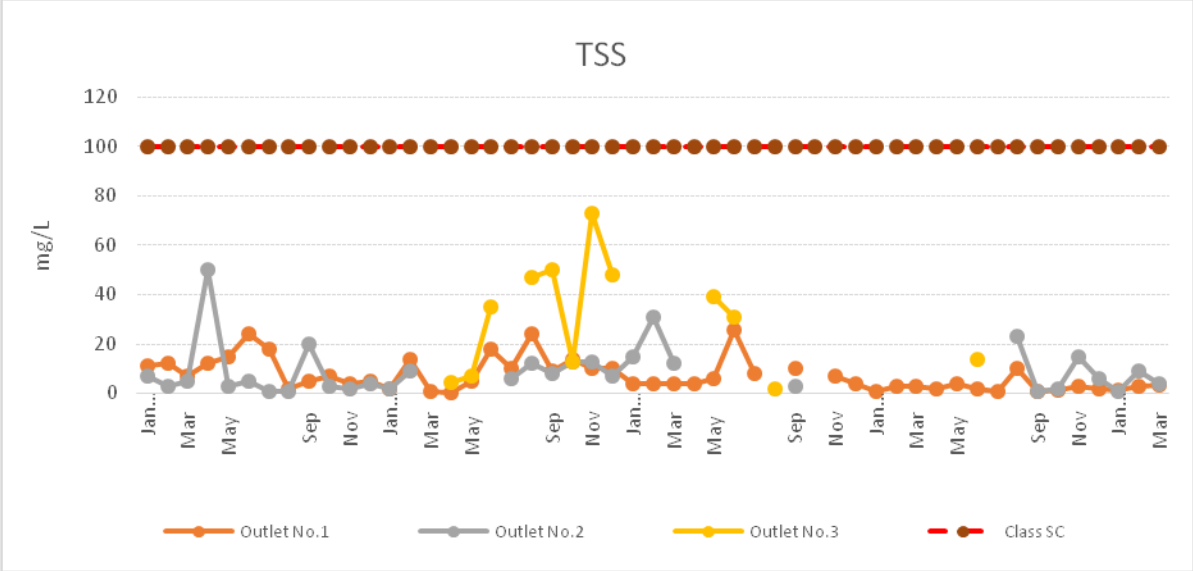


Figure 2.2.44. Result of PSC TSS effluent water quality monitoring

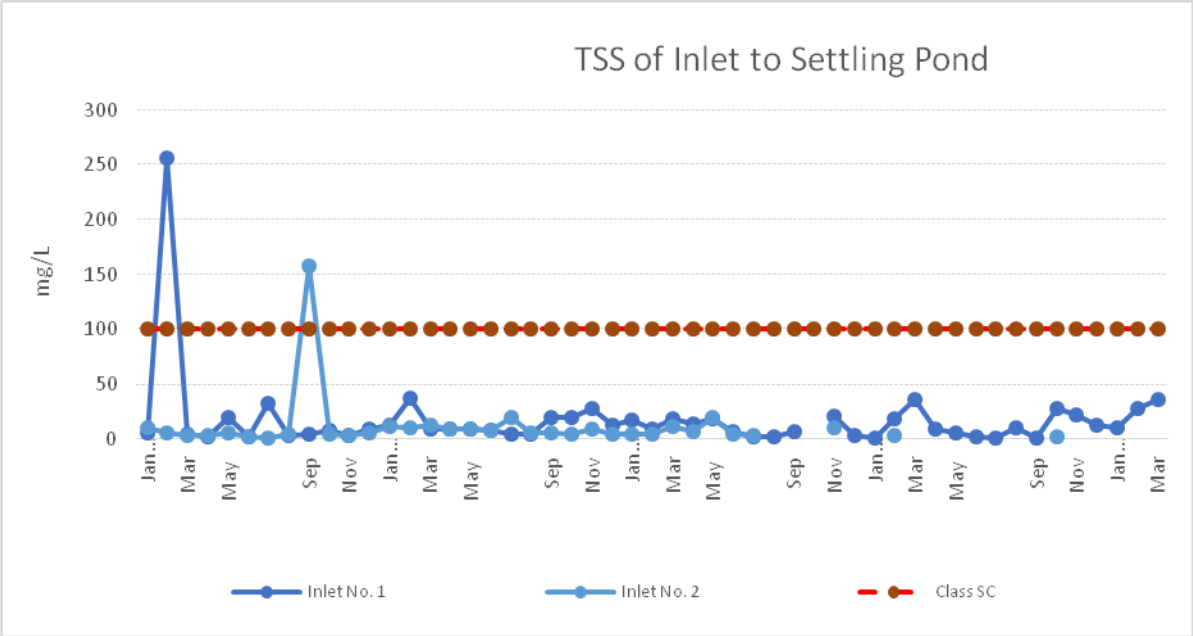


Figure 2.2.45. PSC TSS concentration prior to the entry to the settling pond

Figure 2.2.45 in the preceding page shows the TSS values for the influent to the settling pond. Values above 100mg/L were only experienced in 2017 and thereafter were already below 50mg/L. The average for Inlet 1 was 17mg/L while Outlet 1 was 7.3mg/L. For Inlet 2, average was 11mg/L and Outlet 2 was 9.3mg/L.

The oil and grease measurement for the past period is provided in the next figure. The average values were 3.4, 3.9 and 5.2mg/L for the respective outlets. A single exceedance in Outlet 3 - Motorpool Area during October 2018 was incurred. This effluent, however, still goes to the North Settling Pond which then discharges into the bay (Outlet 1). Values for Outlet 1 were within the effluent standards.

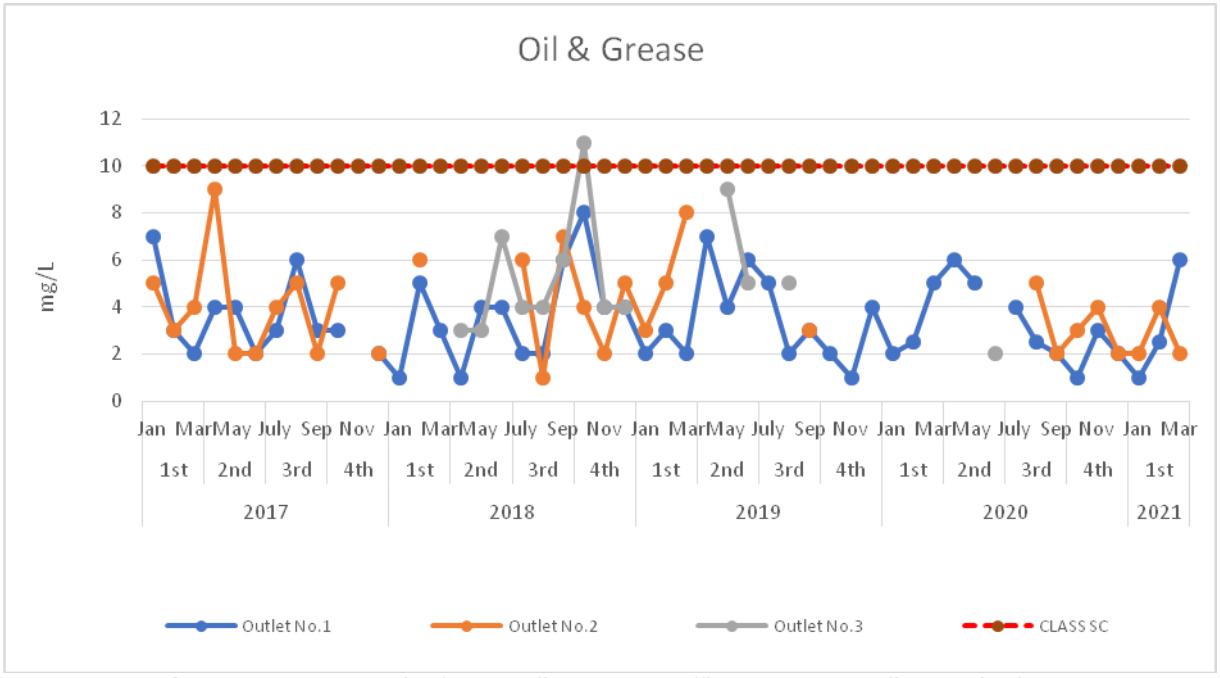


Figure 2.2.46. Result of PSC Oil & Grease effluent water quality monitoring

The other parameters such as cyanide, heavy metals, total coliform and BTEX were also monitored and none of the reported values were above the DAO 2016-08 guide values. The average, maximum value, and number of samples are reported below.

Table 2.2.11. Results of effluent water monitoring for other parameters

Parameter & Guide Value	Location	Average	Max	Samples
Cyanide (0.2 mg/L)	Outlet No.1	0.037133	0.05	15
	Outlet No.2	0.0347	0.05	10
	Outlet No.3	0.05	0.05	3
Benzene (0.5 mg/L)	Outlet No.1	0.0005	0.0005	15
	Outlet No.2	0.00045	0.0005	10
	Outlet No.3	0.0005	0.0005	3
Toluene (20 mg/L)	Outlet No.1	0.000453	0.0008	15
	Outlet No.2	0.0005	0.0005	10
	Outlet No.3	0.001067	0.0022	3
Mercury (0.004 mg/L)	Outlet No.1	0.001667	0.01	15
	Outlet No.2	0.002	0.01	10
	Outlet No.3	0.001	0.001	3
Arsenic (0.04 mg/L)	Outlet No.1	0.009	0.01	15
	Outlet No.2	0.0115	0.02	10

Parameter & Guide Value	Location	Average	Max	Samples
	Outlet No.3	0.013333	0.02	3
Ammonia (0.5 mg/L)	Outlet No.1	0.0338	0.11	15
	Outlet No.2	0.0363	0.1	10
	Outlet No.3	0.031667	0.06	3
Nitrate (20 mg/L)	Outlet No.1	0.474667	0.9	15
	Outlet No.2	0.4	2.65	11
	Outlet No.3	1.166667	3.2	3
T. coliform (10,000 MPN/100 ml)	Outlet No.1	224	450	5
	Outlet No.2	4193.333	7900	3
	Outlet No.3	-	0	0

Overall, PSC's monitoring results show that pollutant parameters which were monitored from Jan 2017 to March 2021 did not exceed the guideline values for discharge into Class SC water as provided by DAO 2016-08.

Marine Water Quality

The results of laboratory analysis of marine water quality assessment as compared to DAO 2016-08 Class SC are shown in **Table 2.2.12**. The actual laboratory reports are in **Annex 2.2.1**.

The results indicate that none of the heavy metals analyzed were present in the sampled stations. All other parameters were within the Class SC guide values with exception of fecal coliform which were found to be above 200 MPN/100ml (guide value) in most of the stations. Despite the household in Villanueva reported to have 100% access to sanitary toilets, most sanitary toilets are septic tanks that do not provide for adequate treatment of the household effluents, hence they are likely to affect the water quality, especially the fecal coliform levels.

Table 2.2.12. Results of marine water sampling

Parameters	Test Method	DAO 2016-08 Class SC	MWQ 1	MWQ2	MWQ3	MWQ4	MWQ5	MWQ6
pH	Electrometric	6.5 – 8.5	8.22	8.24	8.22	8.29	8.3	8.31
Temperature, ^{o}C	Electrometric	--	21.4	20.8	21.3	20.4	20.7	20.6
COD, mg/L	Modified Open Reflux Method	--	151	153	154	155	137	140
DO,mg/L	Iodometric Method	5	6.7	6.7	6.6	6.8	6.8	6.6
Oil & Grease, mg/L	Gravimetric (Petroleum Ether Extraction)	3	<1.0	<1.0	<1.0	<1.0	1	<1.0
TSS, mg/L	Gravimetric (dried at 103 – 105 ^{o}C)	80	9	7	10	9	9	7
Fecal Coliform	Multiple Tube Fermentation	200	780	450	200	200	1300	780
Lead (Pb)	Flame AAS	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mercury (Hg)	Cold Vapor AAS	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic (As)	SDDC Spectrophotometry (modified)	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (Cd)	Flame AAS	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Hexavalent Chromium (Cr^{+6})	Colorimetric Method	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

The results of quarterly TSS analysis for 2017-2021 (Q1) for coastal waters are shown in **Figure 2.2.47**. For all stations, the values are mostly below 40 mg/L.

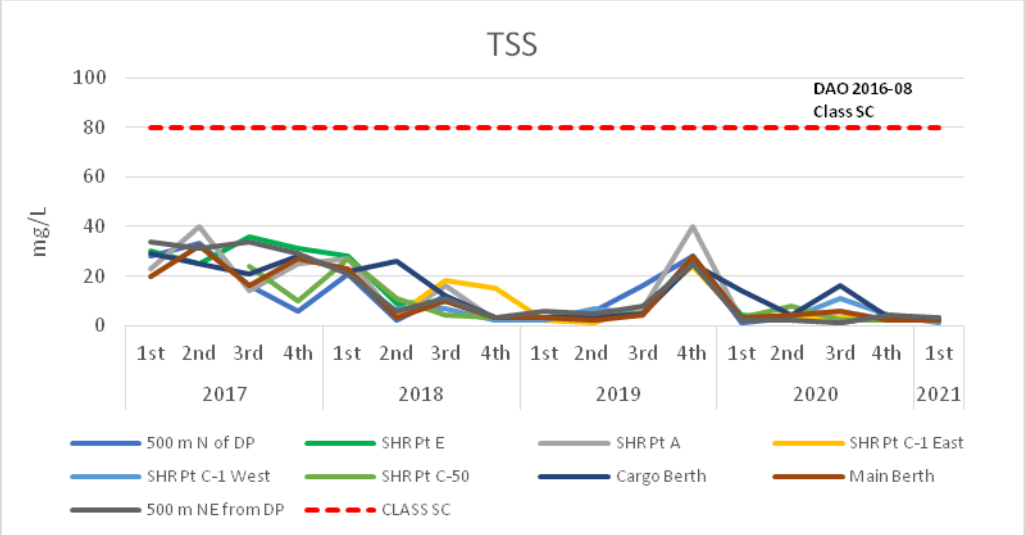


Figure 2.2.47. Result of PSC TSS ambient marine water quality monitoring

The monitoring for oil and grease indicate several areas where the ambient guide value of 3.0mg/L for Class SC water was exceeded. Near the Cargo Berth, values of 15 sampling occasions averaged 6.40mg/L. Nine of the 15 samples were above 3.0mg/L. The presence of other industries (oil/oleochemical company) near the PSC berth previously reported high levels of oil and grease through the LGU. Continuous monitoring and investigation were done by the MMT Team while an Oil Spill Containment, Recovery and Clean-up Program was adopted by PSC per MARINA and Philippine Coast Guard Guidelines (**Annex 1.6**).

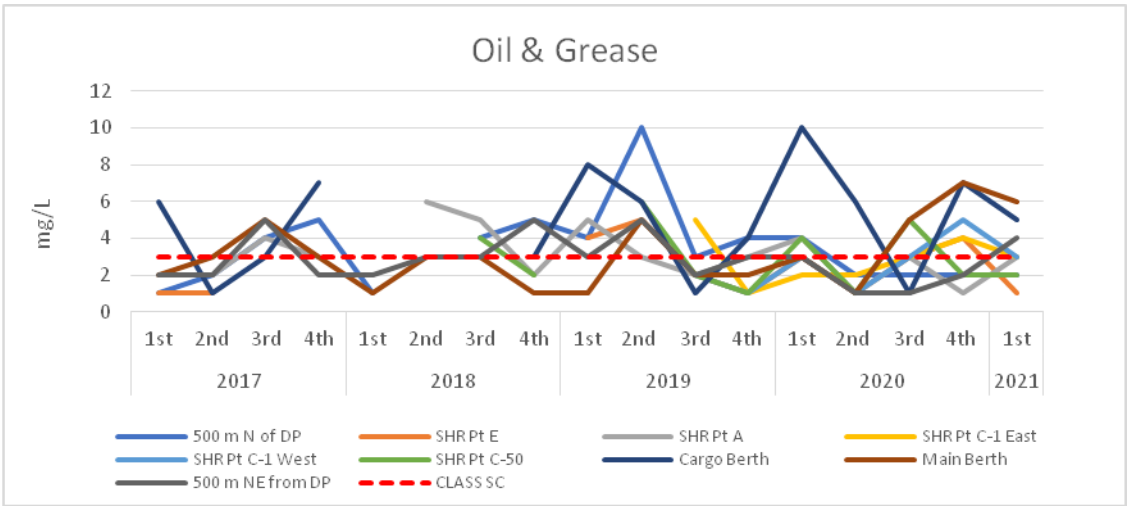


Figure 2.2.48. Result of PSC Oil & Grease ambient marine water quality monitoring

Groundwater Quality

The results of laboratory analysis of domestic/groundwater quality assessment as compared to DAO 2016-08 Class B are shown in **Table 2.2.13**. The actual laboratory reports are in **Annex 2.2.1**.

There are six (6) deep wells that were established by PSC for water supply of the sintering operations since 1975. DW1 & 2 had been retired in 1980 while DW 5 was not operated after its pump was damaged, DW5 also has high chloride content. At present, DW 3, 4 and 6 were operational. Water drawn from Deep Well 3 is also considered very hard having high elevated concentration of chloride, thus it is only used by PSC as back-up water supply and is seldomly used except during special cases. The two samples below indicate agreement with the groundwater guide for Class B use in DAO 2016-08. Presence of heavy metals such as lead, arsenic, and mercury were not detected.

Table 2.2.13. Results of groundwater sampling analysis

Parameters	Test Method	DAO 2016-08, Class B	GWQ1	GWQ2
pH	Glass Electrode	6.5-8.5	8.41	8.36
Fecal Coliform, MPN/100 ml	Multiple Tube Fermentation	100	<18	<18
TSS	Gravimetric	65	<2.0	<2.0
Lead (Pb)	Graphite Furnace AAS	0.01	<0.01	<0.01
Arsenic (As)	SDDC Method (modified)	0.01	<0.01	<0.01
Cadmium (Cd)	Flame AAS	0.003	<0.002	<0.002
Hexavalent Chromium (Cr^{+6})	Colorimetric	0.01	<0.01	<0.01
Mercury	Cold Vapor AAS	0.001	<0.001	<0.001
Oil and Grease	Gravimetric	1	1	<1.0

MPN – Most Probable Number
All units in mg/L except as otherwise stated

Monitoring data from 2016 showed that TSS for the deepwells were consistently below the above guide value of 65mg/L.

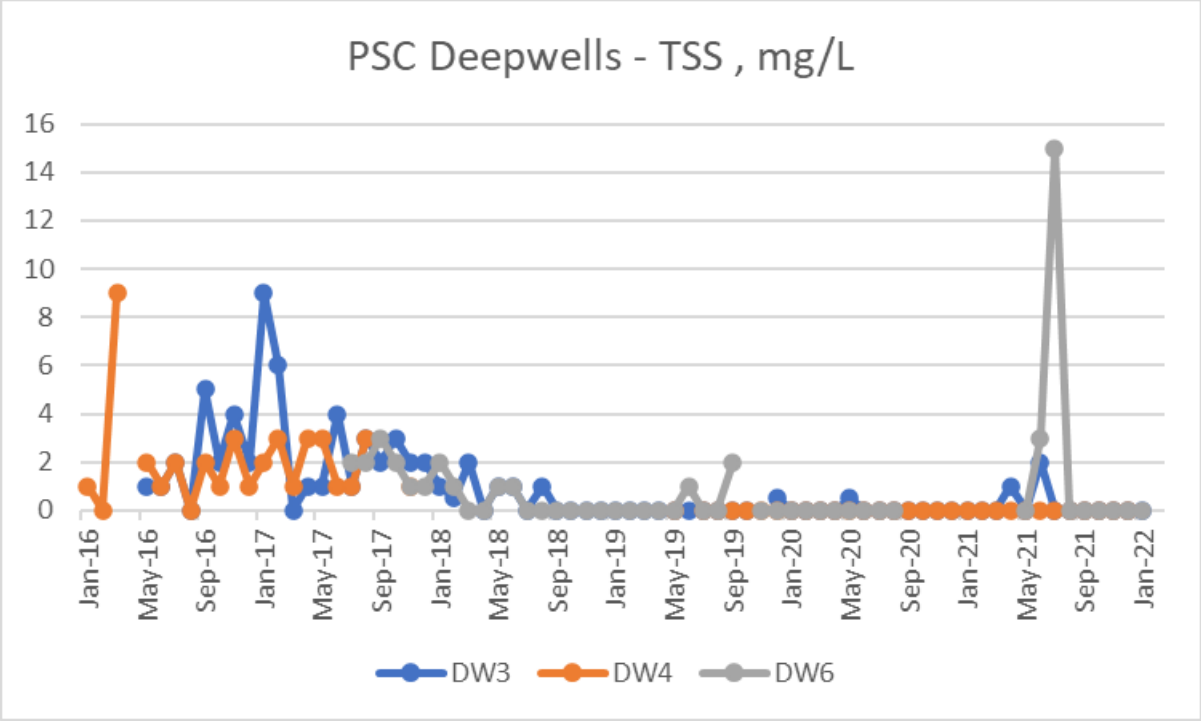


Figure 2.2.49. Result of PSC TSS groundwater quality monitoring

For chloride, Deepwell 3 consistently exceeded the guide value of 250mg/L. Deepwell 4 was showing chloride levels averaging around 142mg/L while Deep Well 6 showed an average of only 6.7mg/L.

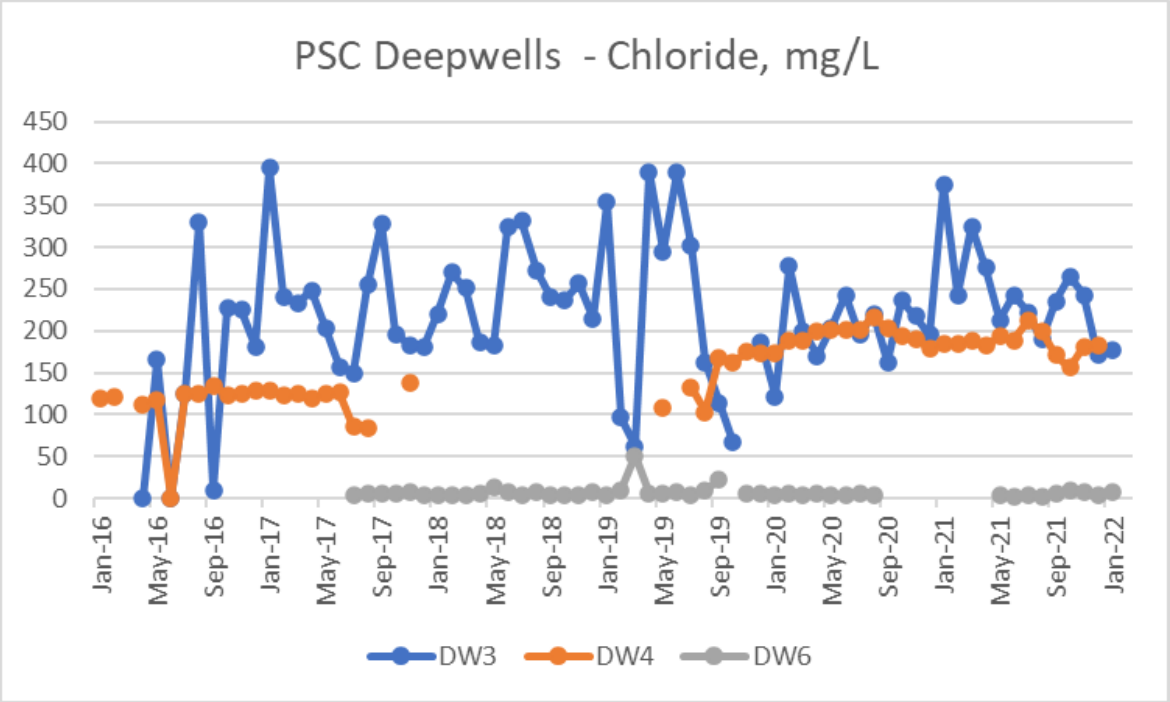


Figure 2.2.49. Result of PSC Chloride groundwater quality monitoring

2.2.3.3 Impact Assessment and Environmental Performance

Table 2.2.14. Predicted impacts of/on water quality to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Degradation of groundwater quality Degradation of surface water quality		☑	☑	☑	<u>Pollution from oil spills and leakage</u> Oil spills during construction and operation may potentially contaminate the groundwater table. Proper handling and storage of diesel, fuel oil and lubricants in covered areas with impermeable flooring and installation of proper bund walls will reduce risk from this environmental aspect. Groundwater is better protected from the risk of microbial contamination than surface water because of the soil, which acts as a barrier above it. However, direct contamination can occur from: poorly constructed groundwater wells and septic tanks. Localized microbial contamination of groundwater is a problem in many coastal areas where small communities rely on septic tanks for sewage disposal.

Degradation of groundwater quality Degradation of surface water quality		☑	☑	☑	To prevent groundwater contamination, the following additional measures should be undertaken: a) Installation of a properly designed and compliant sewage treatment system and its proper operation and maintenance. b) Installation of properly designed oil and water separator and diversion of all oil-containing effluents to this oil-water separator. Waste oil collected must be turned over to an accredited hazardous waste treater. Oil spill response measures should be in place. c) Diversion of all high-suspended solids effluent to the settling pit. The settling pit should be properly designed to clarify the effluent to the approved suspended solids concentration. d) The proposed settling pit should be concreted and be designed with adequate capacity for the expected volumes. With the above measures, the likelihood that wastewater from the settling pit will contaminate the water table will be insignificant. Any overflow from the settling pit will be captured by concrete canals that will be diverted to the mixing zone and combines with the seawater outfall, hence, no groundwater will be affected. As for the construction phase, portable toilets shall be provided at the construction site and sanitary facilities at the workers temporary accommodation.

2.2.4 Freshwater Ecology

The proposed project site is approximately 2.5km away from the Tagoloan River, which is the nearest freshwater body from PSC. As to the current operation and its proposed expansion, no water sourcing or effluent discharge is expected from PSC. Therefore, assessment of freshwater ecology is not applicable in this study.

2.2.5 Marine Ecology

2.2.5.1 Methodology

Sites were selected based on increasing distance from the project site. **Table 2.2.15** describes the location of the sampling stations while **Figure 2.2.51** depicts the actual location of the sampling station.

Table 2.2.15. PSC marine ecology sampling stations

Stations	Latitude	Longitude	Description
PSCME1	8° 34' 44.78"	124° 45' 43.17"	Northeast side of the existing berth; location of proposed new berth
PSCME2	8° 34' 34.65"	124° 45' 21.83"	Pillars of the dolphin structure at the existing berthing facility
PSCME3	8° 34' 23.19"	124° 45' 2.88"	Approximately 760 m southwest of the existing berth
PSCME4	8° 35' 46.84"	124° 46' 7.18"	Outside of the nearby Marine Protected Area (MPA) in Looc

The first site, PSCME1, is a reef area within the PSC site outside the mooring area. Pillars of the mooring site were considered to be PSCME2. The reef across the community most adjacent to the project site was used as the third sampling site (PSCME3) to document anthropogenic impact to the marine environment. As a neutral site, an area outside Looc Marine Protected Area (MPA) as selected as PSCME4.

For benthic profile for the sampling sites were determined through Line Intercept (LIT) method by English et al. (1997). Transects were laid haphazardly on the reef flat by divers in SCUBA. Total length of the transect was set at 100-m or until a sand patch is hit. Category of lifeforms under the transect were determined by collecting a series of photos of the transect line with underwater camera set at continuous shooting. Length of each category were determined by processing the photos and percent cover were determined by dividing the category length with the total transect length.

Using the same transect, fish community was determined using Fish Visual Census (FVC). An observation stop was made by a diver every 5m along the transect. On each observation point, a 180˚ sweep was made to list all fish species within the 5m band on either side of the transect.

For each of the sampling sites, 30L water was collected at the surface using bucket. The collected water was passed through a 250µm plankton net and collected filtrate at the cod end of the net was transferred to sample bottles. Samples were treated with 1% formalin by volume as fixative and brought to the laboratory for taxonomic analysis.

Mangrove assessment was not conducted as its location is approximately 0.5km away from the existing and proposed berth of PSC and impact may be negligible. Moreover, another patch of mangrove is noted 2km south of the project area, in Brgy. Balacanas along Tagoloan River with an estimated area of 87,000m^2.

2.2.5.1 Baseline Conditions

Total coral cover of PSCME1 is at 55.24% dominated by massive lifeforms (**Table 2.2.16**). Among the sites, PSCME1 has the highest diversity of corals with 19 documented genera (**Table 2.2.17**). Most common coral genera found are *Acropora, Euphyllia,* and *Stylophora* (**Plate 2.2.2**). On the other hand, PSCME2 has the lowest coral cover at 2.8%. The pillar recruits mostly the massive *Porites* but is also covered almost entirely of algal assemblage and other invertebrates (**Plate 2.2.3**). Although sparse, the recruitment of corals on the pillar indicates presence of viable reproducing coral colonies.

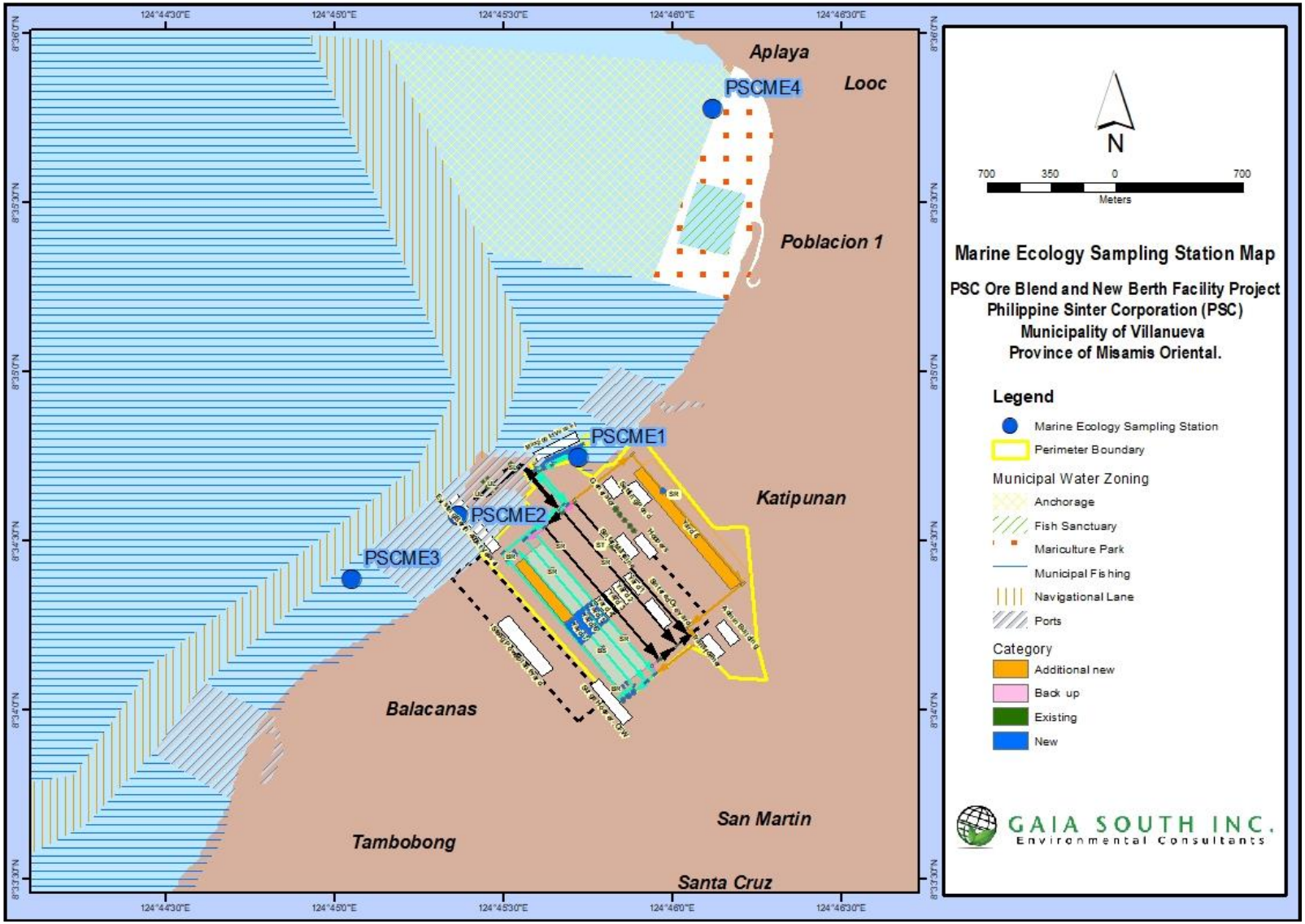


Figure 2.2.51. Map showing the PSC sampling stations for marine ecology assessment

Table 2.2.16. Benthic profile of the sampling sites for PSC, May 2021

Category	PSCME1		PSCME 2		PSCME 3		PSCME 4	
	Cover							
Biotic	(m)	%	(m)	%	(m)	%	(m)	%
Coral	38.81	55.24	2.65	2.877	7.95	24.66	29	57.72
branching	6.24	8.88		0.00	0.55	1.71	23.9	47.57
encrusting	6.35	9.04		0.00		0.00		0.00
massive	26.22	37.32	2.65	2.88	7.4	22.95	5.1	10.15
Algal Assemblage	25.58	36.41	71.59	77.73	10.85	33.65	3.2	6.37
macroalgae		0.00		0.00	0.25	0.78		0.00
Invertebrates	0.64	0.91	17.86	19.39	2.29	7.10	4.09	8.14
Abiotic	5.23	7.444	0	0	10.9	33.81	13.95	27.77
sand		0.00		0.00	4.4	13.65	5	9.95
dead corals with algae	2.68	3.81		0.00	6.5	20.16	7.85	15.63
water	2.55	3.63		0.00		0.00	1.1	2.19
Total	**70.26**	**100**	**92.1**	**100**	**32.24**	**100**	**50.24**	**100**

Algal assemblage and abiotic factors occur at the same rate from PSCME3 with only 24.66% coral cover. Much of the reef is covered with sediment covered algal assemblage indicating the site is impacted anthropologically (**Plate 2.2.4**). Among the sites, PSCME4 has the highest coral cover but with lower diversity relative to PSCME1. The site boasts branching *Porites* as dominant coral colonies (**Plate 2.2.5**).

Table 2.2.17. List of corals documented from the sampling sites of PSC, May 2021

Genera	PSCME1	PSCME2	PSCME3	PSCME4
Acropora	/	-	-	-
Astreopora	/	-	-	-
Diploastrea	-	-	/	/
Echinopora	/	-	-	-
Favia	/	-	/	/
Favites	/	-	/	/
Fungia	-	-	/	/
Galaxea	/	-	/	/
Goniastrea	/	-	-	-
Hydnophora	/	-	-	/
Lobophyllia	/	-	-	-
Merulina	/	-	-	-
Montastrea	/	-	/	-
Pachyseris	/	-	-	-
Pectinia	/	-	-	-
Platygyra	/	-	-	-
Pocillopora	/	-	/	/
Podabacia	/	-	-	-
Porites	/	/	/	/
Seriatopora	/	-	-	-
Stylophora	-	-	-	/
Symphyllia	/	-	-	-
Total	**19**	**1**	**9**	**8**

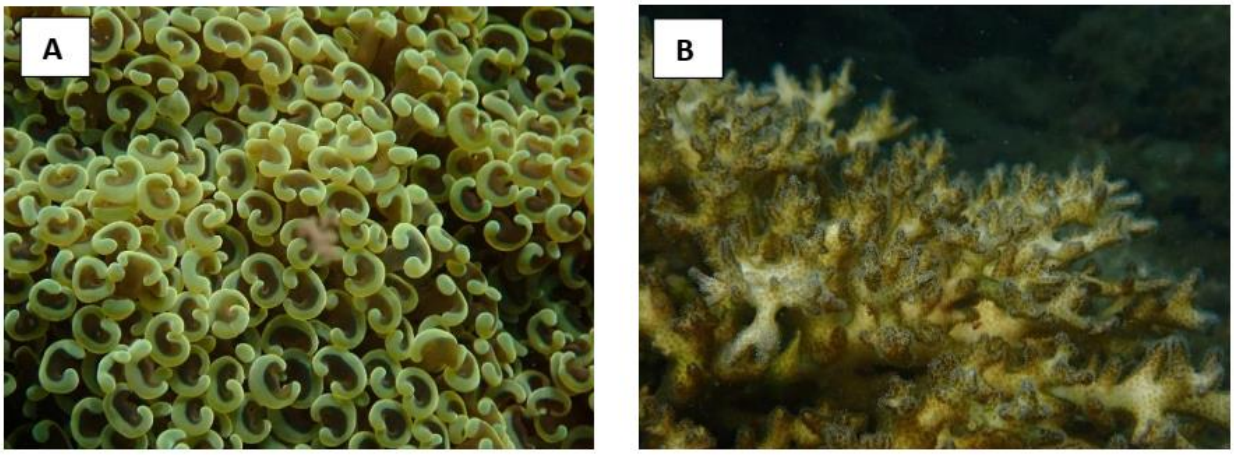


Plate 2.2.2. Most common coral genera from PSCME1 includes *Euphyllia* (A) and *Stylophora* (B).

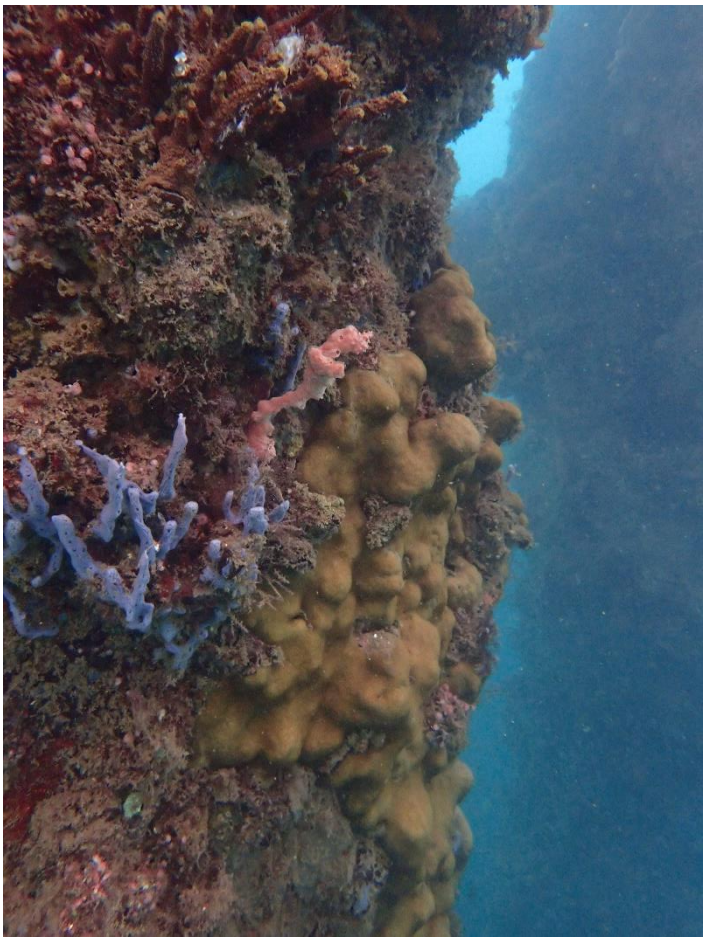


Plate 2.2.3. A large colony of *Porites* clinging on one side of the pier pillar among algal mats and sponges.

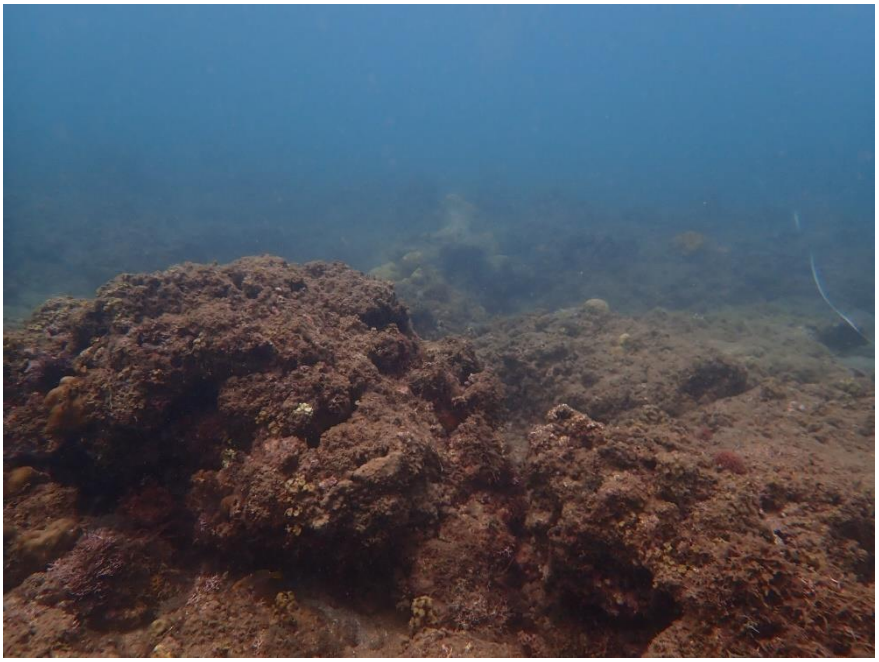


Plate 2.2.4. Algal assemblage cover much of the dead coral material from PSCME3.

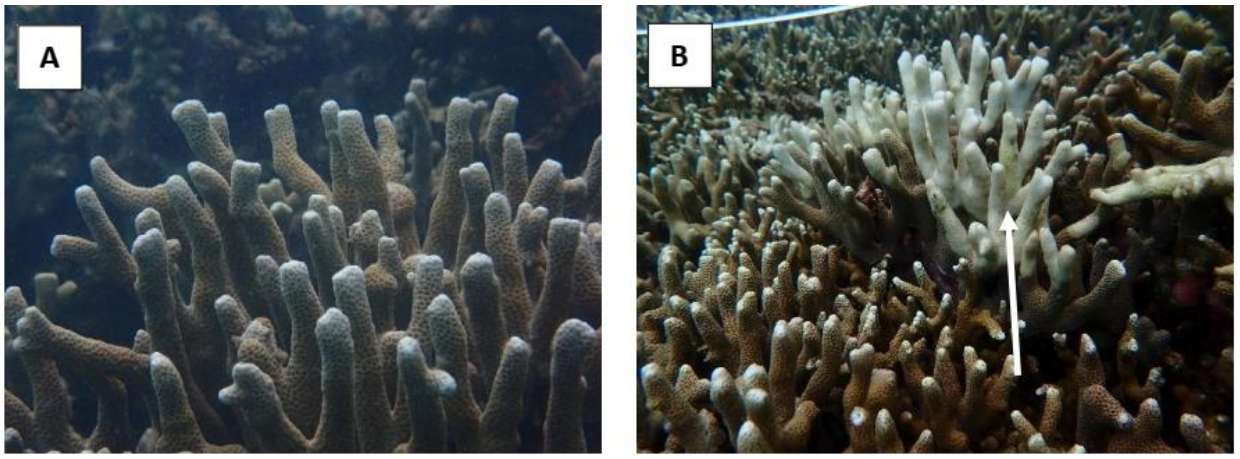


Plate 2.2.5. Branching Porites dominate coral colonies at PSCME4.

The fish community composition is presented in **Table 2.2.18.** PSCME1 has the highest number of species among the sites having 36 species in 14 families. This is followed by PSCME4 with 27 species in 10 families. Following closely behind the 27 species of PSCME4 is PSCME3 with 22 species belonging to 6 families. PSCME2 only has eight (8) identified species.

Table 2.2.18. Fish community composition from sampling site of PSC, May 2021

Family	Species	PSCME 1	PSCME 2	PSCME 3	PSCME 4
Acanthuridae	*Ctenochaetus striatus*	/	/	-	/
Balistidae	*Rhineacanthus Verrucosus*	/	/	-	/
Centriscidae	*Aeoliscus Strigatus*	-	-	-	/
Chaetodontidae	*Chaetodon decussatus*	/	-	/	-
	Chaetodon punctatofasciatus	/	-	-	-
	Chaetodon ulietensis	/	-	-	-
	Heniochus varius	-	-	-	/
	Heniochus singularus	/	-	-	-
Fistularidae	*Fistularia commersonii*	-	-	-	/

Family	Species	PSCME 1	PSCME 2	PSCME 3	PSCME 4
Gobidae	*Istigobius decoratus*	/	-	-	-
Haemulidae	*Plectorinchus Orientalis*	/	-	-	-
Kyphosidae	*Kyphosus vaiglensis*	-	/	-	-
Labridae	*Anampses melagoides*	-	-	-	/
	Anampses meleagrites	/	-	-	-
	Bodianus diana	/	/	-	-
	Bodianus loxozonus	-	/	-	-
	Bodianus mesothorax	/	-	-	-
	Bodianus sp.	-	-	/	-
	Choerodon anchorago	/	-	-	/
	Choerodon fasciatus	-	-	/	-
	Cirrhilabrus cynopleura	-	-	/	-
	Coris gaimard	/	-	-	-
	Halichoeres trimacolatus	/	-	/	-
	Labroides dimidiatus	-	-	/	-
	Thalassoma hardwicke	-	-	/	-
	Thalassoma lunare	/	-	/	/
	Thalassoma lutescens	/	-	/	/
Lethrinidae	*Lithrinus harak*	-	-	/	-
Lutjanidae	*Lutjanus decussatus*	/	-	-	-
Mullidae	*Parupeneus barberinoides*	-	-	-	/
Nemipteridae	*Pentapodus caninus*	-	-	-	/
	Scolopsis bilineatus	/	-	/	-
	Scolopsis margaritifer	/	-	/	-
Pempheridae	*Pempheris vanicolensis*	/	/	-	-
Pomacanthidae	*Centropyge vroliki*	/	/	/	/
	Abudefduf sexfasciatus	-	-	/	/
Pomacentridae	*Amblyglyphidodon curacao*	/	-	-	/
	Chromis margaritifer	/	-	-	-
	Chromis weberi	-	-	-	/
	Chromis xanthura	-	-	/	/
	Chrysiptera unimaculata	/	-	/	/
	Dascyllus reticulatus	/	-	-	/
	Dischistodos melanotus	-	-	-	/
	Neoglyphidodon harak	/	-	/	-
	Neoglyphidodon nigroris	-	-	/	/
	Neopomacentrus azysron	-	-	-	/
	Pomacentrus nigromanus	-	-	-	/
	Pomacentrus coelestis	/	-	/	/
	Pomacentrus mollucensis	/	-	-	/
	Stegastes fasciolatus	/	-	/	/
Scaridae	*Scarus bleekeri*	/	-	/	-
	Scarus flavipectolaris	/	-	-	-
	Scarus schlegeli	/	-	/	/
Serranidae	*Pseudanthias tuka*	/	-	-	/
Siganidae	*Siganus argenteus*	/	-	-	-
Zanclidae	*Zanclus Cornutus*	-	/	-	-
Species richness		34	8	22	27

From all sites, there is a limited occurrence of commercially important or target species. These are the three (3) species of Scaridae (parrotfish) and a species of Siganidae (rabbitfish). Interview with fishers on site indicated that catch from the area includes Siganids (rabbitfish), Caesio (scissortails), Scrombidae (mackerels), and Haemulids (sweetlips). Reported catch per unit effort is .4-1kg/hour.

The Villanueva municipal waters have a reported fish catch of 7.3 tons in 2021. The level went down from 7.5 tons in 2020 and 8.5 tons in 2019. Only the Looc MPA is the declared protected area in the municipal waters. Decrease in fish catch is a complex issue of

increased number of fishers, reduced fish population, and reduced availability of favorable habitat. Either or in synergy with one another, these factors result to decreased fish catch.

Plankton profile from the sampling sites indicated a possible bloom of Chaetoceros. The species is a diatom with projection from its test that high densities may result to itchy waters. Total abundance of plankton ranges from 80,000 to more than 140,000cells/L with about 90% of the abundance being due to Chaetoceros. Blooms of the species is known to occur during warm months.

Table 2.2.19. Phytoplankton profile of sampling sites of PSC, May 2021

Taxa	PSCME1	PSCME2	PSCME3	PSCME 4
	Abundance (n/L)			
Cyanobacteria	95	39	91	91
Trichodesmium	95	39	91	91
Diatoms	143,412	74,755	81,360	81,360
Asterionella	98	-	-	-
Bacillaria	-	32	-	-
Bacteriastrum	8,050	3,911	5,459	5,459
Chaetoceros	133,750	70,175	74,850	74,850
Climacosphenia	-	-	-	-
Coscinodiscus	95	86	136	136
Cylindricotheca	15	-	-	-
Diploneis	34	-	-	-
Ditylum	25	-	-	-
Licmophora	-	13	-	-
Melosira	-	27	-	-
Navicula	14	-	-	-
Odontella	32	-	-	-
Pleurosigma	67	-	-	-
Rhabdonema	-	42	-	-
Rhizosolenia	290	137	397	397
Surirella	22	-	-	-
Thalassionema	912	107	336	336
Thalassiosira	10	228	185	185
Dinoflagellate	314	788	361	361
Ceratium	124	25	41	41
Diplopsalis	37	27	-	-
Gonyaulax	-	144	30	30
Prorocentrum	-	137	-	-
Prorocentrum	-	-	19	19
Protoperidinium	123	387	149	149
Pyrophacus	20	23	124	124
Scripssiella	10	48	-	-
Total Abundance (n/L)	143,820	75,580	81,810	81,810
Species Richness	20	18	12	12

As plankton occur on high densities, zooplankton density occurs at the range of 50 to over a hundred individuals per liter (**Table 2.2.20**). The larval forms constitute more than 50% of the density. Warm months are usually reproductive seasons of marine invertebrates.

Table 2.2.20. Zooplankton profile of sampling sites of PSC, May 2021

Taxa	PSCME 1	PSCME 2	PSCME 3	PSCME 4
	Abundance (n/L)			
Adult zooplankton	18	27	15	41
Calanoid	6	3	2	12
Cyclopoid	4	22	11	21
Harpacticoid	-	-	2	-
Larvacean	-	2	-	3
Mysiids	4	-	-	-
Chaetognaths	4	-	-	5
Larval zooplankton	33	86	51	101
Bivalve veliger	2	21	5	2
Decapod Zoeae	-	-	5	-
Fish eggs	-	-	-	1
Flatworm larvae	-	-	-	4
Gastropod (Snail) veliger	-	6	5	14
Nauplius	30	48	36	76
Trochopore	2	12	-	4
Total Abundance (n/L)	51	114	66	142
Species Richness	5	4	3	5

2.2.5.2 Impact Assessment and Environmental Performance

Table 2.2.21. Predicted impacts of/on marine ecology to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Threat to existence and/or loss of important local species and habitat Threat to abundance, frequency and distribution of species		☑	☑		The installation of pillars is expected to cause disturbance both by noise and vibration. The energy released during the construction may drive mobile species such as fish, away. The movement may also send limited amount of sediment into the water column which may be either deposited in-situ or be carried away and deposited ex-situ. Either way, sediment may smother corals and other benthos. Sediment in the water column may also decrease available solar energy for plankton and may create temporary die-off of planktonic organisms. On the other hand, nutrients within the water column may increase available nutrients that may result to a temporary algal bloom. Activities on pillar thrusting may be limited to daytime to allow settlement of organisms within the area. This will also build behavioral response among mobile species to seek refuge in the area at night and move out during the day. The relative protection provided by the limited access of fishermen within the area is shown to increase coral cover as well as fish density. The hard surfaces and relative security of pier pillars also provide space for coral recruitment and fish aggregation. Increasing the pier area may also increase the space where fishing access is limited, thus protection for the marine resources. Despite this potential, increased sea traffic increases the risk of oil spills and hazards of toxin contamination in water. This may result to either direct death of organisms to be affected to or bioaccumulation of toxins that may either affect the animal directly or its consumer.

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
					An oil spill response protocol should be operationalized to address possible oil and toxin spill in the project site.

2.3 THE AIR

2.3.1 Meteorology/Climatology

2.3.1.1 Methodology

To describe the existing meteorological and climatological conditions in the proposed project site, data from the nearest PAGASA synoptic station and existing maps will be used. The proposed expansion project site is approximately 24 linear km northeast of PAGASA Synoptic Station in Lumbia Airport, Misamis Oriental. The said station has coordinates 8°24' 32.70"N and 124°36'43.57"E and elevation of 182m.

The following were used to describe the conditions at the site:

- Climatological normal data from 1981-2010
- Climatological extremes as of 2020
- Windrose analysis from 1981-2010
- Modified Coronas Climate Map
- Tropical Cyclone Map

Included in **Annex 2.3.1** are the copies of PAGASA Climatological Normals and Extremes as well as the windrose data for Lumbia Synoptic Station. Other relevant information gathered from PAGASA is the climate and typhoon frequency maps and the Misamis Oriental 2020 and 2050 climate projection.

2.3.1.2 Baseline Conditions

Climate

The Municipality of Villanueva where the proposed expansion is located has a Type IV climate under the Modified Coronas Classification of the Philippine Climate (**Figure 2.3.1**). Rain is more or less evenly distributed throughout the year in areas under this climate classification.

Surface Temperature

PAGASA Synoptic Station in Lumbia recorded a normal mean temperature of 26.8°C over the 30-year period. The highest temperature is recorded in May (32.9°C) while the lowest is during February (21.4°C). The temperature difference is at 11.5°C. The minimum, maximum, and mean surface temperatures recorded at the synoptic station is shown in **Figure 2.3.2**.

Between 1979 and 2020, the station recorded 16.1°C as the lowest temperature on January 3, 1991 which is 10.7°C lower than the normal mean and 5.3°C lower than the normal minimum. The highest temperature, however, was 38.4°C recorded on June 6, 2009 which is 11.6°C higher than normal mean and 5.5°C higher than normal high. The climatological extremes are shown in **Annex 2.3.1**.

Rainfall

The total annual rainfall measured at the synoptic station is 1703.3mm. On the average, the station receives 141.93mm of rain monthly. The month with the lowest recorded precipitation is March (49.8mm) while the highest recorded precipitation is in July (245.6mm). Rainy days range five (5) to 18 days in a month with an average of 12 days.

The total number of rainy days is 148 or 40.5%. On average, the synoptic station receives 11.5mm of rain daily.

The strongest daily rainfall recorded was 237.1 mm on November 24, 2009 due to Tropical Depression Urduja which affected the southeastern part of the Philippines. Over 404,623 people across the provinces of Camiguin, Lanao Del Norte and Misamis Oriental in Region X; Agusan Del Norte and Dinagat Island in CARAGA were affected and at the height of the tropical depression around 3,293 people were stranded in various ports in Southern Tagalog, Bicol Region, Eastern Visayas and Northern Mindanao[3].

[3] https://reliefweb.int/map/philippines/philippines-tropical-depression-urduja-affected-population-26-nov-2009 Philippines: Tropical Depression "Urduja" - Affected Population (as of 26 Nov 2009)

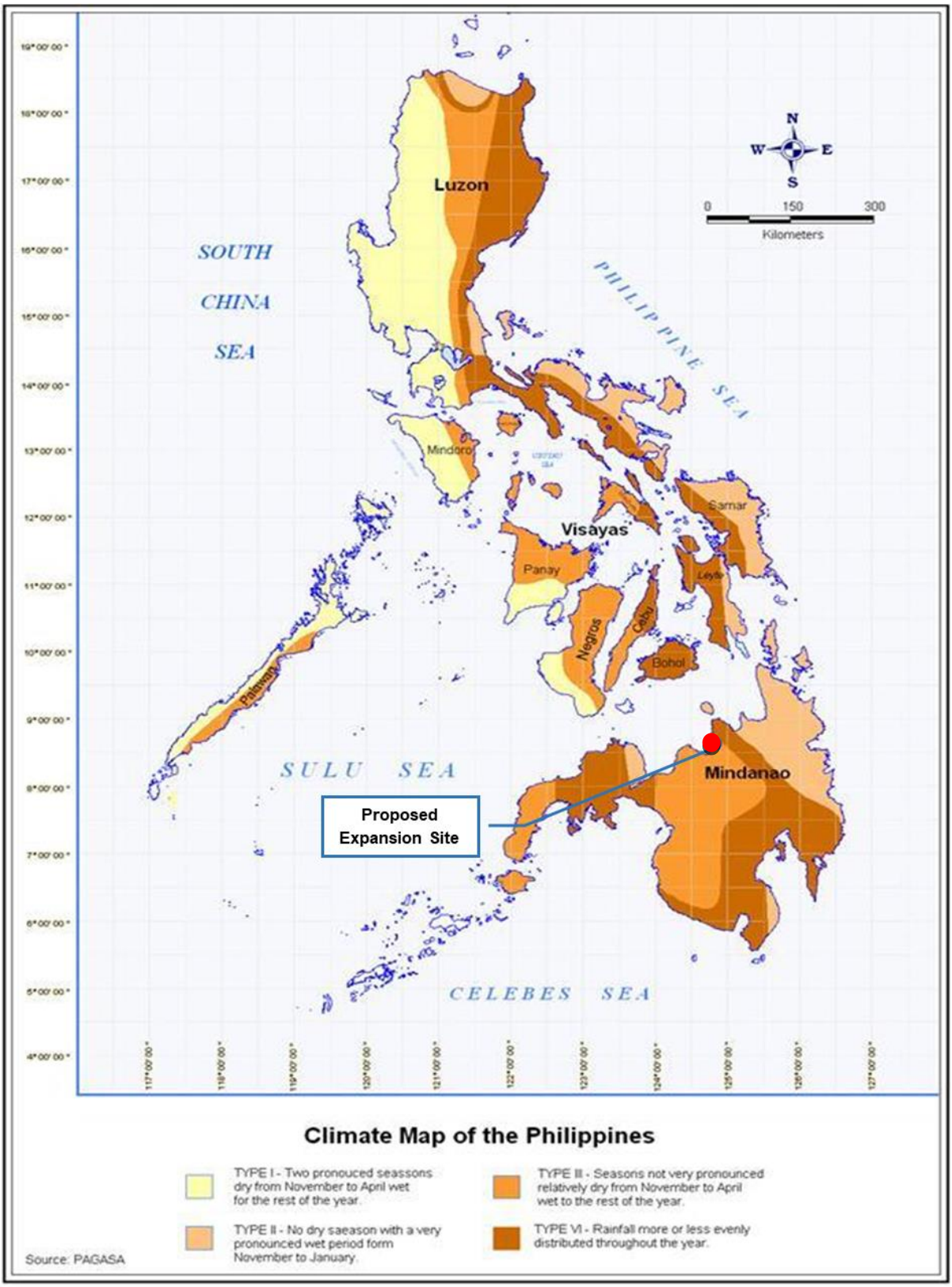


Figure 2.3.1. Modified Coronas Classification Climate Map of the Philippines

The rainfall recorded at the synoptic station is shown in **Figure 2.3.3**.

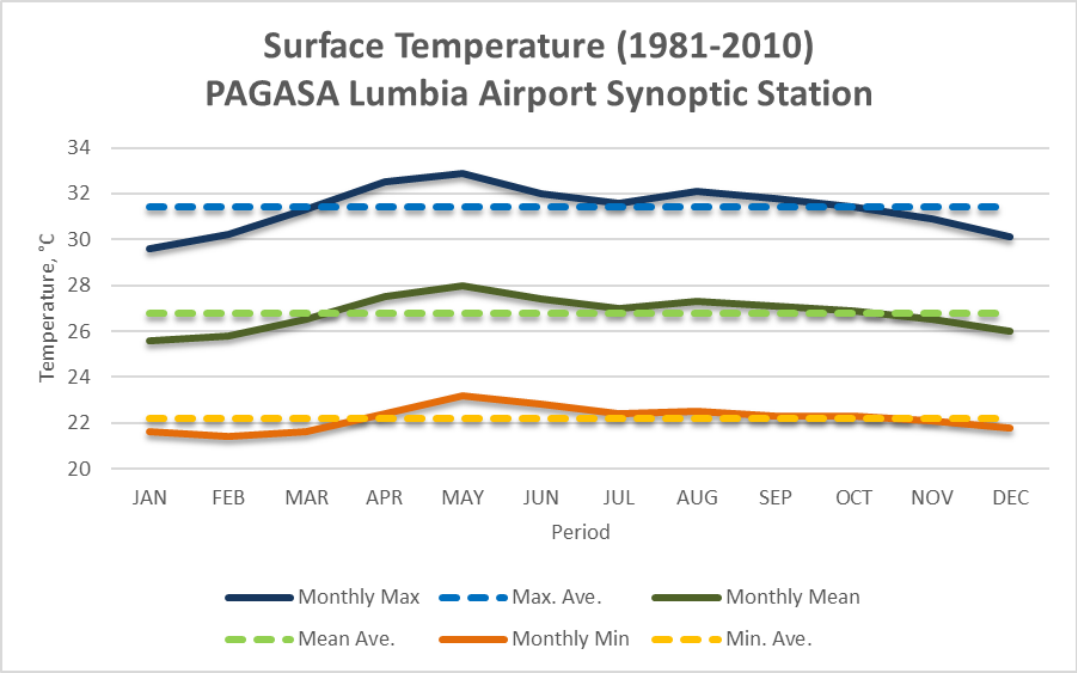


Figure 2.3.2. Normal monthly surface temperature at PAGASA Synoptic Station in Lumbia Airport, Misamis Oriental (1981-2010).

Relative Humidity

Relative humidity is the ratio of the moisture in the air relative to the amount that would be present if the air were saturated. The annual relative humidity is 81%. Monthly, it ranges from 77% in April to 84% in December and January (**Figure 2.3.4**).

Surface Winds

Available wind data from PAGASA Synoptic Stations in Lumbia (2009-2013) and El Salvador (2013-2019) shows that the prevailing wind direction is north and east (**Annex 2.3.1**). Wind speeds of 0 to 3m/s dominate the area (**Figure 2.3.5**).

The strongest wind was recorded on December 4, 2012 with speed of 34mps and wind direction of south (**Annex 2.3.1**).

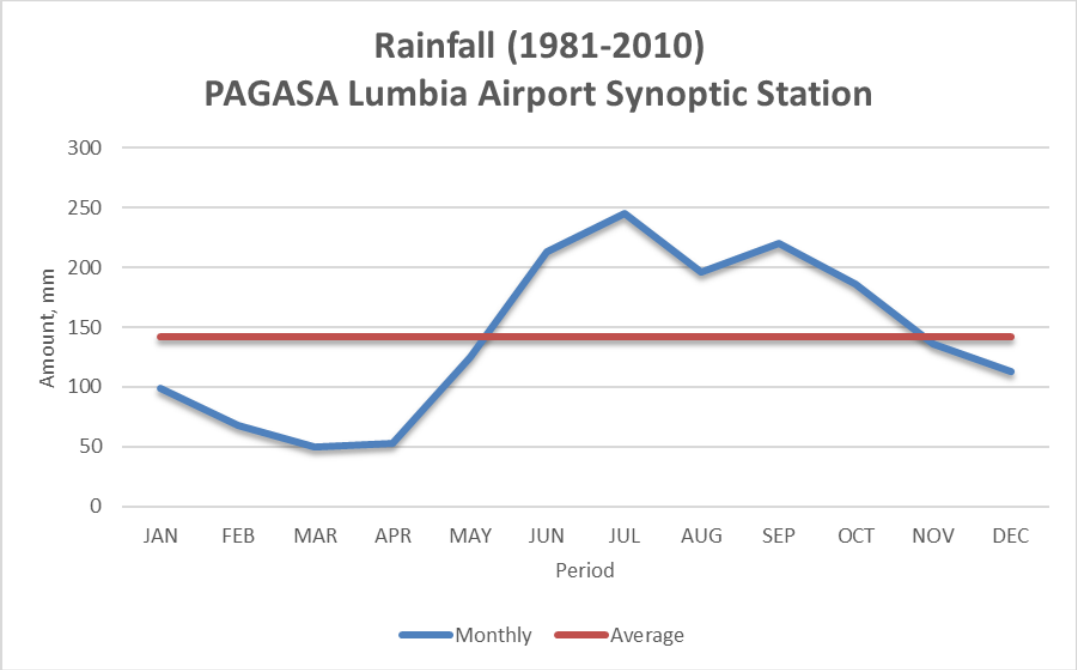


Figure 2.3.3. Normal monthly rainfall at the PAGASA Synoptic Station in Lumbia Airport, Misamis Oriental (1981-2010).

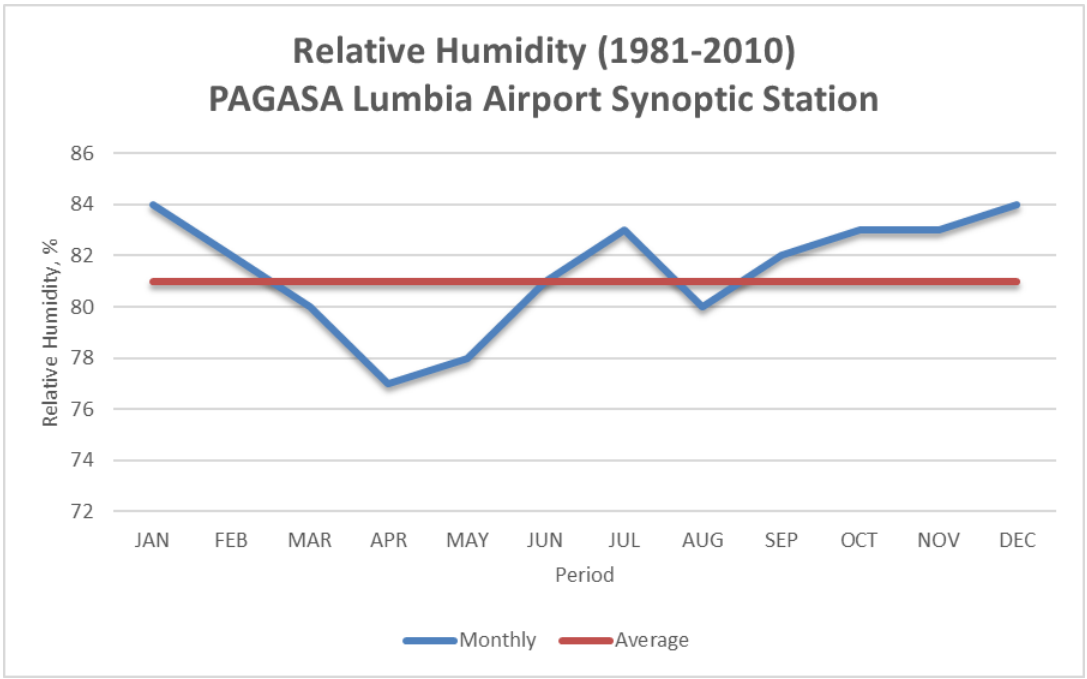


Figure 2.3.4. Normal monthly relative humidity at PAGASA Synoptic Station in Lumbia Airport, Misamis Oriental (1981-2010).

Tropical Cyclones

Nine tropical cyclones have crossed the province of Misamis Oriental from 1948 to 2020. Most of these occur in December. Out of the nine (9) recorded cyclones, four (4) were tropical depression or a low-pressure system with maximum sustained winds of 62kph or less; four were also classified as tropical storm or a low-pressure system with maximum surface sustained winds between 63-113kph. One typhoon was recorded to pass through the province (**Figure 2.3.6**).

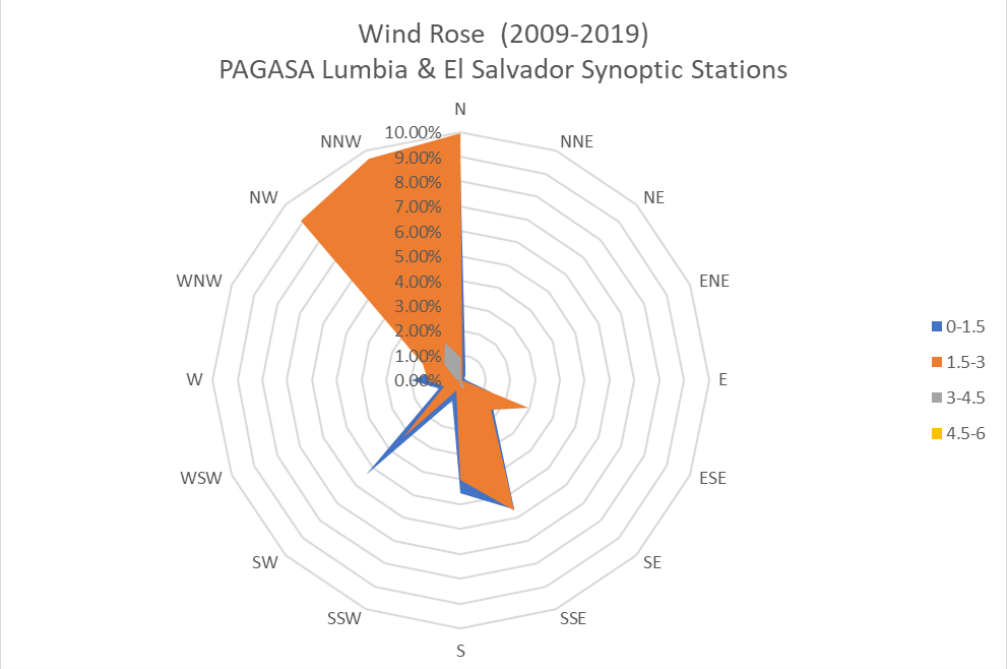


Figure 2.3.5. Normal monthly relative humidity at PAGASA Synoptic Station in Lumbia Airport and El Salvador, Misamis Oriental (2009-2019).

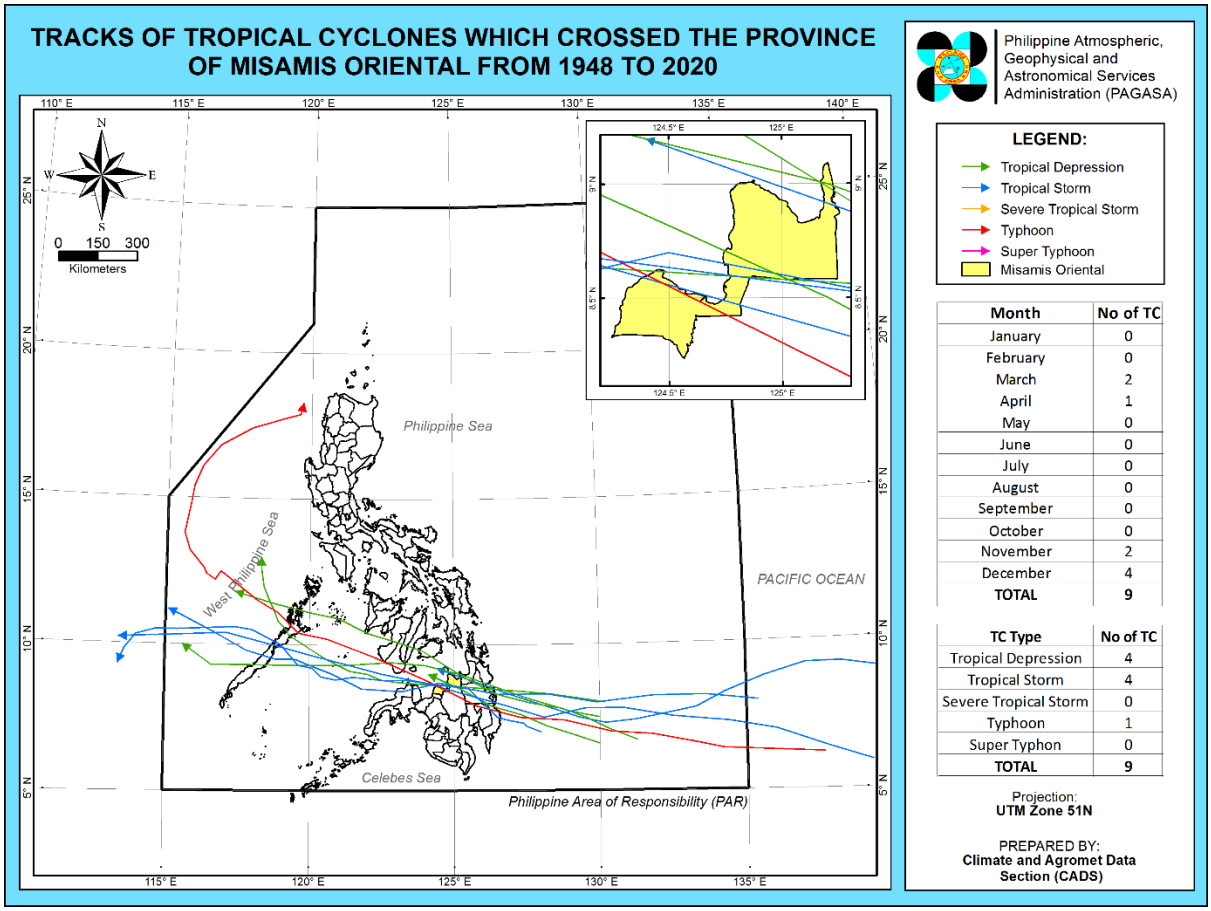


Figure 2.3.6. Tracks of tropical cyclones which crossed the Province of Misamis Oriental (1948-2020).

2.3.1.3 Impact Assessment and Environmental Performance

Table 2.3.1. Predicted impacts of/on meteorology to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Change in the local micro-climate		☑	☑		To assess the change in local micro-climate within PSC project area, the PAGASA published climate projections report[4] derived from models from updated future climate scenarios were used. Two scenarios were included in the projections: moderate emission scenario and high emission scenario. Increasing trends in annual and seasonal rainfall were observed in the Philippines and usually associated with extreme rainfall events (PAGASA, 2018). **Table 2.3.2** shows the projected total rainfall in Misamis Oriental. From observed seasonal rainfall ranging from 296mm to 615.7mm, the lower bound ranges from 239.5mm (MAM) to 478.8mm (JJA) in the moderate emission scenario while in the high emission scenario, total rainfall is estimated to be 236.7 mm (MAM) to 518mm (JJA). The amount of rainfall can increase between 317mm (MAM) and 668mm (JJA) in the moderate emission scenario and between 304.3mm (DJF) and 705.9mm (JJA) in the high emission scenario. It is projected that the country-average temperature could increase by as much as 0.9°C-1.9°C (assuming a moderate emission scenario) and 1.2°C-2.3°C (assuming a high emission scenario) in 2036-2065 (PAGASA, 2018). **Table 2.3.3** shows the projected change in mean temperature. Observed baseline ranges from 25.4°C to 26.9°C. In the lower bound, the mean temperature can range from 26.4°C to 27.9°C in the moderate emission scenario while it can increase up to 26.8°C to 28.2°C in the high emission scenario. The temperature can reach as much as 27.1°C to 28.7°C in the moderate emission scenario and 27.5°C to 29.1°C in the high emission scenario.
Contribution in term of greenhouse gas emissions		☑	☑		**Table 2.3.4** shows the computation of direct and indirect GHG emissions of the proposed project. During construction, direct emissions will be from the use of heavy equipment and indirect from the electricity sourced from CEPALCO. GHG at this phase is estimated to be 9414.75 $MTCO_2e$. During operations, GHG emitted from the sinter production will amount to 3,034,500 $MTCO_2e$, vehicles at 19349.5 $MTCO_2e$, and CEPALCO source-electricity at 8695.18 $MTCO_2e$. GHG at this phase is estimated to be 3,097,943 $MTCO_2e$. The total GHG emissions of the project is estimated to be 3,107,358.10 $MTCO_2e$ wherein majority will come from the sintering process. The Tier 1 emission estimates based on the 2006 IPCC guidelines methodological approach is to combine the extent of human activity with coefficients which quantify the emissions illustrated in the basic equation: *Emissions = Activity Data * Emission Factor* To reduce greenhouse gas (GHG) emissions of the proposed project, the proponent will develop and implement a GHG emissions reduction

[4] PAGASA, 2018. "Observed Climate Trends and Projected Climate Change in the Philippines".

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
					plan with emission targets set annually. One of the programs to be implemented is energy efficiency in addition to establishing carbon sinks to offset the emissions of the proposed project.

Table 2.3.2. CLIRAM* of the projected seasonal change in total rainfall (in millimeters) in 2036-2065 for; baseline period: 1971-2000

Observed (1971-2000)				Scenario	Range**	Projected (2036-2065)							
						DJF		MAM		JJA		SON	
DJF	MAM	JJA	SON			Change	Projected Value	Change	Projected Value	Change	Projected Value	Change	Projected Value
442.5	296	615.7	581.1	Moderate Emission	Lower Bound	-21.4	347.6	-19.1	239.5	-22.2	478.8	-37.3	364.6
					Median	-6.8	412.3	-6.4	277.1	-14.1	529	-21.2	457.8
					Upper Bound	37	606.4	7.1	317	8.5	668	-0.07	576.8
				High Emission	Lower Bound	-27.2	322	-20	236.7	-15.9	518	-33.2	387.9
					Median	-0.7	439.3	-5.6	279.4	-2.8	598.2	-10.9	517.6
					Upper Bound	28.1	567	2.8	304.3	14.6	705.9	16.7	678.4

Note:
* CLIRAM – Climate Information Risk Analysis Matrix Tool
** Percentile range of model projections: lower bound = 10th percentile, median = 50th percentile, upper bound = 90th percentile

Table 2.3.3. CLIRAM* of the projected seasonal change in mean temperature (in degree Celsius) in 2036-2065 for; baseline period: 1971-2000

Observed (1971-2000)				Scenario	Range**	Projected (2036-2065)							
						DJF		MAM		JJA		SON	
DJF	MAM	JJA	SON			Change	Projected Value	Change	Projected Value	Change	Projected Value	Change	Projected Value
25.4	26.8	26.9	26.5	Moderate Emission	Lower Bound	1	26.4	1	27.8	1	27.9	1	27.5
					Median	1.3	26.7	1.2	28	1.2	28.1	1.1	27.6
					Upper Bound	1.7	27.1	1.7	28.5	1.8	28.7	1.8	28.3
				High Emission	Lower Bound	1.4	26.8	1.4	28.2	1.3	28.2	1.3	27.8
					Median	1.6	27	1.7	28.5	1.6	28.5	1.5	28
					Upper Bound	2.1	27.5	2.3	29.1	2.2	29.1	2.2	28.7

Note:
* CLIRAM – Climate Information Risk Analysis Matrix Tool
** Percentile range of model projections: lower bound = 10th percentile, median = 50th percentile, upper bound = 90th percentile

Table 2.3.4. Computation of direct and indirect GHG emissions of the proposed project site

Activity	Phase	Activity Data					Emission Factor									Emissions	
		Production		Fuel													
		Amt	Unit	Type	Amt	Unit	CO_2	Unit	CH_4	Unit	N_2O	Unit	CO_2	CH_4	N_2O	Value	Unit
Direct Emissions																	
Sinter production	Operation	5	MMTPY				0.2	tCO_2/ tonne sinter produced	0.1	kg CO_2/tonne sinter produced	-	-	1000000	8750	-	1008750	tCO_2e
Blend ore	Operation	9	MMTPY				0.2	tCO_2/ tonne sinter produced	0.1	kg CO_2/tonne sinter produced	-	-	1800000	15750	-	1815750	tCO_2e
Pellet production	Operation	7	MMTPY				0.03	tCO_2/ tonne sinter produced	-	-	-	-	210000	-	-	210000	tCO_2e
												Subtotal				**3,034,500**	tCO_2e
Heavy equipment	Construction			Diesel	218.4	m^3/mo	69300	kg/TJ	3.9	kg/TJ	3.9	kg/TJ	7827.88406	11.0132568	131.28	7970.175342	tCO_2e
				Gasoline	7.8	m^3/mo	74100	kg/TJ	33	kg/TJ	3.2	kg/TJ	307.254168	3.328182	3.847	314.429325	tCO_2e
Vehicle use	Operation			Diesel	970	L/mo	69300	kg/TJ	3.9	kg/TJ	3.9	kg/TJ	34766.7012	48.91419	583.06	35398.67253	tCO_2e
	Operation			Gasoline	480	L/mo	74100	kg/TJ	33	kg/TJ	3.2	kg/TJ	18907.9488	204.8112	236.74	19349.49692	tCO_2e
												Subtotal				**63,032.77**	tCO_2e
Indirect Emissions																	
CEPALCO power requirement	Construction				1,594,000	KWh	0.000709	MT CO_2/kWh	-	-	-	-	1130.146	-	-	1130.146	t CO_2e
CEPALCO power requirement	Operations				12,264,000	KWh	0.000709	MT CO_2/kWh	-	-	-	-	8695.176	-	-	8695.176	tCO_2e
												Subtotal				**9825.322**	tCO_2e
												Total				**3,107,358.10**	tCO_2e

2.3.2 Air Quality and Noise

2.3.2.1 Methodology

Air Quality

The ambient air quality at the proposed expansion was assessed according to the DENR Administrative Order (DAO) 2000-81, "Implementing Rules and Regulations of the Clean Air Act of 1999". The sampling procedures used follow the protocols in USEPA, 40 CFR 50, (Appendix A and M) and the EMB Air Pollution Monitoring Manual (1994).

To establish the sampling stations, an air pollution screening model was used to determine the dispersion of pollutants that can affect the ambient air quality in the vicinity of the project area. Air dispersion of particulate matter was conducted using AERSCREEN, a screening model of AERMOD and Gaussian plume model recommended by USEPA.

Yards 5, 6, and 7 and the future expansion, Yard 8 are area sources, and the source characteristics are enumerated in **Table 2.3.5** while the proposed conveyor belts are modeled as line source with source characteristics shown in **Table 2.3.6**. Once operational, the maximum concentration is modeled to fall 454 m away from any point in stock Yards 5, 6, and 7 while maximum concentration is modeled to be 401 m away from yard 8. Uncontrolled emissions of conveyor belt, however, resulted a maximum GLC distance of 4 to 5 m from the source.

Table 2.3.5. Source characteristic of proposed PSC ore yard expansion

Specification	Unit	Yard 5/6/7 (each)	Yard 8
Input			
Length	m	900	800
Width	m	55	55
Area	m^2	49,500	44,000
Volume	tons/day	27,500	27,500
Emission Factor *AP42 Table 12.5-4, particulate matter	lbs/ton	0.0024	0.0024
Emission rate	g/s	0.3640	0.3640
Output			
Max Conc Distance from source	m	401	454
Max 1-h concentration	ug/m3	331.1	298.7

Table 2.3.6. Source characteristic of proposed conveyor belts

Input					
Conveyor Belt	Capacity	Width		Length	Height
	t/h	mm	m	m	m
Additional 1	3600	1600	1.6	500	6
Additional 2	3600	1600	1.6	868	14.5
Additional 3	3600	1600	1.6	350	20
Additional 4	3600	1600	1.6	150	20
Additional 5	3600	1600	1.6	300	10
Additional 6	3600	1600	1.6	130	10
Emission Factor *AP42 Table 12.5-4, particulate matter				0.013 lbs/ton	
Emission rate				5.9 g/s	
Output					
Maximum Concentration distance				4-5 m	

Figure 2.3.7 shows that the maximum ground level concentration (GLC) is within the project site.

Figure 2.3.7. Maximum ground level concentration distance from source

The sampling was conducted in five (5) stations identified to be sensitive receptors of the project. Four of these are established monitoring stations quarterly sampled by PSC as part of its EMoP: San Martin Plaza, Tambal Relocation Area, Phividec Road, and Brgy. Katipunan (blue triangle icon and white label). The other established monitoring station, Villanueva Plaza, was replaced by a new station in Poblacion 3 due to its proximity to the future Yard 8 expansion. The location and description of the stations are provided in **Table 2.3.7** while the sampling map is presented in **Figure 2.3.9**.

The ambient air sampling was done by JCG Industrial Technologies for two periods to represent the meteorological characteristics of the project site – May 2021 (dry season) and June 2021 (wet season). The pollutants sampled were Total Suspended Particulates (TSP), particulates with diameter ≤10microns (PM_{10}), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) with averaging time of 24 hours. One-hour sampling was conducted for the particulates, gaseous pollutants, and heavy metals.

The first period was from May 12-18, 2021. The ambient air monitoring and noise level measurement report is attached as **Annex 2.3.2** while the 2nd sampling period for the wet season was conducted from June 3-9, 2021 (**Annex 2.3.3**).

Figure 2.3.8 depicts the **Maximum ground level concentration distance from line source.** The polygon shows where the maximum GLCs might fall with respect to the proposed area sources. As indicated in **Table 2.3.5** (source characteristic of the proposed ore yard), the maximum GLC distance from the source is 401m from the boundary of the proposed Yard 8 and 454m from the boundary of the proposed Yards 5, 6, 7.

Table 2.3.8. National Ambient Air Quality Guideline Values (NAAQGV) for criteria pollutants

Pollutant	Short Term		Long Term	
	µg/ncm	AT	µg/ncm	AT
TSP	300	1 hr	90	1 year
	230	24 hr		
PM_{10}	200	1 hr	60	1 year
	150	24 hr		
SO_2	340	1 hr	80	1 year
	180	24 hr		
NO_2	260	1 hr	None	1 year
	150	24 hr		
Pb	20	30 minutes	1.0	1 year
	1.5	3 months		

Table 2.3.9. National Ambient Air Quality Standards for Source Specific Air Pollutants from Industrial Sources/Operations

Pollutant	µg/ncm	AT
TSP	300	1 hour
PM10	200	1 hour
SO2	340	1 hour
NO2	260	1 hour
Pb	20	30 minutes
As	0.02 mg/NCM	30 minutes
Cd	0.01 mg/NCM	30 minutes

Figure 2.3.8. Maximum ground level concentration distance from line source

Table 2.3.7. PSC ambient air quality sampling stations

Station ID	Description	1st Sampling (dry season)			2nd Sampling (wet season)			Coordinates	
		Sampling Date	Start	End	Sampling Date	Start	End	Latitude	Longitude
AQ1	Katipunan Barangay Hall	May 12-13	4:00 PM	5:30 PM	June 3-4	4:15 PM	4:15 PM	8°34'50.00" N	124°46'30.00" E
AQ2	Tam-Bal Area (Brgy. Tambobong and Balacanas)	May 13-14	7:45 PM	9:15 PM	June 4-5	5:30 PM	5:30 PM	8°34'11.00" N	124°46'30.00" E
AQ3	Bgy. San Martin, approx. 50m away from Barangay hall & covered court	May 15-16	9:15 PM	10:30 PM	June 6-7	9:45 AM	9:45 AM	8°33'36.00" N	124°46'7.00" E
AQ4	Phividec Road, approx. 150m away from Butuan-Iligan Road	May 16-17	11:30 AM	1:00 PM	June 7-8	12:15 PM	12:15 PM	8°34'32.00" N	124°46'8.00" E
AQ5	Barangay hall of Poblacion 3, approx. 10m away from covered court	May 17-18	03:30 PM	04:45 PM	June 8-9	2:30 PM	2:30 PM	8°35'0.00" N	124°46'6.93" E

Figure 2.3.9. Map showing the PSC sampling stations for ambient air quality sampling and noise

Plate 2.3.1. Station AQ1 – Barangay Hall of Barangay Katipunan, a few meters away from a market being constructed.

Plate 2.3.2. Station AQ2 – In the middle of grassy open area in Tam-Bal Relocation Area (Brgy. Tambobong and Balacanas).

Plate 2.3.3. Station AQ3 – grassy open area with animals and occasional motor vehicles passing in Brgy. San Martin, approximately 50m away from barangay hall and covered court.

Plate 2.3.4. Station AQ4 – along PHIVIDEC Road approximately 150m away from Butuan-Iligan Road. Station is in a private road with animals are occasionally passing the area.

Plate 2.3.5. Station AQ5 – Barangay Hall of Barangay Poblacion 3 approximately 10m away from covered court.

Noise

Noise levels were also measured in the same ambient air stations listed in **Table 2.3.10** using a non-integrating type 2 sound level meter. Sixty-four instantaneous noise readings were taken at each station. The minimum, maximum, mean, and median noise values were determined from the readings. The median noise level at each station was compared to applicable noise standards.

Table 2.3.10. PSC noise sampling stations (May and June 2021)

Station ID	Description	1st sampling (dry season)			2nd (wet season)		
		Sampling Date	Start	End	Sampling Date	Start	End
AQ1	Katipunan Barangay Hall	May 12	6:00 AM	11:40 PM	June 3-4	4:15 PM	4:15 PM
AQ2	Tam-Bal Area (Brgy. Tambobong and Balacanas)	May 14	6:00 AM	11:10 PM	June 4-5	5:30 PM	5:30 PM
AQ3	Bgy. San Martin, approx. 50m away from Barangay Hall & covered court	May 15-16	5:35 AM	00:15 AM	June 6-7	9:45 AM	9:45 AM
AQ4	Phividec Road, approx. 150m away from Butuan-Iligan Road	May 16	06:00 AM	23:40 AM	June 7-8	12:15 PM	12:15 PM

AQ5	Barangay hall of Poblacion 3, approx. 10m away from covered court	May 17	06:05 AM	23:40 AM	June 8-9	2:30 PM	2:30 PM

Note: 1st – conducted in May 2021; 2nd – conducted in June 2021

Table 2.3.11. Philippine noise criteria at different land uses, dBa

Category [1]	Maximum Allowable Noise (dBA) by Time Periods [2]		
	Daytime	Morning/Evening	Nighttime
AA	50	45	40
A	55	50	45
B	65	60	55
C	70	65	60
D	75	70	65

Note:
*[1]**Class AA** - a section of contiguous area, which requires quietness, such as areas within 100 meters from school sites, nursery schools, hospitals and special houses for the aged; **Class A**- a section of contiguous area, which is primarily used for residential areas; **Class B** – a section or contiguous area, which is primarily a commercial area; **Class C** – a section primarily zoned or used as a light industrial area and **Class D** – a section, which is primarily reserved, zoned or used as a heavy industrial area.*
*[2] **Morning** - 5:00 A.M. to 9:00 AM; **Daytime** - 9:00 A.M. to 6:00 P.M; **Evening** - 6:00 P.M. to 10:00 P.M.; **Nighttime** - 10:00 P.M.*

2.3.2.2 Baseline Conditions

Air Quality

Particulate Matter (PM)

Concentrations of particulate matter, both TSP and PM_{10}, are below the NAAQGV for both one-hour and 24-hour averaging times during the first sampling (**Table 2.3.12**). Although within the CAA standards for both one-hour and 24-hour averaging times, AQ1 has the highest concentration of TSP and PM_{10}.

During the second sampling, AQ1 exceeded the NAAQGV for 1-hr and 24-hr TSP by 4.7% and 7.39%, respectively. AQ1 and AQ2 showed increase in particulate matter concentrations during the second sampling for 1-hr averaging

In both sampling periods, activities such as construction of the public market, dance classes, tournaments within 5m of the sampling station may have contributed to the elevated PM levels. Intermittent rains occurred during sampling at AQ2, AQ3, and AQ5. The station is located in an open concrete area, but it is observed to be busy due to foot traffic and passing vehicles.

Table 2.3.12. Ambient particulate matter concentration at the sampling stations

Station ID	TSP, µg/ncm				PM10, µg/ncm			
	1-hr		24-hr		1-hr		24-hr	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	208	314	167	247	87	131	72	78
AQ2	32	99	62	68	32	98	33	36
AQ3	96	56	51	42	58	29	35	20
AQ4	54	41	109	72	28	28	45	34
AQ5	81	75	87	118	44	31	52	52
NAAQGV	300		230		200		150	

Gaseous Pollutants

As combustion by-products, SO_2, and NO_2 are normally emitted by stationary and mobile sources. 1-hour SO_2 is undetected in all stations during the first sampling (**Table 2.3.13**). Although within the CAA standard, SO_2 was recorded in AQ1. Frequent start-ups of vehicles coming and leaving to the nearby barangay hall may have resulted to the presence of SO_2 during the 1-hour sampling at the station. Increased 24-hour SO_2 concentrations were observed during the second sampling period. NO_2 levels are also within the CAA standards for both 1-hour and 24-hour sampling periods.

Table 2.3.13. Ambient gaseous pollutant concentration at the sampling stations

Station ID	SO_2, µg/ncm				NO_2, µg/ncm			
	1-hr		24-hr		1-hr		24-hr	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	<0.29	10.28	2	6	43	17	16	6
AQ2	<0.29	<0.29	2	3	13	4	8	3
AQ3	<0.29	<0.29	5	6	23	27	9	3
AQ4	<0.29	<0.29	<0.29	4	13	16	7	1
AQ5	<0.29	<0.29	<0.29	5	11	9	10	2
NAAQGV	340		180		260		150	

Heavy Metals

Heavy metal concentrations were also measured for one hour at the sampling stations (**Table 2.3.13**). Most of the heavy metals were not detected to very low values. The concentration of Pb was detected ranging from 0.08 to 0.12ug/Ncm, As from <0.09 to 0.07ug/Ncm, Cr^{+6} from <0.1 to 0.04ug/Ncm, and Hg from <0.01 to 0.004ug/Ncm. Increased heavy metal concentrations were observed during the second sampling for As, Cr^{6+}, and Hg. Cd is undetected in both sampling periods.

Table 2.3.14. One-hour concentration of heavy metals at the PSC sampling stations

Station ID	As, µg/Ncm		Cd, µg/Ncm		Cr^{+6}, µg/ncm		Pb, µg/Ncm		Hg, µg/Ncm	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	<0.09	0.02	<0.20	<0.02	<0.1	0.02	0.1	0.07	<0.1	0.003
AQ2	<0.09	0.02	<0.20	<0.02	<0.1	ND	0.12	0.06	<0.1	0.003
AQ3	<0.09	0.02	<0.20	<0.02	<0.1	ND	0.12	0.08	<0.1	0.004
AQ4	<0.09	<0.09	<0.20	<0.02	<0.1	0.03	0.09	0.04	<0.1	0.002
AQ5	<0.09	0.07	<0.20	<0.02	<0.1	0.04	0.08	ND	<0.1	0.001

Noise

The sampling stations were classified under Class A as the land use in the area is primarily residential. Measured noise levels are presented in **Table 2.3.14**. AQ1 and AQ5 have exceeded the maximum allowable noise levels for Class A areas in all time periods. While the dominant noise sources are pedestrians and passing vehicles which are common to all stations, AQ1 and AQ5 are identified to be particularly areas with high activities (e.g., construction and Zumba activities in AQ1 during the monitoring period. AQ2, AQ3, and AQ4 are within the allowed daytime levels. These areas have relatively fewer daytime activities due to its location.

Table 2.3.15. Measured noise levels at the sampling stations

Minimum Instantaneous Noise Levels								
Station ID	Morning		Daytime		Evening		Nighttime	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	56.7	55.2	56.3	56.1	55.9	59.4	57.2	53.3
AQ2	49.6	53.1	48.5	53.7	48.1	52.1	47.5	48.2
AQ3	54.4	52.2	52.7	51.5	54.5	55	53.8	55
AQ4	54.4	55.2	51	53.3	56.8	57.3	55.5	54.3
AQ5	54.5	54.9	52.8	55.3	55.2	54.2	54.9	53.8
Mean								
Station ID	Morning		Daytime		Evening		Nighttime	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	59.5	57.4	62	60.9	59.7	61.5	58.8	56.9
AQ2	56.1	58.9	53.4	56.9	50.7	53.8	49	49.4
AQ3	56.3	54.5	53.8	52.8	55.1	56	54.1	55.7
AQ4	56.1	57.3	55.1	55.4	58	58.2	56	55.7
AQ5	56.9	57.5	57.5	59.1	57.8	59.1	56.9	54.4
Median								
Station ID	Morning		Daytime		Evening		Nighttime	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	59.1	57.3	61.4	60.8	59	61.4	58.5	53.9
AQ2	55.4	58.2	53	55.7	49.4	53.5	48.6	49.1
AQ3	55.6	53.7	53.5	52.3	54.9	55.9	54.1	55.6
AQ4	55.7	57.2	54	55.4	58	58	55.8	55.7
AQ5	56.5	56.9	57.1	59.5	57.6	55.5	56.8	54.4
Maximum Instantaneous Noise Levels								
Station ID	Morning		Daytime		Evening		Nighttime	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
AQ1	63.9	61.6	71.4	67.6	65.6	64.6	62.7	55.5
AQ2	67.1	67.8	64.2	63.7	61	60.1	55	52.6
AQ3	63.4	64	57.2	61.4	56.9	57.7	55.2	58.5
AQ4	59.8	61.4	67.7	58.2	59.6	61.3	59	57.1
AQ5	62.2	63.5	64.9	62.6	64.5	61.5	59.9	55.1
Max allowable noise: Class A	50		55		50		45	

Note: 1st – conducted in May 2021; 2nd – conducted in June 2021

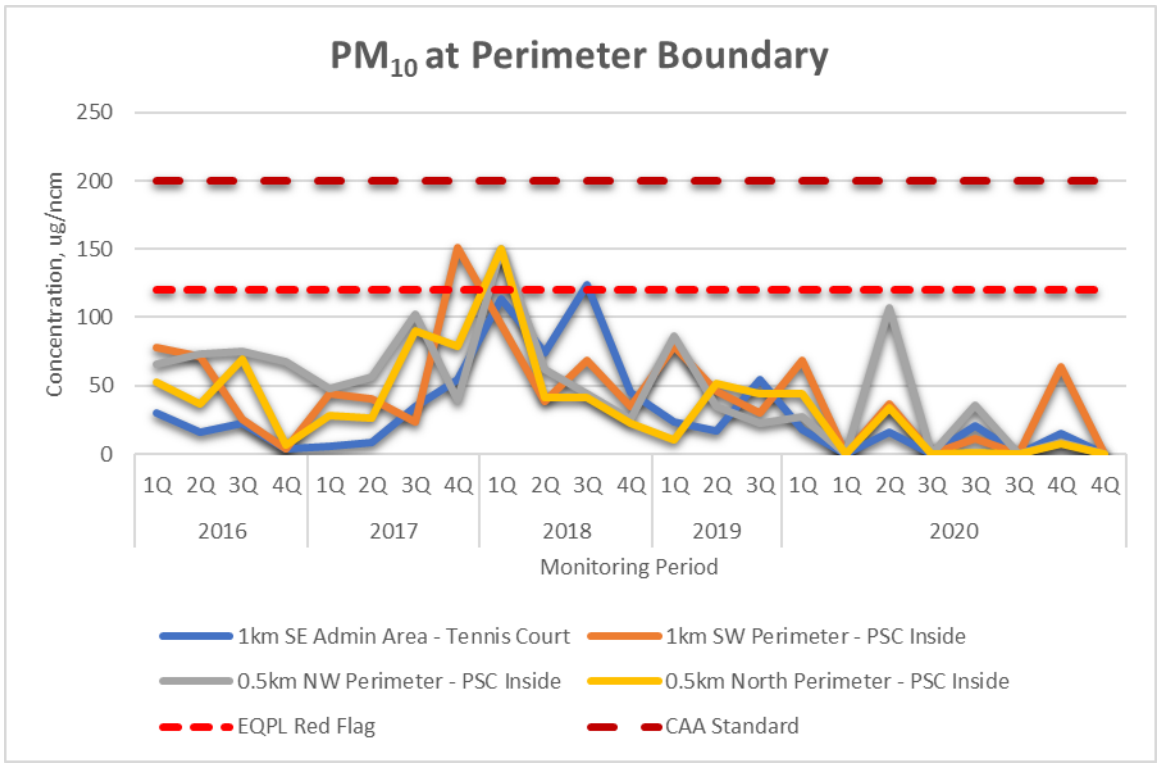
Based on the monitoring data of PSC, monitored criteria pollutants and heavy metals are within the prescribed standards for ambient air quality.

There were instances that PM_{10} concentrations exceeded the 'Red Flag' level. This occurred during the 4Q-2017 (Tennis Court) and 1Q of 2018 (PG #11, PG #4, and PG #6) (**Figure 2.3.10a**). These were also the highest recorded concentrations on the stations at the boundary. PM_{10} at the residential stations, however, nearly reached the CAA limit in 1Q-2017 and 1Q & 2Q-2018 (**Figure 2.3.10b**).

NO_x concentrations at the residential stations were relatively lower than the recorded at the boundary (**Figure 2.3.11**). Low concentrations were observed in 2017 but relatively increasing until 2019.

Stations located north of the plant boundary were observed to have relatively higher SO_2 concentrations and often exceed the 'Red Flag' level (**Figure 2.3.12a**). On the other hand, all of the residential monitoring stations registered high SO_2 levels during 1Q and 3Q of 2016 (**Figure 2.3.12b**).

Heavy metals monitored are Cu, Cr^{6+}, Ni, Pb, Zn, Fe, and Cd (**Figures 2.3.13** to **2.3.19**). These are mostly undetected with the exception of some heavy metals. Cu was detected in 3Q-2016 at the station near the ore yard (**Figure 2.3.13a**). Zn was detected in both perimeter boundary and residential monitoring stations during 3Q-2019 and 1Q-2020 (**Figure 2.3.17**). Fe was also detected 1Q and 3Q-2016 and 1Q-2020 (**Figure 2.3.18**) while Cd was detected 3Q-2019 (**Figure 2.3.19**).



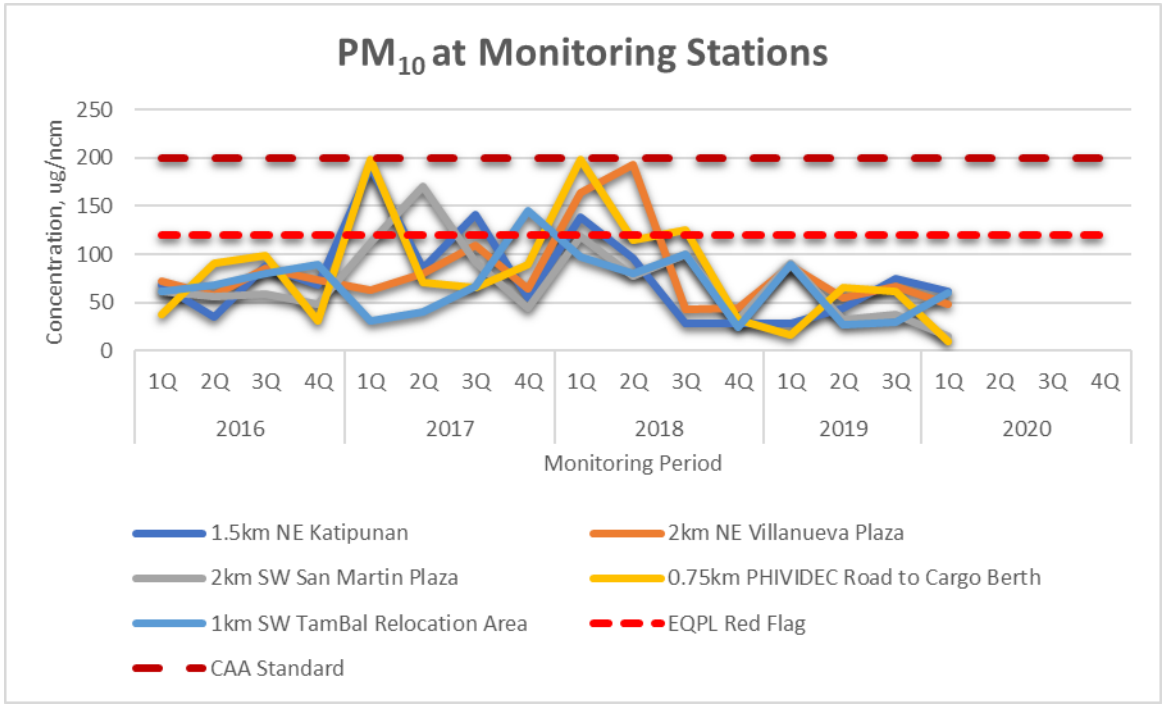
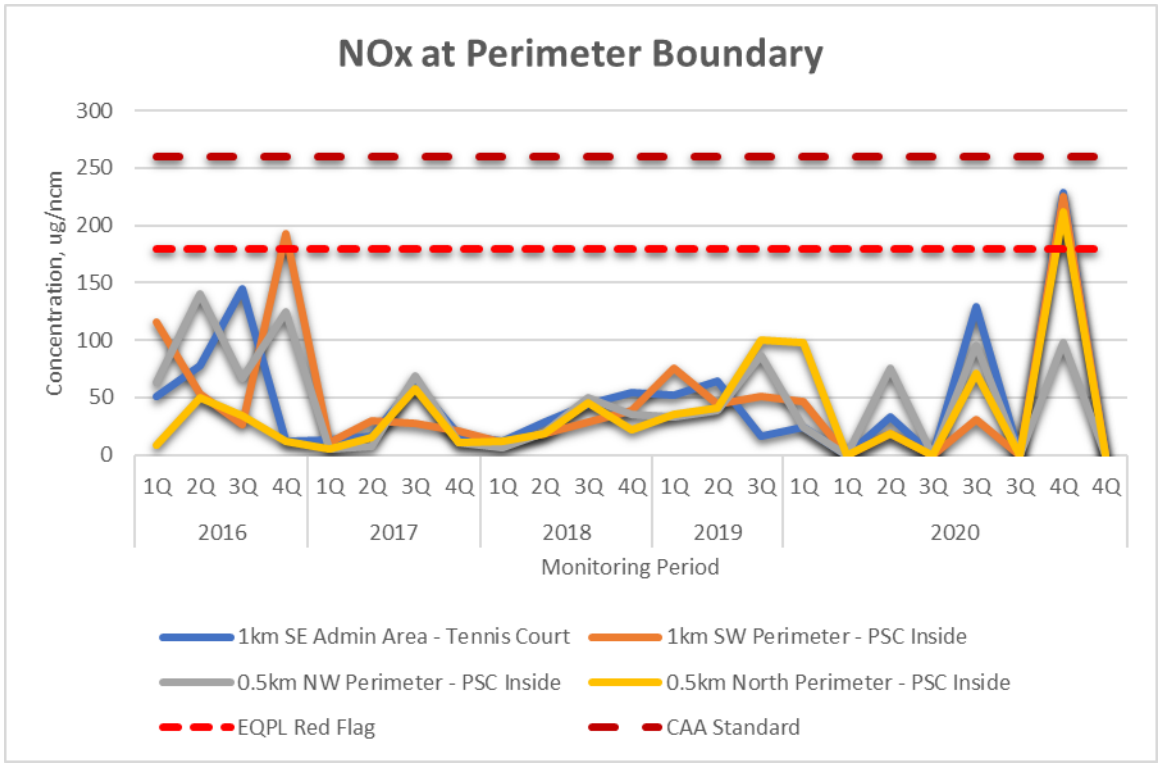


Figure 2.3.10. PM_{10} concentrations at (a) perimeter boundary and (b) monitoring stations



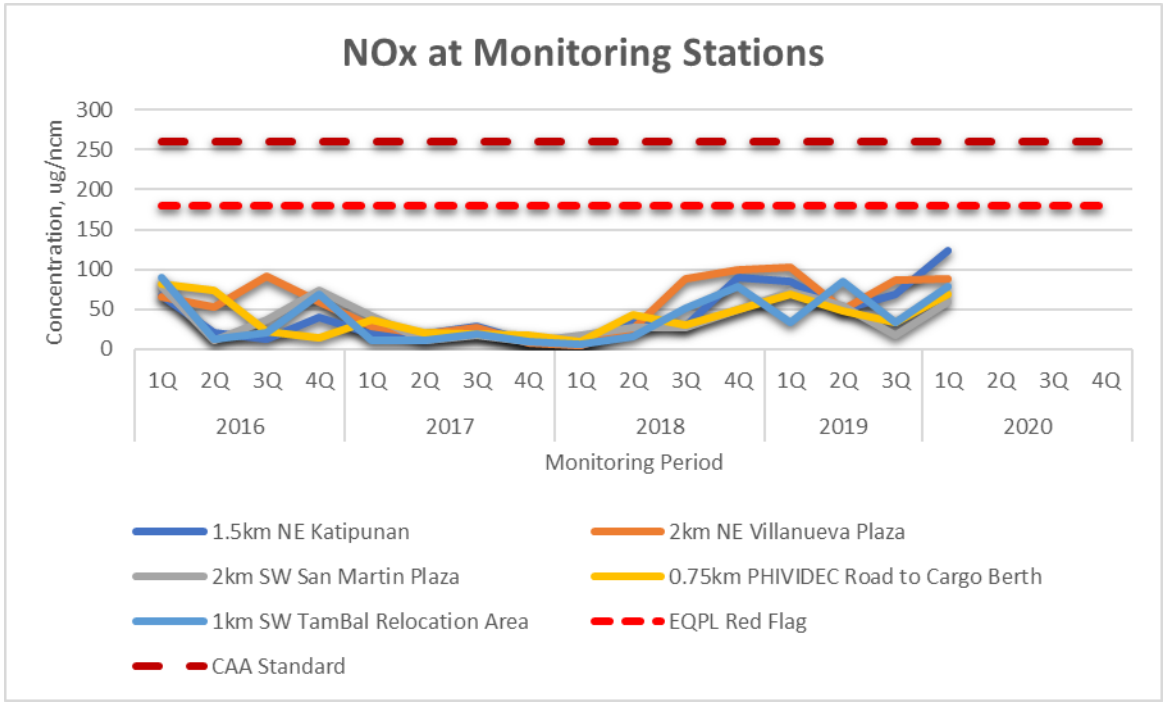


Figure 2.3.11. NO_x concentrations at (a) perimeter boundary and (b) monitoring stations

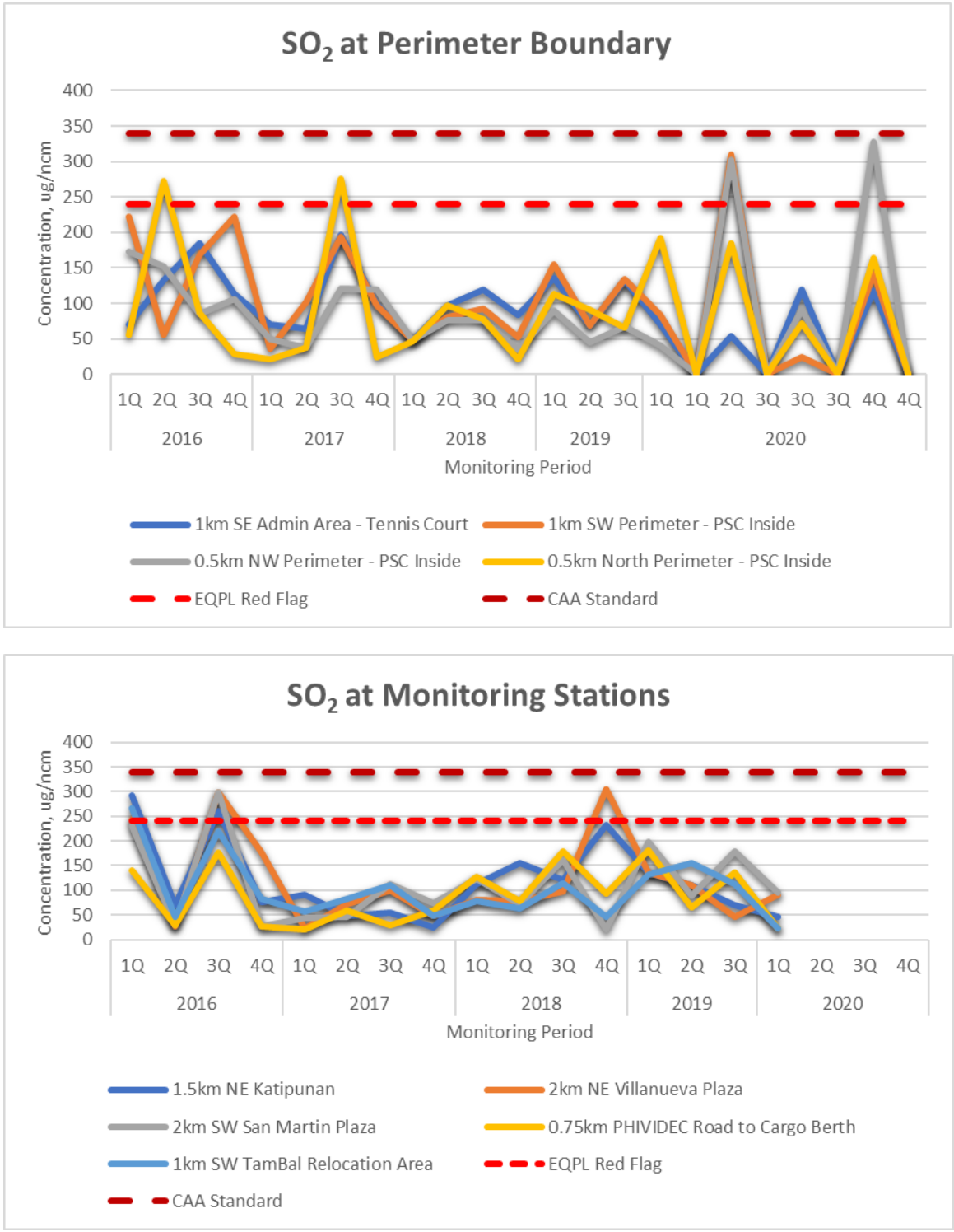
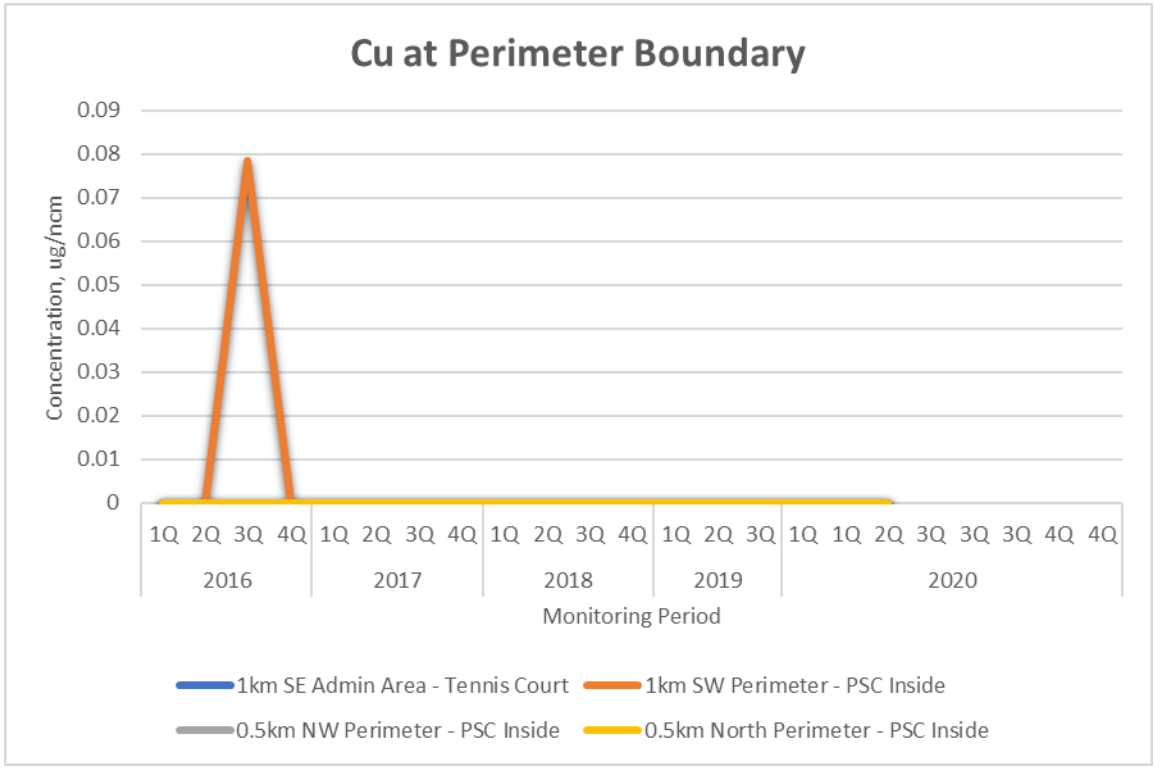


Figure 2.3.12. SO_2concentrations at (a) perimeter boundary and (b) monitoring stations



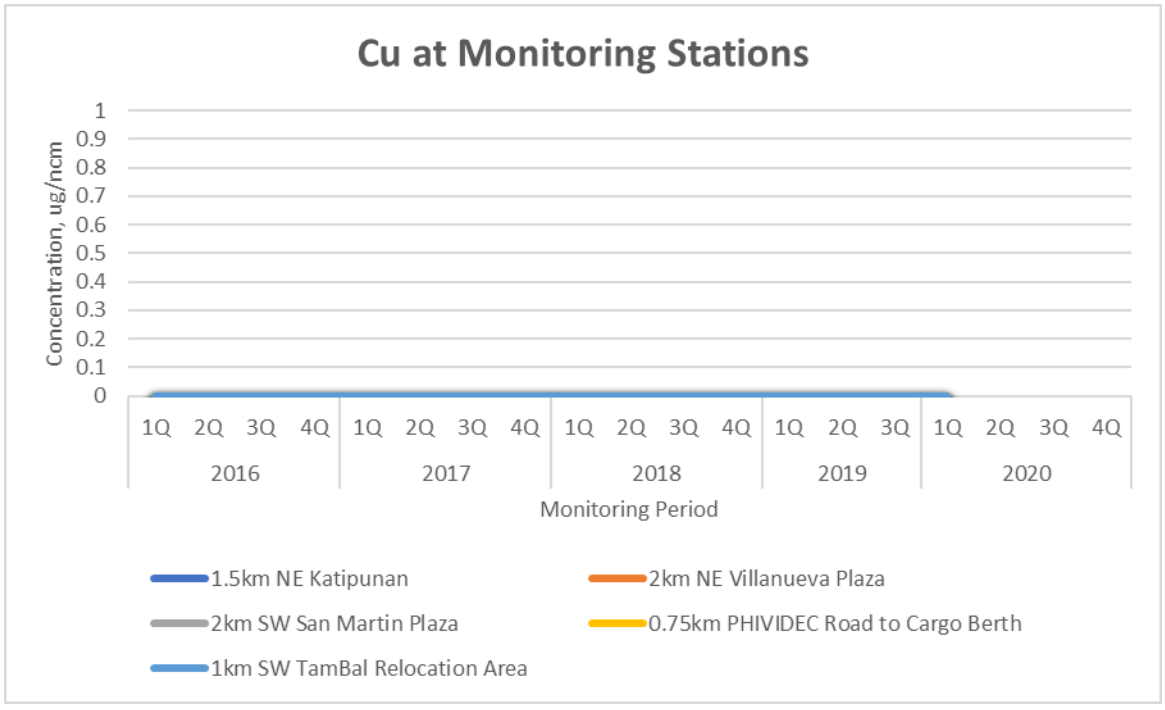
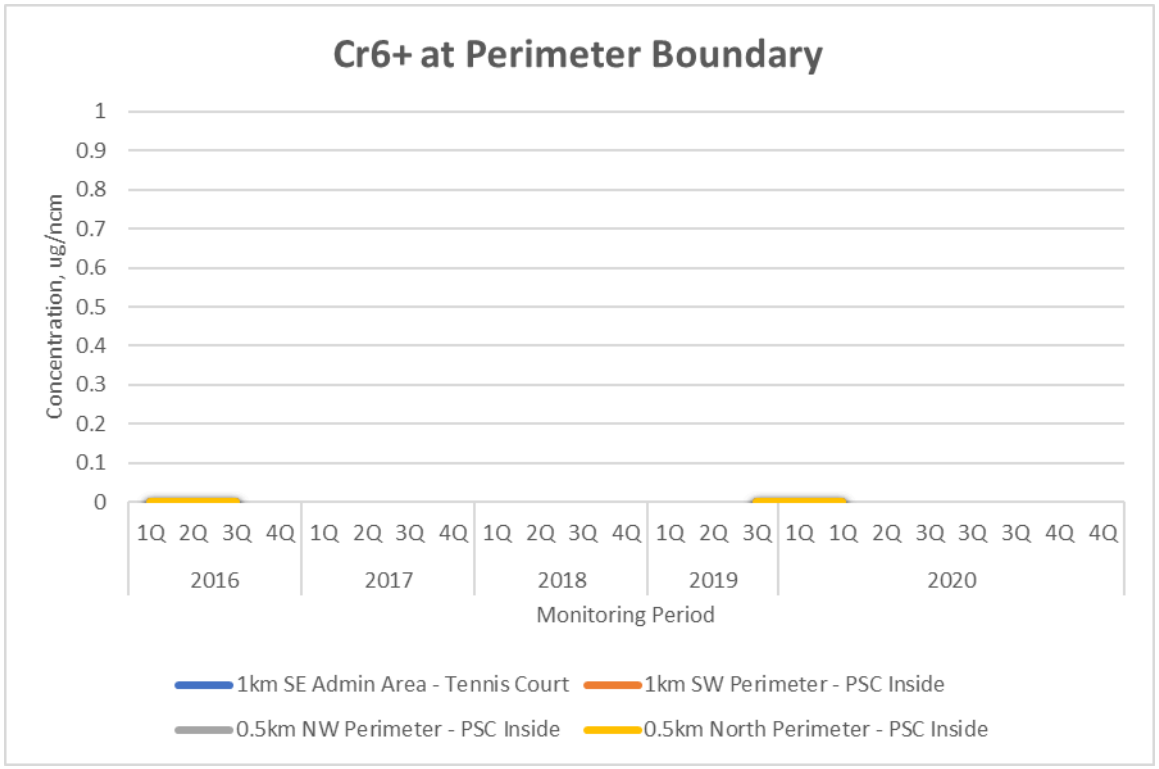


Figure 2.3.13. **Cu concentrations at (a) perimeter boundary and (b) monitoring stations**



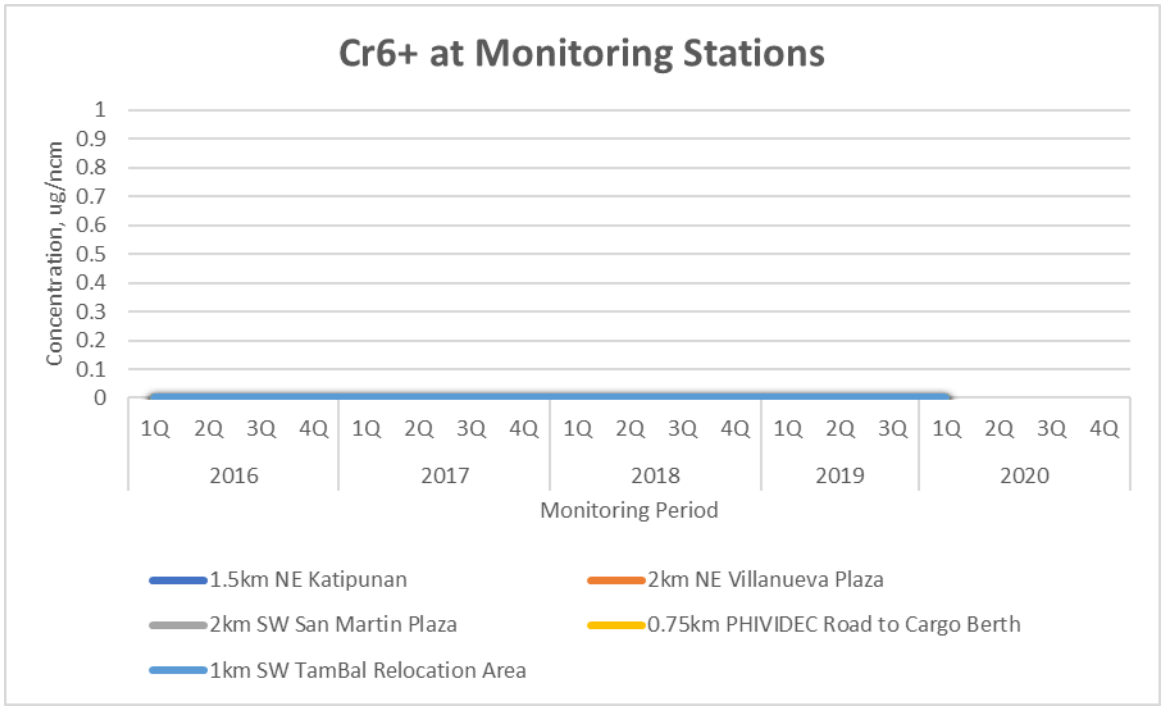
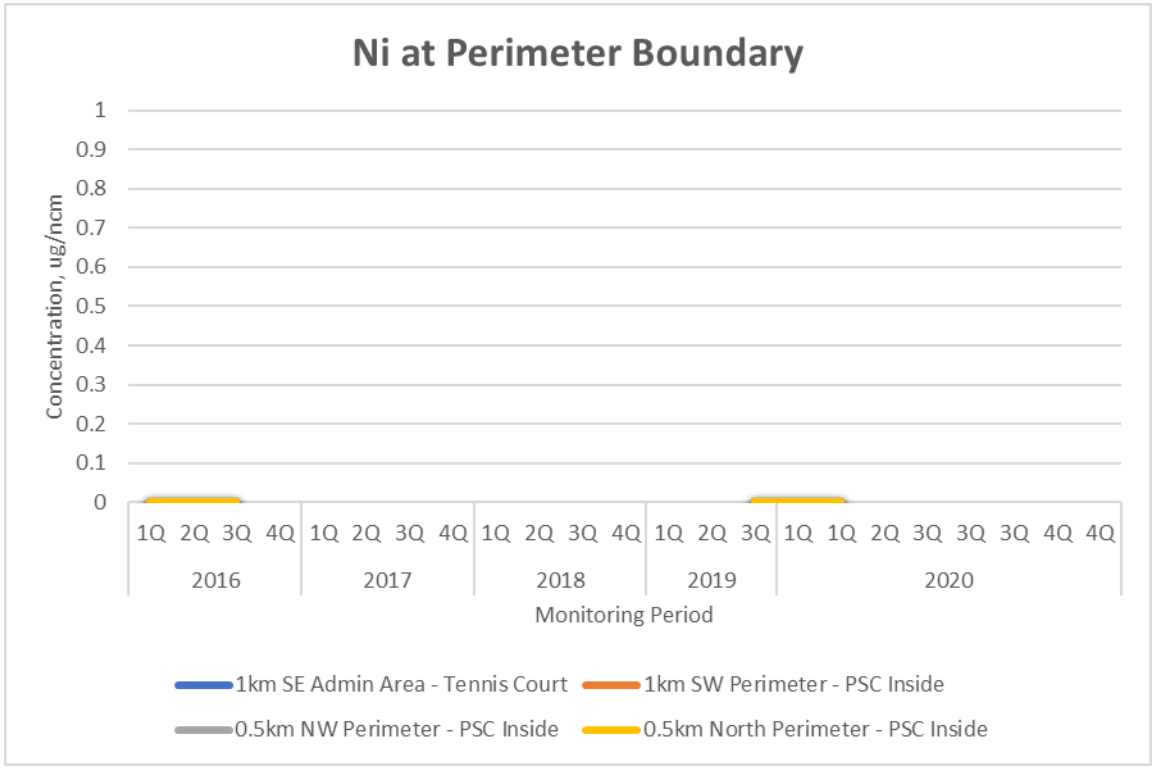


Figure 2.3.14. Cr^{6+} concentrations at (a) perimeter boundary and (b) monitoring stations



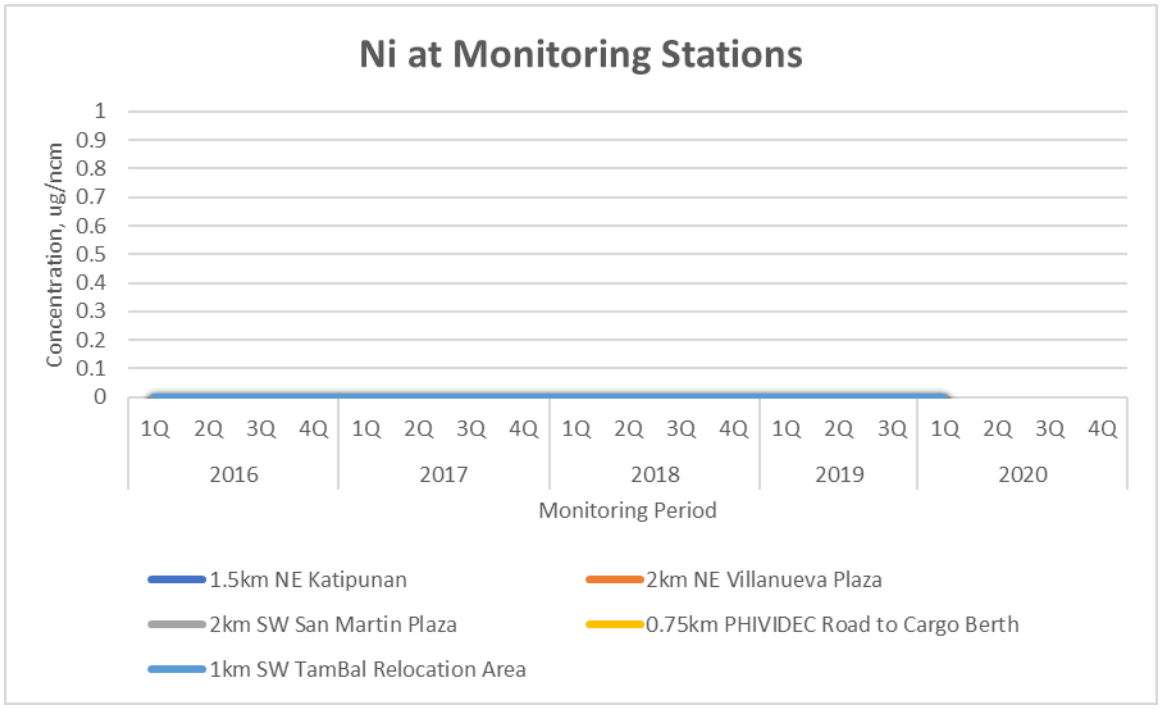


Figure 2.3.15. Ni concentrations at (a) perimeter boundary and (b) monitoring stations

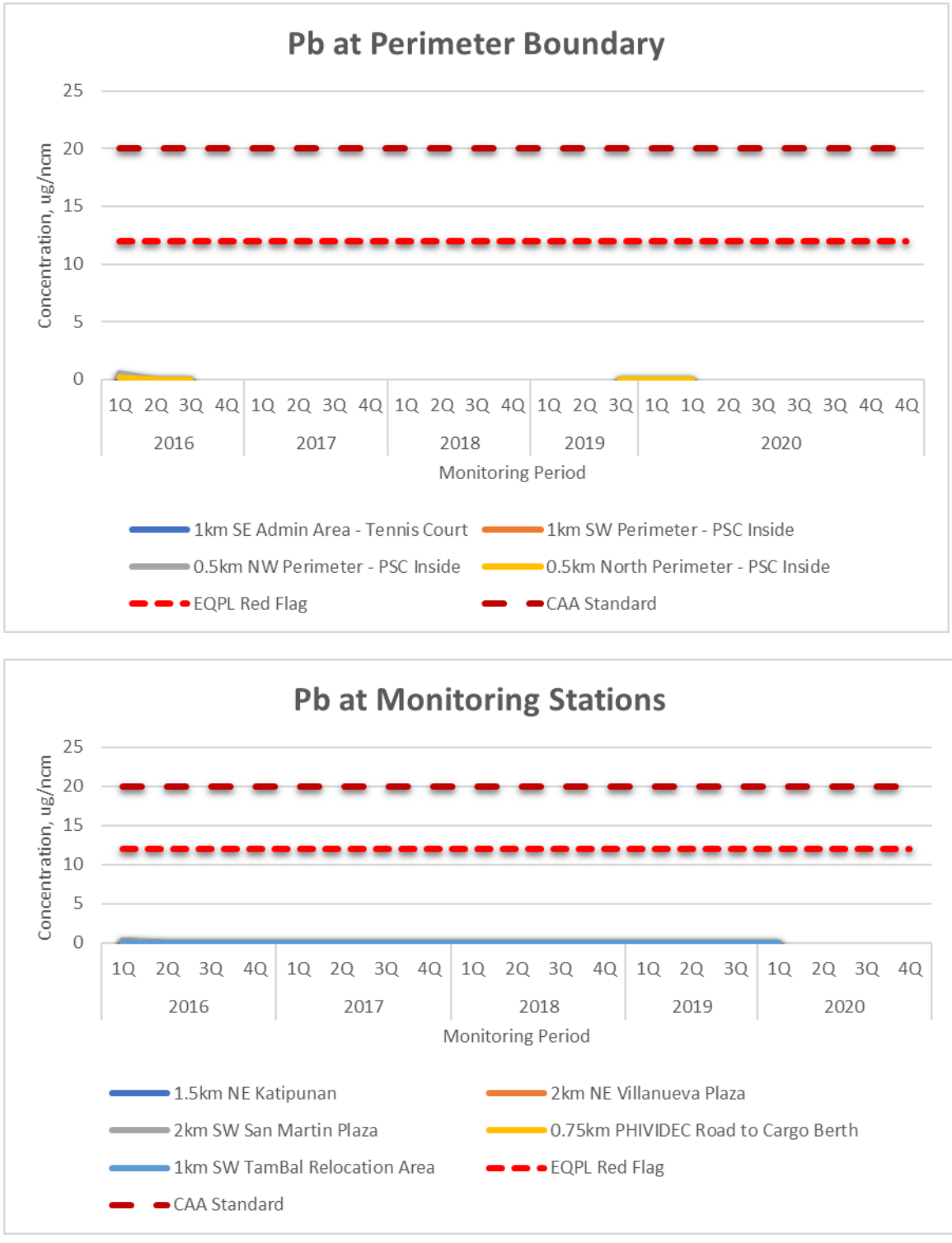
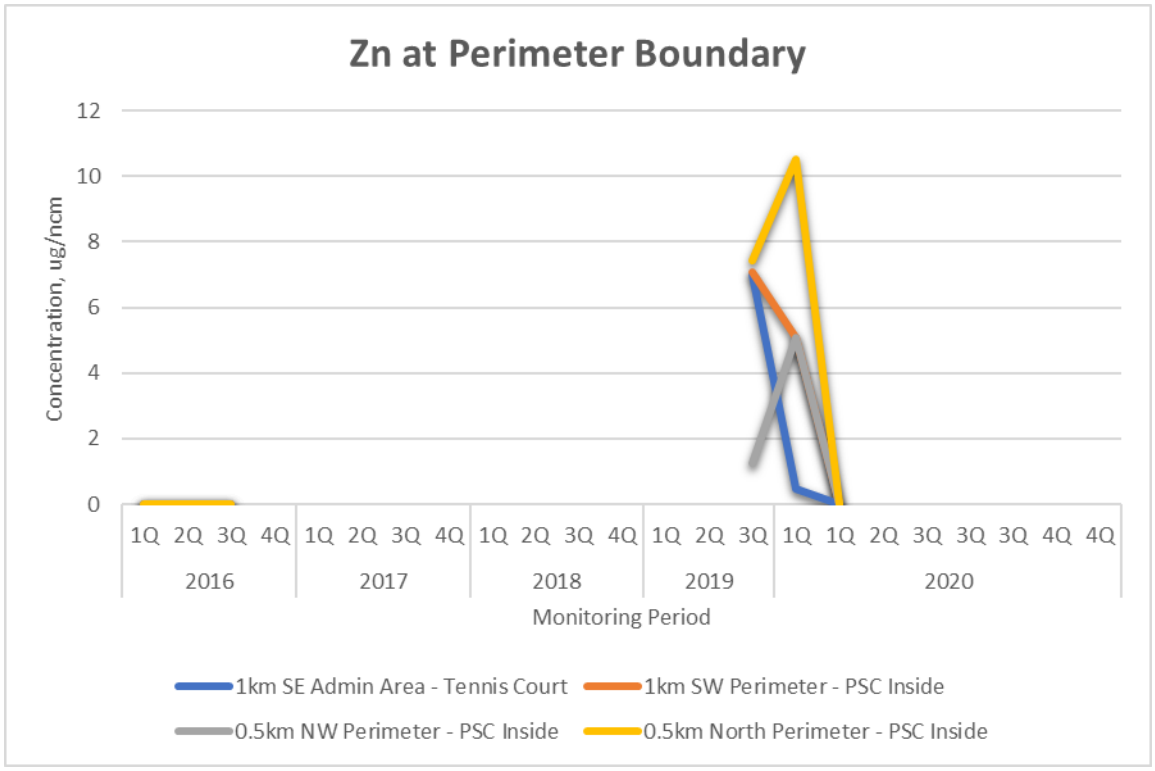


Figure 2.3.16. Pb concentrations at (a) perimeter boundary and (b) monitoring stations



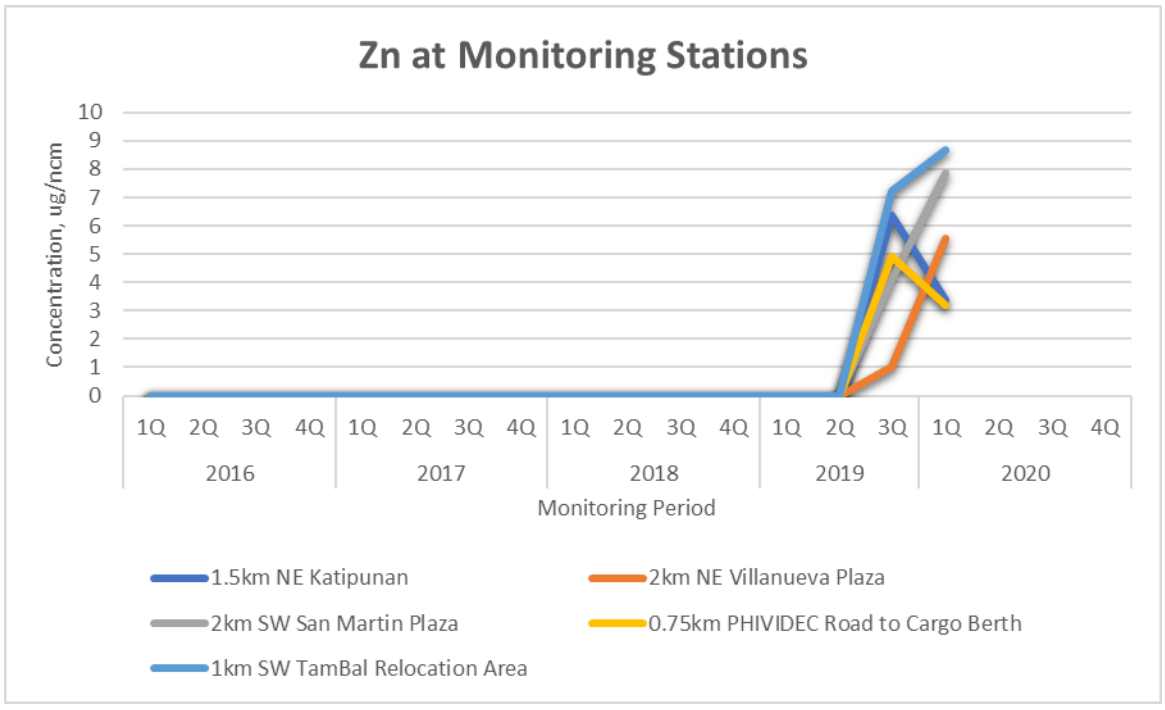
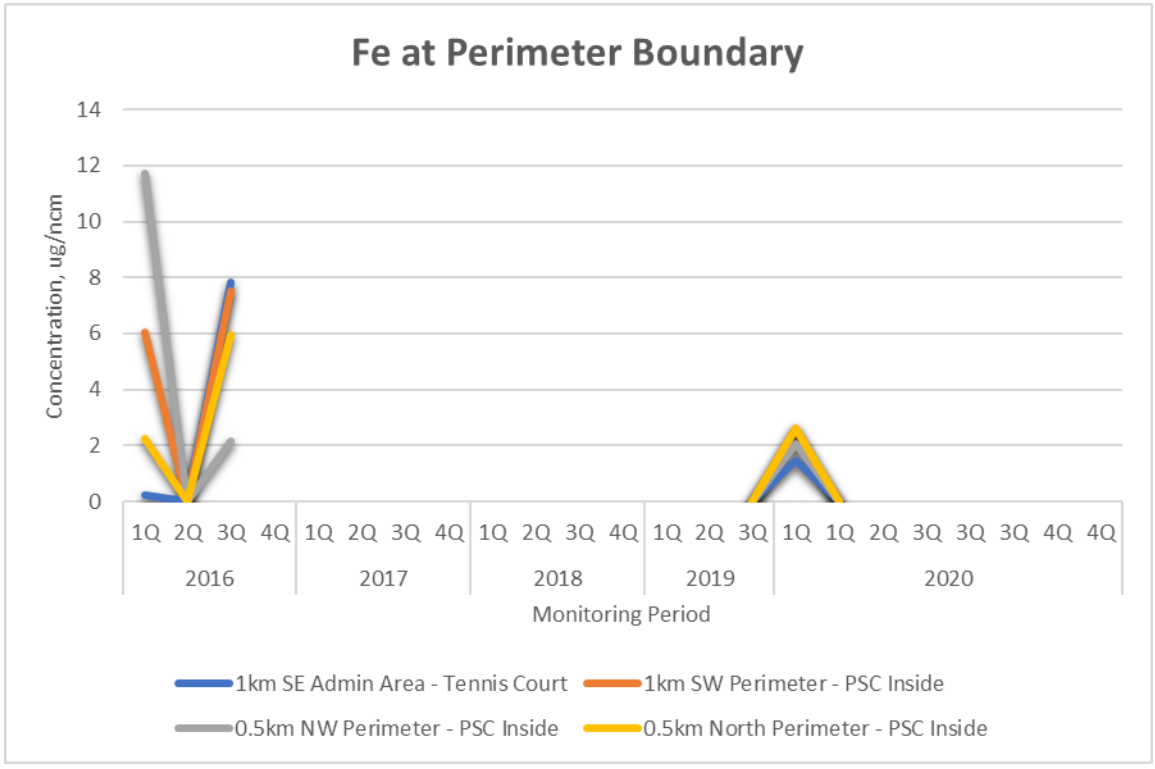


Figure 2.3.17. Zn concentrations at (a) perimeter boundary and (b) monitoring stations



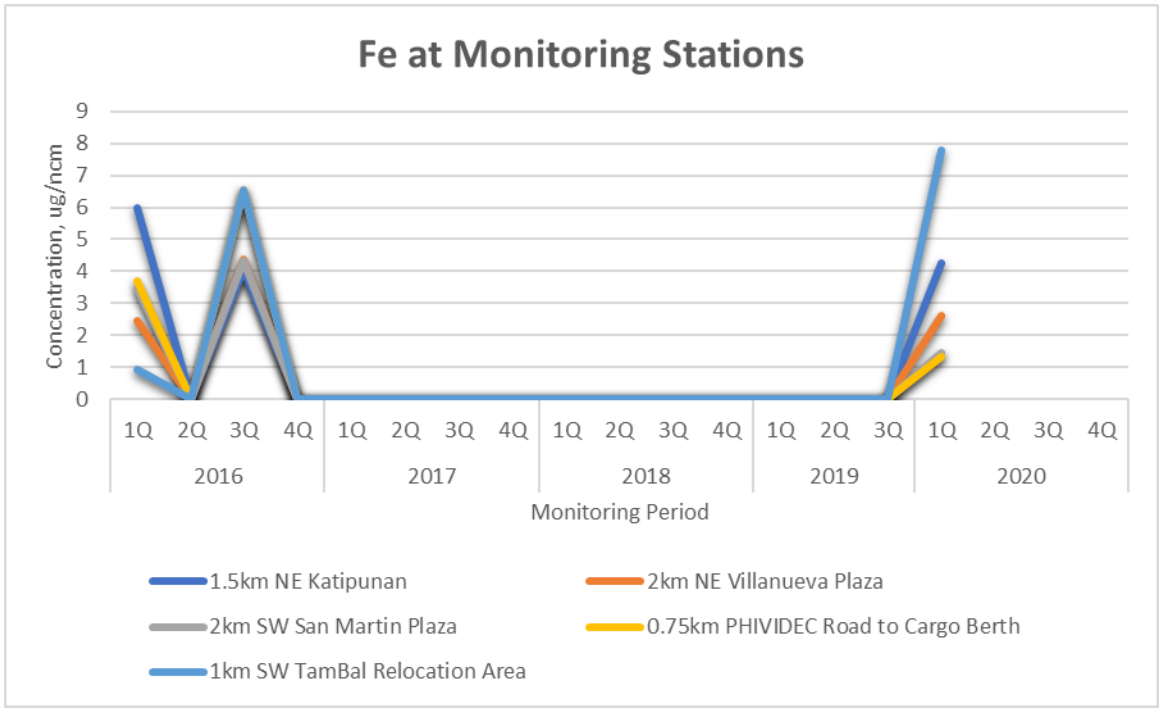
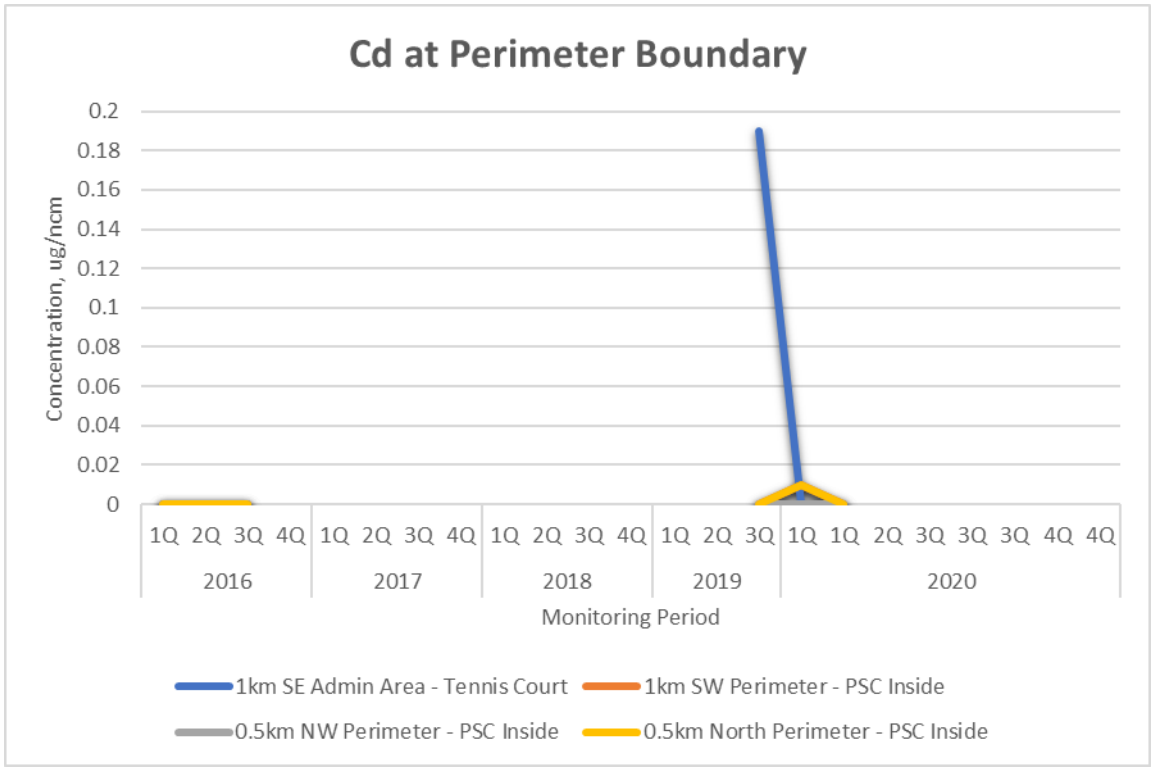


Figure 2.3.18. Fe concentrations at (a) perimeter boundary and (b) monitoring stations



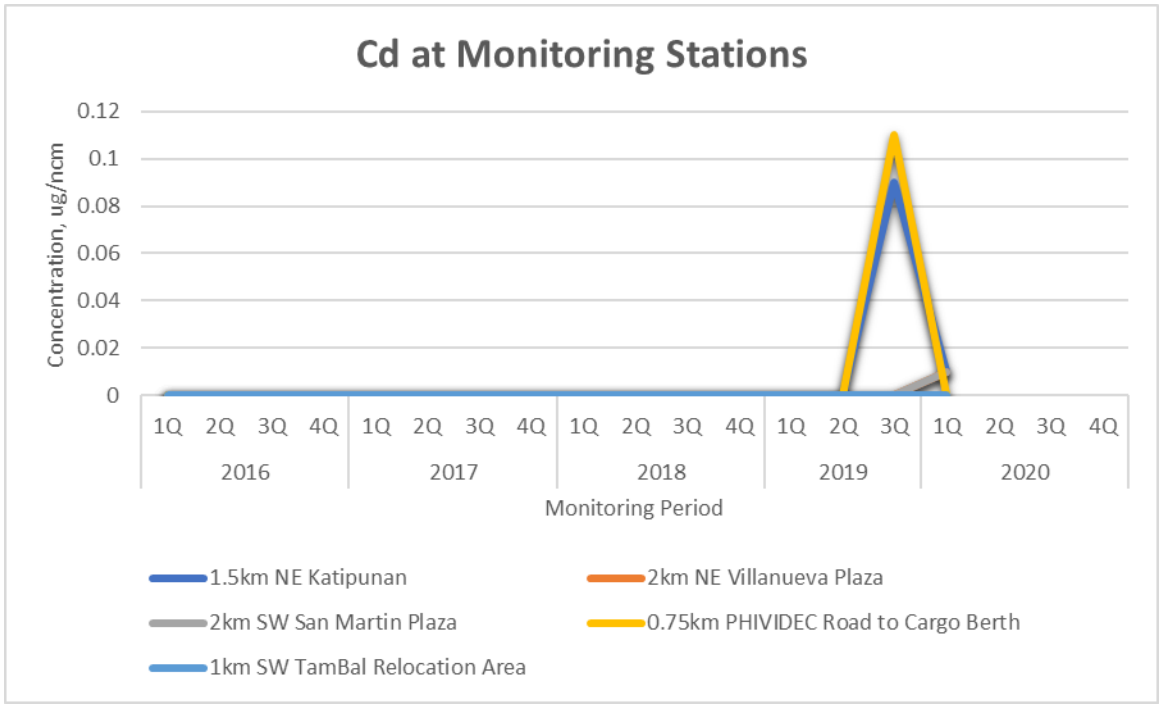
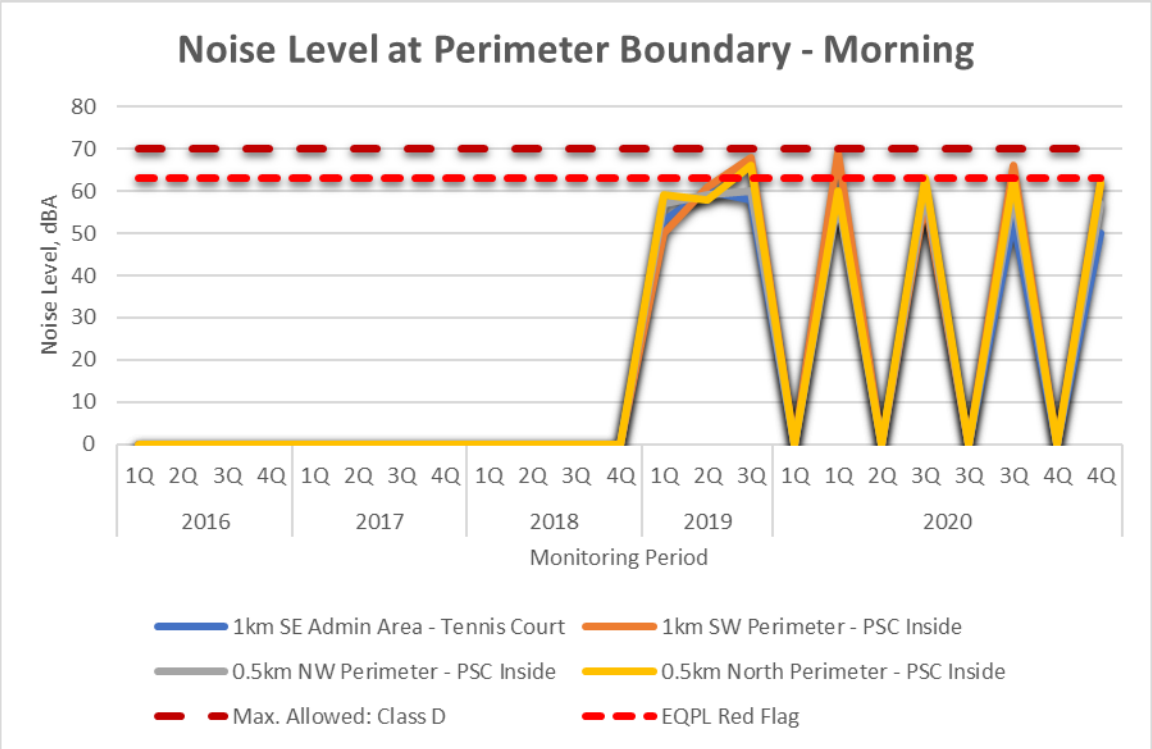


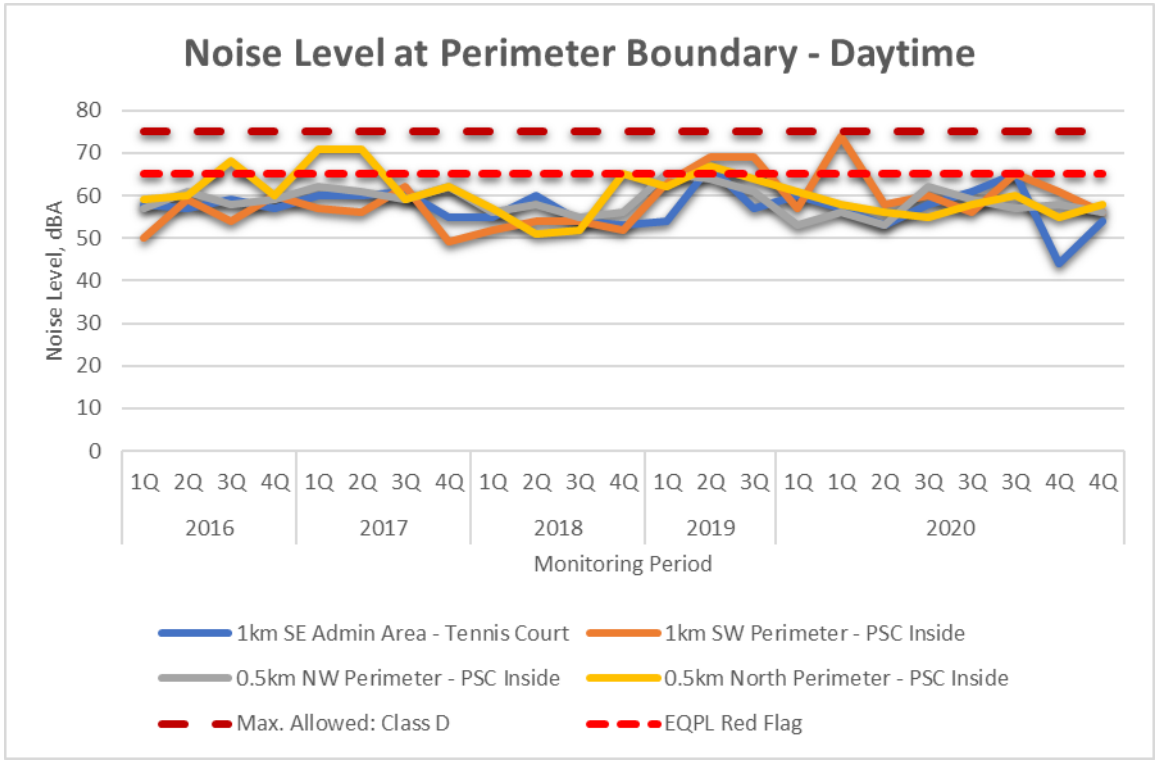
Figure 2.3.19. Cd concentrations at (a) perimeter boundary and (b) monitoring stations

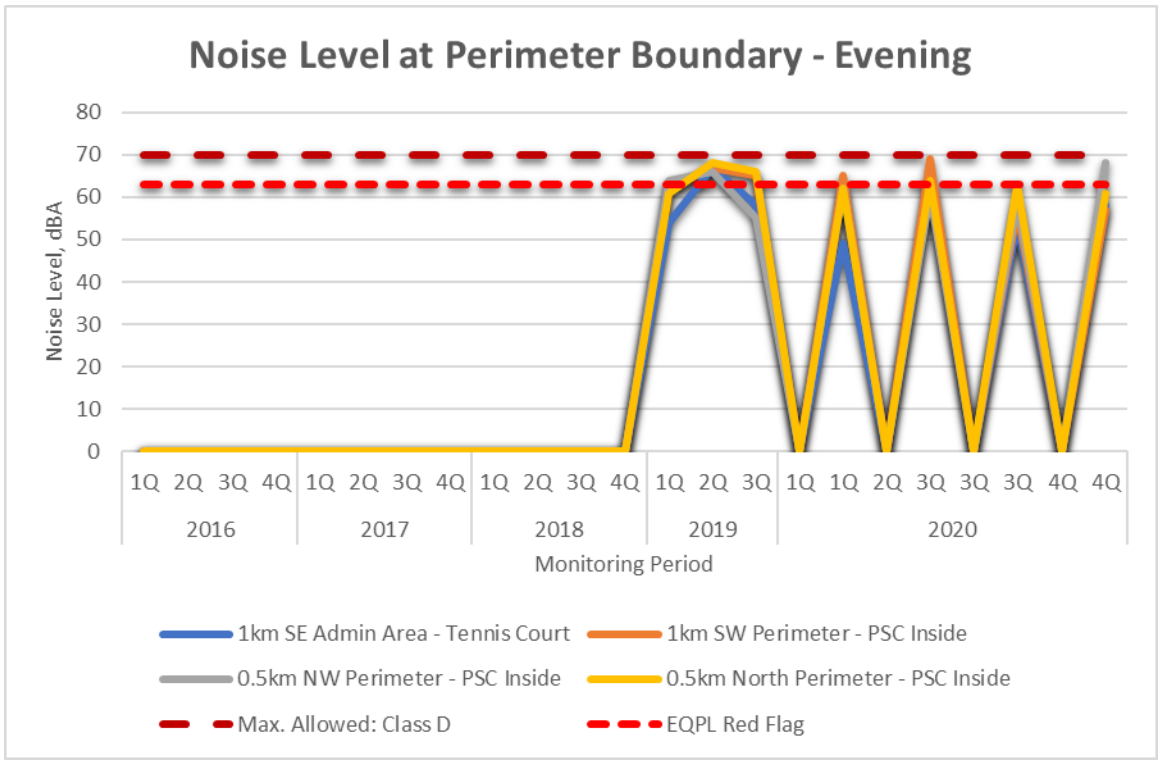
Noise Levels

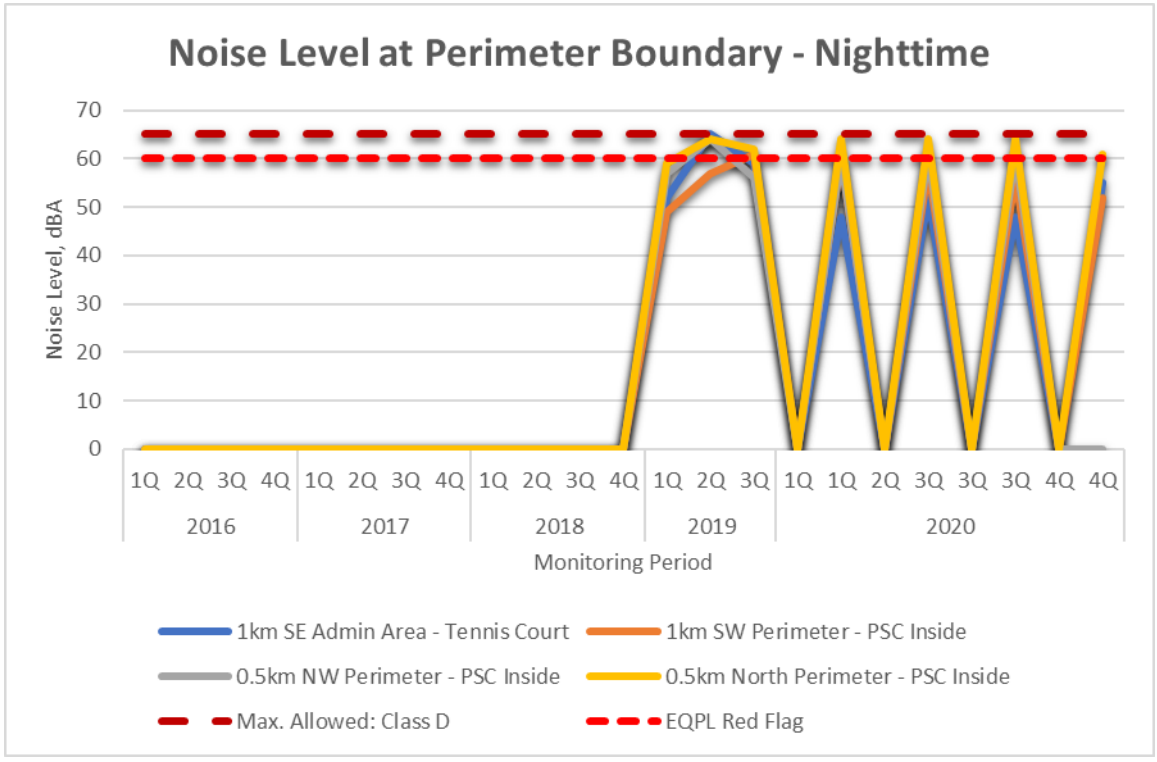
Noise levels at the perimeter boundary were monitored during the four (4) time periods and compared to the maximum allowable levels of a Class D area as PSC is in an industrial zone. Monitoring data during the last five (5) years shows that the noise levels at the perimeter is below the maximum allowed levels. Since the noise levels exceeded the red flag (and action), applicable mitigation measures must be observed (**Figures 2.3.19a to 2.3.19d**).

Noise levels were also measured at ambient monitoring stations but only during daytime. These stations are residential areas and therefore, noise levels are compared to maximum allowable levels of a Class A area (residential). Most of the stations are within the allowable levels except for some instances at the station in Villanueva Plaza (**Figure2.19e**).




Noise Level at Perimeter Boundary - Daytime
Noise Level, dBA
80
70
60
50
40
30
20
10
0
1Q 2Q 3Q 4Q 1Q 2Q 3Q 4Q 1Q 2Q 3Q 4Q 1Q 2Q 3Q 1Q 1Q 2Q 3Q 3Q 3Q 4Q 4Q
2016
2017
2018
2019
2020
Monitoring Period
1km SE Admin Area - Tennis Court
1km SW Perimeter - PSC Inside
0.5km NW Perimeter - PSC Inside
0.5km North Perimeter - PSC Inside
Max. Allowed: Class D
EQPL Red Flag


Noise Level at Perimeter Boundary - Evening
Noise Level, dBA
80
70
60
50
40
30
20
10
0
1Q 2Q 3Q 4Q 1Q 2Q 3Q 4Q 1Q 2Q 3Q 4Q 1Q 2Q 3Q 1Q 1Q 2Q 3Q 3Q 3Q 4Q 4Q
2016
2017
2018
2019
2020
Monitoring Period
1km SE Admin Area - Tennis Court
1km SW Perimeter - PSC Inside
0.5km NW Perimeter - PSC Inside
0.5km North Perimeter - PSC Inside
Max. Allowed: Class D
EQPL Red Flag



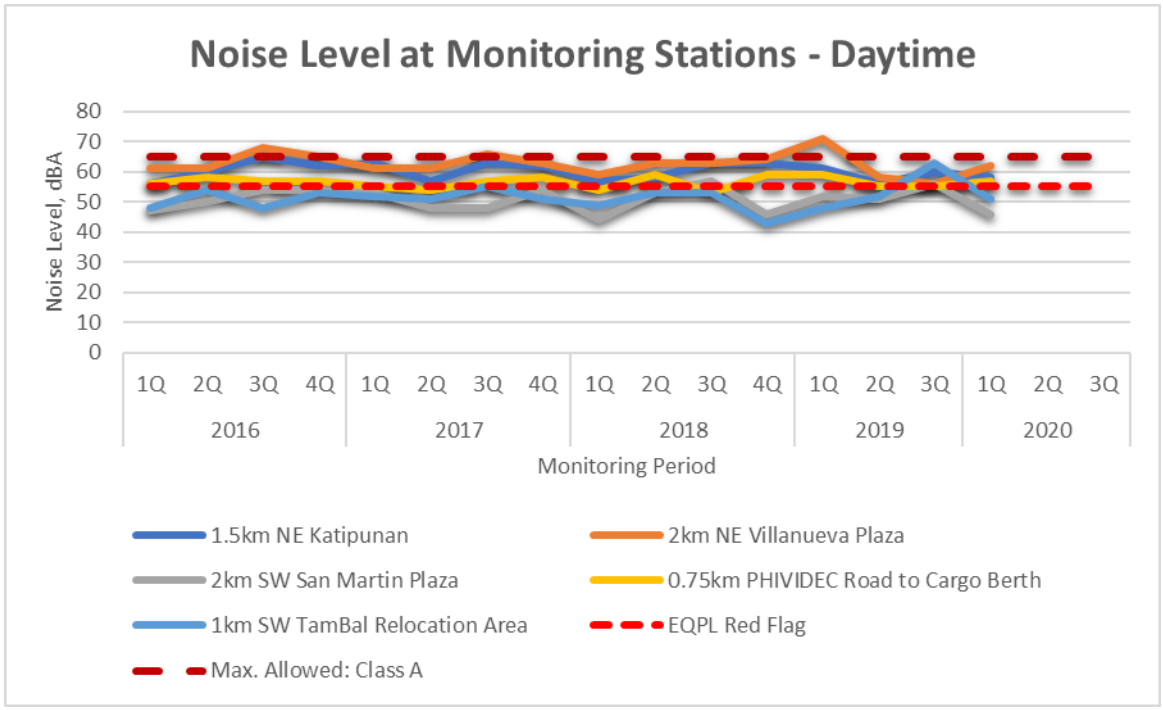


Figure 2.3.20. Noise levels at perimeter boundary during (a) morning time period, (b) daytime time period, (c) evening time period, (d) nighttime and (e) monitoring stations during daytime.

2.3.2.3 Impact Assessment and Environmental Performance

Table 2.3.16. Predicted impacts of/on ambient air quality and noise to/by the proposed expansion of PSC for its ore blend and new berth facility

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Degradation of air quality		☑	☑		**Construction phase** The current operations generate particulate and gaseous pollutants due to the use of fuel and conveyance of raw materials and sintered products. During the construction of the facilities for the expansion, pollutants, primarily fugitive dust, will be generated from the activities such as site clearing and preparation, construction of conveyor system and berth facility. Use of heavy equipment and motor vehicles will result to additional SO_x and NO_x emissions. Dust suppression measures must be implemented on active construction areas to prevent dust from becoming airborne especially during the dry season. Wet suppression and wind speed reduction can also be used to control dust in the construction site. Contractors must also be required to put tarpaulin covers on trucks loaded with construction materials. Regular maintenance of heavy equipment and other mobile sources must be observed to minimize exhaust gas emissions. **Operation phase** During the operation phase, emission of particulate matter is expected due to loading/unloading of raw materials and sintered products. Conveyor belts can also contribute to fugitive dust emissions. Water spray system will be installed in unloading lines to spray water directly to material in case the unloaded material is very dry. Conveying lines will be covered with arc roofing. Green belt zone planted with fast growing native species and bamboo will be maintained along the PSC perimeter. Regular water spraying by water truck will be conducted especially during dry season. Drain water during heavy rain will be catered by the existing settling pond to reduce suspended solids in the water and should be within the acceptable standard prior to discharging to the effluent channel.
Increase in ambient noise level		☑	☑		**Construction phase** Noise generated during the construction of the proposed expansion will be due to the activities such as site clearing and preparation, construction of conveyor system and berth facility, and the use of heavy equipment and vehicle use. Regular maintenance of heavy equipment with installed mufflers and other mobile sources must be observed to minimize noise level. Buffer zones must also be established to serve as noise barrier. **Operation phase** In addition to the current noise level during operations, noise generated from the proposed expansion will be due to loading and unloading activities, operation of the conveyor system, sintering

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
					process. Workers exposed to increased noise levels are required to wear PPEs at work, especially in areas with high noise levels. Green belt zone planted with fast growing native species and bamboo will be maintained along the PSC perimeter. Mufflers and barriers must be installed to reduce sound levels produced by equipment and machineries. These must be regularly maintained.

2.4 THE PEOPLE

2.4.1 Socio-Economics and Public Health

2.4.1.1 Methodology

Data Gathering

Data gathering consisted of collecting primary and secondary information. Primary data was generated from face-to-face survey with household respondents. The assistance of Barangay Health Workers (BHWs) from the impact barangays as enumerators in the conduct of the survey was sought with clearance from the barangay captains. They were first oriented on the survey questionnaire before deploying them for the actual interview.

Using the number of households estimated from the projected 2020 population size of Villanueva and the impact barangays, the sample to be used in the survey was computed using the Slovin's formula which is as follows:

$$n=N/1+Ne^2$$

where n= sample size
N= total number of households
e= margin of error, 10%

The number of household heads or their representatives interviewed were 18 for Brgy. Poblacion I, 45 for Brgy. San Martin and 37 for Brgy. Katipunan for a total of 100 interviewees. **Annex 2.4.1** includes the household perception questionnaire tool.

On the other hand, other primary data were collected through phone interviews with key informants which consisted of barangay captains, fisherfolk association officials, Municipal Disaster Risk Reduction and Management Office (MDRRMO), Municipal Planning and Development Office (MPDO) and municipal nurse of Villanueva, and DENR-City Environment and Natural Resources Office (CENRO) Initao.

Table 2.4.1. Names, positions of key informants and dates of interview

Name	Office/Position	Date
1. Mr. Jose Abejo	Barangay Chairman, Barangay Poblacion I	May 4
2. Mr. Ruel Dagasuhan	Poblacion I Fisherfolks Association	May 4
3. Mr. Conrado Mahinay	CENRO-DENR, Initao	May 4
4. Mr. Michael Factura	Municipal Agriculture and Fisheries Council	May 4
5. Mr. Norman Ricacho	MDRRMO, Villanueva, Mis. Or.	May 4
6. Mr. Julio Cabalo	Barangay Chairman, Barangay Katipunan	May 5
7. Mr. Agustin Sabio	Barangay Chairman, Barangay San Martin	May 5
8. Mr. Roque Flores	Bacalanas Municipal Fisherfolks Association	May 5
9. Engr. Joseph Vacalares	MPDC, Villanueva, Mis. Or.	May 5
10. Mr. Robinson Minoza	Federation President, Poblacion 3 Fisherfolk Association	May 26
11. Mr. Rodney Sabio	Municipal Nurse, Villanueva, Mis. Or.	May 26

Furthermore, focus group discussions or FGDs (one each for the three (3) impact barangays) were conducted with representatives from the various sectors in the barangay as participants. The FGDs were conducted by the Socio-economics Specialist through the virtual platform Zoom with the Research Associate physically present on site who prepared and set-up the hardware used for the virtual meeting, took the attendance of participants and acted as note taker during the activity.

Table 2.4.2. Venue, date and time of Focus Group discussions (FGDs)

Venue	Date	Time
Barangay Katipunan covered court	May 10, 2021	9-11 am
Barangay San Martin covered court	May 10, 2021	11:30 am – 1 pm
Barangay Poblacion I barangay hall	May 10, 2021	1:30-3 pm

Published and unpublished reports such as the Villanueva Comprehensive Land Use Plan (CLUP), barangay socio-economic and health profiles, and other reference materials such as PSC reports were used as reference materials during the analysis to come up with recommendations to mitigate the possible adverse effects or enhance the positive impacts of the proposed project.

Analysis and presentation of data

Descriptive analysis of averages and percentage distribution was pursued together with comparison of data on the municipal and barangay levels. The determination of the community status and needs were analyzed in the determination of the social development programs as part of the proponent's social responsibility toward the community.

2.4.1.2 Baseline Conditions

Profile of the Municipality of Villanueva

Socio-demographic Information

Population by Barangay

The population of Villanueva based on the 2015 PSA data as cited in the municipality's CLUP was 39,378 (**Table 2.4.3**). There are 11 barangays in the municipality. The barangays with the highest number of residents were San Martin (6,924 or 18%), followed by Dayawan (6,724 or 17%) and Katipunan (5,655 or 14%). The barangay with the least population was Tambobong with only six (6) residents or 0.01% of the whole population.

Table 2.4.3. Population of Villanueva, Misamis Oriental by barangay, 2015

Barangay	Number	%
1. Balacanas	2,524	6
2. Dayawan	6,702	17
3. Katipunan	5,655	14
4. Kimaya	1,100	3
5. Poblacion 1	2,539	6
6. San Martin	6,924	18
7. Tambobong	6	0.01
8. Imelda	3,391	9
9. Looc	4,238	11
10. Poblacion 2	2,355	6
11. Poblacion 3	3,944	10
Total	**39,378**	**100**

Source: Villanueva CLUP (2017-2027)

Population Projection for the Municipality of Villanueva

In a population projection made by the PSA using the 2015 figures, the population of Villanueva will increase to 45,109 by the year 2025. The population of the different barangays either increased or decreased in the projected timeframe based on the respective annual growths of each locality. There are barangays with a positive growth rate while barangay Balacanas exhibited a negative annual growth resulting to a decrease in the projected population.

Table 2.4.4. Population projection of the Municipality of Villanueva, Misamis Oriental and its barangays, 2020-2025*

Municipal/ Barangay	2020	2021	2022	2023	2024	2025
Villanueva	42,588	43,152	43,687	44,191	44,666	45,109
Balacanas	2,748	2,766	2,800	2,832	2,863	2,691
Dayawan	7,248	7,344	7,435	7,521	7,602	7,677
Imelda	3,667	3,716	3,762	3,805	3,846	3,885
Katipunan	6,116	6,197	6,274	6,346	6,414	6,478
Kimaya	1,190	1,205	1,220	1,234	1,248	1,260
Looc	4,584	4,644	4,702	4,756	4,807	4,855
Poblacion I	2,746	2,782	2,817	2,849	2,880	2,909
Poblacion 2	2,547	2,581	2,613	2,643	2,671	2,698
Poblacion 3	4,266	4,322	4,376	4,426	4,474	4,518
San Martin	7,488	7,588	7,682	7,770	7,654	7,932
Tambobong	6	7	7	7	7	7

*Note:*Based on the population in the 2015 census population and the 2015 Census-based Population projections of PSA*

Age dependent population

The computed age dependency ratios, as shown in **Table 2.4.5**, depict that among the population of Villanueva, there were 50 youth dependents to every 100 of the working age population while five (5) senior citizens were dependent on every 100 of the working population. On the whole, there were 55 dependents (young and old-age) to every 100 of the working population.

The median age of 25 indicates that half of the entire population of Villanueva was aged below 25 while the other half were over the age of 25.

Table 2.4.5. Age dependent population

Age group	Population (2015)	%
Under 1	945	2.4
1-4	3,693	9.38
5-9	4,303	10.93
10-14	3,839	9.75
15-19	3,445	8.75
20-24	3,790	9.62
25-29	3,773	9.58
30-34	3,232	8.21
35-39	2,945	7.48
40-44	2,330	5.92
45-49	1,968	5.00
50-54	1,651	4.19
55-59	1,263	3.21
60-64	949	2.41
65-69	584	1.48
70-74	260	0.66
75-79	226	0.57
80 and over	182	0.46
Total	39,378	100
Youth Dependency ratio: 50.42 Old age dependency ratio: 4.94 Total Dependency ratio: 55.36 Median age: 24.57		

Source: https://www.philatlas.com/mindanao/r10/misamis-oriental/villanueva.html

Labor force population by sex and employment status

According to the Villanueva CLUP, the municipality had 58.84% of the working population who were employed while 41.165 were not. These figures were almost the same as depicted in the provincial data where 59.72% of the labor force were employed and 40.28% were unemployed. These figures further imply that there was a considerable number of the population both in the province and the municipality that were unemployed in year 2015.

Table 2.4.6. Labor force population by sex and employment status, 2015

Sex	Municipality					Provincial				
	Population 15 years old and over	Employed	%	Un-employed	%	Population 15 years and over	Employed	%	Un-employed	%
Male	12,932	10,446	42.69	2,486	10.16	29,7697	23,7709	40.81	59,988	10.30
Female	11,539	3,953	16.15	7,586	31.00	28,4791	11,0179	18.92	174,612	2998
Total	**24,471**	**14,399**	**58,84**	**10,072**	**41.16**	**58,2488**	**34,7888**	**59.72**	**234,600**	**40.28**

Source: Villanueva CLUP

Population density

The barangay in Villanueva with the most number of people living on a given area was Poblacion 3 with 303.38 persons per sq km while barangay Tambobong was the least dense with 0.04 person/sq km. On the average, the urban barangays had a density of 8 persons/sq km while the lone rural barangay KImaya had a density of 2 persons/sq km.

Table 2.4.7. Population density by barangay, 2015

Barangay	Population	Land area (sq km)	Density (persons/sq km)
Poblacion 1	2530	87	29.18
Poblacion 2	2,355	81	29.07
Poblacion 3	3,944	12	303.38
Dayawan	6,702	588	11.4
Imelda	3,391	1,505	2.25
Katipunan	5,655	294	19.23
Looc	4,238	362	11.71
San Martin	6,924	1,218	5.68
Balacanas	2,524	223	11.32
Tambobong	6	141	0.04
Rural	1,100	710	2
Kimaya	1,100	710	1.55
Total	**39,378**	**5,222**	**7.50**

Source: Philippine Statistics Authority, 2015 as cited in the Villanueva CLUP

Urbanization level for the past 20 years

In the past twenty (20) years, **Table 2.4.8** shows that the municipality has grown from a 66.58% level towards its attainment of urbanization at a level of 97.21%.

Table 2.4.8. Urbanization level

Year	Barangay population			Level of urbanization (%)
	Urban	Rural	Total	
1980	7,920	3,975	11,895	66.58
1990	11,524	5,598	17,122	67.31
1995	12,707	8,603	21,310	59.63
2000	16,167	8,700	24,867	65.01
2010	31,061	905	31,966	97.17
2015	38,278	1,100	39,378	97.21

Source: Philippine Statistics Authority as cited in the Villanueva CLUP

Marital Status

Table 2.4.9 shows that single (43.62%) and married (44.48%) members of the population in Villanueva almost have the same proportion as to the number of residents belonging to the said classifications. There was only 3.63% who were widowed while 1.32% was categorized as divorced or separated. There was 6.75% of the population who had live-in arrangements with their partners.

Table 2.4.9. Household population 10 years old and over by age group, sex and marital status, Villanueva, 2015

Age group	HH population 10 years old and over	Marital status					
		Single	Married	Widowed	Divorced/ separated	Live-in	Unknown
Both sexes	28,310	12,349	12,592	1,027	375	1,912	55
		43.62	44.48	3.63	1.32	6.75	0.19
Below 20	8,574	8,107	165	17	13	240	31
20-24	3,276	2,015	761	3	29	460	8
25-29	3,108	966	1,617	14	46	459	5
30-34	2,611	434	1,901	20	47	207	1
35-39	2,356	283	1,842	37	39	155	0
40-44	2,081	182	1,665	51	54	127	0
45-49	1,796	119	1,459	68	47	102	0
50-54	1,486	102	1,130	119	47	87	0
55-59	1,087	54	842	1126	30	34	1

Age group	HH population 10 years old and over	Marital status					
		Single	Married	Widowed	Divorced/ separated	Live-in	Unknown
60-64	614	38	448	96	10	18	3
65-69	475	16	334	113	3	8	1
70-74	422	16	257	138	4	7	1
75-79	239	9	106	114	1	7	1
80 and over	186	7	63	111	4	1	0

Source: Villanueva CLUP

Dialects Spoken

The profile data of the province of Misamis Oriental as cited in the CLUP of Villanueva stated that Cebuano is the primary spoken language in the province. Many are fluent in Tagalog as a secondary language while English is used in transacting business and in the academe. *Maranao* is also spoken within the province.

Religious affiliation

There are various religious affiliations of the residents in Villanueva as shown in **Table 2.4.10**. However, the same table shows that the Roman Catholic religion was practiced by majority or 81% of the population.

Table 2.4.10. Religious affiliation

Religious affiliation	Number	%
Aglipay	129	0.3
Association of Fundamental Baptist Churches in the Philippines	34	0.08
Bible Baptist church	249	0.6
Buddhist	15	0.04
Church of Christ	27	0.07
Church of Jesus Christ of the Latter day saints	113	0.3
Evangelical Christian Outreach Foundation	14	0.04
Evangelicals (Philippine Council of Evangelical Churches)	1,342	3.4
Faith Tabernacle Church (Living rock Ministries)	17	0.04
Iglesia ni Cristo	597	1.5
Iglesias a Dios Espiritu Santo, Incorporated	14	0.04
Islam	287	0.7
Jehovah's Witnesses	172	0.4
Jesus is Lord Church	29	0.07
Lutheran Church in the Philippines	22	0.05
Missionary Baptist churches in the Philippines	7	0.02
National council of Churches in the Philippines	2,448	6.2
Philippine Benevolent Missionaries Association	153	0.4
Philippine Ecumenical Christian Church	24	0.06
Philippine Grace Gospel	10	0.02
Philippine Independent Catholic Church	34	0.09
Roman Catholic, including Catholic Charismatic	31,737	81
Seventh Day Adventist	886	2.2
United Church of Christ in the Philippines	201	0.51
United Pentecostal Church (Philippines), Inc.	47	0.1
Victory Chapel Christian Fellowship	9	0.02
Other Baptists	158	0.4
Other Protestants	72	0.1
Other religious affiliations	496	1.2
Tribal religions	31	0.08
Not reported	5	0.01
Total	39378	100

Source: PSA 2015, using ratio and proportion from province to municipality as sited in the Villanueva CLUP

Literacy

It can be seen from **Table 2.4.11** that 99% of the population in the age group 10 years to over 65 years old were considered to be literate while only one percent (1%) was classified as illiterate. The age group with the highest literacy rate was in the combined ages 10 to 34 years old.

Table 2.4.11. Literacy of household population

Age group	Literate	%	Illiterate	%	Total	%
10-14	3,817	14	22	10	3,839	13
15-19	3,426	12	15	7	3,441	12
20-24	3,575	13	14	6	3,589	13
25-29	3,365	12	16	7	3,381	12
30-34	2,811	10	10	4	1,821	6
35-39	2,582	9	19	8	2,601	9
40-44	2,038	7	16	7	2,054	7
45-49	1,731	6	16	7	1,747	6
50-54	1,475	5	11	5	1,486	5
55-59	1,163	4	20	8	1,183	4
60-64	908	3	13	6	921	3
65 and over	1,198	4	49	22	1,247	4
Total	28,089	100	221	100	28,310	100

Source: PSA, 2015 using ratio and proportion from 2010 data as cited in the Villanueva CLUP

Major occupation by sex

Majority or 81% of the residents in Villanueva pursued trade and related work as an occupation while 32% were laborers and unskilled workers. There was 15% who were either farmers, forestry workers or fishermen. There were other jobs which the residents engaged in and these include government and private employment, professional work, technicians and associate professionals, clerks, service workers, plant and machine operators and other jobs with special description. There were more males in the labor force than females.

Table 2.4.12. Major occupation by sex

Occupation	Male	Female	Total	%
Officials of government and special interest organizations, corporate executives, managers, managing proprietors and supervisors	513	655	1168	8
Professionals	115	200	315	2
Technicians and associate professionals	288	171	459	3
Clerks	191	259	450	3
Service workers and shop and market sales workers	577	604	1,181	8
Farmers, forestry workers and fishermen	1,896	221	2,117	15
Trade and related workers	1,637	112	11,749	83
Plant and machine operators and assemblers	1,017	14	1,031	7
Laborers and unskilled workers	3,051	1,527	4,578	32
Special occupations (including non-gainful activities)	1	-	1	0.007
Other occupations not elsewhere classified	14	12	26	0.2
Occupation not stated	850	190	1,039	7
Total	**10,149**	**3,964**	**14,113**	**100**

Source: Villanueva CLUP

Social services

Housing

Majority of the houses in Villanueva were made of concrete wall and GI sheet roofs. There were also houses with half concrete and half wood walls while bamboo/sawali/cogon/nipa were also materials used to build the walls of the houses. On the other hand, the other roofing materials were tile/concrete, half GI sheets and concrete, bamboo/cogon/nipa and makeshift, salvaged or improvised materials.

Table 2.4.13. Occupied housing units by construction materials, 2018

Construction materials of outer walls	Total occupied housing units	GI/ aluminum	Tile/ con-crete	Half GI half concrete	Bamboo /cogon / nipa/ anahaw	Makeshift / salvaged / im-provised materials	Trapal	Not reported
Concrete / brick/stone	3,251	2,924	136	186	5	-	-	-
Wood	2,659	2,262	3	193	179	10	12	-
Half concrete / brick/ stone and half wood	1,637	1,056	26	545	8	-	2	-
GI/ aluminum	17	14	-	1	1	-	1	-
Bamboo/ sawali/ cogon/ nipa	878	513	-	31	327	2	5	-
Makeshift/ salvaged/ improvised materials	21	5	-	2	1	12	1	-
Trapal	17	6	-	-	3	-	8	-
No walls	-	-	-	-	-	-	-	-
Not responded	38	36	-	-	-	-	-	2
Total	**8,518**	**6,816**	**165**	**958**	**524**	**24**	**29**	**2**

Source: PSA 2015 Census of population as cited in the Villanueva CLUP

Types of fuel for lighting

The type of fuel used by 91% of the households for lighting was predominantly electricity. The other fuels used were kerosene, liquified petroleum gas, solar panel and solar lamp (**Table 2.4.14**).

Table 2.4.14. Types of fuel for lighting, 2015

Type	Number of HH	%
Electricity	7,920	91
Kerosene (gas)	724	8
Liquefied petroleum gas (LPG)	6	0.07
Solar panel	8	0.1
Solar lamp	64	0.7
Others	9	0.1
None	8	0.09
Total	**8,739**	**100**

Source: Villanueva CLUP

Source of water

Water in the municipality was sourced by 46% of the households from their own use faucet community water system. This system entails the households' getting its water supply from faucets inside their houses which are directly connected to a water pipeline from the municipality's water system. This is different from a shared faucet community water system where one faucet is usually shared by 4-6 households. This system has serviced 34% of the Villanueva households as reported in the municipality's CLUP (**Table 2.4.15**).

Table 2.4.15. Source of water for drinking, 2015

Source	Number of HH	%
Own use faucet community water system	4,048	46
Standard faucet community water system	2,981	34
Own use tubed/piped deep well	89	1
Shared tubed/piped deep well	457	5
Tubed/piped shallow well	50	0.6
Dug well	197	2
Protected spring	168	2
Unprotected spring	93	1
Lake, river, rain and others	8	0.09
Peddler	22	0.2
Water purifying stations/Bottled water	626	7
Total	**8,739**	**100**

Note: Excludes HH in relocation area
Source: PSA, 2015 Census of Population as cited in Villanueva CLUP

Health and sanitation

Morbidity

Table 2.4.16 shows the nine (9) common causes of sickness in the municipality. The most common causes of morbidity were all types of bites followed by wounds and acute respiratory infection. The other causes of morbidity were hypertension, cystitis, boils urinary tract infection, impetigo, and tuberculosis.

Table 2.4.16. Causes of morbidity, 2020

Morbidity	Number	Rate
Bite (all Types)	253	58.43
Wound (all types)	235	55.19
Acute respiratory infection	211	48.73
Hypertension	200	46.19
Cystitis	121	27.94
Boil	107	24.71
UTI	92	21.24
Impetigo	76	17.55
Tuberculosis	67	15.47

Source: Villanueva Rural Health Unit Vital statistics 2020

Mortality

In 2020, the most common cause of death in the municipality was the undetermined natural death with 14 documented cases. Cardiovascular disease, chronic hypertensive vascular disease, hypertensive vascular disease, diabetes mellitus, cancer, cerebrovascular disease, coronary artery disease, COPD and vehicular accidents were the other causes of death (**Table 2.4.17**).

Table 2.4.17. Causes of mortality, 2020

Mortality	Number	Rate
Undetermined natural death	14	0.32
Cardiovascular disease	9	0.20
Chronic Hypertensive vascular disease	7	0.16
Hypertensive vascular DS	7	0.16
Diabetes Mellitus	5	0.11
Cancer (all forms)	4	0.09
Cerebrovascular disease	3	0.06
Coronary artery disease	3	0.06
COPD	2	0.04
Vehicular accident	2	0.04

Source: Villanueva Rural Health Unit Vital statistics 2020

Crude birth and death rates and infant and maternal mortality rates

There were 839 cases of crude birth and 77 cases of crude death in 2020. On the other hand, there was no case of infant mortality while there was one (1) case of maternal mortality.

Table 2.4.18. Crude birth and death, infant and maternal mortality, 2020

	Number	Rate
Crude birth	839	19.35
Crude death	77	1.77
Infant mortality	0	0
Maternal mortality	1	1.09

Source: Villanueva Rural Health Unit Vital statistics 2020

Households served with water supply

There were 6991 or 97% of the total households that were served with safe water in year 2020. On the other hand, there were 210 households or 3% that were able to access only unsafe water.

Table 2.4.19. Household served with water supply, 2020

	Number of households	%
Safe	6,991	97
Unsafe	210	3

Source: Villanueva Rural Health Unit Vital statistics 2020

Toilets

Based on the Villanueva Rural Health Unit Vital Statistics of 2020, there were 7205 households or 100% that had access to sanitary toilet facilities (**Table 2.4.20**).

Table 2.4.20. Type of toilets, 2020

Toilet Facility	Number	%
No toilet	0	0
Antipolo	0	0
Sanitary	7,205	100

Source: Villanueva Rural Health Unit Vital statistics 2020

Education

The public preparatory and elementary schools in Villanueva include the Vicente N. Chaves MCS, San Martin ES, Balacanas ES, Dayawan ES, Don Fernando Jacinto ES, Looc ES, Kalingagan ES, Nangka ES, Lukong Es, Kirahon ES, Kimaya ES.

The private preparatory and elementary schools in the locality were the Our Lady of Guadalupe School of Villanueva, Inc., Regina Angelorum School, and Liberty Christian School. The public secondary schools include the Villanueva NHS, Kalingagan NHS, Tambal NHS and Villanueva Senior High school stand-alone.

There was one (1) private secondary school identified as the Regina Angelorum School.

Protective services

Crime incidence

The crime incidence of Villanueva has gone down from 2013-2017. Of the crimes recorded, the most prevalent crimes were reckless imprudence resulting in physical injury, damage to property, theft and homicide.

These crimes generally transpired at the urban barangays namely: Brgy Looc, Poblacions 1, 2, & 3, Katipunan, and San Martin. However, of the three prevalent crimes, theft and physical injury were attributed to illegal drugs and liquor intoxication, respectively. But these crimes have gone down due to the relentless conduct of police-initiated operations and police presence at the identified crime prone areas. The peace and order situation of the municipality of Villanueva was considered to be manageable hence, generally peaceful.

Protective services by facility and equipment

The condition of the facilities of the police and jail management protective services were described to be from poor to fair as shown in **Table 2.4.21**. These services were reported to be located in Barangay Poblacion I.

Table 2.4.21. Protective services by facility and equipment, 2015

Type of service	Barangay	Physical condition of facilities	Number of personnel	Personnel to population ratio	Vehicles	
					Number	Type
Police						
Head quarters	Poblacion 1	Poor	34	1:1313	4	Patrol cars/ motorcycles
Substation						
Outpost	Poblacion 1	Fair	2			
Traffic	Poblacion 1	Fair	25	1:1575	3	Motorcycle/ bongo
Jail management						
Provincial jail						
District jail	Poblacion 1	Fair	6	1:01	0	
Municipal jail						
Total		198	67		7	

Source: Villanueva CLUP

Economic Sector

The Municipality of Villanueva which is strategically located on an industrial corridor in North Mindanao, has undergone many major changes that are still on-going at a brisk pace which makes it as one of the industrial hubs in Misamis Oriental. With the establishment of Phividec Industrial Estate by virtue of Presidential Decree 538 in 1972, almost one third of the municipality was allocated for industrial establishments covering the areas of Barangay Tambobong, Balacanas and part of San Martin, Dayawan and Katipunan.

Furthermore, data shows that in year 2011, there were 14 industrial establishments located in the municipality, fifteen (15) in 2012, fifteen (15) in 2013, sixteen (16) in 2014 and seventeen (17) in 2017 or basically an increase of one establishment every year. The number of people employed increased annually. There was however no data indicated in year 2013 (**Table 2.4.22**).

Table 2.4.22. Historical data on industrial areas, 2015

Year	Industrial establishments		Area covered		Employment	
	Number	Increase/ decrease	Area (ha)	Increase/ decrease	Number	Increase/ decrease
2011	14		254.85		2,298	
2012	15	1	257.3	2.45	2,333	35
2013	15	-	257.30	-	-	-
2014	16	1	263.3	6	2,583	250
2015	17	1	268.30	5	2,733	150

Source: Planning office Primary survey as cited in the Villanueva CLUP

Commercial establishment by economic activity

There was a total of 354 establishments recorded in 2017 with 2,588 people employed. The total revenue generated by the establishments on the same year amounted to PhP 37,224,789.86. The economic activities undertaken by these establishments include wholesale and retail trade, hotels/restaurants, transport, storage and communication, real estate, renting and business activities, education, health and social work and other community, social and personal services.

Table 2.4.23. Commercial establishment by economic activity

Economic activity	Previous census year (2017)		Revenue in Php
	Number of establishments	Number of employees	
Wholesale and retail trade/ repair of motor vehicles, motorcycles, personnel and household goods	171	1,002	34,100,417.75
Hotels/restaurants	3	24	19,326.92
Transport, storage and communication	20	32	367,169.86
Financial intermediation	23	115	283,009.42
Real estate, renting and business activities	21	546	129,335.83
Education	4	137	6,294.00
Health and social work	5	13	122,831.17
Other community, social and personal services and activities	107	717	2,196,404.91
Total	**354**	**2,588**	**37,224,789.86**

Source: Municipal Treasurer's Office as cited in the Villanueva CLUP

Agriculture

The municipality of Villanueva has engaged in the cultivation of various crops. The highest production recorded in 2017 was for banana at 2,650MT followed by pineapple at 1,750MT. Rice production was reported to be 1,234.5MT while corn was at 1,554MT. The other crops produced include cassava, mango, coconut, vegetables, rubber and root crops (**Table 2.4.24**).

Table 2.4.24. Villanueva Crop production, 2017

Crop	Area (ha)	Production (MT)
Rice	194	1,234.50
Corn	222	1,554.00
Cassava	60	610.00
Banana	212	2,650.00
Mango	69	153.00

Coconut	69	193.20
Pineapple	35	1,750.00
Vegetables	46.75	233.75
Rubber	18	276.80
Root crops	35.5	355.00

Source: Municipal Agriculture Office as cited in the Villanueva CLUP

Livestock

Livestock farms were classified as backyard. The area is suitable and is widely cultivated to various legumes and forages intended for livestock. Barangay Dayawan has a considerable number of swine raisers as well as poultry commercial growers.

Fisheries and aquaculture

Table 2.4.25 shows that there are two (2) fishponds found in barangay Kimaya while a fish sanctuary is located in Brgy. Looc. There were there (3) mangrove areas with two (2) located in Brgy. Balacanas and one (1) in Brgy. Katipunan.

Table 2.4.25. Existing resources

Facility/ Resource	Barangay	Number	Type
Fish pond	Kimaya	2	Fresh water
Fish sanctuary	Looc	1	Protected area/coastal
Mangrove	Balacanas	2	Habitat
	Katipunan	1	Habitat

Source: MAO/Fishery section as cited in the Villanueva CLUP

The nearest mangrove area is in Barangay Katipunan, the host barangay of the project, within Phoenix Petroleum compound which is about 0.5km from the berth of PSC. The estimated area is more than 12,000m^2. The area is off-limit. Another patch of mangrove is 2km south of the project area, in Brgy. Balacanas along Tagoloan River with an estimated area of 87,000m^2. The distance is considered to be outside of the immediate impact area of the project.

The existing fishing grounds for marine resources were identified to be in Brgys. Looc, Poblacion I, Poblacion 2 and Balacanas. On the other hand, inland fishing grounds are found in barangay Kimaya. The market for their harvest was classified as local buyers (**Table 2.4.27**).

Table 2.4.26. Existing fishing grounds and aquaculture production

Fishing ground	Barangay	Volume	Production		Post-harvest facilities		Status	Product market
			Value	Type	Number	Capacity		
Marine	Looc	21	2.52 M	Fish market	1	21	Good	Local
	Poblacion 1	20	2.00 M	Fish market	1	20	Good	Local
	Poblacion 2	60	6.oo M				Good	Local
	Balacanas	30	3.00 M				Good	Local
Inland	Kimaya	5	6.00 M				Good	Local

Source: MAO, fishery Section as cited in the Villanueva CLUP

Physical infrastructure

Road transport is the primary mode of transportation in the municipality of Villanueva. The road network is linked by a barangay road, municipal road and streets, provincial road and national primary & secondary roads with a total length of 170.66km.

As of 2015, the road surface types that exist in the municipality were concrete and gravel roads. Concrete roads comprised 135.23 km that is equivalent to 79.24% of the total road covering. Gravel road with good to fair condition stretched to 35.43km which corresponded to 20.76% of the total road length. The construction and maintenance of roads was expected to generate huge employment opportunities in the locality.

Water system

The LGU operates a Level III local waterworks system which has a total of 3,088 connections, with ninety seven percent (97%) of these as domestic consumers, 2% as commercial and less than one percent (1%) as industrial users. While less than one percent (1%) was assigned for industrial consumption, these industries eat up the biggest in terms of cubic meter per industry per month. Industries consume an average of 458m^3 per industrial establishment while commercial establishments use only 54m^3 per establishment. Domestic consumption was pegged at only 22m^3 per household per month.

Communication service facilities

PHLPOST, a public postal services provider, is located in the municipal hall while PLDT provides telephone services. This is backed up by Smart and Globe Telecommunications which started operating in 2003 and 2006, respectively. Cable television is provided by Parasat while radio broadcasting is run by V Radio, Bandera, and Hope Radio.

Garbage disposal

In 2015, slightly more than half (53.9%) of the total households of the municipality burned their garbage while 31.3% were picked up by garbage truck. There was 10% of the households that did not burn their trash but dumped these in individual household pits. There was 2.7% of the households who practiced composting, while 1.8% buried their waste in the ground.

Profile of Barangay Katipunan

Political information

As per Resolution of the provincial Board of Misamis Oriental, approved on July 17, 1972, Barangay Katipunan was created.

Physical information

Barangay Katipunan has a land area of 150 hectares and it is categorized as an urban barangay.

Fiscal information

The Internal Revenue allotment (IRA) of barangay Katipunan exhibited an increasing trend in the years 2017 to 2021. In 2017, the IRA which was reported to be at PhP3,676,000 increased to PhP5,959,368 within a five-year period in 2021. The increase was estimated at PhP2,283,368.

Table 2.4.27. Fiscal information

Year	Internal Revenue Allotment (IRA) in PhP
2017	3,676,000
2018	4,419,700
2019	4,926,252

2020	5,556,432
2021	5,959,368

Source: 2021 Barangay Katipunan Profile

Demographic information

According to the Barangay Nutrition Scholar (BNS) survey in 2021 as shown in **Table 2.4.28**, there were 7,982 individuals residing in the barangay. Of this number, 50% (3,985 residents) was classified as male while the other 50% (3,997 residents) was comprised of the female population. There was a total of 1,883 households with 2,586 families. These findings connote that there were more than one family residing in one house.

Table 2.4.28. Demographic information

Demographic information	Number
Population	7,982
Number of males in population (50%)	3,985
Number of females in population (50%)	3,997
Number of households	1,883
Number of families	2,586

Source: BNS 2021 Survey

Basic utilities/services

Table 2.4.29 shows that the main power supplier in the barangay is the CEPALCO servicing 2,586 families. On the other hand, water is supplied to 2,586 families through the municipal water district. The major means of transportation in the barangay are through public utility jeepneys, motorized “sikad” and motorcycle.

Communicating within and outside the barangay is through the telephone service by the Philippine Long Distance Telecommunications Company (PLDT) while mobile phones were provided signals through Smart, Globe and Sun Cellular mobile service providers.

Table 2.4.29. Basic utilities/services

Utility/service	Kind	Number of families with access
Power supply	CEPALCO	2,586
Water supply	Municipal water district	2,586
Means of transportation	PUJ, motorized sikad, motorcycle	
Means of communication	Telephone (PLDT) mobile phones (Smart, Globe, Sun), VHF radio	

Source: 2021 Barangay Katipunan Profile

Health information

Morbidity

Table 2.4.30 shows that there was an increase in the number of persons who were sick from 817 in 2019 to 1384 in 2020. The leading causes of these illnesses were fever, cough and colds, skin lesions, hypertension, ear pains, sore eyes, diarrhea, mumps, skin allergies, swollen wounds and hypogastric pain.

Table 2.4.30. Barangay Katipunan health data in 2019 and 2020

Health data	2019	2020	Increase/ decrease	Leading/common causes
Morbidity	817	1,384	Increase	Fever, cough and colds, skin lesions, hypertension, ear pains, sore eyes, diarrhea, mumps, skin allergy,

				swollen wound, hypogastric pain
Mortality	45	17	Decrease	Acute cardio respiratory arrest, chronic obstructive pulmonary disease (COPD), diabetes mellitus, motor accident
Infant mortality	2	0	decrease	asthma
Maternal mortality	0	0	0	-

Source: 2021 Barangay Katipunan Profile

Mortality

With regard to the cases of death in the barangay, there was a reported decrease from 45 in 2019 to 17 in 2020. The common causes of mortality were acute cardio respiratory arrest, chronic obstructive pulmonary disease (COPD), diabetes mellitus and accidents (**Table 2.4.30**).

Table 2.4.30 shows that there was a decrease in infant mortality cases from two (2) in 2019 to zero (0) in 2020. There was no case of maternal mortality in the two given years. The common cause of infant mortality in 2019 was asthma.

Profile of Barangay San Martin

Physical Information

Barangay San Martin, a rural area, is composed of 1,021 hectares.

Fiscal information

Table 2.4.31 shows that based on the barangay profile of San Martin, their estimated budget for the year 2021 is PhP9,000,000. Its IRA is PhP6,988,000 while the share they get from real property taxes is PhP1,400,000. The other income derived is from fees and charges which amounted to PhP111,268 while the grants and donations they obtained totaled to PhP122,197.

Table 2.4.31. Fiscal information

Information	Pesos (PhP)
Estimated budget	9,000,000
Internal Revenue Allotment	6,988,000
RPT share	1,400,000
Fees and charges	111,268
Grants and donations	122,197

Source: Barangay San Martin 2021 Profile

Socio-demographic Information

Population

The population of Barangay San Martin recorded in 2021 was 5,568. There were 24,38 or 44% male residents while 3,130 or 56% were comprised of females. There was a total of 1111 households with 1054 families.

Table 2.4.32. Population by gender, number of households and families

Data	Male		Female		Total
	No.	%	No.	%	
Population	2,438	44	3,130	56	5,568
Number of households					1,111
Number of families					1,054

Source: Barangay San Martin 2021 Profile

Labor force

With a total of 2,000 members of the population who were in the working age class, there were 945 individuals or 47% who were gainfully employed while 1,055 of 53% were classified as unemployed (**Table 2.4.33**).

Table 2.4.33. Labor force

Labor Data	Number	% of population
Individuals in the labor force	945	47
Unemployed	1,055	53
Total number of working age residents	2,000	100

Source: Barangay San Martin 2021 Profile

Basic utilities/services

The barangay profile listed 1565 families who have access to power which was distributed by the CEPALCO as shown in **Table 2.4.34**. On the other hand, there were 236 families who obtained water for their domestic use from the barangay's water supply system. The means of transportation used by the local folks include public utility jeepneys and motorcycles. To be able to communicate their personal, official or business concerns, the barangay residents use either VHF radios or mobile phones. The cellular phones are serviced by either the Smart, Globe or Sun Cellular telecommunication companies.

Table 2.4.34. Basic utilities/services

Utility/service	Service Provider	Number of families with access
Power	Cagayan Electric Power and Light Company, Inc. (CEPALCO)	1,565
Water supply	Barangay San Martin water supply	236
Means of transportation	Public Utility jeepneys, motorcycle	
Means of communication	Mobile phones, VHF radios Mobile phone service provider – Smart, Globe, Sun	

Source: Barangay San Martin 2021 Profile

Health information

Morbidity

The leading causes of morbidity in the barangay according to their 2021 profile include fever, cough, colds, skin lesions, hypertension, sore eyes, diarrhea, mumps, skin allergy, swollen wounds and dog bites. Comparing the 2018 and 2019 records, **Table 2.3.35** shows that there was a decrease from 806 cases in 2018 to 581 cases in 2019.

Table 2.4.35. Barangay San Martin Health Data in 2018 and 2019

Health data	2018	2019	Increase/ decrease	Leading causes
	No. of cases	No. of cases		
Morbidity	806	581	Decrease	Fever, cough and colds, skin lesion, hypertension, sore eyes, diarrhea, mumps, skin allergy, swollen wound, dog bite
Mortality	5	6	Increase	Acute cardio respiratory arrest, chronic obstructive pulmonary disease, diabetes
Infant mortality	0	0	0	-
Maternal mortality	0	0	0	-

Source: Barangay San Martin 2021 Profile

Mortality

The leading causes of death in the barangay were acute cardio-respiratory arrest, COPD and diabetes as shown in **Table 2.4.35**. The 2021 barangay profile documented an increase

from five (5) cases in 2018 to six (6) cases in 2019. The same table shows that there was no incidence of infant and maternal mortality in the given years.

Data on Local Covid-19 Cases

As of August 25, 2021, there were 48 active cases, 333 recovered and 25 deaths from COVID-19 in the Municipality of Villanueva. The impact barangays of Poblacion I had three (3) active cases, 41 recoveries and 3 deaths while San Martin reported four (4) active cases, 34 recoveries, and one (1) death. Barangay Katipunan recorded 11 active cases, 61 recoveries and four (4) deaths (www.villanuevamisor.gov.ph).

There was an increase from last year's data in the number of deaths (33) and recoveries (479) on January 22, 2022, while there was a decrease in the municipality's active cases to 34. Barangay Poblacion I, with its documented two (2) active cases and five (5) recoveries had an increase in death cases to four (4). Barangay Katipunan, recorded a decrease in active cases to four (4) and an increase in recoveries to 79. The barangay's death toll remained the same at four (4). There were two (2) active cases in San Martin, 45 recoveries and two (2) deaths (www.villanuevamisor.gov.ph).

Profile of Barangay Poblacion 1

Land area and barangay boundaries

Barangay Poblacion I has a land area of 88ha. It is bounded in the north by Brgy. Looc, in the South by Poblacion 2 and 3, in the East by Sitio Nangka and in the West by Macajalar Bay.

The barangay is situated about 25km from the center of the municipality.

Population

According to the 2020 Barangay Poblacion 1 profile, its population was 3,750 individuals as shown in **Table 2.4.36**. This was composed of 1900 male residents or 51% and 1834 female individuals (49%). There were 864 households and 2,086 families in the barangay.

Table 2.4.36. Population of Barangay Poblacion 1

Data	Male		Female		Total
	No.	%	No.	%	
Population	1,900	51	1,834	49	3,750
Number of households					864
Number of families					2,086

Source: Barangay Poblacion I Profile, 2020

Other sectors of the barangay population

Table 2.4.37 shows that there were 99 individuals or 3% of the population who were recipients of the 4Ps program. On the other hand, there were 253 females or 7% and 228 or 6% of the population who belonged to the senior's group while 74 or 2% were classified as persons with disability. Based on the 2020 data, there were 601 families or 29% of the total number in the barangay who were affected by calamities that occurred in the locality.

Table 2.4.37. Other sectors in the barangay population

Sector	Number	% of population
4 Ps	99	3
Senior citizen		
- Female	253	7

- Male	228	6
Persons with disability	74	2
Families affected by calamity	601	29
Population =3,750		
Number of families=2,086		

Source: Barangay Poblacion I Profile, 2020

Results of the Household Perception Survey

General Information of Respondents

Respondent's Position in the Family

It can be seen in **Table 2.4.38** that majority of the respondents from Poblacion I (55.56%) and Katipunan (59.46%) were identified as the household heads. There was only 26.67% of the respondents from San Martin who were heads of the household. On the other hand, the spouses who were left behind in their dwelling places to serve as interviewees for the survey consisted the majority in San Martin (71.11%) while a relatively good portion of the respondents in Poblacion I (44.44%) and Katipunan (40.54%) were stated as the spouses. There was only one (1) respondent who indicated being the child who acted as respondent and this person was from San Martin. On the whole however, 55 or 55% of the respondents considered themselves as the spouse.

Table 2.4.38. Respondent's position in the family

Position	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Head of the Family	10	55.56	12	26.67	22	59.46	44	44.00
Spouse	8	44.44	32	71.11	15	40.54	55	55.00
Child	0	0.00	1	2.22	0	0.00	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Respondent's Gender

Table 2.4.39 shows that in all the barangays covered for the survey, there was 68 or 68% of the respondents who were classified as female while only 32% belonged to the male group.

It can also be seen from **Table 2.4.39** that there were three (3) in Poblacion I, three (3) in San Martin and seven (7) in Katipunan for a total of 13 or 13% of the total number of respondents interviewed who were headed by females.

Table 2.4.39. Respondent's gender

Gender	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Female	11	61.11	35	77.78	22	59.46	68	68.00
Male	7	38.89	10	22.22	15	40.54	32	32.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Age

Table 2.4.40 shows the age range of the respondents captured during the household survey. Taking into account the overall results for the three (3) impact barangays, and consolidating the figures for the different age classifications, it was computed that there were 22 or 22% of the respondents in the 15 to 34 years old age group while majority or 62% belonged to the 35-59 years old level. There were only 16 or 16% who fit into the 60 years old and over age category.

Table 2.4.40. Respondent's age

Age	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
15-19	0	0.00	1	2.22	0	0.00	1	1.00
20-24	0	0.00	2	4.44	2	5.41	4	4.00
25-29	2	11.11	4	8.89	2	5.41	8	8.00
30-34	1	5.56	6	13.33	2	5.41	9	9.00
35-39	2	11.11	4	8.89	3	8.11	9	9.00
40-44	2	11.11	8	17.78	4	10.81	14	14.00
45-49	2	11.11	4	8.89	3	8.11	9	9.00
50-54	3	16.67	5	11.11	8	21.62	16	16.00
55-59	4	22.22	3	6.67	7	18.92	14	14.00
60-64	0	0.00	5	11.11	2	5.41	7	7.00
65 and over	2	11.11	3	6.67	4	10.81	9	9.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Civil Status

Majority of the respondents from all the impact barangays – Poblacion I (55.56%), San Martin (71.11%) and Katipunan (64.86%) reported to be married. On the whole, respondents from all three (3) barangays indicated that they were either widowed (12%), in a live-in relationship (11%), single (7%) or divorced/separated (4%) (**Table 2.4.41**).

Table 2.4.41. Respondent's civil status

Civil Status	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Live-in	2	11.11	4	8.89	5	13.51	11	11.00
Single	2	11.11	4	8.89	1	2.70	7	7.00
Married	10	55.56	32	71.11	24	64.86	66	66.00
Widowed	3	16.67	3	6.67	6	16.22	12	12.00
Divorced/separated	1	5.56	2	4.44	1	2.70	4	4.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Religious affiliation

Table 2.4.42 shows that the predominant religion practiced by the respondents was Catholicism at 85%. The other religious affiliations stated were Born Again (6%), Mormon (3%), Jehovah's Witness (1%), Baptist (1%), Protestant (1%), Iglesia ni Cristo (1%) and others (2%).

Table 2.4.42. Respondent's religious affiliation

Religious affiliation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Born Again Christian	1	5.56	0	0.00	5	13.51	6	6.00
Catholic	14	77.78	42	93.33	29	78.38	85	85.00
Mormon	2	11.11	1	2.22	0	0.00	3	3.00
Jehovah's Witness	1	5.56	0	0.00	0	0.00	1	1.00
Baptist	0	0.00	1	2.22	0	0.00	1	1.00
Protestant	0	0.00	0	0.00	1	2.70	1	1.00
Iglesia ni Cristo	0	0.00	0	0.00	1	2.70	1	1.00
Others	0	0.00	1	2.2	1	2.70	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Educational Attainment

It can be seen from **Table 2.4.43** that most of the respondents from San Martin and Katipunan combined were able to finish secondary education while about 23% of the respondents from all the barangays were able to reach high school level. There was an average of 24% of the respondents who were able to reach college but did not graduate

while 13 or 13% completed their respective college degrees. The courses completed to name a few, were Criminology, Medical field, Education, Accountancy/Business and Secretarial.

Table 2.4.43. Respondent's educational attainment

Educational Attainment	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Elementary level	0	0.00	0	0.00	5	13.51	5	5.00
Elementary graduate	0	0.00	1	2.22	1	2.70	2	2.00
High school level	7	38.89	5	11.11	11	29.73	23	23.00
High school graduate	0	0.00	22	48.89	6	16.22	28	28.00
Vocational level	0	0.00	0	0.00	1	2.70	1	1.00
Vocational graduate	2	11.11	0	0.00	2	5.41	4	4.00
College level	3	16.67	11	24.44	10	27.03	24	24.00
College graduate	0	0.00	1	2.22	0	0.00	13	13.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Ethnicity

Table 2.4.44 shows that there was 98% of the respondents who reported to belong to an ethnic group which was identified to be Higaonon.

Table 2.4.44. Respondent's ethnicity

Whether part of an ethnic group	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	0	0.00	0	0.00	2	5.41	2	2.00
Yes	18	100.00	45	100.00	35	94.59	98	98.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.45. Respondent's ethnic group

Ethnic group	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Higaonon	18	100.00	45	100.00	35	94.59	98	98.00
N/A	0	0.00	0	0.00	2	5.41	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Dialect/languages Spoken

Bisaya was reported to be the major dialect spoken in Poblacion I (94.44%), in San Martin (100%) and Katipunan (100%). The other dialects/languages spoken was Tagalog (14%) and English (8%) (**Table 2.4.46**).

Table 2.4.46. Respondent's language spoken

Language/Dialect	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Tagalog	10	28.57	1	2.17	3	7.50	14	11.57
Bisaya	17	48.57	45	97.83	37	92.50	99	81.82
English	8	22.86	0	0.00	0	0.00	8	6.61
Total	**35**	**100.00**	**46**	**100.00**	**40**	**100.00**	**121**	**100.00**

Household Information of Respondents

Sources of income

Table 2.4.47 shows that the incidence of having an income source was highest in Barangay Poblacion I (83.33%), followed by Katipunan (59.56%) and lastly San Martin (55.56%). On the average, there were 62 or 62% of the total respondents from the impact barangays who indicated to have a job or a source of income while 38% did not.

Table 2.4.48 shows that the most common source of income for 16% of the total interviewees was being employed as a worker in the barangay or government. On the other hand, self-employment or engagement in business was the source of income by 10% of the respondents while 8% derived income from being employed as professionals. There were seven (7) or 7% who were caretakers, street sweepers, housemaid/boy doing menial jobs. Rice and vegetable farming was also one of the cited sources of income by 3% of the respondents. Their skills as welder, carpenter, mechanic, and electrician were tapped as mentioned by 3% of the respondents for them to land a job. Fishing was also stated as a source of income by only 1% while six (6) or 6% indicated that they were factory workers.

Table 2.4.47. Respondent's employment status

Whether has a job or income source	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	15	83.33	25	55.56	22	59.46	62	62.00
None	3	16.67	20	44.44	15	40.54	38	38.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.48. Respondent's Job or source of income

Job/ Source of income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No job	3	16.67	20	44.44	15	40.54	38	38.00
No Answer	0	0.00	1	2.22	0	0.00	1	1.00
Employed (Teacher/ Medical Asst./ Military/ Field Coordinator/ Admin Staff/ Sales Clerk/ Sales Agent/ Security Guard/ Supervisor/ Nurse)	3	16.67	4	8.89	1	2.70	8	8.00
Cook/ Labandera/ Caretaker/ Street Sweeper/ Gardener/ House maid/ House boy	1	5.56	6	13.33	0	0.00	7	7.00
Laborer/ Mechanic Aid/ Pahinante	1	5.56	1	2.22	4	10.81	6	6.00
Barangay Workers (Captain/Kagawad/ Healthworker/ Tanod/ Barangay Police/ BHW/ Barangay Utility/ Daycare Worker)	5	27.78	4	8.89	7	18.92	16	16.00
Self-employed/Business	2	11.11	4	8.89	4	10.81	10	10.00
Farmer (Rice Vegetable farm/ Farming related activities	3	16.67	0	0.00	0	0.00	3	3.00
Skilled Worker (Welder/ Carpenter/ Mechanic/ Electrician	0	0.00	2	4.44	1	2.70	3	3.00
Driver	0	0.00	0	0.00	1	2.70	1	1.00
Fishermen/Fishing related activities	0	0.00	0	0.00	1	2.70	1	1.00
Factory Worker	0	0.00	3	6.67	3	8.11	6	6.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Place of work

Most of the respondents worked within their barangays with 61.11% in Poblacion I, 40% in San Martin and 43.24% in Katipunan. There was 7% who worked outside the barangay, 1% in other barangays in Misamis Oriental, 6% in other towns of Misamis Oriental and 3% in other provinces.

Table 2.4.49. Respondent's place of work

Place of Work	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No work	3	16.67	20	44.44	15	40.54	38	38.00
Within barangay	11	61.11	18	40.00	16	43.24	45	45.00
Outside barangay	0	0.00	7	15.56	0	0.00	7	7.00
Other barangays in Misamis Oriental	1	5.56	0	0.00	0	0.00	1	1.00
Other towns in Misamis Oriental	0	0.00	0	0.00	6	16.22	6	6.00
Other provinces	3	16.67	0	0.00	0	0.00	3	3.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Monthly Income

For those who were employed, the average monthly income reported by 16% of the respondents was from PhP7,251-10,000. The highest income of more than PhP20,000 per month was indicated by 5% of the respondents while the lowest was less than PhP1,000 as reported by two (2) or 2% of the respondents. There were 29 or 29% of the respondents who earned from PhP1,001 to PhP7,250 per month.

Table 2.4.50. Respondent's monthly income

Monthly Income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Unemployed	3	16.67	20	44.44	15	40.54	38	38.00
< Php 1,000	0	0.00	1	2.22	1	2.70	2	2.00
Php 1,001-2,500	3	16.67	2	4.44	7	18.92	12	12.00
Php 2,501-5,000	0	0.00	4	8.89	3	8.11	7	7.00
Php 5,001-7,250	4	22.22	4	8.89	2	5.41	10	10.00
Php 7,251-10,000	4	22.22	6	13.33	6	16.22	16	16.00
Php 10,001-15,000	2	11.11	3	6.67	2	5.41	7	7.00
Php 17,251-20,000	0	0.00	2	4.44	0	0.00	2	2.00
>Php 20,000	1	5.56	3	6.67	1	2.70	5	5.00
Total	**17**	**94.44**	**45**	**100.00**	**37**	**100.00**	**99**	**99.00**

Other sources of income by the respondents

There were 33 or 33% of the respondents who indicated that they had other income sources while the remaining 67% did not (**Table 2.4.51**).

Table 2.4.51. Respondent's other source of income status

Whether there are other sources income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	6	33.33	12	26.67	15	40.54	33	33.00
No	12	66.67	33	73.33	22	59.46	67	67.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

The other sources of income as shown in **Table 2.4.52** include vending or selling various items (15%), pension (7%), laundry services (1%), 4Ps allowance (2%), agricultural sources/farm produce (1%), singing in a band (1%), property rentals (2%), sewing/dressmaking (1%), blacksmith services (1%), painting (1%) and foreign remittances (1%).

The income derived from other sources ranged from less than Php 1,000 to more than Php 20,000 per month with majority earning from less than Php 1,000 to Php 15,000 per month (**Table 2.4.53**).

Table 2.4.52. Respondent's other sources of income

Other sources income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	12	66.67	33	73.33	22	59.46	67	67.00
Vending/selling	4	22.22	4	8.89	7	18.92	15	15.00
Pension	1	5.56	3	6.67	3	8.11	7	7.00
Laundry services	1	5.56	0	0.00	0	0.00	1	1.00
4P's	0	0.00	2	4.44	0	0.00	2	2.00
Agricultural sources	0	0.00	1	2.22	0	0.00	1	1.00
Singing/band	0	0.00	1	2.22	0	0.00	1	1.00
Rental	0	0.00	1	2.22	1	2.70	2	2.00
Sewing/dressmaking	0	0.00	0	0.00	1	2.70	1	1.00
Blacksmith	0	0.00	0	0.00	1	2.70	1	1.00
Painting	0	0.00	0	0.00	1	2.70	1	1.00
Foreign remittances	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.53. Respondent's Monthly Income from other sources

Monthly Income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	12	66.67	33	73.33	22	59.46	67	67.00
< Php 1,000	0	0.00	0	0.00	3	8.11	3	3.00
Php 1,000	2	11.11	0	0.00	1	2.70	3	3.00
Php 1,001-2,500	2	11.11	3	6.67	2	5.41	7	7.00
Php 2,501-5,000	1	5.56	3	6.67	3	8.11	7	7.00
Php 5,001-7,250	0	0.00	3	6.67	1	2.70	4	4.00
Php 7,251-10,000	0	0.00	1	2.22	2	5.41	3	3.00
Php 10,001-15,000	0	0.00	1	2.22	3	8.11	4	4.00
Php 15,001-17,250	0	0.00	0	0.00	0	0.00	0	0.00
Php 17,251-20,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 20,000	0	0.00	1	2.22	0	0.00	1	1.00
No answer	1	5.56	0	0.00	0	0.00	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Household size

Table 2.4.54 shows that the most mentioned average size of four (4) family members per household was indicated by 27% of the respondents. There was 24% who stated that there were three (3) members in their household. On the other hand, there was three percent (3%) who specified living alone while one (1) of the respondents in Poblacion I reported to have 10 members in the household.

Table 2.4.54. Respondent's household size

Household size	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
1	0	0.00	3	6.67	0	0.00	3	3.00
2	0	0.00	4	8.89	4	10.81	8	8.00
3	5	27.78	14	31.11	5	13.51	24	24.00
4	3	16.67	13	28.89	11	29.73	27	27.00
5	4	22.22	2	4.44	8	21.62	14	14.00
6	3	16.67	3	6.67	3	8.11	9	9.00
7	1	5.56	1	2.22	2	5.41	4	4.00
8	0	0.00	0	0.00	2	5.41	2	2.00
9	1	5.56	1	2.22	2	5.41	4	4.00
10	1	5.56	0	0.00	0	0.00	1	1.00
No answer	0	0.00	4	8.89	0	0.00	4	4.00

Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Family members who have income

Table 2.4.55 shows that 53% of the respondents stated to have only one (1) family member who was in the labor force while 13% indicated to have two (2) members of the household who were gainfully employed. The other respondents reported to have three (3) or four (4) working household members who were working.

Table 2.4.55. Respondent's number of family members who have income

Number	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
1	12	66.67	22	48.89	19	51.35	53	53.00
2	3	16.67	4	8.89	6	16.22	13	13.00
3	0	0.00	1	2.22	1	2.70	2	2.00
4	0	0.00	0	0.00	1	2.70	1	1.00
None	3	16.67	18	40.00	10	27.03	31	31.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Relationship of respondent with the working household member

Table 2.4.56 shows that 32% of the respondents mentioned that the working family member is their spouse while 27% is their child. The other working household members were relatives or others who were distantly related to the respondents.

Table 2.4.56. Respondent's relationship with working family members

Relationship	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	3	16.67	18	40.00	10	27.03	31	31.00
Spouse	6	33.33	16	35.56	10	27.03	32	32.00
Child	6	33.33	7	15.56	14	37.84	27	27.00
Relative	1	5.56	2	4.44	2	5.40	5	5.00
Others	2	11.11	2	4.44	1	2.70	5	5.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Civil Status

Table 2.4.57 reveals that 37% of the respondents are married while 20% were single. Only 1% stated that they are separated and 31% did not answer.

Table 2.4.57. Civil status of working household member

Relationship	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Live-in	2	11.11	2	4.44	5	13.51	9	9.00
Single	5	27.78	7	15.56	8	21.62	20	20.00
Married	7	38.89	17	37.78	13	35.14	37	37.00
Widowed	1	5.56	1	2.22	0	0.00	2	2.00
Separated	0	0.00	0	0.00	1	2.70	1	1.00
N/A	3	16.67	18	40.00	10	27.03	31	31.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Educational attainment of household members in the workforce

Table 2.4.58 shows that on the average, there were 34 or 34% of the respondents reported to have household members in the work force as college graduates while 30% mentioned that their household members have graduated from high school. There was only 3% of the respondents who stated that their household members who were out making a living finished grade school and vocational school (2%).

Table 2.4.58. Educational attainment of household members in the workforce

Education	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	3	16.67	18	40.00	10	27.03	31	31.00
Grade school	0	0.00	3	6.67	0	0.00	3	3.00
High School	9	50.00	9	20.00	12	32.43	30	30.00
Vocational	0	0.00	0	0.00	2	5.41	2	2.00
College	6	33.33	15	33.33	13	35.14	34	34.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Age of working household members

All the respondents who stated that they had working household members signified that these were aged 15-65 years old (**Table 2.4.59**).

Table 2.4.59. Age of household members in the workforce

Age	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
15-65 years	15	83.33	27	60.00	27	72.97	69	69.00
N/A	3	16.67	18	40.00	10	27.03	31	31.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Occupation of working household members

It can be seen from **Table 2.4.60** that 12 or 12% of the respondents averred that their household members worked as factory worker with six of those coming from Brgy.Katipunan while 16% of the respondents indicated that their household members were employed based on their degrees obtained. There was likewise 17% who had household members who worked as laborers with nine (9) coming from San Martin. The other jobs include oversees work, local government work, call center agent, painter, pension, self-employed, skilled work, farming, personal services and labor jobs among others.

Table 2.4.60. Occupation of household members in the workforce

Occupation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	3	16.67	18	40.00	10	27.03	31	31.00
OFW	0	0.00	1	2.22	2	5.41	3	3.00
LGU worker	1	5.56	0	0.00	0	0.00	1	1.00
Factory Worker	2	11.11	4	8.89	6	16.22	12	12.00
Call Center Agent	2	11.11	0	0.00	1	2.70	3	3.00
Painter	1	5.56	0	0.00	0	0.00	1	1.00
Pension	1	5.56	0	0.00	0	0.00	1	1.00
Self-employed/Business (Buy and Sell/ Sari-sari Store/ Karinderya/ BBQ Vendor/ House Rental	3	16.67	1	2.22	1	2.70	5	5.00
Employed	1	5.56	8	17.78	7	18.92	16	16.00
Skilled Worker	1	5.56	0	0.00	0	0.00	1	1.00
Farmer / Farming relate activities	1	5.56	0	0.00	0	0.00	1	1.00
Cook/ Labandera/ Caretaker/ Street Sweeper/ Gardener/ House maid/ House boy/ Body Guard	1	5.56	1	2.22	1	2.70	3	3.00
Driver	1	5.56	2	4.44	1	2.70	4	4.00
Laborer	0	0.00	9	20.00	8	21.62	17	17.00
Barangay Workers (Captain/Kagawad/ Healthworker/ Tanod/ Barangay Police/ BHW/	0	0.00	1	2.22	0	0.00	1	1.00

Occupation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Barangay Utility/ Daycare Worker)								
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Monthly contribution to household income

There were twenty-two (22) or 22% of the respondents from the impact barangays who reported to have Php 7,251 – Php 10,000 monthly contribution from the members of the household who have jobs. On the other hand, there was about 5% of the respondents who stated that monthly contribution ranged from less than PhP1,000 to PhP2,500 (**Table 2.4.61**).

Table 2.4.61. Monthly contribution of working members into the family income

Monthly Income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	3	16.67	18	40.00	10	27.03	31	31.00
< Php 1,000	0	0.00	0	0.00	2	5.41	2	2.00
Php 1,000	1	5.56	0	0.00	0	0.00	1	1.00
Php 1,001-2,500	1	5.56	1	2.22	0	0.00	2	2.00
Php 2,501-5,000	1	5.56	1	2.22	4	10.81	6	6.00
Php 5,001-7,250	3	16.67	4	8.89	1	2.70	8	8.00
Php 7,251-10,000	3	16.67	10	22.22	9	24.32	22	22.00
Php 10,001-15,000	3	16.67	1	2.22	3	8.11	7	7.00
Php 15,001-17,250	0	0.00	0	0.00	0	0.00	0	0.00
Php 17,251-20,000	1	5.56	6	13.33	1	2.70	8	8.00
>Php 20,000	1	5.56	4	8.89	2	5.41	7	7.00
No answer	1	5.56	0	0.00	5	13.51	6	6.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Other sources of income of household members

There was 14% of the respondents who reported that the members in their households who have been working had other sources of income and this is shown in **Table 2.4.62**.

Table 2.4.63 shows that the other sources of income include income from bank dividends, rental of properties, pension, farm produce and foreign remittances.

Table 2.4.62. Other sources of income for household members

Whether there are other sources of income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	5	27.78	4	8.89	5	13.51	14	14.00
No	13	72.22	41	91.11	32	86.49	86	86.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.63. Different sources of income for household members

Other source of income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	13	72.22	41	91.11	31	83.78	85	85.00
Income from bank dividends and loans given	1	5.56	0	0.00	1	2.70	2	2.00
Rental	1	5.56	1	2.22	1	2.70	3	3.00
Pension	1	5.56	1	2.22	3	8.11	5	5.00
Farm produce	2	11.11	0	0.00	1	2.70	3	3.00
Foreign remittances	0	0.00	2	4.44	0	0.00	2	2.00
Total	**35**	**100.00**	**46**	**100.00**	**40**	**100.00**	**121**	**100.00**

Monthly income from household members who had other sources

Table 2.4.64 shows that the income from other sources ranged from PhP1,000- 20,000. The lowest income of PhP1,000 was reported in Poblacion I while the highest range of PhP 17,251- 20,000 was mentioned by the respondent from Poblacion I.

Table 2.4.64. Respondent's Monthly income from other sources

Monthly Income	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	13	72.22	41	91.11	31	83.78	85	85.00
< Php 1,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 1,000	1	5.56	0	0.00	0	0.00	1	1.00
Php 1,001-2,500	0	0.00	0	0.00	1	2.70	1	1.00
Php 2,501-5,000	2	11.11	1	2.22	3	8.11	6	6.00
Php 5,001-7,250	0	0.00	0	0.00	2	5.41	2	2.00
Php 7,251-10,000	1	5.56	1	2.22	0	0.00	2	2.00
Php 10,001-15,000	0	0.00	2	4.44	0	0.00	2	2.00
Php 15,001-17,250	0	0.00	0	0.00	0	0.00	0	0.00
Php 17,251-20,000	1	5.56	0	0.00	0	0.00	1	1.00
>Php 20,000	0	0.00	0	0.00	0	0.00	0	0.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Household expenses

The items paid for every month by the respondents' households include food, clothing/apparel, household necessities, transportation, education, health, utilities, vices, communication/cell phone load and others as shown in **Table 2.4.65**.

The highest expense was for food of more than PhP10,000 was reported by 5% of the respondents while the expenditure on food was PhP3,001-5,000 as stated by 35% of the interviewees. The lowest value was PhP200 as reported by one (1) respondent from barangay Katipunan.

Table 2.4.65. Respondent's expenses on food items

Expenses on food items	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	0	0.00	0	0.00	1	2.70	1	1.00
Php 201-500	0	0.00	0	0.00	0	0.00	0	0.00
Php 501-1,000	0	0.00	0	0.00	2	5.41	2	2.00
Php 1,001-2,000	3	16.67	7	15.56	8	21.62	18	18.00
Php 2,001-3,000	2	11.11	6	13.33	2	5.41	10	10.00
Php 3,001-5,000	8	44.44	19	42.22	8	21.62	35	35.00
Php 5,001-8,000	3	16.67	7	15.56	11	29.73	21	21.00
>Php 10,000	2	11.11	1	2.22	2	5.41	5	5.00
N/A	0	0.00	0	0.00	0	0.00	0	0.00
Total	**18**	**100.00**	**40**	**88.89**	**34**	**91.89**	**92**	**92.00**

The expenses incurred for clothing/apparel seemed to be minimal from less than PhP200-500 per month as stated by 43% of the respondents. The highest expenditure for one (1) respondent from Poblacion I was from PhP5,000-8,000 per month.

Table 2.4.66. Respondent's expenses on clothing/apparel

Expenses on clothing/apparel	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	5	27.78	11	24.44	8	21.62	24	24.00
Php 201-500	4	22.22	11	24.44	4	10.81	19	19.00
Php 501-1,000	0	0.00	4	8.89	2	5.41	6	6.00
Php 1,001-2,000	1	5.56	2	4.44	1	2.70	4	4.00
Php 2,001-3,000	0	0.00	1	2.22	0	0.00	1	1.00

Php 3,001-5,000	0	0.00	1	2.22	0	0.00	1	1.00
Php 5,001-8,000	1	5.56	0	0.00	0	0.00	1	1.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	7	38.89	15	33.33	22	59.46	44	44.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

The expense for other household necessities ranged from less than Php 200 for 17% of the respondents to Php 3,000 for one (1) respondent in San Martin.

Table 2.4.67. Respondent's expenses on household necessities

Expenses on household necessities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	5	27.78	12	26.67	0	0.00	17	17.00
Php 201-500	1	5.56	1	2.22	2	5.41	4	4.00
Php 501-1,000	2	11.11	3	6.67	1	2.70	6	6.00
Php 1,001-2,000	0	0.00	1	2.22	0	0.00	1	1.00
Php 2,001-3,000	0	0.00	1	2.22	0	0.00	1	1.00
Php 3,001-5,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	10	55.56	27	60.00	34	91.89	71	71.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Transportation expenses ranging from less than PhP200-2,000 per month was incurred by 60% of the respondents. The highest transportation expense was reported to be from PhP3,001-5,000 per month as stated by four percent (4%) of the respondents.

Table 2.4.68. Respondent's expenses on transportation

Expenses on transportation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	6	33.33	10	22.22	1	2.70	17	17.00
Php 201-500	1	5.56	10	22.22	6	16.22	17	17.00
Php 501-1,000	1	5.56	7	15.56	6	16.22	14	14.00
Php 1,001-2,000	1	5.56	5	11.11	6	16.22	12	12.00
Php 2,001-3,000	3	16.67	2	4.44	0	0.00	5	5.00
Php 3,001-5,000	0	0.00	1	2.22	3	8.11	4	4.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	6	33.33	10	22.22	15	40.54	31	31.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Educational expense was reported to be from less than PhP200 to PhP8,000 per month.

Table 2.4.69. Respondent's expenses on education

Expenses on education	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	6	33.33	6	13.33	7	18.92	19	19.00
Php 201-500	0	0.00	6	13.33	5	13.51	11	11.00
Php 501-1,000	2	11.11	4	8.89	1	2.70	7	7.00
Php 1,001-2,000	0	0.00	2	4.44	2	5.41	4	4.00
Php 2,001-3,000	0	0.00	1	2.22	3	8.11	4	4.00
Php 3,001-5,000	0	0.00	1	2.22	0	0.00	1	1.00
Php 5,001-8,000	0	0.00	1	2.22	1	2.70	2	2.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	10	55.56	24	53.33	18	48.65	52	52.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

It seems that the amount spent for health concerns as reported by 46% of the respondents was low which was from less than PhP200-500 per month. The highest reported amount was PhP5,000 per month by 3% of the respondents.

Table 2.4.70. Respondent's expenses on health

Expenses on health	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	4	22.22	17	37.78	5	13.51	26	26.00
Php 201-500	3	16.67	9	20.00	8	21.62	20	20.00
Php 501-1,000	4	22.22	1	2.22	3	8.11	8	8.00
Php 1,001-2,000	2	11.11	1	2.22	2	5.41	5	5.00
Php 2,001-3,000	1	5.56	1	2.22	1	2.70	3	3.00
Php 3,001-5,000	0	0.00	2	4.44	1	2.70	3	3.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	4	22.22	14	31.11	17	45.95	35	35.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

The payment of utilities was true for 100% of the respondents. The amount disbursed ranged from less than Php 200 to more than Php 10,000 per month.

Table 2.4.71. Respondent's expenses on utilities

Expenses on utilities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	1	5.56	5	11.11	0	0.00	6	6.00
Php 201-500	0	0.00	10	22.22	8	21.62	18	18.00
Php 501-1,000	9	50.00	8	17.78	13	35.14	30	30.00
Php 1,001-2,000	1	5.56	7	15.56	10	27.03	18	18.00
Php 2,001-3,000	4	22.22	6	13.33	3	8.11	13	13.00
Php 3,001-5,000	2	11.11	3	6.67	1	2.70	6	6.00
Php 5,001-8,000	0	0.00	1	2.22	0	0.00	1	1.00
>Php 10,000	1	5.56	0	0.00	0	0.00	1	1.00
N/A	0	0.00	5	11.11	2	5.41	7	7.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Vices had a part in the budget of the households. There was 16% of the respondents who indicated that an amount ranging from less than PhP200-5,000 per month was incurred.

Table 2.4.72. Respondent's expenses on vices

Expenses on vices	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	2	11.11	2	4.44	1	2.70	5	5.00
Php 201-500	0	0.00	0	0.00	2	5.41	2	2.00
Php 501-1,000	1	5.56	0	0.00	2	5.41	3	3.00
Php 1,001-2,000	0	0.00	0	0.00	3	8.11	3	3.00
Php 2,001-3,000	0	0.00	0	0.00	1	2.70	1	1.00
Php 3,001-5,000	0	0.00	0	0.00	2	5.41	2	2.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	15	83.33	43	95.56	26	70.27	84	84.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Majority of the respondents (60%), spent less than PhP 200-500 per month on communication or cell phone load. However, there were other respondents who were willing to spend more as indicated by 15% of the respondents' response who incurred PhP501-1,000 per month. On the other hand, much higher amounts of PhP1,001-2,000 (4%), PhP 2,001-3,000 (3%) and PhP3,001-5,000 (1%) per month were given by the respondents.

Table 2.4.73. Respondent's expenses on communication/cellphone load

Expenses on communication/ cellphone load	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	6	33.33	16	35.56	12	32.43	34	34.00
Php 201-500	3	16.67	11	24.44	12	32.43	26	26.00
Php 501-1,000	2	11.11	8	17.78	5	13.5	15	15.00
Php 1,001-2,000	2	11.11	1	2.22	1	2.70	4	4.00
Php 2,001-3,000	1	5.56	0	0.00	2	5.41	3	3.00
Php 3,001-5,000	0	0.00	0	0.00	1	2.70	1	1.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	4	22.22	9	20.00	4	10.81	17	17.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

There were five (5) of 5% of the respondents who incurred expenses for other unspecified items. The amount ranged from less than PhP200 to as high as PhP8,000 per month.

Table 2.4.74. Respondent's expenses on others

Expenses on others	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
<Php 200	0	0.00	0	0.00	1	2.70	1	1.00
Php 201-500	0	0.00	0	0.00	0	0.00	0	0.00
Php 501-1,000	1	5.56	0	0.00	0	0.00	1	1.00
Php 1,001-2,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 2,001-3,000	0	0.00	0	0.00	1	2.70	1	1.00
Php 3,001-5,000	1	5.56	0	0.00	0	0.00	1	1.00
Php 5,001-8,000	1	5.56	0	0.00	0	0.00	1	1.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
N/A	15	83.33	45	100.00	35	94.59	95	95.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Where household necessities are purchased

Table 2.4.75 shows that 94% of the respondents went to the Villanueva Public Market to purchase their household essentials while 4% shopped from other nearby municipal markets. On the other hand, there was 1% of the respondents who purchased their household necessities from the supermarket while 1% goes to the barangay market or "talipapa" to source their daily needs.

Table 2.4.75. Places where respondent purchase household necessities

Where respondents purchase household necessities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Villanueva Public Market	18	100.00	40	88.89	36	97.30	94	94.00
Nearby municipal markets	0	0.00	4	8.89	0	0.00	4	4.00
Supermarket	0	0.00	1	2.22	0	0.00	1	1.00
Market within Barangay	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Information on Respondent's House Make and Utilities

Source of water

Fifty-one (51) or 51% of the respondents abstracted water from their faucets connected from local government water supply while nine (9) or 9% fetched water from community faucets. On the other hand, three (3) or 3% derived water from deep wells while a good number purchased from water refilling stations (**Table 2.4.76**).

Table 2.4.76. Respondent's source of water

Source of water	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Faucet inside house	12	60.00	11	25.00	28	66.67	51	48.11
Community faucet	2	10.00	3	6.82	4	9.52	9	8.49
Deep well	0	0.00	3	6.82	0	0.00	3	2.83
Water refilling station	6	30.00	27	61.36	10	23.81	43	40.57
Total	**20**	**100.00**	**44**	**100.00**	**42**	**100.00**	**106**	**100.00**

Power source

Eighty-five or 85% of the respondents reported that they were connected to a power source while the other 15% was not (**Table 2.4.77**)

The source of power was basically provided by CEPALCO to the 85% who stated that they had access to a power provider.

Table 2.4.77. Respondent's access to power source

Whether connected to a power source	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	17	94.44	35	77.78	33	89.19	85	85.00
No	1	5.56	10	22.22	4	10.81	15	15.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.78. Respondent's power source

Source of power	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
CEPALCO	17	94.44	35	77.78	33	89.19	85	85.00
N/A	1	5.56	10	22.22	4	10.81	15	15.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Monthly electricity expense

Table 2.4.79 shows that the lowest electricity bill paid was less than PhP200 per month as stated by 7% of the respondents. The higher monthly expense went from PhP201- 2,000 per month as mentioned by a consolidated number of 64 or 64% of the respondents who mentioned their electricity bill falling in this expense range. The highest reported monthly bill was more than PhP10,000 as reported by one (1) respondent from Poblacion I.

Table 2.4.79. Respondent's monthly electricity expense

Expenses on power source	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	1	5.56	10	22.22	6	16.22	17	17.00
<Php 200	0	0.00	4	8.89	3	8.11	7	7.00
Php 201-500	3	16.67	8	17.78	12	32.43	23	23.00
Php 501-1,000	6	33.33	8	17.78	7	18.92	21	21.00
Php 1,001-2,000	3	16.67	9	20.00	8	21.62	20	20.00
Php 2,001-3,000	3	16.67	3	6.67	0	0.00	6	6.00
Php 3,001-5,000	1	5.56	3	6.67	1	2.70	5	5.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Other sources of lighting

To those who were not connected to CEPALCO, ten (10) of the 14 respondents mentioned to have flying connections while the others used flashlights or kerosene as a source of light in their homes (**Table 2.4.80**).

Table 2.4.80. Source of lighting for respondents not connected to power source

Source of lighting	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	17	94.44	36	80.00	33	89.19	86	86.00
Top	1	5.56	0	0.00	0	0.00	1	1.00
Flying connection	0	0.00	6	13.33	4	10.81	10	10.00
Flashlight	0	0.00	1	2.22	0	0.00	1	1.00
Gaas/ kerosene	0	0.00	2	4.44	0	0.00	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Monthly expenses incurred for using other sources of lighting

Table 2.4.81 shows that six (6) of the respondents who used other sources of lighting incurred less than PhP200 per month while three (3) spent from PhP201-500 per month. On the other hand, there were four (4) respondents who reported to pay from PhP501-1,000 per month for the use of other sources to illuminate their dwelling places.

Table 2.4.81. Respondent's monthly expense from source of lighting

Expenses on source of lighting	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	17	94.44	37	82.22	33	89.19	87	87.00
<Php 200	0	0.00	6	13.33	0	0.00	6	6.00
Php 201-500	0	0.00	0	0.00	3	8.11	3	3.00
Php 501-1,000	1	5.56	2	4.44	1	2.70	4	4.00
Php 1,001-2,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 2,001-3,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 3,001-5,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Household durables/appliances

The highest number of responses was mentioned for the television set (81 responses) while the second most stated was the electric fan with 68 responses as shown in **Table 2.4.82**. Keeping the food fresh was probably the one kept in mind by the respondents for owning a refrigerator as one of the home appliances they have in the household. The other durables owned include gas stove, electric stove, wood stove, kerosene-fired stove, microwave oven, radio, stereo, personal computer, laptop, washing machine, and iron.

Table 2.4.82. Respondent's household durable/ appliances

Household durables/ appliances	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
LPG/GASUL stove	13	12.87	23	12.23	16	10.13	52	11.63
Electric stove	0	0.00	1	0.53	2	1.27	3	0.67
Wood stove	3	2.97	27	14.36	28	17.72	58	12.98
Gaas/ Kerosene stove	0	0.00	0	0.00	0	0.00	0	0.00
Microwave	0	0.00	0	0.00	2	1.27	2	0.45
Radio	2	1.98	0	0.00	2	1.27	4	0.89
Stereo	5	4.95	10	5.32	8	5.06	23	5.15
TV	16	15.84	35	18.62	30	18.99	81	18.12
Refrigerator	15	14.85	26	13.83	20	12.66	61	13.65
Electric fan	15	14.85	29	15.43	24	15.19	68	15.21
Personal computer	2	1.98	2	1.06	4	2.53	8	1.79
Laptop	4	3.96	8	4.26	1	0.63	13	2.91
Washing machine	10	9.90	15	7.98	10	6.33	35	7.83
Gas/ Electric stove	5	4.95	6	3.19	5	3.16	16	3.58
Iron	11	10.89	6	3.19	4	2.53	21	4.70

Household durables/ appliances	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	0	0.00	0	0.00	2	1.27	2	0.45
Total	**101**	**100.00**	**188**	**100.00**	**158**	**100.00**	**447**	**100.00**

Toilet facilities

On a per barangay basis, there was 66.67% of the respondents from Poblacion I who have flush type toilets while only 8.89% in San Martin and 10.81% in Katipunan were reported. Conversely, there was 33.33% of the respondents from Poblacion I, 91.11% from San Martin and 89.19% from Katipunan who stated that they have water-sealed or “de buhos” type of toilet.

Table 2.4.83. Respondent’s type of toilet

Type of toilet	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Water sealed	6	33.33	41	91.11	33	89.19	80	80.00
Flush	12	66.67	4	8.89	4	10.81	20	20.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

House ownership

As shown in **Table 2.4.85** there was 92.00% of the respondents from the three (3) impact barangays who stated that they owned the houses they dwell in.

For those who indicated non-ownership of the house, there were six (6) of the respondents who stated that they live with the owner of the house while two (2) respondents mentioned that they pay a monthly rent ranging from PhP1,000-2,000 per month.

Table 2.4.84. Respondent’s house ownership status

House ownership status	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	15	83.33	42	93.33	35	94.59	92	92.00
No	3	16.67	3	6.67	2	5.41	8	8.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.85. Respondent’s living arrangements if house is not owned

Living arrangements	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	15	83.33	42	93.33	35	94.59	92	92.00
Lives with owner of the house	3	16.67	2	4.44	1	2.70	6	6.00
Renter with P1000-2000 monthly rental payment	0	0.00	1	2.22	1	2.70	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Lot/land ownership

For those who owned the house they reside in, 39% of the respondents from the impact barangays mentioned ownership while 61% responded in the negative (**Table 2.4.86**).

Table 2.4.86. Respondent’s lot/land ownership status

Lot/land ownership status	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	13	72.22	14	31.11	12	32.43	39	39.00
No	5	27.78	31	68.89	25	67.57	61	61.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Other owners of the land

Table 2.4.87 shows that aside from the respondents who owned the land where the houses were built, the other title holders were identified to be relatives (17%), government (7%) and private entities (37%).

Lot/land rent was paid by 13% of the households with five (5) of the respondents paying less than PhP200 per month. The other six (6) respondents reported to have paid between PhP201-500 per month while one of the respondents incurred a monthly rental fee of more than PhP2,000 (**Table 2.4.89**)

Table 2.4.87. Other owners of the land where the respondent's house is located

Owners of land	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	13	72.22	14	31.11	12	32.43	39	39.00
Relative	4	22.22	9	20.00	4	10.81	17	17.00
Government	1	5.56	4	8.89	2	5.41	7	7.00
Private entity	0	0.00	18	40.00	19	51.35	37	37.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.88. Whether rent is paid for the use of the land

Payment of rent for use of land	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	3	16.67	4	8.89	6	16.22	13	13.00
No	15	83.33	41	91.11	31	83.78	87	87.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.89. Respondent's monthly rent for use of land

Monthly rent for use of land	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	15	83.33	41	91.11	31	83.78	87	87.00
<Php 200	2	11.11	2	4.44	1	2.70	5	5.00
Php 201-500	0	0.00	1	2.22	5	13.51	6	6.00
Php 501-1,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 1,001-2,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 2,001-3,000	0	0.00	1	2.22	0	0.00	1	1.00
Php 3,001-5,000	0	0.00	0	0.00	0	0.00	0	0.00
Php 5,001-8,000	0	0.00	0	0.00	0	0.00	0	0.00
>Php 10,000	0	0.00	0	0.00	0	0.00	0	0.00
No answer	1	5.56	0	0.00	0	0.00	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

House materials

Table 2.4.90 shows that majority of the roof materials used in the houses of the respondents were GI sheets (88.00%) while 21% was wood. There was 11% who reported that cement was the material used for their roofs while 2% made use of bamboo.

The same table shows that for the walls of their houses, 74% utilized cement as building material while 50% mentioned wood as the construction material for their walls. There was 2% of the respondents who used nipa/cogon while 4% preferred bamboo for the walls of their dwelling places.

Table 2.4.90. Materials used for the respondent's house

Materials	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Roof materials								
Wood	3	15.00	15	24.59	3	7.32	21	17.21
Cement	0	0.00	9	14.75	2	4.88	11	9.02
Nipa/cogon	0	0.00	0	0.00	0	0.00	0	0.00
Bamboo	1	5.00	0	0.00	1	2.44	2	1.64
GI Sheets	16	80.00	37	60.66	35	85.37	88	72.13
Total	**20**	**100.00**	**61**	**100.00**	**41**	**100.00**	**122**	**100.00**
Wall Materials								
Wood	8	36.36	21	35.59	21	42.86	50	38.46
Cement	13	59.09	36	61.02	25	51.02	74	56.92
Nipa/cogon	0	0.00	2	3.39	0	0.00	2	1.54
Bamboo	1	4.55	0	0.00	3	6.12	4	3.08
Total	**22**	**100.00**	**59**	**100.00**	**49**	**100.00**	**130**	**100.00**

Years residing in the barangay

It can be seen in **Table 2.4.91** that majority of the respondents from Poblacion I (83.33%) and 64.44% from San Martin have lived in their respective barangays since birth while only 21.62% of the respondents from Katipunan stated the same response. On the other hand, there was almost one-half (48.65%) of the respondents in Katipunan who have dwelled in their barangay for more than 10 years. The results show that the respondents have stayed in their respective barangays for a relatively long period of time. There was only a combined percentage of 16% of the respondents from all the impact barangays who have stayed there from one (1) to 10 years.

Table 2.4.91. Respondent's number of years residing in the barangay

Number of years	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Since birth	15	83.33	29	64.44	8	21.62	52	52.00
1-5 years	0	0.00	1	2.22	2	5.41	3	3.00
5-10 years	1	5.56	3	6.67	9	24.32	13	13.00
> 10 years	2	11.11	12	26.67	18	48.65	32	32.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Information on the Community where the Respondent Belongs

Place of origin

For those who have not been born in the barangay but moved to the community, twenty-eight (28) or 28% have originated from Northern Mindanao. The other places of origin include the Ilocos Region, Bicol, Western Visayas, Central Visayas, Eastern Visayas, Zamboanga Peninsula, CARAGA and the NCR (**Table 2.4.92**).

The reasons given for transferring to their present residence were due to their livelihood or jobs and family/spouse.

Table 2.4.92. Respondent's place of origin

Place of origin	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Region 1 - Ilocos Region	0	0.00	1	2.22	0	0.00	1	1.00
Region 5 - Bicol	0	0.00	0	0.00	1	2.70	1	1.00
Region 6 - Western Visayas	0	0.00	1	2.22	1	2.70	2	2.00
Region 7 - Central Visayas	1	5.56	1	2.22	3	8.11	5	5.00

Place of origin	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Region 8 - Eastern Visayas	0	0.00	0	0.00	1	2.70	1	1.00
Region 9 - Zamboanga Peninsula	0	0.00	0	0.00	2	5.41	2	2.00
Region 10 - Northern Mindanao	2	11.11	12	26.67	14	37.84	28	28.00
Region 13 - CARAGA	0	0.00	0	0.00	1	2.70	1	1.00
National Capital Region	0	0.00	0	0.00	1	2.70	1	1.00
Not stated	0	0.00	1	2.22	5	13.51	6	6.00
N/A	15	83.33	29	64.44	8	21.62	52	52.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.93. Respondent's reason for transfer

Reason for transfer	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	15	83.33	29	64.44	8	21.62	52	52.00
Family/spouse	2	11.11	3	6.67	14	37.84	19	19.00
Livelihood	1	5.56	12	26.67	14	37.84	27	27.00
Others	0	0.00	1	2.22	1	2.70	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Membership in organizations

The results, as shown in **Table 2.4.94**, imply that the respondents are not so gregarious or organization-oriented as only 36% indicated membership in organizations or associations. Majority of the respondents did not have any organizational affiliation.

There was one (1) respondent from Katipunan who stated being a member in three (3) organizations while six (6) had two (2) organizational memberships. The rest belonged to only one (1) group.

The economic group was the most mentioned organization the respondents were members of followed by the religious and civic affiliations (**Table 2.4.97**)

Table 2.4.94. Respondents membership status to any organization

Whether member of an organization	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	4	22.22	15	33.33	17	45.95	36	36.00
No	14	77.78	30	66.67	20	54.05	64	64.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.95. Respondent's number of organization affiliated with

Number of organization affiliated with	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	14	77.78	30	66.67	20	54.05	64	64.00
1	4	22.22	14	31.11	11	29.73	29	29.00
2	0	0.00	1	2.22	5	13.51	6	6.00
3	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.96. Respondent's type of organization affiliated with

Type of organization affiliated with	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	14	77.78	30	66.67	20	54.05	64	64.00
Civic	1	5.56	0	0.00	4	10.81	5	5.00
Religious	2	11.11	5	11.11	4	10.81	11	11.00
Economic	1	5.56	6	13.33	6	16.22	13	13.00
Others	0	0.00	4	8.89	3	8.11	7	7.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.97. Respondent's position in the organization affiliated with

Type of organization affiliated with	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Women's organization								
Officer	1	5.56	0	0.00	2	5.41	3	3.00
Member	0	0.00	3	6.67	0	0.00	3	3.00
Higaonon								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	0	0.00	0	0.00	1	2.70	1	1.00
Purok System								
Officer	0	0.00	0	0.00	1	2.70	1	1.00
Member	0	0.00	0	0.00	0	0.00	0	0.00
Community Managed Savings and Credit Association (COMSCA)								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	0	0.00	0	0.00	3	8.11	3	3.00
SENIOR CITIZENS ORGANIZATION								
Officer	0	0.00	1	2.22	0	0.00	1	1.00
Member	0	0.00	0	0.00	1	2.70	1	1.00
CHRISTIAN ORGANIZATION								
Officer	0	0.00	0	0.00	1	2.70	1	1.00
Member	0	0.00	0	0.00	1	2.70	1	1.00
ROMAN CATHOLIC ORGANIZATION								
Officer	0	0.00	0	0.00	1	2.70	1	1.00
Member	2	11.11	5	11.11	3	8.11	10	10.00
4Ps								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	0	0.00	1	2.22	4	10.81	5	5.00
ASA PHILIPPINES								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	0	0.00	0	0.00	1	2.70	1	1.00
LOAN AND SAVINGS GROUP								
Officer	0	0.00	0	0.00	1	2.70	1	1.00
Member	0	0.00	3	6.67	1	2.70	4	4.00
FISHERFOLKS ASSOCIATION								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	1	5.56	4	8.89	0	0.00	5	5.00
UNITY								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	0	0.00	0	0.00	1	2.70	1	1.00
LUPON								
Officer	0	0.00	0	0.00	0	0.00	0	0.00
Member	0	0.00	0	0.00	1	2.70	1	1.00

Number of household members who were in school

Table 2.4.98 shows that more than one third (36%) of the respondents had one household member who was in school while 35% had none. The other respondents had two (2) household members (19%), three (3) household members (7%), four (4) household members (2%) and five (5) household members (1%) who were still studying.

Table 2.4.98. Number of respondent's household members in school

Number of household members who are in school	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	3	16.67	20	44.44	12	32.43	35	35.00
1	5	27.78	14	31.11	17	45.95	36	36.00
2	7	38.89	6	13.33	6	16.22	19	19.00
3	3	16.67	3	6.67	1	2.70	7	7.00
4	0	0.00	1	2.22	1	2.70	2	2.00
5	0	0.00	1	2.22	0	0.00	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Educational institutions where household members are enrolled

Table 2.4.99 shows that the respondents who had household members who were in elementary either studied in schools within their barangays, elementary schools in Villanueva and other nearby municipalities. The same is true for the students who were attending secondary school. College students had to leave the barangay to study in the other nearby municipalities.

Table 2.4.99. Institutions where the respondent's household members are enrolled

Institutions	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
ELEMENTARY *(WITHIN BARANGAY)*	0	0.00	19	46.34	0	0.00	19	19.39
ELEMENTARY *outside the barangay (WITHIN VILLANUEVA)*	12	50.00	1	2.44	14	42.42	27	27.55
ELEMENTARY *(Other municipalities)*	0	0.00	2	4.88	0	0.00	2	2.04
HIGH SCHOOL *WITHIN BARANGAY*	0	0.00	1	2.44	0	0.00	1	1.02
HIGH SCHOOL *outside the BARANGAY (WITHIN VILLANUEVA)*	8	33.33	0	0.00	10	30.30	18	18.37
HIGH SCHOOL *other municipalities*	0	0.00	8	19.51	2	6.06	10	10.20
JUNIOR HIGHSCHOOL *WITHIN BARANGAY*	0	0.00	3	7.32	0	0.00	3	3.06
JUNIOR HIGHSCHOOL *other municipalities*	1	4.17	4	9.76	2	6.06	7	7.14
SENIOR HIGHSCHOOL *outside the BARANGAY (WITHIN VILLANUEVA)*	0	0.00	0	0.00	1	3.03	1	1.02
COLLEGE/ VOCATIONAL *Other municipalities*	3	12.50	3	7.32	4	12.12	10	10.20
Total	**24**	**100.00**	**41**	**100.00**	**33**	**100.00**	**98**	**100.00**

Medical institutions where household members are enrolled

Table 2.4.100 shows that the respondents who had household members who were in elementary either studied in schools within their barangays, elementary schools in Villanueva and other nearby municipalities. The same is true for the students who were attending secondary school. College students had to leave the barangay to study in the other nearby municipalities.

Table 2.4.100. Medical institutions/facilities where the respondent's household members are enrolled

Medical institutions/facilities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Barangay Health Center	16	57.14	33	66.00	34	69.39	83	65.35
Public Hospital (within Villanueva)	1	3.57	0	0.00	1	2.04	2	1.57
Public Hospital (other municipalities)	7	25.00	8	16.00	9	18.37	24	18.90
Private Hospital (within Villanueva)	0	0.00	0	0.00	0	0.00	0	0.00
Private Hospital (other municipalities)	3	10.71	8	16.00	4	8.16	15	11.81
Clinic (within Villanueva)	1	3.57	0	0.00	0	0.00	1	0.79
Clinic (other municipalities)	0	0.00	1	2.00	1	2.04	2	1.57
Total	**28**	**100.00**	**50**	**100.00**	**49**	**100.00**	**127**	**100.00**

Problems encountered in the community

Table 2.4.101 shows that there were 59 respondents who mentioned that the lack of job opportunity in their locality was a concern they faced. On the other hand, there was 19% of the respondents who indicated that they did not encounter problems in their barangays while about one-third (35%) stated that illegal drug issues were experienced. The other problems confronted in their respective communities include out of school youth (15%), child labor (5%), political differences (4%), dirty surroundings (10%), muddy roads (1%), traffic (4%) and gadget/computer addiction especially among the youth (1%).

Table 2.4.101. Problems encountered in the respondent's community

Problems encountered	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	2	6.90	12	19.67	5	7.81	19	12.34
Drug addiction	8	27.59	10	16.39	17	26.56	35	22.73
Lack of job opportunities	12	41.38	26	42.62	21	32.81	59	38.31
Many children are not in school	2	6.90	4	6.56	9	14.06	15	9.74
Child labor	0	0.00	4	6.56	1	1.56	5	3.25
Theft/Robbery	0	0.00	1	1.64	0	0.00	1	0.65
Political	1	3.45	1	1.64	2	3.13	4	2.60
Dirty surroundings	2	6.90	2	3.28	6	9.38	10	6.49
Muddy roads	0	0.00	0	0.00	1	1.56	1	0.65
Traffic	2	6.90	1	1.64	1	1.56	4	2.60
Gadget/computer addiction	0	0.00	0	0.00	1	1.56	1	0.65
Total	**29**	**100.00**	**61**	**100.00**	**64**	**100.00**	**154**	**100.00**

Positive attributes of the community

Majority of the responses given by the respondents highlighted the good governance of the leaders in their respective communities most especially for San Martin (51.11%) and Katipunan (75.68%). Only 5.56%.of the respondents from Poblacion I gave the same response. The other positive characteristics of the barangays include clean surroundings (42%), children are able to be enrolled in school (28%), many are gainfully employed (20%) and new establishments/infrastructures have been built. Only 3% stated that they cannot think of any positive attribute of their locality (**Table 2.4.102**).

Table 2.4.102. Positive attributes of the respondent's community

Positive attributes	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	0	0.00	3	4.29	0	0.00	3	1.86
Many are gainfully employed	1	4.55	9	12.86	10	14.49	20	12.42
Good governance	16	72.73	23	32.86	28	40.58	67	41.61
Children are in school	2	9.09	17	24.29	9	13.04	28	17.39
Clean surroundings	3	13.64	17	24.29	22	31.88	42	26.09
New establishments	0	0.00	1	1.43	0	0.00	1	0.62
Total	**22**	**100.00**	**70**	**100.00**	**69**	**100.00**	**161**	**100.00**

Income opportunities of women

Table 2.4.103 shows that 78% of the women in the three impact barangays were into selling or vending consumer items. There was also 8% who derived income from sewing or dressmaking while 5% was employed and 0.9% engaged in farming activities. There were eight (8) or 8% of the respondents who mentioned that food preparation and cooking various food items were the sources of income derived by women most especially in Brgy.Katipunan.

Table 2.4.103. Income opportunities of women in the respondent's community

Opportunities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	1	5.00	0	0.00	0	0.00	1	0.85
Vending/Selling	16	80.00	39	81.25	37	74.00	92	77.97
Sewing/dressmaking	1	5.00	4	8.33	5	10.00	10	8.47
Employment	1	5.00	5	10.42	0	0.00	6	5.08
Farming	1	5.00	0	0.00	0	0.00	1	0.85
Food preparation and cooking	0	0.00	0	0.00	8	16.00	8	6.78
Total	**20**	**100.00**	**48**	**100.00**	**50**	**100.00**	**118**	**100.00**

Issues/problems encountered by women in the community

Table 2.4.104 shows that 52% of the respondents did not experience any issue or concern in the barangay. On the other hand, the lack of income opportunities was reported by the respondents as a difficulty they have to tackle. The other hindrances that women faced include teen age pregnancy as reported by one (1) respondent from San Martin while being a victim of discrimination was mentioned by another respondent from Katipunan.

Table 2.4.104. Issues/problems encountered by women in the respondent's community

Issues/ problems	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	7	38.89	31	68.89	14	37.84	52	52.00
Lack of income or job opportunities	11	61.11	13	28.89	22	59.46	46	46.00
Teenage pregnancy	0	0.00	1	2.22	0	0.00	1	1.00
Victim of discrimination	0	00.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Possible activities women can be involved for community development

Table 2.4.105 shows that women participation in livelihood programs (43%) can help foster community development. Furthermore, the provision of community service (36%) was seen by the respondents as one way by which women can help in the growth of their locality. The other ways by which women can be of assistance in working for the advancement of their community is by being gainfully employed and pursuing online selling and other forms of vending/selling.

Table 2.4.105. Possible activities women can be involved for community development in the respondent's community

Possible activities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	1	5.00	11	23.91	4	11.11	16	15.69
Employment	0	0.00	2	4.35	2	5.56	4	3.92
Livelihood programs	8	40.00	19	41.30	16	44.44	43	42.16
Online selling	1	5.00	1	2.17	0	0.00	2	1.96
Vending/selling	1	5.00	0	0.00	0	0.00	1	0.98
Community service	9	45.00	13	28.26	14	38.89	36	35.29
Total	**20**	**100.00**	**46**	**100.00**	**36**	**100.00**	**102**	**100.00**

Common activities of the youth in the community

It can be seen from **Table 2.4.106** that playing games or operating their gadgets (28.6%) was the most common activity done by the youth in the barangays. However, there was 27.3% of the respondents who reported that the youth are busy doing their school work or studying while 26.6% indicated sports as an undertaking by the youth. The other endeavors indicated were pursuing part-time jobs and doing household chores and community services.

Table 2.4.106. Common activities of youth in the respondent's community

Common activities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	1	2.63	5	6.41	1	2.63	7	4.55
Sports	8	21.05	25	32.05	8	21.05	41	26.62
School work/study	11	28.95	20	25.64	11	28.95	42	27.27
Part-time jobs	1	2.63	6	7.69	1	2.63	8	5.19
Play games/operating gadgets	15	39.47	14	17.95	15	39.47	44	28.57
Assist in household chores/community activities	2	5.26	8	10.26	2	5.26	12	7.79
Total	**38**	**100.00**	**78**	**100.00**	**38**	**100.00**	**154**	**100.00**

Other activities that the youth can be involved for community development

Table 2.4.107 shows that in order for the youth to contribute to community development, they should complete their college degrees as indicated by 35 respondents. Furthermore, assisting the family and being involved in community activities should likewise be undertaken

by the youth as well as taking on part-time jobs and undergoing training courses to hone their skills. Participation in sports activities was likewise a given response.

Table 2.4.107. Other activities that youth can be involved with in the respondent's community

Other activities	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Completion of college degree	7	28.00	17	50.00	11	28.95	35	36.08
Sports	0	0.00	1	2.94	2	5.26	3	3.09
Part-time jobs	7	28.00	5	14.71	1	2.63	13	13.40
Trainings	10	40.00	1	2.94	2	5.26	13	13.40
Assist family and community	1	4.00	10	29.41	22	57.89	33	34.02
Total	**25**	**100.00**	**34**	**100.00**	**38**	**100.00**	**97**	**100.00**

Information on Respondent's Health and Sanitation

Most common sickness in the past five years

The most common illnesses that the respondents and their household members experienced over the last five (5) years were cough (27%), colds (26%), and fever (24%) as shown in **Table 2.4.108**. The other health issues experienced in their household were hypertension, dengue, urinary tract infection (UTI), kidney disease, arthritis and diarrhea. There were four (4) respondents from Poblacion I and eleven (11) from Katipunan who indicated that respiratory diseases were also confronted. Twelve percent (4%) of the interviewees stated that there were some who struggled with diabetes.

Table 2.4.108. Most common sickness in the past five years in the respondent's community

Most common sickness in the past five years	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Cough	13	22.81	35	25.18	35	32.41	83	27.30
Colds	11	19.30	34	24.46	34	31.48	79	25.99
Fever	10	17.54	28	20.14	34	31.48	72	23.68
Dengue	3	5.26	3	2.16	0	0.00	6	1.97
UTI	1	1.75	0	0.00	1	0.93	2	0.66
Hypertension	5	8.77	13	9.35	1	0.93	19	6.25
Kidney disease	2	3.51	0	0.00	0	0.00	2	0.66
Arthritis	2	3.51	1	0.72	0	0.00	3	0.99
Diarrhea	3	5.26	1	0.72	0	0.00	4	1.32
Respiratory diseases	4	7.02	11	7.91	0	0.00	15	4.93
Diabetes	2	3.51	9	6.47	1	0.93	12	3.95
Heart diseases	1	1.75	4	2.88	0	0.00	5	1.64
Skin allergies	0	0.00	0	0.00	2	1.85	2	0.66
Total	**57**	**100.00**	**139**	**100.00**	**108**	**100.00**	**304**	**100.00**

People in the community to whom respondents consult with regarding illness

The most common person stated by majority (79%) of the respondents whom they consulted with when faced will the aforementioned diseases was the doctor as shown in **Table 2.4.109**. The second person consulted was the midwife (44%) and the barangay health worker (BHW) as third (15%). There were instances (11%) when the local "albularyo" or herb doctor was approached by the respondents when they got sick. There was only one (1) respondent who mentioned that self-medication was practiced.

Table 2.4.109. Person in the community to whom respondents consult with regarding illness

Person/people	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Doctor	17	62.96	42	60.87	20	37.04	79	52.67
BHW	4	14.81	7	10.14	4	7.41	15	10.00
Midwife	1	3.70	16	23.19	27	50.00	44	29.33
Albularyo	5	18.52	4	5.80	2	3.70	11	7.33
None/self-medication	0	0.00	0	0.00	1	1.85	1	0.67
Total	**27**	**100.00**	**69**	**100.00**	**54**	**100.00**	**150**	**100.00**

Source of medicine

Majority of the respondents sourced their medicines from drug stores (64%) while 30% got theirs from the respective Barangay Health Units. There was 5% of the interviewees who indicated that the over-the-counter medicines they used were bought from the nearby *sari-sari* stores. On the other hand, only 2% approached the municipal/rural health units for the needed medical drugs (**Table 2.4.110**).

Table 2.4.110. Source of medicine in the respondent's community

Source of medicine	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Drug store	17	80.95	40	64.52	26	56.52	83	64.34
Sari-sari store	0	0.00	4	6.45	1	2.17	5	3.88
Barangay Health Unit	2	9.52	18	29.03	19	41.30	39	30.23
Municipal/Rural Health Unit	2	9.52	0	0.00	0	0.00	2	1.55
Total	**21**	**100.00**	**62**	**100.00**	**46**	**100.00**	**129**	**100.00**

Source of funds to buy the medicine

Table 2.4.111 shows that majority of the respondents from all the barangays (85%) bought their medicines from their personal funds. On the other hand, 14% relied on government money or support to be able to access the medicines they needed.

Table 2.4.111. Respondent's source of funds to buy medicine

Source of funds to buy medicine	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Out-of-pocket	17	89.47	37	86.05	32	82.05	86	85.15
Government	2	10.53	6	13.95	6	15.38	14	13.86
N/A	0	0.00	0	0.00	1	2.56	1	0.99
Total	**19**	**100.00**	**43**	**100.00**	**39**	**100.00**	**101**	**100.00**

Annual expenses incurred for medicines

There was 40% of the respondents from all the barangays who incurred from less than PhP 200-2,000 per year for the cost of medicines. On the other hand, there was 30% who spent from PhP2,001 to more than PhP10,000 a year for the medicines their needed. These finding imply that the cost of medicine incurred is proportional to urgency and gravity of the sickness undergone by the patient.

Table 2.4.112. Expenses incurred by the respondent per year for medicine

Expenses on medicine	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	0	0.00	0	0.00	0	0.00	0	0.00
<Php 200	0	0.00	1	2.22	2	5.41	3	3.00
Php 201-500	2	11.11	5	11.11	3	8.11	10	10.00
Php 501-1,000	2	11.11	5	11.11	8	21.62	15	15.00
Php 1,001-2,000	1	5.56	7	15.56	4	10.81	12	12.00
Php 2,001-3,000	0	0.00	2	4.44	4	10.81	6	6.00

Expenses on medicine	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Php 3,001-5,000	3	16.67	2	4.44	3	8.11	8	8.00
Php 5,001-8,000	0	0.00	1	2.22	4	10.81	5	5.00
Php 8,001-10,000	2	11.11	1	2.22	0	0.00	3	3.00
>Php 10,000	2	11.11	4	8.89	2	5.41	8	8.00
No answer	6	33.33	17	37.78	7	18.92	30	30.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Medical missions

Tables 2.4.113 and **2.4.114** show the various medical missions benefitted by the respondents from the local and national government units and private sector as well as the frequency of holding these medical activities. It can be gleaned from the tables that the majority of these medical missions were conducted once a year which were mostly LGU driven undertakings.

Table 2.4.113. Frequency of medical missions from the government taking place in the respondent's community

Frequency	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
LGU	**10**	**83.33**	**26**	**89.66**	**7**	**70.00**	**43**	**84.31**
Once a year	6	60.00	16	61.54	5	71.43	27	62.79
Twice a year	4	40.00	10	38.46	2	28.57	16	37.21
National	**1**	**8.33**	**3**	**10.34**	**2**	**20.00**	**6**	**11.76**
Once a year	0	0.00	2	66.67	2	100.00	4	66.67
Twice a year	1	100.00	1	33.33	0	0.00	2	33.33
Barangay	**1**	**8.33**	**0**	**0.00**	**1**	**10.00**	**2**	**3.92**
Once a year	0	0.00	0	0.00	1	100.00	1	50.00
Twice a year	1	100.00	0	0.00	0	0.00	1	50.00
Total	**12**	**100.00**	**29**	**100.00**	**10**	**100.00**	**51**	**100.00**

Table 2.4.114. Frequency of medical missions from the private sector taking place in the respondent's community

Frequency	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
FDC	**9**	**36.00**	**0**	**0.00**	**0**	**0.00**	**9**	**16.67**
Once a year	8	88.89	0	0.00	0	0.00	8	88.89
Twice a year	1	11.11	0	0.00	0	0.00	1	11.11
Steel Asia	**0**	**0.00**	**1**	**100.00**	**0**	**0.00**	**1**	**1.85**
Once a year	0	0.00	1	100.00	0	0.00	1	100.00
Twice a year	0	0.00	0	0.00	0	0.00	0	0.00
PSC	**8**	**32.00**	**0**	**0.00**	**10**	**35.71**	**18**	**33.33**
Once a year	7	87.50	0	0.00	10	100.00	17	94.44
Twice a year	1	12.50	0	0.00	0	0.00	1	5.56
Phoenix	**0**	**0.00**	**0**	**0.00**	**10**	**35.71**	**10**	**18.52**
Once a year	0	0.00	0	0.00	10	100.00	10	100.00
Twice a year	0	0.00	0	0.00	0	0.00	0	0.00
STEAG	**8**	**32.00**	**0**	**0.00**	**8**	**28.57**	**16**	**29.63**
Once a year	7	87.50	0	0.00	8	100.00	15	93.75
Twice a year	1	12.50	0	0.00	0	0.00	1	6.25
Total	**25**	**100.00**	**1**	**100.00**	**28**	**100.00**	**54**	**100.00**

Most common causes of mortality in the past five years

Table 2.4.115 shows that hypertension was the predominant cause of death in all the households from the impact barangays especially in Poblacion I (94%) and Katipunan (70%) as reported by the respondents. There are 47% of the respondents in San Martin who stated that hypertension was a common killer in their households. The second most mentioned cause of death was heart attack for 40% of the respondents while diabetes (39%) came in

third. The other reasons listed for the death of members in the household include kidney disease, respiratory disease, accidents, old age, cancer and dengue.

Table 2.4.115. Causes of mortality in the respondent's community

Causes of mortality	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Hypertension	17	94.44	21	46.67	26	70.27	64.00	64.00
Heart attack	3	16.67	27	60.00	10	27.03	40.00	40.00
Diabetes	15	83.33	19	42.22	5	13.51	39.00	39.00
Kidney disease	3	16.67	4	8.89	1	2.70	8.00	8.00
Respiratory disease	7	38.89	0	0.00	3	8.11	10.00	10.00
Accidents	1	5.56	11	24.44	7	18.92	19.00	19.00
Old age	0	0.00	4	8.89	5	13.51	9.00	9.00
Cancer	3	16.67	7	15.56	0	0.00	10.00	10.00
Dengue	0	0.00	9	20.00	6	16.22	15.00	15.00

Smoking

Table 2.4.116 shows that majority of the respondents were non-smokers (88%) while the others smoked cigarettes (12%). For those who smoked, nine (9) or 9% has been smoking for the past 10 years or more while three (3) respondents had been into the vice from one (1) to less than 10 years. (**Table 2.4.117**)

There were five (5) of the smokers who consumed one pack a day while four (4) were content with just one-half a pack in a day. Three respondents were light smokers with less than 10 sticks of cigarettes per day (**Table 2.4.118**).

Table 2.4.116. Smoking habits of respondents

Whether respondent is a smoker	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	3	16.67	1	2.22	8	21.62	12	12.00
No	15	83.33	44	97.78	29	78.38	88	88.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.117. Smoking habits of respondents (number of years)

Number of years	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	15	83.33	44	97.78	29	78.38	88	88.00
1-2 years	0	0.00	0	0.00	1	2.70	1	1.00
3-5 years	0	0.00	0	0.00	1	2.70	1	1.00
5-10 years	1	5.56	0	0.00	0	0.00	1	1.00
>10 years	2	11.11	1	2.22	6	16.22	9	9.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.118. Smoking habits of respondents (number of sticks consumed in a day)

Number of sticks	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	15	83.33	44	97.78	29	78.38	88	88.00
< 10	1	5.56	1	2.22	1	2.70	3	3.00
10 (half pack)	0	0.00	0	0.00	4	10.81	4	4.00
20 (one pack)	2	11.11	0	0.00	3	8.11	5	5.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Alcohol consumption

Table 2.4.119 shows that majority or 73% of the respondents do not drink alcoholic drinks while 27% did. Drinking on occasion was stated by 24% of the respondents while only one (1) drank alcohol every day (**Table 2.4.120**).

Table 2.4.119. Alcohol consumption of respondents

Whether respondent drinks alcohol	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	5	27.78	13	28.89	9	24.32	27	27.00
No	13	72.22	32	71.11	28	75.68	73	73.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.120. Drinking habits of respondents (frequency)

Frequency	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	13	72.22	32	71.11	28	75.68	73	73.00
Everyday	0	0.00	0	0.00	1	2.70	1	1.00
Once a week	0	0.00	0	0.00	1	2.70	1	1.00
Once a month	0	0.00	1	2.22	0	0.00	1	1.00
Occasional	5	27.78	12	26.67	7	18.92	24	24.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Birth control

Table 2.4.121 shows that only twenty-eight (28) or 28% practice birth control. Furthermore, the birth control method adopted various methods as shown in **Table 2.4.122**. These include Depo-Provera injection, condom, rhythm, pills, withdrawal, Intra-uterine device (IUD), and ligation.

Table 2.4.121. Birth control practices of respondents

Whether practicing birth control	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	6	33.33	12	26.67	10	27.03	28	28.00
No	12	66.67	33	73.33	27	72.97	72	72.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.122. Birth control method being practiced by the respondents

Birth control method	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	12	66.67	33	73.33	27	72.97	72	72.00
Depo-Provera injection	1	5.56	0	0.00	0	0.00	1	1.00
Condom	2	11.11	1	2.22	0	0.00	3	3.00
Rhythm Method	1	5.56	1	2.22	1	2.70	3	3.00
Pills	1	5.56	3	6.67	5	13.51	9	9.00
Withdrawal	1	5.56	2	4.44	1	2.70	4	4.00
IUD	0	0.00	4	8.89	1	2.70	5	5.00
Ligation	0	0.00	1	2.22	0	0.00	1	1.00
Others	0	0.00	0	0.00	2	5.41	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Source of water for laundry and other domestic use

It can be seen in **Table 2.4.123** that almost all of the respondents in San Martin (93.33%) and Katipunan (97.30%) while only 44.44% of the respondents from Poblacion I obtain their water for laundry and other domestic use from their faucets connected with the major water service provider in their locality. On the other hand, there was a majority of the respondents from Poblacion I who obtained water from springs in their barangay. The other sources of water include shallow (3%) and deep wells (1%).

Table 2.4.123. Respondent's source of water for laundry and other domestic use

Source of water	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Spring	10	55.56	0	0.00	0	0.00	10	10.00
Faucet in the house connection	8	44.44	42	93.33	36	97.30	86	86.00
Shallow well	0	0.00	3	6.67	0	0.00	3	3.00
Deep well	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Source of water for drinking/cooking

The source of water for drinking and cooking was predominantly obtained from the respective household faucets connected to the water system (66%), water-refilling stations (31%) and wells (3%) (**Table 2.4.124**).

Table 2.4.124. Respondent's source of water for drinking/cooking

Source of water	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Water refilling station	10	55.56	19	42.22	2	5.41	31	31.00
Faucet in the house	8	44.44	23	51.11	35	94.59	66	66.00
Well	0	0.00	3	6.67	0	0.00	3	3.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Waste disposal method

Table 2.4.125 shows that majority of the respondents from the impact barangays, if not all, had their waste collected by garbage trucks of their LGU unit. The other methods of disposal include burying the trash in the soil (3%), piled or composted (1%) and burned (4%). Segregation was likewise practiced by 96% of the respondents in all the impact barangays as shown in **Table 2.4.126**.

Table 2.4.125. Waste disposal method being practiced by the respondents

Method	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Garbage truck collection	18	100.00	42	93.33	32	86.49	92	92.00
Burying	0	0.00	2	4.44	1	2.70	3	3.00
Piled/compost	0	0.00	1	2.22	0	0.00	1	1.00
Burned	0	0.00	0	0.00	4	10.81	4	4.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.126. Segregation practices of respondents

Whether practicing segregation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	18	100.00	45	100.00	33	89.19	96	96.00
No	0	0.00	0	0.00	4	10.81	4	4.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Respondents Response on Environmental Matters and Issues

Changes in the environment over the past five (5) years

There was a majority of the respondents (60%) who mentioned that there were observed changes in the environment in the last five (5) years. The changes that occurred in their locality include the establishment of new facilities, construction/repair of roads, added vehicles plying the area, increased population, cleaner surroundings, improved water quality, upgraded solid waste management and positive politics/governance. The other changes encountered were negative economic changes, infestation, poor air quality, poor water

quality, flooding, decreased area for agricultural purposes, decreased educational performance, weak solid waste management, traffic congestion, increased ambient temperature and skin allergies (**Table 2.4.127**).

Table 2.4.127. Respondents observation of the changes in the environment in the past five (5) years

Whether changes were observed	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	16	88.89	23	51.11	21	56.76	60	60.00
No	2	11.11	22	48.89	16	43.24	40	40.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.128. Changes observed by the respondents in the environment in the past five (5) years

Observed changes	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
New facilities/ roads/ vehicles	7	38.89	22	48.89	13	35.14	42	42.00
Increase in population	4	22.22	0	0.00	0	0.00	4	4.00
Clean surroundings	0	0.00	2	4.44	3	8.11	5	5.00
Positive Economic change	0	0.00	1	2.22	0	0.00	1	1.00
Negative Economic change	0	0.00	1	2.22	0	0.00	1	1.00
Infestation	0	0.00	1	2.22	0	0.00	1	1.00
Poor Air Quality	1	5.56	4	8.89	0	0.00	5	5.00
Improved Water Quality	0	0.00	0	0.00	0	0.00	0	0.00
Poor Water Quality)	1	5.56	1	2.22	0	0.00	2	2.00
Flooding	5	27.78	1	2.22	0	0.00	6	6.00
Decreased area for agricultural purposes	0	0.00	1	2.22	0	0.00	1	1.00
Positive Politics	0	0.00	0	0.00	3	8.11	3	3.00
Decreased Educational performance	0	0.00	0	0.00	0	0.00	0	0.00
Improved Solid Waste Management	1	5.56	0	0.00	8	21.62	9	9.00
Poor Solid Waste Management	6	33.33	0	0.00	4	10.81	10	10.00
Traffic	2	11.11	0	0.00	0	0.00	2	2.00
Increased ambient temperature	0	0.00	1	2.22	1	2.70	2	2.00
Skin Allergies	6	33.33	2	4.44	3	8.11	11	11.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Agriculture/vegetation

As far as agriculture is concerned, there was crop failure/poor harvest and occurrence of infestation which severely affected the farmers.

Table 2.4.129. Changes observed by the respondents on agriculture/vegetation in the past five (5) years

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Problems/issues								
Crop failure/poor harvest	6	100.00	1	50.00	0	0.00	7	63.64
Infestation	0	0.00	1	50.00	3	100.00	4	36.36
Total	**6**	**100.00**	**2**	**100.00**	**3**	**100.00**	**11**	**100.00**
Period observed								
2016	1	16.67	1	50.00	0	0.00	2	18.18
2017	1	16.67	0	0.00	0	0.00	1	9.09

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
2018	0	0.00	0	0.00	0	0.00	0	0.00
2019	0	0.00	0	0.00	0	0.00	0	0.00
2020	0	0.00	1	50.00	2	66.67	3	27.27
2021	0	0.00	0	0.00	1	33.33	1	9.09
More than 10 ago	4	66.67	0	0.00	0	0.00	4	36.36
No answer	0	0.00	0	0.00	0	0.00	0	0.00
Total	**6**	**100.00**	**2**	**100.00**	**3**	**100.00**	**11**	**100.00**
Possible reasons for changes								
Construction of new buildings	1	16.67	0	0.00	0	0.00	1	9.09
Natural causes	3	50.00	1	50.00	2	66.67	6	54.55
Polluted environments	2	33.33	0	0.00	0	0.00	2	18.18
Surrounding companies	0	0.00	1	50.00	0	0.00	1	9.09
Caused by community/human beings	0	0.00	0	0.00	1	33.33	1	9.09
Total	**6**	**100.00**	**2**	**100.00**	**3**	**100.00**	**11**	**100.00**

Water

The changes which have been observed on water resources focused on poor water quality, low water pressure and occurrence of floods (**Table 2.4.130**).

The time these changes may have occurred from more than ten years ago to the present.

The reasons given as to why there were changes in water resources in the community include man-made factors, garbage issues, presence of nearby companies/plants, polluted surroundings and natural causes.

Table 2.4.130. Changes observed by the respondents on water resources in the past five (5) years

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Problems/issues								
Poor water quality	5	71.43	0	0.00	6	75.00	11	64.71
Low water pressure	1	14.29	1	50.00	0	0.00	2	11.76
Floods	1	14.29	1	50.00	2	25.00	4	23.53
Total	**7**	**100.00**	**2**	**100.00**	**8**	**100.00**	**17**	**100.00**
Period observed								
2016	1	14.29	0	0.00	1	12.50	2	11.76
2017	0	0.00	0	0.00	0	0.00	0	0.00
2018	0	0.00	0	0.00	0	0.00	0	0.00
2019	1	14.29	0	0.00	1	12.50	2	11.76
2020	1	14.29	0	0.00	0	0.00	1	5.88
2021	0	0.00	0	0.00	2	25.00	2	11.76
More than 10 ago	4	57.14	1	50.00	0	0.00	5	29.41
No answer	0	0.00	1	50.00	4	50.00	5	29.41
Total	**7**	**100.00**	**2**	**100.00**	**8**	**100.00**	**17**	**100.00**
Possible reasons for changes								
Man -made	1	33.33	0	0.00	1	50.00	2	40.00
Garbage	0	0.00	0	0.00	0	0.00	0	0.00
Nearby companies	0	0.00	0	0.00	0	0.00	0	0.00
Polluted surroundings	1	33.33	0	0.00	1	50.00	2	40.00
Natural causes	1	33.33	0	0.00	0	0.00	1	20.00
Total	**3**	**100.00**	**0**	**0.00**	**2**	**100.00**	**5**	**100.00**

Land

The respondents mentioned that there was an observed drying up of the land or soil resources, unavailability of the land for farming activities and presence of muddy roads (**Table 2.4.131**). The changes were observed to have happened more than 10 years ago.

The reasons given for the changes in land resources include natural causes, man-made factors, polluted surroundings, increase in population and the presence of nearby companies.

Table 2.4.131. Changes observed by the respondents on land in the past five (5) years

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Problems/issues								
Dry	3	75.00	0	0.00	0	0.00	3	50.00
No available land to farm	1	25.00	1	100.00	0	0.00	2	33.33
Muddy roads	0	0.00	0	0.00	1	100.00	1	16.67
Total	**4**	**100.00**	**1**	**100.00**	**1**	**100.00**	**6**	**100.00**
Period observed								
2016	0	0.00	1	100.00	0	0.00	1	16.67
2017	0	0.00	0	0.00	0	0.00	0	0.00
2018	0	0.00	0	0.00	0	0.00	0	0.00
2019	0	0.00	0	0.00	0	0.00	0	0.00
2020	0	0.00	0	0.00	0	0.00	0	0.00
2021	0	0.00	0	0.00	0	0.00	0	0.00
More than 10 ago	4	100.00	0	0.00	0	0.00	4	66.67
No answer	0	0.00	0	0.00	1	100.00	1	16.67
Total	**4**	**100.00**	**1**	**100.00**	**1**	**100.00**	**6**	**100.00**
Possible reasons for changes								
Dry	3	37.50	0	0.00	0	0.00	3	27.27
No available land to farm	1	12.50	1	50.00	0	0.00	2	18.18
Muddy roads	0	0.00	0	0.00	1	100.00	1	9.09
Dry	3	37.50	0	0.00	0	0.00	3	27.27
No available land to farm	1	12.50	1	50.00	0	0.00	2	18.18
Total	**8**	**100.00**	**2**	**100.00**	**1**	**100.00**	**11**	**100.00**

Air

The issues or changes that have been observed in relation to air include air pollution, foul smelling atmosphere, skin allergies, illnesses and warm air temperature (**Table 2.4.132**). These changes have been observed to have transpired more than 10 years ago.

The reasons given for the observed changes include community or man-made factors, absence of trees, natural causes and pollution.

Table 2.4.132. Changes observed by the respondents on air quality in the past five (5) years

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Problems/issues								
Air Pollution	5	100.00	3	50.00	5	55.56	13	65.00
Foul smell in the air	0	0.00	1	16.67	2	22.22	3	15.00
Skin Allergy	0	0.00	1	16.67	0	0.00	1	5.00
illness	0	0.00	1	16.67	0	0.00	1	5.00
Warm air temperature	0	0.00	0	0.00	2	22.22	2	10.00
Total	**5**	**100.00**	**6**	**100.00**	**9**	**100.00**	**20**	**100.00**

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Period observed								
2016	0	0.00	4	66.67	1	11.11	5	25.00
2017	0	0.00	0	0.00	1	11.11	1	5.00
2018	0	0.00	0	0.00	1	11.11	1	5.00
2019	0	0.00	0	0.00	0	0.00	0	0.00
2020	0	0.00	0	0.00	0	0.00	0	0.00
2021	0	0.00	0	0.00	0	0.00	0	0.00
More than 10 ago	5	100.00	0	0.00	0	0.00	5	25.00
No answer	0	0.00	2	33.33	6	66.67	8	40.00
Total	**5**	**100.00**	**6**	**100.00**	**9**	**100.00**	**20**	**100.00**
Possible reasons for changes								
No answer	1	20.00	0	0.00	0	0.00	1	16.67
Nearby companies	0	0.00	1	100.00	0	0.00	1	16.67
Community	1	20.00	0	0.00	0	0.00	1	16.67
Absence of trees	1	20.00	0	0.00	0	0.00	1	16.67
Natural causes	1	20.00	0	0.00	0	0.00	1	16.67
Pollution	1	20.00	0	0.00	0	0.00	1	16.67
Total	**5**	**100.00**	**1**	**100.00**	**0**	**0.00**	**6**	**100.00**

Economy

The issue or problem that was faced by the respondents as far the economy is concerned over the last five years was the lack of job opportunities (**Table 2.4.133**). On the other hand, the possible reasons given for this experience was the occurrence of the COVID-19 pandemic and other natural causes.

Table 2.4.133. Changes observed by the respondents on economy in the past five (5) years

Observation	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Problems/issues								
Lack of job opportunities	0	0.00	0	0.00	1	100.00	1	100.00
Total	0	**0.00**	0	**0.00**	1	100.00	1	100.00
Possible reasons for changes								
Pandemic	0	0.00	0	0.00	1	50.00	1	50.00
Natural causes	0	0.00	0	0.00	1	50.00	1	50.00
Total	**0**	**0.00**	**0**	**0.00**	**2**	**100.00**	**2**	**100.00**

Problems addressed by the barangay LGU

Table 2.4.134 shows that there was flooding, health issues, poor solid waste management, poor water quality and muddy roads experienced and have become problems in the barangay. The assistance provided by the barangay include support to tree planting activities, financial needs, medical missions, garbage collection, clean-up drives and concreting of canals.

Table 2.4.134. Problems encountered by the respondents and the corresponding assistance from the barangay

Problems	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Flooding	2	33.33	0	0.00	0	0.00	2	22.22
Health	1	16.67	0	0.00	1	25.00	1	11.11
Poor Solid Waste Management	3	50.00	0	0.00	0	0.00	3	33.33
Poor Water Quality	0	0.00	0	0.00	1	25.00	1	11.11
Muddy roads	0	0.00	0	0.00	2	50.00	2	22.22

Problems	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Total	**6**	**100.00**	**0**	**0.00**	**4**	**100.00**	**9**	**100.00**
Assistance from the barangay								
Tree planting	1	14.29	0	0.00	0	0.00	1	9.09
Financial	2	28.57	0	0.00	1	25.00	3	27.27
Medical Mission	1	14.29	0	0.00	0	0.00	1	9.09
Garbage collection	3	42.86	0	0.00	0	0.00	3	27.27
Clean-up drive	0	0.00	0	0.00	1	25.00	1	9.09
Concrete open canal	0	0.00	0	0.00	2	50.00	2	18.18
Total	**7**	**100.00**	**0**	**0.00**	**4**	**100.00**	**11**	**100.00**

Problems addressed by the MLGU

The problems encountered in the community that were addressed by the municipal LGU include poverty, infestation and low water pressure (**Table 2.4.135**). The assistance given to address these problems include financial support, pesticides, and renovation of water pipes.

Table 2.4.135. Problems encountered by the respondents and the corresponding assistance from the municipal government

Problems	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Poverty	1	100.00	0	0.00	0	0.00	1	33.33
Infestation	0	0.00	1	50.00	0	0.00	1	33.33
Low water pressure	0	0.00	1	50.00	0	0.00	1	33.33
Total	**1**	**100.00**	**2**	**100.00**	**0**	**0.00**	**3**	**100.00**
Assistance from the municipal government								
Financial	1	100.00	0	0.00	0	0.00	1	33.33
Pesticides	0	0.00	1	50.00	0	0.00	1	33.33
Renovation/fixing of water pipes	0	0.00	1	50.00	0	0.00	1	33.33
Total	**1**	**100.00**	**2**	**100.00**	**0**	**0.00**	**3**	**100.00**

Problems addressed by the national government

According to the respondents, the problems addressed by the national government were the concerns regarding the low productivity of farmlands and poor air quality (**Table 2.4.136**). The means by which these were given focused consisted of the provision of seeds, fertilizer and insecticides as well as the management of pollution control and provision of policies to address the concerns.

Table 2.4.136. Problems encountered by the respondents and the corresponding assistance from the national government agencies

Problems	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Low productivity of farmlands	2	11.11	0	0.00	0	0.00	2	2.00
Poor Air Quality	0	0.00	3	6.67	0	0.00	3	3.00
Total	**1**	**100.00**	**2**	**100.00**	**0**	**0.00**	**3**	**100.00**
Assistance from the national government								
Provision of seeds, fertilizer, and insecticides	2	100.00	0	0.00	0	0.00	2	40.00
Pollution control	0	0.00	2	66.67	0	0.00	2	66.67
Policies	0	0.00	1	33.33	0	0.00	1	33.33
Total	**0**	**0.00**	**3**	**100.00**	**0**	**0.00**	**3**	**100.00**

Satisfaction with the state of the environment

Majority of the respondents from Barangay San Martin (80%) and Katipunan were satisfied with the present condition of the environment. There was only 44.44% of the respondents from Poblacion I who felt contentment with the current attributes of the environment. On the whole, there was only 17% of the total respondents who deemed dissatisfaction regarding the environmental condition presently experienced. There was nine (9) percent who had no idea or opinion about the matter on hand (**Table 2.4.137**).

Table 2.4.137. Respondent's satisfaction with the state of the environment

Whether the respondent is satisfied with the state of the environment	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	8	44.44	36	80.00	30	81.08	74	74.00
No	7	38.89	6	13.33	4	10.81	17	17.00
No idea	3	16.67	3	6.67	3	8.11	9	9.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Calamities encountered in the last five years

The predominant calamities experienced by the respondents in the three (3) impact barangays include typhoon (83%), floods (73%) and earthquake (31%) as shown in **Table 2.4.138**.

Table 2.4.138. Calamities encountered by the respondents in their barangay for the last five (5) years

Problems	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Typhoon	13	37.14	33	42.31	37	50.00	83	44.39
Earthquake	8	22.86	10	12.82	13	17.57	31	16.58
Floods	14	40.00	35	44.87	24	32.43	73	39.04
Total	**35**	**100.00**	**78**	**100.00**	**74**	**100.00**	**187**	**100.00**

Perception of Respondent to PSC and its proposed Project

Awareness of Philippine Sinter Corporation as a company operating in their area

Table 2.4.139 shows that 91% of the respondents were aware that PSC is a company operating in their area while there was 9% who did not.

Furthermore, those who expressed awareness of PSC mentioned that their predominant source of information was from relatives, friends, neighbors or people working in the nearby plant sites (60%) while 22% stated that information was derived from barangay meetings, consultations and surveys. Other government agencies/entities (8%) were also reported to be the respondents' informants' regarding the company (**Table 2.4.140**).

Table 2.4.139. Respondent's awareness about the PSC

Whether the respondent is aware of PSC as a company operating in the area	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	15	83.33	41	91.11	35	94.59	91	91.00
No	3	16.67	4	8.89	2	5.41	9	9.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.140. Respondent's source of information about PSC

Source of information	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	3	16.67	5	11.11	2	5.41	10	10.00
Relatives/ friends/ neighbors/ people working in nearby plant site	5	27.78	23	51.11	32	86.49	60	60.00
Barangay meetings/consultation/Survey	4	22.22	15	33.33	3	8.11	22	22.00
Government	6	33.33	2	4.44	0	0.00	8	8.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Awareness of the proposed PSC Ore Blending and New Berth Facility

With regard to the proposed PSC Ore Blending and New Berth Facility, majority of the respondents from all the barangays – Poblacion I (72.22%), San Martin (53.33%) and Katipunan (54.05%) or an average of 57% expressed unfamiliarity about the said project (**Table 2.4.141**).

The respondents who indicated that they were aware of the proposed project stated that they got some knowledge from government representatives (23%), barangay meetings, consultations and surveys (18%), relatives, friends or neighbors (2%) and from local newspapers/radio programs (1%) (**Table 2.4.142**).

Table 2.4.141. Respondent's awareness about the proposed Ore Blend and New Berth Facility project of PSC

Whether the respondent is aware of proposed project of PSC	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	5	27.78	21	46.67	17	45.95	43	43.00
No	13	72.22	24	53.33	20	54.05	57	57.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.142. Respondent's source of information about the proposed project of PSC

Source of information	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	13	72.22	23	51.11%	20	54.05	56	56.00
Government	5	27.78	14	31.11%	4	10.81	23	23.00
Barangay meetings/consultation/Surveys	0	0.00	6	13.33%	12	32.43	18	18.00
Relatives/ friends/ neighbors	0	0.00	2	4.44%	0	0.00	2	2.00
Radio/TV/newspaper	0	0.00	0	0.00%	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Knowledge about the proposed project

Table 2.4.143 shows that thirty percent (30%) of the respondents stated that the proposed project was about expansion activities in the PSC grounds. On the other hand, 2% just indicated that there will be a new PSC project.

Table 2.4.143. Respondent's knowledge about the proposed ore blend and new berth facility

Type of information	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	15	83.33	25	55.56	28	75.68	68	68.00
Expansion	3	16.67	18	40.00	9	24.32	30	30.00
New project	0	0.00	2	4.44	0	0.00	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Potential beneficial effects of the proposed project

Table 2.4.144 shows that majority of all the respondents - Poblacion I (55.56%), San Martin (68.89%) and Katipunan (64.8%) – felt that there will be jobs generated as a result of the project. Other positive impacts perceived to happen include provision of assistance to the community in terms of the use of PSC ambulance, fire trucks, etc. (2%) and additional income or revenue to the barangay and municipality (4%) as a result of the payment by PSC of fees, permits and other government charges (**Table 2.4.145**).

Table 2.4.144. Respondent's perception on whether the proposed Ore Blend and New Berth Facility project of PSC has beneficial effects

Whether the of proposed project of PSC has beneficial effects	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	10	55.56	37	82.22	25	67.57	72	72.00
None	8	44.44	8	17.78	12	32.43	28	28.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.145. Respondent's perception about the beneficial effects of the proposed ore blend and new berth facility

Beneficial effects	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	8	44.44	8	17.78	13	35.14	29	29.00
Jobs generation	10	55.56	31	68.89	24	64.86	65	65.00
Assistance to the community (ambulance/ fire trucks/taxes)	0	0.00	2	4.44	0	0.00	2	2.00
Additional income to the barangay/municipality	0	0.00	4	8.89	0	0.00	4	4.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Benefits derived from other private companies operating in the barangay

It can be seen from **Table 2.4.146** that 61% of the respondents knew of the benefits derived by the community from other private companies in their locality while 39% did not.

Foremost of these benefits as shown in **Table 2.4.147**, include the educational assistance extended like scholarship grants/school supplies (32%), support to community health needs such as financial and medical/medicine needs (15%), provision of jobs (10%), participation in livelihood projects (7%), assistance to the barangay such as the use of ambulance and fire/dump trucks when needed (2%), additional income to the local government (0.8%), and financial and construction materials (0.8%) among others.

Table 2.4.146. Respondent's awareness on the benefits from other private companies in the barangay

Whether the respondent is aware of the benefits from other private companies	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	10	55.56	25	55.56	26	70.27	61	61.00
No	8	44.44	20	44.44	11	29.73	39	39.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.147. Respondent's awareness on the different benefits received from other private companies in the barangay

Benefits from other private companies	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	8	44.44	20	44.44	11	18.33	39	31.71
No opinion	2	11.11	0	0.00	0	0.00	2	1.63
Jobs	4	22.22	2	4.44	6	10.00	12	9.76
Educational assistance (scholarship/ school supplies)	0	0.00	17	37.78	22	36.67	39	31.71
Additional income for the barangay/municipality	0	0.00	1	2.22	0	0.00	1	0.81
Assistance to the barangay (ambulance/fire trucks/dump trucks)	0	0.00	3	6.66	0	0.00	3	2.44
Financial and material assistance	0	0.00	1	2.22	0	0.00	1	0.81
Livelihood	0	0.00	1	2.22	7	11.67	8	6.50
Assistance to community health needs (financial/medicines)	4	22.22	0	0.00	14	23.33	18	14.63
Total	**18**	**100.00**	**45**	**100.00**	**60**	**100.00**	**123**	**100.00**

Recommendations/suggestions to enhance potential positive impacts

Majority of the respondents (56%) mentioned that nothing is needed to be done to improve or enrich the positive impacts that may be brought about by the proposed project. The other respondents forwarded suggestions such as provision of information about the proposed project, extension of assistance to the affected communities, continued aid to the barangays in keeping the surroundings clean, hiring of locals, regular monitoring of social and environmental parameters, increased educational support (scholarship grants), and openness of the company to the recommendations of the residents (**Table 2.4.148**).

Table 2.4.148. Respondent's recommendations/suggestions to enhance potential positive impacts of the proposed project

Recommendations/ suggestions	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	15	83.33	26	57.78	15	40.54	56	56.00
Provide information about the proposed project	2	11.11	0	0.00	2	5.41	4	4.00
Provision of assistance to those who might be affected	1	5.56	5	11.11	1	2.70	7	7.00
Continue the assistance provided to the community	0	0.00	5	11.11	0	0.00	5	5.00
Sustain the cleanliness of surroundings	0	0.00	1	2.22	0	0.00	1	1.00

Recommendations/ suggestions	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Provision of jobs	0	0.00	6	13.33	7	18.92	13	13.00
Regular and careful monitoring	0	0.00	1	2.22	8	21.62	9	9.00
Openness to the recommendations/suggestions of the residents	0	0.00	1	2.22	0	0.00	1	1.00
Increase scholarship grants	0	0.00	0	0.00	4	10.81	4	4.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Perceived negative impacts

Table 2.4.149 shows that 24% of the respondents felt that the proposed project will bring about negative impacts while 76% opined that no negative effects are anticipated.

The perceived detrimental impacts as stated by the respondents are shown in **Table 2.4.150**. Foremost of these include poor air quality, followed by air and water pollution and respiratory diseases. There were three (3) respondents from Katipunan who mentioned that bathing areas for the residents in the community will be lost while two (2) respondents believed that there will be a decrease in water quality which might bring adverse effects on the health conditions in the locality (1%).

Table 2.4.149. Respondent's perception on the possible negative impacts of the proposed project

Whether the proposed project will bring about negative impacts	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	8	44.44	8	17.78	8	21.62	24	24.00
None	10	55.56	37	82.22	29	78.38	76	76.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.150. Respondent's perceived negative impacts of the proposed project

Impacts	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	10	55.56	36	80.00	28	75.68	74	74.00
Air, Water Pollution; Respiratory Diseases	8	44.44	1	2.22	0	0.00	9	9.00
Poor Air Quality	0	0.00	7	15.56	3	8.11	10	10.00
Adverse effects on health conditions	0	0.00	1	2.22	0	0.00	1	1.00
Loss of bathing area for residents in the community	0	0.00	0	0.00	3	8.11	3	3.00
Decreased Quality of water	0	0.00	0	0.00	2	5.41	2	2.00
Loss of agricultural lands	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Recommendations/suggestions to mitigate negative impacts

For those who responded that there will be negative impacts as a result of the project, the suggestions forwarded to mitigate the adverse effects include the practice of proper waste disposal as well as pollution control. Furthermore, information sharing about the proposed project should be conducted regularly together with the provision of assistance to the community. Meticulous monitoring of environmental parameters was suggested together with the implementation of the preventive measures to ensure safety in the community.

There should also be a relocation or designation of bathing areas for the residents as well as designation of land area where farmers can plant and cultivate crops.

Table 2.4.151. Respondent's recommendations/suggestions to mitigate negative impacts

Recommendations/ suggestions	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
None	15	83.33	38	84.44	31	83.78	84	84.00
Proper Waste Disposal	1	5.56	0	0.00	0	0.00	1	1.00
Information sharing	1	5.56	0	0.00	0	0.00	1	1.00
Pollution Control	1	5.56	2	4.44	0	0.00	3	3.00
Provision of assistance to the community	0	0.00	1	2.22	0	0.00	1	1.00
Meticulous monitoring	0	0.00	1	2.22	1	2.70	2	2.00
Implementation of preventive measures to ensure safety of the community	0	0.00	3	6.67	1	2.70	4	4.00
Relocation of bathing areas	0	0.00	0	0.00	3	8.11	3	3.00
Provision of land for agriculture	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Perception towards the proposed project

Majority of the respondents from San Martin (88.89%) and Katipunan (56.76%) felt that the proposed project will greatly benefit the community and its residents while majority of the respondents from Poblacion I perceived that the planned project will bring only minimal benefit. There was 4% of the respondents from the three (3) impact barangays who believed that the intended project will negatively affect the community. There was 3% who had no opinion about the subject matter (**Table 2.4.152**)

Table 2.4.152. Respondent's perception towards the proposed project

Perception towards the proposed project	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Will be of minimal benefit	13	72.22	4	8.89	11	29.73	28	28.00
Will greatly benefit the community and its residents	4	22.22	40	88.89	21	56.76	65	65.00
Will negatively affect the community	1	5.56	1	2.22	2	5.41	4	4.00
No opinion	0	0.00	0	0.00	3	8.11	3	3.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Attitude towards the proposed project

Table 2.4.153 shows that there was about 75% of the respondents who agreed to the project with 28% who strongly agreed and 47% who simply agreed. There was 21% who had no opinion. There was one (1) interviewee who strongly disagreed while 3% merely disagreed.

Table 2.4.153. Respondent's attitude towards the proposed project

Attitude towards the proposed project	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Strongly Agree	2	11.11	21	46.67	5	13.51	28	28.00
Agree	8	44.44	17	37.78	22	59.46	47	47.00
No Opinion	7	38.89	6	13.33	8	21.62	21	21.00
Disagree	1	5.56	1	2.22	1	2.70	3	3.00
Strongly Disagree	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

For those who agreed to the project, they opined that this will provide jobs and provide benefits to the community while those who disagreed thought that this will be damaging and will not benefit the community because of politics. Furthermore, a respondent answered that the proposed project will bring about pollution (**Table 2.4.154**).

Table 2.4.154. Respondent's reasons for response

Reasons for response	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No opinion	9	50.00	13	28.89	13	35.14	35	35.00
Will provide jobs	6	33.33	22	48.89	17	45.95	45	45.00
Will be bad for the community	1	5.56	0	0.00	1	2.70	2	2.00
Will provide benefits to the community	2	11.11	9	20.00	5	13.51	16	16.00
Will not be of benefit because of politics	0	0.00	1	2.22	0	0.00	1	1.00
Pollution	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Willingness to know the results of monitoring and other activities of the project

Majority of the respondents in Poblacion I (88.89%), San Martin (93.33%) and Katipunan (81.08%) were willing to be informed of the monitoring results and other activities that had been undertaken regarding the project (**Table 2.4.155**). However, there was 1% who did not like to be updated while 11% has no idea or no response.

Table 2.4.156 shows that among those who expressed willingness to be informed of monitoring results and activities regarding the project, the reasons forwarded include their desire to know more about the project, its impacts, rules and policies of PSC, be assured of continued assistance by the company and participate in the livelihood of programs.

Table 2.4.155. Respondent's willingness to know the results of monitoring and other activities of the project

Willingness to know the results of monitoring and other activities of the project	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	16	88.89	42	93.33	30	81.08	88	88.00
No	0	0.00	0	0.00	1	2.70	1	1.00
No idea	2	11.11	3	6.67	6	16.22	11	11.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.156. Respondent's reasons for response

Reasons for response	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No opinion	6	33.33	17	37.78	12	32.43	35	35.00
To know the effects of the project	5	27.78	4	8.89	7	18.92	16	16.00
To ensure compliance	3	16.67	1	2.22	5	13.51	9	9.00
To ensure benefits for the community residents	1	5.56	2	4.44	4	10.81	7	7.00
To guarantee cleanliness and safety of the community	3	16.67	21	46.67	9	24.32	33	33.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Willingness to attend meetings organized/called by PSC

Majority of the respondents answered positively towards attending meetings organized by PSC (**Table 2.4.157**). The primary reasons are to know the impacts of the project and to know more about the proposed project.

Table 2.4.157. Respondent's willingness to attend meetings organized/called by PSC

Willingness to attend to meetings organized/ called by PSC	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	17	94.44	41	91.11	32	86.49	90	90.00
No	0	0.00	2	4.44	0	0.00	2	2.00
No idea	1	5.56	2	4.44	5	13.51	8	8.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.158. Respondent's reasons for response

Reasons for response	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No Opinion	6	33.33	17	37.78	6	16.22	29	29.00
To know more about the proposed project	7	38.89	4	8.89	18	48.65	29	29.00
To know the impacts of the project	5	27.78	13	28.89	12	32.43	30	30.00
To know about the rules and policies of PSC	0	0.00	2	4.44	0	0.00	2	2.00
To ensure continued assistance of the company	0	0.00	1	2.22	1	2.70	2	2.00
To participate in the livelihood programs	0	0.00	7	15.56	0	0.00	7	7.00
No notices sent	0	0.00	1	2.22	0	0.00	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Willingness for the establishment of a Grievance Redress Mechanism (GRM)

There was 75% of the respondents who agreed for the establishment of a Grievance Redress Mechanism while 3% did not. There is a considerable portion of the respondents, which was 22%, who had no idea (**Table 2.4.159**).

Table 2.4.160 shows the various suggestions given by the respondents on how to implement a GRM. These include information/knowledge sharing about the project, addressing complaints made by the community, pursuance for the construction and operation of the project and assurance of the safety and health of the community.

Furthermore, setting aside political or self-serving motives, creation of a task force to plan and implement the GRM, involvement of the community through meetings and surveys and implementation of appropriate solutions and programs must be observed and carried out for the smooth implementation of a GRM.

The reason given by those who gave a negative answer was the need for them to have more information about PSC while one (1) was fundamentally not in favor of the project **Table 2.4.161**.

Table 2.4.159. Respondent's willingness for the establishment of a Grievance Redress Mechanism

Willingness for the establishment of a Grievance Redress Mechanism	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	16	88.89	33	73.33	26	70.27	75	75.00
No	0	0.00	2	4.44	1	2.70	3	3.00
No idea	2	11.11	10	22.22	10	27.03	22	22.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.160. Respondent's opinion on how to implement the Grievance redress mechanism

Reasons for response	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No opinion	11	61.11	18	40.00	13	35.14	42	42.00
Information/knowledge sharing about the project	1	5.56	1	2.22	0	0.00	2	2.00
Addressing complaints	4	22.22	9	20.00	1	2.70	14	14.00
Commencement of project	1	5.56	7	15.56	0	0.00	8	8.00
To guarantee safety and health of the community	1	5.56	4	8.89	0	0.00	5	5.00
No political or self-serving motives	0	0.00	1	2.22	0	0.00	1	1.00
Creation of a task force to plan and implement the GRM	0	0.00	1	2.22	7	18.92	8	8.00
Involvement of the community through meetings and surveys	0	0.00	3	6.67	7	18.92	10	10.00
Implementation of appropriate solutions and programs	0	0.00	1	2.22	9	24.32	10	10.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.161. Respondent's reasons if response is in the negative

Reasons for response	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
N/A	18	100.00	41	91.11	36	97.30	95	95.00
No opinion	0	0.00	3	6.67	0	0.00	3	3.00
There should be more information about PSC	0	0.00	1	2.22	0	0.00	1	1.00
Not in favor of the project	0	0.00	0	0.00	1	2.70	1	1.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Whether the project will generate more jobs

Majority of the respondents from Poblacion I (94.44%), San Martin (95.56%) and Katipunan (78.38%) anticipated that the proposed project will generate jobs. There was no respondent who replied in the negative while 11% had no opinion (**Table 2.4.162**).

The reasons given for their positive response include that if residents in the barangays will be given the priority, there will be a greater possibility for them to be employed. They also opined that unemployment will be reduced if skills training programs are conducted by the company, if politics is not considered, if qualified residents are employed, if scholarship grants and educational assistance are provided and if additional workforce is needed by the proposed project (**Table 2.4.163**).

Table 2.4.162. Respondent's perception on whether proposed project will generate more jobs

Whether proposed project will generate more jobs	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
Yes	17	94.44	43	95.56	29	78.38	89	89.00
No	0	0.00	0	0.00	0	0.00	0	0.00
No opinion	1	5.56	2	4.44	8	21.62	11	11.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

Table 2.4.163. Respondent's reasons for response

Reasons for response	Poblacion		San Martin		Katipunan		Total	
	No.	%	No.	%	No.	%	No.	%
No opinion	7	38.89	6	13.33	9	24.32	22	22.00
Not sure	1	5.56	0	0.00	0	0.00	1	1.00
Unemployed residents will have jobs	6	33.33	28	62.22	12	32.43	46	46.00
If residents of Villanueva are given the priority	3	16.67	1	2.22	13	35.14	17	17.00
If skills training programs are conducted	1	5.56	0	0.00	0	0.00	1	1.00
If qualified residents get to be employed	0	0.00	7	15.56	2	5.41	9	9.00
If politics are not considered in the hiring process	0	0.00	1	2.22	0	0.00	1	1.00
If scholarship grants and educational assistance of residents are provided	0	0.00	1	2.22	0	0.00	1	1.00
Additional workforce will be needed by the proposed project	0	0.00	1	2.22	1	2.70	2	2.00
Total	**18**	**100.00**	**45**	**100.00**	**37**	**100.00**	**100**	**100.00**

2.4.1.3 Impact Assessment and Environmental Performance

Table 2.4.164. Predicted impacts on the socio-economics and public health

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Displacement of settler/s Displacement / disturbance of properties Change/ conflict in land ownership Change/ conflict right of way Impact on Public Access		☑	☑		No houses or individuals will be displaced as well as conflict in land ownership as a result of the proposed project because the project site will be situated within the Phividec Estate.
In-migration		☑	☑	☑	Migration of people into the barangay in search of possible employment in the proposed project is highly possible. To deal with this potential issue, the company or its contractors should employ qualified people from the impact barangays and municipality. To help out residents who may possess some skills but do not fit into the requirements of the project, PSC should, in coordination with the LGU, conduct skills trainings to better equip the locals for them to suit with the company's human resource needs.
Cultural/ Lifestyle change					The present cultural activities/lifestyle of the residents in the barangays will not be adversely affected by the proposed project. On the contrary, with the possible job and livelihood opportunities that may be derived from the proposed project's activities, the lifestyle and living situations are expected to improve.
Impacts on physical cultural resources					There is no physical or cultural resource that will be damaged by the proposed project since it will be located within the premises of the Phividec estate.
Threat to delivery of basic services/ resource competition					There is no threat to the delivery of basic services such as power, communication and water as a result of the proposed project. The demand for power shall be adequately delivered by the local service provider while water shall be sourced from the existing deep well in the property. No competition for power, water or communication shall be experienced as a result of the project.

List of Key Impacts	Phase Occurrence				Discussion
	Pre-Construction	Construction	Operation	Abandonment	
Threat to public health and safety					There might be possible incidences of accidents during construction and operation. This may be averted with the setting up of signages in strategic places, conduct of IEC initiatives, provision of safety gears for workers and cordoning of areas for the safety of pedestrians and other people not involved in the construction and operation. Strict implementation of safety protocols should be carried out by the company. There is a possibility of an increased incidence of sexually transmitted diseases during international vessel port calls or docking. The said situation may be addressed through PSC's proper guidelines to the officers and crew of the international vessels as well as to the local contractors to observe good behavior and tact regarding this matter. Moreso, strict and close monitoring by the LGU health workers of women who are highly vulnerable to transmissible diseases must be enforced.
Generation of Local Benefits from the project Enhancement of employment and livelihood opportunities					It is anticipated that qualified local residents will be employed by the company especially during the construction phase. The implementation of livelihood projects through the Social Development Program is projected to provide additional income and other positive benefits such as enhanced capabilities to men, women and other disadvantaged groups.
Increased business opportunities and associated economic activities					As a result of these projects, the capacity to spend will be higher thus, more business opportunities are expected to operate in the surrounding area together with its associated activities.
Increased revenue of LGUs					The revenue of the local government is predicted to increase due to the booming economy from payment of taxes by local businesses that will benefit from the expansion of the project.
Traffic congestion					The traffic situation in the roads has been observed to be slightly or lightly congested during peak periods. It has been predicted that with additional trucks delivering materials during construction, a possible build-up of traffic in the area may happen. A closer coordination with the LGU traffic unit/ barangay traffic personnel should be undertaken by PSC to come up with strategies on how to minimize traffic as a result of the additional trucks plying the roads during project construction.

3 ENVIRONMENTAL MANAGEMENT PLAN

This chapter discusses the recommended Environmental Management Plan (EMP) incorporating the best practice environmental management measures already being implemented by the company and taking into account areas for enhancement and the necessary actions to improve on them. This plan is presented into various project phases including pre-construction, construction phase, operations, and abandonment phase.

3.1 EXISTING ENVIRONMENTAL MANAGEMENT PLAN

The Self-Monitoring Report (SMR) of Philippine Sinter Corporation (PSC) presented the following Modules verifying its current environmental activities and compliance pertaining to its operations:

Module 1	-	General Information
Module 2	-	RA 6969 (An Act to Control Toxic Substances and Hazardous and Nuclear Wastes, Providing Penalties for Violations and for other Purposes
Module 3	-	PD 984 (Water Pollution)
Module 4	-	RA 8749 (Air Pollution)
Module 5&6	-	PD 1586 (Ambient Air Quality Monitoring)/ Others

3.1.1 PSC Integrated Quality and Environmental Management System

PSC has in place an integrated Quality and Environmental Management System (QEMS). This is also discussed in *Chapter 6* of this EPRMP. The proceeding sections presents the specific subjects covering goals and target setting for environmental impacts, documentation, training, and communications and monitoring as well as the purposes of the procedures and their scope.

Environmental Aspects, Objectives and Targets, and Management Programs
PSC has documented procedures for identification of environmental aspects associated with the Sinter, Burnt and Hydrated Lime plant operations, products and services in order to determine those aspects that have actual, potential, or significant impacts on the environment and surrounding communities.

The procedures (PM-RPL-001, Resource Planning Process, PSC Integrated QEMS Manual) provide a framework for establishing environmental objectives and targets as well as environmental management programs that will facilitate achievement of the environmental policy of the company.

The procedures have the following scope:

- Identification and analysis of the details of operational activities, products and services;
- Identification and significance evaluation of the environmental aspects against

established criteria or relevant regulatory standards, company policy, involvement in previous accidents and public concern, environmental management programs and operational control procedure to address the associated environmental impacts; and

- Periodic review of significant environmental impacts. It covers aspects that PSC can control and those that the company can influence such as planned or new developments, or new or modified activities, products and services.

The procedures cover all aspects that PSC can control and those that the company can influence such as planned or new developments, or new or modified activities, products and services. A List of Environmental Aspects and Impacts is generated with the corresponding Environmental Management Programs.

With the proposed facilities, it is expected that the current EMP will mostly cover all its possible impacts. As such, the integrated QEMS however will have to be reviewed and if necessary revised to incorporate the requirements of the new facilities. This is discussed in the succeeding section.

Operations and Activities

PSC has specific procedures for Environmental Review of Projects (PM-RPL-002 Resource Planning Process, PSC Integrated QEMS Manual).

The procedures for environmental review of projects are aimed to institute and sustain a documented scheme for the recognition and evaluation of environmental issues of new facilities within the complex. The actions as detailed in the company's integrated QEMS Manual cover the following:

1. Identification and evaluation of environmental aspects and necessary prevention, mitigation or control activities; and
2. Determination of requirements for obtaining approvals from environmental regulatory and local government agencies.

Reports and Records Keeping

The Company retains a Procedure on Document and Data Control (PM-RAI-003) and Control of Integrated Records (PM-RAI-004) - Review and Improvement Process , PSC Integrated QEMS Manual, which guarantees that:

1. documents and data related to the quality and environmental management system are reviewed and authorized before being issued to the personnel concerned;
2. those personnel requiring access to quality and environmental management system documents have the most updated issues and are aware of the document control process; and
3. Information on the status of controlled documents are recorded in a master list and readily available.

Training and Tracking

The Company has general procedures for Training and Development for the employees (PM-HRM-002, Human Resources Management Process, PSC Integrated QEMS Manual). This is to guarantee that all regular employees of PSC are thoroughly and appropriately

qualified to deal with up with the organizational needs or goals of PSC. The training begins with skills and knowledge determination and ends with training records updating.

The scope of the training that PSC gives its employees includes:

1. All rank and file and managerial employees having positions affecting the quality, environmental management and main activities of production / operation; and
2. Identified sub-contractors handling tasks and activities at PSC.

3.1.2 Environmental Management System for Contractors and Suppliers

The implementation of the ore blend and new berth facilities will rely on the contractors for the construction of the ore blend yard and new berth, installation and maintenance of equipment. The corporate policy of PSC requires all contractors and suppliers to be in compliance with the rules of conduct, practice, and accountabilities, as part of the company's environmental including strict health protocol in relation with Covid-19.

The accountabilities of contractors include:

- Full disclosure of product information relating to safety and environmental impact;
- Safe transport and delivery of products;
- Minimum pollution and risks in the construction activities; and
- Immediate response to environmental incidents.

The contractors and suppliers are responsible for any damages that may occur to human being, property, and or environment caused by their operations. Compensation, clean up, remediation, and even criminal responsibility is a requisite of the ECC's issued to PSC. Termination of contract or exclusion from the list of qualified contractors and suppliers is the penalty for disregarding the environmental policy of the company if proven liable to such undertakings. The responsibilities and accountabilities of the contractors and suppliers are incorporated in the contract signed by both the parties for every activity.

All contractors and their employees are required to attend an integrated Quality and Environmental Management System (QEMS) and Safety orientation of the PSC plant before commencement of their work with the company.

3.1.3 Covid-19 Protocols and Management

Biodegradable and non-biodegradable solid wastes as well as hazardous wastes including sharps, non-sharps (cotton, tissue, etc.), face masks, and Covid-contaminated materials (e.g. jazmat, etc.) will be generated by the clinic. The existing prevention mechanisms of PSC to eliminate cases of Covid-19 within its workplace will be implemented continuously during the commencement of the proposed project as well as during the construction phase:

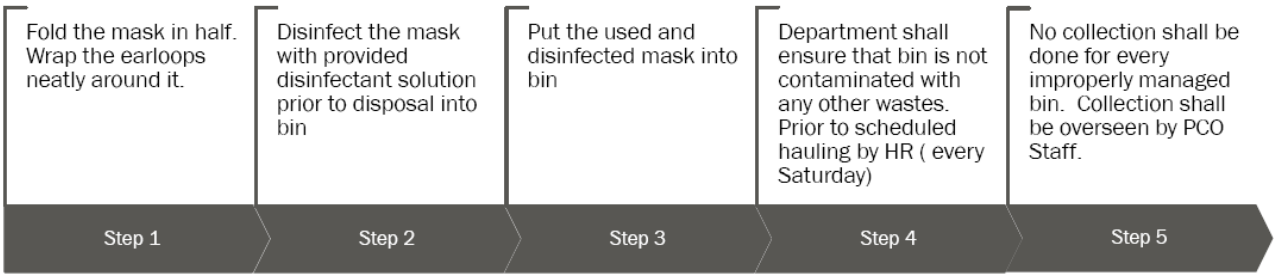
1. Set-up area dedicated for temporary hazardous wastes storage.
2. Provide bins (yellow containers with hazard signs) for sharps, non-sharps, facemasks, and Covid-contaminated materials.
3. Bins should have cover and a visible label. If possible foot operated bins.

4. Do not place bins for solid wastes near the area dedicated for hazardous wastes to avoid confusion.
5. HR to schedule weekly or monthly check-up of these bins as part of environmental aspect control procedure.
6. Establish schedule for turnover of the hazardous wastes.

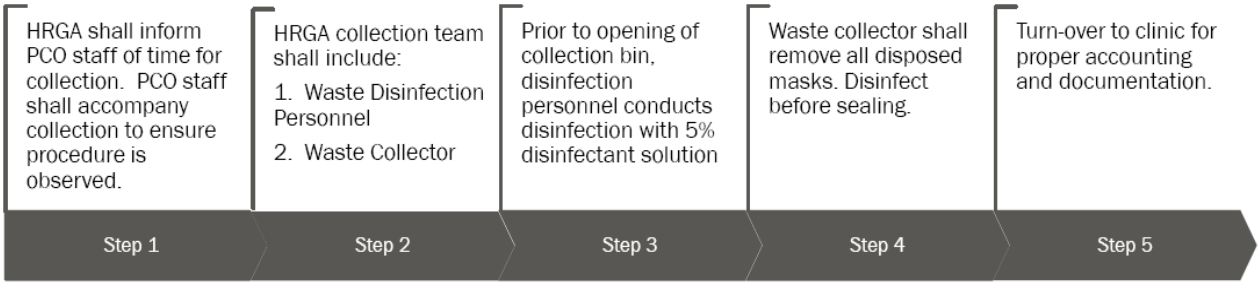
Storage bins are also provided inside the clinic while face masks bins will be placed strategic areas around the sinter plant (main gate, sinter building, admin) with proper labeling including:

Yellow bins – clinic wasted non-sharp, used masks, contaminated PPEs
Stainless bins – clinic wastes including sharps

PSC also established proper facemask disposal scheme into bins per area:



For the face mask collection procedure, the team shall be provided with the Covid-appropriate PPEs including latex gloves, double face masks, and face shield.



Covid-19 Prevention Protocol for Employees

In compliance with PSC OSCH Memorandum No. 2022-01-001 (**Annex 3.1**) which is aligned to the Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF) through Resolution No. 148 and 149 dated November 11 and 18. The following must be strictly followed at all times:

1. Employees who remain to be unvaccinated by December 1, 2021 shall be required to undergo RT-PCR tests regularly at their own expense (valid within 2 weeks). Provided that, antigen tests may be resorted to when RT-PCR capacity is insufficient or not immediately available.

2. The negative RT-PCR test should be taken 72 hours before entry at work on December 1, 2021.
3. All employees, contractors and visitors must present their Vaccination Card upon entry at the Main Gate or a negative RT-PCR test result (valid within 2 weeks) if remained unvaccinated.
4. Only the presentation of a medical clearance issued by a Municipal Health Office, City Health Office, and/or Provincial Health Office or birth certificate, as the case may be, shall serve as sufficient and valid proof of ineligibility for vaccination.

Moreover, PSC also implemented a strict guidelines on the prevention of Covid-19 for Authorized Persons Outside Residence (APORs) from private sector coming from areas within Region X per PSC OSHC Memorandum No. 2021-08-001:

1. Requesting department for APORs should coordinate all itinerary activities to OSH Committee c/o Safety Manager.
2. APOR travel documents must be forwarded thru email to PSC Safety Manager for evaluation.
3. APOR within Region X must present the BHERT certification within seven (7) days before the date of entry to PSC, certifying that the APOR must not be a PUM/PUI and no symptoms related to Covid-19.
4. APORS shall comply with the usual health screening procedure and fill out heath declaration form upon arrival at PSC Main Gate. Screening will be conducted by trained security personnel.
5. 5. Safety office will conduct surveillance of APOR movement inside PSC premises. Physical exposure with PSC employees is strictly prohibited.

The same requirements will be required of the contractor/workers during the construction phase of the proposed project.

3.2 PROPOSED ENVIRONMENTAL MANAGEMENT PLAN

Table 3.2.1 presents the existing and proposed EMP of PSC.

Table 3.2.1. Impact management plan of PSC

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
Pre-construction							
• Application of permits/licenses/ clearances from LGUs and national government agencies	PEOPLE	• Continuing partnership and coordination with host barangays and LGU of Villanueva	• PSC shall continue its IEC efforts and inform/ update respective the barangay councils of the host barangays and the LGU of Villanueva regarding the project and requirements for permits and/or clearances.	100% compliance to local and national requirements	ComRel PSC HRGA ComRel	Part of the permit application cost	IEC Plan
• Site clearing of the proposed ore blend yard area including leveling and surveying • /Site preparation for new berth facility area	PEOPLE	• Safety of the workers/staff within the premises of PSC	• Fences shall be installed around the perimeter of the project area. • Notice should be placed to inform about the workers/staff on the dangers of falling debris. • Security guards shall be stationed at the entry/exit to prevent unauthorized people from entering the construction site.	100% compliance to PSC's existing Safety Management Protocol – zero LTA and Fatal Accident	PSC Safety	Part of the construction cost	Construction Agreement
Construction							
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system	LAND	• Removal of vegetation cover *-a total of 2,421 trees is expected to be felled* • Change in habitat	• A 100% tree inventory within the developable areas was already conducted and PSC will secure tree cutting permit for the trees that will be felled. • PSC shall replace a maximum total of 242,100 seedlings in compliance to the provision of DENR DMO 2012-02 that a total of 100 seedlings shall be replaced for every naturally grown tree that is felled. • Seedlings will be planted along the remaining open areas within the PSC and along reforestation areas in agreement with DENR's National Greening Program. • Restocking and supplementary planting of endemic trees along existing green belts and corridors of PSC. • Earthballing and transplanting of Narra trees observed at the proposed ore blending area. • Collaboration with other Phividec locators such as STEAG for the continued protection of adjoining forested areas and marsh habitats to serve as refuge for displaced wildlife.	100% compliance to PD 705 and tree cutting permit conditions	PSC Laboratory & Envi Dept PCO	Part of the construction cost	• Include in TOR of contractor • Tree cutting permit • MOA by and between PSC, PHIVIDEC, Province of Misamis Oriental, Villanueva LGU and DENR Region X, PENRO and CENRO and other stakeholders including adjoining municipalities for participation in NGP
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system (*Continuation…*)	LAND	• Loss of topsoil and occurrence of soil erosion • Soil compaction	• Preferential scheduling of clearing and excavations works during the drier months (Low rainfall in Type IV areas is during the months of March to May). • Maximize cut-and-fill method of site preparation and road construction. Minimal topsoil spoils will be generated since excavation will be limited to structural foundations mainly isolated footings. • Spoils shall be hauled to designated run-off- controlled temporary spoil holding/storage area located North northwest of the proposed ore blending facility (N8°34'32.06", E124°45'32.77") with an approximate area of 6,000 m^2.	100% compliance to the EMP	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in the TOR of the contractor • Topsoil storage and management plan • SMR

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			• Immediate re-vegetation of exposed areas, which will not be utilized in subsequent development. • Establishment of appropriate erosion control measure such as concreting or use of gabions specifically along the drainage channel (approximately 1,250m in length with a width of 3m and a depth of 2 meters) southwest of the proposed ore blending yard. • Limiting the spoil height to 5m and covering the spoils with sacoline or tarpaulin especially during rainy months (June to September in Type IV areas).				
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system (*Continuation…*)	LAND	• Loss of topsoil and occurrence of soil erosion • Soil compaction	• Utilization of dredged materials from the new berth for backfilling and leveling of the ore blending yard.	100% compliance to the EMP	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in the TOR of the contractor • Topsoil storage and management plan • SMR
		• Generation of construction debris	• Construction spoils such as waste concrete/mortar will be brought to the 6,000 m^2 temporary spoil holding/storage area (N8°34'32.06", E124°45'32.77"). • PSC shall look for contractors/entities willing to accommodate the debris for backfilling purposes or other end use. • Woodwastes materials, waste rubber and plastic scraps shall be brought to the existing 40m^2 PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • The sorting facility shall classify the waste materials for recycling or for proper disposal. • Scrap metals shall be brought to the existing 4,600 m^2 PSC scrapyard (N8°34'24.93", E124°46'5.14") for temporary storage • PSC shall look for third-party scrapyard to broker scrap metals for recycling.	100% compliance to the EMP	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in the TOR of the contractor • Construction debris management plan • SMR
		• Solid waste generation	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the new project/work area similar to the waste segregated bins set in the existing area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73") (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the solid waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP and integrated manual in compliance to RA 9003	• PSC Lab & Envi Dept • PCO	Part of the construction cost	• PSC Integrated Manual EMP-07 (IM-APX-003-07)

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment at the yard including the conveyor system (*Continuation…*)	LAND	• Generation of hazardous wastes – busted bulbs – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – lead and lead compounds (vehicle batteries, spent battery packs) – assorted compounds (dry battery cell) – welding butts – pathogenic wastes	• Set-up of additional hazwaste container bins in identified areas where hazwaste generation is likely to occur such as the temporary facility of contractors. • Regular collection of hazardous waste generated during construction to be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01") (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the hazardous waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP and integrated manual in compliance to RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-03 (IM-APX-003-03) • Hazardous Wastes Management, Treatment and Disposal Program • Hazwaste Generator ID • Hazwaste Treater and EMB Certificate of Treatment including Hazwaste Transport Permit
	WATER	• Increase in surface run-off and silt deposition	• Construction of a 1.6 hectares (4-chambered) new south settling pond (N8°34'28.68", E124°45'29.71") with an approximate water holding capacity of 66.58m^3 prior to the start of site grading and leveling of the area intended for the ore blending yard. • Improvement of southern drainage channel (approximately 1,250 meters in length with a width of 3m and a depth of 2m) and run-off canals within the periphery of the construction area for ore blending area (Yard 5,6&7). • Construction of a new drainage channel (approximately 900 min length with a width of 3m and a depth of 2m) in the northern side to collect run-off emanating from the proposed Yard 8. • The southern drainage channel will eventually be connected by PSC to the proposed new south settling pond as the existing south settling pond will be condemned once ore blending yard is established while the new northern drainage channel will be connected to the existing northern settling pond (N8°34'41.10", E124°45'51.01"). • Establishment of peripheral berm within the ore yard to prevent run-off from directly discharging to the nearest discharge channel. • Construction of slightly slope ore blending yard with the inclination towards the center to collect run-off allowing the flow towards southeast first to the drainage channel to give ample time for the run-off laden with soil and ore particles to settle and diverted to a sump pit (N8°34'3.49", E124°45'53.44") thereby collecting silt materials and particles thereby before meandering the drainage channel. • In the northern drainage channel, sump pit will be established prior to confluence with the 1st chamber of the northern settling pond (N8°34'34.82", E124°45'59.01"). • PSC is encouraged to consider construction of additional collector sumps or silt fences especially during the construction phase of the ore blending yards. • Secure the necessary discharge permit for the development	100% compliance to PSCs EMP in compliance to RA 9275	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• Include in TOR of contractor • PSC Run-off Water and drainage Mgmt. Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			of the new south settling pond.				
	WATER	• Water Pollution	• New workers, laborers and contractors shall be oriented on PSC's existing wastewater management program (EMP 04 (IM-APX-003-04). • Set-up of three (3) portalets for the contractors and laborers temporary facility near the construction area for the ore blending yards and conveyor system • For sanitary purposes, civil contractors shall be tasked to maintain cleanliness and ensure that accumulated wastewater shall be collected and treated before it reaches full capacity. • Wastewater that will be generated from the said portalets will be hauled and treated by a third party pozo negro siphoning service provider. • The service provider will be monitored as to the treatment and disposal and will be compelled to follow PSC Wastewater Mgmt Plan Protocol. • PSC also has several existing toilets connected to septic tanks that were located the vicinity. The said toilets can be utilized by workers and employees involved in the construction. • Aquatic plants and reeds were allowed to grow in the existing northern settling pond to facilitate phytoremediation. This practice shall also be introduced in the new southern settling pond once established. • The existing material handling area has two (2) existing oil and water separator with a total holding capacity of 5.88m^3 sufficient to trap oil that may spill near the construction area. • PSC also has an installed oil and water separator with a total holding capacity of 4.52m^3 at the Motorpool Facility in Material Handling Dept. where PMS and repair for vehicles is done. The facility shall also be utilized during the construction of the ore yard and conveyor system. • Oil and water separators are regularly monitored and maintained by PSC to ensure its effectivity and functionality. • PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of soil. • PSC also practices lining of limestone and HDPE in the final discharge of the northern settling pond and this shall also be implemented in the new southern settling pond. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented during the construction of the ore blending yard and conveyor system. • PSC also has procured universal spill kits and sorbents such as polypropelene as well as oil containment boom that can be utilized for any untoward oil spillage.	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan
• Site clearing and leveling including removal of vegetation • Construction of structural foundation for conveyors • Installation of equipment	AIR	• Dust Generation	• Regulation of vehicle speed to 40km/hr within the construction areas. • Strict implementation of tarpaulin covering for delivery and haul trucks within and outside the construction area. • Wind barriers or covering of tarpaulin or sacoline materials shall be installed over excavated and dredged spoils.	100% compliance to PSCs EMP in accordance with RA 8749	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-01 (IM-APX-003-01), EMP-01A (IM-APX-003-01A), EMP-02 (IM-APX-

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
at the yard including the conveyor system • (*Continuation…*)			• Sprinkling of water along exposed areas especially during dry seasons. • PSC has two (2) water trucks to perform this activity with a capacity of 5.5kL per water truck. Water spraying activity will be done once in the early morning and once in the mid-afternoon. During drier days, additional spraying can be done before noon. The expected water requirement for the activity is 22,000 to a maximum of 33,000L per day. • The deepwell pumps of PSC have a capacity of 176,000L per day. PSC however has an option to utilize the impounded water at the settling ponds to lessen abstraction of water from their deepwell.				003-02) • Include in TOR of contractor
	AIR	• Increase in gaseous emission	• Regular maintenance of vehicles and construction equipment. • Designating a PSC envi staff and security guards to monitor and record heavy equipment during construction for smoke belchers • Identified smoke belchers shall be brought to the Motorpool Maintenance Facility for immediate overhaul of vehicles and heavy equipment. • Conduct of periodical smoke emission testing for vehicles and construction equipment. • Orientation of new employees and contractors regarding air quality management program included in EMP 01A (IM-APX-003-1A). • PSC shall require contractor that vehicles and heavy equipment that will be used on site are Euro 4 or Euro 5 compliant machine.	100% compliance to PSCs EMP in accordance with RA 8749	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-01 (IM-APX-003-01), EMP-01A (IM-APX-003-01A), EMP-02 (IM-APX-003-02) • SMR • EMB Permit to Operate • Include in TOR of contractor
		• Increase in noise level	• Maintain equipment deployment schedule. • Regular maintenance of vehicles and construction equipment. • Use of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the warehouse for all vehicles emitting severe noise. • Orientation of new employees and contractors regarding noise management program included in EMP 08 (IM-APX-003-08).	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • Include in TOR of contractor
• Pile driving and dredging at the new berth facility • Construction of new berth • Installation of material handling equipment • Installation of rubber dock fenders, bollards, signages etc	LAND	• Generation of solid waste, dredged materials and hazardous wastes – busted bulbs – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the new berth construction area similar to the waste segregated bins set in the existing area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the solid waste and hazardous waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID • Phil Coast Guard approved Oil Spill Contingency Plan
	WATER	• Wastewater generation	• New workers, laborers and contractors shall be oriented on PSC's existing wastewater management program (EMP 04	100% compliance to	• PSC Lab & Envi Dept • PCO	Part of the construction cost	• PSC Integrated Manual EMP-04

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			(IM-APX-003-04). • Set-up of one (1) portalet for the contractors and laborers temporary facility near the construction area for the new berth. • For sanitary purposes, civil contractors shall be tasked to maintain cleanliness and ensure that accumulated wastewater shall be collected and treated before it reaches full capacity. • Wastewater that will be generated from the said portalet will be hauled and treated by a third party pozo negro siphoning service provider including the three (3) portalets at the construction area for the ore blending facility. • The service provider will be monitored as to the treatment and disposal and will be compelled to follow PSC Wastewater Mgmt Plan Protocol (PSC EMP-04 (IM-APX-003-04). • PSC also has existing toilets connected to septic tanks that were located near the existing berth and BBASI Office. The said toilets can be utilized by workers and employees involved in the construction.	PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Planning Department • Contractors		(IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan
	WATER	Marine Ecology • Marine habitat disturbance • Increased turbidity of adjacent marine waters due to possible deposition of debris and silt from construction • Dredging activities stir up fine sediment which increases turbidity. This reduces light penetration which in turn reduces photosynthetic rates lowering DO concentration in the water column • Resuspension of heavy metals and other persistent pollutants trapped in sediments; may also result to algal blooms as a result of nutrient release due to silt suspension.	• Proper delineation of construction boundaries for the new berth ensures that construction shall be confined to that area alone and will not damage the adjoining marine habitat. • PSC shall use silt or turbidity curtains to contain water suspended silt within the dredging/piling area. • The silt curtain can be made of vinyl barrier with float above and chain ballast below and shall be anchored in the benthic zone or the marine bottom. • Dredging shall be done in two phases enclosing it in a 300 to 400-m silt curtain (perimeter), the said protective measure will be transferred to the second phase once piling and dredging is done in the first phase. • Dredged materials shall be brought to a temporary spoil holding/storage area (N8°34'32.06", E124°45'32.77"). approximately 450m southwest of the proposed new berth • Monitoring of turbidity outside the dredging area using Secchi disk to check the effectiveness of silt curtain. • PSC shall also consider establishing a temporary settling pond (N8°34'40.77", E124°45'40.48") to pump out and collect settled silts in case of heavy turbidity. This will ensure that re-suspended silt, heavy metals and persistent pollutant are arrested and transferred to the storage area. • Mitigation measures to minimize siltation (cited above) will also reduce the impact on dissolved oxygen. Wave action also naturally increases the DO in the marine water. • Since the silt curtain has an installed float/pontoon above the water and enclosing the whole dredging/piling area, the float can effectively contain oil slick and sheen from accidental spillage and prevent it from spreading into adjoining areas. • A staff from the PSC Laboratory & Envi Dept shall be tasked to monitor the environmental condition within and adjacent to the dredging/piling area. • PSC already have universal spill kits, oil recovery equipment and sorbent dispersants that they can immediately use in	100% compliance to PSCs EMP in compliance to RA 9275	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractors	Part of the construction cost	• PSC Silt Curtain Deployment Plan • PCG approved Oil Spill Contingency Plan • PSC Silt and Dredged Materials Management Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			case of oil spillage. • PSC is on the process of securing an approval from the Philippine Coast Guard (PCG) for their Oil Spill Contingency Plan. • PSC shall limit activities on pillar thrusting to daytime to allow settlement of organisms within the adjacent area. This will also build behavioral response among mobile species to seek refuge in the area at night and move out during the day.				
	AIR	• Increase in gaseous emissions	• New workers, laborers and contractors shall be oriented on PSC's existing air quality management program (EMP 01A (IM-APX-003-01A). • Regular maintenance of tug boats, vehicles and construction equipment. • Prior to deployment of dredger and pile driving machine, PSC will inspect the pile driving machine and will secure certificate of assurance from the contractor that the machine is in good working condition. • Maintain equipment deployment schedule. • Proper operation of pile driving machine, dredger, tugboat and heavy equipment/vehicle. • PSC shall require contractor that vehicles and heavy equipment that will be used on site are Euro 4 or Euro 5 compliant machine.	100% compliance to PSCs EMP in accordance with RA 8749	• PSC Lab & Envi Dept • PCO • PSC Material Handling • PSC Mechanical Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-01 (IM-APX-003-01), EMP-01A (IM-APX-003-01A), EMP-02 (IM-APX-003-02) • SMR • EMB Permit to Operate • Include in TOR of contractor
		• Increase in noise level	• Maintain equipment deployment schedule. • Regular maintenance of vehicles and construction equipment. • Use of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the mechanical repair shop for all vehicles emitting severe noise. • Orientation of new employees and contractors regarding noise management program included in EMP 08 (IM-APX-003-08).	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Mechanical Department • Contractor	Part of the construction cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of contractor
	PEOPLE	• Occupational awareness	• Promote training/Orientation of new employees, laborers and contractors.	100% compliance to PSCs OHS	• PSC Safety Office	Part of the construction cost	• Include in TOR of contractor • PSC OHS Manual
		• Occupational risk	• Posting of safety warning and danger signs in strategic locations within the construction site.				
		• Health Risk in relation to Covid-19	• Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.	100% compliance to PSCs Covid Action Plan	• PSC Safety Office, Security and Clinic	Part of the construction cost	• Include in TOR of contractor • IATF approve Covid Safety Protocol Manual
		• Increase in local employment	• Prioritization of local hiring.	100% compliance to PSCs Hiring Plan	PSC	Part of the construction cost	• HR Hiring Procedure Manual
		• Generation of government taxes	• Prompt payment of correct and proper taxes and appropriate of necessary permits.	100% compliance based on applicable local and national laws	PSC	Part of the construction cost	• Proof of Tax payment
		• Increased traffic due to	• Installation of safety barriers (e.g. fence) and signages.	100%	PSC Safety Office and Security	Part of the construction	• Compliance

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
		hauling trucks, vehicles and equipment going to and from the site	• Drafting and implementation of Traffic management plan(including ingress/egress of vehicles at construction site), including properly trained personnel to manage traffic flow. • Implement pedestrian walkways near the construction site. • Ensure that contractor's vehicles, trucks and equipment are of good working condition through timely inspections. • Ensure that the contactor employs properly trained crew and operators, especially drivers of large equipment like cranes and earth moving vehicles.	compliance to PSCs traffic management plan		cost	Monitoring Report • Traffic Management Plan
Operation							
Operation of the following: • Existing Berth • New Berth facility • Ore Stockyard (Existing 1 to 4) • Ore-blending Yard (5 to 8) • Conveyor Systems (Existing and new)	LAND	• Generation of solid waste, raw material spoil, lumpy ores and pellets	• Strict implementation of PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07). • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 07 (IM-APX-003-07) for proper waste segregation and handling of generated solid waste in the berthing facility, raw material yard, ore blending area and contractors facility. • PSC Lab & Envi Dept has put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in each work area. • Regular inspection of collection bins and replacement of worn-out solid waste collection drums to fiber glass containers. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). (*Please see subsequent management and mitigation process in the solid waste management at the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*) • Installation of diverter plates with automatic recovery conveyor on the uploaders. • Manual gathering of accumulated spillage materials after completion of unloading. • Installation of strainers at discharge end to filter spilled solids. • Provision of revetments and embankments at raw material yard (1-4) and ore blending (5-8). • Manual collection of spillage at the conveyor route.	100% compliance to PSCs EMP in compliance to RA 9003	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-07 (IM-APX-003-07) • Include in TOR of contractor
	LAND	• Generation of Hazardous Wastes – busted bulbs – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts	• Regular collection of hazardous waste generated in the daily operation to be brought to the PSC sorting facility. • Hazardous wastes shall be classified and sorted according to its classification and shall be temporarily stored in the 260m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). (*Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area*)	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • SMR • Hazwaste Generators ID • Include in TOR of contractor
	WATER	• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management	100% compliance to	• PSC Lab & Envi Dept • PCO	Part of the operation cost	• PSC Integrated Manual EMP-04

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			program and EMP 04 (IM-APX-003-06) water conservation program in the berthing facility, raw material yard , ore blending area and contractors facility. • Periodic inspection of drainage and collector's sump pit in the existing berth facility. • Installation of drainage and collector's sump pit in the new berth facility to collect silt and divert run-off water. • Periodic inspection of two (2) oil/water separator with a total holding capacity of 5.88m^3 at the raw material handling station. • Installation of an additional oil/water separator with a total holding capacity of 2.94m^3 at the new berth facility. • All run-off water emanating from Yard 8 shall be diverted to North Settling Pond. • While all run-off water emanating from Yards 1-7 shall be diverted to the new South Settling Pond. • Periodic inspection of north and south settling pond for its condition including water depth, access road, influent and effluent canals, filtering weir material replacement. • Quarterly monitoring of essential effluent parameters (relative to the operation of PSC) discharging from the North Settling Pond and New South Settling Pond shall be monitored monthly. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Use of floats and pontoons to contain oil slick and sheen in case of accidental spillage and prevent it from spreading into adjoining areas. • A staff from the PSC Envi Dept shall be tasked to monitor the environmental condition within and adjacent to the berth facilities. • PSC already have universal spill kits, oil recovery equipment and sorbent dispersants that they can immediately use in case of oil spillage, additional procurement of such kits for the new berth facility. • PSC also has existing toilets connected to septic tanks that were located near the existing berth and BBASI Office that can be also be utilized by the workers assigned at the new berth facility. • PSC shall require all berthing vessels that in case of offloading sewage waters, the chartered vessel will coordinate with PSC for tapping an accredited wastewater treater. • Since majority of the vessels are delivering raw materials, de-ballasting will not take place in the berth facility but instead they will intake ballast water. • For chartered vessels that will deliver the sintered ore, pellets and blended ores, PSC may request the chartered vessel to conduct partial de-ballasting at the international waters prior to entry at the country's maritime waters in accordance with the IMO protocol. • PSC shall collate information on the chartered vessel ballast water treatment system and request for record of de-	PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Planning Department • Contractor		(IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			ballasting activity in accordance with the IMO protocol. • In the event of de-ballasting at the berth facilities, PSC shall monitor the activity provided that the chartered vessel has an installed ballast water treatment system. For vessels that have chemical ballast treatment system, PSC may require information on the chemicals used for treatment and ensure that the chemicals are included in the PCL list. PSC may request in advance information on such prior to the chartering date.				
	AIR	• Air Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • Operation of unloader water spray system (10m^3 per hour) during unloading activity. • Installation of another unloader water spray system (10m^3 per hour) at the new berth facility. • PSC has an existing 85 conveying lines, 79 of which are covered by arc roofing. PSC emphasizes on covering the conveyors that are used for transporting dry and fine materials. • PSC shall also install arc roofing for all the conveying route of the conveying system for ore blending as it is projected to convey dry and fine materials to and from the chartered vessels. • Covering of tarpaulins or sacoline of raw materials, ore blended stockpiles and lumpy ores and pellets during drier months. • Periodic inspection of/survey/replacement of defective/worn out conveyor belt rubber hood curtain plate to ensure that it is functioning properly and prevent spillage that may generate fugitive dust. • Regular maintenance of belt conveyor tip cleaner /head scraper. • Use of non-stick belt conveyor to reduce raw material mix spillage. • Paving of conveying route for easy maintenance especially during collection of unwarranted spillage. • Manual collection in case of spillage for all the conveying lines. • Periodic washing and spraying along paved and unpaved roads and grounds especially during dry season. • Continued use of industrial mobile vacuum cleaner. • Periodic inspection/ survey/ replacement of damaged water spray. • Quarterly monitoring of PM_{10}. • Use of low sulfur fuel oil for tugboats. • Use of Euro 4 or Euro 5 fuel for service vehicles. • Conduct of Ringelmann test for emission of all vehicles utilized in the operation of berthing facilities and conveyor system. • Immediate overhaul of smoke belching vehicles at the	100% compliance to PSCs EMP in compliance to RA 8749	• PSC Lab & Envi Dept • PSC Material Handling • PSC Mechanical Department •	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Permit to operate

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			mechanical area.				
	AIR	• Noise generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08) for noise management program including use of ear muffs in noise prone areas. • Regular maintenance of vehicles and heavy equipment. • Installation of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the mechanical repair shop for all vehicles emitting severe noise.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Material Handling Dept. • PSC Mechanical Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of contractor
	PEOPLE	• Occupational awareness • Occupational risk • Health risk in relation to Covid-19	• Promote Training/Orientation of new workers and employees. • Posting of safety warning and danger signs. • Prioritization of local hiring. • Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.	100% compliance to PSCs OHS	PSC Safety PSC HRGA	Part of operation cost	• EMS • SMR • IEC • IATF approved Covid 19 safety Protocol
Operation of the following: • Sintering Facility • Burnt Lime Facility • Pelletizing Ore Facility (for development)	LAND	• Generation of solid waste and hazardous wastes	• Strict implementation of PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07). • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 07 (IM-APX-003-07) for proper waste segregation and handling of generated solid waste in the sintering facility, burnt lime facility and the proposed pelletizing ore facility. • PSC has put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in each work area. • Regular inspection of collection bins and replacement of worn-out solid waste collection drums to fiber glass containers. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated in the daily operation to be brought to the PSC sorting facility. • Hazardous wastes shall be classified and sorted according to its classification and shall be temporarily stored in the 260 sq.m. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)*	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID • Phil Coast Guard approved Oil Spill Contingency Plan
		Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the Sintering Facility, Burnt Lime Facility and Pelletizing Ore Facility (for development). • Periodic inspection of drainage and collector's sump pit in the perimeters of the existing Sintering Facility and Burnt Lime Facility and for the Pelletizing Ore Facility once established. • Periodic inspection and cleaning of the following oil/water separator.	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), E9MP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			• Sintering facility with 1.13m^3 capacity • Burnt lime facility with 0.20m^3 capacity. • All run-off water emanating from sintering facility and burnt lime facility shall be diverted to North Settling Pond to allow run-off laden with silt to settle. • Periodic inspection of north and south settling pond for its condition including water depth, access road, influent and effluent canals, filtering weir material replacement. • Annual desilting of the north settling pond. • Silt and spoils shall be deposited temporarily near the first compartment of the North Settling Pond (N8°34'33.56", E124°45'59.13"). • Quarterly monitoring of essential effluent parameters (relative to the operation of PSC) discharging from the North Settling Pond and New South Settling Pond shall be monitored monthly. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Periodic inspection and maintenance including siphoning of sludge of septic tanks in the sintering facility and the burnt lime facility. • PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of soil in work areas. • PSC also practices lining of limestone and HDPE in the final discharge of the north settling pond. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented. • PSC also has procured universal spill kits and sorbents such as polypropelene as well as oil containment boom that can be utilized for any untoward oil spillage.				Guard approved Oil Spill Contingency Plan
		Air pollution - Point Source Dust - Gaseous Emission - Ambient Dust	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • Continuous monitoring of Sintering machine bed surface condition. • Regular cleaning of burner guns • Monitoring on the improvement of sintering process operation with emphasis on complete combustion of bunker oil • Continuous operation, rehabilitation and maintenance of the following air pollution control measures - Main gas handling equipment ➢ Waste gas main duct ➢ Waste Gas Cyclone ➢ Main Blower ➢ Double damper - Room dedusting cyclone (Cooler dedusting) ➢ Room dedusting equipment (8 multi cyclones) ➢ Cooler dedusting equipment (4 units dry type) ➢ Vertical double dampers for room dedusting cyclone	100% compliance to PSCs EMP in compliance to RA 8749	• PSC SNT Mgr • PSC Envi Dept PCO • PSC Production Dept (QA/QC) • PSC Mechanical Department	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Permit to operate • PSC Rehabilitation Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			(12 sets) - 1 unit electrostatic precipitator (Main) - 2 units electrostatic precipitator (Room EP) - stack - Main EP Smoke Stack (70 meters) • Periodic declogging of VDDs, dedusting cyclones dust chamber. • Patching of holes and replacement of deteriorated ducts. • Periodic inspection/survey/replacement of defective room dedusting system dust dropper damper/seals. • Periodic replacement of Bag Filter of Kiln # 1, #2 and #3. • Standardize automatic operation of REP Hopper Auto Vibrator Control. • Periodic monitoring of rapping insulator at MEP and REP. • Installation of level indicator alarm at dust hopper. • Installation of sampling point at Sinter Pot Machine Stack. • Installation of three (3) sets of multi cyclone and 3 sets of electrostatic precipitator for the process emission control of the proposed pelletizing plant. • Installation of hoods and suction ducts in Room EP for the proposed pelletizing plant. • Use of low sulfur BFO (Sinter, Kilns) and Carbon (Sinter, Kilns). • Continued use of burnt lime in sintering for SO_2 gas removal in flue gas. • Continued use of Fuel Catalyst at BLM Kiln/ SM IF. • Use of fuel catalyst for PSC tugboats & heavy mobile equipment. • Performance test of ORSAT Gas Analyzer @ main stack. • Measurement of Sulfur & FC content for Anthracite Coal. • Periodic conduct of stack sampling with RATA. • Periodic repair/rehabilitation of SM Ignition Furnace Hood. • Continued crushing of burnt lime in enclosed area. • Reduction of gas temperature using a heat exchanger in the burnt lime facility prior to release into the atmosphere. • Periodic monitoring of bag filters in the burnt lime facility to capture dust carried by the emitted gas. • Quarterly monitoring of ambient air concentration (PM_{10}, SO_2, NO_x and CO). • Regular conduct of studies and research that could optimize operation of sintering, burnt lime and pelletizing. • Manual collection in case of spillage in the sintering in burnt lime facility . • Periodic washing and spraying along paved and unpaved roads and grounds especially during dry season. • Continued use of industrial mobile vacuum cleaner. • Periodic inspection/ survey/ replacement of damaged water spray. • Use of Euro 4 or Euro 5 fuel for service vehicles. • Conduct of Ringelmann test for emission of all vehicles utilized in the operation of berthing facilities and conveyor system.				

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			• Immediate overhaul of smoke belching vehicles at the mechanical area.				
		• Noise Generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08) for noise management program including use of ear muffs in noise prone areas. • Continued maintenance of main blower and ignition fan silencer for noise attenuation that effectively reduce to <80dB. • Cleaning of CLF during preventive maintenance shutdown. • Regular maintenance of vehicles and heavy equipment. • Installation of mufflers for heavy equipment, trucks and machines. • Immediate overhaul at the mechanical repair shop for all vehicles emitting severe noise.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Mechanical Department • Contractor	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of contractor
	PEOPLE	• Occupational awareness • Occupational risk • Health risk in relation to Covid-19	• Periodic re-orientation of workers, employees and contractors. • Posting of safety warning and danger signs. • Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.	100% compliance to PSCs OHS	PSC Safety	Part of operation cost	• EMS • SMR • IEC • IATF approved Covid 19 safety Protocol
Operation of Heat Recovery Boiler, Steam Turbine, Generator Set and Tank farm		• Generation of solid waste and hazardous wastes	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the SHR and back up genset area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated during construction to be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)*	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • PSC Mechanical Dept • PSC ELE Dept • WHSE • Powerplant Dept • Sinter Dept. • Material Handling • Administration • Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID
		• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the SHR Facility and back-up generator sets powerhouse work area. • Periodic inspection and cleaning of the following oil/water separator: - WHSE Tank Farm #1 with 1.29 m^3 capacity - WHSE Tank Farm #2 with 1.28 m^3capacity - WHSE Tank Farm #3 with 0.96 m^3 capacity	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • PSC Mechanical Dept • PSC ELE Dept • WHSE • Powerplant Dept • Sinter Dept. • Material Handling	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			- Diesel Storage with 0.34 m^3 capacity • Recycling of used oil, filtering and blending with heavy fuel oil at sinter day tank for use at the sinter plant. • All run-off water emanating from SHR Facility and back-up generator sets powerhouse work area shall be diverted to North Settling Pond. • Quarterly monitoring of essential effluent parameters (relative to the operation of PSC) discharging from the North Settling Pond and New South Settling Pond shall be monitored monthly. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Periodic inspection and maintenance including siphoning of sludge of septic tanks in the SHR Facility and back-up generator sets powerhouse. • PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of soil specifically in back-up diesel genset powerhouse. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented. • PSC has procured universal spill kits and sorbents such as polypropelene as well as oil containment boom that can be utilized for any untoward oil spillage. • Regular monitoring of thermal water not to exceed the 3 degrees Celsius allowed in the DAO 2016-08. • Periodic inspection of HFO storage facilities including the issuing and receiving pipelines.		• Administration Sub-Contractor		approved Oil Spill Contingency Plan
		• Increase in gaseous emission	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • The sinter waste heat recovery plant is a positive innovation of PSC operation as it utilizes the heat from the sintering process operation to be converted into electrical energy instead of releasing the waste heat directly into the atmosphere. • Periodic maintenance of the SHR and back-up genset to ensure efficiency. • Use of low sulphur fuel for the back-up diesel genset.	100% compliance to PSCs EMP in compliance to RA 8749	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • PSC ELE Dept • Material Handling Dept Sub-Contractor	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Permit to operate • PSC Rehabilitation Plan
		• Noise Generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08)for noise management program including use of ear muffs in noise prone areas. • Installation of silencer and noise attenuators in the SHR facility. • Regular maintenance of SHR facility and diesel gensets. • Installation of mufflers for the diesel genset. • Conduct of periodic preventive maintenance . • Cleaning of CLF primarily during preventive maintenance shutdown.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • Material Handling Dept • PSC ELE Dept Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS • Include in TOR of sub-contractor
	PEOPLE	• Occupational awareness • Occupational risk • Health risk in relation to Covid-	• Periodic re-orientation of workers, employees and contractors. • Posting of safety warning and danger signs.	100% compliance to PSCs OHS	PSC Safety	Part of operation cost	• EMS • SMR • IEC

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
		19	• Regular testing of workers from Covid-19. • Immediate quarantine/isolation of workers with symptoms. • Periodic Health Awareness on Covid-19 prevention. • Strict monitoring of visitors (with proper Covid-19 testing) prior to access to PSC facilities.				• IATF approved Covid 19 safety Protocol
Operation of mechanical maintenance shop, electrical building and warehouse	LAND	• Generation of solid and hazardous wastes – busted bulbs – Lead and lead compounds (vehicle batteries, UPS, spent battery packs) – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts – WEEEs – Assorted compounds (dry cell batteries)	• New workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07)) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the new berth construction area similar to the waste segregated bins set in the existing area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated during construction to be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 sq.m. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). *(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area)*	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • PSC ELE Dept • Material Handling Dept • Administration Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID
	WATER	• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the mechanical maintenance facility, warehouse and ELE work area. • Periodic inspection and cleaning of the following oil/water separator: - 4 units of same dimension (1.0mx1.0mx1.13m) with a total capacity of 4.52m^3 - ELE with a total capacity of 0.74m^3 - Garage with a total capacity of 3.22m^3 • Recycling of used oil including those scooped from the oil and water separator by filtering and blending with heavy fuel oil at sinter day tank for use at the sinter plant. • All run-off water emanating from warehouse shall be diverted to North Settling Pond. • Quarterly monitoring of essential effluent parameters discharging from the oil & water separator specifically oil & grease parameter. • Periodic re-orientation of workers, laborers and contractors on PSC's EMP 05 (IM-APX-003-05) on Oil Spill Containment, Recovery and Clean-up Program. • Periodic inspection and maintenance including siphoning of sludge of septic tanks in the mechanical maintenance shop and warehouse and ELE.	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Lab & Envi Dept • PCO • PSC Planning Department • Sinter Dept • Powerplant Dept • PSC Mechanical Dept • PSC ELE Dept • Material Handling Dept • Administration Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit • Phil Coast Guard approved Oil Spill Contingency Plan

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			•PSC practices putting bins containing saw dust and sand that can be sprinkled in case of accidental spillage of oil. A lot of this were observed in the Mechanical maintenance shop. • An existing oil spill management protocol is being implemented by PSC and this shall be strictly implemented • PSC has procured universal spill kits and sorbents such as polypropelene and a dedicated kit is supplied in the Mechanical maintenance shop. • Implementation of waste exchange program with a cement plant to be used as fuel feed for the cement kilns • Strict implementation of car and service vehicle designated at the mechanical maintenance area to ensure that accidental spillage of oil or grease shall be captured by the oil&water separator • Periodic monitoring on the effectiveness of the oil and water separator as well as cleaning and maintenance				
	AIR	• Increase in gaseous emission	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) on air quality management program for point source dust, ambient gas and ambient dust. • Strict conduct of Ringelmann test for emission of all vehicles entered in the facility for repair. • Routine conduct of mechanical check-up and maintenance of all PSC vehicles, trucks, heavy equipment and diesel generator sets. • Immediate overhaul of smoke belching vehicles at the mechanical area.	100% compliance to PSCs EMP in compliance to RA 8749	• PSC Lab & Envi Dept headed by PCO • PSC Planning Department • PSC Mechanical Dept • PSC Electrical Dept • Material Handling Dept • Sub-Contractor	Part of operation cost	• PSC's EMP 01 (IM-APX-003-01), EMP 01A (IM-APX-003-01A) and EMP 02 (IM-APX-003-02) • SMR • Emission test
		• Noise generation	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 08 (IM-APX-003-08) for noise management program including use of ear muffs in noise prone areas. • Installation of mufflers for the heavy equipment, trucks and service vehicles.	100% compliance to PSCs EMP in accordance with NEPC standard	• PSC Lab & Envi Dept • PCO • PSC Planning Department • PSC Mechanical Dept • PSC ELE • Material Handling Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-08 (IM-APX-003-08) • SMR • PSC OHS
Operation of Admin Building, Kitchen (Uniflow), clinic and other offices		• Generation of solid and hazardous wastes – busted bulbs – Lead and lead compounds (UPS, spent battery packs) – containers previously containing toxic chemical substances – WEEEs – Assorted compounds (dry cell batteries)	• Re-orientation of workers, laborers and contractors shall be oriented on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07)) for proper waste segregation of solid waste. • PSC shall put in place trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste) in the admin area. • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • Regular collection of hazardous waste generated in the regular operation shall be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01").	100% compliance to PSCs EMP in compliance to RA 9003, and RA 6969	• PSC Admin • Clinic • PSC Lab & Envi Dept • PCO • PSC Planning Department • Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			(Please see subsequent management and mitigation process for hazardous wastes indicated in the operation of PSC Envi Dept, Laboratory, PSC Solid Waste Sorting Facility and Hazardous Waste Storage Area) • PSC shall continue to practice Environmentally Preferable Purchasing (EPP) via Procurement Department in coordination with the Envi Dept. • PSC shall also continue to implement Product Stewardship Program as part of its ISO 14001compliance.				
		• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the SHR Facility and back-up generator sets powerhouse work area. • Periodic inspection and cleaning of the oil & grease separator at the Uniflow kitchen with a total capacity of 6.48 m^3. • The admin building has a septic tank capable of accommodating all the wastewater emanating from the admin building including the water from Uniflow kitchen. • Regular conduct of wastewater analysis of Uniflow kitchen drainage including surfactant, ammonia, nitrate and phosphate to ensure that no exceedance will come from the kitchen wastewater. • Periodic dredging of drainage canals of uniflow kitchen to remove accumulated grease and siphoning of sludge from the septic tank by a third party wastewater and sludge treater.	100% compliance to PSCs EMP in compliance to RA 9275 and RA 6969	• PSC Admin • Clinic • PSC Envi Dept headed by PCO • PSC Engineering Dept • Sub-Contractor	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit
Operation of PSC Envi Dept Office, Laboratory, Solid waste management sorting facility and hazardous waste storage area	LAND	• Generation of solid waste	• Envi dept shall spearhead the re-orientation of workers, laborers and contractors on PSC's existing solid waste management protocol (EMP 07 (IM-APX-003-07)) for proper waste segregation of solid waste. • The dept shall ensure that all work places shall have trash bins segregated according to the type of waste (biodegradable, non-biodegradable, recyclable and hazardous waste). • Each bin shall be regularly collected by PSC garbage truck with segregated compartment. • The collected solid waste shall be brought to the existing PSC sorting, storage and disposal facility (N8°34'32.34", E124°45'57.73"). • The envi dept has dedicated workers trained to classify waste accordingly and recover recyclable materials as well as handle hazardous wastes. • Biodegradables are sorted, brought to the existing PSC compost pit located adjacent to the sorting facility. • Non-biodegradables are temporarily stored but are regularly collected by a third-party solid waste collector and transport it to their MRF for further sorting prior to disposal at a landfill facility. • PSC shall continue to practice Environmentally Preferable Purchasing (EPP) in coordination with the procurement department. • PSC shall also continue to implement Product Stewardship	100% compliance to PSCs EMP in compliance to RA 9003	• PSC Envi Dept headed by PCO	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) EMP-05 (IM-APX-003-05) EMP-07 (IM-APX-003-07) • Include in TOR of contractor • Hazardous Waste Generators ID

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
			Program as part of its ISO 14001compliance. • Provision of training for solid waste sorters on new techniques and technology of composting such as vermiculture. • Utilization of compost and vermicast as fertilizer additive for PSC reforestation program.				
		• Generation storage of hazardous wastes and storage of hazardous wastes – Barium from laboratory wastes – Mercury compound COD/SO2 gas analysis waste – busted bulbs – Lead and lead compounds (vehicle batteries, UPS, spent battery packs) – used oil – oil contaminated wastes – containers previously containing toxic chemical substances – lubrication wastes – welding butts – WEEEs – Assorted compounds (dry cell batteries) – Asbestos compound from the dismantling and rehabilitation of sintering facility in year 2000	• Regular collection of hazardous waste generated during operation shall be brought to the PSC sorting facility. • Hazardous shall be classified and sorted according to its classification and shall be temporarily stored in the 260 m^2. PSC hazardous waste storage area (N8°34'31.81", E124°45'59.01"). • Recycling of used oil including those scooped from the oil and water separator by filtering and blending with heavy fuel oil at sinter day tank for use at the sinter plant. • Pathogenic wastes such as RBS strips, sharps, contaminated cottons, needles, syringe and lancet shall be disinfected and deposited in the PSC chambered underground entombment facility. • Asbestos compound were also entombed in the underground facility in a separate compartment. The added safeguard is that the chamber is lined with limestone while the asbestos materials are inside a container covered by HDPE. • Mercury wastes are also entombed enclosed in specialized containers and covered by HDPE. • Used facemask shall also be disinfected prior to disposal • PSC has an existing agreement with a DENR-accredited waste treater for hazardous waste transporting, treatment and disposal. • PSC shall ensure that disposal of accumulated hazardous shall not exceed 6 months as prescribed in RA 6969 and its IRR. • Compilation off Certificate of Treatment for every batch of hazardous waste that were hauled and treated and regular reporting in the SMR submitted to EMB.	100% compliance to PSCs EMP in compliance to RA 6969	• PSC Lab & Envi Dept • PCO • Warehouse • HRGA	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04), EMP-05 (IM-APX-003-05), EMP-09 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit
	WATER	• Water Pollution	• Periodic re-orientation of workers, laborers and contractors on PSC's EMP 04 (IM-APX-003-04) on wastewater management program and EMP 04 (IM-APX-003-06) water conservation program in the SHR Facility and back-up generator sets powerhouse work area. • The laboratory has a septic tank capable of accommodating all the wastewater emanating from the laboratory with acid and organics waste pit. • Regular conduct of wastewater analysis of laboratory waste shall be conducted with implementation on neautralization of laboratory wastes before it is discarded. • Periodic dredging of drainage canals of uniflow kitchen to remove accumulated grease and siphoning of sludge from the septic tank by a third party wastewater and sludge treater.	100% compliance to PSCs EMP in compliance to RA 9275	• PSC Lab Envi Dept • PCO • HRGA	Part of the operation cost	• PSC Integrated Manual EMP-04 (IM-APX-003-04) • Include in TOR of contractor • Discharge Permit
Abandonment Phase							
• Abandonment of all buildings including offices, plant facilities, port facilities	LAND	• Devaluation of land value as result of improper solid and hazardous waste management and other	• PSC should include in the TOR of the contractor the collection, hauling and proper disposal of debris, solid waste and hazardous wastes generated. • Rehabilitation of the area until its safe and acceptable for the	100% compliance to PSCs Abandonment	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment

Activity	Environmental Component Likely to be Affected	Potential Impacts	Enhancement/ Mitigating Measure	Efficiency of Measures	Responsible Entity	Cost	Commitment/ Guarantee
• Demolition of buildings or dismantling of facilities		related impacts	construction of a new building/facilities.	Plan			Plan
	WATER	• Sedimentation / siltation of drainage or waterways during dismantling activities or demolition activities	• PSC should include in the TOR of the contractor the protection of the drainage or waterways within or nearby the site.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan
	AIR	• Generation of dust • Degradation of air quality due to use of heavy equipment	• Set-up fences around the site to act as wind barrier . • Hauling trucks should be covered with canvass. • Proper maintenance of equipment and vehicles.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan
	PEOPLE	• Occupational health and safety of workers hired by the contractors • Risk to the safety of workers/staff and community	• Set-up fences around the site to prevent unauthorized person near the site. • Placing visible warning signs.	100% compliance to PSCs Abandonment Plan	PSC	Part of the Abandonment cost	• Include in TOR of contractor • EMB Approved Abandonment Plan

4 ENVIRONMENTAL RISK ASSESSMENT AND EMERGENCY RESPONSE POLICYAND GUIDELINES

This Chapter presents the Environmental Risk Assessment (ERA) conducted for the proposed Ore Blending and New Berth Facility Project of PSC. Hazards and risks involved in the operation shall be identified and proper mitigating measures shall be recommended. Moreover, the current health and safety measures of the Company and its Emergency Response Policy are also discussed in this chapter.

4.1 OBJECTIVES OF ERA

This Environmental Risk Assessment (ERA) aims to identify and analyze the hazards and assess the environmental risks associated with the proposed PSC Expansion Project (Ore Blending and New Berth Facility). It includes a descriptive characterization of consequences for identified potential hazards in terms of loss of human lives or injuries, damage to or loss of assets and environmental risks. As indicated in the Technical Scoping Agreement, this ERA will likewise address the status of implementation of the existing safety policies/guidelines and any proposed changes; assess the last three years of safety performance; and discuss incidence occurrences and actions taken in the same period.

4.2 SCOPE AND LIMITATIONS OF THE ERA

This ERA deals with the analysis of various potential safety (fire, explosion, toxicity) and physical hazards related with the PSC Expansion Project. It will also include risks associated with earthquakes, storm surges and insurgency. It complies with the requirements of the Procedural Guidelines for Scoping of Environmental Risk Assessment (Annex 2-7e of the Revised Procedural Manual of DAO 03-30) and focuses on safety risks, which are characterized as low probability, high consequence, accidental in nature and with acute effects (EMB-EIAMD, 2007).

The study does not discuss geological, geo-technical and detailed structural risks, as these issues are tackled in a separate Geology/Geomorphology component of the EPRMP. It also does not include environmental impacts from normal and other planned operations, which are discussed in *Chapter 2*.

4.3 ERA FRAMEWORK

The Procedural Manual for DAO 2003-30 (Annex 2-7e) defines environmental risk assessment as *the use of universally accepted and scientific methods to assess the risks associated with a project*. Risk is defined as a measure of potential human injury death, economic loss, or environmental damage. It is determined based on the probability (likelihood) of the loss, injury, death or damage occurring and the severity (magnitude) of the loss, injury, death or damage, if it occurs. In simple terms, risk involves two measurable parameters: severity and probability. The general ERA process is illustrated in **Figure 4.3.1**. The various elements and steps in the risk assessment procedure are elaborated in succeeding sections.

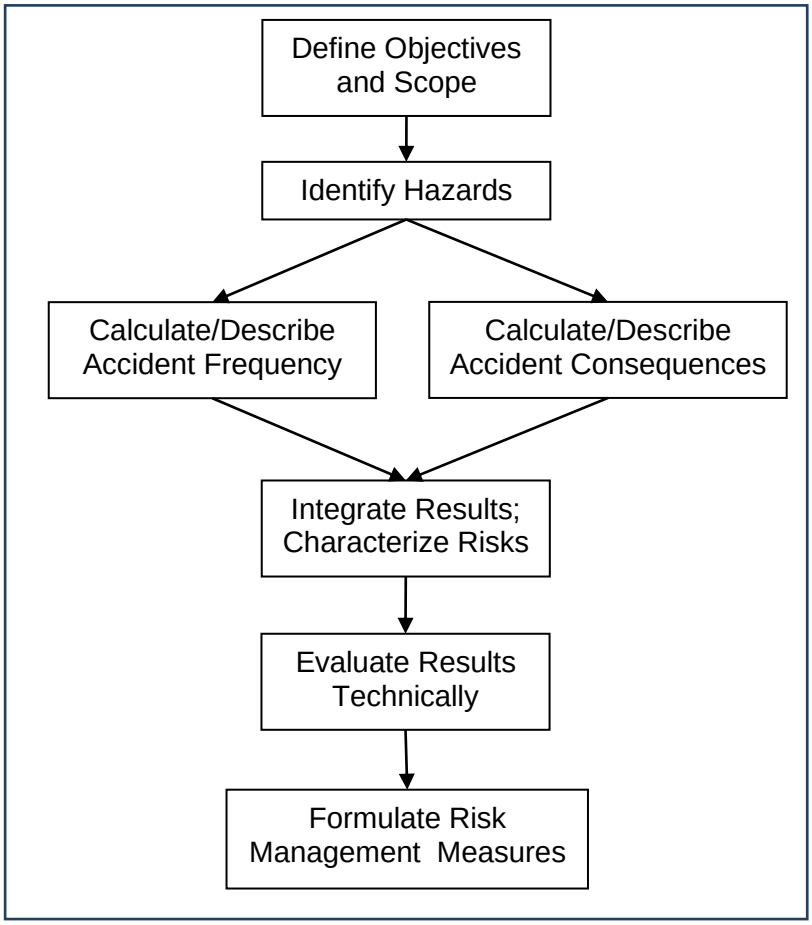


Figure 4.3.1. The ERA Process

4.4 ERA METHODOLOGY

Hazards were rated as to their consequence severity ("C") and their frequency or probability of occurrence ("F") using 5x5 Rating Charts. **Table 4.4.1** and **4.2** show the rating charts for consequence severity and frequency of occurrence, respectively. Indicative risks were characterized by integrating the results of the Consequence Severity Rating (C) and the Frequency of Occurrence Rating (F) using a 5x5 Risk Rating Matrix as shown in **Figure 4.4.1**.

4.4.1 Consequently Severity Analysis

Consequence severity analysis involved the qualitative description of possible impacts on people, assets and the environment in case of occurrence of accidents or incidents due to the identified hazards. Accident or consequence is graded according to a Consequence Severity Rating Chart as shown in **Table 4.4.1**. The rating ranges from 1 to 5, with 1 being of the lowest consequence and 5 as having the highest consequence severity.

Table 4.4.1. The Consequence Severity Rating Chart Used in Consequence Analysis

Rating	Description	Consequence/Impact		
		On-site Health and Safety	Environment and Community	Assets
1	Very low	Self-administered first aid treatment; No specific treatment	No community complaints; no corrective actions required; No breach of regulations	No property damage
2	Low	First Aid treatment injury	Impacts confined to site; corrective actions required; no breach of regulations	Slight/temporary damage and nuisance to one or more properties
3	Moderate	Medical treatment injury; possible loss time injury	Off-site environmental/ community damage could easily be contained or prevented; breach of regulations	Significant but temporary damage to property
4	High	Injuries require hospitalization	May result to uncontained environmental or community damage; multiple community complaints; may result to civil prosecution	Sustained damage to property lasting many months
5	Very High	Fatalities; Permanent disabilities	Long term environmental damage; May result to criminal prosecution	Long term and possible permanent loss of property

4.4.2 Probability/Frequency Analysis

Probability/frequency analysis of accidents or incidents due to the realization of project hazards was described using a Probability of Occurrence Rating Chart as shown in **Table 4.4.2**. Probability (frequency) were assigned values ranging from 1 to 5, with the value of 1 corresponding to the lowest probability and 5 having the highest probability value.

Table 4.4.2. The Probability of Occurrence Rating Chart Used in Consequence Analysis

Rating	Description	Explanation
1	Rare	Might occur at some time in exceptional circumstances
2	Unlikely	Could occur at some time although unlikely
3	Possible	Might occur at some time
4	Likely	Will probably occur, has happened
5	Almost Certain	Expected to occur, quite common

4.4.3 Risk Characterization

Risk characterization involved the integration of the results of the consequence severity analysis and consequence probability analysis. For purposes of risk prioritization, indicative risk (IR) values were computed for each identified hazard by computing the product of the severity rating and probability rating values. **Table 4.4.3** shows the guide for interpreting the risk matrix.

Table 4.4.3. The Risk Matrix

Qualitative Risk Matrix			Probability/Frequency				
			1	2	3	4	5
			Rare	Unlikely	Possible	Likely	Almost Certain
Consequence/ Impact	5	Very High	5	10	15	20	25
	4	High	4	8	12	16	20
	3	Moderate	3	6	9	12	15
	2	Low	2	4	6	8	10
	1	Very Low	1	2	3	4	5

Low Risk Medium Risk High Risk

4.5 ERA SCOPING AND RISK SCREENING

ERA scoping and risk screening was done according to the process and criteria described in the Revised Procedural Manual of DAO 2003-30: Guidelines for the Conduct of Environmental Risk Assessment, particularly Annex 2-7e. Results of the ERA scoping showed that the level of ERA coverage for the PSC Expansion Project is *Risk Screening Level*. **Figure 4.4.1** shows the process and result of the ERA Scoping.

The level of ERA coverage is defined by the type of hazardous substance and the expected maximum inventory of this substance to be stored or handled at the project site at any one time. The levels of ERA coverage are as follows (*Annex 2-7e of the RPM of DAO 2003-30*):

- Level 2 – for facilities that will use, manufacture, process or store hazardous materials in excess of **Level 2** threshold inventory shall be required to conduct a Quantitative Risk Assessment (QRA) and prepare an Emergency/Contingency Plan based on the results of the QRA;
- Level 1 – for facilities that will use, manufacture, process or store hazardous materials in excess of **Level 1** threshold inventory shall be required to prepare an Emergency/Contingency Plan based on the worst-case scenario. The Plan shall be based on a Hazard Analysis study; and
- Risk screening level – specific facilities or the use of certain processes shall require the conduct of a risk screening study even if the projected or estimated inventory does not reach the threshold levels.

The PSC Expansion Project is not expected to use, handle, transport, or store significant amounts of substances that are explosive, flammable, oxidizing, or toxic. It may use minimal amount of a flammable substance (acetylene gas) for welding purposes during the construction phase but the amount of the said substance will be below DENR Level 1 Threshold Inventory, which is 10 tons for extremely flammable substances.

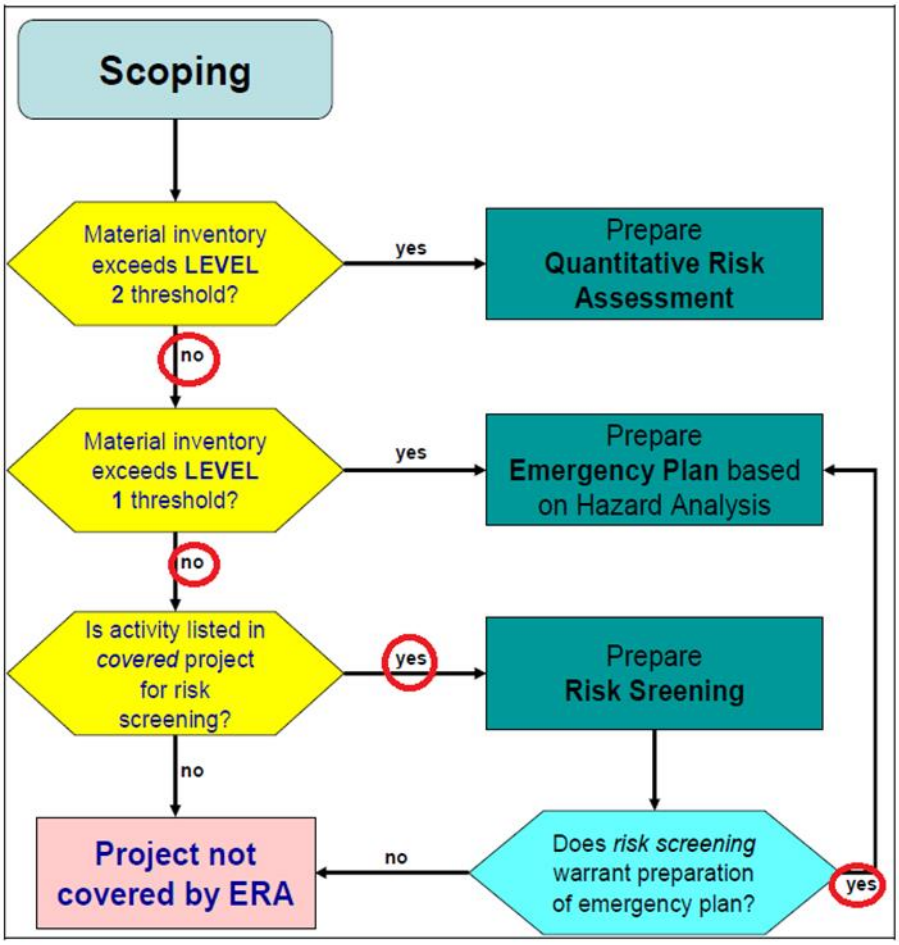


Figure 4.4.1. Result of the ERA Scoping for the PSC Expansion Project.

4.6 HAZARD IDENTIFICATION AND RISK CHARACTERIZATION

Various hazards associated with the project were identified and assessed. Identified hazards during the construction and operation phases of the project include physical, chemical, natural, occupational, internal and external hazards. Emphasis was given to those that could result to damage and failure of structures, as well as to injury and fatality of the PSC Expansion Project workers and the general public.

Chemical hazards include those that have the potential to cause fires, explosions and toxic releases, which make it imperative to identify all hazardous substances to be used, handled and stored during various project phases. Natural factors include earthquakes, extreme weather events, flooding, tsunami, and storm surge. Internal factors include design errors, deficiencies in construction, material defects and lack of maintenance. External factors include sabotage and terrorism.

Table 4.6.1 presents 33 identified hazards associated with the project during the construction and operation phases, which were assessed in terms of consequence severity rating (C), frequency rating (F) and indicative risk rating (R), contributing factors and sectors at risk. Identified hazards during the construction phase include the following: flammable

gases (acetylene gas and oxygen gases (in cylinders), occupational hazards, noise, hazardous construction wastes, fugitive cement dusts, and construction accidents such as collapse of structures and vehicular accidents. Occupational hazards include worker exposure to hazardous chemical contents of some construction materials (e.g. respirable silica crystals from cement, paint fumes, welding fumes, etc.), unsafe conditions (working from heights, working near deep excavations, working over deep waters, hot surfaces, working with electricity, moving machineries and machinery parts, sharp cutting tools and equipment, etc.), physical hazards (e.g. vibration, noise, radiation and hot surfaces), and ergonomic hazards.

Hazards during the operation phase may include the following: hazards associated with loading/unloading operations of iron ore fines (fugitive iron ore dusts, falling loads, being struck with moving equipment parts, etc.); conveyor system hazards (being caught in conveyor belt parts, defective electricals, etc.); and hazards associated with ore blending operations (fugitive iron ore dusts, equipment accidents, being struck by equipment parts, etc.). Damage to port structures and other project infrastructures may result from natural hazards, specifically strong earthquakes, storm surge and other extreme climate events (e.g. very strong typhoons).

Table 4.6.1. PSC Expansion Project Hazards List and Risk Characterization

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
A.	**Construction Phase**						
1	Construction vehicles and equipment movement	▪ Traffic accidents (collision with other vehicles, overturning, fall from heights, hitting pedestrians and workers) ▪ Fatalities/ injuries	▪ Human error ▪ Vehicle/ equipment malfunction ▪ Insufficient vehicle/ equipment maintenance ▪ Poor traffic management at the area ▪ Lack of traffic education among delivery truck and other drivers ▪ Insufficient warning signages	▪ Workers ▪ Pedestrians ▪ Assets	4	3	12
2	Collapse/malfunc-tion of construction equipment and structures (e.g. construction cranes)	▪ Damage to berth structures under construction ▪ Possible fatalities/injuries ▪ Damage to nearby	▪ Extreme weather events ▪ Earthquakes ▪ Collision/ mechanical impacts	▪ Workers ▪ Assets ▪ Public	4	3	12

[1] SN = Series Number
[2] C = Consequence Severity Rating
[3] F = Frequency Rating
[4] R = Indicative risk rating

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
		properties	▪ Lack of maintenance				
3	Storage and use of flammable liquids and gases (e.g. liquid fuels, acetylene gas)	▪ Fire/ Explosion accidents ▪ Injuries, possible fatalities, ▪ Damage to berth structures and other assets	▪ Spillage of fuel and subsequent ignition ▪ Mechanical impacts on fuel tanks/ cylinders	▪ Workers ▪ Public ▪ Assets ▪ Environment	4	3	9

4	Concrete Batching Operations	• Exposure to hazardous trace components of cement that may include CaO - <4%; MgO - <5%; free crystalline silica - <0.1%; Cr - trace amount; Ni – trace. Sand and aggregates also contains crystallne silica
		  • MgO and CaO are corrosive to body tissues;
		  • respirable silica is a respiratory irritant; COPD from long term exposure; carcinogenic
		• High impact noise
		▪ Being hit by fugitive gravel fragments
			▪ Inadequate PPEs (e.g. goggles, gloves, coveralls, hardhats, safety shoes) for exposed workers
			▪ Inadequate safety orientation of workers
				▪ Workers and other persons at the vicinity of concrete batching operations	2	3	6

5	Improper disposal and handling of hazardous construction wastes (e.g. spent paints, acids, solvents, insulation fibers, broken fluorescent lamps, etc.)	• Contamination of air, water and soil with hazardous chemicals • Public health hazard	▪ Poor housekeeping practices ▪ Non-implementation of RA 6969 ▪ Lack of proper orientation and education of workers and supervisors on hazardous waste management ▪ Lack of facilities	▪ Immediate and surrounding environment ▪ public	3	3	9

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
			for hazardous waste storage and collection				
6	Extreme climate events (very strong typhoons, torrential and prolonged rains, storm surge)	▪ Damage to berth and ore yard structures that may lead to its failure ▪ Work stoppage and interruptions	▪ Natural events ▪ Climate change factors	▪ Workers ▪ Public ▪ Assets	5	3	15
7	Earthquake hazards (ground shaking, subsidence, landslides, lateral spread, ground rupture, tsunamis, etc.)	▪ Damage to berth and ore yard structures that may lead to failure/ collapse ▪ Work stoppage and interruptions ▪ Fatalities/ injuries	▪ Natural event ▪ The PSC area is affected by several fault systems (e.g. Tagaloan Fault System, Lanao Fault System, Davao River Fault System, Central Mindanao Fault System, Western Mindanao Fault System, etc)	Workers Public Assets	5	3	15
8	Working near moving vehicles, equipment and equipment parts	▪ Struck by vehicles/ construction equipment ▪ Fatalities/ injuries	▪ Human error ▪ Vehicle/ equipment malfunction ▪ Inadequate lighting	▪ Workers	4	3	12
9	Working at height	▪ Fall leading to fatality or injury	▪ Inadequate PPE ▪ Inadequate guards ▪ Lack of training	Workers	4	3	12
10	Electrical contact	▪ Electrocution, electrical shock, burns	▪ Inadequate PPE ▪ Damaged electricals ▪ Lack of training	▪ Workers	4	3	12
11	Working over/ near water	▪ Fall into water that may cause drowning	▪ Inadequate PPE ▪ Inadequate training	▪ Workers	4	3	12
12	Working near moving equipment/machi-nery parts or between moving equipments	▪ Caught-in Equipment or Object ▪ Injury/ Fatality	▪ Inadequate machine guards ▪ Inadequate training ▪ Inappropriate work clothes	▪ Workers	4	3	12
13	Working near moving vehicles, equipment	▪ Being ran over, backed over or struck	▪ Driver/operator error ▪ Inadequate training ▪ Failure to follow SOPs ▪ Inadequate PPEs	▪ Workers	4	3	12
14	Exposure to harmful	▪ Occupational	▪ Inadequate PPE	▪ Workers	3	3	9

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
	substances and agents (e.g. cement and sanding dusts, welding and brazing fumes, welding radiation, paint fumes, corrosives, degreasing solvents, oils and lubricants, hot surfaces, etc.)	diseases (e.g. silicosis, metal fever, blindness, burns, contact dermatitis, etc) ▪ Chemical burns ▪ Burns	▪ Lack of training ▪ Inadequate housekeeping ▪ Unsafe work practices				
15	Uneven, slippery or irregular surfaces	▪ Slips, trips and falls	▪ Inadequate housekeeping ▪ Inadequate PPEs ▪ Lack of training ▪ Heavy rains	▪ Workers	2	3	6
16	Working near or in deep excavations	▪ Fall into excavation	▪ Inadequate guarding ▪ Inadequate warning signages ▪ Inadequate PPEs ▪ Not fit to work (drunk, sick, sleepy, etc.)	Workers	4	2	8
17	Working under water (for divers)	▪ Drowning, Bends (decompression) sickness	▪ Inadequate PPEs ▪ Inadequate training ▪ Failure to follow SOPs ▪ Unsafe work practices	▪ Workers	4	3	12
18	Operation of vibrating and vibration-prone equipment and tools (e.g. excavators, drills, etc)	• High impact vibration could lead to muscle and/or nerve damage and result to diseases such as Hands-Arm Vibration Syndrome (HAVS)	• Inadequate equipment maintenance • Insufficient vibration guards and protection • Prolonged exposure to high impact vibrations	▪ Equipment operators	2	3	6
19	Operation of high-noise emitting equipment and noisy construction activities	▪ Harmful noise levels could lead to impairment/ loss of hearing	• Inadequate hearing protection PPEs ▪ Inadequate equipment maintenance	• Workers at construction site	2	3	6
20	Operation of tools and equipment	▪ Cuts in body parts ▪ Mechanical impacts ▪ Body parts caught in machine ▪ Crushing of body parts and other	▪ Inadequate training ▪ Inadequate PPEs ▪ Inappropriate work clothes ▪ Inadequate machine guards	Workers	4	3	12

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
		injuries ▪ Burns from hot surfaces ▪ Eye damage from welding arcs	▪ Inadequate warning signages ▪ Failure to follow SOPs				
21	Ergonomic hazards (heavy lifting, prolonged standing, repetitive movement, awkward postures, etc.)	▪ Bodily injuries ▪ Stress	▪ Inadequate training ▪ Inadequate rest periods ▪ Prolonged exposure to unsafe work conditions	Workers	2	3	6
22	Falling/flying debris and large objects	▪ Hit by falling/flying objects	▪ Inadequate housekeeping ▪ Inadequate PPEs ▪ Unsafe work practices	▪ Workers ▪ Assets	4	3	12
B.	**Operational Phase**						
23	Unloading of iron ore from ship to conveyor system	▪ Injuries from mechanical impacts with moving equipment parts ▪ Harmful noise levels could lead to hearing impairment or loss ▪ Fugitive iron ore dusts could lead to respiratory irritation and diseases	▪ Sudden movement of ship ▪ mechanical failure of equipment ▪ operator error ▪ Equipment malfunction ▪ Inclement weather conditions ▪ Insufficient PPEs against noise (ear muffs, plugs, etc.) ▪ Insufficient PPE's against dusts (face masks, respirators)	▪ Workers and other persons at the site	3	3	9
24	Loading of blended iron ore to ore vessels	• Injuries from mechanical impacts with moving equipment parts or falling loads ▪ Harmful noise levels could lead to hearing impairment	▪ Same as above	▪ Workers and other persons at the site	3	3	9
25	Conveyor system operation and maintenance	• Being caught or entangled in conveyor parts ▪ Inhalation of, dermal or eye contact with	• Lack of appropriate guarding mechanism of conveyor danger zones	▪ Conveyor system workers and personnel ▪	3	3	9

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
		fugitive airborne iron ore dusts	• Inadequate safety engineering • Failure to comply with rules, regulations, standards and protocols in conveyor system construction, operation and maintenance ▪ Conveyor control system malfunction				
26	Ship operation while in port	• Minor ship accidents (mechanical impacts, sudden movement, etc.) resulting to injuries from mechanical impacts and/or fall into deep waters	Unloading/loading crew, other ship crew, persons at vicinity, assets	• Inclement weather conditions ▪ Operator error	3	3	9
27	Ship operation while in port	▪ Major ship accidents – collision with structures, grounding, ship-to-ship collision	▪ Ship crew and persons at vicinity ▪ Assets	• Very strong typhoons, storm surge, tsunami • Failure to follow protocols ▪ Operator error	5	3	15
28	Stacking, reclaiming, and blending of iron ore fines at the iron ore yards	• Expsoure to fugitive iron ore dusts (inhalation, dermal, mucosal) could lead or predispose to respiratory, dermal and/or eye irritation and/or diseases. Respiratory diseases may include COPD and cancer from exposure to respirable free crystalline silica and particles of iron and other heavy metals	▪ Insufficient/ lack of PPE's (e.g. gloves, goggles, respirators) ▪ Non-airconditioned and open equipment operator cab ▪ Poor housekeeping	▪ Equipment operators (reclaimers, stacker, etc) and other persons in the vicinity	2	3	6

SN[1]	Activity / Hazard	Consequence/ Risk	Causes/ Contributing Factors	At Risk Sectors	C[2]	F[3]	Risk[4]
29	Environmental degradation of port structures and facilities (e.g. corrosion of steel components by airborne chloride, metal fatigue)	▪ Damage to port structures and port facilities that may predispose to collapse or failure	▪ Airborne chlorides and other environmental corrosives ▪ Inadequate maintenance	▪ Port workers ▪ Docked vessels ▪ Assets	5	2	10
30	Earthquake hazards (ground shaking, subsidence, landslides, lateral spread, ground rupture, tsunamis, etc.)	▪ Damage to the port, berthed vessels and PSC Plant structures that may lead to failure/ collapse ▪ Fatalities/ injuries	▪ Workers and other staff of PSC ▪ Assets ▪ Public	▪ Natural event ▪ The PSC area is affected by several fault systems (e.g. Tagaloan Fault System, Lanao Fault System, Davao River Fault System, Central Mindanao Fault System, Western Mindanao Fault System, etc.)	5	3	15
31	Extreme climate events (increased frequency and intensity of typhoons, storm surge, torrential and prolonged rains during rainy seasons, floods)	▪ Damage to port and other PSC Plant structures ▪ Fatalities/injuries	▪ Natural events ▪ Climate change factors ▪ The area of the port and some parts of the PSC Plant are susceptible to storm surge	▪ Workers ▪ Public ▪ Assets	5	3	15
33	Terroristic attacks and/or sabotage of the port and Plant	▪ Major damage that may lead to port and other structure failure/collapse ▪ Fatalities/ injuries to people	▪ Inadequate security ▪ Peace and order problems	▪ Workers ▪ Assets	5	2	10

* High Risk Medium Risk

Identified hazards associated with the PSC Expansion Project have the potential to result either to medium risks (27 of the 33 hazards) or high risks (6 of the 33 hazards). The high-risk hazards are the following:

- Earthquake/Seismic hazards
- Extreme climate events (very strong winds, rain-induced flooding and storm surge)
- Major ship accidents (e.g. grounding, ship-to-ship collision, collision with port structures)

4.6.1 Seismic Hazards

The seismic hazards associated with the project site was assessed using the GeoRisk Philippines' *HazardHunterPH* App (https://hazardhunter.georisk.gov.ph/map#), a seismic hazard modeling tool based on DOST-PHIVOLCS' data. Based on the Seismic Hazard Assessment Report generated, the project site is assessed to be prone to ground shaking. That is, all sites may be affected by ground shaking in the event of an earthquake. It is also classified as generally susceptible to liquefaction, a phenomenon wherein the ground, especially near the river, lake and coasts, behaves like liquid similar to quicksand due to very strong shaking. Ground shaking hazards and liquefaction hazards can be mitigated by following the provisions of the National Building Code and the Structural Code of the Philippines. The site is assessed as safe from ground rupture from earthquake that may be generated from the nearest active fault, the ND segment of the Tagoloan River Fault, which is 2.4 km from the project site. The PSC project site is affected by several fault systems, such the Tagaloan River Fault System, Lanao Fault System, Davao River Fault System, Central Mindanao Fault System, and Western Mindanao Fault System.

Assessment using GeoRisk Philippines' *HazardHunterPH* App, which used PHIVOLCS data, showed that the site may experience seismic ground shaking of up to Intensity 7.6 (PEIS) with the movement of the Central Mindanao Fault, Intensity 7.3 (PEIS) with the movement of Western Mindanao Extension Fault System, Intensity (PEIS) 7.1 with the movement of Davao River Fault, and Intensity (PEIS) 6.9 with the movement of the Lanao Fault System.

Table 4.6.2. Seismic Hazards Assessment Report of the PSC Project Site (3July 2021)[5]

Hazard	Assessment	Explanation and Recommendation
Ground Rupture	**Safe; Approximately 2.4km from the ND**	Active faults are those that have moved within the last 10,000 years. It shows evidence or has documented history of its recent movement. Ground rupture is a displacement along an active fault trace that reaches the surface.
Ground Shaking	**Prone**	All sites may be affected by ground shaking in the event of an earthquake and can be mitigated by following the provisions of the National Building code and the Structural Code of the Philippines.
Liquefaction	**Generally Susceptible**	Liquefaction is a phenomenon wherein the ground, especially near the river, lake and coasts, behaves like liquid similar to quicksand due to very strong shaking. Liquefaction hazards can be mitigated by following the provisions of the National Building Code and the Structural Code of the Philippines.
Earthquake-Induced Landslide	**Data are being updated**	Earthquake-induced landslides are the downward slope movement of rocks, solid and other debris commonly triggered by strong shaking.

[5] Generated using GeoRisk Philippines' HazardHunterPH App on July 3, 2021.

		Avoidance is recommended for sites with earthquake-induced landslide hazard unless appropriate engineering interventions are in place.
Tsunami	**Data being updated**	A tsunami is a series of sea waves commonly generated by under-the-sea earthquakes and whose heights could be greater than 5 meters.

4.6.2 Hydro-meteorological Hazards

4.6.2.1 Storm Surge Hazards

Storm surge hazards at the project site were assessed using the *Nationwide Operational Assessment of Hazards (NOAH)* app. (*http://noah.up.edu.ph/#/*). An abnormal rise in sea level that occurs during tropical cyclones, a storm surge occurs when a very strong tropical cyclone blows-off excessive amounts of seawater toward low-lying coastal communities. A storm surge can cause massive inland flooding, sometimes in unimaginable heights. It becomes more dangerous when it occurs together with a high tide (PAGASA).

Storm surge hazard maps based on predicted storm surge heights were generated using the NOAH app. Four scenarios or Storm Surge heights were modeled as follows:

- Storm Surge Advisory (SSA) 1: 2m storm surge height
- SSA 2: 3m storm surge height
- SSA 3: 4m storm surge height
- SSA 4: 5m storm surge height

The generated storm surge hazard maps of the project site are shown in **Figure 4.s 4.6.1** to **4.6.4**. Areas of high risk to storm surge are shaded with red. Those of medium risk are shaded orange, and areas of low risk to storm surge are shaded yellow.

Figure 4.6.1. Storm Surge Hazard Map of the Project Site at 2-m Storm Surge Height Scenario.

Figure 4.6.2. Storm Surge Hazard Map of the Project Site at 3-m Storm Surge Height Scenario.

Figure 4.6.3. Storm Surge Hazard Map of the Project Site at 4-m Storm Surge Height Scenario

Figure 4.6.4. Storm Surge Hazard Map of the Project Site at 5-m Storm Surge Height Scenario.

4.6.2.2 Severe Wind Hazards

The severe wind hazards associated with the project site was assessed using the GeoRisk Philippines' HazardHunterPH app (*https://hazardhunter.georisk.gov.ph/map#*)**,** which utilized the data of PAGASA. A Severe Wind Hazard Map was generated for the site. Based on the said mapping, the site may experience severe winds of 88.1 - 117 kph at 20-year return period and 117.1 - 220 kph at 500-year return period.

4.6.2.3 Flooding Hazard

Flooding hazard at the site was assessed using GeoRisk Philippines' HazardHunterPH app (*https://hazardhunter.georisk.gov.ph/map#*), which utilized the data of the Mines and Geological Bureau (MGB). The flooding hazard map generated (**Figure 4. 4.6.5**) show that the site is not susceptible to flooding.

Figure 4.6.5. Flooding Hazard Map of the Project Site

4.7 RISK MANAGEMENT

The risk assessment showed that potential inherent (unmitigated) risks from earthquakes, particularly seismic ground shaking and liquefaction could be high and must be prevented and/or controlled with the application of appropriate mitigation measures. The site may also be affected by storm surge and severe winds with the occurrence of very strong typhoons. Risks from other hazard sources are generally assessed as moderate.

The identified risks should be managed and reduced to as low as reasonably practicable (ALARP). Reasonable in this context means a balance between the benefits of increased safety, environmental protection or lives saved and the costs involved in the process of risk reduction. Major considerations in risk reduction are:

- Appropriate infrastructure design of the port that takes into consideration resilience to earthquakes, tsunamis, storm surge, high winds, and load projections, among other factors;

- Compliance with local, national and international design standards, building codes and structural codes for port facilities (construction and operation);
- Quality control of construction materials and close supervision and monitoring of construction processes/activities;
- Regular and timely inspection and maintenance of the infrastructures and facilities;
- Installation and proper maintenance of safety systems (e.g. emergency signaling and communication systems);
- Well-trained and motivated workers;
- Use of appropriate construction equipment and personal protection equipment to keep workers safe;
- Adequate supervision and monitoring of workers to ensure compliance with safety systems and standard operating procedures;
- Conduct of necessary training and drills especially for emergency situations (e.g. earthquake, tsunamis, storm surge fire, bomb threats, work accidents) among the entire workforce; and
- Regular review and implementation of appropriate emergency response and contingency systems.

4.8 SAFETY HEALTH PROGRAM (SHP) OF PSC

4.8.1 Safety Policy

PSC states its Safety Policy as follows:

> "The Safety and health of every worker is of utmost importance in this Plant. Any work shall be stopped without hesitation when unsafe conditions or unsafe acts are observed. Similarly, to ensure Safety, any machine may be stopped without reservation even if it may cause downtime.
>
> "Our goal is 'ZERO ACCIDENT'. To achieve this, We will constantly work towards:
> - The maintenance of Safety and healthy living Conditions
> - The observance of proper operating practices and procedures designed to prevent injuries and illness.
> - The Compliance of all Government & Company Safety Regulating Procedures."

4.8.2 Framework of PSC's Safety and Health Program

The Safety and Health Program (SHP) of the PSC is premised on the framework as shown in **Figure 4.**.

Figure 4.8.1. Framework of PSC's Safety and Health Program

4.8.3 Safety and Health Organization

The Central Safety/Health Committee (CSHC) takes the overall lead in the planning, direction, implementation, monitoring and evaluation of PSC's Safety and Health Program. The organizational structure of the said committee is shown in **Figure 4.8.2** below.

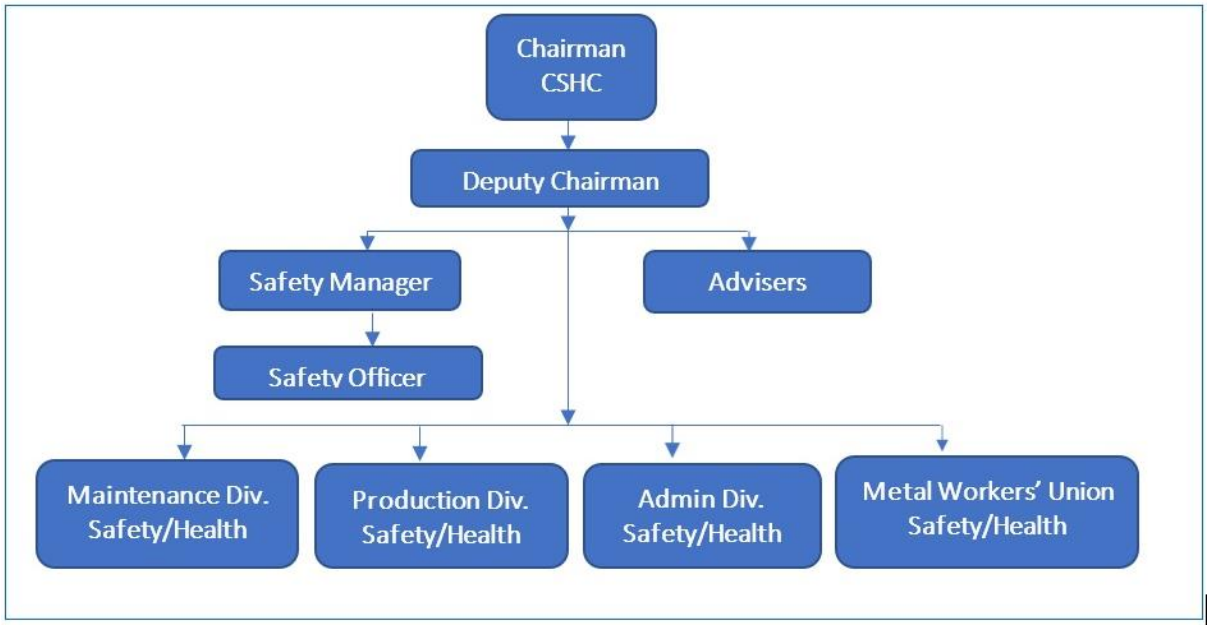


Figure 4.8.2. The Central Safety and Health Committee of PSC

4.8.4 Components of the Safety and Health Program of PSC

The Safety and Health Program (SHP) of PSC includes the following components:

- Education
- Safety Awareness / Promotion & Campaign
- Accident Prevention
- Health Promotion
- Supply and Proper Use of PPE
- Emergency Response
- Emergency Preparedness

4.8.4.1 Education

The Education Component of PSC's SHP regularly conducted the following training courses and education for its staff and Contractor workers:

- Security and Safety Briefing to All Newly Hired PSC and Contractor Workers
- KYT (Kiken Yochi Training) or Danger Anticipation
- Monthly Safety Lecture for PSC and Contractor Workers
- Fire Lecture
- Fire Drill
- Defensive Driving Seminar
- Bomb Treat Lecture / Drill
- Earthquake Drill
- Oil Spill Drill at Sea
- Tsunami Drill
- Rigging

4.8.4.2 Safety Awareness/Promotion & Campaign

For this component, the following projects/ activities were undertaken regularly:

- First Aid & BLS-CPR Training
- Safety Promotion Contest
    - Slogan/Poster Contest
    - Ky (Danger Anticipation) Sketch / Picture Contest
- Long Shutdown Safety Orientation and Ceremony
- Posting of Monthly Safety Messages in conspicuous places
- Establishment and maintenance of Safety Bulletin Board
- Safety Award Every 100 Days Without Lost Time (LT) Days Accident (Departmental/Plant Wide)

4.8.4.3 Accident Prevention

Implemented under this SHP component are the following projects/ activities:

- Safety Patrol or Inspection
- Toolbox Meeting / KY Board Use
- Job Hazard Analysis
- Proper Job Instruction
- Shutdown Coordination Meeting
- Definition of the *Flow for Improving Unsafe Conditions*

Safety Patrol and Inspection

To implement this project, the *Shutdown Safety Patrol Table of Organization* (SSPTO) was established with defined responsibilities and procedures to follow. The SSPTO is headed by the Safety Manager. Each of the following departments are represented and are directly under the supervision of the Safety Inspector: Sinter, Materials Handling, Electricals, Mechanical, Laboratories, Power Plant, Planning, MOBI, MCPI, ERQ, AIR Power, and BBASI. Prior to proceeding with their task of inspection, the Shutdown Safety Patrol team, conducts a Toolbox Meeting. The following are the defined *Inspection Points* that should be covered in the safety inspection:

- Safety Double Tagging
- Safety Harness and Scaffoldings
- PPE
- KY Board
- Welding Cables/ Grounding
- Oxygen/ Acetylene Hoses
- Checking on Previous Findings
- Unsafe Acts
- Unsafe Conditions
    - Cordons and barricades in areas with lifting/ overhead worsk
    - Trip/ bump hazards
    - Obstructions on walkways
    - Confined spaces
    - Overhead cranes
    - Lighting during night time

Improving Unsafe Conditions

Unsafe conditions were addressed and mitigated through the procedure as in **Figure 4.8.3.**

Figure 4.8.3. Flow of Improving Unsafe Conditions.

4.8.4.4 Health Promotion

The Health Promotion component implemented the following projects and activities:

- Lectures on medical issues
- Diet plan for over-weights
- No smoking in enclosed areas
- Smoking cessation program for staff and workers
- Hypertension monitoring
- Blood sugar, lipid profile, ECG and cholesterol monitoring for staff and workers
- Sports and Wellness Program (includes holding of events such as cycling, hiking, belly dancing, vegetarian cooking classes, badminton, chess tournaments.

Establishment and maintenance of physical fitness facilities such as the following: tennis courts, billiard hall, bowling lanes, basketball court, volleyball court and gym.

4.8.4.5 Supply and Proper Use of Personal Protective Equipment (PPE)

Appropriate PPEs are supplied to workers as required in their line and area of work. The various PPEs include the following: CO Analyzer, O_2 Analyzer, safety helmets, safety shoes, respirators, ear plugs, safety gloves, safety belts/ harness, Self-Contained Breathing Apparatus (SCBA). The importance of and criteria for PPEs is shown in the photo of a poster as shown in **Figure 4.** below.

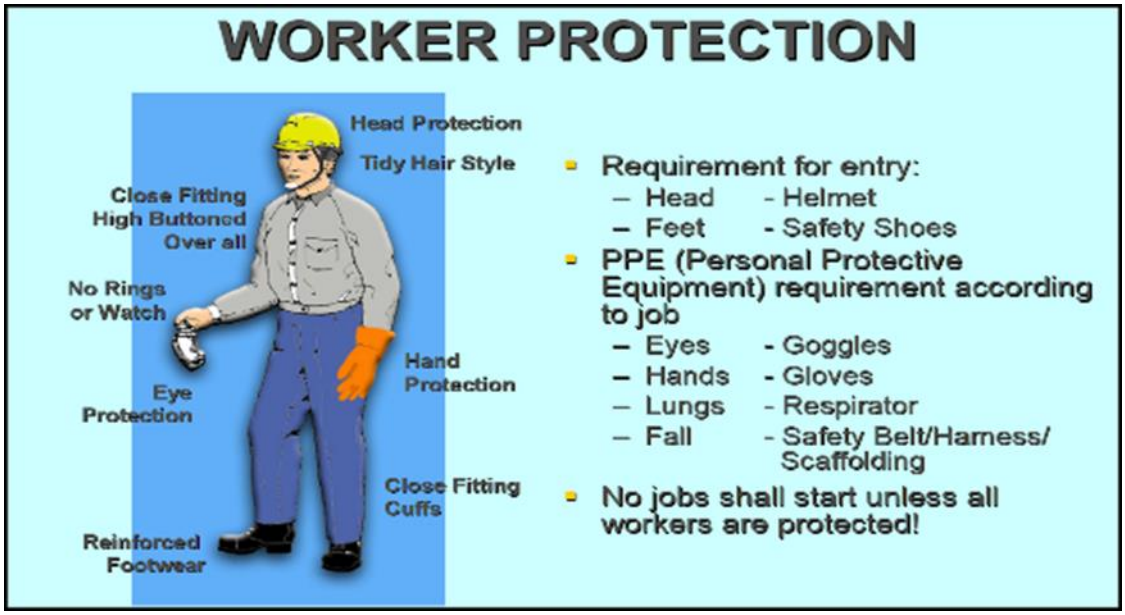


Figure 4.8.4. Poster on the Importance of and Criteria for PPEs.

4.8.4.6 Emergency Response Plan (ERP)

This SHP component is part of PSC's *Procedures Manual* and *Safety* Manual. The ERP details the Company's response in case of emergencies involving the following events:

- Fire Explosion
- Oil Spill
- Loss of Power/ Water
- Storm

- Earthquake
- Others

The ERP likewise encompasses the following aspects:

- Evacuation Plan
- Treatment of Injuries
- Accident Investigation and Countermeasure Meeting

4.8.4.7 Emergency Preparedness

Emergency Evacuation Plan. As part of its Emergency Preparedness Plan, PSC has posted Emergency Evacuation Plans made of photo-luminiscent materials in strategic areas in every building. The glow in the dark evacuation plans make it possible for workers and other people to read the evacuation plan even in no light situations.

Oil Spill Containment Equipment. The Company is equipped with several oil spill response equipment such as the following:

- Ultraspin S1 Skimmer (1 set, 5 cubic meter per hour capacity
- Spill Boom (50m in length)

4.9 SAFETY STATISTICS FOR THE PERIOD 2018-2020

Table 4. below shows the annual safety statistics for the existing PSC projects for the period 2018-2020. For the said period, there was no fatal accident that occurred, while there were six (6) non-fatal lost time accidents (NF-LTA) and 12 non-lost time accidents. Majority of accidents happened to workers of PSC's Contractors. Of the 21 workers that were involved in 21 incidents, 13 of these were workers of Contractors while eight (8) were direct-hired workers of PSC. It is worth noting that no fatal lost time accident (F-LTA) occurred in the three-year period, indicating that no major accident happened in the said period. Based on the safety statistics, it could be said that the safety performance of PSC for the period was good.

A lost time accident is an accident occurring at the workplace that results in at least one full day away from work due to sustained injury. A Fatal Lost Time Accident (F-LTA), on the other hand, is an accident occurring at the workplace that results to the death of a worker or workers. A death at the workplace is equivalent to 6,000 days lost.

Table 4.9.1. Annual Safety Statistics for PSC Project Operations, 2018-2020

Year	Number of Persons Injured per Type of Accident			Total of persons injured
	NLTA	Lost Time Accident (LTA)		
		Non-Fatal	Fatal	
2018	6	1	0	7
2019	4	4	0	8
2020	2	1	0	3
Total	12	6	0	18

Hazards that contributed to the occurrence of the various accidents/incidents within the period were the following:

- Inattentive behavior of some workers;
- Failure to follow standard operating procedures;
- Failure by equipment operator to give the required warning signals;
- Loitering within declared danger zones;
- Unsafe driving practices resulting to vehicular/equipment accidents;
- Failure to follow danger/warning communication system (e.g. No whistle at hand for equipment operator to call an endangered worker's attention);
- Inadequate coordination and communication between equipment operator and workers at hazard zone;
- Inadequate safety operating procedures in some instances;
- Unsafe conditions: Unsafe design of some machine parts, uneven surface, lack of cover of uneven surfaces, inadequate machine guarding, working near or between moving equipment or machine parts, unguarded hot materials (no rails/ guards to prevent stepping into in some areas);
- Unsafe road conditions (e.g. presence of some potential obstructions by the road side);
- Non-wearing of required PPEs;
- Inappropriate PPEs;
- Inadequate housekeeping (accumulation of dust in some areas) ;
- Inadequate safety signages; and
- Inadequate vehicle/equipment maintenance (e.g. defective brakes).

The occurrence of each incident had been properly investigated and appropriate preventive/ mitigating measures were identified. Mitigating measures identified included the following:

- Reorientation of Contractors and workers on the hazards, unsafe conditions and risks at the PSC Plant;
- Reorientation of all equipment operators;
- Conduct of Refresher Course on Overhead Crane Operational Safety;
- Replacement of unsuitably designed machine or machine parts with safer designed ones;
- Ensuring that proper PPEs are worn as required;
- Regular scraping of accumulated dusts and water sprinkling of dusty open surfaces;
- Installation of machine guards in hazardous moving machine parts;
- Improvement of established Standard Safety Operating Procedures; and
- Regular and timely inspection and maintenance of vehicles and moving equipment (e.g. daily brake test of vehicles/ equipment prior to operation).

5 SOCIAL DEVELOPMENT PLAN/ FRAMEWORK (SDP) AND IEC FRAMEWORK

This chapter presents the analysis of the Key Informant Interview (KII), Focus Group Discussion (FGD), and household perception survey discussed in *Chapter 2* of this Environmental Performance Report and Management Plan (EPRMP). Likewise, the Information, Education, and Communication (IEC) scheme is presented as preference in disseminating proper and correct information to the host community.

5.1 SOCIAL DEVELOPMENT PLAN

The proposed Social Development Plan (SDP) is a plan or design which considered the needs and concerns of the project affected communities, existing LGU Development Plans and previous community projects implemented by PSC. The SDP itemizes the Programs, Projects, and Activities (PPAs) that shall be implemented with the objective of minimizing the project's foreseen unfavorable impacts and/or enhancing the beneficial effects on the people's livelihood, health, and environment.

Key Informant Interviews (KII) were conducted with the barangay leaders of the three (3) impact barangays, key officials of the Municipality of Villanueva such as the Municipal Planning and Development Officer/Coordinator (MPDO), Municipal Disaster Risk Reduction Management Officer (MDRRMO), Municipal Nurse, the DENR-CENRO Initao, Misamis Oriental and representatives of fisherfolk associations. Focus Group Discussions (FGD) were held in the three impact barangays with representatives of the various community sectors – barangay officials, Barangay Health Workers (BHWs), women, Persons with Disabilities (PWD), transport, farmers, fisherfolk, teachers and religious - as participants. These discussions were done to gather various perspectives and insights on the present socio-economic and health situations and needs and concerns in the community. In addition, a household perception survey was undertaken to further gather additional dimension on the community aspects from the household's point of view.

PSC through its corporate social arm - PSC Foundation has been conducting social services such as free medical, dental and opthalmological services, scholarship grants for high school, college and even primary school students, school equipment donation, and other community development programs in coordination with the Municipalities of Villanueva, Tagoloan, and Claveria.

The commitment of PSC in providing assistance to improve the living condition of its host communities is an on-going pledge of the company. PSC values progress which translates to its continuous realization of various projects including livelihood, education, and health among others. **Annex 5.1** includes the documentation and proof of implementation of PSC's programs.

In the last five (5) years, from 2016 to 2020, PSC implemented projects that focused on skills trainings, school supplies donation (Project Scwela), scholarship grants and free clinic as

shown in **Table 5.1**. In 2018 and 2020, the company made technical equipment donations which benefitted a total of four (4) beneficiaries.

The PSC in 2016 incurred a total of PhP1,794,014 in the implementation of its community projects which touched the lives of 4,924 beneficiaries. Furthermore, there was a slight increase in 2017 amounting to PhP1,810,453.5 for social development projects conducted with 5,704 recipients. The highest expenditure of PhP2,738,726 benefitting 8,852 residents happened in 2018 with the highest cost item incurred on the conduct of free clinics (PhP1,306,165). On the following year (2019), there were 5,180 beneficiaries which called for a project cost of PhP1,267,618.92. There was a low disbursement for social undertakings in 2020 which can be due to a slow-down in community activities as a result of the COVID-19 pandemic. The activities for the said year required PhP408,075 for its implementation benefitting 82 beneficiaries. For the year 2021, a total of PhP1,476,380.00 was spent for school supplies, scholarship grants and equipment such as printer/scanner. There were 29 school beneficiaries from Malitbog, Claveria and Villanueva, Misamis Oriental that benefitted from the project. A total of PhP238,732.00 was spent on the same year for free clinic/rural health assistance in the municipality of Villanueva.

For the early projects undertaken, PSC focused on skills training, health and education. It can be seen from **Table 5.1** that from 2016-2019, free clinics had the biggest share of the total budget allocation of the company for community projects except in 2021. In 2020, the holding of medical missions/free was not pursued for safety reasons brought about by the COVID-19 pandemic. pandemic but this was again pursued in 2021.The project on skills training was the least given attention in terms of budget appropriation and number of people who benefitted. Livelihood projects were put on hold in 2021. Please see **Annex 5.1** for the SDP accomplishments as of 2021.

The following are the issues and concerns raised during the interviews:

Agriculture/fisheries

The area for agriculture has been reported to be decreasing but the farmers do not expect any adverse effect on their farms as a result of the proposed project. However, if the project is approved, they requested that they be assisted by PSC with financial support and agricultural inputs such as fertilizers, seeds and insecticides. Their plight had been exacerbated by the impacts of the COVID-19 pandemic.

Among the concerns of the fisherfolk is the lack of fishing gears. They further mentioned that in the past, they can fish as near as they can by the shores of PSC. However, the company has declared that the fishermen cannot come closer than 400m to the PSC-set boundaries to ensure safety as the port operates regularly and there is consistent movement of large vessels in the area. Fishermen were aware of this and accept the reasons given by PSC. Nevertheless, they hope that PSC relaxes the distance to at least 50m because over the years fish catch has decreased allegedly due to increasing population, market demand as well as illegal fishing practices. They likewise indicated that they feared that the area for fishing will further decrease as a result of the construction of the PSC berth facility.

It was further mentioned in key informant interviews and FGDs that illegal fishing is usually done not by the residents in the impact barangays but by fishermen coming from outside the municipality.

Table 5.1. PSC Social Development Projects, 2016-2020

Activity	2016			2017			2018			2019			2020			2021		
	Cost, PhP	%	Beneficiaries	Cost, PhP	%	Beneficiaries	Cost, PhP	%	Beneficiaries	Cost, PhP	%	Beneficiaries	Cost, PhP	%	Beneficiaries	Cost, PhP	%	Beneficiaries
Skills training	-	-	0	391,893	22	67	376,651	14	84	165,050	13	28	15,000	4	10	-	-	-
School supplies donation - (Project Skwela)	375,300	21	2,081	491,998	27	2,794	477,171	17	3,104	241,825.92	19	1,596	57,620	14	8	1,267,830	69	29 schools
Technical equipment Donation	-		-	-	-	-	158,729	6	1	-	-	-	30,980	7	3	-		-
Scholarship	217,902	12	43	217,902.5	12	43	420,010	15	63	403,830	32	556	304,475	75	51	208,550	11	8 college34 high school
Free clinic	1,200,812	67	2,800	708,660	39	2,800	1,306,165	48	5,600	456,913	36	3,000	-	-	0	364,316	20	1600
Total	1,794,014	100	4,924	1,810,453.5	100	5,704	2,738,726	100	8,852	1,267,618.92	100	5,180	408,075	100	82	1,840,696	100	29 schools, 8 college, 34 high school, 1600 individuals

Source: Philippine Sinter Corporation reports

Employment

Because of the predicament of the fisherfolks and other unemployed residents in the barangay, it was hoped that in the hiring process, PSC will give priority to the people from the barangays of Villanueva. In addition, it was requested for PSC to be clear or transparent with the requirements when people apply for a job. According to the participants, the municipality of Villanueva has available skilled workers who are qualified to be employed by PSC. However, it was reported that the residents from other municipalities are the ones prioritized and employed leaving behind the people of Villanueva. A call for transparency on hiring requirements and procedures was raised by the key informants, FGD participants and household representatives surveyed.

Health

The residents of Villanueva, according to the Comprehensive Land Use Plan (CLUP), seemed to have a poor health-seeking behavior which leads to delayed illness diagnosis and treatment and consequently increased morbidity/mortality and high malnutrition rate.

Furthermore, as cited in the CLUP, some residents have poor compliance to solid waste management resulting to increased cases of diarrhea, respiratory, skin, and other infectious diseases. Likewise, pollution of water, air, and land is a consequence of this poor practice.

The lack of physician, nurse, and BHWs and other health services help trigger poor health seeking behavior

Women

The women present during the FGDs mentioned that they have skills in dress-making/ sewing, cooking/vending food. They stated that the women in their barangay are willing to participate in trainings and seminars to be conducted leading to the implementation of the appropriate livelihood options.

Education

As per the CLUP, there is a shortage of classrooms in public pre-schools, elementary and high schools. These rooms are not conducive for learning due to large class size. In addition, there are dilapidated school buildings which make it dangerous for students and teachers during class hours. Furthermore, there is a lack of or no school laboratories which affect the performance of students. Multi-media instructional materials or audio-visual rooms are inadequate. The absence of sports equipment as well as the limited integrated fitness program was a dilemma encountered in the community. The dearth of modern technology and information to help teachers impart more knowledge to students was a problem mentioned.

Social welfare

The poverty incidence in the municipality was 40.2% when the CLUP was crafted. As of 2015, the situation improved with only 22.08% of the municipality's population classified as poor.

Due to the low level of education and increase in school drop outs, there is unemployment experienced in the barangays and municipality.

Traffic

It was expected by the participants that there might be an increase in traffic as a result of the proposed project since there will be more employment opportunities which will increase the earning and spending capacity of the residents to purchase vehicles. There was also a perceived increase in the number of commuters which makes it necessary for additional vehicles to ply the roads.

Perception of the interviewees on the community projects implemented by PSC during the past years

The people interviewed - key informants, sectoral representatives and household heads or their representatives-felt that PSC is a good neighbor to them. According to the interviewees, in the past 40 plus years, PSC has provided employment to qualified residents. Assistance to the educational needs of indigent students was extended by donating school supplies, conferring scholarship grants and participating in the *Brigada Eskwela* program. PSC likewise supported the repair of foot bridges and other small infrastructure rehabilitation projects. The company likewise supported the health needs of the community through medical missions and provision of medicines and helped the community during calamities by allowing the use of the company's fire truck.

Proposed Social Development Plan

Taking into consideration the issues and concerns raised by the key informants, FGD participants and socio-economic profiles of Villanueva, Misamis Oriental as well as the social development programs implemented from years 2016-2020, **Table 5.2** enumerates the suggested programs and activities to be implemented as well as the beneficiaries and government agencies that will provide assistance to realize the planned activities. The financial source for the implementation of the Social Development Programs, projects and activities will come from the Corporate Social Responsibility (CSR) funds of PSC.

Employment

There are residents from the impact barangays who are gainfully employed because of the existence of industries in their respective localities. However, there are also some other members of the community who rely on fishing and agriculture-based activities. These sectors direly need alternative sources of livelihood in between planting and harvesting periods for farmers or during monsoon season when fishermen cannot go out to fish at sea. It was perceivedthat the proposed project would generate employment to be able to hire qualified people especially during the construction phase. However, PSC must prioritize hiring of local people because the respondents feel that at present, very few locals are employed by the company. Therefore, PSC must be transparent in the hiring process and not let favoritism or politics be the basis in engaging the services of people in the company.

To date, PSC has a total of 222 regular employees and about 600 contractor workers. PSC implements a policy of prioritizing qualified applicants from the municipality of Villanueva. Villanueva LGU always receives first information through the PESO Office of any opening or hiring activity of PSC. In addition, in terms of engaged service providers or contractors (i.e for special projects), majority of the hired workers shall be coming from the Villanueva. Per recent record, around 60% of the total contractor workers' population is sourced out in Villanueva while around 40% are from neighboring communities of Tagoloan, Jasaan, and Cagayan de Oro locality. Due to the presence of many multi-national companies in

Villanueva like the Coca-Cola Philippines, Steag State Power, FDC, and Jacobi Carbon among others, qualified Villanueva residents have many options for employment.

Education and skills training programs

Based on information gathered from the barangay representatives, women, farmers, and fisherfolks, they are willing to undergo trainings and capacity building in relation to livelihood projects which may be identified as one of the community development projects of PSC. Hence, trainings on skills enhancement must be carried out to prepare and equip the participating residents for future livelihood endeavors. Furthermore, financial and labor support to the *Brigada Eskwela* program should be continued to maintain the cleanliness and integrity of public-school buildings.

The upgrading of reading rooms/libraries through book donations or physical improvement by providing additional ceiling fans, chairs, tables or setting up of laboratories, audio-visual rooms, classrooms, etc. in the primary or secondary levels of public schools would greatly contribute to the students' quest for knowledge and information. The sustained school supply donations to indigent students will significantly meet some of the educational needs of poor schoolchildren.

Health

Because of the importance of having information for the residents to seek early medical attention, there should be a close coordination between the barangay/municipal health workers regarding the continued IEC activities on this aspect. Furthermore, funds for repair and maintenance as well as for the purchase of medical tools and equipment are recommended to be part of the social development plan for the community. In addition, the conduct of medical, dental and ophthalmological missions which the company has pursued in the past years must be sustained to further address the health needs of the barangay.

Livelihood

In the 2016-2020 SDP accomplishment report of the company, the item on skills trainings was given the least allocation of 4%-28% from the yearly total budget for community projects. In fact, there was no activity or funds allotted in 2016 for skills enhancement. Based on the recent consultations with the local residents, they are in dismal need for additional sources of income due to the pandemic which has exacerbated their financial condition. Furthermore, a decrease in farm yield and fish catch has increased their need for other income options.

However, the identification and implementation of appropriate livelihood projects should first be carried out before embarking on a specific livelihood project. Workshops or brainstorming sessions should be held where the availability of skills, raw materials and know-how, including the willingness of the participants to be involved should be resolved. These activities are very important to carry out before any livelihood option is introduced for implementation. Undertaking these will provide a venue to identify potential problems that may later on be encountered and come up with solutions.

Based on the initial insights of women and other sectoral representatives during the FGDs, buy and sell of cooked or native delicacies, dress-making and *sari-sari* store management were the identified options that can be pursued to augment their household income. The

realization and success of these income alternatives may be achieved with the appropriate preparation of the participants and close coordination among the community, LGU, PSC, and other agencies that will take part in project implementation.

Environment

Because of the nature of the proposed project where potential dust particles might escape in the air and probability of creating noise during operation, planting of trees at the periphery of the plant site may buffer the sound and filter the dust from the project operation.

Disaster Risk Reduction Management

Disaster happens but its effects can be reduced and managed with awareness, proper education, preparedness, and alert systems. An activity that can be included in the SDP for the proponent's guide is for PSC to coordinate with the local government units in coming up with an acceptable and community-friendly alert system. Trainings and seminars related to disaster management will have to be conducted to better equip the residents and concerned officials in handling disasters.

Table 5.2. Proposed Social Development Plan

Program/project/Activity	Responsible community member/ beneficiary	Government agency/non-government agency and services	Proponent	Indicative timeline	Source of Fund
1. Employment program • Transparent hiring process and prioritization of qualified locals	Municipal/ barangay officials Qualified residents of the impact barangays/municipality	Municipal and barangay local government	PSC/ General Management Division Manager	Construction Operation	CSR funds
2. Education and skills training programs • Sustained granting of scholarship or educational assistance to qualified students • Sustained school supplies donation to qualified students • Improvement of public elementary schools' reading rooms/ libraries (donation of books, electric fans, chairs, tables, etc.) • Assistance in setting up of laboratories/audio visual room is public secondary schools • Continued Support to the Brigada Eskwela program	Qualified women and other disadvantaged members in the impact barangays	Department of Education TESDA Municipal and barangay officials	PSC/ General Management Division Manager	Operation	CSR funds
3. Health programs • Continued conduct of medical, dental and ophthalmological	Barangay health center Residents of impact barangays	Municipal Health office Barangay health representative	PSC/ General Management Division Manager	Operation	CSR funds

Program/project/Activity	Responsible community member/ beneficiary	Government agency/non-government agency and services	Proponent	Indicative timeline	Source of Fund
missions/ free clinics • Support to the improvement/upgrading of barangay health centers as well as donation of medical tools and equipment					
4. Livelihood assistance program • Identification and implementation of appropriate livelihood options • As earlier identified, the following income generating activities may be pursued after consideration of all factors for its success: - Vending of cooked or native delicacies - Dress making - sari-sari store management • Conduct of training programs on skills development of men, women and members of the disadvantaged groups in the community • Support to the agriculture and fisheries sector through the provision of agricultural inputs and fishing gears/tools ○ Strong collaboration between the LGU enforcement units, the *Bantay Dagat* or Sea Patrol of Villanueva and PSC. *The Bantay Dagat is a community-based Law enforcement program under BFAR that involves fisherfolk in coastal barangays on a volunteer basis to support the detection and enforcement of illegal fishing in coastal waters. Since funds to pursue the activities of the Bantay Dagat may be limited and members are on a voluntary basis and do not always have the capability to obtain gears and tools needed to guard the sea,*	Residents of host barangays Women and other disadvantaged members of the impact barangays	DSWD TESDA DA Local government units	PSC/ General Management Division Manager	Operation	CSR funds

Program/project/Activity	Responsible community member/ beneficiary	Government agency/non-government agency and services	Proponent	Indicative timeline	Source of Fund
PSC may assist in the provision of these which may include but are not limited to flashlights, safety vests, telescopes, patrol boat, etc.					
5. Environmental enhancement program • Tree planting in buffer zones to mitigate the possible noise and fugitive dust	LGU and barangay representatives	DENR/ CENRO Municipal and barangay environmental focal person	PSC/ General Management Division Manager Pollution Control Officer	Operation	CSR funds
6. DRRM • Coordination efforts of PSC and LGU in coming up with an acceptable and unified barangay emergency alert system that can be relied on during times of disaster • Conduct of trainings and seminars in relation to disaster management • Continued support of PSC to the LGU in terms of lending fire trucks and other vehicles and equipment during DRRM activities	Residents of host barangays - women - men - PWDs - elderly - schoolchildren	MDRRMO Barangay DRRMO focal person	PSC/ General Management Division Manager Safety Manager	Operation	CSR funds

5.2 INFORMATION, EDUCATION AND COMMUNICATION (IEC) FRAMEWORK

Holding of educational plant tours and consultation meetings with the local residents which touched on topics such as the project's description, cycle and processes including the company's environmental management system were the IEC initiatives of PSC in the past years. Audio-visuals were used to deliver the information to the target audience. However, the distribution of simple handouts/brochures is recommended to be done during the said activities to further inculcate in the participants what were discussed and for them to potentially expand the area of information dissemination to their friends or members of their household.

In addition, the presentation of national and local environmental laws and ordinances and results of monitoring done by the Multi-partite Monitoring Team (MMT) on the environmental parameters of PSC operations must be incorporated in seminars and team building activities conducted by the company. Updates on the company's ECC and SDP/CSR compliances are likewise recommended to be discussed during these seminars, workshops, and regular meetings involving the residents and officials of the impact barangays as well as other stakeholders such as the civil society and government and private agencies.

The identification of appropriate livelihood or social enterprise options must be disseminated to the target participants through meetings, workshops and focus group discussions to minimize issues that may possibly hinder the success of its implementation. There were failures observed in livelihood projects of other companies when these were not properly consulted with the community or appropriately characterized and researched on before the actual start of the project.

When the appropriate PSC social development projects have been identified, initiated and implemented, posters or signages should be established to make people aware of what these projects are all about as well as strengthening the identity of the Philippine Sinter Corporation in the locality. In addition, the power of social media cannot be underestimated in terms of disseminating the accomplishments of SDP projects, hence should be tapped as part of the IEC initiatives of PSC.

Disaster Risk Reduction Management (DRRM) is an important aspect that needs to be included in the IEC framework. People, especially those living near the project site, must be made aware of impending disasters or hazardous situations, whether natural or man-made, that might happen anytime. The effects of these possible precarious circumstances may be mitigated with proper awareness, education, preparedness and properly installed warning systems. The residents of the impact barangays must be appropriately and adequately informed through meetings, consultations, safety drills, handouts and warning signages which should be strategically located in the barangay.

Table 5.3. Information, Education and Communication (IEC) Framework

Target sector for IEC	Major Topics	IEC strategy/ Method	Information medium	Indicative timeline/ frequency	Indicative cost
Affected barangay • Barangay officials • Representative sectors (women, men, youth, elderly, PWD, business, civil society, etc.)	Project cycle and processes, monitoring Environmental parameters	Seminars workshop	Audio visual presentations Handouts/ brochures	Construction Operation	PhP 5,000/ meeting
Affected barangay • officials and residents • Civil society	ECC compliance report National and local environmental laws and ordinances Monitoring results SDP compliance and updates	Seminars/ workshops Regular meetings	Compliance/ monitoring reports Consultation meetings	Operation	PhP 15,000/ quarter
Barangay officials and residents • Senior citizens, men, women and youth sectors, leaders of affected barangay • Barangay health services, school representatives, women, youth, elderly, people organizations, concerned government agencies, private companies	Programs identified in SDP and CSR on: Health Education Livelihood Environmental enhancement Planned/ identified programs and other benefits from the proposed projects Issues and concerns and suggestions on how to smoothly pursue the implementation of projects and activities	Seminars/ workshops Meetings One on one meetings Focus group discussion Establishment of project posters/ signages Websites	Official letters, memorandum circulars, focus group discussions, reports/ consultation meetings handouts/ brochures signages Social media platforms such as Facebook, Instagram, etc.	Construction Operation	PhP 20,000/ quarter
Students and other participants during plant tours and team-building activities	PSC profile and activities PSC Socio-environmental	Seminars Plant tour Teambuilding	Handouts/ brochures Actual observation	Operation	PhP5,000 /plant tour PhP15,000/

Target sector for IEC	Major Topics	IEC strategy/ Method	Information medium	Indicative timeline/ frequency	Indicative cost
	projects Quality and environmental management system of PSC				teambuilding activity
Residents of impact barangays	DRRM - related activities such as establishment of community alert system, evacuation drills, workers' and residents' safety	Meetings/ consultations Safety drills	Meetings Handouts/ brochure Signages	Operation	PhP 7,500/ quarter

6 ENVIRONMENTAL COMPLIANCE MONITORING

This section presents the plans based on the assessment of the impacts of the project components and baseline data of the environment and the people within the project area. Philippine Sinter Corporation (PSC) is responsible in ensuring that the management and monitoring measures are effective and that the monitoring plan shall be equipped with parameters that will aid the Environmental Unit in assessing if the mitigating measures are consistently effective or needs further review and amendment.

6.1 ENVIRONMENTAL PERFORMANCE

Part of the requirements in comprehending this Environmental Performance Report and Management Plan (EPRMP) is the documentation of the environmental performance of PSC in the recent years of operation. This channels good information to the authorities on the capability of the Company in maintaining its facilities and entire operation within the standards set forth by the DENR and that the inclusion of new facilities will not aggravate the environmental impacts of the current operations. The new facilities to be built is an improvement to the existing operation which will further enhance the capacity of PSC to accommodate additional materials including the delivery of raw materials to/from other countries. It is expected that any adverse environmental effects of the plant will be better mitigated. This section provides an overview of strategies being implemented by PSC in addressing environmental impacts and a documentation of performance by which PSC needs to consider in terms of handling its environmental management mechanisms especially on areas where exceedances in environmental criteria or parameters were observed.

The discussion on performance assessment primarily covered the recent 5-year monitoring activities performed by the Laboratory and Environmental Group of PSC and the Multipartite Monitoring Team (MMT) as documented in the Monitoring Reports. Moreover, the performances on social development projects are documented based on the reports provided by the Community Relations Staff of PSC-Human Resource & General Affairs.

It is significant to note that PSC has obtained certification for ISO 9002:1996 (manufacturing) in October 1998, ISO 9001:2000 (manufacturing and design) in October 2001 and ISO 14001:1996 for Environmental Management Systems in November 2001 and is continuously being complied with by the Company in the last 23-years.

Transition from previous ISO version and adoption of the 2015 ISO version-Annex SL (common structure & terms for QMS/EMS) with Risk based thinking was completed in a period of four (4)-months. This achievement places PSC as one of the first manufacturing industries in Northern Mindanao to obtain certification of its Quality and Environmental Management System to ISO 9001:2015 and ISO 14001:2015 last September 30, 2016.

Summary of Impact Identification

Table 6.1.1 summarizes the associated impacts with the operation of PSC's operations with corresponding environmental management program.

Table 6.1.1. Aspects and impacts of PSC operations and corresponding programs

Sources	Environmental Aspects	Environmental Impact	Environmental Management Program
Sinter, Burnt Lime, Hydrated Lime, Power House, Bag houses, sinter pot machine facility	Air Emissions: point source dust emission	Air pollution	Air Quality Management – Point Source Dust Control (EMP-01)
Sinter, Burnt Lime, Hydrated Lime, Mechanical (e.g. sandblasting, asbestos pit operation)	Fugitive Dust Emission	Air pollution	Air Quality Management – Ambient Dust (EMP-02)
Sinter, Burnt/Hydrated Lime, Sampling House/Laboratory/SI/ Sinter Pot Machine facility, Warehouse, Electrical/ Mechanical, Engineering, Personnel, Contractor's area, MTH/Mobile	Airborne dust emission	Air pollution	Air Quality Management – Ambient Dust (EMP-02)
Sinter, Burnt Lime, Powerhouse, Sinter Pot machine facility	Stack Gas Emissions (CO_2, CO, NO_2, SO_2)	Air pollution	Air Quality Management – Stack/ Ambient Gas Emissions (EMP-01A)
Various sources	Ambient Gas Emissions ▪ volatile organic compounds, acid fumes & chlorine gas ▪ vehicular exhaust, compressed gas and combustion gas ▪ Ozone depleting substances ▪ Compost pit gas (methane)	Air pollution	Air Quality Management – Stack / Ambient Gas Emissions (EMP-01A)
Warehouse, Sinter, IMPEX-Material, Mechanical, Electrical, Powerhouse, Material Handling, Laboratory, Contractor's area, Burnt Lime, Holding Station, Wash Rack – Personnel, Engineering	Water discharges (toxic) ▪ Petroleum products lube/fuel oil (lubricants, grease, transformer / capilla oil) ▪ Organic solvent spills (thinners, degreaser, carbon remover)	Water pollution	Petroleum Product Waste Management (EMP-03)
Warehouse, Sinter, Laboratory, Electrical, Mechanical, SW Holding Station MEP/REP-CE & DE replacement	Chemical spills ▪ Laboratory washings & spills (organic & inorganic) ▪ AC Cooling Tower softener ▪ Maintenance & shop works – degreasers/CCL4/ battery solution) Effluent contaminated with heavy metals	Water pollution	Wastewater Management Program (EMP-04)
Personnel	Pathogenic solutions (spent medical solutions)	Water pollution	-
Personnel	Kitchen effluents (effluents contaminated with oil and surfactants)	Water pollution	Wastewater Management Program (EMP-04)
All Departments including Contractors	Vehicle washings	Water pollution	

Sources	Environmental Aspects	Environmental Impact	Environmental Management Program
All Departments including Contractor's Shop, Holding Station, Engineering (construction works), K-3 construction	Paint spills	Water pollution	
Material Handling, IMPEX (Main / Cargo Berth)	Sewage/Bilge water	Water pollution	Wastewater Management Program (EMP-04)
Warehouse, Sinter, Mechanical, Material Handling, Storage Tanks, Powerhouse, Contractor's Area Uniflow/Admin Canteen, Vehicle Washing station	Abnormal water discharges (toxic) ▪ Petroleum product spills (from shops, transport lines, storage tanks, washing area, bus terminal ▪ Used/spent cooking oil & spills from kitchens	Water pollution	Oil Spill containment recovery & clean-up program (EMP-05)
Warehouse, Sinter, Mechanical, Material Handling, Storage tanks, Powerhouse, Contractor's area, Engineering	Accidental water discharges (toxic) ▪ Petroleum product spills during unloading, handling & storage	Water pollution & Fire Hazard	Oil Spill containment recovery & clean-up program (EMP-05)
Material Handling, Sinter area, material storage area, pavement, drainage canal, settling pond, Main/cargo Berth Quay walls	Overflow/Breakdown of Settling Pond	▪ Water pollution ▪ Siltation of receiving body of water; ▪ Damage to coral reef/ obstruction to navigation ▪ Coastal/ shoreline erosion	Wastewater Management Program (EMP-04)
Mechanical, Electrical, Sampling House, Laboratory, Material Handling, Sinter, Lubrication, Carbon Drying, Sinter Pot machine facility, Engineering, K-3 construction	Water discharges (non-toxic) Process equipment cooling & washing / Raw Material spill	▪ Water pollution ▪ Siltation of water bodies	Wastewater Management Program (EMP-04)
Shop, pavement, Laboratory, kitchens, offices, Contractor's area, Engineering, K-3 construction, tennis courts	Domestic wastewater (soaps, detergents, solids)	Water pollution	Wastewater Management Program (EMP-04)
All Departments, PSC Silver Heritage Garden, Vehicle washing station, Engineering, Sinter Pot machine facility, tennis courts, K-3 construction	Water consumption	Depletion of water supply	Water Conservation (EMP-06)
Kitchens, Personnel, Administration & Field offices, Warehouse, Laboratory, all Departments, Engineering, tennis courts, K-3 construction	Bio-degradable Solid Wastes (non-toxic) (food refuse, cut grasses, used newspaper, thrash paper, cartons, garbage, sandpaper, sample, envelopes, filter paper, food refuse, remnants)	Land contamination	Solid Waste Management (EMP-07)
Clinic, Laboratory, Administration & Field Offices, Contractor, Mechanical & Mobile shop	Biodegradable Solid Wastes (toxic), pathological waste, contaminated sawdust, septic tank waste)	Land contamination	Hazardous Waste Management (EMP-07B)

Sources	Environmental Aspects	Environmental Impact	Environmental Management Program
Various sources including construction of SHR plant	Non-biodegradable Solid Wastes (non-toxic) ▪ Metal waste/scraps/chips/trimmings/liners/castings ▪ Damaged sampling ▪ Laboratory equipment ▪ Rubber material ▪ PE plastic packaging & containers ▪ Others.	▪ Land contamination ▪ Material subsidence	Solid Waste Management (EMP-07)
Various Sources including construction of SHR plant	Non-biodegradable (toxic) ▪ Empty cattery shell, ▪ used spent lead acid and dry cell batteries, ▪ Empty ink and toner cartridges/ribbons ▪ Empty petroleum product container and other contaminated materials ▪ Paint contaminated materials ▪ Electric bulbs and tubes and ballasts ▪ Acid and organic solvent containers	▪ Land contamination	Hazardous waste management (EMP-07B)
	▪ Chemical spills Asbestos sheets and gaskets		
Sinter, Burnt Lime, Engineering, Mechanical, Powerhouse, Hydrated Lime Sampling House, SI facility, Sinter Pot machine facility, K-3 construction	Noise emission	▪ Nuisance ▪ Hearing impairment ▪ Disturbance to wildlife	Noise Management Program (EMP-08)
Sinter, Material Handling, SI facility, Sampling House, Burnt / Hydrated Lime, Plant, Laboratory, Carbon Drying, Sinter Pot machine facility, Baghouse collapse	Raw Material Spillages	▪ Land contamination ▪ Siltation of water bodies	Spillage Recovery and Utilization (EMP-09)
Sinter, Burnt Lime, Hydrated Lime, Sinter Pot machine facility	Raw Material Consumption (iron ore, coke breeze, ant. Coal, limestone, dolomite)	Depletion of natural resources	Spillage Recovery and Utilization (EMP-09)
Sinter, Burnt Lime, Mechanical, Electrical, Laboratory, Sampling House, Material Handling Warehouse, Engineering	Fuel and oil consumption (sintering, calcinations, mobile vehicles, tugboats)	Depletion of natural resources	Energy (Fuel) Conservation Program (EMP-10); Energy (Carbon) Conservation Program (EMP-11)
All Departments, new baghouses, SI Facility, Engineering, PSC Silver Heritage Garden, Sinter Pot machine facility, tennis court, K-3 construction	Power consumption	Depletion of natural resources	Energy (Electric Power) Conservation Program (EMP-12)
Laboratory, Offices	Exposure to radiation (MXF-2100 and personal computers)	Mutagenic effect to humans	EMP-05

Sources	Environmental Aspects	Environmental Impact	Environmental Management Program
Mechanical, Electrical, Sinter, Warehouse, Burnt/Hydrated Lime, Material, Handling Laboratory, Sampling House, Administration, Engineering, Compost pit, Solid waste holding station, K-3 construction	Exposure to toxic gas (fumes and vapors) ▪ Welding fumes ▪ Organic solvent fumes ▪ Acid fumes ▪ Chlorine gas ▪ CO/SO_2 gas ▪ Vehicle exhaust ▪ CH_4 gas pungent odor	Respiratory illness	▪ Proper use of PPEs ▪ Safety policy & promotional programs
Burnt / Hydrated Lime, Sinter, Sampling House, Mechanical, Engineering, Sinter Pot machine facility, K-3 construction	Exposure to Heat / Steam ▪ Welding ▪ Calcination ▪ Hydration ▪ Ignition ▪ Crushing ▪ Drying	Skin & eye irritation and burns	▪ Proper use of PPEs ▪ Safety policy & promotional programs
Sinter, Warehouse, Sampling House, Mechanical, Electrical, Engineering, Material handling, Burnt/Hydrated Lime, K-3 construction	Vibration	▪ Nuisance ▪ Human discomfort / inconveniences	
Warehouse, engineering, Mechanical, Electrical, offices, MEP/REP – CE & DE replacement	Materials utilization ▪ compressed gas ▪ steel & construction materials ▪ welding rods ▪ bond paper	▪ Health & fire hazard ▪ Depletion of natural resources	
Laboratory, SI facility, Mechanical, sampling house, Electrical, Sinter, MTH,	Exposure to dust particulates	Respiratory irritation & illness	
Engineering, MEP/REP-DE & CE replacement, Sinter Pot facility, Asbestos Pit (operation), K-3 construction			
Sinter Cooler Waste Heat Construction and Operations	Thermal pollution	Thermal pollution	Assurance of thermal temperature rise not to exceed 3°C in the receiving body of water (DAO 34)

Source: PSC EMS Manual, 2021

6.1.1 Compliance to Environment Regulations

PSC was granted an ECC (Ref. No. 0807-021-2711) on 14 April 2009 which consolidated the issued ECCs of the following major and support facilities:

- PSC Sintering Plant;
  - Port;
  - Ore Yard;
  - Burnt Lime Facility; and
  - Sintering Facility

- Sinter Cooler Waste Heat Recovery Operation;
  - Heat Recovery Boiler;
  - Steam Turbine;
  - Generator;
  - Water Treatment Plant; and
  - Cooling Water System

- 5.5 Diesel Generator

- Additional Facilities;
  - 2-Burnt Lime Facilities
  - Hydrated Lime Facilities

6.1.1.1 Land

a. Republic Act No. 6969 – Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990

Republic Act No. 6969, otherwise known as The Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 controls and regulates activities involving toxic chemicals and hazardous wastes. Such activities include importation, manufacturing, use, transport, handling and disposal. The following section details compliance of the PSC with Republic Act No. 6969 and its Implementing Rules and Regulations.

b. Title 2: Toxic Substances

Title II of DAO 1992-29 requires chemicals and chemical substances used by each establishment to be listed in the Philippine Inventory of Chemicals and Chemical Substances (PICCS).

During the audit period, all chemicals and chemical substances used by PSC are included in the PICCS. No new chemical and chemical substances have been introduced for use within the audit period. As such, securing Small Quantity Importation (SQI) Clearance or Pre-Manufacture Pre-Importation Notification (PMPIN) Compliance Certificate is not necessary.

c. Priority Chemicals List (PCL)

DAO 2005-27 requires all users, importers, and manufacturers of chemicals listed in the PCL to comply with the following requirements:

- Completion and submission of Annual Report to EMB Central Office;
- Completion and submission of HW Registration Form to EMB Region X; and
- Submission of Registration and Annual Reports in a form prescribed by DENR and accompanied with the payment of prescribed fees.

For the audit period, PSC use the following compounds in their operations:

- Benzene
- Formaldehyde

Since this chemical is listed in the Revised PCL, PSC is required to comply with the above requirements. As noted during the audit, PSC has been issued PCL Compliance Certificates for these chemicals and substances. **Annex 6.1** shows the PCL Compliance Certificates.

d. Chemical Control Order (CCO)

To date, there are six (6) chemical control orders (CCO) issued by the DENR-EMB, which include the following:

- Lead and Lead Compounds
- Mercury and Mercury Compounds
- Polychlorinated Biphenyls

Among the chemicals issued with CCOs by the DENR-EMB, PSC uses the following chemicals covered by a CCO, namely: asbestos, lead (Pb), mercury (Hg) and polychlorinated biphenyls (PCB) and ozone depleting substances. Please refer to **Annex 6.2** for the CCO Registration Certificates.

CCO for Lead and Lead Compounds

Lead compounds are chemical compounds that contain lead (Chemical Abstract Service Registry No. 7439-92-1). Also covered are lead paints or other similar surface coating materials containing lead or lead compounds (calculated as lead metal) in excess of 0.009% (or 90 ppm) of the weight of the total non-volatile content of the weight of the dried paints film.

The use of lead tetraoxide and lead nitrate by PSC in its laboratory is covered by CCO Registration Certificate CCO-2016-005Pb. There is a need to clarify with EMB if the other lead and lead compounds used by PSC in its operations including lead batteries and lead solders in the welding and fabrication shops needs to be covered with a separate CCO registration as these are already articles in nature.

CCO for Mercury and Mercury Compounds

As a user of mercury and mercury compounds, PSC secured CCO Registration for the following compounds: mercuric sulfate and mercuric chloride for laboratory analysis.

In addition, the possession of Hg-filled thermometers by PSC may necessitate securing a separate CCO, under the DAO 2019-20 (Revised CCO for Mercury and Mercury Compounds). These Hg-filled thermometers had been no longer in used by PSC.

PSC may seek for a clarification whether a separate CCO for Hg-filled thermometers are necessary.

The purchase, use, stock inventory, and waste generation must be recorded and reported, as part of the SMR.

CCO for Polychlorinated Biphenyls (PCB)

EMB MC 2015-004 and MC 2015-007 under DAO 2004-01 require all PCB owners to register online and secure CCO Registration Certificate for PCBs. Other requirements of MC 2015-004 include the submission of PCB Inventory Report and PCB Management Plan through the Online PCB Database.

PSC has registered online with the EMB database and has submitted the PCB Management Plan. Only the PCO and two (2) laboratory staff attended the mandatory 16-hour PCB Management and Emergency Response Training.

e. Title 3: Hazardous Wastes

Title III of DAO 1992-29 prescribes the management of hazardous wastes generated within the country for the purpose of minimizing its generation and preventing pollution. PSC generates hazardous wastes as by-products of its operations and support activities. The company was audited based on the requirements of DAO 2013-22 and DAO 2004-36.

Registration as HW Generator

PSC generates HW as by-products of its operations and support activities. It is a registered HW Generator with ID No. OL-GR-R10-43--003928 (**Annex 6.3**) issued through the EMB's Online HWMS on September 7, 2020. **Annex 6.4** depicts the DENR Hazardous Manifest. **Annex 6.5** includes the TSD Storage Management while **Annex 6.6** is the TSD Certification for PSC.

Inventory of HW

PSC conducts an inventory of their HW and submits this as part of Module 2B of the SMR. Review of the SMRs from 2017 to present indicated complete inventory of hazardous waste generated, treated, and disposed.

The accounting of PSC's HW was also evaluated through assessment of its reported HW generation quantities as well as all transactions made during the audit period. Based on the SMR, the following were observed:

- Transport and disposal of hazardous were limited only to large quantities generated such as I101, I104, J201 and M501. Other wastes especially those generated in small quantities were not transported and disposed;
- Hazardous wastes were stored longer than six (6) months; and
- Hazardous wastes generated were not recorded in terms of unit weight until the 2nd quarter of 2019 but was corrected thereafter (Table 3-1 of DAO 2013-22).

Offsite Transport, Treatment, and Disposal of HW

PSC commissioned DENR-registered hazardous waste transporters and TSD facilities for the offsite transport and treatment of its HW. For every transaction, required records were maintained to ensure proper documentation. These included the following:

- Compliance Tracking of Hazardous Waste Transporter and TSD Facilities commissioned by PSC;

- Manifest and COT Monitoring Log Sheet; and
- Pre-transport Hazardous Waste Checklist.

f. Republic Act No. 9003: Ecological Solid Waste Management Act

As an industrial facility generating various types of solid wastes, PSC is covered by Republic Act No. 9003, otherwise known as the Ecological Solid Waste Management Act of 2000 and its Implementing Rules and Regulations[1]. This section details the findings of the audit team related to PSC's compliance with Republic Act No. 9003 and its Implementing Rules and Regulations.

Domestic and Industrial Solid Wastes

PSC implements waste segregation at source. It has provided properly labeled and color coded bins in its workplace, offices, restrooms, warehouses and other facilities to ensure proper segregation of domestic solid wastes. On the other hand, industrial solid wastes generated by PSC at the work area are collected and subsequently stored at the Materials Recovery Facility (MRF) established by PSC.

- Recyclable wastes such as scrap wood, scrap metals, rubber, paper/cartons, tins/aluminum, glass and plastics are stored but are mixed;
- Residual wastes; and
- Some wastes are not segregated.

g. Terrestrial Ecology

PSC has managed to set portions of the PSC complex as plantation forests, in particular the reforestation site beside the administration building. The company has also maintained no cutting or timber collection policy as evidenced by the remaining forest patch in the proposed ore yard 7, which has enhanced the overall vegetation within the complex. These existing vegetation serve as habitat for various wildlife species.

There are some portions that can be utilized as additional reforestation or rehabilitation sites such as the areas in T2 and T3. Enhancing the vegetation in these areas will definitely promote improvement of terrestrial biodiversity within the PSC complex.

Carbon Sink Management Program

PSC has conducted tree planting activities within its vicinities to enhance its existing vegetation and contribute in sequestering carbon dioxide from the atmosphere. In addition to this, following DENR policy on replacement ratio 1:100 on naturally growing trees within private lands, PSC shall produce and plant 227,200 seedlings of indigenous trees within its complex as replacement for the number of trees that will be affected in the vegetation clearing within the proposed ore yard 7. PSC likewise has to produce and plant an additional 14,900 seedlings of indigenous trees as replacement for the clearing of the proposed ore yard 8.

[1] Department Administrative Order 2001-34.

6.1.1.2 Water

a. Republic Act No. 9275 – Philippine Clean Water Act of 2004 (RA 9275)

Republic Act No. 9275, otherwise known as the Philippine Clean Water Act of 2004 and its IRR primarily govern the water-quality management in all bodies of water in the country for the principal purpose of abating and controlling pollution from land-based sources.

Republic Act No. 9275 prohibits any person to cause water pollution in any body of water including groundwater, soil, and soil sub-surfaces. Pollutants in this context are defined as substances, whether solid, liquid, gaseous, or radioactive, which directly or indirectly:

- Alter the quality of any segment of the receiving water body so as to affect or tend to affect adversely any beneficial use thereof;
- Are hazardous or potentially hazardous to health;
- Impart objectionable odor, temperature change, or physical, chemical, or biological change to any segment of the water body; and
- Are in excess of the allowable limits or concentrations or quality standards specified, or in contravention of the condition, limitation, or restriction prescribed in the law.

For PSC, various wastewater sources are managed through series of siltation ponds which serve as the collection area for wastewater from the plant operations. Domestic wastewater, cooling water and wastewater from equipment and vehicle washing all constitute the total influent of the North Settling Pond; while the influents of the South Settling Pond consist of washings and run-off from Raw Material Stockyard. There are two (2) exit canals from the ponds that discharge wastewater into the Macajalar Bay making it the terminal receiving body of all possible pollutants. Monitoring wastewater quality of the ponds would contextualize any contamination of Macajalar Bay with regard to the existing plant operations.

PSC monitors its wastewater in two areas: (1) North Settling Pond (NSP) Effluent Discharge and (2) South Settling Pond (SSP) Effluent Discharge. **Annex 6.7** includes the Wastewater Management Program of PSC.

b. Discharge Permit

Republic Act No. 9275 provides that any person who discharges wastewater in any manner into the Philippine waters and/or land to secure a discharge permit from the DENR-EMB. This permit is the legal authorization granted by the DENR on an establishment to discharge wastewater unto any RBW.

In compliance with the above-mentioned requirement, PSC secured DPs from DENR-EMB Region X for all its discharge outlets. These outlets are covered by DPs detailed in **Annex 6.8.**

The DP covers the following discharge points:

Table 6.1.2. PSC Discharge Permits

DP No.	Source	Receiving Body of Water	Expiry Date
DP-R10-20-01812	Seawater Cooling System	Macajalar Bay	April 7, 2025
DP-R10-20-01778	Water Deionization System	Macajalar Bay	March 30, 2025
2018-DP-D-1043-481 (1/2)	North Settling Pond	Macajalar Bay	February 12, 2023
2018-DP-D-1043-481 (2/2)	South settling Pond	Macajalar Bay	February 12, 2023
2018-DP-C-1043-1636	Motorpool Area	Macajalar Bay	March 4, 2024

The DP shall be renewed not later than one (1) month prior to its expiration.

c. Effluent Standards

Republic Act No. 9275, otherwise known as, the Philippine Clean Water Act of 2004 requires compliance of all discharges with the Effluent Standards stipulated in DAO 2016-08, entitled Revised Water Quality Guidelines and General Effluent Standards. It also requires that establishments perform regular effluent quality monitoring to ascertain compliance with the law.

PSC's discharges are comprised of the following:

- Overflow from north settling pond;
- Overflow from south settling pond;
- Overflow from the seawater cooling system; and
- Overflow from the Water deionization plant, which are diverted into the North Settling Pond.

Effluent monitoring was conducted at the north settling pond, south settling pond and motor pool area. Overflow from the water deionization plant were diverted into the north settling pond. On the other hand, the spent seawater cooling was discharge through a submarine outfall, which provided limitations on the conduct of effluent sampling. In the absence of discharge or effluent monitoring, temperature monitoring at the mixing zone was implemented.

Table 6.1.3. Results of Effluent Monitoring, 2017-2021

Parameters	Unit	North Settling Pond		South Settling Pond		Motor Pool		DENR Standard (DAO 2016-08)
		Min	Max	Min	Max	Min	Max	
pH		7.17	8.88	7.31	8.42	7.60	8.50	6.0-9.0
DO	mg/L	4.00	6.80	2	8.10	1.00	4.90	None
Temp rise	mg/L	0.00	2.00	0.00	1.00	0.00	1.00	3
BOD	mg/L	1.00	39.00	6.00	16.00	6.00	18.00	100
COD	mg/L	3.30	36.2	6.00	24.50	Not tested		200
TSS	mg/L	0.50	26.00	<1	50	2.00	73.00	100
NH_3	mg/L	<0.004	0.11	0.006	0.1	<0.005	0.06	0.5
Cl	mg/L	5.00	373.00	4.00	117.30	1.97	104.00	n/a
NO_3	mg/L	0.04	0.90	<0.05	2.66	0.10	3.20	20
Oil&Grease	mg/L	1.00	8.00	1.00	9.00	3.00	11.00	10
PO_4	mg/L	<0.01	<1.0	0.07	<1	Not tested		1
SO_4	mg/L	14.90	80.60	42.30	91.4	12.20	47.60	550
Total Coliform	MPN/100mL	180.00	6,300.00	680.00	7,900.00	Not tested		10,000
As	mg/L	<0.01	<0.01	<0.01	0.02	<0.01	0.02	0.04

Parameters	Unit	North Settling Pond		South Settling Pond		Motor Pool		DENR Standard (DAO 2016-08)
		Min	Max	Min	Max	Min	Max	
Ba	mg/L	<0.05	0.14	<0.05	0.5	<0.05	0.05	2
Cd	mg/L	Not tested		Not tested		Not tested		0.01
CN	mg/L	<0.01	<0.05	<0.007	<0.05	<0.05	<0.05	0.2
Cr^{+6}	mg/L	<0.001		Not tested		Not tested		0.1
Fe	mg/L	0.28	0.28	0.30	0.30	Not tested		7.5
Ni	mg/L	0.1		0.09	0.09	Not tested		0.3
Pb	mg/L	<0.001	0.10	Not tested		Not tested		0.1
Mn	mg/L	0.012	0.23	<0.001	0.041	Not tested		4
Hg	mg/L	<0.0001	<0.001	<0.001	0.041	<0.0001	<0.0001	0.004
Zn	mg/L	<0.001	0.03	0.08	0.08	Not tested		1.5
C_6H_6	mg/L	<0.0005	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	0.5
Toluene	mg/L	<0.0005	<0.0008	<0.0005	<0.0005	<0.0005	0.0022	20
Ethylbenzene	mg/L	<0.0005	0.0021	<0.0005	<0.0005	<0.0005	0.0013	7.5
o-Xylene	mg/L	<0.0005	0.0036	<0.0005	<0.0005	<0.001	0.0024	15
m-Xylene	mg/L	<0.001	0.006	<0.001	<0.001	<0.01	0.0040	
p-Xylene	mg/L	<0.001	0.006	<0.001	<0.001	<0.002	0.0040	

Source: PSC Self-Monitoring Reports, 2017-2021

Results of effluent monitoring (**Table 6.1.3**) indicated compliance with the applicable effluent standards except for oil and grease at the Motor Pool area.

Review of the SMRs and monitoring data indicated that effluent monitoring was not consistently implemented. There were instances where some key parameters were not measured. This was one of the previous audit findings (2017 Environmental Audit).

In addition, it must be noted that thermal discharge from cooling water system through a submarine outfall or underground conveyance as a means of discharging effluent is not allowed (Section 11(4) of DAO 2016-008) except when all of the following are met:

a. Effluent is compliant to the GES under the DAO;
b. The receiving body of water is marine water in order to protect the aesthetic requirements of the shoreline; and
c. The needed infrastructure for sampling treated effluent is constructed above ground prior to conveyance.

Thermal effluent from cooling water systems can not comply with the temperature effluent standard of not more than 3^0C rise[2]. No infrastructure for sampling the temperature at the condenser discharge point due to technological and safety reasons. Providing a sampling point constructed above ground prior to conveyance of the thermal discharge may release the vacuum which needs to be maintained across the condenser and pose safety concerns.

d. Water Quality Guidelines

Results of water quality monitoring are shown in **Table 6.1.4**.

Temperature, pH, TSS, and DO generally comply with the applicable water quality guideline values in accordance with *Table 3* of DAO 2016-008. For TSS, all results were within the

[2] Temperature difference between the background value and discharge point (Ref.: Footnote h, Table 9 of DAO 2016-008)

DENR Standards. There are eight (8) readings were DO level is below the minimum Standard. Oil and grease, on the other hand, exceeded the water quality guideline value of 3mg/L in a number of occasions, mostly during the Fourth Quarter of 2018, First Quarter of 2019 and Second Quarter of 2019. The exceedances may be due to other sources, sampling, or sample handling prior to its analysis. PSC has a neighboring Oleochemical Manufacturing Facility and an Oil Depot.

Table 6.1.4. Results of Water Quality Monitoring, 2017-2021

Location	Temp. °C		pH		TSS, mg/L		DO, mg/L		Oil&Grease, mg/L	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Main Berth	280	31.0	7.8	8.5	2.0	34.0	4.3	8.0	1.0	5.0
Cargo Berth	27.0	31.0	7.8	8.4	3.0	29.0	4.5	8.6	1.0	10
NSP-10m	28.0	31.0	7.6	8.4	1.0	25.0	2.8	9.9	1.0	8.0
SSP-10m	27.0	31.0	7.9	8.4	3.0	27.0	5.1	9.2	1.0	7.0
SHR Point A	24.2	32.0	7.7	8.4	2.0	40.0	5.7	6.8	2.0	6.0
SHR Point C	28.0	31.0	7.8	8.5	3.0	27.0	5.4	9.4	1.0	6.0
SHR Point C-1 East	29.0	31.0	7.5	8.4	1.0	33.0	4.8	7.9	1.0	5.0
SHR Point C-1 West	27.0	31.0	7.9	8.9	2.0	28.0	5.1	7.9	1.0	3.0
SHR Point E	24.2	31.0	7.8	8.4	2.0	36.0	4.8	7.7	1.0	5.0
SHR Unaffected	26	31.0	7.6	8.4	2.0	33.0	4.5	9.1	1.0	10.0
STEAG	28.0	31.0	7.8	8.4	3.0	24.0	4.3	6.7	1.0	4.0
LKKS Area - Unaffected	28.0	31.0	7.2	8.4	3.0	34.0	4.6	6.9	2.0	5.0
DENR Standard (DAO 2016-08)	25-31		6.5-8.5		80		5.0 (min value)		3.0	

Source: PSC Self-Monitoring Report, 2017-2021

e. Incident Reporting

Republic Act No. 9275 and its Implementing Rules and Regulations require the reporting of plant operational problems to the EMB due to a breakdown of any installation covered by the Discharge Permit within 24 hours from its occurrence. During the audit period, there was no breakdown or collapse of settling ponds and related infrastructures which may have the potential to significantly affect the quality of the RBW.

6.1.1.3 Air

Emissions from PSC operation are generated from raw materials handling, lime kiln operations and sintering operations – wind box exhaust, discharge end (associated sinter crushers and hot screens) and sinter cooling. The Sinter Cooler Waste Heat Recovery Power Generation Project of the company is in itself a gauge to assess performance of the company to reduce environmental impacts. The project was specifically designed to recover the heat generated from the current sintering operations of PSC to generate power using a steam turbine generator. The utilization of its waste energy streams is expected to reduce the operating costs and decrease the potentials of global warming by reducing the amount of energy that shall be acquired from fossil fuel burning power plants.

This pioneering innovation of the company, the project is approved as a Clean Development Project under the Clean Development Mechanism (CDM) of the Kyoto Protocol which allows developed nations to achieve their commitment to reduce emissions through projects in developing countries that reduce emissions or sequester CO_2 from the atmosphere while

contributing toward sustainable developments in developing countries. The Sinter Cooler Waste Heat Recovery Power Generation Project was officially registered with the United Nation CDM Executive Board last May 5, 2007.

In compliance with the directives of the EMB Region 10 during the technical conference held in 25 September 2020, PSC submitted a 5-year Rehabilitation Plan to address the frequent occurrences of emergency shutdowns. **Annex 6.9** includes the duly received Rehabilitation Plan by the EMB Regional Office in 28 October 2020.

Table 6.1.5 lists the major sources of emissions from PSC operations identifying the source and point of emission and pollutant of concern. The location of each specific emission source is shown in **Figure 6.1.1**.

Table 6.1.5. Emission sources at the Philippine Sinter Corporation operations

Operation/ Location	Process/Source	Emissions	Emission point
Burnt Lime Plant (BLM)	Heating of limestone to produce burnt lime (mostly CaO) in three (3) units of vertical rotary kiln fueled with Bunker C.	SO_2, NO_2, PM_{10} and CO_2	Three (3) units vertical rotary kiln stacks
Hydrated Lime Plant (HLM)	Lime hydration	PM_{10}	HLM Stack
Sintering	Sintering of iron ore, coke and limestone in sintering machine using Bunker C.	SO_2, NO_2, PM_{10}, CO_2, and heat	Main EP Stack
	Crusher, screen and transfer points	PM_{10}	Room EP Stack
	Rotary drum mixer	PM_{10}	M-101BF Stack
	Airborne dusts from blend hoppers and belt conveyors	PM_{10}	BH-101BF Stack
	Airborne dusts from blend hoppers and belt conveyors	PM_{10}	BH-105 BF Stack
Standby Power Generators	Combustion of fuel to generate electricity in three (3) generators (2 – diesel 1MW generators and 1 – diesel/bunker oil 5.5MW generator)	SO_2, NO_2, TSP and CO_2	Three (3) units of diesel generator stacks
Sinter Cooler Waste Heat Recovery (SHR)	Dust entrained in the cooling air from the sintering process used to produce steam in the waste heat recovery boiler.	PM_{10}	SHR boiler stack.
Proposed project - Iron Ore Pelletizing Plant	Rotary kiln or travelling grate	SO_2, NO_2, PM_{10} and CO_2	

Source: PSC, 2021

a. Republic Act No. 8749 - Philippine Clean Air Act of 1999

Republic Act No. 8749, otherwise known as the Philippine Clean Air Act of 1999, is the primary and governing law of air quality management in the Philippines. All stationary sources of air pollution and their control facilities are subject to the said law and its IRR.

Specific requirements of DAO 2000-81 applicable to PSC are as follows:

- Permitting requirements (Section 1, Rule XIX, Part VI)
- Compliance with emission standards (Section 1, Rule XXV, Part VII)
- Compliance with ambient air quality standards (Section 1, Rule XXVI, Part VII)
- Installation of Continuous Emissions Monitoring System (Section 5(a)(3), Rule XXV, Part VII; DAO 2007-22; DAO 2017-14; and EMB Memorandum Circular 2020-003 Incident Reporting (MC 2011-004 entitled Clarificatory Guidelines on DAO 2008-81 and Part VI, Rule XIX, Section 13)

Permit to Operate for Air Pollution Sources

Republic Act No. 8749, otherwise known as the Philippine Clean Air Act of 1999 and its IRR govern the air quality management of the country through the issuance of regulatory permits for the prevention and abatement of air pollution. The permit covers emission limitation for regulated air pollutants to aid and maintain the ambient air quality standards. In compliance with the above requirements, PSC secured Permit To Operate (PTOs) for their various Air Pollution Source Equipment (APSE) and Air Pollution Control Facilities (APCF) (**Table 6.1.6**). Please refer to **Annex 6.10** for the Permit to Operate Air Pollution Source and Control Installations.

Table 6.1.6. Various Permit to Operate issued by the DENR-EMB

Permit No.	APSE/APCF	Date Issued	Expiry Date
2019-POA-K-1043-3069 I	Sinter Machine	August 13, 2019	November 19, 2024
2019-POA-H-1043-152 (1/5)	Burnt Lime Plant #1 (Bunker Fired)	August 13, 2019	August 8, 2024
2019-POA-H-1043-152 (2/5)	Burnt Lime Plant #2 (Bunker Fired)	August 13, 2019	August 8, 2024
2019-POA-H-1043-152 (3/5)	Burnt Lime Kiln No. 3 (Bunker Fired)	August 13, 2019	August 8, 2024
2019-POA-H-1043-152 (4/5)	Hydrated Lime Plant	August 13, 2019	August 8, 2024
2019-POA-H-1043-152 (5/5)	Power House	August 13, 2019	August 8, 2024
2019-POA-H-1043-802	Sinter Pot Machine	August 13, 2019	August 8, 2024
2019-POA-H-1043-802	Sinter Heat Recovery	August 13, 2019	August 8, 2024
2019-POA-I-1043-1144	Dual Fired Generator	August 13, 2019	September 30, 2024
2017-POA-H-1043-152	Diesel Generators 1 & 2	August 18, 2017	August 8, 2022
2019-POA-J-1043-1066	Diesel Generators 4 & 5	August 13, 2019	October 21, 2024
2019-POA-I-1043-3330	50 KVA Frontier Diesel Fired Generator Set	August 13, 2019	September 30, 2024
2017-POA-K-1043-2622	Laboratory Fume Hoods	November 20, 2017	November 16, 2022

Compliance with Emission Standards

Emission monitoring for the sources covered by PTOs were employed by PSC. Parameters measured include particulate matter (PM), sulfur oxides (SO_2), nitrogen oxides (NO_2), carbon monoxide (CO), and trace metals for the main EP serving the sintering process. Other sources monitored were Burnt Lime Kilns (#1, #2 and #3), SHR Boiler and Diesel Generators (#1, #2 #3, #4, and #5). The 2017-2021 emission monitoring results are shown in **Table 6.1.7.**

Table 6.1.7. Results of Emission Monitoring from Different Sources (in mg/Ncm), 2017-2021

Sources	PM (mg/Ncm)		SO_2 (mg/Ncm)		NO_2 (mg/Ncm)		CO (mg/Ncm)	
	Min	Max	Min	Max	Min	Max	Min	Max
Main EP	14	147	147	678	178	293	398	491
Room EP	23	147	Not applicable		NT			
Burnt Lime Kiln 1	6	148	7	82	221	223	286	
Burnt Lime Kiln 2	8	99	6	148	171	214	268	279
Burnt Lime Kiln 3	13	126	26	224	90	172		225
								225
SHR Boiler	29	130	Not applicable					
DG #1	6.48	29	8	260.68	9.49	223	0.86	266
DG #2	6.91	41	8	187.84	10.13	254	0.92	281
DG #3	11.64	40	10	503.8	17.05	274	1.55	289
DG #4	127		8		226		293	
DG #5	59		7		244		279	
DENR Standard	150		1500		1500*/2000**		500	

Source: PSC Self Monitoring Reports, 2017-2021

Note:
**emission standard applicable to fuel burning sources (existing sources)*
***emission standard applicable to diesel generator sets*

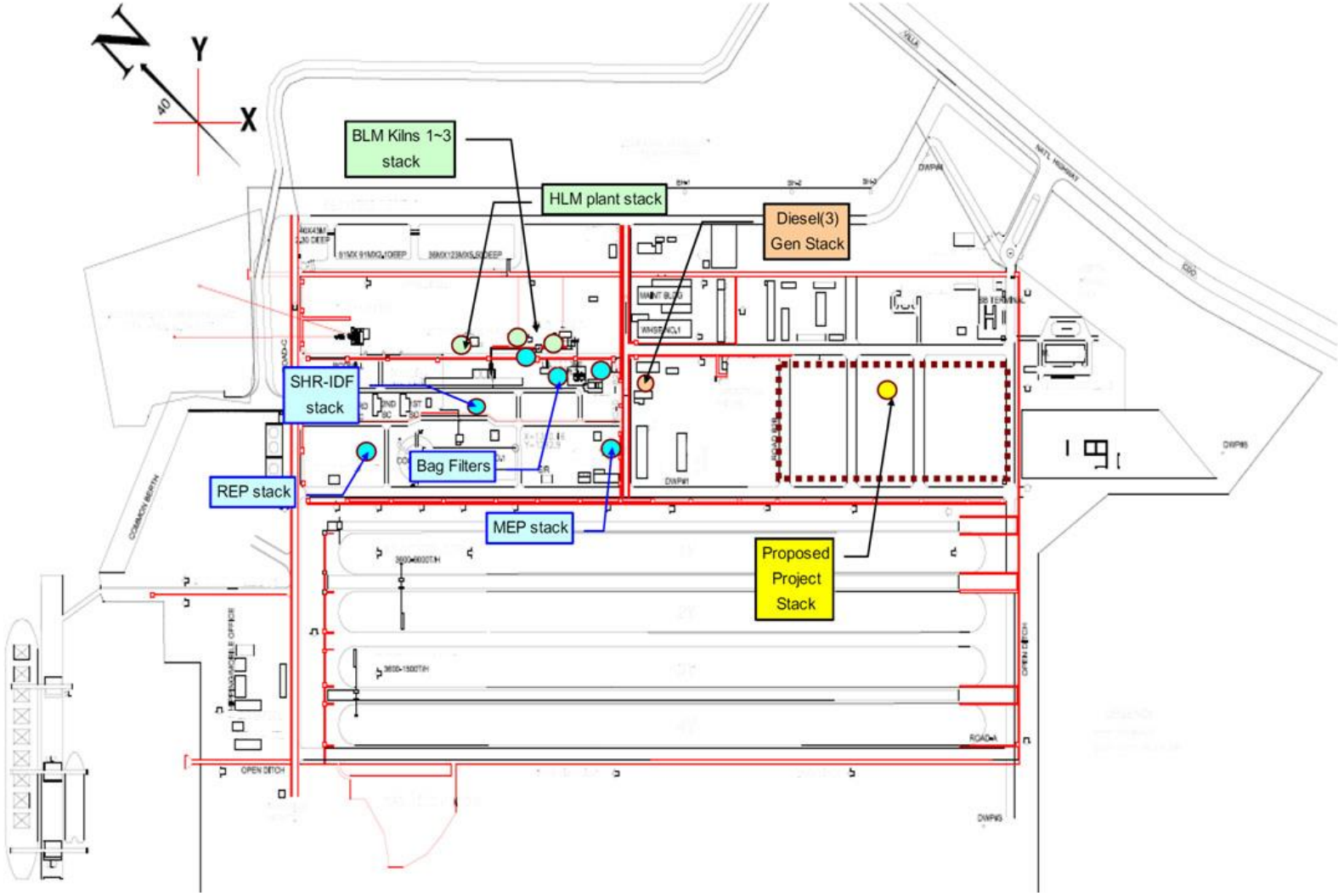


Figure 6,1.1. Location of point source emissions within PSC Complex

Review and evaluation of the monitoring data and self-monitoring reports for the period 2017 and 2021 showed the following:

- Emission from all sources covered by PTOs comply with the applicable emission in accordance with Table 2, Section 1, Rule XXV, Part VII of DAO 2000-81.

- Emission testing and monitoring were not consistently implemented and does not conform with the frequencies in accordance with **Table 6.3.1** (Environmental Monitoring Plan). Due to non-operation of equipment, there were months that no emission testing or monitoring were implemented. In addition, trace metals which should have been measured quarterly were not implemented. Corrective action has been done as this was also one of the findings of the 2017 Environmental Audit.

- Diesel generators sets must be tested in accordance consistent with the requirements of EMB Memorandum Circular No. 2007-003 (**Table 6.1.8**). DG 3 (powerhouse), DG$ and 5, and the dual fuel, which are classified as large sources where issued an exemption by the EMB Region 10 from the 2x/year compliance monitoring.

- Results of trace metals or heavy metals were very low compared to relevant emission standards in accordance with Table 2, Section 1, Rule XXV, Part VII of DAO 2000-81.

Continuous emissions monitoring systems (CEMS) and continuous opacity monitoring system (COMS) were installed at the sinter process. CEMS and COMS output were transmitted on a real-time basis to the EMB-Region X and EMB Central Office, in compliance with DAO 2017-14.

Table 6.1.8. Classification of stationary sources

Classification	Boiler Capacity, HP	Diesel Generator Sets, KW	Potential Emissions (tons)	Frequency of Compliance Testing
Environmentally significant	Any source of emissions of hazardous air pollutants included in the Priority Chemicals List			Twice per year
Large	≥ 251	≥ 1,250 (regardless of frequency of operation)	≥ 100	Twice per year
Medium	100 - 250	600 – 1,249 (regardless of frequency of operation)	30 -100	Once per year
Small	< 100	< 600 (regardless of frequency of operation)	10 -30	Once every two (2) years

Source: Annex 2, EMB Memorandum Circular No. 2007-03.

Compliance with Air Quality Standards

PSC implements air quality monitoring in nine (9) different locations, as reflected in the SMR. Monitoring is inconsistent with the EMoP, as defined in **Table 6.3.1** which the company committed to conduct monitoring on a quarterly basis.

Table 6.1.9 shows the results of air quality monitoring from period 2017-2021.

Table 6.1.9. Results of Air Quality Monitoring (in ug/Ncm), 2017-2021

Location	PM_{10}		NO_2		SO_2	
	Min	Max	Min	Max	Min	Max
(1) Main Gate	17	124.4	10.84	77.8	35.2	158.7
(2) PG #6	17.5	150.3	5.23	115.6	20.9	121.07
(3) PG #11	10.4	150.3	5.55	161.9	47.4	275.11
(4) PG #4	20.3	151.1	10.6	75.4	48.4	215.2
(5) San Martin	20.2	171.2	8.61	71.7	21.0	199.1
(6) PHIVIDEC Road	16.5	198.6	9.9	68.3	21.2	181.6
(7) Villanueva Plaza	20.3	192.7	5.0	102.4	22.4	304.4
(8) Katipunan	17.4	141.6	5.0	90.0	55.7	231.6
(9) Tambal Relocation	24.2	145.4	5.7	85.6	46.8	155.6
DENR Standard (DAO 2000-81)	**200**		**260**		**340**	

Source: PSC Self-Monitoring Reports, 2017-2021.

Results of air quality monitoring showed compliance with the applicable standards for PM-10, SO_2, and NO_2.

Noise Monitoring

One of the audit findings in 2017 Environmental Audit is the implementation of the noise monitoring. PSC's commitment in its EMoP is to carry out noise monitoring every two (2) months in sensitive receptors likely to be affected PSC's operations such as the communities opposite the PSC Main Gate.

The results of the noise monitoring are shown in **Table 6.1.11**.

Table 6.1.10. Results of Noise Monitoring, 2017-2021

Location	Observed/Measured Values (in dBA)		
	Minimum	Maximum	Arithmetic Median
Main Gate	49	67	54.5
PG #6	55	67	60.6
PG #11	51	71	61.5
PG #4	49	82	58
San Martin	44	57	52.5
PHIVIDEC Road	53	59	55
Villanueva Plaza	56	71	63
Katipunan	56	64	60.5
Tambal Relocation	43	63	52

Source: PSC Self-Monitoring Reports, 2017-2021

Table 6.1.11. Environmental Quality Standards for Noise in General Areas
(Maximum Allowable Noise Levels in General Areas)

Category	Maximum Allowable Noise (dBA) by Time Periods		
	Daytime	Morning/Evening	Nighttime
AA	50	45	40
A	55	50	45
B	65	60	55
C	70	65	60
D	75	70	65

Note:
Morning – 5:00 AM to 9:00 AM
Daytime – 9:00 AM to 6:00 PM
Evening 6:00 PM to 10:00 PM
Nighttime – 10:00 PM to 5:00 AM

Classification	Description
AA	A section or contiguous area which requires quietness, such as an area within 100 meters from school sites, nursery schools, hospitals and special homes for the aged
A	A section or contiguous area which is primarily used for residential purposes
B	A section or contiguous area which primarily used for commercial purposes

C A section primarily reserved as a light industrial area
D A section primarily reserved as a heavy industrial area

Source: Rules and Regulations of the National Pollution Control Commission (1978), Section 78, Table 1: Environmental Quality Standards for Noise in General Areas (Maximum Allowable Noise Levels in General Areas)

Installation of CEMS

Among the emission sources at PSC, only the sintering process was installed with a continuous emission monitoring system (CEMS) and continuous opacity monitoring system (COMS). With the installation of a new CEMS and COMS on January 2019, the performance specifications as provided in DAO 2007-22 were complied.

CEMS data were transmitted through the FTP server at EMB Central Office, in accordance with the requirements of DAO 2017-14.

The issuance of EMB Memorandum Circular 2020-003 requiring submission of CEMS data through the EMB Air Quality Network Center using a Data Acquisition and Handling System (DAHS). PSC has submitted a work plan to EMB-Central Office on the establishment of PSC DAHS connection with EMB DAHS.

For the period 2018-2019, two (2) cylinder gas audits were conducted on January 30, 2019 and July 18, 2019 while no Relative accuracy test audits were conducted during this period. Status of this required compliance were reported to EMB Region Office and Central Office.

Incident Reporting

Pursuant to MC 2011-004 entitled Clarificatory Guidelines on DAO 2008-81, Part VI, Rule XIX, Section 13 (IRR of RA 8749), any breakdown of Air Pollution Source Equipment (APSE) or Air Pollution Control Facilities (APCF) must be reported to the Bureau as follows:

- Breakdown and non-operation of an APSE must be reported in the SMR;
- Breakdown of an APCF lasting up to 1 hour must be reported in the SMR; and
- Breakdown of APCF lasting more than 1 hour must be reported within 24 hours.

For the audit period, there were notifications to EMB Region X submitted accordingly by PSC. These incidences either resulted in exceeding emission standards for dust or particulate matter arising from emergency shutdown, start-up, shutdown maintenance and other operational upsets. These incidents were also included in the SMR and were attached in **Attachment 3.**

Incident reporting submitted to EMB Region X did not result in the issuance of notices of violation.

6.1.1.5 Other Compliance to Environmental Regulations

Aside from the environmental laws, rules and regulations discussed, PSC was also audited based on their compliance with other environmental legal requirements imposed by other government agencies. Status of PSC's compliance with these requirements is discussed in the succeeding subsections.

a. Revised Guidelines for PCO Accreditation

DAO 2014-02 covers the accreditation of PCOs of establishments that discharge solid, liquid or gaseous waste to the environment or whose activities, products or services are actual and/or potential sources of land, water or air pollution.

Based on *Section 5* (PCO Accreditation Based on Categorization of Establishment), PSC is classified as a Category B Establishment and the PCO must be accredited based on this category. Engr. Edili Joy Camaganacan is PSC's Pollution Control Officer (PCO Acc. No. 2019-PCO-1043-1341). Her accreditation is valid until July 22, 2022.

b. Philippine Mining Act of 1995 (RA 7942)

The Mining Act is the main mining legislation in the Philippines and governs large-scale exploration, development and utilization of mineral resources. The Executive Order No. 79, or the Philippine Mining Policy, is an executive fiat recently enacted on July 6, 2012. It makes several innovations on the Mining Act, specifically in the following areas: expansion of areas closed to mining applications, establishment of mineral reservations, competitive public bidding for areas open to mining, and compliance with the social acceptability requirement of the communities affected.

Mining laws in the Philippines follow the Regalian Doctrine. Under *Section 2*, Article XII of the 1987 Constitution, all natural resources, including mineral, are owned by the State. The State may however, enter into agreement such as Mineral Production Sharing Agreements (MPSAs), Financial or Technical Assistance Agreements (FTAAs), and Joint Venture Agreements (JVAs) for the exploration, development and utilization of natural resources.

Respecting its operations, PSC is not required to enter into an agreement with the State such as MPSA, FTAA, or JVA. Individual or entities that plan to engage in mineral processing apart from mineral development should, however, be in possession of a Mineral Processing Permit (MPP) (Section 55 of RA 7942 and Chapter XI, Section 109 of CDAO 2010-12).

There is no law requiring mining contractors to process extracted minerals in the Philippines. The Philippine Mining Laws, likewise, do not have provision regarding the importation of minerals.

c. National Water Resources Board (NWRB)

Presidential Decree No. 1067, otherwise known as The Water Code of the Philippines mandates the National Water Resources Board (NWRB) to monitor the utilization, exploitation, development, conservation, and protection of water resources in the Philippines. NWRB regulates the use of water or the taking or diverting of water from a natural source for domestic, municipal, irrigation, power generation, fisheries, livestock raising, industrial, and recreational uses. Entities utilizing water resources in the country are required to secure a Water Permit (WP) from the NWRB and pay annual water charges.

Under PD 538, as amended by PD 1491, PHIVIDEC controls and regulates water resources within the PHIVIDEC Industrial Estates. By virtue of its charter, PHIVIDEC issues water permits and not NWRB. PSC holds valid permit issued by PHIVIDEC for the use of

groundwater within the industrial estate. **Annex 6.11** includes the Water Permit from PHIVIDEC.

d. Philippine National Police (PNP)

Based on the inventory of the chemicals, PSC utilizes 70% HNO_3, 100% $KMnO_4$, 100% KNO_3, and 100% $NaNO_3$ and hence, a License to Purchase/Possess Explosives is required or must be secured, in accordance with PD 1866, as amended by RA 8294 and RA 9516. PSC has applied for license to purchase/possess explosives with the PNP and has been issued the license. **Annex 6.12** shows PNP Permit (Lic. No. PJD27-181027-04592) issued on November 26, 2020 and with a validity until October 17, 2021.

e. Philippine Drug Enforcement Agency (PDEA)

Republic Act No. 9165, otherwise known as the Comprehensive Dangerous Drugs Act of 2002, enumerates controlled chemicals that are precursors to the manufacture of dangerous drugs. The use of chemicals listed in the Act requires the issuance of a license from PDEA.

At the time of the audit, PSC possesses a License to handle Control Precursors and Essential Chemicals (CPECS) for the following chemicals: acetone, hydrochloric acid, sulfuric acid, and toluene. **Annex 6.13** shows the PDEA License to Handle Controlled Precursors and Essential Chemicals.

f. Philippine Coast Guard (PCG)

PCG MC 01-2005 mandates the protection of all bodies of water within the territorial jurisdiction of the Philippines including ports, coastlines, lakes, rivers and their tributaries by the prevention, containment, abatement, and control of oil marine protection. The Circular also requires power plants to have a complete set of oil containment and recovery equipment, sorbet dispersants, and other MARPOL combating accessories duly accredited by the PCG.

PSC's Oil Spill Contingency Plan has not been submitted and approved by the Philippine Coast Guard (**Annex 1.6**).

g. Department of Transportation – Office for Transportation Security (DOTr-OTS)

PSC possesses a Statement of Compliance of a Port Facility issued by the DOTr-OTS. The Statement of Compliance was issued on February 17, 2018 and valid until August 16, 2023. **Annex 6.14** shows the Statement of Compliance of PSC's Port Facility.

6.2 COMPLIANCE TO ECC CONDITIONS

Based on the requirements highlighted in PD 1586 and DAO 2003-30, **Table 6.2.1** presents the findings on compliance of PSC to the ECC Conditions. Please see also **Annex 6.15.**

Table 6.2.1. PSC Compliance to ECC Conditions

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
ECC Ref 0807-021-2711 dated April 14, 2009					
Scope	This Certificate covers the proposed expansion of the iron ore sintering facility and all the existing facilities and operations of the PSC located at the	☑			All were installed except the 7MMTPY of pelletized iron ore. However, the status of the component is regularly

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
	PHIVIDEC Industrial Estate, Barangay Katipunan, Municipality of Villanueva, Misamis Oriental. Essentially, this Certificate consolidates the four (4) projects that were given ECCs earlier, namely: 1. ECC Reference No. 9207-006-120A issued on August 10, 1992 which covered the proposed 5.5MW Diesel Generator Set of the PSC 2. ECC Reference No. 9807-004-120 issued on May 14, 1999, which covered the one hundred forty-four (144) hectares Mindanao Sinter Plant composed of limestone crushing, coke grinding, material blending, mixing, feeding, and a sinter machine with a rated capacity of five (5) million metric tons per year (MMTY); a burnt lime facility with an aggregate capacity of one hundred forty (140) metric tons per day (MTPD) of burnt lime; an existing port with three hundred fifty one (351) meters long main berth having a mooring depth of twenty five (25) meters for big carriers and a 230 meters long smaller cargo berth with six (6) meters mooring depth; and an existing eighteen (18) hectare ore year with a storage capacity of 1.5 million metric tons (MMT) which is divided into four (4) yards, each being 4.5 hectares; 3. ECC Reference No. 0101-028-120 issued on September 16, 2002, which covered the installation and operation of two (2) additional burnt lime kilns and facilities having an aggregate production capacity of 200 MTPD; one (1) hydrated lime plant and facilities with a capacity of 100 MTPD and; one (1) rotary dryer and its facilities; and 4. ECC Reference No. 10(43) 0608-084262-41100 issued on August 8, 2006 which covered the construction and operation of 17.9 MW Sinter Cooling Waste Heat Recovery Power Generation System consisting of a Heat Recovery Boiler, steam turbines, waste treatment plant, and cooling water system The Certificate also covers the proposed expansion of the Iron Ore Sintering Facility from five (5) to twelve				included in the SMR and CMR.

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
	(12) MMTPY with the following components: production capacity of five (5) MMTPY sintered ore and seven (7) MMTPY of pelletized iron ore; addition of 100 meters to the existing 351-meter main berth; a new material and product stockyard and a water intake and pipeline system.				
Attachment A - Environmental Management and Monitoring Plan					
1	Adequate mitigating measures and buffer zones shall be provided and maintained along the entire periphery of the project site with appropriate species/dense vegetation cover to enhance the condition of the ecosystems and to serve as noise, vibration and dust buffers.	☑			The environmental management plan, as described in **Table 6.2** summarizes the implementation of the mitigating measures. Buffer zones are maintained by PSC.
2	Establishment of a reforestation program and carbon sink to mitigate greenhouse gas (GHG) emissions from the plant's operations which is in line with the DENR's thrust for GHG emission reduction program	☑			The undisturbed vegetation cover inside PSC premises is approximately 69 hectares planted with a total of 2,900 trees. No assessment of carbon sequestration was made. Another GHG reduction program is PSC's implementation of Sinter Heat Recovery (SHR) Project, which reduces the project's CO_2 footprint by an average of 53,000 CO_2 tons equivalent annually. Please refer to **Annex 6.16** for the copy of PSC's Reforestation Program.
3	An effective and continuing Information, Education and Communication (IEC) Program shall be undertaken to inform and educate all stakeholders about the proposed expansion and the project's mitigating measures embodied in its EPRMP and EIS, the conditions stipulated in this Certificate and safety measures in the plant operations for greater awareness, understanding and sustained acceptance of the project. The IEC program shall be submitted to DENR-EMB Region X. The IEC activities shall be funded by the proponent and shall be implemented in coordination with DENR-EMB Region X.	☑			PSC submits IEC program to DENR-EMB Region X and implemented in coordination with the same Office. In some cases, however, DENR-EMB did not attend the IEC. **Annex 5.2** presents the IECs conducted by PSC. **Annex ES1a and 1b** also includes the IEC conducted for the proposed Ore Blend and New Berth Facility Project of PSC.
4	Implementation of the Social Development Program formulated and developed in consultation with the other stakeholders and in concurrence with the LGUs.	☑			The formulation and development of SDP is done by PSC Foundation, for and on behalf of PSC. Based on consultation and dialogues, PSC Foundation identifies the program to be

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
					implemented. A stakeholder engagement program has been developed for PSC Foundation to ensure that program identified is responsive to needs of the community. Please refer to **Annex 5.1** for the proof of SDP implementation.
5	Implementation of an Emergency Response Plan and Disaster Preparedness Program (ERPDPP) in case of emergencies in coordination with the LGUs.	☑			PSC has its own emergency response plan and responds to the need of the LGU, when required and follows the protocols agreed between them and the LGU.
General Conditions					
6	The plant and berth operations shall conform with the provisions of RA 6969 (Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990), RA 9003 (Ecological Solid Waste Management Act of 2000), RA 9275 (Philippine Clean Water Act of 2004) and RA 8749 (Philippine Clean Air Act of 1999)	☑			Compliance with the different environmental laws is discussed in the succeeding sections.
7	Modify the Memorandum of Agreement (MOA), specifically the provisions on Environmental Guarantee Fund (EGF) and Environmental Monitoring Fund (EMF) to include additional facilities and operation as well as the duties and functions of the Multi-partite Monitoring Team (MMT), which shall be submitted to EMB within sixty (60) days after the final approval of the proposed expansion. Failure of the proponent to comply herewith shall automatically cancel this Certificate.	☑			As reported in the latest CMR for 2H 2021 (**Attachment 4**), the most recent communication from EMB-CO dated 03 Nov 2020 instructed PSC to finalize the MOA based on DAO 2017-15 and for the concurrence of all signatories. Once completely signed, this shall be immediately submitted to the EMB-CO for approval of the EMB Director.
8	The proponent shall ensure that all relevant conditions of this Certificate are properly complied with by its commissioned contractors/sub-contractors throughout the project implementation.	☑			PSC conducts orientation to all its service providers on EMS, ECC conditions, and other compliance obligations. All new employees of service providers undergo the orientation program prior to deployment in their respective work areas.
9	The existing Environmental Unit (EU) shall competently handle the environment related aspects of the project. In addition to the monitoring requirements as specified in the Environmental Monitoring Plan (EmoP) for the EIS and EPRMP, EU shall have the following responsibilities: • Monitor actual impacts vis-à-vis the predicted impacts and management	☑			Environmental Section is under the Laboratory and Environment Department. *Chapter 8* includes the table of organization of PSC showing the environment section of PSC.

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
	measures • Ensure that monitoring and reporting are carried out as required; • Comply with the condition of the ECC; and • Formulate suggestions on the revision of the EMP/EMoP, whenever necessary, subject to the approval of the EMB Central Office.				
Restrictions					
10	Any significant and/or modification of the currently approved operations shall be subjected to a new EIA requirement.	☑			All project components are consistent with the approved EPRMP and ECC.
11	A detailed abandonment plan shall be submitted to the EMB not later than one year before abandonment. The plan shall include rehabilitation measures/clean-up, remediation of areas possibly contaminated with oil, grease and other substances, and proposed alternative projects in the area.				Not applicable. The sinter plant and its components are still operational.
12	In the case of transfer of ownership of this project, these same conditions and restrictions shall apply and the transferee shall be required to notify the EMB within fifteen (15) days from the date of the transfer of ownership.				No transfer of ownership as of the audit period.
Attachment B - Regulatory Conditions					
1	Proponent needs to comply with: • Sanitation Code of the Philippines; • Labor Code of the Philippines including occupational health and safety standards; • Building Code of the Philippines for building structures, drainage system and flood control; and • Regulations, operations and management of vessels in ports and coastal waters	☑			Complied with. The necessary permits have been secured by PSC.
2	Allocation of water supply	☑			Complied with. All sources of water used in the operations were covered by permits.
3	Solid waste management system	☑			PSC has established a solid waste management program.
4	A Community Assistance Program (CAP) for livelihood and skills training that shall entail the meaningful participation of the residents, including women that shall be continuously executed throughout the project implementation. This program shall include livelihood/skills training and community assistance.	☑			CAP is implemented by the PSC foundation and undergoes similar process on the development of SDP.

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
Environmental Planning Recommendations for the Proponent					
5	Prepare an Emergency Response Plan (ERP) and Disaster Preparedness Program which will include an off-site emergency plan based on APELL (Awareness and Preparedness for Emergency at the Local Level). It should also include ERP for oil and chemical response.			☑	PSC has developed its own emergency response plans and solicits community participation during drills and exercises. PSC has yet to develop an emergency response plan on APELL. No APELL was drafted and developed by PSC in coordination with the LGUs.
6	Implementation of a roadway maintenance and transport management program to offset impacts of heavy vehicular traffic on pavement and bridges and nuisance/damages to people and properties.	☑			PSC maintains the road network within their premises. In similar manner, transport management.
7	Given priority in employment to qualified local residents, including women. Adequate public information for jobs available to local residents in the affected areas needs to be implemented.	☑			PSC implements hiring policy and included coordination with the local PESO.
8	Commission an independent third party auditor to undertake an environmental audit, including a continuing study on the effects of the project on the workers and affected residents, particularly women and children. The results of the third party environmental audit, including the auditing of risks and hazards of the project need to be submitted to DENR-EMB every two (2) years.	☑			Complied with. ISO 14001 surveillance audits by SGS Philippines annually is among the audits that occur. Health assessments were carried out by PSC among its employees during annual physical and medical examination. No studies on the effects of PSC operations on the health of the local residents had been carried out. This audit is undertaken as part of the compliance to this condition.
ECC-R10-1107-0212 dated July 15, 2011					
Scope	The proposed installation of 2 units (7.5 MW each) Duel fuel generator Sets and its auxiliary equipment project shall have the following components: • Engine generator room • Electrical room • Workshop • Transformer yard • Exhaust gas boiler • Fuel, oil and sludge tanks • Transformer pumps • Compressed air system • Cooling system • Radiator area	☑			Complied with. The project was implemented as designed.

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
	It shall be located at PSC Plant, PHIVIDEC Industrial Estate, Barangay Katipunan, Villanueva, Misamis Oriental.				
Environmental Management					
The proponent shall strictly implement the following mitigating, enhancement, and rehabilitating measures:					
1	Air emission and effluent discharge from the power house shall conform to the standards set by the DENR. Any exceedance thereof shall be ground for automatic cancellation or suspension of this Certificate and imposition of penalties.	☑			Discussion of PSC's compliance on air emissions and discharges are detailed in succeeding sections.
2	Noise, vibration and dust emissions shall be confined within the project area	☑			Complied with. No community complaints received during the period 2016 and 2017.
3	Solid waste generated shall be collected effectively and disposed properly. Good housekeeping and sanitation shall be maintained at all times.	☑			PSC implements a comprehensive solid waste management program.
General Conditions					
Further administrative conditions for the grant of this certificate shall be strictly complied with:					
5	The local residents shall be prioritized for employment.	☑			Complied with.
6	Adequate firefighting equipment shall be provided	☑			Complied with. The power plant has adequate firefighting systems, in compliance with the Fire Code of the Philippines.
7	The proponent shall initiate to put up an Environmental Monitoring Fund for the use of the multipartite monitoring team in monitoring compliance to ECC.	☑			Complied with. PSC provides sufficient funds to MMT.
8	The DENR-EMB Region 10 and/or multipartite monitoring team can initiate an on-the-spot monitoring and inspection anytime without prior notice.	☑			Complied with. PSC allows visits from the MMT and the DENR-EMB Region X.
9	In case of abandonment, the proponent shall notify the EMB Regional Office concerned within three (3) months prior to abandonment and the proponent shall submit its abandonment mitigation plan.				Not applicable. The project is still operational.
General Conditions					
10	No other activities should be undertaken other than what was stipulated in the IEE document.	☑			All activities undertaken by PSC are covered under its EPRMP and ECC.
11	Expansion of the project beyond the project description, or any change in the				No expansion was carried out by PSC. All activities are

Laws & Applicable Citations	Compliance Requirements	Compliance			Remarks
		Yes	No	Partial	
	activity beyond those stated in the IEE document, shall be made subject to a new Environmental Impact Assessment				covered by its EPRMP and ECC.
12	All other permits from the concerned government agencies shall be secured prior to project implementation wherein copies of which shall be submitted to this Office within fifteen (15) days upon receipt hereof, otherwise this ECC shall be considered null and void; and	☑			Complied with.
13	In case of transfer of ownership of this project, the same conditions and restrictions shall apply and the transferee shall be required to notify the EMB Regional Office concerned within fifteen (15) days as regards to the transfer of ownership.				No transfer of ownership as of the audit date.

6.3 SELF-MONITORING PLAN

6.3.1 SMR (DAO 2003-27) and CMR (DAO 2003-30) Submission

DAO 2003-27 requires covered facilities to submit SMRs quarterly within fifteen (15) days after the end of each quarter. SMRs were submitted to DENR-EMB Region X in accordance with the dates or deadlines set in DAO 2003-27 while the CMR is submitted through the Online Compliance Monitoring System of EMB Central Office. **Attachment 3** includes the copies of the SMRs duly received by the EMB.

6.3.2 Current Self-Monitoring Plan of PSC

The details of current monitoring of PSC are depicted on **Table 6.3.1**. See also **Annex 6.17** indicating the date of recent sampling.

Table 6.3.1. Environmental Monitoring Plan of PSC

Aspect	Parameters to be Monitored	Source/Location	Frequency	Coordinates	Remarks
Emission	Particulate matter	• Kilns - Burnt Lime Kiln 1 - Burnt Lime Kiln 2 - Burnt Lime Kiln 3 • HLP Bag Filters-stacks • Ancillary Equipment • Bag filters – stacks - Installed in 1999	Monthly	N8°34'32" E124°45'55" N8°34'32" E124°45'55" N8°34'33" E124°45'55" N8°34'32" E124°45'53" N8°34'30" E124°45'54" N8°34'32"	Due to either production shutdown, equipment maintenance or repair, monitoring frequency is not consistently observed. There were periods that monthly monitoring was carried out and in some instances, monitoring was done quarterly.

Aspect	Parameters to be Monitored	Source/Location	Frequency	Coordinates	Remarks
		at BLP plant #1&#2 - Installed in 2005 at BLP plant#3 • Main/Room EP Ducts • SHR-IDF stack • Powerhouse– stack	Annual	E124°45'55" N8°34'33" E124°45'55" N8°34'32" E124°45'53" N8°34'32" E124°45'50"	*For the powerhouse, PSC noow follows permit condition of 1x/year testing. This Powerhouse is only on standbyand used only for very rare, emergency conditions like prolonged power supply cut-off which is very rare in Northern Mindanao.*
	SO_x, NO_x, CO_2, CO, O_2, N_2	• Main EP Ducts • Kiln stack		N8°34'32" E124°45'53"	
	Heavy metals (Pb, Ni, Cu, Zn)	• Outlet of new EP • Kiln 1, 2 & 3 stacks Kiln 1 Kiln 2 Kiln 3	Annual	N 8°34'9" E 124°45'56" N 8° 33' 28.9692" E124° 45' 39.8088" N 8° 34' 9.4476" E124° 45' 56.2644" N 8° 34' 22.728" E 124° 46' 2.586"	Complied with.
Ambient Air Quality	Particulate Matter-10, SO_2, NO_2	Within PSC (regulatory) • PG #11 (NSP perimeter boundary) • Main gate (East boundary) • PG #6 (West perimeter boundary) • PG #4 (SW West perimeter boundary)	Quarterly	N8°34'43" E124°46'61" N 8°34'20.49" E 124°46'9.90" N8°34'27" E124°45'27" N8°34'05" E124°45'56"	Complied with.
		Within PSC (internal control) • Road B-2 (adjacent to yard 1 pile) • Road C-1 (seaside and/main berth) • Blending hopper area		N 8°34'25.46" E 124°45'51.87" N8°34'32" E124°46'08" N 8°34'32.73" E 124°45'52.09"	*Pending upon construction of Pelletizing Plant.* Complied with. *Tested internittently. Will be completely complied upon construction of Pelletizing Plant.*

Aspect	Parameters to be Monitored	Source/Location	Frequency	Coordinates	Remarks
		Outside PSC (regulatory) • Villanueva plaza (2-km NE of the plant) • Katipunan plaza (2-km east of the plant) • San Martin plaza (2-km SW of the plant) • Tambal Relocation Area • Sta. Ana plaza (6-km SW of the plant) • Kirahon 1st Plateau (6-km SE of the plant) • Tagoloan Plaza (6-km West of the plant)		N8°35'12" E124°46'18" N8°34'50" E124°46'30" N8°33'36" E124°46'07" N8°34'11" E124°46'30" N 8° 32' 22.8984" E124° 45' 15.8466" N 8° 33' 28.1556" E124° 48' 37.1772" N 8° 32' 22.8984" E124° 45' 15.8466"	Complied with. *Pending upon construction of Pelletizing Plant for Sta. Ana Plaza, Kirahon 1st Plateau, and Tagoloan Plaza*
Emission-Vehicular exhaust	CO and sulfur density	All PSC and contractors' vehicles which are regularly operating inside plant premises	Annually	-	Complied with.
Noise - ambient	Noise level	• PG #12 Laboratory (NE boundary-1) • PG #11 North settling pond (NE boundary-4) • PG #6 (West perimeter boundary) • PG #4 (SW perimeter boundary) • Quay wall Main Berth (West boundary) • PG #4 (SW boundary) • Receiving station (SE boundary) • Main gate (East boundary)	Every two (2) months	N 8°34'31.87" E 128°46'0.07 N8°34'43" E124°46'61" N8°34'27" E124°45'27" N8°34'05" E124°45'56" N 8°34'41.79" E124°45'33.76" N 8°34'6.37" E 124°45'56.44" N 8°34'17" E124°45'59" N 8°34'20.49" E124°46'9.90"	Complied with.
Coastal and Marine	DO, oil and grease, pH, transparency,	• Main berth (Villanueva and	Semi-annual	N8°34'44.0" E124°45'26.0"	Complied with.

Aspect	Parameters to be Monitored	Source/Location	Frequency	Coordinates	Remarks
Waters	temperature, heavy metals	CDO side) • Cargo berth (Villanueva and CDO side)		N8°34'33.6" E124°45'27.6"	
		• NSP, mixing zone, 100m north of exit, 100 meters east of exit, 100 m west • SSP, mixing zone, 100m north of exit, 100m east of exit, 100m west	Monthly	N8°34'42.0" E124°45'46.0" N8°34'31.00" E124°45'35.0"	Complied with.
		• SHR mixing zone, 100m x 100m isobaths from discharge pipe outfall (seawater temperature, DO, pH, TSS, oil and grease)	2x per week after normalization of the SHR operation	N8°34'48.0" E124°45'45.0"	Complied with.
Effluent	DO, pH, temperature, TDS, TSS, O&G, color and heavy metals	Influent and effluent of settling ponds • North settling pond influent/effluent • South settling pond influent/effluent	Monthly	NSP – N8°34'42.0" E124°45'35.0" SSP - N8°34'31" E124°46'35"	Complied with.
	Phenols, transparency, turbidity	Settling ponds influent/effluent	Quarterly		Complied with.
	BOD, COD, MBAS, mercury, arsenic	Settling ponds influent/effluent NSP and SSP	Semi-annual		Complied with.
Freshwater - Deepwells	pH, chloride, hardness, TDS, flow-rate for operational deepwells	Deepwell Pump #3, Deepwell Pump #4 Deepwell Pump #6	Monthly	N8°34'4.12" E124°46'53.76" N8°34'23.49" E124°46'11.30" N8°34'28" E124°45'54.07"	Complied with.
	Heavy metals, oil and grease		Quarterly		Complied with.
Freshwater	TSS, total coliform, fecal coliform, DO, oil and grease	Tagoloan River	Annually	N 8° 33' 12.9456" 124° 44' 56.6736"	*Pending upon construction of Pelletizing Plant*
Waste generation	Generation of the hazardous waste	Mercuric sulfate, Mercuric chloride Chrysolite asbestos, Benzene	Quarterly	-	Complied with.
	Recyclable (non-biodegradable/toxic)	Empty lube oil drums, thinner and paint cans, Freon/acid/organic containers, spend paint brush/rollers, oil contaminated waste (cloth, rags, gloves, and oil filters); spent asbestos sheets, gaskets and silica	Quarterly	-	Complied with.

Aspect	Parameters to be Monitored	Source/Location	Frequency	Coordinates	Remarks
		wool insulators, mercury lamps, battery/battery shells, pathogenic wastes from clinic, spent acid washings from the laboratory			

PSC maintains a bi-annual Independent Review and Plant Environmental Audit which started in 2018 and being conducted by Gaia South, Inc. as a third-party environmental consultant. The conduct of independent audit satisfies Condition No. 7 of the ECC, and aims to focus on verifying the site's compliance against key permits, commitments, and supporting documents such as environmental management plan, among others. Furthermore, the result of the independent audit commits to the following:

- Assessment of the methodology as well as adequacy and management of its sintering facility and ancillary facilities including environmental control measures;
- Checking compliance to previous audit findings;
- Assessment whether the Project is complying with the relevant standards, performance measures, and statutory requirements;
- Assessment of the environmental performance of the Project, and its effects on the surrounding environment; and
- Recommend measures or actions to improve the environmental performance of the Project, and/or any strategy/plan/program required.

Likewise, PSC also conducts a periodic self-audit procedure (PM-ECC-002, Environmental Controlling Process, PSC Integrated QEMS Manual) that aims to institute documented strategies for monitoring and measurement of key characteristics of significant environmental aspects associated with the plant operations and activities. The scheme defines the mechanism for the monitoring and measurement of significant environmental aspects, objectives and targets and operational control calibration and maintenance. The main purpose of this procedure is to internally verify the conformance to environmental objectives and targets of the Company to relevant environmental legal and policy requirements.

The following table lists the responsible personnel and their roles during the internal Environmental Self Audit of PSC:

Table 6.3.2. Matrix of responsibilities for the Environmental Self Audit of PSC

Responsibility	Details
PCO	Determine environmental monitoring and measurement parameters related with identified environmental significant aspects, Environmental Management Programs and covered by DENR Regulations.
	Prepare Annual Environmental Control Monitoring Plan containing the desired parameter, reference sampling points, type, method and frequency of sampling. Plan shall be updated on a case-to-case basis in order to accommodate current trends and update of DENR Laws and Regulations and PSC Policy requirements.
	Verify measurement / monitoring results against objectives and targets of Environmental Management Programs and compliance with relevant environmental, legal requirements

Responsibility	Details
	Prepare and submit PCO Quarterly Report on relevant environmental legal requirements to DENR-EMB Region 10 and Central Office. (Report must be duly approved by Resident Manager)
	Update environmental records filed at laboratory (with Lab – SVR)
IMR	Determine correctness and approves the Annual Environmental Control Monitoring Plan.
Lab/Environmental Dept	Monitoring of Air, Water and Noise Quality parameters as required by DENR and PSC Environmental Management Programs (IM-APX-004).
ENERCON - Committee Area In-charge	Monitoring of power, fuel oil and carbon reduction targets based on ENERCON Environmental Management Program (IM-APX-003-10 /11/12)
WATERCON - Committee Area In-charge	Monitoring of water consumption and reduction target based on Water Conservation Program (IM-APX-003-06)
SOLIDWASTE - Management Committee Area In-charge	Monitoring of solid waste generation target reduction based on Solid Waste Management Program (IM-APX-003-07)
SNT- Mgr.	Monitoring of raw material and finished product spill volume reduction based on Spillage Prevention, Recovery and Utilization Program (IM-APX-003-09)
Lab-Mgr	Countercheck Quality Assurance & calculation results, calibration and maintenance data of environmental monitoring equipments used in periodic environmental monitoring of significant parameters Update environmental records filed at laboratory (with PCO)
Committee Chairman [ENERCON, WATERCON, SOLIDWASTE& Spillage Recovery)	Validate recorded results and pertinent data
Internal Audit Chairman and Team	Evaluation of action plans; schedule of implementation and performance indicator will be done by Internal Audit Team and discussed during the conduct of Environmental. Management Review.
DIMR / IMR / PCO	Prepare CAR on parameters/OTP with monitoring results that did not comply with standards and targets Prepare PAR on parameters with alarming trend of results vs. standard value
Concerned Dept. Manager	Brainstorm for root causes, plan corrective/preventive action and schedule implementation. Use FM-RAI-011 (CAR).
Concerned Dept. Manager	Concerned dept shall coordinate with implementation if other groups are involved Implement the corrective actions within the agreed timeframe Preventive action must be doable solutions to the potential problems identified
Concerned Dept. Manager/DIMR/PCO/ IMR	Monitor effectiveness of C~~A~~ and implementation schedule
DIMR / IMR / PCO	Closed out NC only if found effective
DIMR	Prepare and submit consolidated evaluation results on EMP objectives and targets & compliance to legal requirements to Resident Manager during management review.
Internal Audit Chairman and Team	Prepare consolidated Environmental Audit Report on EMP action plans and implementation status every after audit period and during management review.
Concerned Environmental Record Holders	Update environmental records and environmental management program files
Internal Audit Division	Ascertain compliance with existing policies, rules and regulations through conduct of Review and Evaluation of the existing internal control systems (Quality and environmental management system) and make recommendations for improvement whenever and wherever necessary

Source: PSC EMS Manual

6.3.4 Proposed Self-Monitoring Plan of PSC

PSC plans to adopt and request for the following amendments and additional monitoring for the marine environment. Please see below matrix.

Table 6.3.3. Proposed amendment to the monitoring plan

Component	Current Monitoring	Proposed Amendment/Stations	
		Location	Coordinates
Air Quality (Heavy metals)	**Frequency** Quarterly	**Frequency** Semi-annual	
Marine Ecology		**Frequency** Annual • Stn 1 - Northeast side of the existing berth; location of proposed new berth • Stn 2 - Pillars of the dolphin structure at the existing berthing facility • Stn 3 - Approximately 760 m southwest of the existing berth • Stn 4 - Outside of the nearby Marine Protected Area (MPA) in Looc	 N8° 34' 44.78"N E124° 45' 43.17" N8° 34' 34.65" E124° 45' 21.83" N8° 34' 23.19" E124° 45' 2.88" N8° 35' 46.84" E124° 46' 7.18"
Effluent	• North settling pond influent/effluent • South settling pond influent/effluent	Upon full operation of the new project, the runoff will be diverted to the new location of the south settling	N8° 34' 31.74" E124° 45' 30.51"

6.4 MULTI-SECTORAL FRAMEWORK

Aside from the actual monitoring, the Multi-Partite Monitoring Team (MMT) is the organization concerned with the assessment and validation of the company's compliance with prescribed environmental standards. The functions of the MMT include:

- Setting up the environmental standards and criteria specific to the project and its location;
- Conducting trainings for MMT members for more effective monitoring activities;
- Deciding on the merits of complaints filed against the proponent and acting on these complaints; and
- Planning of the annual work and financial plan.

The MMT has been organized by PSC for its current operations as defined in the Memorandum of Agreement (MOA) executed by the identified members. This includes the function, roles, duties and responsibilities of each member and committees. It also defines the procedures for documentation, reporting and public information campaign, training, and funding. However, in compliance with DAO 2017-15 or the *Guidelines on Public Participation under the Philippine Environmental Impact Statement (EIS) System,* PSC is on the process or reviewing and re-organizing the MMT line-up considering the following members per signed MOA (**Annex 6.18**):

- MENRO of LGU- Villanueva
- Rural Health Unit (RHU) LGU-Villanueva
- Barangay Katipunan
- Barangay Poblacion-1

- Barangay San Martin
- Philippine Coastal Resource Management Corporation (PCRMC)
- University of Science and Technology of Southern Philippines (USTP)
- Municipal Purok Federation
- PENRO – Misamis Oriental
- CENRO - Initao
- PHIVIDEC Industrial Authority
- Philippine Coast Guard

6.5 ENVIRONMENTAL GUARANTEE AND MONITORING FUND COMMITMENTS

PSC has an existing Memorandum of Agreement (MOA) with DENR-EMB for the establishment of the Environmental Guarantee Fund (EGF) and Environmental Monitoring Funds (EMF). Based on the current MMT work and financial program, the EMF is equivalent to **PhP 1,193,100.00** (2021), which is being replenished at a regular basis. A system for disbursement, processing, accounting, and validation of the funds has already been established by the MMT Executive Committee.

The EGF on the other hand is created for projects that will pose a considerable public risk or where the project requires rehabilitation or restoration. The EGF has been established by PSC for the following 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 the 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 necessary IEC and capability building activities to significantly minimize or buffer environmental risk-related impacts.

The EGF has two (2) components: the EGF Trust Fund in the form of an insurance bond, which amounts to **PhP 1,000,000.00** will be used to compensate parties for any damages to life and property caused by the PSC operations while the EGF Cash Fund, which is earmarked for the immediate rehabilitation and compensation of affected communities. This amounts to **PhP 1,000,000.00**.

For this proposed ECC amendment, it is proposed that the current MMT, EMF, and EGF agreements including institutional and financial arrangements be retained. It is important to note that the EMF is regularly adjusted to sustain the workplan. No claims against the EGF have been made as of this application.

Cost Estimate of Management and Monitoring Programs

Table 6.5.1 depicts the cost estimates for the management and monitoring programs of PSC.

Table 6.5.1. Cost of mitigation and monitoring measures

Activities	Cost (PhP)
APCF Procurement	171,431,650.00
APCF Maintenance (2019-2020 average monthly cost)	3,391,353.88
Sedimentation Pond Maintenance Cost (2020)	66,000.00
Solid Waste Mgmt Facility Maintenance Cost (2020)	56,000.00
Treatment, Storage and Disposal Facility (Spent Asbestos / busted hg lamp UGT, 2020)	483,374.00
Sinter Cooler Waste Heat Recovery Project	920,000,000.00
Annual Environmental Monitoring Fund(2020),PSC-MMT	407,300.00

Source: PSC, 2021

Table 6.5.2. PSC's status of implementation of Impact Management Plan (during operations)

Environmental Component Likely to be affected	Potential Impacts	Planned Mitigation Measures	Actual Measures Implemented	Remarks
Land	Generation of solid wastes	• Implement practices on EPP • Establish kitchen refuse composting system • Strict implementation of solid waste disposal/restriction • Provision/maintenance of solid waste collection drums • Inventory of solid waste generated/inspection of facility	PSC implements a comprehensive solid waste management program.	
Water	Water pollution	• Car wash only in designated area • Periodic inspection of oil/water separators (OWS), fuel oil tank farm facilities, powerhouse, etc. for oil spill traces • Periodic monitoring of water quality along coastal/marine waters/SP discharges, effluents and groundwater resources, North and South settling ponds, SHR equipment discharges • Periodic dredging of drainage canal	Complied with. Inspection of OWS was carried out.	OWS were covered by valid discharge permit from DENR-EMB Region X.
		• Periodic review of tanker emergency response plan • Periodic oil spill containment and recovery drill • Periodic review of powerhouse bunkering operation OCP	Bunkering operations were allowed by PSC under extreme occasions and follow strictly PSC's environmental procedures on bunkering. Periodic drills were conducted.	PSC's oil spill contingency plan has not been approved by the Philippine Coast Guard

Environmental Component Likely to be affected	Potential Impacts	Planned Mitigation Measures	Actual Measures Implemented	Remarks
		• Monitoring of deepwells	Groundwater monitoring was continuously implemented by PSC.	
Air	Air pollution from point sources	• Periodic monitoring and inspection of stack emission and ambient air • Periodic declogging of VDD's dedusting cyclones dust chamber • Patching of holes and replacement of deteriorated ducts • Periodic inspection of/survey/replacement of defective/worn out belt conveyor/hood/rubber curtain plate/bag filter • Installation of CEMS	PSC has installed continuous emissions monitoring systems (CEMS) for its sinter plant. PSC implemented periodic stack emission monitoring in accordance with the frequencies as specified in EMB Circulars No. 2007-03 and 2009-04.	Complied with.
		• Periodic road washing and washing spraying along paved and unpaved roads and grounds during dry season • Effective use of industrial mobile vacuum cleaner • Periodic inspection/survey/replacement of damaged water spray • Reforestation on boundary lines (NE, NW, SW, SE)	Complied with.	
		• Periodic monitoring of SPM_{10} level	Complied with. Implemented as part of the ambient air quality monitoring.	
		• Perimeter boundary line monitoring of SPM		
People	Occupational awareness	• Promote training/orientation of new workers and employees	Orientation is provided to all new employees and workers prior to deployment in their respective work areas.	Complied with.
	Occupational risk	• Posting of safety warning and danger signs	Safety signages were posted in conspicuous areas in the plant.	Complied with.
	Increase in local employment	• Prioritization of local hiring	Prioritization of local hiring is embedded in PSC's hiring policy.	Complied with.

Source: 2020 Independent Review and Third Party Environmental Audit

Table 6.5.3. Proposed Environmental Monitoring Plan (EMoP)

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
I. Construction Phase													
• Site clearing and leveling including removal of vegetation • Installation of equipment at the yard including the conveyor system • Pile driving at the new port facility	• Removal of vegetation cover • Change in habitat • Loss of topsoil and occurrence of soil erosion • Soil compaction • Solid waste generation	Diversity and species richness (Abundance and Frequency)	Quadrant sampling for flora and transect monitoring for fauna	Semi-annual on 1st year Annually on the succeeding years	Within the proposed site	PCO Third party consultant	Include in EMF	30% abundance and frequency reduction of flora along the monitoring stations 30% reduction of abundance and frequency of common and endemic avian species observed on site as based on the baseline data	40% abundance and frequency reduction of flora along the monitoring stations 40% reduction of abundance and frequency of common and endemic avian species observed on site as based on the baseline data	50% abundance and frequency reduction of flora along the monitoring stations 50% reduction of abundance and frequency of common and endemic avian species observed on site as based on the baseline data	Assess extent of vegetation clearing and identify areas within the EP for reforestation Use indigenous and native species as well as fruiting trees reforestation species Minimize revving-up of vehicles and heavy equipment	Establish green corridors and shelterbelts Establish off-limit zone for vehicles along areas identified as conservation areas and shelterbelts	Assess areas prone to soil creep or landslide and stabilize slope area and rehabilitate Institute biodiversity offset areas Conduct enrichment planting with emphasis on Assisted Natural Regeneration (ANR)
	• Soil erosion, loss of topsoil/ overburden	Volume of topsoil conserved and mapping of storage sites	Record keeping of topsoil volume conserved and mapping of storage sites	Semi-annual on 1st year Annually on the succeeding years	Within the proposed yard	PCO	Include in EMP	Volume of topsoil conserved is less than 70% of the estimated volume needed for future rehabilitation	Volume of topsoil conserved is less than 60% of the estimated volume needed for future rehabilitation	Volume of topsoil conserved is less than 50% of the estimated volume needed for future rehabilitation	Notify heavy equipment operator to set aside topsoil and identify additional storage area	Implement volume quota to heavy equipment operator to set aside top soil and maximize additional storage area	Future acquisition of topsoil from adjoining areas to be used for rehabilitation
	• Increase in surface run-off and silt deposition	Species richness of marine organisms - Fish - Corals - Seagrass - plankton	Underwater survey Field sampling	Semi-annual on 1st year Annually on the succeeding years	Near the proposed new berth	PCO	Include in EMF	High siltation of marine waters near the new berth area	Continuous siltation even after periods of rain	Decrease in species diversity along stations Occurrence of algal bloom	Observation of frequency and extent of siltation Identification of sources of silt	Improve efficiency of silt ponds by conducting maintenance or construction of additional ponds Intensify mangrove planting along the river mouths	Stop plant operations and install additional silt ponds and check dams to manage siltation

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
	• Marine habitat disturbance • Increased turbidity of adjacent marine waters due to possible deposition of debris and silt from construction • Resuspension of heavy metals and other persistent pollutants trapped in sediments; may also result to algal blooms as a result of nutrient release due to silt suspension.	Species richness of marine organisms - Fish - Corals - Seagrass - Plankton	Underwater survey Field sampling	Semi-annual on 1st year Annually on the succeeding years	• Stn1 – Northeast side of the existing berth; location of the proposed new berth (8° 34' 44.78"N, 124° 45' 43.17"E) • Stn 2 - Pillars of the dolphin structure at the existing berthing facility (8° 34' 34.65"N, 124° 45' 21.83") • Stn 3 - Approximately 760 m southwest of the existing berth (8° 34' 23.19"N, 124° 45' 2.88"E) • Outside of the nearby Marine Protected Area (MPA) in Looc (8° 35' 46.84", 124° 46' 7.18")	PCO	Include in EMF	High siltation of marine waters specially near the new berth area	Continuous siltation even after periods of rain	Decrease in species diversity along stations Occurrence of algal bloom	Observation of frequency and extent of siltation Identification of sources of silt	Improve efficiency of silt ponds by conducting maintenance or construction of additional ponds Intensify mangrove planting along the river mouths	Stop operations and install additional silt ponds and check dams to manage siltation
	• Dust generation • Increase in gaseous emissions	Ambient PM-10, TSP, SO_x, and NO_x	24-hour ambient air monitoring for PM-10, TSP, SO_x, and NO_x	Quarterly	PSC complex and nearby residential area	PCO	Include in EMF	➢ SO_x – 306 µg/Ncm ➢ NO_x – 234 µg/Ncm ➢ PM_{10} – 270 µg/Ncm	➢ SO_x – 323 µg/Ncm ➢ NO_x – 247 µg/Ncm ➢ PM_{10} – 270 µg/Ncm	DENR Standard Limit as stipulated in the IRR of Clean Air Act ➢ SO_x – 340 µg/Ncm ➢ NO_x – 260 µg/Ncm ➢ TSP – 300 µg/Ncm ➢ PM_{10} – 200 µg/Ncm	Identification of possible source of pollutant Use of tarpaulin to cover ore during hauling	Temporarily halt operation and do corrective measures Conduct of maintenance of equipment/ machinery identified as the source of pollution Increase frequency of water spraying	Stop operations and resume only when corrective measures were in place Replace equipment that emits high concentration of pollutants or use better fuel Increase frequency of water spraying

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
	• Occupational awareness • Occupational risk • Health Risk in relation to Covid-19 • Increased traffic due to hauling trucks, vehicles and equipment going to and from the site	Safety record, accident/ fatality incidence/ occurrence	Record keeping	Daily	New yard and new berth facility sites	Safety officer	Include in EMF	Increase in frequency of non-lost time accident	Occurrence of non-fatal lost time accident	Occurrence of fatal lost time accident	Conduct quarterly safety briefing and orientation to laborers and workers Installation of safety signages along accident prone areas within the construction site	Conduct daily inspection of construction area Conduct daily briefing on safety program	Work stoppage along accident area and identify proper safety measures and implement specific safety procedures and protocol
	• Complaints management	No. of valid complaints	Record keeping	Daily	Host communities and secondary impact areas	PCO and ComRel	Part of the operation cost	Formal complaint submitted can be resolved at the ComRel level	Intervention from the Upper Management is needed to resolve a formal complaint	Complaint is broadcasted over mass media	Institution of grievance system Conduct regular IEC to inform and justify the activities being undertaken by PSC during construction	Notify PSC Admin for complaint and take remedial measures to address complaints Investigate all complaints, conduct dialogue with communities and implement mitigating measures Compensate affected communities	Conduct in depth investigation and identify root cause for all valid complaints Institute measures to avoid occurrence of similar problems
II. Operation Phase													
Daily Operation	Land	Volume,diversity, species richness, GHG emission	GHG calculation, biodiversity index	Annual	• Vegetated area adjacent to the admin and other buffer zones around the complex	PCO/3rd Party consultant	Include in EMF	30% abundance and frequency reduction of flora along the monitoring stations 30% reduction of abundance and frequency of common and endemic avian species observed on site as based on the baseline data	40% abundance and frequency reduction of flora along the monitoring stations 40% reduction of abundance and frequency of common and endemic avian species observed on site as based on the baseline data	50% abundance and frequency reduction of flora along the monitoring stations 50% reduction of abundance and frequency of common and endemic avian species observed on site as based on the baseline data	Assess extent of vegetation clearing and identify areas within the EP for reforestation Use indigenous and native species as well as fruiting trees reforestation species	Establish green corridors and shelterbelts Conduct immediate rehabilitation once area is cleared	Assess areas prone to soil creep or landslide and stabilize slope area and rehabilitate Institute biodiversity offset areas
	Effluent	DO, pH, temperature, TSS, O&G, color and heavy metals Other parameters for Clas SC: Temp., pH, COD, TSS, Ammonia, Nitrate, Phosphate, Sulfate, Fluoride,	In-situ sampling , grab sampling and laboratory analysis	DO, pH, temperature, TSS, O&G, color and Monthly Heavy Metals: Pb, Fe, Cr, Ni , Cd , Zn)	Influent and effluent of settling ponds • North settling pond influent/effluent • South settling pond influent/effluent	PCO	Include in the EMF	➢ TSS – 80 mg/L ➢ Ammonia – 0.4 mg/L ➢ Nitrate – 16 mg/L ➢ Phosphate – 0.8 mg/L ➢ Sulfate – 440 mg/L ➢ Fluoride –	➢ TSS – 90 mg/L ➢ Ammonia – 0.45 mg/L ➢ Nitrate – 18 mg/L ➢ Phosphate – 0.9 mg/L ➢ Sulfate – 495 mg/L ➢ Fluoride –	DAO 2016-08 Class SC: ➢ Temp. - 3°C Change ➢ pH – 6.0 - 9.0 ➢ COD – 200 mg/L ➢ TSS – 100 mg/L	Map out location of contaminated or sources and observed for one quarter Determine possible sources of contamination	-	-

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
		Chloride, Cyanide, Barium, Chromium, Manganese, Mercury, O&G, Benzene, Toluene, Ethylbenzene, Xylenes (PSIC Code 241,2431)		Semi-annual				2.4 mg/L ➢ Chloride – N/A ➢ Cyanide - 0.16 mg/L ➢ Ba – 1.6 mg/L ➢ Mn -3.2 mg/L ➢ Fe – 6 mg/L ➢ Ni – 0.3 mg/L ➢ Zn – 1.2 mg/L ➢ Cd – 1.6 mg/L ➢ Hg – 0.0032 mg/L ➢ Pb – 0.08 mg/L ➢ O&G – 8 mg/L ➢ Benzene – 0.4 mg/L ➢ Toluene – 16 mg/L ➢ Ethylbenzene – 6 mg/L ➢ Xylenes – 12 mg/L	2.7 mg/L ➢ Chloride – N/A ➢ Cyanide - 0.18 mg/L ➢ Ba – 1.8 mg/L ➢ Mn – 3.6 mg/L ➢ Fe – 6.75 mg/L ➢ Ni – 0.3 mg/L ➢ Zn – 1.35 mg/L ➢ Cd – 1.8 mg/L ➢ Hg – 0.0036 mg/L ➢ Pb – 0.09 mg/L ➢ O&G – 9 mg/L ➢ Benzene – 0.45 mg/L ➢ Toluene – 18 mg/L ➢ Ethylbenzene – 6.75 mg/L ➢ Xylenes – 13.5 mg/L	➢ Ammonia – 0.5 mg/L ➢ Nitrate – 20 mg/L ➢ Phosphate – 1 mg/L ➢ Sulfate – 550 mg/L ➢ Fluoride – 3 mg/L ➢ Chloride – N/A ➢ Cyanide - 0.2 mg/L ➢ Ba – 2 mg/L ➢ Mn -4 mg/L ➢ Fe – 7.5 mg/L ➢ Ni – 0.3 mg/L ➢ Zn – 1.5 mg/L ➢ Cd – 2 mg/L ➢ Hg – 0.004 mg/L ➢ Pb – 0.1 mg/L ➢ O&G – 10 mg/L ➢ Benzene – 0.5 mg/L ➢ Toluene – 20 mg/L ➢ Ethylbenzene – 7.5 mg/L ➢ Xylenes – 15 mg/L			
		Phenols, transparency, turbidity	In-situ sampling, grab sampling and laboratory analysis	Quarterly	Settling ponds influent/effluent	PCO	Include in the EMF	➢ Phenols – 0.04 mg/L ➢ Transparency – N/A ➢ Turbidity – N/A	➢ Phenols – 0.045 mg/L ➢ Transparency – N/A ➢ Turbidity – N/A	DAO 2016-08 Class SC: ➢ Phenols – 0.05 mg/L ➢ Transparency – N/A ➢ Turbidity – N/A	Map out location of contaminated or groundwater sources and observed for one quarter Determine possible sources of contamination	-	-
		BOD, MBAS,	In-situ sampling , grab sampling and laboratory analysis	Semi-annual	Settling ponds influent/effluent NSP and SSP	PCO	Include in the EMF	➢ BOD – 90 mg/L ➢ MBAS – N/A	➢ BOD – 95 mg/L ➢ MBAS – N/A ➢	DAO 2016-08: ➢ BOD – 100 mg/L ➢ MBAS – N/A	Reconsider design runoff flow rate and rate of particle settlement of the silt ponds to ensure effectiveness	Addition of embankment and other flood control measures for the reduction of runoff flowrate and containment of runoff	Immediate desilting of silt ponds Establishment of additional silt pond

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
	Freshwater deepwells	pH, chloride, hardness, TDS, flow-rate for operational deepwells	In-situ sampling , grab sampling and laboratory analysis	Monthly	Deepwell Pump #3, #4 and #5	PCO	Include in the EMF	➢ pH – 6.7 to 8.3 ➢ Chloride – 240 mg/L ➢ Hardness – N/A ➢ TDS – N/A	➢ pH – 6.6 to 8.4 ➢ Chloride – 245 mg/L ➢ Hardness – N/A ➢ TDS – N/A	DAO 2016-08: ➢ pH – 6.5 to 8.5 ➢ Chloride – 250 mg/L ➢ Hardness – N/A ➢ TDS – N/A	Map out location of contaminated sources and observed for one quarter Determine possible sources of contamination	-	-
		Heavy metals (Pb, Fe, Cu,,Ni, Cd, Zn), oil and grease	n-situ sampling , grab sampling and laboratory analysis	Quarterly (Oil& Grease) Semi-annual (Heavy Metals)	Deepwell Pump #3, #4 and #5	PCO	Include in the EMF	➢ O&G – N/A ➢ Pb – 0.04mg/L ➢ Cu – 0.01mg/L ➢ Ni – 0.05mg/L ➢ Cd – 0.0044mg/L ➢ Zn – 0.65mg/L	➢ O&G – N/A ➢ Pb – 0.045mg/l ➢ Cu – 0.015mg/L ➢ Ni – 0.055mg/L ➢ Cd – 0.0047mg/L ➢ Zn – 0.72mg/L	DAO 2016-08 for Class SC: ➢ O&G – N/A ➢ Pb – 0.05mg/L ➢ Cu – 0.02mg/L ➢ Ni – 0.06mg/L ➢ Cd – 0.005mg/L ➢ Zn – 0.8mg/L	Map out location of contaminated sources and observed for one quarter Determine possible sources of contamination	-	-
	Coastal and marine waters	DO, oil and grease, pH, transparency, temperature, heavy metals (Pb, Fe, Cu,,Ni, Cd, Ni, Zn),	In-situ sampling , grab sampling and laboratory analysis	Semi-annual	• Main berth (Villanueva and CDO side) • Cargo berth (Villanueva and CDO side)	PCO	Include in the EMF	➢ DO – 4 mg/L ➢ O&G – N/A ➢ pH -6.7 to 8.3 ➢ Transparency – N/A ➢ Temp : Max 2.8 degC rise ➢ Pb – 0.04mg/L ➢ Cu – 0.01mg/L ➢ Ni – 0.05mg/L ➢ Cd – 0.0044mg/L ➢ Zn – 0.65mg/L	➢ DO – 4.5 mg/L ➢ O&G – N/A ➢ pH -6.6 to 8.4 ➢ Transparency – N/A ➢ Temp : Max 2.9 degC rise ➢ Pb – 0.045mg/l ➢ Cu – 0.015mg/L ➢ Ni – 0.055mg/L ➢ Cd – 0.0047mg/L ➢ Zn – 0.72mg/L	DAO 2016-08 for Class SC: ➢ DO – 5 mg/L ➢ O&G – N/A ➢ pH -6.5 to 8.5 ➢ Transparency – N/A ➢ Temp : Max 3.0 degC rise ➢ Pb – 0.05mg/L ➢ Cu – 0.02mg/L ➢ Ni – 0.06mg/L ➢ Cd – 0.005mg/L Zn – 0.8mg/L	Map out location of contaminated sources and observed for one quarter Determine possible sources of contamination		
				NSP/SSP: Monthly Mixing Zones: Semi-annual	• NSP, mixing zone, 100 meters north of exit, 100 meters east of exit, 100m west • SSP, mixing zone, 100 meters north of exit, 100 meters east of exit, 100 m • west	PCO	Include in the EMF				Map out location of contaminated or groundwater sources and observed for one quarter Determine possible sources of contamination		
				Semi-annual	• SHR mixing zone, 100 meters	PCO	Include in the EMF	➢ DO – 4 mg/L ➢ O&G – 2.4	➢ DO – 4.5 mg/L	DAO 2016-08:	Map out location of contaminated		

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
					x 100 m isobaths from discharge pipe outfall (seawater temperature, DO, pH, TSS, oil and grease)			mg/L ➢ pH -2.3 to 8.3 ➢ Transparency – N/A ➢ Temp : Max 2.8 degC rise	➢ O&G – 2.7 mg/L ➢ pH -6.4 to 8.4 ➢ Transparency – N/A ➢ Temp : Max 2.9 degC rise	➢ DO – 5 mg/L ➢ O&G – 3mg/L ➢ pH -6.5 to 8.5 ➢ Transparency – N/A ➢ Temp : Max 3.0 degC rise	sources and observed for one quarter Determine possible sources of contamination		
	• Marine habitat disturbance • Increased turbidity of adjacent marine waters due to possible deposition of debris and silt from construction • Resuspension of heavy metals and other persistent pollutants trapped in sediments; may also result to algal blooms as a result of nutrient release due to silt suspension.	Species richness of marine organisms - Fish - Corals - Seagrass - Plankton	Underwater survey Field sampling	Annual	• Stn1 – Northeast side of the existing berth; location of the proposed new berth (8° 34' 44.78"N, 124° 45' 43.17"E) • Stn 2 - Pillars of the dolphin structure at the existing berthing facility (8° 34' 34.65"N, 124° 45' 21.83") • Stn 3 - Approximately 760 m southwest of the existing berth (8° 34' 23.19"N, 124° 45' 2.88"E) • Outside of the nearby Marine Protected Area (MPA) in Looc (8° 35' 46.84", 124° 46' 7.18")	PCO	Include in EMF	High siltation of marine waters specially near the new berth area	Continuous siltation even after periods of rain	Decrease in species diversity along stations Occurrence of algal bloom	Observation of frequency and extent of siltation Identification of sources of silt	Improve efficiency of silt ponds by conducting maintenance or construction of additional ponds Intensify mangrove planting along the river mouths	Stop operations and install additional silt ponds and check dams to manage siltation
	Noise	Noise level (dB)	Noise meter	Every two (2) months	• PG #12 Laboratory (NE boundary-1) • PG #11 North settling pond (NE boundary-4) • PG #6 (West perimeter boundary) • PG #4 (SW perimeter boundary) • Quay wall Main Berth (West boundary) • PG #4 (SW boundary) • Receiving station (SE boundary)	PCO	Include in the EMF	72-73dB	73-74dB	75dB	Identification of possible source of noise Issuance of ear plugs	Maintenance, adjustment and installation of noise reduction apparatus	Reduction on the use of noisy equipment

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
					• Main gate (East boundary)								
	Air Quality	1-hour Ambient air sampling for PM_{10}, SO_2 and NO_2	Air quality sampling	Quarterly	Within PSC (regulatory): • PG #11 (NSP perimeter boundary) • Main gate (East boundary) • PG #6 (West perimeter boundary) • PG #4 (SW West perimeter boundary) Within PSC (internal control): • Road B-2 (adjacent to yard 1 pile) • Road C-1 (seaside and/main berth) • Blending hopper area Outside PSC (regulatory): • Villanueva plaza (2-km NE of the plant) • Katipunan plaza (2-km east of the plant) • San Martin plaza (2-km SW of the plant) • Tambal Relocation Area • Sta. Ana plaza (6-km SW of the plant) • Kirahon 1st Plateau (6-km SE of the plant) • Tagoloan Plaza (6-km West of the plant)	PCO/3rd Party consultant	Include in the EMF	➢ SO_x – 306 µg/Ncm ➢ NO_x – 234 µg/Ncm ➢ PM_{10} – 270 µg/Ncm	➢ SO_x – 323 µg/Ncm ➢ NO_x – 247 µg/Ncm ➢ PM_{10} – 270 µg/Ncm	DENR Standard Limit as stipulated in the IRR of Clean Air Act ➢ SO_x – 340 µg/Ncm ➢ NO_x – 260 µg/Ncm ➢ TSP – 300 µg/Ncm ➢ PM_{10} – 200 µg/Ncm	Identification of possible source of pollutant Use of tarpaulin to cover ore during hauling	Temporarily halt operation and do corrective measures Conduct of maintenance of equipment/ machinery identified as the source of pollution Increase frequency of water spraying	Stop operations and resume only when corrective measures were in place Replace equipment that emits high concentration of pollutants or use better fuel Increase frequency of water spraying
	Emission – vehicular exhaust	Vehicle emission Density	Ringlemann Chart	PSC Vehicles: Annually Suppliers: Upon Entry	All PSC and contractors' vehicles entering PSC premises	PSC Security / PCO	Include in the EMF				Identification of possible cause of exceedances	Check-up and maintenance	No usage of vehicle and utilize only upon corrective maintenance
	Emission – Stationary sources	PM_{10}	Air quality sampling (1-hour)	Monthly	• Kilns • HLP Bag Filters-stacks	PCO	Include in the EMF	➢ PM-10 – 120.5 µg/Ncm	➢ PM-10 – 135.5 µg/Ncm	DENR Standard Limit as	Identification of possible source of pollutant	Temporarily halt operation and do corrective measures	Stop operations and resume only

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
					• Ancillary Equipment • Bag filters – stacks • Main/Room EP Ducts • Powerhouse – stack • SHR-IDF stack					stipulated in the IRR of Clean Air Act ➢ PM-10 – 150 µg/Ncm	Use of tarpaulin to cover ore during hauling	Conduct of maintenance of equipment/ machinery identified as the source of pollution Increase frequency of water spraying	when corrective measures were in place Replace equipment that emits high concentration of pollutants or use better fuel Increase frequency of water spraying
		SO_x, NO_x, CO_2, CO, O_2, N_2		Monthly	• Main EP Ducts • Kiln stack	PCO	Include in the EMF	➢ PM-10 – 120.5 µg/Ncm	➢ PM-10 – 135.5 µg/Ncm	DENR Standard Limit as stipulated in the IRR of Clean Air Act ➢ PM-10 – 150 µg/Ncm	Identification of possible source of pollutant	Temporarily halt operation and do corrective measures Conduct of maintenance of equipment/ machinery identified as the source of pollution	Stop operations and resume only when corrective measures were in place Replace equipment that emits high concentration of pollutants or use better fuel
		Heavy metals (Fe, Ni, Cr, Zn)		Semi-annual	• MEP-1-Duct (Villanueva side) • MEP-2-Duct (CDO side) • Kiln 1, 2 & 3 stacks	PCO	Include in the EMF	➢ NO_x – 120.5 µg/Ncm ➢ CO_2 – N/A ➢ CO – 470 mg/NCM ➢ O_2 -135 µg/NCM ➢ N_2 – N/A	➢ NO_x – 135.5 µg/Ncm ➢ CO_2 – N/A ➢ CO – 490 mg/NCM ➢ O_2 -137 µg/NCM ➢ N_2 – N/A ➢ N_2 – N/A ➢	DENR Standard Limit as stipulated in the IRR of Clean Air Act: ➢ NO_x – 150 µg/Ncm ➢ CO_2 – N/A ➢ CO – 500 mg/NCM ➢ O_2 - 140µg/NCM ➢ N_2 – N/A	Identification of possible source of pollutant	Temporarily halt operation and do corrective measures Conduct of maintenance of equipment/ machinery identified as the source of pollution	Stop operations and resume only when corrective measures were in place Replace equipment that emits high concentration of pollutants or use better fuel
	Generation of hazardous waste	Mercuric sulfate, Mercuric chloride Chrysolite asbestos, Benzene	Estimation of volume	Quarterly	Laboratory	PCO	Include in the EMF	Foul odor from waste disposal site	Sighting of pest such as rats and roaches	-	Review of housekeeping practices when pests are present at holding areas Spread of disease to surrounding areas	Pest eradication Immediate clean-up of the temporary storage site and disposal of accumulated wastes	All waste from the kitchen should be contained Compost pit should be covered
	Generation of recyclable (non-biodegradable/ toxic)	Empty lube oil drums, thinner and paint cans, Freon/acid/organic containers, spend	Estimation of volume	Quarterly	Offices, motorpool, maintenance areas and other facilities of PSC	PCO/ Department Heads	Include in the EMF	Foul odor from waste disposal site	Sighting of pest such as rats and roaches	-	Review of housekeeping practices when pests are present at holding areas	Pest eradication Immediate clean-up of the temporary storage site and	All waste from the kitchen should be contained

Key Environmental Aspects per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limit
		paint brush/rollers, oil contaminated waste (cloth, rags, gloves, and oil filters); spent asbestos sheets, gaskets and silica wool insulators, mercury lamps, battery/battery shells, pathogenic wastes from clinic, spent acid washings from the laboratory									Spread of disease to surrounding areas	disposal of accumulated wastes	Compost pit should be covered
	Safety record and accident occurrence	Safety record, Accident/fatality incidence /occurrence	Record keeping	Daily during operation	PSC Complex	Safety officer	Minimal cost	Lost time due to minor injury	Occurrence of major injury due to accident	Occurrence of fatality due to accident	Conduct quarterly safety briefing and orientation Installation of safety billboards	Conduct daily briefing on safety program	Work stoppage along area where accident occurs and conduct investigation and institute safety measures and formulate specific safety procedures and protocols
	Record on illness related to Covid-19	Frequency of occurrence	Record keeping	Daily during operation	PSC Complex	Safety officer/ Company Doctor	Include in the operational cost	Lost time due to occurrence	Occurrence of illness (asymptomatic, moderate, severe cases)	Occurrence of fatality due to Covid-19	Conduct regular Covid-19 testing Regular IEC on Covid-19 precautions Regular vaccination Provision of safety gears and anti-Covid-19 kits Regular workplace sanitation	Isolation/Quarantine of infected personnel, suspected cases and probable cases outside the complex in a designated facility by the LGU	Work stoppage on areas/ section of the operation where exposure from Covid-19 is highly possible
	Complaints management	No. of valid complaints	Record keeping	Daily	Host communities and secondary impact areas	PCO and HRGA Community Relations Staff	Minimal cost	Formal complaint submitted can be resolved at the Human Resource & General Affairs level	Intervention from the Upper Management is needed to resolve a formal complaint	Complaint is broadcasted over mass media	Institution of grievance system Conduct regular IEC to inform and justify the activities being undertaken by PSC	Notify PSC Admin for complaint and take remedial measures to address complaints Investigate all complaints, conduct dialogue with communities and implement mitigating measures Compensate affected communities	Conduct in depth investigation and identify root cause for all valid complaints Institute measures to avoid occurrence of similar problems

7 DECOMISSIONING/ ABANDONMENT REHABILITATION POLICY

This chapter presents the course of action of Philippine Sinter Corporation (PSC) should the Company decides to cease its operation.

7.1 GENERAL DESCRIPTION

PSC sees no intention to abandon its operation in the near future. However, in the event that the entire plant will be abandoned, an extensive decommissioning and rehabilitation plan will be prepared by the PSC management to be submitted to appropriate authorities for the action. Once the land use plan is firmed up, the implementation schedules, system of environmental compliance guarantees, monitoring, reporting, and cost provisions will be included.

In general,

- To rehabilitate and revegetate disturbed areas affected by the operation;
- To mitigate on-site and off-site impacts; and
- To carry out comprehensive monitoring and evaluation.

The finalization of the Decommissioning/Abandonment and Rehabilitation Plan shall consider the following factors:

- Review of the Environment Impact Statement (EIS) Report. The EIS Report provides the information regarding the state of the environment and the community before the introduction of the project;
- Assessment of the actual impacts generated by the project and the various environmental management measures that were implemented, and other schemes that still have to be done;
- Aspirations, perceptions, and expectations of the stakeholders at the time the decision is made; and
- Evaluation of the obligations of PSC to the stakeholders, including its employees.

Among the significant programs to be considered in the Decommissioning/Abandonment and Rehabilitation Plan include the following:

- Final Land Use of surface facilities and rehabilitation
- Environmental Risk Assessment
- Waste Management
- Social Development and Livelihood

The plan shall likewise provide details on the following:

- Description of the project and various facilities including the schedule of abandonment;
- Company officials who will be responsible for the implementation of the abandonment plan ;
- Previous and most recent assessment reports made on aspects concerning the environmental, social, and public health, conducted by the MMT;
- Suggested options, recommendations or alternatives for the host communities

including the employees so that only minimal dislocation will result from the abandoning the project;
- Detailed rehabilitation plans for the coastal areas, water bodies and other important environmental resources. These plans should include specific rehabilitation activities, persons responsible for implementation, and the amount of funds to be committed for rehabilitation;
- Environmental, social and economic projections of host communities years after the company has abandoned the project;
- Action plan of the company and concerned authorities on severance benefits and dislocation compensation; and
- Sourcing of funds to implement the Decommissioning/ Abandonment and Rehabilitation Plan.

Specifically, the plan should involve the following:

- Destroying or removing any residual toxic material within the plant premises. Proper documentation must be made of the location and contents of the dump sites/landfill;
- Dismantling the plants, shops, and other facilities;
- Stabilizing and re-vegetating the stockyard, plant site, and other open and disturbed areas to make them blend with the natural landscape;
- Filling up and riprap of the catch basins, settling ponds, oil water separator, etc.; and
- Putting the altered areas to the programmed land use.

Demolition of infrastructure

An accredited contractor shall be hired to perform safe demolition of the facilities within the complex. Among the activities include the removal, proper and on-time disposal of the dismantled materials. All the necessary environmental mitigating measures should be applied during the dismantling process.

Site Rehabilitation

The entire area should be cleaned of any debris from the ruins of the facilities. It should also be leveled to avoid accumulation of rainwater. Proper drainage system should be maintained during the course of rehabilitation. PSC must ensure that the entire area is devoid of any hazardous chemicals or materials to ensure safety of the surrounding communities. Close monitoring and should be performed if the area is yet to be developed into a new project.

Waste Management

Waste materials such as metals, concrete debris, wood, and plastics among others should be properly collected, segregated and disposed of through an accredited garbage collector. Non-hazardous and non-reusable materials shall be properly disposed and sent to the designated dumpsite. The contracted DENR-hazardous waste treater must ensure proper handling, storage, and disposal of hazardous materials. PSC is responsible in the overall supervision of the activities of the Contractor based on the Decommissioning/Abandonment and Rehabilitation Plan. Proper documentation shall be done as part of the work commissioned. PSC will submit a report to EMB-DENR upon completion of the decommissioning works. Consequently, a joint site inspection will be conducted by the DENR-EMB and the Multipartite Monitoring Team (MMT).

8 INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

In *Chapters 3* and *6* of this EPRMP, the proposed Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) matrices were presented in *Chapters 3* and *6* of this Environment Performance Report and Management Plan (EPRMP). Philippine Sinter Corporation (PSC) will continue to adopt the existing management plan and enhance the scheme based on the operation of the proposed additional facilities. The proceeding discussion presents the duties and responsibilities of the units involved in the realization of these measures.

8.1 CORPORATE ENVIRONMENTAL POLICY

The Integrated Management System (QEMS) Policy Statement of the company is institutionalized in the Overview of Organization's Business and Activities section of the Integrated Management System (QEMS) Manual (IM-OGB-003). Through this policy, PSC is devoted in setting environmental protection and conservation as one of the primary considerations in running the business. This is being achieved through vigilant supervision of the management plan implementation and identification of the impacts caused by the company's operations. With the continuous upgrade in technology, PSC will continue to innovate its operations to keep the company updated on its processes, systems, and methods. With the proposed expansion, PSC commits to implement and maintain the Environmental Management System that will benefit the company and its employees, its host communities, and customers.

PSC's Integrated Management System Policy is stated as:

> *We commit to provide customer value through a reliable and stable supply of quality sintered ore, burnt lime and hydrated lime. We conduct our business in ways that our environment is protected, pollution prevented, our natural resources conserved, our employees' and stakeholders' health and safety preserved. This commitment is manifested through programs focused on continual improvement and reasonable compliance with applicable regulations, industry standards and contractual requirements. We strive to be recognized by our employees, customers, contractors or suppliers, community, and other stakeholders as a socially and environmentally responsible organization.*

8.2 ORGANIZATIONAL SCHEME

The Organizational Chart of PSC is presented in **Figure 8.2.1**. PSC also designated a team for the implementation of the QEMS as shown in **Figure 8.2.2**.

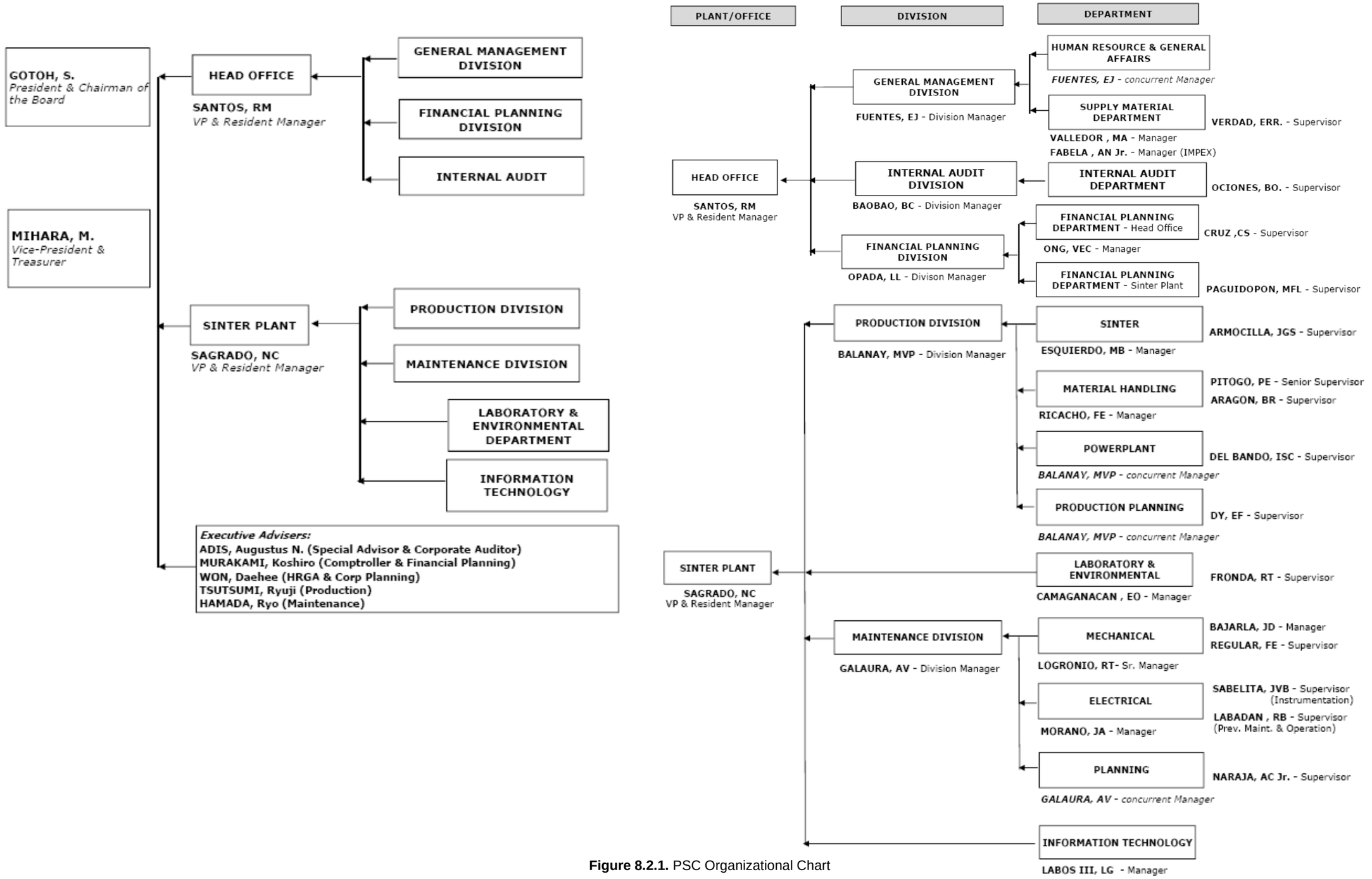


Figure 8.2.1. PSC Organizational Chart

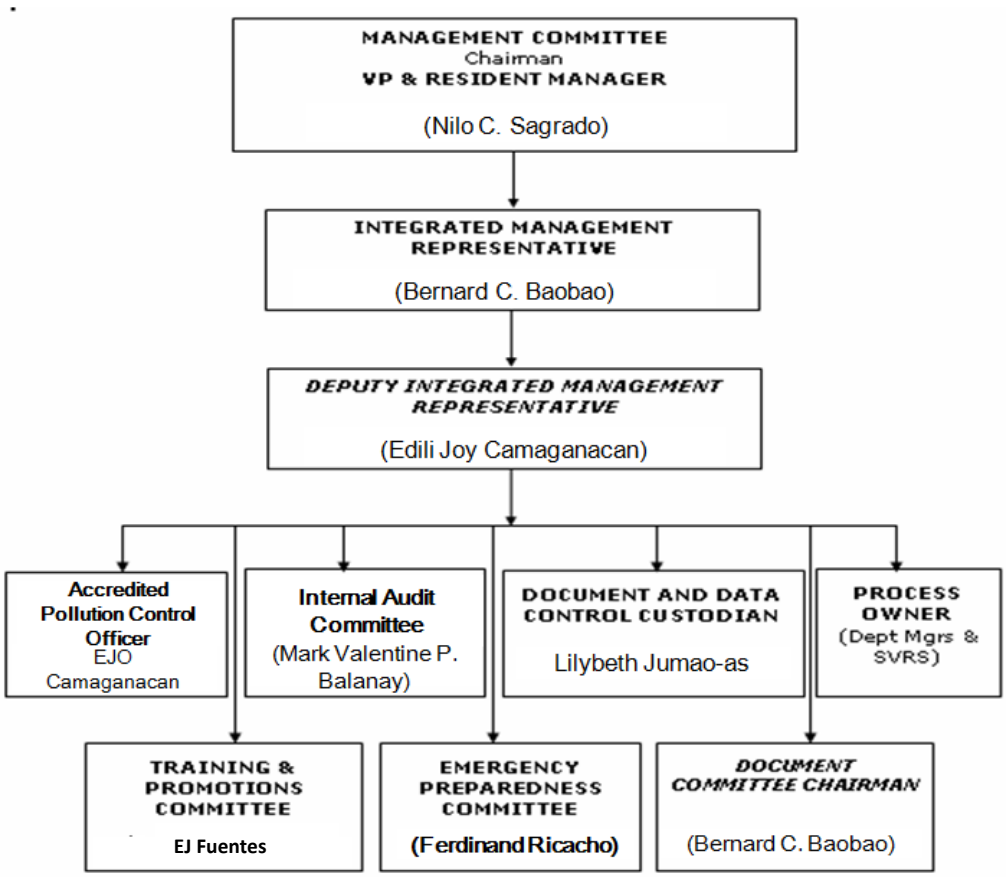


Figure 8.2.2. PSC QEMS Organizational Chart

The fundamental organization of PSC is composed of officials and staff from the Head Office and the Sinter Plant. The General Management, Financial Planning, and Internal Audit Division directly report to the VP and Resident Manager for Head Office.

While the Production Division, Maintenance Division, Laboratory and Environmental Department, and Information Technology Department directly report to the VP and Resident Manager for Sinter Plant.

As an ISO-accredited company, PSC is maintaining leadership in implementing its compliance. The QEMS Team is headed by the Vice President and Resident Manager for Sinter Plant. The Organization also includes the support from the PCO and other committees including the Internal Audit, Training and Promotions, Emergency Preparedness and Document.

8.3 ENVIRONMENTAL MANAGEMENT UNIT

Institutional arrangements to deal with environment-related concerns were already established by PSC from its long existing operation. The Laboratory and Environmental Unit directly reports to the VP and Resident Manager of the Sinter Plant.

8.3.1 Laboratory and Environmental Group

This group is in-charge of the monitoring of air, water and noise quality parameters required by the Department of Environment and Natural Resources (DENR) and PSC Environmental Management Programs.

8.3.2 EMS Committee

The EMS Committee is responsible in implementing the environmental projects and plans of the company including the conduct of monthly self–monitoring, quarterly sectoral monitoring activities, and Information, Education, and Communication (IEC) activities. The specific functions of the EMS Committee are the following:

- Employ the master plan for ISO 14001 (Environmental Management System);
- Diligently monitor the compliance of contractors in implementing the EMP;
- Identify the possible sources of pollution;
- Constantly monitor and evaluate the effectiveness of mitigating/enhancement measures;
- Check, plan, propose, and employ modifications, or additional environmental schemes that are deemed necessary to more effectively protect the environment; and
- Coordinate with the local government, related agencies, and the host communities to guarantee their valuable partaking in the realization of environmental management plan.

The EMS Committee directly reports to the Steering Committee, which is being chaired by the Plant Resident Manager. The Committee is being led by the Environmental Management Representative (EMR) and is composed of the different Division Managers of the Maintenance, Production and Planning Divisions. The group is coordinated by the Deputy Environmental Management Representative (DEMR) or the company's Pollution Control Officer (PCO).

8.3.3 Pollution Control Officer (PCO)

One of the primary roles of the PCO is ensuring the company's compliance with relevant environmental (e.g. standards) and legal requirements. The PCO is also in-charge of preparing the Annual Environmental Monitoring Plan containing the desired parameters, reference sampling points, type, method and frequency of sampling. Presented in **Figure 8.2.1** above is the organizational and communication line of the PCO vis-à-vis the hierarchy.

8.4 COMMUNITY RELATIONS OFFICE

The COMREL through the PSC Foundation, Inc. (PSCFI) is in charge of addressing the social issues that are related from the plant operations, and assigned in the implementation of the Social Development Program (SDP) of the company.

PSC Foundation, Inc. is a non-stock, non-profit organization which was incorporated in January 13, 1998 and eventually accredited by the Department of Social Welfare and Development (DSWD 10) in October 6, 1999 and by the Philippine Council for NGO Certification (PCNC) on March 17, 2006. PSCFI is headed by its President, Mr. Nilo Sagrado. Other officers include the following:

- President - Nilo C. Sagrado
- Vice President - Augustus N. Adis
- Secretary - Emmanuel L. Gapuz
- Treasurer - Rogelio B. Lim
- Auditor - Bienvenido M. Tolentino
- Coordinators - Lucille Myschkin Flores (Accounting Supervisor)
  - Jan Michael Tagam (Program Supervisor)
- Full-time Staff - Renelyn Solon (Admin/Accounting)
  - Manilyn Mabaylan (Social Worker)

8.5 MULTI-PARTITE MONITORING TEAM

PSC is compliant in coordinating and conducting activities with its Multi-Partite Monitoring Team (MMT). Throughout PSC's operation, successful assessment and validation with MMT were done to ensure that the Company adheres to the prescribed environmental standards of the Philippines. The functions of the MMT aside from doing actual monitoring are the following:

- Setting up the environmental standards and criteria specific to the project and its location;
- Conducting trainings for MMT members for more effective monitoring activities;
- Deciding on the merits of complaints filed against the proponent and acting on these complaints; and
- Planning of the annual work and financial plan.

Currently, PSC maintains a set of MMT performing the above tasks. The operation of the MMT is defined in the Memorandum of Agreement (MOA) executed by the identified members. This includes the function, roles, duties and responsibilities of each member and committees. However, in compliance with DAO 2017-15 or the *Guidelines on Public Participation under the Philippine Environmental Impact Statement (EIS) System,* PSC is on the process or reviewing and re-organizing the MMT line-up considering the following members:

- MENRO of LGU- Villanueva
- Rural Health Unit (RHU) LGU-Villanueva
- Barangay Katipunan
- Barangay Poblacion-1
- Barangay San Martin
- Philippine Coastal Resource Management Corporation (PCRMC)
- University of Science and Technology of Southern Philippines (USTP)
- Municipal Purok Federation
- PENRO - Misamis Oriental
- CENRO - Initao
- PHIVIDEC Industrial Authority
- Philippine Coast Guard

8.6 CITATION OF AWARDS/RECOGNITION

Since its operation, PSC has maintained first-rate reputation in the manufacturing industry and has proven its role and providing opportunities to its impact communities and in complying to environmental regulations. PSC's foundation of a good proof of its corporate social responsibilities, accomplishment and assistance extended to the community and other stakeholders have been presented with various awards and citation. The awards and citation also include PSC's involvement in fire safety competition and zero accidents/lost time track records. A summary of these awards and citation from the Local Government Units, National Agencies, and Socio Civic organization is presented in **Table 8.6.1**.

Table 8.6.1. Summary of awards and citation received from 1979 to 1999

Award or Citation	Place and Sponsor	Date
2020		
PEZA - Outstanding Community Project "Exemplary projects in community development in 2019"	Philippine Economic Zone Authority	12/10/2020
Plaque of Appreciation For unwavering support to our children of Our Lady of Guadalupe Parish	Our Lady of Guadalupe School Villanueva, Inc.	3/28/2020
Certificate of Appreciation In grateful appreciation for their invaluable support to the Marine Environmental Protection Command (MEPCOM)	Philippine Coast Guard, Marine Environmental Protection Command, Binondo, Manila	8/25/2020
Certificate of Recognition In recognition of its participation in the FAST-CaReS program	Bureau of Customs, Collection District 10, Cagayan de Oro City	11/9/2020
Certificate of Commendation In recognition for its invaluable contribution in the area of Trade facilitation as one of the Top Importing Companies	Bureau of Customs, Collection District 10, Cagayan de Oro City	11/18/2020
Certificate of Commendation In recognition for its invaluable contribution in the area of Trade Facilitation as one of the Top Importing Companies that has attained the 30-Minute ASEAN Standard Time of Cargo Clearance Releasing from Filing of the Customs Declaration Entry to the Release of its Cargo in the Importer's Premises	Bureau of Customs Port of Cagayan de Oro	11/18/2020
2019		
"Plaque of Recognition Top 10 Outstanding Exporters is hereby presented to Philippine Sinter Corporation, in recognition for its invaluable contribution for growth of the export industry in Region 10 for having exported goods amounting US$ 40,740,088.99 thereby making it as the Top 9 Exporter in the region during the calendar year 2018"	Department of Finance & Bureau of Customs, Customshouse, Macabalan Cagayan de Oro City	3/11/2019
Plaque of Appreciation For the generous commitment and support the parish' children	Our Lady of Guadalupe School Villanueva, Inc.	3/25/2019
Plaque of Appreciation For generous support extended to deserving students which lead to the successful completion of Baccalaureate Degree	University of Science and Technology of Southern Philippines Cagayan de Oro Campus	4/24/2019
Plaque of Recognition In grateful recognition of PSC's ongoing commitment and dedicated service to Villanueva Senior High School	Department of Education, District of Villanueva, Villanueva Senior High School	4/3/2019
Certificate of Appreciation Benevolent Support in the 4th Annual General Assembly Meeting	National Tribal Elders of Datus in the Philippine Territory Incorporated	4/7/2019

Award or Citation	Place and Sponsor	Date
Certificate of Appreciation as Host Training Establishment of the Students during On the Job Training	University of Science and Technology of Southern Philippines Cagayan de Oro Campus, College of Engineering	5/30/2019
Certificate of Appreciation as Host Training Establishment of the Students during On the Job Training	University of Science and Technology of Southern Philippines Cagayan de Oro Campus, College of Engineering	5/30/2019
Certificate of Appreciation as Host Training Establishment of the Students during On the Job Training	University of Science and Technology of Southern Philippines Cagayan de Oro Campus, College of Engineering	5/30/2019
Certificate of Appreciation for its support extended to the participants of the Basic Occupational Safety & Health Training Course	Dept of Labor Region X and the Occupational Safety & Health Network 10, Inc.	7/4/2019
Plaque of Recognition In appreciation of ardent partnership and service to the 66th Environmental Youth Camp	Department of Environment and Natural Resources, Environmental Management Bureau Region 10	10/16/2019
Certificate of Appreciation for its support extended to the participants of the Basic Occupational Safety & Health Training Course	Dept of Labor Region X and the Occupational Safety & Health Network 10, Inc.	11/28/2019
Plaque of Recognition For the support and exemplary contribution to improve the quality of public education facilities and surroundings	Department of Education School's Division of Misamis Oriental	12/20/2019
2018		
"Plaque of recognition TOP 10 OUTSTANDING EXPORTERS, in recognition for its valuable contribution for growth of the export industry in Region 10 for having exported goods amounting to US$ 34,612,222.98, thereby making it as the Top 8 Exporter in the Region during the calendar year 2017"	Customshouse, Macabalan Cagayan de Oro City	2/26/2018
Plaque of Appreciation For untiring support and devoted efforts in helping the children of Our Lady of Guadalupe Parish	Our Lady of Guadalupe School Villanueva, Inc.	4/2/2018
Plaque of Recognition In grateful recognition of PSC's ongoing commitment and dedicated service to Villanueva Senior High School	Department of Education District of Villanueva, Villanueva Senior High School	4/3/2018
Plaque of Appreciation For touching and transforming the lives of deserving students	University of Science and Technology of Southern Philippines Cagayan de Oro Campus	4/5/2018
Certificate of Appreciation Generous donation and commitment during the BRIGADA ESKWELA 2018	Department of Education , District of Cagayan de Oro City, Lapasan National High School	6/2/2018
Certificate of Appreciation as Zealous Support and Generous Contribution being a Partner for Development of the Local Government Unit of Villanueva in the "Conduct of the Community Based Fire Fighting & Response Training"	Municipality of Villanueva Misamis Oriental, Municipal Disaster Response and Risk Management Office	3/21/2018
Certificate of Appreciation, Unwavering support in the community in the field of Education and Health which contributed greatly to the development of Claveria, Misamis Oriental	Municipality of Claveria Misamis Oriental	7/21/2018

Award or Citation	Place and Sponsor	Date
Certificate of Appreciation For generous support as partner institution for learning tour activity	Maria Reyna Xavier University Hospital (MRXUH) Cagayan de Oro City	7/23/201
Certificate of Appreciation for its support extended to the participants of the Basic Occupational Safety & Health Training Course	Dept of Labor Region X and the Occupational Safety & Health Network 10, Inc.	11/30/2018
Plaque of Recognition In sincere appreciation for the support extended to the Philippine Statistics Authority- Misamis Oriental by providing reliable and timely data in the PPS for 2018	Philippine Statistics Office Misamis Oriental Provincial Office	
2017		
"Plaque of Recognition for the invaluable support extended to the Philippine National Police most especially to this office to our various programs and activities"	PNP, Misamis Oriental Provincial Office San Martin, Villanueva Misamis Oriental	2/13/2017
"Plaque of Appreciation is presented to Engr. Augustus Adis, President PIEMO Industries Association, in grateful recognition and deep appreciation for his valuable contribution , expertise and generosity in sharing his time as Guest Speaker during 37th Regional Quality Circles Convention"	37th Regional Quality Circles Convention Mallberry Suites Business Hotel, Limketkai Cagayan de Oro City	March 26-27, 2017
"Certificate of Appreciation is awarded to Reymar M. Santos, in sincere appreciation and recognition of your outstanding support which contributed to the mission accomplishment of 58th Infantry (DIMALULUPIG) Battalion 4th Infantry (DIAMOND) Division, Philippine Army"	Headquarters 58th Infantry (DIMALULUPIG) Battalion, Sitio Migbanday, Poblacion Claveria Misamis Oriental	12/18/2017
"Certificate of Appreciation in grateful recognition of the unconditional support given to the school which contributed to the simplification of the Teachers work tasks in ICT activities"	Vicente N. Chaves Memorial School, Villanueva District Villanueva Misamis Oriental	8/8/2017
Plaque of Appreciation For the generous contribution and continuous support to the parish of Our Lady of Guadalupe	Our Lady of Guadalupe School Villanueva, Inc.	3/26/2017
Certificate of Appreciation Exemplary involvement and Contribution for BRIGADA ESKWELA 2017	Department of Education District of Villanueva, Kirahon Elementary School	5/20/2017
Certificate of Appreciation Unconditional Support given by Vicente Chaves Memorial Central School	Department of Education, District of Villanueva, Vicente N. Chaves Memorial Central School	8/8/2017
Plaque of Recognition for Invaluable support extended to the various programs of the Philippine National Police	Philippine National Police Misamis Oriental Police Provincial Office	2/13/2017
Certificate of Appreciation Given through Resident Manager In sincere appreciation and recognition for outstanding to 58IB, 4ID, Philippine Army	Philippine Army 4th Infantry Division , 58th Infantry Battalion	12/18/2017
2016		
"Plaque of Appreciation in recognition of its invaluable contribution to the export industry in the region making it to the Top 3 Exporter during the Fiscal Year 2015 in the district"	Bureau of Customs, District X, Limketkai Luxe Hotel Lapasan, Cagayan de Oro City	2/23/2016
"Certificate of Appreciation, for its support extended to the participants of the Basic Occupational Safety	DOLE Region 10, Polymedic Medical Plaza, Kauswagan	2/4/2016

Award or Citation	Place and Sponsor	Date
& Health Training Course on February 1-5, 2016"	Highway, Cagayan de Oro City	
"Certificate of Membership, Occupational Safety & Health Network (OSHNET) - 10 Inc., whose primary objective is to promote culture of safety & health in private and public establishment through networking"	OSH Net - Region 10, Cagayan de Oro City	4/8/2016
"Certificate of Membership, Safety Organization of the Philippines Inc."	SOPI, Region 10 Chapter	5/20/2016
2015		
"Certificate of Appreciation, for its support extended to the participants of Basic Occupational Safety & Health Training Course on March 23-27, 2015"	DOLE Region 10, Polymedic Medical Plaza, Kauswagan Highway, Cagayan de Oro City	3/16/2015
"Certificate of Appreciation, for its support extended to the participants of the Basic Occupational Safety and Health Training Course on July 6-10, 2015"	DOLE Region 10, Polymedic Medical Plaza, Kauswagan Highway, Cagayan de Oro City	7/9/2015
"Certificate of Recognition whose cooperation and invaluable support contributed greatly to the success of the On-The-Job (OJT) Training Program of the Institute of Engineering and Technology (IET) of MOscat during the Summer of School year 2014-2015"	MOSCAT, Claveria Misamis Oriental	5/27/2015
2014		
"Certificate of Appreciation, for its support extended to the participants of the Basic Occupational Safety and Health Training Course on September 15-19, 2014"	DOLE Region 10, Polymedic Medical Plaza, Cagayan de Oro City	9/19/2014
"Certificate of Appreciation for unselfish support and enthusiastic dedication in hosting the Adidas Tennis Challenge 2004 - Cagayan de Oro Leg for the development of Junior Tennis Players in Northern Mindanao"	Adidas Philippines and Children Tennis Workshop, Cagayan de Oro City	6/14/2014
"In grateful recognition for their demonstration of exemplary performance and courage in their aid to the CDOC Fire District Personnel in the prevention and suppression of destructive fire"	Bureau of Fire Protection Cagayan de Oro City	8/15/2014
"Plaque of Recognition for 2013 best LMC Practitioner of Region 10"	DOLE, NMCB Region 10, Cagayan de Oro City	8/27/2014
"Top Corporate Partner 2014"	Seda Hotel, Cagayan de Oro City	2014
"Certificate of Appreciation and invaluable support to the undertakings of PDEA - Region 10 from July 2013 to June 2014"	PDEA - ROX , 2/F GA Pelaez Sports Center, Velez St. Cagayan de Oro City	7/30/2014
"Certificate of Recognition for its valuable contribution for the protection and enhancement of the water quality of "Tagbalitang Creek" in support of the Adopt-an-Estero / Waterbody Program of the Bureau"	DENR Region 10, Philtown Hotel, Velez - Macahambus, Cagayan de Oro City	10/16/2014
"Gold Award in fitting acknowledgement and recognition for sharing its resources and for working behind the scenes with contributed significantly in the achievements of the goals and objectives of the society and in the successful conduct of the chapter activities of the year"	The Philippine Society of Mechanical Engineers Inc., Grand Caprice and Restaurant and Convention Center Limketkai, Complex, Cagayan de Oro City	12/10/2014
"Plaque of Appreciation as third Top Contributor of Taxes (both Business Taxes and Real Property	Office of the Municipal Mayor Villanueva Gymnasium, Villanueva	6/16/2014

Award or Citation	Place and Sponsor	Date
Taxes) due to the Local Government Unit of Villanueva Misamis Oriental for the Calendar year 2013"	Misamis Oriental	
"Plaque of Appreciation Engr. Reymar M. Santos for sharing their time and expertise as one of the major partners of the Local Government Unit of Villanueva and continuous contributions to the success of our Medical Missions"	Municipality of Villanueva, Province of Misamis Oriental	6/16/2014
2013		
"Plaque of Appreciation in grateful acknowledgement and deep appreciation for consistently supporting the PSME programs by sending good numbers of Mechanical Engineers and Certified Plant Mechanics to the Chapters Quarterly General Membership Assemblies, Regional Conferences and National Conventions that had immensely contributed to the success of the goals and objectives of the society"	The Philippine Society of Mechanical Engineers Inc., Grand Caprice and Restaurant and Convention Center Limketkai, Complex, Cagayan de Oro City	6/28/2013
"Plaque of Appreciation for unselfish and invaluable services, support and cooperation to the projects, program and activities of Villanueva National High School, Villanueva Misamis Oriental"	Villanueva National High School Villanueva, Misamis Oriental	3/19/2013
"Plaque of Appreciation for unselfish and invaluable services, support and cooperation to the projects, program and activities of Villanueva National High School, Villanueva Misamis Oriental"	Villanueva National High School Villanueva, Misamis Oriental	3/19/2013
"Award of Recognition: Outstanding Quality Circle Project"	PICAP, Cebu Parkline International Hotel Cebu City, Philippines	9/20/2013
"Special Award in Innovative Organizational Structure"	DOLE, NCMB & PLLMCPI Grand Men Seng Hotel, Davao City Philippines	11/28/2013
"Special Award in Innovative Organizational Structure"	DOLE, NCMB & PLLMCPI Grand Men Seng Hotel, Davao City Philippines	11/28/2013
"2013 Best Enterprise - Based Dispute Resolution Practices"	DOLE, Grand Me Seng Hotel, Davao City Philippines	11/28/2013
2011		
"Certificate of Appreciation, for its support extended to the participants of the Basic Occupational Safety and Health Training Course"	DOLE Region 10, Cagayan de Oro City	3/25/2011
"Safety Recognition Award, for its commitment in implementing effective programs & activities on occupational safety and health, thereby attaining SAFETY MILESTONE (SMILE) - No Lost Time Accident from January to December 2010"	DOLE, The Bayleaf Intramuros Manila	12/12/2011
"Plaque of Appreciation for the invaluable scholarly support warm, accommodation and propitious intra-company immersion that paved way towards the highly satisfactory achievement as of the objectives of the local education mission complementing the Production and Operations management and Marketing Management Courses"		2/10/2011
"Certificate of Recognition for the very significant continuous cooperation as support as venue of our students' field exposure activities"	Mindanao State University Marawi City, Philippines	7/25/2011

Award or Citation	Place and Sponsor	Date
"Plaque of Appreciation in profound and sincere appreciation for the splendid cooperation and magnanimous support extended as HOST during the plant tour of the Basic Course in Occupational Medicine participants on September 30, 2011"	Capitol University Medical City, Cagayan de Oro City	10/2/2011
"Plaque of Recognition, in grateful recognition and appreciation for sharing its resources and invaluable support which contributed significantly in the achievement of the goals and objectives of the society and in the successful conduct of the chapter activity of the year"	The Philippine Society of Mechanical Engineers Inc., Grand Caprice and Restaurant and Convention Center Limketkai, Complex, Cagayan de Oro City	12/14/2011
"Certificate of Recognition, with sincere appreciation for their outstanding volunteer services to the community by always reinforcing the Bureau of Fire Protection in its efforts of preventing and suppressing destructive fires"	Bureau of Fire Protection - Region 10 Middleton Apartelle, Carmen, Cagayan de Oro City	3/31/2011
2010		
"Plaque of Appreciation in grateful recognition & profound appreciation for exemplary support to the society"	The Philippine Society of Mechanical Engineers, Cagayan de Oro Chapter, Buffalo Grill & Restaurant, Luna Velez St. Cagayan de Oro City	12/4/2010
"Safety Recognition Award, for having attained SAFETY MILESTONE with 1,891,247 Safe-workhours without Lost Time Accident from January 1, 2006 - December 31, 2009"	DOLE, Traders Hotel, Manila	12/15/2010
"Plaque of Recognition for being the No. 1 EXPORTER (Large Category) locator firm in the Phividec Industrial Estate - Misamis Oriental contributing to the Socio-Economic Development in Northern Mindanao"	PIA Administration Building, MCT Complex, Tagoloan Misamis Oriental	8/13/2010
"Certificate of Appreciation for her utmost participation in the 1st JPSME Regional Convention held on February 5-7, 2010"	Philippine Sinter Plant, Villanueva Misamis Oriental	2/5/2010
"Plaque of Appreciation in grateful recognition and sincere appreciation for the deep for the deep and abiding concern for the welfare of VNHS by extending valuable assistance in the implementation of programs and project of the Department of Education which redound to the higher achievement and much-improvement performance of students and teachers of Villanueva National High School"	Villanueva National High School Villanueva, Misamis Oriental	3/29/2010
"Plaque of Recognition for its invaluable contribution to pre-school education in the parish of Our Lady of Guadalupe , Villanueva Misamis Oriental"	Our Lady of Guadalupe, Nursery and Kindergarten School Villanueva Misamis Oriental	3/18/2010
"Plaque of Appreciation in grateful acknowledgement and deep appreciation for being the HOST for the 1st Technical Seminar and Plant Tour of IIEE - Cagayan de Oro Chapter"	Institute of Integrated Electrical Engineers (IIEE) Grand Caprice Restaurant and Convention Center, Limketkai Center, Cagayan de Oro City	3/10/2010
"Plaque of Appreciation for the unwavering and constant support to sustain the cost of education and the welfare of the university"	Mindanao of Science and Technology Jasaan Campus, Jasaan Misamis Oriental	3/26/2010
"Bongloy Partnership Award, for the unwavering support, cooperation and endless partnership extended to the various programs and projects of	Republic of the Philippines Province of Misamis Oriental Villanueva Misamis Oriental	6/11/2012

Award or Citation	Place and Sponsor	Date
The Local Government Unit of Villanueva"		
"Plaque of Appreciation for sharing its resources and for working behind the scenes with contributed significantly in the achievements of the goals and objectives of the society and in the successful conduct of the chapter activities of the year"	The Philippine Society of Mechanical Engineers, CDOC Chapter, Grand Caprice Restaurant and Convention Center Limketkai Complex, Cagayan de Oro City	11/23/2012
"Plaque of Appreciation in grateful appreciation for your invaluable support and contribution to Customs Collection District X, Port of CDO which made it collect the total amount of 5.152 Billion thereby exceeding its collection target"	Bureau of Customs, District X Customshouse, Macabalan, Cagayan de Oro City	12/5/2012
"Certificate of Appreciation for sustained and far-reaching efforts on imparting knowledge during the lectures and discussions upon the conduct of the fieldtrip regarding with the analysis of mining technique. Nothing can ever adequately show our appreciation for the time and dedication you have displayed to support the third year mining Engineering students from the University of Southeastern Philippines"		3/6/2012
"Plaque of Appreciation for its unselfish and invaluable services, support and cooperation to the projects, programs and activities of Villanueva Nation High School, Villanueva Misamis Oriental"	Villanueva National High School Villanueva, Misamis Oriental	3/27/2012
"Plaque of Appreciation for their manifest involvement and commendable support during the BSECE - CDO Iligan Educational Tour and Plant Visit"	BSECE - CDO Iligan Educational Tour	2/8/2012
"Plaque of Appreciation in grateful recognition and sincere appreciation for its continuous support to the organization by being one of the Sponsors in the Chapters activities for the year 2012"	Philippine Institute of Chemical Engineers Cagayan de Oro Chapter PSC Clubhouse, Gusa, Cagayan de Oro City	12/12/2012
"Plaque of Appreciation in grateful recognition and profound appreciation for exemplary support to the society which by a large measure contributed immensely to the attainment of the society's plan and programs for the year"	The Philippine Society of Mechanical Engineers Cagyan de Oro Chapter, Bufallo Grill and Restaurant , Luna Velez St. Cagayan de Oro City	12/4/2010
2009		
"Safety Recognition Award, for having attained SAFETY MILESTONE with 1,424,865 Safe-workhours without lost-time accident from January 1, 2006 - December 31, 2008"	DOLE, Intramuros Manila	8/28/2009
"Plaque of Recognition in grateful recognition and appreciation for its indispensable rule in the furtherance vision and mission of the school, a clear and concrete manifestation of corporate responsibility worthy of emulation by other concern"	Our Lady of Guadalupe, Nursery and Kindergarten School Villanueva Misamis Oriental	3/20/2009
"Plaque of Recognition for Most Outstanding Industry in Environmental Advocacy and Pollution Control during Search for Outstanding DENR-10 partners in Region 10"	DENR Regio10 / DENR - 10 Compound, Cagayan de Oro City	6/29/2009

Award or Citation	Place and Sponsor	Date
"Plaque of Appreciation , for 34 years as a Locator Firm in Phividec Industrial Estate in Misamis Oriental thus capitalizing development in Northern Mindanao as a prime contributor to the region's investment and exports"	Phividec Industrial Authority Phividec Industrial Estate ,Tagoloan Misamis Oriental	8/13/2009
"Plaque of Appreciation, for being one of the four hosting companies in the Second PICHE Mindanao Chapters Joint Plant Tours"	Philippine Institute of Chemical Engineers, Cagayan de Oro Chapter @ PSC Mindanao Sinter Plant, Villanueva Misamis Oriental	10/24/2009
"Plaque of Appreciation, in grateful acknowledgement and deep appreciation for being the HOST for the 1st Technical Seminar and Plant Tour of IIEE - Cagayan de Oro Chapter"	Institute of Integrated Electrical Engineers (IIEE) Grand Caprice Restaurant and Convention Center, Limketkai Center, Cagayan de Oro City	3/13/2010
"Plaque of Appreciation for their unwavering and constant support to sustain the cost of education and the welfare of the university"	Mindanao of Science and Technology Jasaan Campus, Jasaan, Misamis Oriental	3/26/2010
"Clock of Cooperation"	Municipality of Villanueva Province of Misamis Oriental	7/29/2010
"Plaque of Recognition for being No. 1 Exporter (Large Category)"	Phividec Industrial Estate Admin Bldg. MCT Complex, Tagoloan, Misamis Oriental	8/13/2010
"Thank you for your constant support, we look forward to a successful partnership between our institutions"	Phividec Industrial Estate Admin Bldg. MCT Complex, Tagoloan, Misamis Oriental	February 16-20, 2009
"Plaque of Appreciation for unwavering support and cooperation extended to the various programs and projects of the Local Government Unit of Villanueva	47th Kadlawanan sa Villanueva, Local Government Unit of Villanueva Villanueva, Misamis Oriental	29-2009
"Plaque of Appreciation for 34 years of Locator Firm in Phividec Industrial Estate in Misamis Oriental thus catalizing development in Northern Mindanao as prime contributor to the region's investment and exports"	Phividec Industrial Authority 's 35th Anniversary Celebration	8/13/2009
"Plaque of Appreciation represented by Mr. Nilo C. Sagrado (Resident Manager), for its unselfish and continuous sponsorship of the Annual Christmas Golf Tournament held on December 10-13, 2009, which will support and promote better Military and Civilian relations"	Camp Evangelista Golf Club Patag, Cagayan de Oro City	12/13/2009
"Safety Recognition Award for having attained Safety Milestone with 1,424,865 Safe-workhours without Lost Time Accident from January 1, 2006 - December 31, 2008 as a result of the company's commitment in implementing effective programs and activities on occupational safety and health"	DOLE Intramuros, Manila Pasay City	11/5/2009
"Perfect Safety Record for the achieving 994,060 Millions manhours without Lost Time Accident"	SOPI, The Manila Hotel One Park, Roxas Boulevard, Manila	12/29/2009
2008		
Plaque of Recognition as one of the highest Real Property Taxpayers for 2007	Office of the Provincial Governor Province of Misamis Oriental / Cagayan de Oro City	Feb. 18, 2008

Award or Citation	Place and Sponsor	Date
Over-all Champion, PSC Fire Brigade Team, Fire Olympics 2008	SOPI-Cagayan de Oro ,CDO City	March 24-25, 2008
2007		
Plaque of Recognition as one of the highest Real Property Taxpayers for 2006	Office of the Provincial Governor Province of Misamis Oriental / Cagayan de Oro City	Jan. 12, 2007
Certificate of Recognition (CR-029/2007) for Laboratory and Environmental Group of PSC having complied the requirements of DAO 98-63 Guidelines in the Designation of DENR Recognized Environmental Laboratories for 25-parameters	DENR Office ,Visayas Avenue, Diliman, Quezon City	March 7,2007
Plaque of Appreciation in grateful support and cooperation during the Pollution Control Officers plant tour (Hazardous Waste Mgmt Facility)	DENR-EMB region 10 and Guardians of the Earth Association, Inc. /SM City Event Center ,CDO City	June 29,2007
Most Outstanding Industry in Environmental Advocacy and Pollution Control during Search for Outstanding DENR-10 partners in Region 10	DENR Region 10 / DENR-10 Compound ,CDO City	June 29,2007
Plaque of Appreciation in grateful appreciation of its exemplary contribution and support to OSH Network 10 particularly during the 2nd Occupational Safety Health Mindanao Summit	OSH Network 10 / Cagayan de Oro City	August 17, 2007
Certificate of appreciation for the invaluable assistance extended during the 2007 Inter-Comparison Exercises for DENR-EMB Laboratory Analysts	EMB Central Office / VIP Hotel ,CDO City	Oct. 23, 2007
Certificate of appreciation for being one of the 2007 Top 5 Customers (Regional Non-Distribution Utility Category)	National Power Corporation Diliman, Quezon City	Nov. 21, 2007
2006		
Plaque of Appreciation in profound gratitude and sincere acknowledgement for the support and services rendered to LGU - Villanueva, particularly in the establishment of the Municipal Lying In.	LGU- Villanueva Municipality Villanueva, Misamis Oriental	July 28, 2006
Certificate of Recognition for sponsoring the Environmental Youth Camp Seminar-Workshop conducted by EMB 10	DENR - EMB 10 / Mapawa, Cagayan de Oro City	Oct. 7, 2006
Plaque of Appreciation in grateful recognition and appreciation of the full support extended to SOPI	Safety Organization of the Phils. Inc. Misamis Oriental, Cagayan de Oro & Bukidnon Chapter	Dec. 8, 2006
Certificate of Appreciation for valuable support to National Power Corp. for being a PROMPT Payor with its Automatic Prompt Payment Discount maintained for the year 2006	National Power Corporation Diliman, Quezon City	Dec. 13, 2006
Plaque of Appreciation for Invaluable Financial Support of "Tabang Medico" a Medical Mission of Provincial Government of Misamis Oriental	Provincial Government of Misamis Oriental, Provincial Capitol, Cagayan De Oro City	Dec. 17, 2006
2005		
Presidential award in recognition of its efficient, successful and on-time completion of the 5.5MT High Production Project	Mr. Shinichiro Yamana, President and Chaiman of the Board	Aug. 8, 2005

Award or Citation	Place and Sponsor	Date
Award of Recognition to MAGTECH Circle for its Outstanding Quality Circle Non-Production Category during the 2005 Productivity Improvement Circles National Convention	Productivity Improvement Circles Association of the Phils. Westin Phil. Plaza, Pasay City	Sept. 30, 2005
2004		
Plaque of Appreciation for generous and invaluable support to programs and activities of COCI thus contributing greatly to the growth and development of the Chamber	Cagayan de Oro Chamber of Industries Cagayan de Oro City	Jan. 24, 2004
Certificate of Appreciation for unselfish support and enthusiastic dedication in hosting the Adidas Tennis Challenge 2004- Cagayan de Oro Leg for the development of Junior Tennis Players in Northern Mindanao	Adidas Philippines and Children Tennis Workshop Cagayan de Oro City	June 14, 2004
2003		
Plaque of Recognition to HEAT INNOVATORS II, PSC, as Best Quality Circle Project - Non Production Category	Mindanao Association for Quality, Iligan City	May 30, 2003
Outstanding Award for considerably improving energy efficiency achieving a 12.0% Savings equivalent to 18,963,740 liters of Oil Equivalent (LOE) that significantly contributed to the overall national goals and objectives of the Philippine Energy Plan	Don Emilio Abello Energy Efficiency Awards MERALCO Management and Leadership Dev't Center	Dec.2, 2003
2002		
Certificate of Recognition (CR-029/2002) for Laboratory and Environmental Group of PSC having complied the requirements of DAO 98-63 Guidelines in the Designation of DENR Recognized Environmental Laboratories for 11-parameters	DENR Office ,Visayas Avenue ,Diliman, Quezon City	July 17,2002
Certificate of Recognition for the generosity and support in the completion of various school projects in attainment of quality education.	Kalingagan, National High School Imelda, Villanueva, Mis. Or.	Sept. 6, 2002
Plaque of Appreciation in grateful recognition of its support and implementation of the Adopt-a-School Program" through a donation of an additional school building to Maribojok Elem. School, Tagoloan, Mis. Oriental	Department of Education - 10 / Cagayan de Oro City	Dec. 10, 2002
Plaque of Recognition as Healthy Workplace and in grateful recognition for having sustained this award for 4 consecutive years as support for the success of the Philippines Health and Promotion Program through Healthy Places	Department of Health Region 10 ,Cagayan de Oro City	December 27, 2002
2001		
Plaque of Recognition to Labor Management Council of PSC as finalist in the 2001 Search for Outstanding LMC for Industrial Peace during the LMC - 3rd National Convention	NCMB and PHILAMCOP, INC.	Oct. 26, 2001
2000		
Third Place, Fire Extinguisher Category, Fire Brigade Competition		March 27, 2000
1999		

Award or Citation	Place and Sponsor	Date
1st Place, Busted Hose Competition, Industrial Category, Regional Fire Brigade Competition	SOPI Cagayan de Oro and Bukidnon Chapter	31 March 1999
2nd Place, Busted Hose Competition, Industrial Category, Regional Fire Brigade Competition	SOPI Cagayan de Oro and Bukidnon Chapter	31 March 1999
Over-All Champion – Industrial Category, Regional Fire Brigade Competition	SOPI Cagayan de Oro and Bukidnon Chapter	31 March 1999
1998		
Over-All Champion – Industrial Category, Regional Fire Brigade Competition	SOPI Cagayan de Oro and Bukidnon Chapter	1998
1997		
Over-All Champion – Industrial Category, Regional Fire Brigade Competition	SOPI Cagayan de Oro and Bukidnon Chapter	1997
1996		
Award of Appreciation in Grateful and Deep Appreciation of the Distinguished Service and Unselfish Cooperation	Philippines Councilor's League of Villanueva Chapter Community Project	7 Sept 1996
Award of Merit, TOP 25 Healthy Workplace	Department of Health	2 May 1996
Firm with Outstanding Family Welfare Program in the Philippines		1996-1995
1995		
Over-All Champion – Industrial Category, Regional Fire Brigade Competition	SOPI Cagayan de Oro and Bukidnon Chapter	1995
1994		
Outstanding Company Award for its Deep Sense of Social Responsibility which it has demonstrated in its exceptional performance as an active participant in the RP-MCH	Pryce Hotel, Cagayan de Oro	11 December 1994
Plaque of Appreciation for the Most Outstanding Industry, Outstanding role in Attaining the Goals and Objectives of PHILVIDEC Industrial Estate	PHILVIDEC Industrial Estate, Misamis Oriental	13 Aug 1994
Plaque of Recognition for Its Environmental Concern, particularly on the Conduct of the Summer Ecological Camp	CAMP 1, Casa Hidalgo and Tiano Akut Sts.	25-30 May 1994 and 30 June 1994
Plaque of Appreciation for Institutionalizing Labor-Management Cooperation	Development Academy of the Philippines	6 May 1994
1st Place, Busted Hose Connection Competition	Don Gregorio Pelaez Sports Center, Cagayan De Oro	12 March 1994
1st Place, Fire Extinguishment Competition, Industrial Category	Don Gregorio Pelaez Sports Center, Cagayan De Oro	12 March 1994
1st Runner-up, Industrial Category Fire Brigade Competition	Don Gregorio Pelaez Sports Center, Cagayan De Oro	12 March 1994
1991		
Plaque of Appreciation for Valuable Support and Assistance Extended to Cagayan de Oro Fire Station	Cagayan de Oro Fire Station	14 Dec 1991
Special Award for Attaining 12,874,673 Manhours without Lost Time Accident	Safety Organization of the Philippines, Inc. (SOPI)	Oct 1991
2nd Runner-up, 2nd Regional Fire Brigade Competition	Awarded at the Don Gregorio Pelaez Sports Center, Cagayan De	15 Feb 1991

Award or Citation	Place and Sponsor	Date
	Oro	
Special Award for Attaining 10 Years without Lost Time Accident	Department of Labor and Employment (DOLE)	1991
1990		
3rd Place, Regional Fire Brigade Competition	Awarded at the Don Gregorio Pelaez Sports Center, Cagayan De Oro	17-18 Feb 1990
1989		
Special Award for Attaining 10 Million Manhours without Lost Time Accident	Safety Organization of the Philippines, Inc. (SOPI)	1989
1987		
Award of Excellence for Attaining 7 Million Manhours without Lost Time Accident	Safety Organization of the Philippines, Inc. (SOPI)	13 May 1987
1986		
Plaque of Appreciation for Generous and Continuing Support for the College of Law, Xavier University	Xavier University	26 July 1996
Award of Honor for Attaining more Five Years without Lost Time Accident	Safety Organization of the Philippines, Inc. (SOPI)	1986
1985		
Award of Honor for Attaining more than Five Million Manhours without Lost Time Accident	Safety Organization of the Philippines, Inc. (SOPI)	9 Nov 1984
Certificate of Appreciation for its whole-hearted Support in Providing Job Opportunities to Our People	Villanueva, Misamis Oriental	6 August 1985
Plaque of Appreciation for Invaluable Support in the Upliftment and Education of the Children and Youth of Villanueva and Tagoloan, Misamis Oriental through the Scholarship Program and Donation of School Supplies		23 July 1985
Salamat Po Award for Invaluable Assistance to the Typhoon Victims of Tagoloan and Villanueva, Misamis Oriental and Continued Support of the Kaug-maon Youth Center at Jasaan, Misimis Oriental	Local Government of Tagoloan and Villanueva, Misamis Oriental	July 1985
1984		
Recognition Award for Installed and Continuously Operated Adequate Anti-pollution Facilities	National Pollution Control Commission	5 June 1984
Award of Merit for Attaining One Million Manhours without Lost Time Accident	Safety Organization of the Philippines, Inc. (SOPI)	26 June 1984
Nishiyama Memorial Award (Silver Prize) for Outstanding Achievement in Cost Reduction, Effective Maintenance Program and Promotion of Safety and QCC Activities	Nishiyama Memorial Award	1984
1982		
Plaque of Appreciation for Compliance of the Fire Safety and Invaluable Support to Integrated National Police (INP)	Cagayan de Oro Fire Station	Dec 1982
1981		

Award or Citation	Place and Sponsor	Date
Special Award for Achieving 15 Million Manhours without Lost Time Injury	Safety Organization of the Philippines, Inc. (SOPI)	30 Sept 1981
Certificate of Appreciation for Unselfish and Dedicated Support to Scholars	Kalilangan High School	5 Jan 1981
1980		
Energy Conservation Special Award		1980
1979		
Manila Enercon Recognition Award	Manila Peninsula Hotel, Makati	1979
Recognition Award for Installed and Continuously Operated Adequate Anti-pollution Facilities	National Pollution Control Commission	1979

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