BIRD'S NEST RESOURCES CORPORATION

ENVIRONMENTAL IMPACT STATEMENT

Mompong River Restoration Project

Sablayan, Occidental Mindoro

Version	:	0.0
Date	:	18-May-2022
Prepared by	:	GreenDevelopment Sustainable Solutions, Inc.

Document Information

Title	**Environmental Impact Statement (EIS)**
Prepared for	Bird's Nest Resources Corporation (BNRC) Bencom, Building, Barangay Phil-am, Quezon City, Philippines
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EIA COVERAGE & REQUIREMENT SCREENING CHECKLIST (ECRSC)

Purposes of the Screening Checklist:

1. ***Self-Screening Form by the Proponent (unofficial, for guidance purposes)***
2. Screening Validation Form by the EMB (official; signed copy may be transmitted to banks, economic/industrial zone administrators, other users who request EMB validation, or any entity EMB may want to inform)
3. Site Inspection Report Form by the EMB for ECC/CNC applications
4. Site Inspection Report Form by the EMB for suspected or reported projects operating without ECC

A. SCREENING FOR EIA COVERAGE AND REQUIREMENTS			
1. Purpose of Screening	Proponent Self-Screening for [√] ECC, [ ] CNC, [_] ECC Amendment		
2. Project Name	Mompong River Restoration Project		
3. Project Location	Municipality of Sablayan		
4. Proponent Name	Bird's Nest Resources Corporation		
Proponent Address	Bencom, Building, Barangay Phil-am, Quezon City, Philippines		
Contact Person Name	Steve Taule		
Proponent Means of Contact	Telephone Number: +632 8529-4741 local 112 Email address: tauleteb02@gmail.com		
5. EIS Consultant and Contact Information	GreenDevelopment Sustainable Solutions, Inc. 3F Unit 8, Arcade 1 Bldg., 68 Don Alejandro Roces Ave, Quezon City Tel. Nos. (02) 8362 4933; email: info@greendevsolutions.com		
10. Project's Component & Categorization	EIS-BASED CATEGORY B PROJECT		
12. Project Group based on Type of Threshold Only	Single Project: **[√] Group 1 (ECP in ECA/NECA)** [ ] Group II (NECP in ECA), [ ] Group III (NECP in NECA) [] Group IV (Co-located Project in ECA/NECA) [_] Group V (Unclassified Projects)		
13. EIA Report Type	**[√] EIS** [_] PEIS [_] IEER [ ] PDR [ ] EPRMP [_] PEPRMP [ ] IEEC [_] Letter Request		
17. Processing/ Endorsing Authority	[__] EMB CO Director **[√] *EIAMD Chief*** *Refer to Table 3*		
18. Application Deciding Authority	**[√] *EMB RO Director*** [ ] EMB CO Director [] DENR Secretary		
SIGN-OFF PAGE FOR PROJECT PROPONENT			
Project Proponent		Date of Signing	
Received by EMB: Signature over Printed Name		Date of Receipt:	
Remarks by EMB			
SIGN-OFF PAGE FOR EMB (For Purposes #2,3,4)			
Prepared by EMB Regional Office_ Signature over Printed Name		Date of Signing	
Remarks by EMB Regional Office			
Remarks by EMB Central Office			

TABLE OF CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY

ES.1 Project Fact Sheet

Project Name	Mompong River Restoration Project
Project Location	Brgy. Tuban, Brgy. San Nicolas, Brgy. Sta. Lucia, Brgy. Brgy. Malisbong, Municipality of Sablayan, Occidental Mindoro
Name of Project	Mompong River Restoration Project
Estimated Total Volume to be Dredged	42,746,263.43 cu.m
Average Design Depth	5 meters
Project Area	Mompong River (the area will cover a length of about 200 m of the central part of the river and approximately 500mx500m of foreshore area of the river mouth of Mompong River)
Project Life	5 years
Indicative Project Cost	Php 136,810,347.00
Project Proponent	Bird's Nest Resources Corporation
Office Address	Bencom, Building, Barangay Phil-am, Quezon City, Philippines
Authorized Signatory / Representative	*President & CEO*
Contact Person and Information	Steve Taule Compliance Officer Mobile : +63915 562 7782 Email : tauleteb02@gmail.com
Project History	According to the MIMAROPA Regional Development Plan 2011-2016, in terms of flooding hazard, the major hotspot areas in the region are the provinces of Occidental Mindoro, Oriental Mindoro, and Marinduque. This includes the municipality of Sablayan where the Mompong River is located highly susceptible to deltaic flooding during period of incessant rainfall. Mompong River watershed is listed as one of the critical watersheds in Mindoro Occidental that supplies water and irrigation for the locals. With the steady rise of population in the area and impacts of climate change, the frequency of flooding along the stretch of the river posed as threat to the safety of the locals and economy. It is therefore vital to take action to prevent this threat and to promote economic growth and development within the locality.
Project Rationale	The project area is located in Mompong River, located in the municipality of Sablayan. The main purpose of the dredging project is to increase the capacity of discharge flowing and to minimize amount of silt amount accumulated in the river mouth.

ES 2 Process Documentation of the Conduct of EIA

1 Based on Presidential Decree 1586 or the Philippine Environmental Impact Statement System, DENR Administrative Order No. 30 of 2003 (Implementing Rules and Regulations of PD 1586), and EMB Memorandum Circular No. 4 series of 2015, the proposed project is within Category B: Non-Environmentally Critical Project, thus it requires the preparation of Environmental Impact Statement (EIS) for the application of the Environmental Compliance Certificate (ECC) in EMB Regional Office.

ES 2.1 Reference and Guidelines for the EIA Study

2 The primary reference and guideline in undertaking this Environmental Impact Assessment (EIA) study is the DENR AO 2003-30 (Implementing Rules and Regulations of the Philippine Environmental Impact Statement System), which follows the recommended format and outline of the contents of the said manual.

3 Scoping is a stage in the EIS System where information and project impact assessment requirements are established to provide the Proponent and the stakeholders the scope of works and terms of reference for the EIS. Scoping sessions and consultations with EMB and the Review Committee and resource persons will take place at EIA level, respectively, which will provide essential inputs and context for identifying and assessing environmental impacts and the drafting of the Project's environmental management plan.

ES 2.2 The EIA Team

4 Bird's Nest Resources Corporation (BNRC) engaged with GreenDevelopment Sustainable Solutions, Inc. (GSSI) for its consultancy services to conduct the EIA for the Project, prepare the EIS, and secure the ECC. The EIA team is composed of the following professional experts based on their respective fields:

Name	EIA Component / Involvement	EIA Registration No.
Joseph JR Anders Abella	Project Manager / EIA Team Leader	IPCO-370
Jerome T. Magdato	Peer Review / Report Integration / Meteorology Air Quality and Noise, Climate Change Projections	IPCO-324
Felixberto M. Centeno	Hydrology	IPCO-290
Tomas D. Reyes	Terrestrial Ecology	IPCO-386
Benjamin S. Francisco	Marine and Freshwater Ecology	IPCO-038
Mark Abrenica	People, SDP and IEC Framework	-
Cathy Petalcorin	Peer Review / Report Integration	-
Oliver V. Macaranas	Peer Review / Meteorology	-

ES 2.3 EIA Study Schedule and Area

5 The summarized schedule of activities for the EIA study is presented in the table below.

EIA Activity/Stage	Date
IEC and Household Perception Survey	January 15-16, 2021
Submission of Project Description Report for Scoping	August 9, 2022
Public Scoping	August 29, 2022
Submission of Public Scoping Report	September 9, 2022

EIA Activity/Stage	Date
Technical Scoping	September 20,2022
Baseline Characterization (Assessment and Sampling)	June 3, 2022
EIS Report Preparation and Lab Analysis	June 27, 2022 / June 6, 2022
Submission of Draft EIS Report	
1st Technical Review	
Receipt of Signed AI Letter for 1st Deliberation	
Submission of First AI	
2nd Technical Review	
Receipt of Signed AI Letter for 2nd Deliberation	
Submission of Final Report	

6 The EIA study area for the proposed Mompong River Restoration Project is located in Barangay Tuban, Barangay San Nicolas, Barangay Sta. Lucia, Barangay Malisbong, Sablayan Occidental Mindoro.

ES 3. Description of Key EIA Methodologies

7 The Project EIA report addresses environmental effects that include biophysical aspects such as air, water, soil and terrain, land use, and social and economic aspects. The scope of the Project for EIA involves decommissioning and abandonment. The overall approach to conducting EIA for this Project is shown below.

Environmental Assessment Framework

Environmental Study	Sampling and Analytical Method / Data Source
Scoping and Ocular Visit	• Site Visit and data gathering • Validation of permits • Inventory and component confirmation • Identifying issues of concern and possible action
Soils and Land Use	• Mapping data from NAMRIA • Land Use and Classification
Geology and Geohazard Assessment	• Geohazard Mapping based on Local Government Agencies (MGB, Phivolcs data) • Geological Information from Geological and Geohazards reports and • Secondary sources (MGB, Philvolcs data)
Terrestrial Flora and Fauna	• Flora - Nested quadrat sampling and transect method • Fauna - Transect walk and mist-netting
Hydrology	• On-site observation (rainfall monitoring data); • Secondary data sources (PAGASA, published reports) • Watershed Mapping and Streamflow measurements • Flood Assessment
Water Quality	• Grab Sampling and analysis of Freshwater and Marine Water ○ pH – Glass Electrode (in situ) ○ Dissolved Oxygen - DO Meter ○ True Color - Visual Comparison Method (Platinum Cobalt Scale) ○ BOD_5 - Azide Modification (Dilution Technique) ○ TSS – Gravimetric (dried at 103-105 deg. C ○ Oil and Grease – Gravimetric (Petroleum Ether Extraction) ○ Fecal Coliform - Multiple Tube Fermentation Technique ○ Nitrate – Brucine Sulfate

Environmental Study	Sampling and Analytical Method / Data Source
	○ Phosphate - Stannous Chloride Method ○ Turbidity – Nephelometric ○ Temperature – Direct Reading – Instrument Method ○ Surfactants (MBAS) – Methylene Blue Method (Colorimetric) ○ Chloride – Argentometric ○ Arsenic (As) – Silver Diethyldithiocarbamate Method (Colorimetric)
Freshwater and Marine Ecology	• Aquatic Communities Assessment: Phytoplankton, Zooplankton, Macro-benthos, and Fish
Climatological Data	• Secondary Sources both published and Online
Ambient Air Quality and Noise Level	• Noise Level: Sound Level Meter - Direct-reading • Ambient Air Quality Sampling: ○ TSP - High Volume - Gravimetric Method ○ PM_{10} - High Volume - Gravimetric Method ○ SO_2 - Impinger - Pararosaniline Colorimetric Method ○ NO_2 - Impinger - Griess Saltzman Reaction method ○ Noise – Direct Reading – Instrumental Method
People	• Public Participation Activities • Perception Survey • Focused Group Discussion • Secondary Data
Analysis of Key Environmental Impacts	• Impact analysis of the Project • Assess effects of the Project on biophysical, land use, and socio-economic aspects
Identification of Mitigation and Impact Management	• Recommend mitigation measures
EIS preparation	• Review secondary data and sources gathered • Validate data gathered from secondary data and the site visit • Preparation of report based on impact analysis and mitigation • Completion of the report based on the data and analysis gathered • Draft report completion and review • Final report submission

Module	Philippine Standards
Ambient Air Quality	Philippine Clean Air Act of 1999, Republic Act 8749 National Ambient Air Quality Standards and Guidelines Values, "Implementing Rules and Regulations of the Philippine Clean Air Act of 1999, DENR Administrative Order 2000-81
Noise	The National Pollution Control Commission (NPCC) Memorandum Circular No. 002 Series of 1980, Section 78 – Ambient Noise Quality and Emission Standard of Noise
Water Quality	DENR Administrative Order No. 2016-08: Water Quality Guidelines and General Effluent Standards of 2016 and DENR Administrative Order No. 2019-20 DENR Administrative Order No. 2005-10: Implementing Rules and Regulations of the Philippine Clean Water Act of 2004 (Republic Act No. 9275)
Hazardous Waste	DENR Administrative Order No. 1992-29: Implementing Rules and Regulations of the Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (Republic Act No. 6969)

Module	Philippine Standards
Solid Waste	DENR Administrative Order No. 2001-34: Implementing Rules and Regulations of the Philippine Ecological Solid Waste Management Act of 2000 (Republic Act No. 9003)

ES 2.3 EIA Summary

Environmental Component	Key Findings
Physical Environment - Land	The project site is located in the municipality of Sablayan in the province of Occidental Mindoro. The area covers four barangays of Sablayan, namely: Tuba, Sta. Lucia, San Nicolas and Malisbong. Based on the Existing General Land Use Plan, the project site is classified as underwater use. The surrounding area of this channel is currently for agricultural use. The land use classification remains the same with respect to the Proposed General Land and Water Use Map. There will be no long-term structures and development onsite, thus, there will be no need for any land change use. The geologic map of Mindoro Island shows that Neogene sedimentary rocks underlie the project site. These rocks refer to the Miocene-Pliocene age sedimentary rocks, comprised dominantly by shale, siltstone, sandstone, conglomerate, and limestone. However, along the riverbed of Mompong River, sediments mainly sand-sized and pebble to cobble-sized occur. These were observed during the initial river channel survey analysis and geologic sampling. The said deposits decrease in size going downstream, and most of the pebble to cobble-sized sediments are located at the inner bank of the river. The topography of Sablayan is characterized by successive ranges of mountains from rolling, steep, very steep and serrated ridges. Between these mountain ranges occur deep sided canyons, intermittent valleys, and elongated plateaus with level and rolling plains along the coastal regions. In addition, there are 15 soil types found in Sablayan. These are: are Buayan, Buguey, Baler, Umingan, Tagulod, Catanauan, San Manuel, Babuyan, Bolinao, Tilik, Alimodian, Boac, Banto, Magsaysay and Tarug Series. Tilik Clay Loam is the predominant soil series in the municipality, covering an area of 69,774.85 hectares (32% of the municipality's total land area) and is described as rolling to moderately steep, steep, and very steep slopes. On seismicity, there are three earthquake generators proximal to the project area – the Central Mindoro fault, the most proximal at 47.2 km away, the Southern Mindoro Fault, the Aglubang River Fault and the Lubang Fault. The notable earthquake is the Mindoro Earthquake near Verde Island that occurred in November 15, 1994. The epicenter was located at 13.5° N, 121.1° E with a hypocenter of 15 km. The earthquake was actually tsunamigenic which generated a tsunami that destroyed 1530 houses and killed 41 people (PHIVOLCS, 1994). The earthquake was associated to the Aglubang River Fault. The most proximal fault is the Central Mindoro Fault, which is around 47.2 km away from the project site. The recommended buffer zone, or Zone of Avoidance, against ground rupture hazard is at least 5 meters on both sides of the active fault or from its zone of deformation. Since the nearest fault is 47.2 km away, the project site does not contain any fault within its boundaries nor within 5 meters on both sides of the fault. Thus, there is no threat of ground rupture in the area. Further, the intensity of ground shaking is magnitude-dependent and gradually decreases with distance from the seismic source. The project site classifies under areas not susceptible to earthquake-induced

Environmental Component	Key Findings
	landslides, thus confirming its level topography while inferring that the effect of ground shaking in this area is less than other sites which are said to experience shaking of intensity VII-VIII possibly. On the other hand, the project area's landslide susceptibility is low to none due to the site's gently sloping areas with no identified landslides. The steep to very steep slopes are located northeast of the project site, classified as having moderate to high landslide susceptibility. Concurrently, the project site, especially the area immediate to it, can be said to be generally susceptible to liquefaction due to the presence of the river channel and due to the nature of the sediments that the river brings about to unconsolidated. However, it is to note that no long-term structures are to be built around the area. The degree and extent of vulnerability of an area to volcanic hazards depend on its proximity to an active volcano. Eruption-related hazards include Taal Volcano, located 140.1 km away from the site. The distance, however, makes the area safe from any possible lava flows, lahar, volcanic mudflows or debris flows that may occur in the event that Mt. Pinatubo would erupt. Ash fall, though, may affect the site. Based on the soil map, the area consists of mostly BaM and BaN (Baler Silty Clay Loam), BcP3 (Boac Clay Loam), and BorP3 (Bolinao Rocky Phase). Since there is clay in the soil composition, further testing site must be done to confirm if these would be expansive. Given its location along the Mompong River, the project area has a moderate to high susceptibility. Furthermore, the dredging activities will have no impact on flooding. Instead, channelization via dredging will allow the flow regime to be stabilized.
Physical Environment - Terrestrial Ecology	A total of 110 plots or quadrats were established all over the project area consisting of about 30 standardized plots (10 m x 10 m) and 80 smaller nested plots (2 m x 2 m) for flora inventory and assessment. The standard (10 m x 10 m) plot was intended to facilitate recording of trees and other erect plants with a diameter at breast height (DBH) of equal and more than 1 centimeter. The smaller nested (2 m X 2 m) plot at the center of each plot, on the other hand, was purposely utilized to facilitate listing of ground vegetation and understorey plants with less than 1 cm DBH. Apart from listing down of plant names, bio-measurements such as diameter at breast height (DBH in cm) and total height (TH in m) were recorded at each standard plot. While for the ground vegetation and understorey plants in each nested plot, only the number of individuals and percent crown cover were recorded. In addition, other associated plant species not documented in sampling plots, however seen in the vicinity, were also noted. For fauna, different survey techniques were employed. About 3 mist-netting days for birds and 3 mist-netting nights for bats were carried out for 3 consecutive days and nights. Ten (10) metal traps with baits were installed in 3 days for small mammals, while search method, on the other hand, was considered for amphibians and reptiles. Key informant interviews (KII) were also performed to enrich the field data since some of the fauna are seasonal in nature. Data analyses were limited to species richness, abundance and diversity. Conservation status and endemicity were obtained using the website of IUCN 2021 Red List of Threatened Flora and Fauna and from DAO 2017-11 and DAO 2019-09 for the lists of Philippine threatened species of flora and fauna. The proposed project site along the Mompong River has three (3) distinct major vegetation types: (a) shrubland; (b) grass-dominated vegetation; and (c) agro-ecosystem. The last ecosystem type is further

Environmental Component	Key Findings
	classified, as: (i) banana farms, (ii) corn farms, (iii) vegetable farms, and (iv) rice paddies. A total of 101 species of plants were recorded in the proposed project area, all of which except two (2) were identified down to species level. These belong to 89 genera and 37 families. Herbs dominate in terms of the number of species followed by trees and vines, among all other plant types. The threatened plant species noted were bikal (*Dinochloa acutiflora*), dao (*Dracontomelon dao*), molave (*Vitex parviflora*), tagbak (*Alpinia elegans*), isis (*Ficus ulmifolia*), and lingatong (*Dendrocnide rigidifolia*). The last three species were also found to be endemic to the country. About 34 faunal species were recorded. These include 21 birds, seven (7) reptiles, four (4) amphibians, and two (2) bats. No rodents and other small mammals were caught using traps and baits. More additional wildlife species were noted during the KII, most of which are not anymore evident in the area in a usual day due to anthropogenic disturbances. There were about 11 species of endemic fauna listed mostly thru KII. These include: Philippine duck (*Anas luzonica*), Philippine coucal (*Centropus viridis*), Philippine megapode (*Megapodius cumingii*), colasisi (*Loriculus philippensis*), brown-banded rail (*Lewinia mirifica*), Luzon scops owl (*Otus longicornis*), Mindoro racket trail (*Prioniturus mindorensis*), greater musky fruit bat (*Ptenochirus jagori*), marbled monitor (*Varanus marmoratus*), Philippine sailfin lizard (*Draco rizalii*), and Philippine narrow-mouth toad (*Kaloula conjuncta*). The species diversity is very variable depending on the type of vegetative cover or ecosystem type. Tree diversity is very low in open landscapes while high diversity is computed in all vegetation types for ground vegetation and low stature plants.
Physical Environment – Meteorology and Climate	The meteorological and climatological data used in this study is based on the nearest PAGASA synoptical station and World Weather Online. Sablayan, Occidental Mindoro, where the project is located, is characterized by Type I climate based on the Modified Corona Climate Classification system. There are two pronounced seasons throughout the year, typically dry from November to April and wet during the rest of the year. The months of June to October generally receive the most amount of rainfall. The PAGASA data shows that the rainiest months are between May to October. It is forecasted that majority of rainfall in the area is brought by the southwest monsoon. Further, the most humid months are expected between June to October with mean values ranging from 83 to 87 percent. Additionally, the monthly wind direction reckoned at the synoptic station at the San Jose, Occidental Mindoro PAGASA Station shows westerly winds generally prevail throughout the year.
Air and Noise Quality	The reference of the air and noise quality is based on the ambient air quality standards of the Department of Environment and Natural Resources (DENR) Administrative Order No. 2000-81 (Implementing Rules and Regulations of the Philippine Clean Air Act of 1999), and with the noise level standards of the National Pollution Control Commission (NPCC) Memorandum Circular 002 Series of 1980. The pollutants considered for the ambient air quality monitoring were total suspended particulates (TSP), Particulate Matter Less than 10 (PM10), sulfur dioxide (SO2) and nitrogen dioxide (NO2). Three (3) designated sampling stations at the vicinity of the project were tested

Environmental Component	Key Findings
	for TSP, PM10, SO2 and NO2. In addition, noise level measurements were also undertaken at the same stations. The amount of the pollutants collected in the sampling stations was relatively low and within the ambient air standards of DENR. On the other hand, noise levels were slightly higher than the NPCC standards. This is due to the unexpected loud noise during the sampling hour. The sources were children playing basketball, blowing of horn, light to moderate rainfall, and animal calls (i.e., crowing roosters, choiring birds).
Physical Environment – Hydrology and Water Quality	**A. Hydrology** The Mompong River with catchment area of about 3,380 hectares is draining Mt. Siburan. The headwater is dendritic consisting of two major streams that converge to form the Mompong River. After the confluence, the stream flows southwest as it meanders towards Pandan Bay. The channel is relatively shallow but is at least 100 m wide and still exhibits widening going downstream. The riverbed consists of cobbles, gravel and sand while grasses grow after the riverbanks. The water depth is shallow and is limited to the deeper section of the riverbed. The streamflow is turbulent with slightly turbid water. The small-scale quarrying and pumping of water for irrigation are the primary usage of Mompong River. The Mompong River is ungauged. Hydrologic and sediment transport simulations were conducted to characterize the hydrologic characteristics of the river. The result of hydrologic simulation indicated an optimum flow ranging from 589.34 m^3/s up to 1,863.87 m^3/s from 2-Yrs RRP to 100-Yrs RRP, respectively. The optimum flow occurs 20 hours after the start of rainfall or a lag time of 8 hours from the peak rainfall. The gentle slope of the area, low drainage density or few streams receiving surface runoff draining to Mompong River, and the relatively long river channel are some of the factors that contribute to the longer lag time. The result of hydrologic simulation indicated that flooding is expected at baseline condition from 2-Yrs RRP up to 100-Yrs RRP. The projected inundated area is increasing with the higher rainfall return period and from upstream going downstream. The inundated area is wider at the floodplain on the left bank. A community to the left of Mompong River and its adjacent agricultural area are expected to be flooded even at 2-Yrs RRP. The diverging streams from the main channel of Mompong River serve as the pathway of floodwater that inundates the community and its adjacent agricultural land. In general, the extreme rainfall events will cause degradation or lowering of the invert elevation or riverbed in most sections of the river. The optimum lowering of the riverbed after extreme rainfall recession could reach up to 0.85 m. On the other hand, the optimum aggradation or sediment deposition could reach only up to 0.39 m. The predicted river aggradation and degradation will subsequently result to riverbed mass accumulation and loss, respectively. The mass gain and loss are expected to increase with higher rainfall return period. The optimum mass loss ranges from 58,607 tons at 2-Yrs RRP to 94,857 tons at 100-Yrs RRP. On the other hand, the aggradation is from 65,127 tons to 136,271 tons at 2-Yrs RRP and 100-Yrs RRP, respectively. Considering that the decrease in depth due to erosion is higher, it indicates that wider area is covered by the aggradation thus

Environmental Component	Key Findings
	spreading the higher volume of sediments without resulting to significant increase in mass of the riverbed. **B. Potential Impacts and Mitigating Measures** The direct impact area (DIA) encompasses the project site while the Indirect Impact Area (IIA) consists of the floodplain, coastal outlet of the river, and the agricultural lands that are using the river as source of water for irrigation. The dredging or development phase will include activities such as excavation, hauling and storage of excavated materials, and setting-up of area for site office, equipment terminal and fuel farm. The dredging will directly affect the drainage morphology while the development of support facility offsite could change the mode of surface runoff generation and its conveyance to the natural waterway. A depression could be formed by the dredging activity which will act as reservoir and block the continuous flow in the channel. The exposed ground surface could facilitate water infiltration and percolation during rainfall and possibly cause erosion and landslide upon saturation. Re-routing of the streamflow away from the dredging area thru construction of temporary channel should be implemented to ensure unobstructed flow. A sedimentation pond should be provided for the settling of sediments in the runoff from the dredging area. The settled sediments should be regularly collected and disposed in designated disposal site to prevent its resuspension. The excavated materials in the dredging activities should also be transported to designated stockpile area. The stockpile should be enclosed by a drainage system connected to the sedimentation pond prior to the final discharge. In addition, a stockpile will also be assigned for the storage of waste materials to be generated from the ground clearing and preparation of the offsite support facility. Upon completion of river dredging, an unobstructed streamflow is expected due to widening and deepening of the river channel. The surface runoff from the catchment area could be contained within the river channel. The formation of diverging channel is no longer possible due to deepening of the main river channel. This could result to the increase in the volumetric flow of the main channel. In addition, no flooding is expected since the flow could be fully-contained in the river channel. The sediment transport will be greatly reduced during project operation. The projected change in invert elevation is less than 1.0 cm even at 100-Yrs RRP with no noticeable change in the depth of the riverbed at Stn 8+900. In general, sediment scouring or degradation occurs at the upstream sections while aggradation is prevalent at the downstream section upon project completion. During operation, no significant change in the mass bed is noted due to slight change in the invert elevation. The projected change in the mass bed is below 10,000 tons up to the 50-Yrs RRP. This could be attributed to the widening of the riverbed wherein the aggradation or degradation is evenly distributed to wide area thus effecting slight change in the riverbed elevation. Mompong River is primarily used as source of water for irrigation. The downstream area not being served by NIA particularly downstream that could be affected by the project is using the diverging streams that is passing the agricultural land. The flow of water in these diverging streams will be stopped from construction until the project operation.

Environmental Component	Key Findings
	Thus, the project proponent should provide alternative source of water for the current users of the diverging stream. They could possibly coordinate with the NIA, LGUs, and the current water users on how the water requirement could be supplied. No groundwater source and/or users are observed within the project area and vicinity that could be affected by the project. **C. Water Quality** *Baseline Conditions* Except for fecal coliform, the 3 surface water sampling stations have met the DENR Water Quality Guidelines (WQG) for Class C. The birds and roaming animals could have contributed to the fecal coliform detected in the 3 sampling stations. Most of the contaminants analyzed are quite low or not detected. The marine water is suitable for Class SB classification or for primary contact recreation such as bathing and swimming with only MW1 exhibiting fecal coliform slightly above the WQG. On the other hand, the relatively high temperature at MW3 could be partly attributed to the ambient condition during the sampling. The mitigation measures to minimize the potential impact on hydrologic conditions are also applicable to prevent the water quality pollution. Furthermore, no wastewater will be disposed without treatment. This will include the treatment of sewage through septic tank and interception of oil-contaminated wastewater to oil-water separator for oil recovery prior to disposal. A paved area will be designated for the repair and maintenance of vehicles and heavy equipment with the drain to be connected to the oil-water separator. All petroleum-based storage and handling areas will be paved with bund wall to prevent groundwater contamination and facilitate easy clean-up and recovery of spills. Lastly, a solid waste management plan will be implemented to prevent deposition of solid waste in the waterways.
Physical Environment – Marine and Freshwater Ecology	**Marine Ecology** The primary assessment of estuarine and coastal habitats and resources in the nearshore area fronting the Mompong River Dredging Project that can be potentially affected by the proposed dredging in 11 kilometers of the river. The assessment covered a stretch of more than 1 kilometer of the inter-tidal zone in front of the estuary and about 500 meters of estuarine area inside the river mouth. More importantly, the survey was conducted to identify any coastal benthic habitat that may be vulnerable to stresses from potential anthropogenic environmental impacts associated with the Project's establishment and operation. This information will then be used to enable the development of appropriate response measures to ensure that such impacts are reduced over the long term and in the most efficient way possible. It is to be noted that the benthic environment in the estuary and coastal zone in front of the river has already been significantly altered due to constant sediment streams and accretions from the river over the years. The stretch of sandy beach and the nearshore waters in front of the proposed river dredging project's coastline are the primary impact areas. The estuary is already covered in sand deposits, but the coastal waters and seabed configuration is typical of a sloping sandy-muddy shelf with deeper cuts. The overall result of the assessments indicates that the primary coastal impact area of the proposed causeway project in Mompong, Sablayan is largely devoid of significant habitats and

Environmental Component	Key Findings
	resources that can be negatively impacted by dredging, plant construction, vessel navigation, and project operations. **Freshwater Ecology** The Mompong River system is the major freshwater surface water system that runs through Sablayan. The Mompong River originates in the Mount Iglic-Bato Mountain range and flows for approximately 30 to 35 kilometers through the boundaries of five (5) Sablayan Barangays before emptying into an estuary in the Dongon Bay, which is part of the larger Mindoro Strait. The river flows through low gradient meadows that are mostly barren and devoid of dense households and settlements. The assessment reveals very poor macro-invertebrate aquatic biota diversity consisting of approximately 43 individuals in eight taxa – five gastropods, two bivalves, and one penaeid crustacean. Pomacea gastropods dominated the river system. In terms of richness, the highest recorded number of species was found in the upstream station while no taxa were observed in the lower downstream station. The freshwater prawn and brackish water fishes and crustaceans documented in the Mompong River are of high conservation value, although they are not reported as threatened and endangered. None of the cataloged species are endemic. These species, particularly the freshwater prawn in upstream and estuarine stations, have significant commercial value as fish food. Further, all of the fish observed to be caught in the Mompong River including those captured by fishers in the estuary are food fishes but most are of juvenile sizes, indicating growth overfishing most probably caused by extensive use of fine mesh nets and alteration of riverbed habitats. Overall, rotifers were the most dominant group accounting for 45% of the total zooplankton abundance.
The People – Traffic Assessment	Sablayan is traversed by a national road linked to the municipalities of Abra de Ilog in the north and Magsaysay in the south, both located within the Province of Occidental Mindoro. The stretch of the national road is mostly concrete paved with patches of all-weather pavement in critical areas. In the urban core, the road network is made up of asphalt and concrete. Bridges along the national road are mostly made of concrete while those which are located inlands are either bailey or timber bridges. Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road are the identified roads which will be primarily affected by the project during the river restoration for a short period. The Mindoro West Coastal Road where the access to the project is located will be mainly affected during the river restoration period. The Mindoro West Coastal Road is a 2-way-2 lane roadway with a 6.7-meter carriageway width. It is classified as a National Secondary Road based on the Road Traffic Information of the DPWH. On the other hand, the JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road is also a 2-way-2 lane roadway with a 6.7-meter carriageway width but classified as a National Tertiary Road based on the Road Traffic Information of the DPWH. According to the 2019 Annual Average Daily Traffic (AADT) from the DPWH records, there are 6,724 vehicles along Mindoro West Coastal Road while there are 1000 vehicles along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road. Out of the total vehicles, the portion of truck traffic is 5.1% along Mindoro West Coastal Road while 7.5% is along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road. However, due to the effect of pandemic, there were inconsistencies in

Environmental Component	Key Findings
	the traffic data. In order to formulate forecast, the 2021 AADT will be utilized as the base volume for traffic forecast without relating the volume to other historical data. The forecast presents the traffic during a typical off-peak hour since project related trips will most likely happen during the off-peak periods. The table below makes the assumption that the project will begin in 2023 and last until 2028. The volume-capacity ratio without the project ranges from 87 to 105 and 203 to 252 when the project exists. By maintaining a high level of service, all roads will be able to handle the volume of traffic generated by the projected forecast.
The People – Socioeconomic & Cultural Environment	Sablayan is a first-class coastal municipality in the province of Occidental Mindoro. It has a total land area of 229,559.1741 hectares subdivided into its 22 barangays, three of which are classified as urban while the remaining 19 are all rural. Among these barangays, four were only considered as part of the impact area of the project. These barangays include Malisbong, San Nicolas, Santa Lucia, and Tuban. Further, it is recorded that there are no existing parcels of land with Certificate of Ancestral Domain Claims and Titles (CADC/CADT) within the project area. In terms of socio-cultural and economic profile, Sablayan is predominantly a Tagalog speaking locale. The majority of its members speak the dialect, followed by Ilocano, Cebuano, and Mangyan. A significant number of the total population belongs to the Roman Catholic sect of the Christian religion. In the aspect of healthcare, each barangays have Barangay Health Workers and Barangay Nutrition Scholars who are actively assisting the community. These health personnel manage the medical complaints and provide first aid treatment and carry out the health programs of the DOH to the residents. Additionally, the water sources of the four (4) barangays were mainly from shallow wells. At the municipal level, Sablayan Water District provides Level III water supply in the urban core and seven rural barangays. There are still some households that rely on natural water sources like springs, lakes, rivers, and wells, especially in rural areas. The pitcher pump is the most popular method of drawing water from the ground, but some households, particularly those in rural areas, still rely on natural water sources like springs, lakes, rivers, and wells. Pitcher pumps are the most typical method of extracting ground water. **Impact Assessment** During the Project's operation phase, a brief influx of workers is to be anticipated, which could cause the impact barangays to experience an increase in the number of informal settlers. As a result, the project has no negative effects on forced relocation. It is advised that the LGU and the barangays collaborate to organize the monitoring and stop the encroachment of squatters in the area. On the other hand, community operations will not be significantly affected during the whole project implementation but even augment the services and resources of the host communities because of the revenue and development programs that it will bring to the barangays and municipality. Nuisance and alteration in the routine of the residents and circulating population in the project's area of influence are expected during the operation phase. Concurrently, implementation of the project will improve the standard of living of some residents in the host locations

Environmental Component	Key Findings
	brought about by additional jobs and higher household incomes. In general, improvement in demand for local services and commerce is expected during project operations. When the mobility and demands for goods and services boomed as a spill-over impact of the project, taxes, incentives, and fees from the project during its operation phase will absolutely increase the revenue generated by the LGU.

1 PROJECT DESCRIPTION

1.1 Project Description

Project Name	Mompong River Restoration Project
Project Location	Municipality of Sablayan, Occidental Mindoro
Project Type	River Dredging Project
Project Area	Mompong River
Type of Dredge Work	Cutter Suction Dredge
Estimated Total Volume to be Dredged	42,746,263.43 cu.m
Average Design Depth	10 meters
Estimated Project Duration	5 years
Total Initial Project Cost	Php 136,810,347.00

1.2 Profile of the Proponent

Name of Proponent	Bird's Nest Resources Corporation (BNRC)
Proponent's Address	Bencom, Building, Barangay Phil-am, Quezon City, Philippines
Authorized Signatory / Representative	President & CEO
Contact Person / Position	Steve Taule Geologist
Contact Information	Mobile : +63915 562 7782
	Email : tauleteb02@gmail.com

8 Bird's Nest Resources Corporation (BNRC) aspires to become one of the Philippines leading natural resources development company. The company engages in the exploration, development and operation of mineral and quarry resources around the country.

9 BNRC promotes the implementation of the best available techniques and best environmental practices, as well as the generation of employment and economic growth in both urban and rural areas. In cooperation with the local and national government, the company ensures that the benefitsof mining extend beyond the life of the mine itself so that the extractive operation has a positive impact on the natural environment and social community.

10 Sharing the vision for the sustainable development, the company promotes sustainable productionand extraction of mineral resources, and production of construction aggregates, prioritizing environmental protection and the safety and health of its employees above all, while consistently delivering economic growth to its stakeholders, clients, and the community.

11 BNRC aims to prospect or explore for ores, minerals and quarry resources, and acquire, operate, or develop mineral and quarry properties of all kinds, including water rights. The company has filed applications to legally conduct its mining and quarrying activities including but not limited to applications for Mining Permits, Exploration Permits, and Government Seabed Quarry Permit from pertinent government agencies.

1.3 Project Location and Land Area

1.3.1 Description of the Project Area

12 Bird's Nest Resources Corporation enter into agreements for river restoration through dredging and conventional sand and gravel quarrying activities. The survey area is located in the Municipality of Sablayan that is central part of Occidental Mindoro which is geographically situated between N 12°47' and 120°47'E. It is bounded in the north by the municipality of Santa Cruz and the Municipalities of Baco, Naujan, Victoria and Socorro all in Oriental Mindoro province; to east by the municipalities of Pinamalayan, Gloria, Bansud, Bongabong, and Mansalay also in Oriental Mindoro; to the south by the municipality of Calintaan; and to the west by the Mindoro Strait. The survey area covers 4 barangays of Sablayan: Tuban, Sta. Lucia, San Nicolas, and Malisbong. **Table 1-1** present the geographic coordinates of the project site. The project location map is presented in **Figure 1-1** while the vicinity map is shown in **Figure 1-2.**

Table 1-1. Mompong River Geographic Coordinates

Corner No.	Latitude	Longitude
1	12°44'13.65"N	120°47'22.08"E
2	12°43'51.10"N	120°47'31.26"E
3	12°43'38.71"N	120°47'52.25"E
4	12°43'51.74"N	120°48'26.98"E
5	12°44'29.74"N	120°49'2.36"E
6	12°44'48.95"N	120°49'26.99"E
7	12°45'16.58"N	120°49'54.67"E
8	12°46'58.73"N	120°50'21.34"E
9	12°47'19.84"N	120°50'23.72"E
10	12°47'31.84"N	120°50'11.60"E
11	12°46'56.69"N	120°49'37.97"E
12	12°46'13.95"N	120°49'53.85"E
13	12°45'18.46"N	120°49'13.91"E
14	12°46'42.04"N	120°50'19.90"E

1.3.2 Accessibility

13 Occidental Mindoro is approximately 290 kilometers (via Western Nautical Highway) southwest of Manila. It may be reached either by land, water and air transportation. It is 4-to-5-hour drive from Manila and 2-hour ferry ride. For air transportation, there are commercial flights from Manila to San Jose, Mindoro Occidental and you can reach the Mompong River via a 1-hour land travel via Sablayan

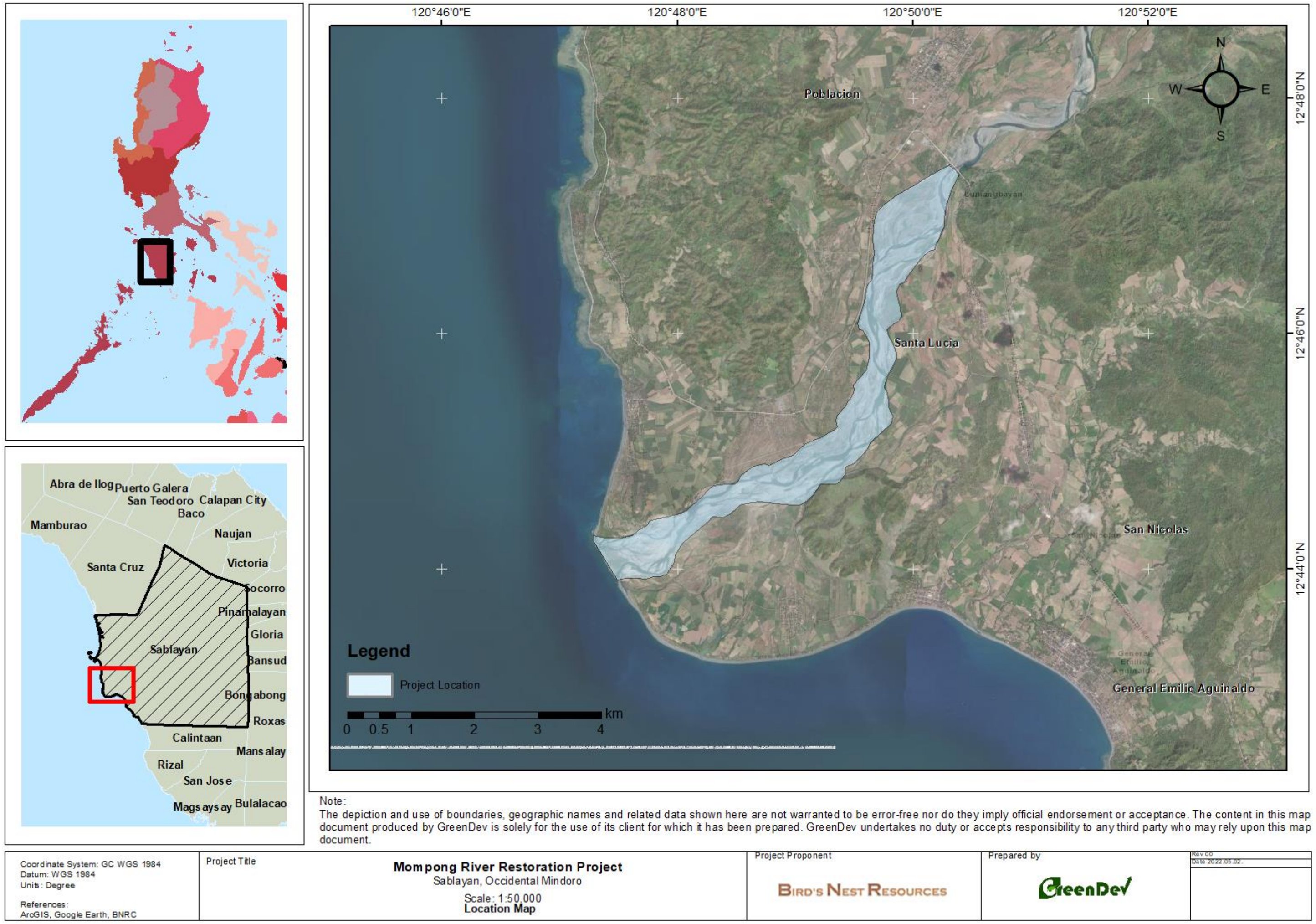

Figure 1-1. Project Location

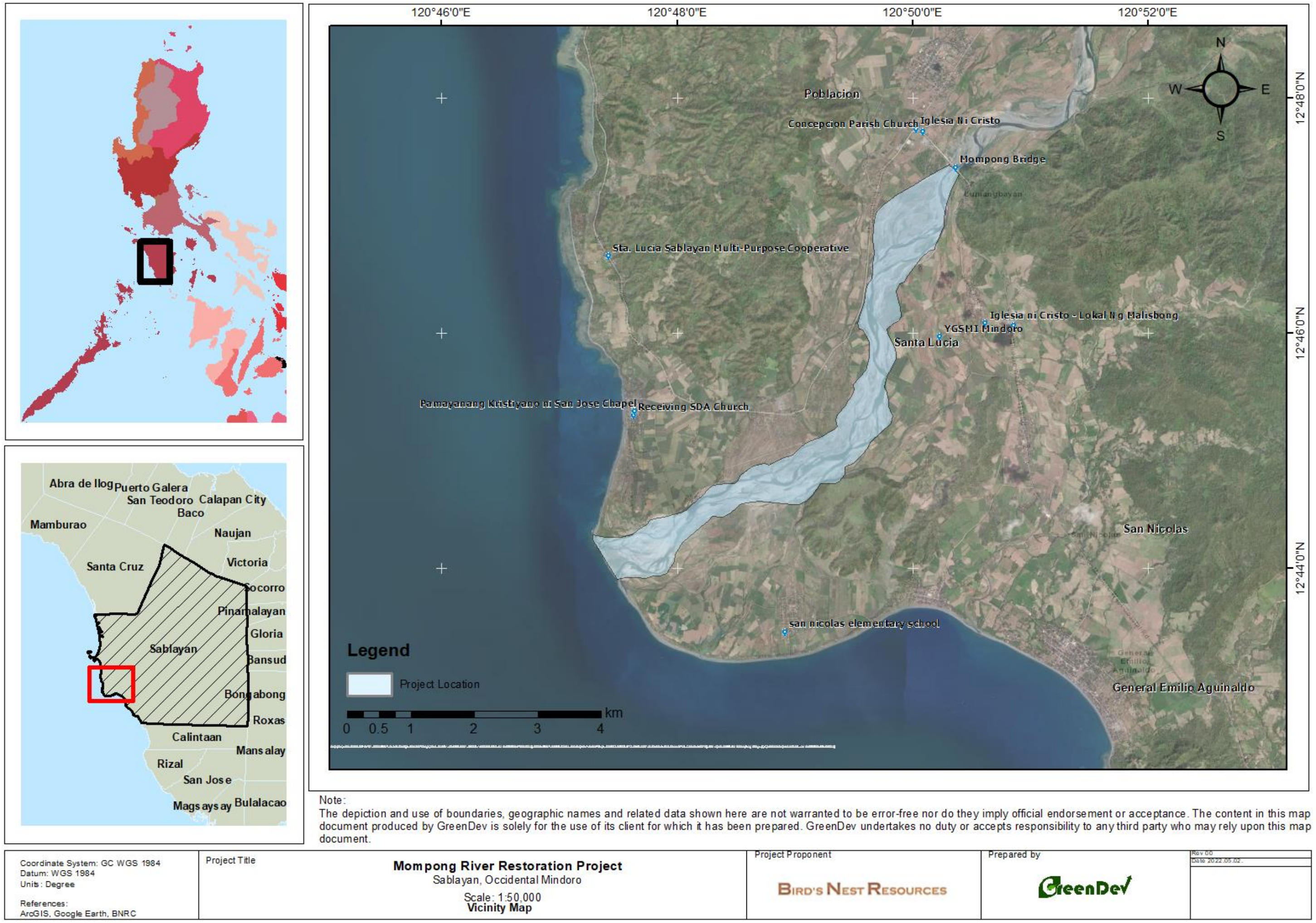

Figure 1-2. Vicinity Map

1.3.3 Direct and Indirect Impact Areas

14 The impact areas were delineated based on Section 10 of DENR Administrative Order 15 series of 2017 guidelines. The direct impact areas are within the Mompong River.

15 On the other hand, the Indirect Impact Areas (IIA) cover the adjacent barangays, the access roads for transport materials and equipment for mobilization, and the place where the construction workers will stay. The direct and indirect impact areas is shown in **Figure 1-3**.

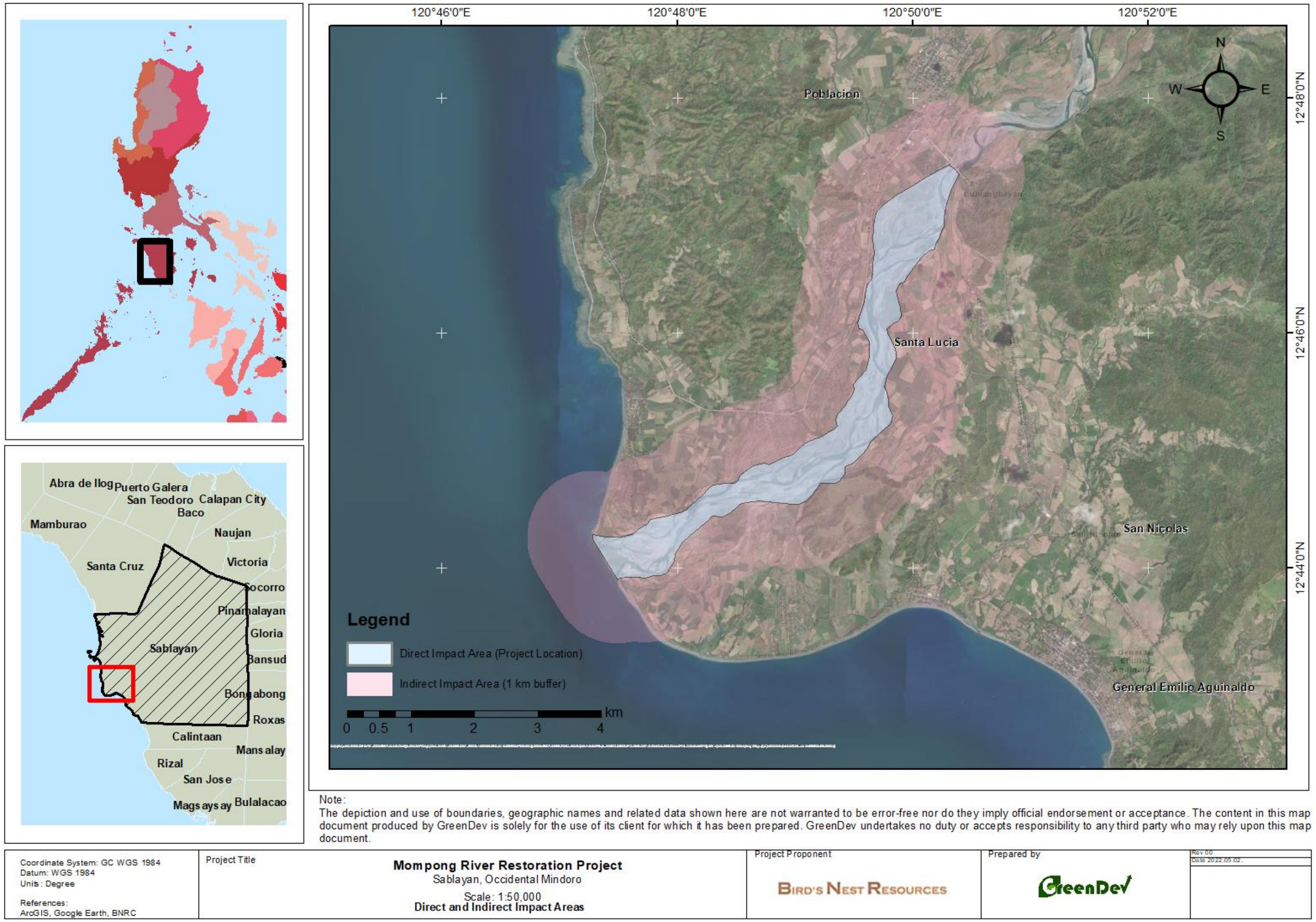

Figure 1-3. Direct and Indirect Areas

1.4 Project Rationale

16 According to MIMAROPA Regional Development Plan 2011-2016 in terms of flooding hazard, the major hotspot areas in the region are the provinces of Occidental Mindoro, Oriental Mindoro, and Marinduque. This includes the municipality of Sablayan where the Mompong River is located that usually overflows during excessive rainfall. The floodplain and delta of Mompong River is also highly susceptible to deltaic flooding during period of incessant rainfall.

17 The Mines and Geosciences Bureau-MIMAROPA (MGB-MIMAROPA), together with the Occidental Mindoro Provincial Government Environment and Natural Resources Office (PGENRO) conducted an assessment of possible River Dredging Zones (RDZ). Based on Mompong River extensive width from the riverbank to the other, the river is characterized as heavy-silted. The inner bends of the river channel are heavily accumulated by eroded sediments that forms numerous point bars and island bars. This is because the erosion of sediments from the outer bend comprises a cut bank and the deposition of sediments on the inner bend that makes up the point bars. The deposits have varying sizes from mud to cobble-sized sediments. Dredging the delineated river dredging zones will mitigate the flooding hazards in nearby communities. All the way to the delta or locally termed as “wawa”, RDZ was assigned to further give way to the volumes of water that are expected to pass through. The total area of the recommended RDZ is 532 hectares.

18 Mompong River watershed is listed as one of the critical watersheds in Mindoro Occidental that supplies water and irrigation for the locals. With the steady rise of population in the area and impacts of climate change, the frequency of flooding along the stretch of the river posed as threat to the safety of the locals and economy. It is therefore vital to take action to prevent this threat and to promote economic growth and development within the locality.

19 The main purpose of the dredging project is to increase the capacity of discharge flowing and to minimize amount of silt accumulated in the river mouth.

1.5 Project Alternatives

1.5.1 Site and Technology Selection

1.5.1.1 Siting

20 The Mompong River Watershed is one of the critical watersheds supplying water for drinking and irrigation in Occidental Mindoro. It has a catchment area of 333.35 square kilometers and covers about 14% of the municipality of Sablayan. As the perennial flooding continues to persist within the area, there is clearly a need for flood control measures to be implemented.

21 In line to the objective in alleviating the flooding within the basin, BNRC conducted a Detailed Engineering Design for this project with coordinated efforts and mandates of the Department of Public Works and Highways (DPWH), Department of Environment and Natural Resources (DENR), and other offices involved in the flood management of Mompong River. The design provides the comprehensive methodology on the calculations and determination of the appropriate channel designs to be employed during operations. Also, the proper dredge and support equipment to be used is identified.

1.5.1.2 Technology Selection/ Operation Process

22 The type of dredging that will be utilized depends on the current physical configuration of the river. For shallow and very silted riverbeds, wet and dry dredging methods such as backhoe, grab buckets,

and other suitable mechanical dredgers are employed. At the offshore 100 meters from the shoreline, all the way upstream of the river 500 meters beyond the shoreline, marine or cuttersuction dredgers may be employed.

23 Cutter suction dredger or sand-pumping vessel will be used for this operation. The sand content of the area is about 70%. Considering the presence of gravel in the sand, a filter is required to be installed on the pump head of sand-pumping vessel. As the water depth at river estuary is 4.8 m, the 5 m dredging depth is considered for initial dredging operation. The depth to be dredged from river estuary to the upstream is 5 meters deep to form thepassage for further dredging operation. Thus, the estimated dredging quantity near river estuary is around 3,800,000 m^3 (76 ha x 5 m = 3,800,000 m^3).

24 When the estuary is dredged to the area where large amount of material are mixed sand and gravel, sand pumping vessels and cutting suction dredger cannot be used to continue the operation. The upstream channel could meet the operation condition of excavator and dump trucks, so excavators and dump trucks are used for dredging in this section. Excavator and dump truck could start the operation from the center of the river to both sides of the river. A temporary shipping port will be set up at the depth of 10m in the southeast side of the estuary, and a crushing and screening plant will be set up behind the temporary shipping dock. The dredging quantity is around 30,000,000 m3.

1.6 Project Components

25 The project will have a minimal impact on the river bottom of the project area where no chemicals will be used in the river dredging operations and no facility will be constructed.

1.6.1 Major Components

26 The major components of the project are as follows:

- Dredging of materials from the Mompong River
- Transportation of the dredged materials

1.6.2 Materials Resource, Human Resources

27 The estuary dredging is mainly carried out by ships and the personnel are mainly ship crew. The upstream course is beyond 500m distance from river estuary. The dredging is mainly operated by excavators and dump trucks. **Table 1-2** shows the personnel and equipment to be used in the operation.

Table 1-2. General Project Components

Series No.	Ship and Personnel	Quantity
1	Cutter-suction dredger with capacity of 2500m^3/h	1
2	Cutter-suction dredger operator	8
3	Pipeline workers	6
4	Tug boat	2
5	Tug boat operator	12
6	Self- propelled belt vessel with capacity of 5000m^3	5
7	Belt boat operator	30
8	Hydraulic Excavator	10
9	Mechanical loader	4
10	Dump truck with capacity of 20m^3	40
11	Crushing Equipment	1
12	Electric Generator	3
13	Quartering hammer	1
14	Administrative staff	3
15	Technician	2
16	Qualify inspector	1
17	Material management staff	3
18	General worker	10
19	Pick-up	3

1.6.3 Equipment Specification

28 The estimated annual extraction using a dredging vessel is about eight million four hundred thousand (8,400,000) cubic meter of river sand. **Figure 1-4** shows the Cutter Suction Dredger to be used while dredger specifications is presented in **Table 1-3**.

Figure 1-4. Cutter Suction Dredger

Table 1-3. Dredger Specifications

Dredger Specifications	
Main Dimension	
a) Length O.A	100.0 m
b) Breadth mid	16.8 m
c) Depth mid	4.8 m
d) Draught	3.3 m
Dredging Capacity	2500 m^3/h
Dredging Depth	63 m. – 25.0 m
Inboard Dredge Pump	
a) Capacity	8000 m^3/h
b) Head	63 m., 1 set, single wall
Submersible Pump	
a) Capacity	8100 m^3/h
b) Head	23 m., 1 set, single wall
Inboard Dredging Pump Diesel Engine	G8300, 2426Kw @ 630 rpm, 1 set
S.D.P. Diesel Engine	G6300, 1470Kw @ 600 rpm, 2 sets
Main Generator Set	250Kw @ 1500 rpm, 3 sets
Harbor Generator Set	90Kw @1500 rpm, 1 set
Cutter Head	
a) Diameter	2520 mm
b) Height	.1540 mm
c) Power	900Kw
d) Drive Type	Hydraulic motor (1200Kw @ 33 rpm, 1 set)
Suction Pipe Diameter	750 mm
Discharge Pipe Diameter	700 mm
Spuds and Carriage	
a) Weight	60t x 2
b) Length	37 m
c) Diameter	1200 mm
d) Cylinder Stroke	6.0 m
Anchor Boom	2 sets

1.7 Process/Technology

1.7.1 Dredging Development Plan

29 The cutter suction dredging vessel will be used for the operation to extract/pump 42,746,263 cubic meters (mineral/sand reserve) of river raw sand with a daily production of 30,000 cubic meter of river sand.

30 The dredging production schedule was based on the usage of a 2,500 cubic meter per hour capacity of the Cutter Suction Dredger. The dredging vessel will operate 12 hours a day for 300 days a year of the operating schedule.

1.7.2 Sequence of Dredging/Quarrying

31 The yearly production of 6,000,000 cubic meter of river sand will be dredged for 5 years starting from east to west, from downstream to upstream of the polygon.

1.7.3 Process Plant

32 Dredging vessels will extract the raw materials through a suction hose connected to the vacuum pump with cutter suction head. The pump produces a vacuum which pulls the materials into the suction hose. For extraction of compacted materials, if any, the dredgers have a cutter head at the end of the suction tube. The cutter head is used to loosen the materials and feed it to the opening of thesuction tube.

33 On ideal condition, the estimated extraction rate of the vessel is 30,000 cubic meter per day of river sand which will pump to the loading barges for stock piling and later will be shipped once the loading barges are in full storage capacity.

1.7.4 Water and Electricity Supply

34 There is no need to consider the supply of water and electricity during the dredging operation at river estuary. Fresh water for personnel is transported from land to ships for use. Fresh water usedin the crushing plant is directly extracted from the river, bottled water for personnel will be purchased. Diesel generators are used to supply electricity for the crushing plant.

35 Transformers, switches, circuit breakers, and other auxiliary equipment installed in an open yard supported by structural steel frameworks laid on reinforced concrete foundation.

1.8 Yearly Mine Production

36 The yearly production schedule table shows the annual production of six million cubic meter (6,000,000 m^3) equivalent monthly of seven hundred fifty thousand cubic meters (750,000 m^3) of river dredge material. The company will use cutter suction dredger offshore and dredging area 500 meters above the shoreline attaining the production of 4,500,000 cubic meter to 6,000,000 cubic meters on the first year. The succeeding years at 6,000,000 m^3 per year may be accomplished with the conventional sand and gravel quarrying.

Table 1-4. Yearly Mine Production Schedule using Dredging Vessel

Mine Production Schedule					
Year	1	2	3	4	5
Million Cubic Meter	6	6	6	6	6

37 The dredged sand has an estimated production cost of Php 192.40/cubic meter. This estimated production cost includes the staff/crew personnel salaries for vessel, barge, fuel, lubricants, freshwater requirement, and port/management charges. The corresponding estimated production cost per annum for four million five hundred thousand (4,500,000) cubic meter yearly production is Php 865,736,000.00.

38 The commercial production of river sand concentrates is estimated to commence after the successful dry run of the dredging vessel and approval of Dredging Permit application with a yearly production as shown above table.

1.9 Project Development Plan

39 The dredging project will have its various activities corresponding to the phases of implementation.

1.9.1 Pre-Construction Phase

40 Prior to the implementation of the project, conduct of significant studies are being done. These includes preliminary design, detailed engineering study, impact study to include geohazard identification and environmental impacts assessments. All the necessary information, plans, and designs will be gathered and prepared relative to the requirements in compliance with the existing laws and regulations applicable to the project. Jurisdiction over the project site, clearances, permits and all other administrative requirements of concerned agencies will also be acquired.

1.9.2 Construction and Commissioning

41 A quality assurance/quality control program during construction and commissioning ensures that equipment is purchased and built according to the design requirements, while meeting all applicable legal and technical standards and codes.

42 The operator's manual should provide guidance and mechanisms to assure that appropriately qualified and trained personnel are used for specified vessel and piping fabrication and for installing safety critical equipment and instrumentation. Include necessary health and safety precautions during operations in addition to the minimum required personal protective equipment (PPE) to all dredge personnel against hazards and risks.

1.9.3 Dredging Operation

43 The extraction/dredging of river sand will simply utilize a cutter dredging vessel with loading/storage barges on the side. These are locally available cutter suction vessel. The vessel will pump the river sand from the river segment area and will be loaded to the holding barges for transport to the approved unloading area. The approved dredging plan can be found in Annex E.

1.9.4 Abandonment

44 After securing ECC, BNRC shall submit to MGB a Final Mine Rehabilitation/Decommissioning Plan (FMRDP) outlining the mine closure scenarios, criteria, performance standards and Decommissioning Plan. Said FMRDP shall be prepared alongside the Environmental Protection and Enhancement Program (EPEP). This EPEP-FMRDP shall be evaluated and approved by the Contingent Liability Rehabilitation Fund Steering Committee (CLRFSC). Its approval shall be made before project operation.

1.10 Organization and Line of Responsibilities

45 BNRC will hire and deploy a total of 47 employees for this Mompong River Dredging Project. The management and admin will consist of 11 personnel, while the cutter suction vessel and barge operation will require 36 personnel.

1.10.1 Management and Administrative Personnel

46 The total number of management and admin personnel is 11. The management and admin personnel consist of the President, VP-Operations and Project Development, Chief Finance Officer, HR Manager, Purchasing Manager, Accounting Head, HR Assistant, Site Purchasing and Inventory Assistant, Environmental Officer, Accounting and Admin Assistant, Safety Officer and Mining

Engineer/Operations Manager.

1.10.2 Vessel and Barge Operations Workforce & Support Group

47 The vessel operations workforce consists of Dredging Supervisor, Maintenance Supervisor Equipment Operator, Dredge Master, 1st Officer, 2nd Officer, 3rd Officer, 4th Officer, Docking and Rigging Foreman, Dredgerman Foreman, Welder, Electrician, Warehouseman/Lubeman, Data Encoder, Checker, Communication Equipment Operator Dredgeman, Checker/Spotter, and Utility Personnel.

1.10.3 Management

48 The total number of management and admin personnel is 12. The management and admin personnel consist of the President, VP-Operations and Project Development, Chief Finance Officer, HR Manager, Purchasing Manager, Accounting Head, HR Assistant, Site Purchasing and Inventory Assistant, Environmental Officer, Accounting and Admin Assistant, Safety Officer, and Project Manager.

1.10.4 Exploration

49 The exploration and drill barge will be manned by a Captain with maritime experience and crew plus periodic visits of Mining Engineer Consultant and Geologist.

1.10.5 River Quarrying

50 A Mining Engineer, Maintenance/Mechanical Manager and Geologist together with Equipment Mechanic/Technician shall be part of the mining or dredging team.

1.10.6 Engineering

51 The engineering team composed of a Mining Engineer, Mechanical/Maintenance Engineer, and Geologist, together with an Equipment Mechanic/Technician, shall be part of the mining or dredging team as well.

1.10.7 Administration

52 The Administration shall consist of Office Manager for the for the field and Administrative Staff, Finance Manager, and support staff.

1.10.8 Environmental and Social

53 The Environmental and Social Team shall be composed of Mining Engineer/Operations Manager, Safety, Health, and Environmental Officer, Administration Manager, and Staff.

1.10.9 Safety and Health

54 The Safety, Health, and Environmental Officer, shall conduct a SHE orientation on daily basis. The SHE Officer shall create a Safety and Health program in relation to the nature of business.

1.10.10 Maintenance

55 Repair and Maintenance Crew shall be headed by a Maintenance Supervisor and will report directly to the Operations Manager on the Predictive and Preventive Maintenance of the vessel as well as support equipment.

1.10.11 Security

56 A well-trained security officer shall head and supervise hired Security Guards from privately licensed security agency.

1.10.12 Sablayan Office

57 The assigned officer in Sablayan shall be completely staffed for purpose of managing, supervising and over-seeing the smooth flow of dredging operation.

1.11 Implementation Schedule

1.11.1 Mobilization of Cutter Suction Dredger

58 Testing of purchased and installed equipment will be on the middle of the 2nd quarter or once the design of equipment. Preparation for application and approval of mandatory technical permits and purchase/fabrication of equipment has been accomplished on the 1st quarter. Dry run of the cutter suction dredging vessel will commence once the approval of the Dredging Permit has been released. The target date of the dry run activity of the dredging vessel and barge will be on the last half of the 2nd quarter. If there are no other issues and adjustment after the dry run of Cutter Suction Dredger, the operations will comment on the mid-3rd Quarter of the year.

Table 1-5. Schedule of Cutter Suction Dredger Operations

Activity Schedule	1st Qtr			2nd Qtr			3rd Qtr			4th Qtr		
Choosing & Purchase of Equipment												
Permits Compliance and Approvals												
Drydocking												
Technical Personnel Hiring												
Purchased Equipment Trial Test												
Dry Run Operation												
Start of Operations												

1.11.2 Test Runs of Cutter Suction Dredging Vessel

59 Dry run of the cutter suction dredging will commence once the approval of the Dredging Permit has been released. The target date of the dry run activity of the dredging vessel and barge will be on the early half of the last month of 2nd quarter of the year.

1.11.3 Start of Operations

60 The commercial production of river sand is estimated to commence after the successful dry run of the dredging vessel and approval of Dredging Permit application.

1.12 Operation Cost Computation

61 River dredging has been one of the emerging industries in our country due to the demand for reclamation materials and construction materials that can be derived from river channels with voluminous amount of river sand deposits. The targeted volume to be dredged in Mompong River is 42,774,404.03 cubic meters**.** Table 1-6shows the cost for monthly direct mining and processing.

Table 1-6. Direct Mining Cost

Particulars	Monthly Cost (PhP)
Operating Cost	136,030,347
Administrative Cost	780,000
TOTAL	**136,810,347**

1.12.1 Mining and Processing Maintenance Cost

62 Dredging maintenance cost of the dredging vessel per month is one percent (1%) of the total operating cost which is Php 1,360,303.47.

1.12.2 Total Dredging Cost

63 **Table 1-6** shows the total quarrying and processing cost.

Table 1-7. Mining and Processing Cost

Particulars	Annual Cost, (PhP)
Dredging Operations	357,209,600
Labor Operating Cost	12,662,000
TOTAL	**369,871,600**

1.13 Pollution Control and Waste Management

1.13.1 Anti-Fouling Curtain

Before the dredging operation of cutting suction dredger at estuary, an anti-fouling curtain will be installed outside the 200m range of the hull to prevent the floating mud formed by stirring the seabed from flowing into the sea. Domestic garbage on ships is not directly discharged into the sea but is collected and regularly transported to designated location on land for disposal.

1.13.2 Wastewater Facility

The wastewater from the Crushing Plant is not directly discharged into the river or sea, it will be transported and processed in a centralized method after collected in septic tanks and sewage collection tanks.

1.13.3 Hazardous Waste Storage

The operation of the project shall conform with the applicable provisions of RA 6969 (Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990) and its corresponding Implementing Rules and Regulations (e.g., Secure Hazardous Waste ID, etc.)

2 ANALYSIS OF KEY ENVIRONMENTAL IMPACTS

2.1 The Land

64 This section presents the potential impacts of the proposed project on the land of the area. Proposed measures to enhance or mitigate these potential impacts are also presented in this section.

65 The methodology involved the following process:

- Review of secondary data such as geologic maps, geologic studies, and reports
- Review of secondary data on terrestrial ecology, including flora and fauna
- Review of soil classification of the project area
- Description of land use of project area

2.1.1 Land Use Classification

2.1.1.1 Methodology

66 This section describes the existing land use within the project area and its surroundings as well as the land classification of the proposed project site to assess the potential project impacts in relation to the following:

- Change/inconsistency in land use;
- Encroachment in Environmentally Critical Areas (ECA); and
- Possible tenurial/land issue

67 Secondary data gathering was conducted to determine the existing land use and classification of the project area. Actual land use was determined through ocular inspection at the proposed project site.

2.1.1.2 Change/Inconsistency in Land Use

68 The project site is located in the municipality of Sablayan in the province of Occidental Mindoro. The area covers four barangays of Sablayan, namely: Tuba, Sta. Lucia, San Nicolas and Malisbong. According to the Comprehensive Land Use Plan for 2015-2042 of Sablayan, the 229,559.1741 (Apo Island) hectares total land area of the municipality is divided into the following land and water use:

Table 2-1. Existing Land and Water Use based on Sablayan's CLUP

Land Use/Water Use Classification	Land Area (hectares)	Percentage (%) of total land area
Forest Use	210,413.9390	91.66
Productive Agriculture	13,130.7848	5.72
Inland Water	3,053.1370	1.33
Roads & other Open Areas	206.6033	0.09
Protection Buffer	459.1183	0.20
Urban Use	1,010.0604	0.44
Mixed agriculture/pasture/scattered trees	229.5592	0.10
Tourism, protected areas	1,055.9721	0.46

69 Based on the Existing General Land Use Plan shown in **Figure 2-1,** the project site is classified

under water use. The surrounding area to this channel is currently for agricultural use. The land use classification remains the same with respect to the Proposed General Land and Water Use Map in **Figure 2-1**, with the addition areas classified under residential and protection buffers surrounding the river channel.

70 There will be no long-term structures and development onsite, thus there will be no need for any land change use. The dredging plan and clearance, along with the Environment Clearance Certificate, will serve as proof that the project is allowed to conduct dredging along that section of the Mompong River.

2.1.1.3 Encroachment in Environmentally Critical Areas

71 The Revised Procedural Manual for DENR Administrative Order No. 30, Series of 2003 (DAO 03-30) defined Environmentally Critical Areas (ECA) in twelve categories. Assessment of the project's encroachment in ECAs is presented in Table 2-2.

72 Based on the assessment, the project belongs to the following ECA category/ies:

- Areas frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.).

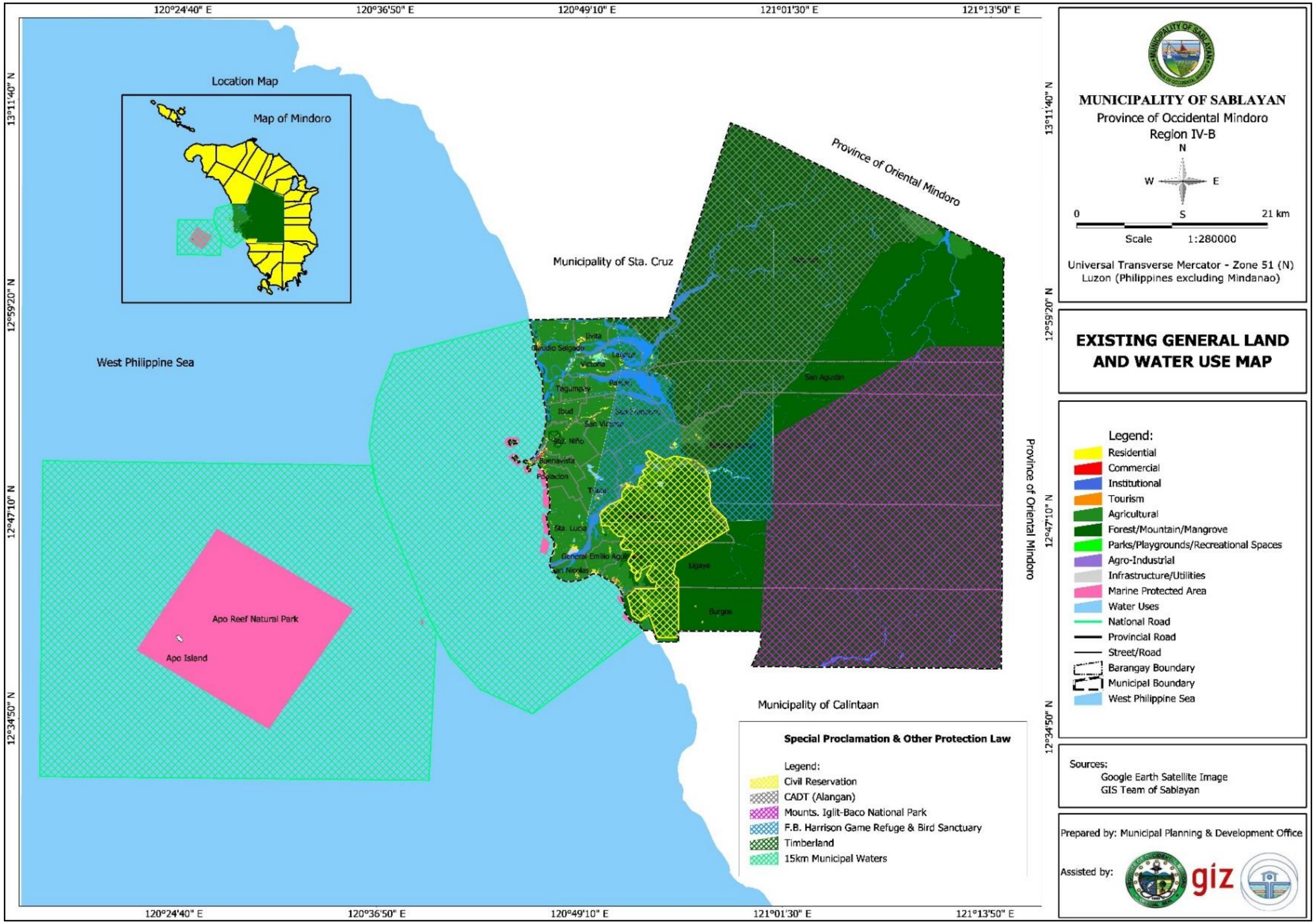

Figure 2-1. Existing General Land and Water Use Map from the Sablayan CLUP (2015-2042). Project location enclosed in red box.

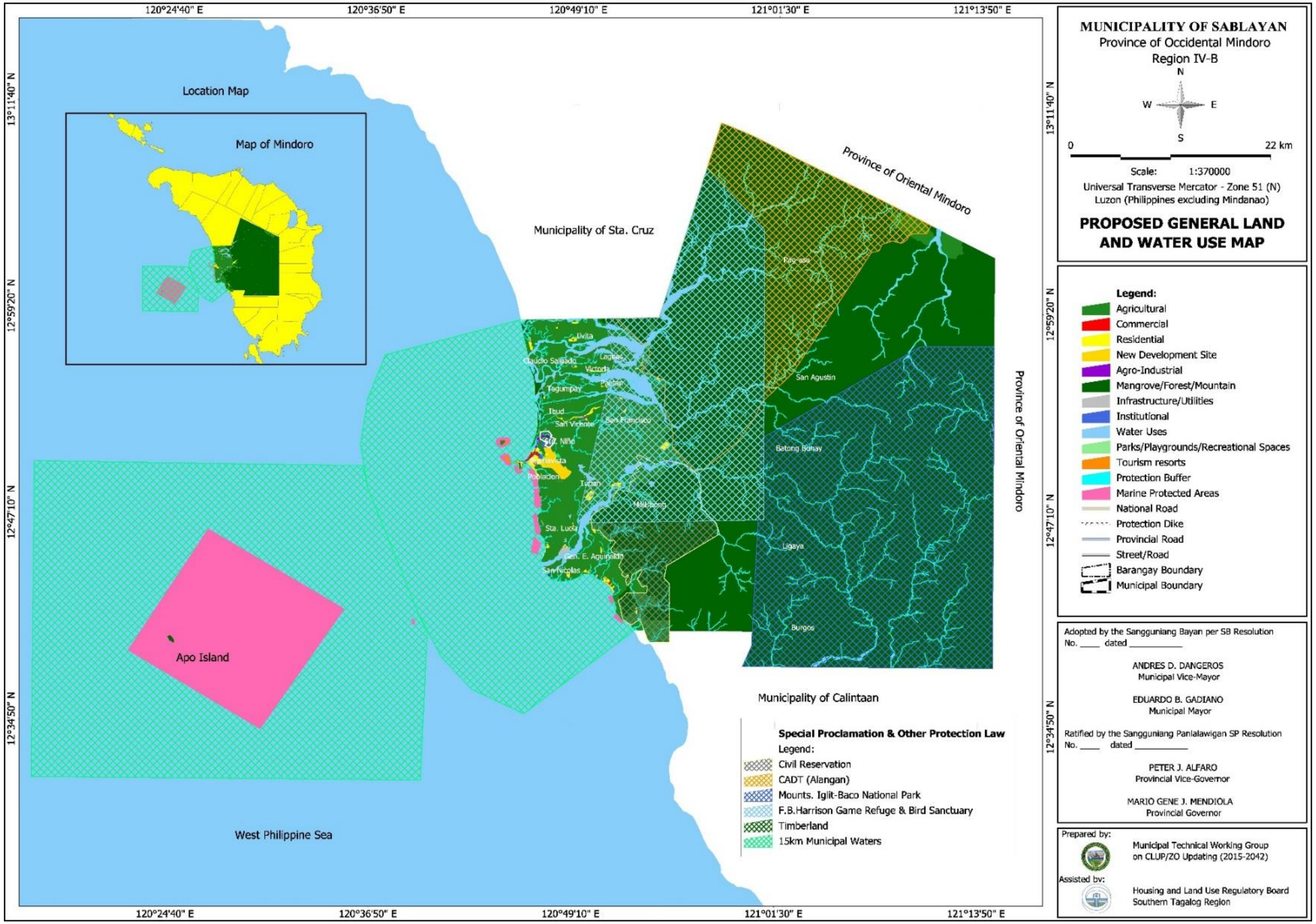

Figure 2-2. Proposed General Land and Water Use Map from the Sablayan CLUP (2015-2042). Project location enclosed in red box.

Table 2-2. Assessment of Project's Encroachment in ECA

	ECA Categories	Technical Description (Based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
1	Areas declared by law as national parks, watershed reserves, wildlife preserves, sanctuaries	The laws referred to by this provision are Presidential Decree No. 705, as amended, otherwise called the Revised Forestry Code, Republic Act 7586 or the NIPAS Act, and other issuances including other proclamations, executive orders, local ordinances, and international commitments and declarations.	No	There are no declared national parks, watershed reserves, wildlife preserves, sanctuaries within the proposed project area.
2	Areas set aside as aesthetic potential tourist spots	Aesthetic potential tourist spots declared and reserved by the DOT or other appropriate authorities for tourism development.	No	The proposed project area is not a tourist spot.
3	Areas that constitute the habitat of any endangered or threatened species of Philippine wildlife (flora and fauna)	This refers to areas considered as wilderness areas and areas identified by the PAWB to be natural habitats of endangered or threatened, rare, and indeterminate species of flora and fauna, as defined by PAWB.	No	The proposed project site is not identified as the natural habitat of any endangered or threatened species of Philippine wildlife-based on-site assessments and KII.
4	Areas of unique historical, archaeological, or scientific interest	This refers to areas that are more than 100 years old (now superseded by new law RA10066, reduced to 50 years old) and declared by the National Historical Institute, National Museum, or National Commission for Culture and the Arts, through national or local laws or ordinances as areas of cultural, historical, and scientific significance to the nation, (e.g., declared national historical landmarks, geological monuments, and paleontological and anthropological reservations).	No	There are no known cultural heritage areas within the project site.
5	Areas that are traditionally occupied by cultural communities or tribes	This refers to all ancestral lands of the National Cultural Communities in Section 1 of Presidential Decree No. 410 and settlements designed, implemented, and maintained by the PANAMIN for national minorities (non-Muslim hill tribes referred	No	There is no identified CADT/CALC area and IP community within the project area.

ECA Categories		Technical Description (Based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
		to in Presidential Decree No. 719) as may be amended by Republic Act 8371 or the Indigenous Peoples Rights Act of 1997 and its Implementing Rules and Regulations.		
6	Areas frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.)	The area shall be so characterized if any of the following conditions exist: - Geologic hazard areas: This refers to all areas identified by the Mines Geosciences Bureau (MGB) as geologic hazard areas. - Flood-prone areas: This refers to low-lying areas usually adjacent to large active water bodies experiencing an inundation of at least 2 m, twice a year for the last five years prior to the year of reckoning. For example, a determination made in 2007 will consider the weather records from 2002 to 2006. - Areas frequently visited or hard-hit by typhoons: This refers to all areas where typhoon signal No. 4 was hoisted for at least twice a year during the last five years prior to the year of reckoning. - Areas prone to volcanic activities/ earthquakes: This refers to all areas identified as such by the Philippine Institute of Volcanology and Seismology (PHIVOLCS) (e.g., areas within permanent exclusion zones of active volcanoes or areas within the required minimum buffer zone of fault zones as determined by PHIVOLCS).	Yes	The proposed project site is located in an area susceptible to ground shaking and flooding
7	Areas with critical slopes	This refers to all lands with slopes of 50% or more classified as geohazard by MGB. Such slope	No	The project site is located in a levelled area.

	ECA Categories	Technical Description (Based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
		conditions favor their natural susceptibility to geohazards such as landslides.		
8	Areas classified as prime agricultural lands	Prime agricultural lands refer to lands that can be used for various or specific agricultural activities and can provide optimum sustainable yield with minimum inputs and development costs as determined by the Department of Agriculture.	No	The project area is predominantly of water use based on the land use map from the 2015-2042 Comprehensive Land Use Plan (CLUP) of the municipality of Sablayan.
9	Recharge areas of aquifers	Refers to sources of water replenishment where rainwater or seepage actually enters the aquifers. Areas under this classification shall be limited to all local or non-national watersheds and geothermal reservations.	No	The project does not fall within any critical watershed in the area.
10	Water bodies characterized by one or any combination of the following: tapped for domestic purposes; within the controlled and/or protected areas declared by appropriate authorities; which support wildlife and fishery activities	Water bodies shall refer to waters that are tapped for domestic purposes or those which support wildlife and fishery activities within declared protected areas, including the buffer zones.	No	There are no water bodies located in the vicinity of the project which are tapped for domestic purposes.
11	Mangrove areas characterized by one or any combination of the following conditions: with primary pristine and dense young growth; the adjoining mouth of major river systems; near or adjacent to traditional productive fry or fishing grounds; areas which act as natural buffers against shore erosion, strong winds, and storm floods; areas on	Mangrove areas shall be characterized by one or any combination of the following conditions: - With primary pristine and dense young growth - Adjoining mouth of major river systems; - Near or adjacent to traditional productive fry or fishing grounds; - Areas that act as natural buffers against shore erosion, strong winds, and storm floods; and	No	There are no observed mangrove areas along the river channel.

ECA Categories		Technical Description (Based on Annex 2-1a of the Revised Procedural Manual of DAO 2003-30)	Present in Project Area?	Remarks
	which people are dependent for their livelihood.	- Areas on which people are dependent for their livelihood, pursuant to and taking into consideration *Republic Act 7161*, which prohibits the cutting of mangrove species.		
12	Coral reefs characterized by one or any combination of the following conditions: - With 50% and above live coral line cover; - Spawning and nursery grounds for fish; - Act as natural breakwater of coastlines	Characterized by one or any combination of the following conditions: - With 50% and above live coralline cover; Spawning nursery grounds for fish; and Act as natural breakwater of coastlines.	No	There are no live corals in the dive sites characterized.

2.1.2 Geology

2.1.2.1 Regional Tectonic Setting

73 The Philippine archipelago represents one of the most complex tectonic zones of the West Pacific Region. It traces its origin from the combination of the Palawan Microcontinental Block and oceanic Philippine Mobile Belt. The Palawan Microcontinental Block (PCB) trends northeast-southwest into the Philippine Mobile Belt approximately halfway between the islands of Luzon and Mindanao (Suzuki et al., 2016). The Philippine Mobile Belt (PMB), where majority of the country is located, is an actively deforming zone composed of terranes of various affinities, such as Indo-Australian margin and the ancient Philippine Sea plate (Yumul et al., 2005). The PMB was created by the interaction between the Philippine Sea Plate and the southeastern edge of the Eurasian Plate (Aurelio, 2000).

74 In Luzon, the NW-SE oblique convergence between these plates is currently being absorbed by two oppositely dipping subduction zones: the Manila Trench to the west and the East Luzon Trough-Philippine Trench to the east (Queaño et al., 2007). The Manila Trench defines the eastward subduction of the oceanic crust of the South China Sea that mainly formed the Luzon magmatic arc while the Philippine Trench and its northern extension, the East Luzon Trough, mark the subduction of the Philippine Sea Plate along the eastern margin of the archipelago. The East Luzon Trough is separated from the Philippine Trench by the East Luzon Transform Fault.

75 The PMB is also subject to arc-continent collision along the southern termination of the Manila Trench, characterized by the transformation of subduction under the Luzon Arc of the South China Sea Plate into an arc-continent collisional deformation occurring within Mindoro Island, where the project site is located (Marchadier, 1988; Marchadier and Rangin, 1989; 1990). However, observations on Mindoro Island indicate that the intensity to which the collision occurs seems to have decreased since Pliocene (Marchadier, 1988).

76 Shallow earthquakes dispersed across the PMB are evidence of active deformation due to plate tectonic forces (Cardwell et al., 1980). Another manifestation of active deformation in the region is the presence of the Philippine Fault (PF), a 1,300 km-long left lateral strike slip fault resulting from virtue of shear partitioning due to the oblique convergence of the Philippine Sea Plate, moving westward along the Philippine Trench-East Luzon trough, with the thinned margin of the Eurasian Plate (Pinet and Stephan, 1990). The PFZ longitudinally cuts the archipelago from north to south, with segments reaching Luzon to Mindanao.

77 The tectonic activity in the archipelago also produces other fault systems. In Mindoro, the faults present include the Central Mindoro Fault, Southern Mindoro Fault, Aglubang River Fault and the offshore Lubang Fault as shown in **Figure 2-3**. The most proximal fault to the project site is the Central Mindoro Fault approximately 47.2 km away (**Figure 2-4**).

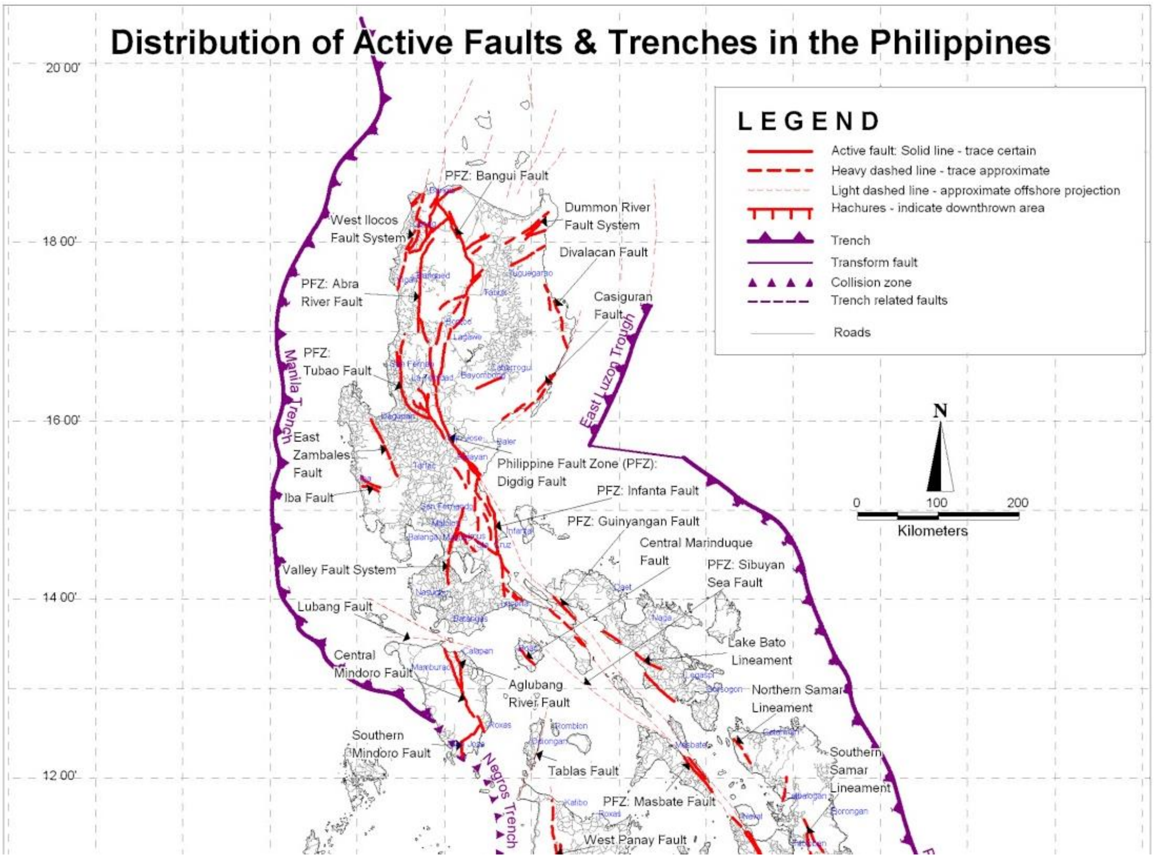

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Figure 2-3. Project Site location with respect to the Active Faults and Trenches of the Philippines

(Source: PHIVOLCS Active Faults Mapping Group)

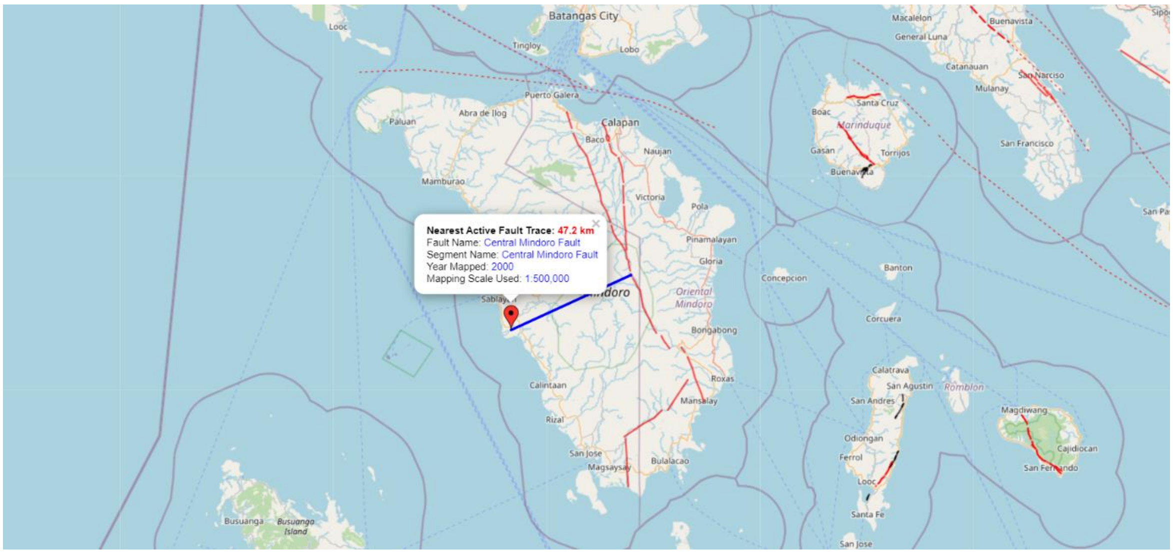


Figure 2-4. Nearest Active Fault Trace to the Project Site Location

(Source: PHIVOLCS FaultFinder)

79

2.1.2.2 Regional Geologic Setting

80 The Philippines has a complex Tertiary geologic history. The oldest rocks are Mesozoic, Late Permian to Jurassic, chert and schist, metamorphosed marine siliceous sediment exposed in the North Palawan block. Due to the complexity of the archipelago's geology, the stratigraphy and petrology of specific areas in the Philippines are grouped according to their affinity as stratigraphic groupings. A stratigraphic grouping (SG) corresponds to an area with distinct stratigraphic character that can be distinguished from those of adjacent areas.

81 In terms of the stratigraphy, the formations in the region of the project site are part of the Mindoro Island Stratigraphic Group (SG 7, 11) shown in **Figure 2-5**. This SG embodies the previously discussed arc-continent collision event during the Miocene involving parts of the North Palawan Block (SG 11) and Philippine Mobile Belt (SG 7). In the Geology of the Philippines 2nd Edition of Aurelio and Peña (2010), the stratigraphy of Mindoro is divided into two parts – southwestern Mindoro, representing the portion of the North Palawan Block and preserves continent-related characteristics, and northeastern Mindoro representing the southwestern portion of the Southwest Luzon Stratigraphic Grouping. The northeast block also has Philippine Mobile Belt affinity and is characterized by rocks of island arc to oceanic affinity.

82 The project site lies in southwest Mindoro, thus the stratigraphy in this region is composed of the following formations:

Mansalay Formation (late Middle Jurassic – early late Jurassic)

83 An ammonite bearing formation composed principally of sandstones, mudstones and shales with minor limestones and pebble conglomerate. It is uncomformably overlain by the Carugay formation.

Agbahag Conglomerate (Middle Eocene)

84 These are poorly sorted and consists of pebbles of limestone, sandstone, mudstone, phyllite, chert, schist, basic volcanic rocks and granitic rocks. The Conglomerate Is conformably overlain by a sequence of green and red siltstones, green to white arkosic sandstones and green conglomerate that was dated Late Eocene (Marchadier and Rangin, 1990).

Carugay Formation (Late Eocene to Early Oligocene)

85 Principally consists of shale, mudstones and sandstones with minor conglomerates and limestone. In places, the mudstone occurs as greenish gray and reddish thin beds in the sequence. The formation uncomformably overlies the Mansalay Formation.

Bugtong Formation (Late Oligocene to Early Miocene)

86 The formation was formerly named the Bugtong Limestone, but later on was changed into Bugtong Formation to include classic tocks and minor agglomerate that are associated with the limestone and calcarenite. described having limestone with associated siltstone, sandstone, conglomerate and agglomerate. The limestone and calcarenites are medium to thick bedded, the sandstone, light gray and coarse.

Tangon Formation (Early Miocene)

87 Consists of brown to dark gray, partly carbonaceous shale with interbedded sandstone.

Napisian Formation (Early Miocene)

88 The formation is overlain by the Pocanil Formation and is composed of shale, coal beds, limestone sandstone and conglomerate. The coal beds have a thickness of three meters and are classified as low rank sub-bituminous. The coal is described to be black, shiny, breaks conchoidally and often

found between shale beds.

89 The limestone is dark, fine-grained and impure while the shale is said to be brown and dark gray f black. The sandstone is described to be poorly bedded and exhibits cross bedding, while the conglomerate is composed of small rounded pebbles and consist of quartz, chert, feldspar and even coal.

Pocanil Formation (Early Miocene to Middle Miocene)

90 Conformable over the Napisian Formation, the Pocanil Formation was originally named Pocanil Limestone by Villa (1941), but was called Pocanil Formation by Weller and Vergara (1955) to include the shale, siltstone and sandstone interbedded with the limestone.

Famnoan Formation (Early Pliocene)

91 Consists of a basal conglomerate succeeded by sandstone and shale and topped by limestone. The pebbles found in the conglomerate are indurated clastic rocks and occasional serpentine, while the limestone is found to be bedded, white and also fossiliferous.

Balanga Formation (Late Pliocene to Early Pleistocene)

92 Consists of a basal conglomerate succeeded by sandstone and shale and topped by limestone. The pebbles found in the conglomerate are indurated clastic rocks and occasional serpentine, while the limestone is found to be bedded, white and also fossiliferous.

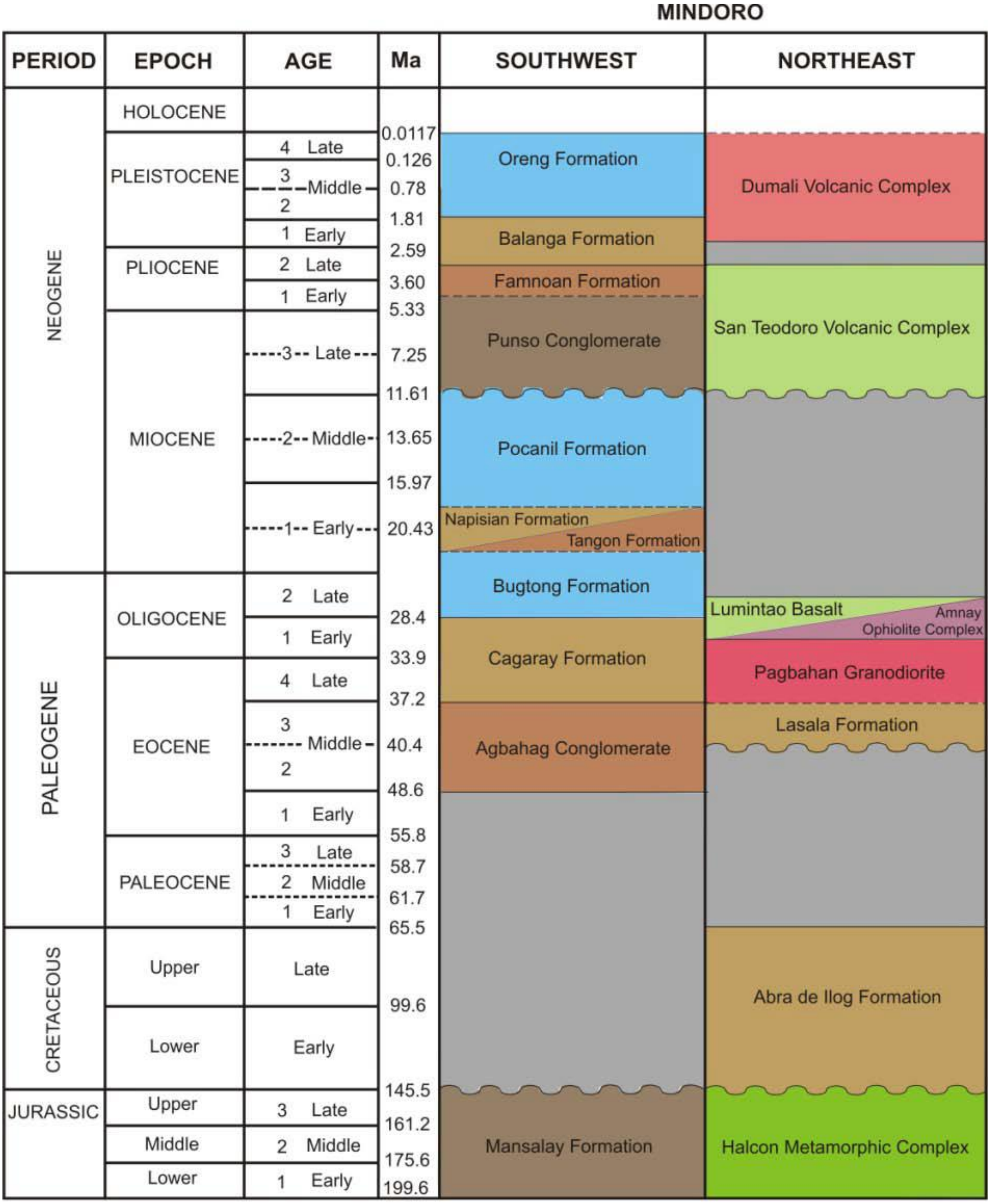
Oreng Formation (Pleistocene)

93 The formation consists of limestone and conglomerate. The limestone occupies the lower portion of the formation and is described as milky, white, vuggy, sugary, and fossiliferous. The overlying conglomerate consists of loosely cemented pebbles.

2.1.2.3 Local Geology

94 The Geologic map of Mindoro Island adopted after Yumul et al. (2009) in **Figure 2-5** shows that the project site is underlain by Neogene sedimentary rocks. These rocks refer to the Miocene-Pliocene age sedimentary rocks which are comprised dominantly by shale, siltstone, sandstone, conglomerate and limestone.

95 However, along the riverbed of Mompong River, sediments mainly sand-sized and pebble to cobble-sized occur. These were observed during the initial river channel survey analysis and geologic sampling conducted. The said deposits decrease in size going downstream, and most of the pebble to cobble-sized sediments are located at the inner bank of the river. The riverbed sample log shows the presence of different sediment lithology such as andesites, metamorphic rocks, and chert.



Geologic Time Scale adopted from International Commission on Stratigraphy (2009)

Figure 2-5. Stratigraphic column of Mindoro Island

(Source: Lexicon of the Philippines, 2010)

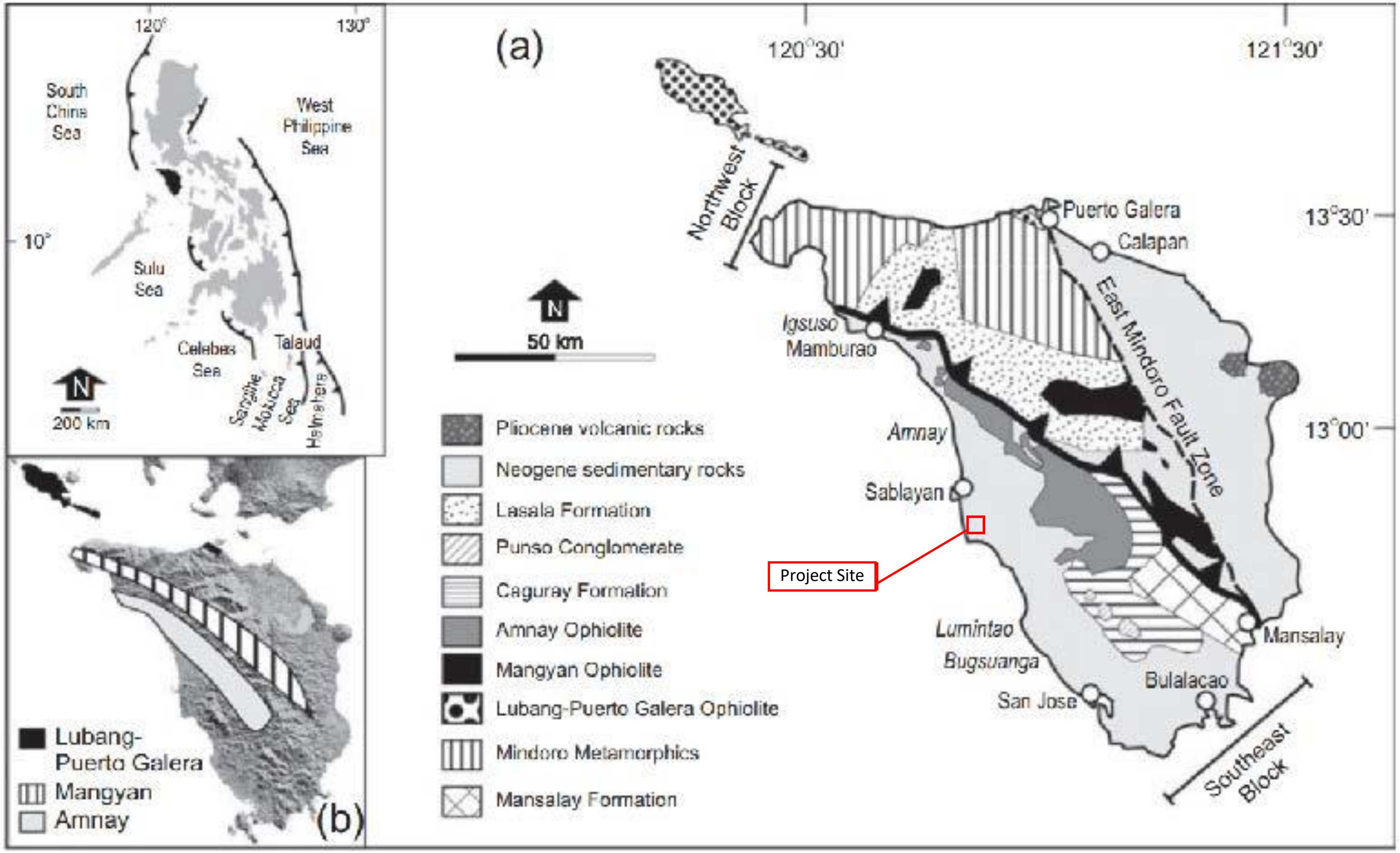


Figure 2-6. Geologic Map of Mindoro Island adopted after Yumul et al., 2009. Project site is in the red box.

2.1.3 Geomorphology and Topography

96 Mindoro has a mountainous core which runs along the island's entire length. It is surrounded by a broken coastal plain which can be seen to be the widest at the eastern shore. Mt. Halcon, the island's highest point, is estimated to peak at 2,585 meters.

97 In the area of Sablayan, the topography is characterized by successive ranges of mountains from rolling, steep, very steep and serrated ridges. Between these mountain ranges occur deep sided canyons, intermittent valleys and elongated plateaus with level and rolling plains along the coastal regions. According to Sablayan's CLUP, the elevation in the area ranges from 1.52 meters to 2,200 meters above sea level in the mountainous area.

98 The area distribution of slope ranges in Sablayan as well as those miscellaneous land types such as built-up areas, braided river bed, beach sand, riverwash, inland water lakes, and small islands are presented in **Table 2-3**, lifted from the municipality's CLUP which credits BSWM and the LAPADI Report for Occidental Mindoro (2010). The CLUP notes, however, that there is a mistake in the report about inland water lakes thus is not included in the table.

Table 2-3. Area and Slope by Land Type, Municipality of Sablayan

Slope Range (in percent rise %)	Description	Area (in hectares)	% total
0-3	Level to gently sloping	20,468.00	8.92
3-8	Gently sloping to undulating	454.00	0.20
8-18	Undulating to rolling	1,775.00	0.77
18-30	Rolling to moderately steep	39,754.7227	17.32
30-50	Steep	24,346.00	10.60
>50	Very steep	134,404.4514	58.55
Miscellaneous Land Type			
	Built-up Areas	554.00	0.24
	Braided River Bed	15.00	0.01
	Beach Sand	88.00	0.04
	Riverwash	7,191.000	3.13
	Major River	423.00	0.18
	Inland Water Lakes	-	-
	Small Islands	86.00	0.04
	TOTAL	**229,559.1741**	**100.00**

99 A contour map generated from SRTM imagery in **Figure 2-7** shows that the project site elevation reaches only a maximum of 40 m, found to the north of the project area. Elsewhere, the ground is level to gently sloping. The hillshade map (**Figure 2-9**) further provides visualization of the terrain by using a light source and the slope and the aspect of the elevation surface. At an azimuth of 315º, the hillshade emphasizes the level ground at the side, and shows that the moderately steep to steep slopes are found to the northeast of the area,

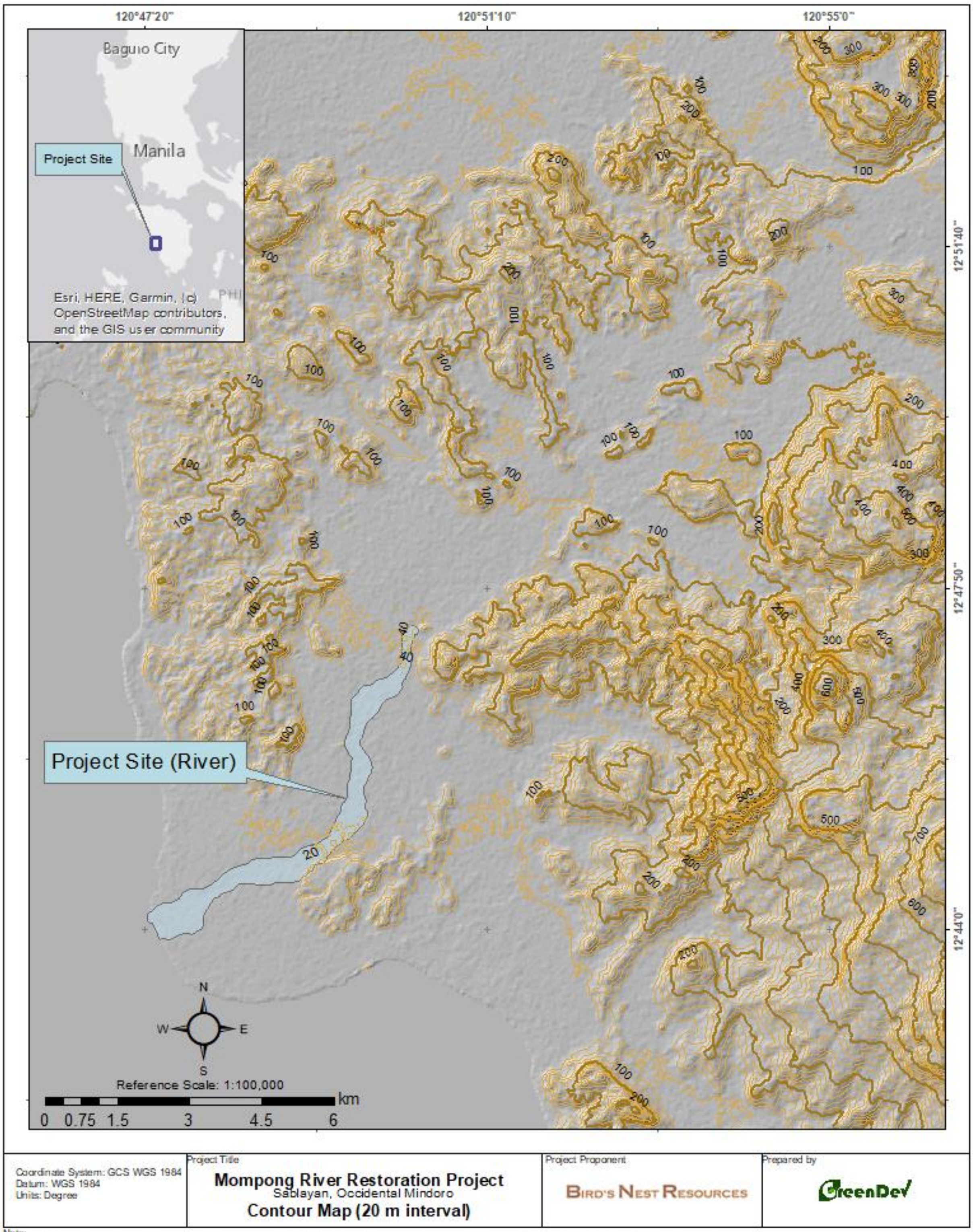
100 The slope map produced presented in **Figure 2-10** shows level to gently sloping grounds, with 60.48% of the total project area composed of slopes 0-3% (percent rise). There are no slopes that exceed 50% (percent rise). In the surrounding areas, steep to very steep slopes within the 30-50% can be found dominantly to the northeast of the project site. This is consistent with what is observed through the generated hillshade map. There is also a small area with steep slopes located to the

southeast of the project site.

101 A summary table of slope ranges and the percentage of the area these ranges cover in the project site is presented in **Table 2-4.**

Table 2-4. Percentage of Slope (percent rise) in project area

Slope Range (in percent rise)	Description	Area (in hecatres)	% area covered by project site
0-3	Level to gently sloping	20,468.00	60.48
3-8	Gently sloping to undulating	454.00	37.08
8-18	Undulating to rolling	1,775.00	1.82
18-30	Rolling to moderately steep	39,754.7227	0.30
30-50	Steep	24,346.00	0.30



Note:
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Greendev undertakes no duty or accepts responsibility to any third party who may rely upon this map document.

Figure 2-7. Contour Map of the Project Site and Surrounding Areas

(Source of SRTM Image: USGS EarthExplorer)

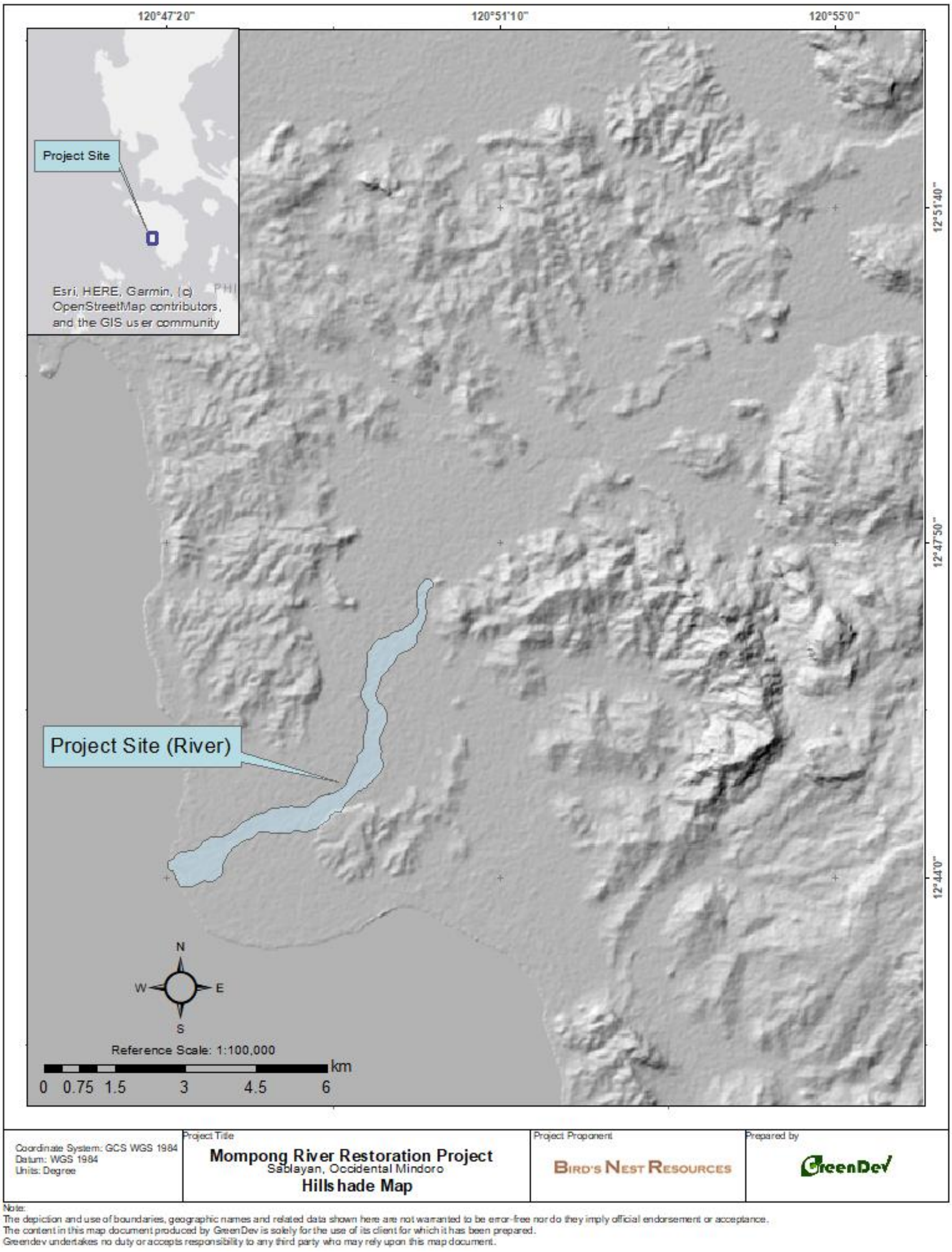


Figure 2-8. Hillshade Map of the Project Site and surrounding areas

(Source of SRTM Image: USGS EarthExplorer)

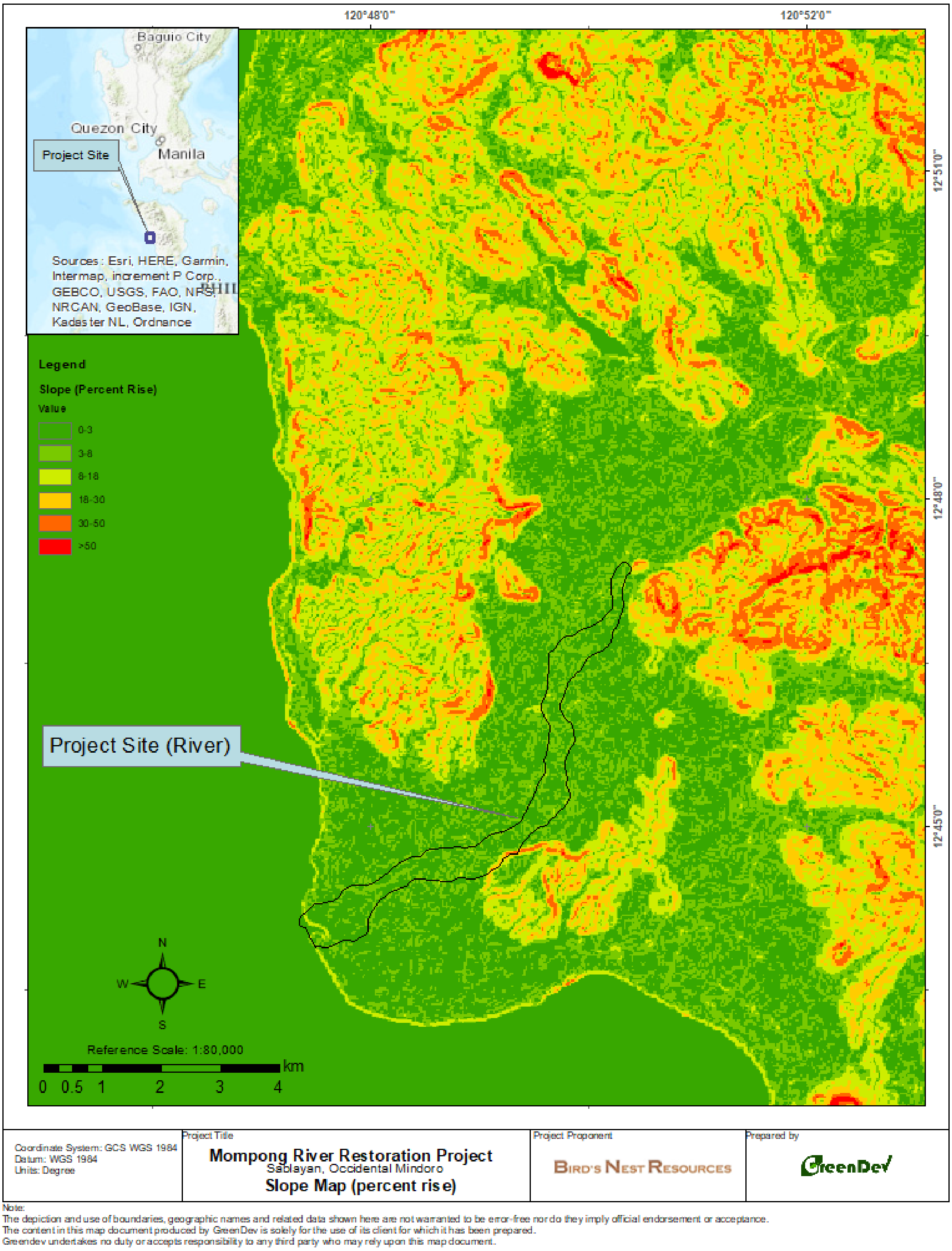


Figure 2-9. Slope Map of the Project Area, in percent rise

(Source of SRTM Image: USGS EarthExplorer)

2.1.4 Pedology

102 There are 15 soil types found in Sablayan. These are: are Buayan, Buguey, Baler, Umingan, Tagulod, Catanauan, San Manuel, Babuyan, Bolinao, Tilik, Alimodian, Boac, Banto, Magsaysay and Tarug Series. The distribution of each soil type is shown in **Figure 2-10**. Tilik Clay Loam is the predominant soils series in the municipality, covering an area of 69,774.85 hectares (32% of the municipality's total land area) described to be of rolling to moderately steep, steep and very steep slopes.

103 Based on the soil map, the project area can be expected to have a soil with Soil mapping Unit Code BaM and BaN (Baler Silty Clay Loam), BcP3 (Boac Clay Loam), and BorP3 (Bolinao Rocky Phase).

2.1.4.1 Soil Fertility (pH, Organic Matter and Macronutrients)

104 Soil sampling will be undertaken to determine the baseline characteristics of the study's area soil fertility. Soil samples are to be obtained through grab sampling and brought to the soil laboratory for analysis.

105 The results of soil analyses on the indicators of soil fertility which are pH, organic matter and macronutrients (i.e., N, P, K) shall be presented while the soil fertility of samples is to be assessed based on the Soil Fertility Rating Guideline Values of the Bureau of Soils and Water Management (BSWM) for pH and macronutrients and the Philippine Council for Agriculture and Resources Research Development (PCARRD) for organic matter, Hoanh and Natividad (1987) for nitrogen.

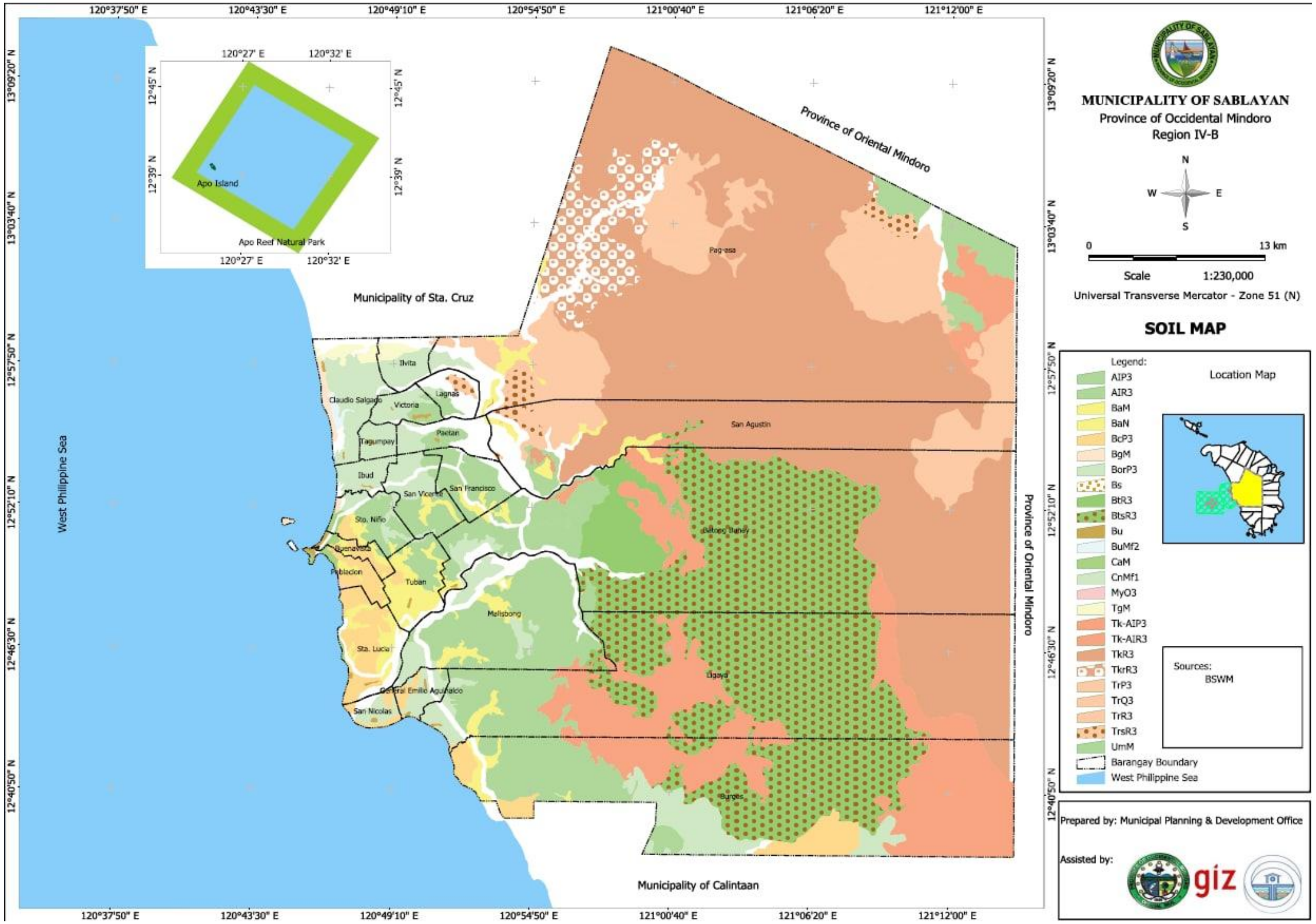


Figure 2-10. Soil Map

(Source: Sablayan CLUP 2015-2042)

2.1.5 Seismicity

106 There are three earthquake generators proximal to the project area – the Central Mindoro fault, which is the most proximal at 47.2 km away, the Southern Mindoro Fault, the Aglubang River Fault and the Lubang Fault as presented earlier in **Figure 2-4**. Other faults in surrounding areas may have also contributed to the seismic activity in the region.

107 From the earthquake catalog of the National Earthquake Information Center of the United States Geological Survey (USGS-NEIC), there are 51 earthquakes with magnitude ≥ M 5.5 and within 150-km radius from the Project at around the coordinates 12.753845° N, 120.824479 °E were recorded from 1900 to present. The plots of the epicenters of the earthquakes are shown in **Figure 2-11**.

108 Of these 49 earthquakes, one is considered major (M ≥ 7) earthquakes, 7 are strong (M 6 to 6.9) earthquakes, and 43 are moderate (M 5.5 to 5.9) earthquakes. Most of the earthquakes range from 0-30 km to 70-150 km depth.

109 The lone notable earthquake is the November 15, 1994, Mindoro Earthquake which occurred near Verde Island. The epicenter was located at 13.5° N, 121.1° E with a hypocenter of 15 km. The earthquake was actually tsunamigenic and generated a tsunami that destroyed 1530 houses and killed 41 people (PHIVOLCS, 1994). The earthquake was associated to the Aglubang River Fault.

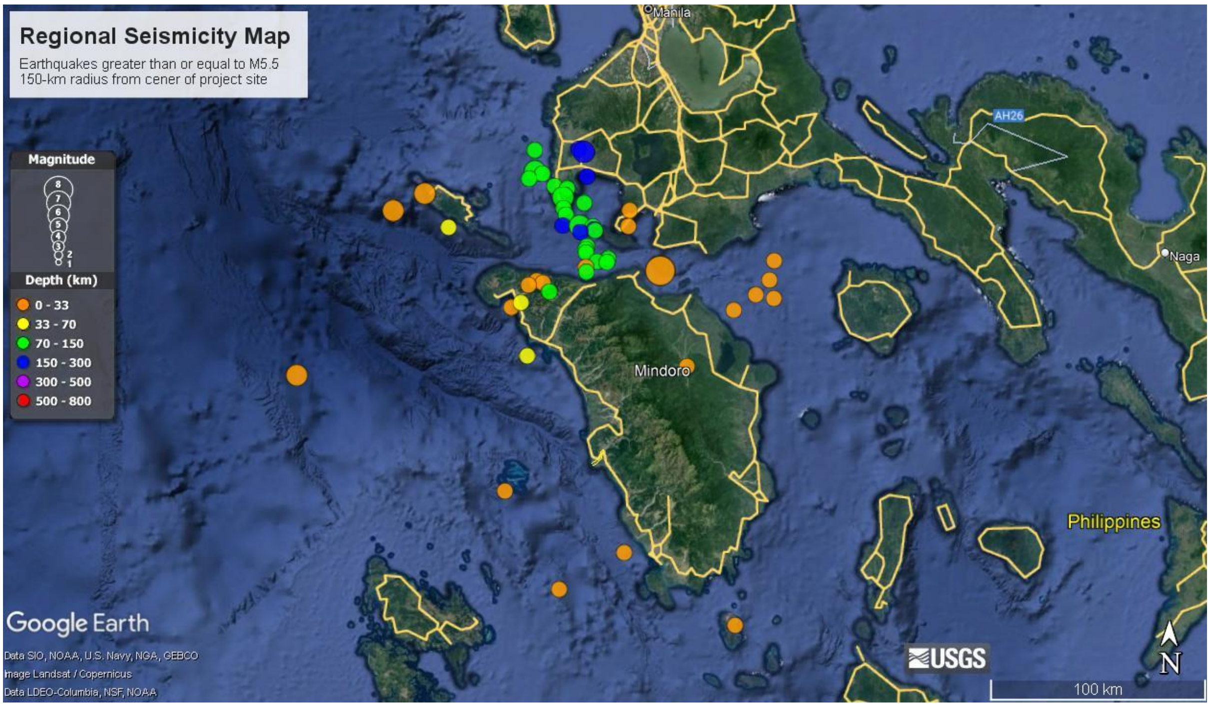


Figure 2-11. Regional Seismicity Map of earthquakes ≥ 5.5 in a 150-km radius around the project site

(Plots of earthquakes taken from USGS- NEIC)

2.1.6 Geologic Hazards

110 The Philippines, given its geological and geographic location, is vulnerable to natural hazards that should be considered in planning for a development. These hazards are attributed to natural phenomena and may either be caused by events from the Earth's interior or near the surface of the Earth. Such hazards include fault related/seismic hazards, ground shaking, landslide, liquefaction, and volcanic hazard.

2.1.6.1 Fault-Related/Seismic H azards

111 As mentioned in earlier sections and through the active faults map shown in **Figure 2-4**, the most proximal fault is the Central Mindoro Fault, which is around 47.2 km away from the project site.

2.1.6.2 Ground Rupture

112 Ground or surface rupture is a displacement along an active fault trace that reaches the surface. An active fault in this context is defined as faults that have moved within the last 10,000 years. If active, the faults may show evidence or may have documented history of recent movements. Such evidence includes ground rupture.

113 The recommended buffer zone, or Zone of Avoidance, against ground rupture hazard is at least 5 meters on both sides of the active fault or from its zone of deformation. Since the nearest fault is 47.2 km away, the project site does not contain any fault within its boundaries nor within 5 meters on both sides of the fault. Thus, there is no threat of ground rupture in the area.

2.1.6.3 Ground Shaking

114 In general, the intensity of ground shaking is magnitude-dependent and gradually decreases with distance from the seismic source. Differences in ground conditions, however, may cause deviations from this expected norm, particularly in areas underlain by recent alluvium and fill materials.

115 All sites may be affected by ground shaking in the event of an earthquake, considering the presence of earthquake generators around the site and the history of earthquakes in the area as shown in the previously presented regional seismicity map.

116 An Earthquake Induced Landslide Map from Sablayan's CLUP in **Error! Reference source not f ound.** has a legend which indicates the possible intensity of ground shaking for areas across the municipality. The project site classifies under areas that are not susceptible to earthquake-induced landslide, thus confirming its level topography while inferring that the effect of ground shaking in this area is less versus other sites which are said to possibly experience shaking of intensity VII-VIII.

117 Seismic hazards study specific to the area along with an Engineering, Geological and Geohazard Assessment (EGGAR) must be conducted along the site and its vicinity to further characterize the contribution of possible earthquake generators in the area. Structures that may be affected can mitigated by following the provisions of the National Building Code and the Structural Code of the Philippines. However, since there will be no long-term development/structures will be built onsite besides equipment and structures to be used for dredging, the conduct of the EGGAR will ensure proper risk assessment while operations are ongoing.

118 To further characterize ground shaking at the site, peak ground acceleration values may be estimated. Peak ground acceleration (PGA) is determined either by probabilistic or by deterministic method.

119 In the 2017 Philippine Earthquake Model (PEM), PHIVOLCS performed a probabilistic seismic hazard analysis (PSHA) of the Philippines and Metro Manila. The PSHA calculated PGA and spectral acceleration (SA) for the following ground conditions based on soil profile type and average shear wave velocity of the upper 30 m of the soil layer (Vs30) as classified by the Association of Structural Engineers of the Philippines, Inc. (ASEP) under the 2015 National Structural Code of the Philippines (NSCP) as follows:

Rock site	:	Soil Profile Type SC ; Vs30 = 760 m/sec
Stiff soil	:	Soil Profile Type SD ; Vs30 = 360 m/sec

120 The calculated PGA responses for rock site, and SA responses for rock site and stiff soil at the project area for a 500-year return period (10% probability of exceedance in 50 years) are shown below.

Table 2-5. Peak Ground Acceleration and Spectral Acceleration responses (g) at the project area for 500-year return period.

(Source: PHIVOLCS, PEM, 2017)

Ground condition	PGA	SA (0.2sec)	SA (0.5sec)	SA (0.8sec)
Rock site	0.50	-	-	-
Stiff soil	0.50	1.95	1.8	1.5

121 The seismic zonation map in the 2015 National Structural Code of the Philippines (NSCP) defines the project area to be within Zone 4 which has an assigned PGA of 0.4g for Class B rock condition (i.e., rock with shear wave velocity from 760 to 1500 meters per second), as shown in **Table 2-5**.

122 A deterministic approach for estimating peak horizontal ground acceleration was performed using the attenuation relation of Fukushima and Tanaka (1990). The attenuation relation is given by the equation:

123 $\mathrm{Log}_{10}A = 0.41M - \log_{10}(R + 0.032*10^{0.41M}) - 0.0034\ R + 1.30;$

124 where *A* is the mean of the peak acceleration from two horizontal components at each site (cm/sec^2), *R* is the shortest distance between the site and fault rupture (km), and *M* the surface-wave magnitude. Mean rations (coefficient) according to the nature of the subsurface are then applied to the derived A-value.

125 **Table 2-6** presents the calculated PGA of different earthquake scenarios from different possible earthquake sources. However, only values for the Central Mindoro fault and the Lubang Fault are available. Applying the attenuation relation equation developed by Fukushima and Tanaka, the computed PGA of a major seismic event from the earthquake generators could range from 0.171 g to 0.080 g for medium soil and from 0.118 g to 0.55 for rock.

Table 2-6. Calculated peak ground acceleration values for possible earthquake sources

(based on the 1990 Fukushima and Tanaka attenuation relation equation)

Possible Earthquake Source	Scenario Earthquake Magnitude [(a)]	Approx. nearest distance to the project site (km) [(b)]	Calculated PGA (g) values	
			Medium Soil	Rock
Central Mindoro Fault	7.5	47.2	0.171	0.118
East Zambales Fault	7.7	100	0.080	0.055

(a) Scenario earthquake magnitude is from Table 2.1.2 of Volume 2 of the Final Report on Study for Earthquake Impact Reduction for Metropolitan Manila in the Republic of the Philippines (MMEIRS).
(b) As reckoned approximately at the central part of the project area.

2.1.6.4 Landslide Hazard

126 Mass movement of material could be induced by triggers such as earthquakes and rain. The strength of material and the slope of the terrain are contributing factors that dictate the occurrence of a landslide in an area.

127 The project area's landslide susceptibility is low to none due to the site's gently sloping areas with no identified landslides. A landslide susceptibility map adopted from MGB is shown in **Figure 2-14**. As earlier identified, the steep to very steep slopes are located to the northeast of the project site, classified as having moderate to high landslide susceptibility.

2.1.6.5 Liquefaction

128 Liquefaction refers to the phenomenon whereby water-saturated, cohesionless ground, especially near the river, lake and coasts, substantially loses strength and stiffness in response to an applied stress, usually earthquake shaking causing it to behave like a liquid. Liquefaction-induced lateral spreading occurs on mild slopes of less of 0.3 to 5% underlain by loose sands and a shallow water table (Bartlett and Youd, 1992).

129 Torres et al. (PHIVOLCS, 2001) cited the main determinants that influence an area's susceptibility to liquefaction are mainly (i) grain size, (ii) depth of water table, and (iii) thickness of the deposit.

130 The project site, especially the area immediate to it, can be said to be generally susceptible to liquefaction due to the presence of the river channel and due to the nature of the sediments that the river brings about to be unconsolidated. However, it is to note that no long-term structures are to be built around the area. In case any mitigation measures are needed to address the liquefaction hazards, provision of the National Building Code and Structural Code of the Philippines may be followed.

2.1.6.6 Tsunami

131 A tsunami is a series of sea waves commonly generated by under-the-sea earthquakes. The project site is prone to tsunamis and is considered as a tsunami inundation area due to its proximity to the coast. Since there will be no long-terms structures at the site, what to look out for is for any threat of a tsunami during operations for the safety of those involved. There are three natural signs of a tsunami, which are: 1) strong ground shaking, 2) unusual rise or fall of sea level, and 3) strong or unusual sound coming from the sea.

2.1.7 Volcanic Hazard

2.1.7.1 Ashfall

132 The degree and extent of vulnerability of an area to volcanic hazards depends on its proximity to an active volcano. Eruption-related hazards include Taal Volcano located 140.1 km away from the site. The distance, however, makes the area safe from any possible lava flows, lahar, volcanic mudflows or debris flows that may occur in the event that Mt. Pinatubo would erupt. Ash fall, though, may affect the site. It must be noted that the degree of ashfall will depend on the scale of eruption and prevailing wind direction at that time.

2.1.8 Foundation Hazards

2.1.8.1 Differential Settlement

133 Settlement is the settling of a material (soil) resulting from the load imposed by a structure. The unequal settling of a material is termed differential settlement. When all parts of a structure rest on the same kind of soil, and the loads on the structure and the design of its structural system are uniform throughout, differential settlement is normally not a concern. However, where soils, loads, or structural systems differ between parts of a structure, different parts of the building structure may settle by substantially different amounts. Excessive differential settlement can cause foundation

failures.

134 It is necessary to determine the load bearing capacity of the soil and estimate settlement of the planned structure. An allowable bearing capacity is the maximum bearing stress that can be applied to a foundation such that if is safe against instability due to shear failure and the maximum tolerable settlement is not exceeded.

2.1.9 Expansive Soils

135 Expansive soil such as fat clays is prone to swelling and shrinkage, varying in proportion to the amount of moisture present in the soil. As water is initially introduced into the soil (by rainfall or watering), an expansion takes place. If dried out, the soil will contract, often leaving small fissures or cracks. Excessive drying and wetting of the soil will progressively deteriorate structures over the years.

136 Based on the soil map in **Figure 2-10**, the area consists of mostly BaM and BaN (Baler Silty Clay Loam), BcP3 (Boac Clay Loam), and BorP3 (Bolinao Rocky Phase). Since there is clay in the soil composition, further testing site must be done to confirm if these would be expansive. However, this would pose as less of a threat since there will be no permanent structures that will be constructed onsite.

2.1.10 Hydrometeorological Hazards

2.1.10.1 Flooding

137 The project area has a moderate to high susceptibility considering it is located along the Mompong River, as presented in Figure 2-16. The Mompong River affects Barangays Malisbong and Santa Lucia.

138 To further describe the implications whether a site is classified under low, moderate and high flood susceptibility, the flood category descriptions provided for by the Mines and Geosciences Bureau are as follows:

139 High flood susceptibility indicates a possibility of flood heights of greater than 1.00 meter and/or flood duration of more than three days. Areas with high flood susceptibility are immediately flooded during heavy rains of several hours. Landforms of topographic lows such as active river channels, abandoned river channels and areas along riverbanks are also prone to flashfloods.

140 Moderate flood susceptibility pertains to areas that experience flood heights of 0.50 to 1.00 meter and/or flood duration of one to three days. These areas are subject to widespread inundation during prolonged and extensive heavy rainfall or extreme weather condition. Fluvial terraces, alluvial fans, and infilled valleys are areas moderately subjected to flooding.

141 Low flood susceptibility occurs in areas likely to experience flood heights of less than 0.50 meter and/or flood duration of less than one day. These also have sparse to moderate drainage density.

142 The implementation of appropriate mitigation measures as deemed necessary by project engineers and LGU building officials is recommended for areas that are susceptible to various flood depths. Site specific flood studies are recommended for high susceptibility areas. However, it is noted that no long-terms structures are to be constructed on site that may be affected by flooding.

143 Also, the dredging activities will not contribute to flooding. Instead, channelization through dredging will allow stabilization of flow regime. This will also reduce incidence of flooding since it will help reduce presence of excessive depositional bars along the river channel, which cause flow constrictions and reduces channel width and depth.

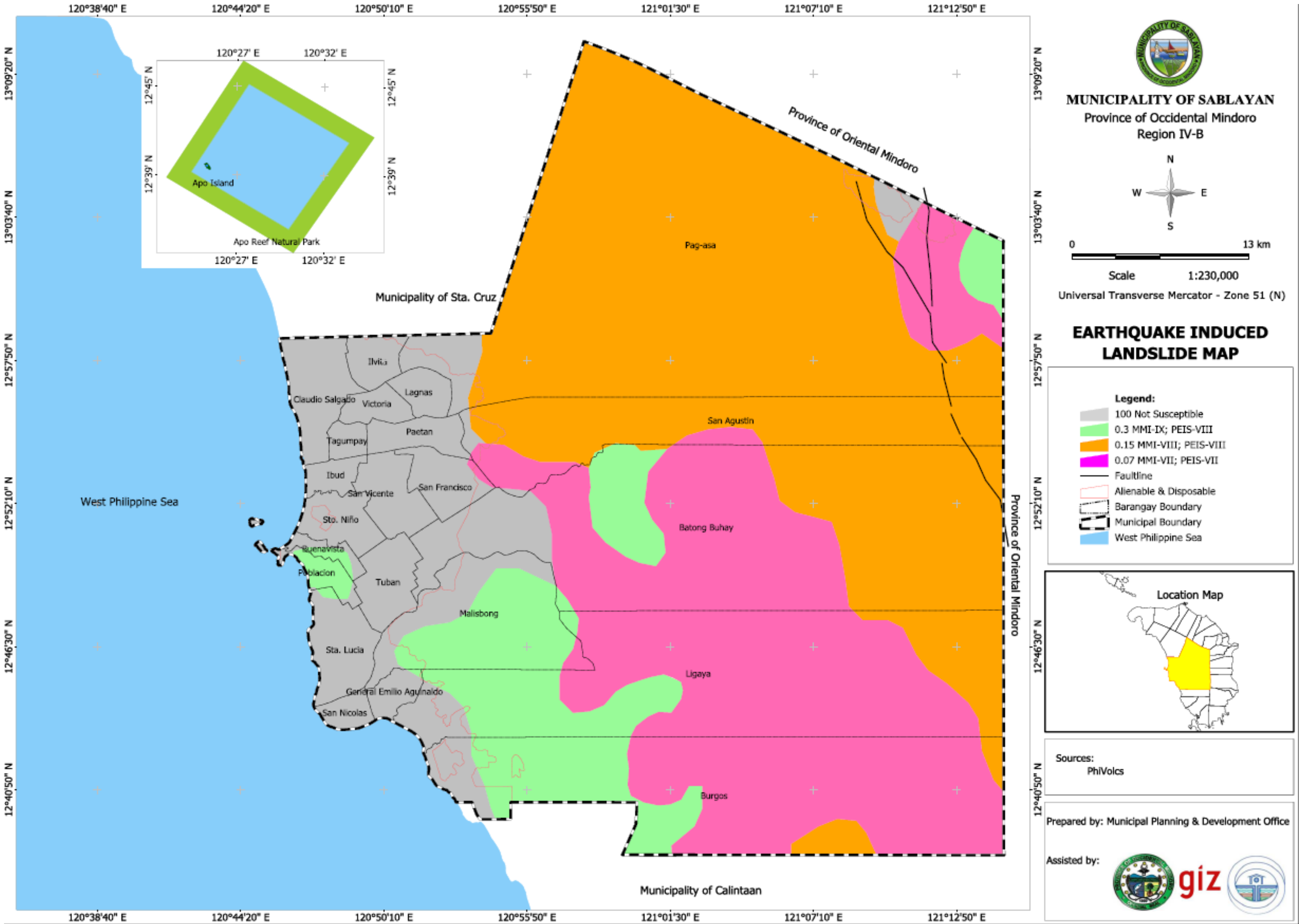


Figure 2-12. **Earthquake Induced Landslide Map, with legend showing Intensity of Ground shaking possible across Sablayan**

(Source: Sablayan CLUP 2015-2042)

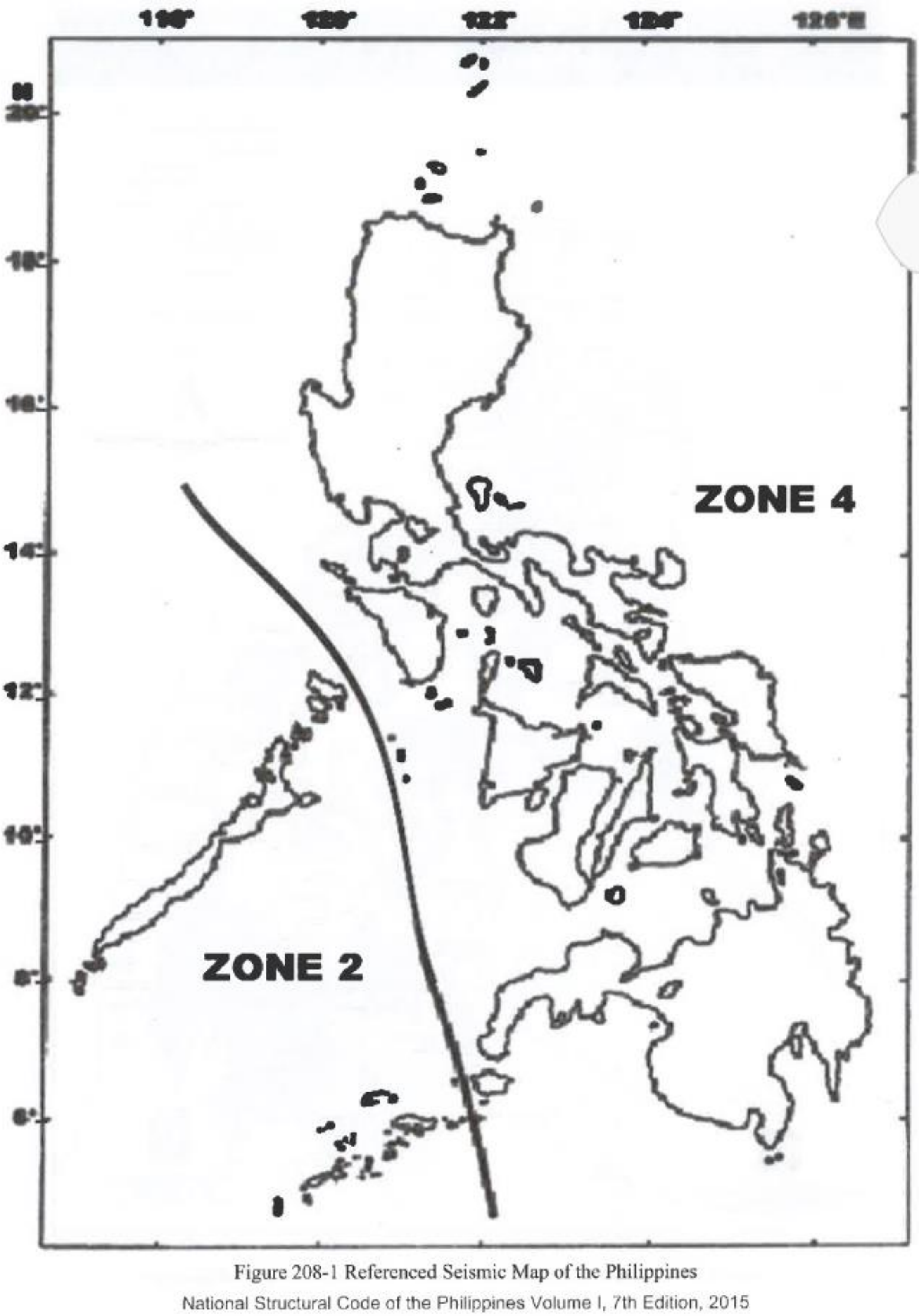


Figure 2-13. Regional Seismic Map of the Philippines

(Source: National Structural Code of the Philippines Volume I, 7th Edition, 2015)

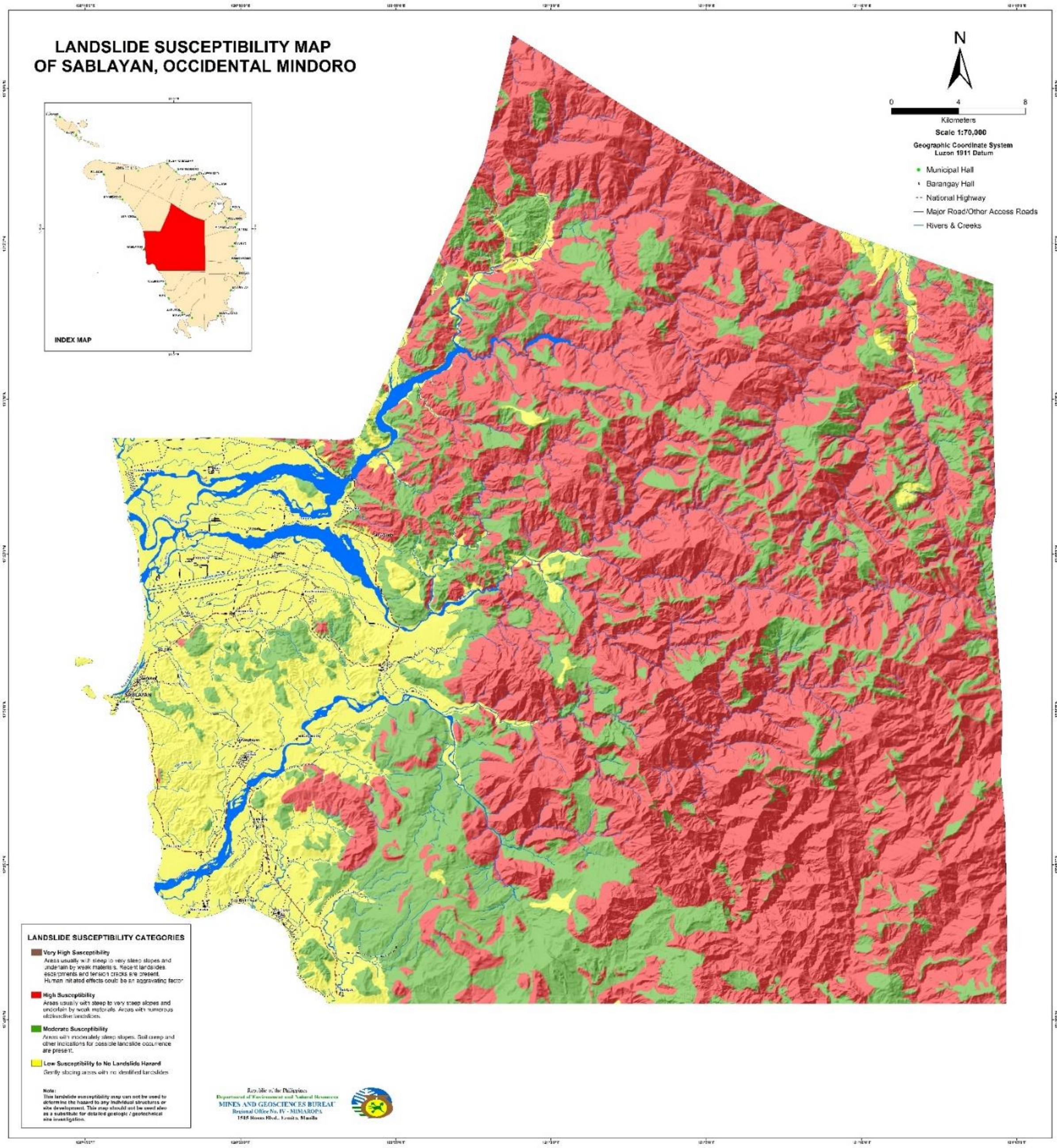


Figure 2-14. Landslide Susceptibility Map of Sablayan

(Source: Mines and Geosciences Bureau)

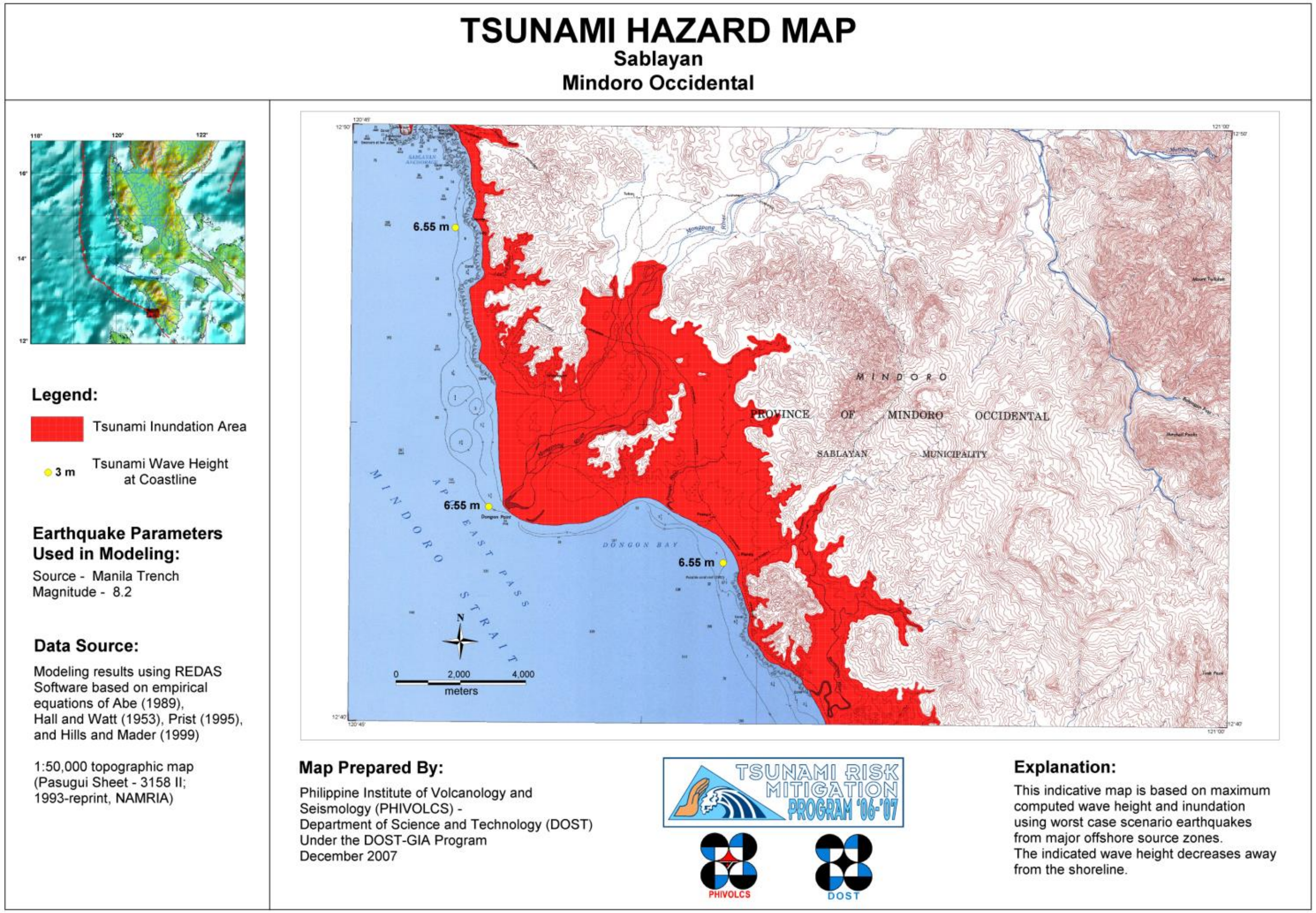


Figure 2-15. Tsunami Hazard Map of Sablayan

(Source: PHIVOLCS, DOST)

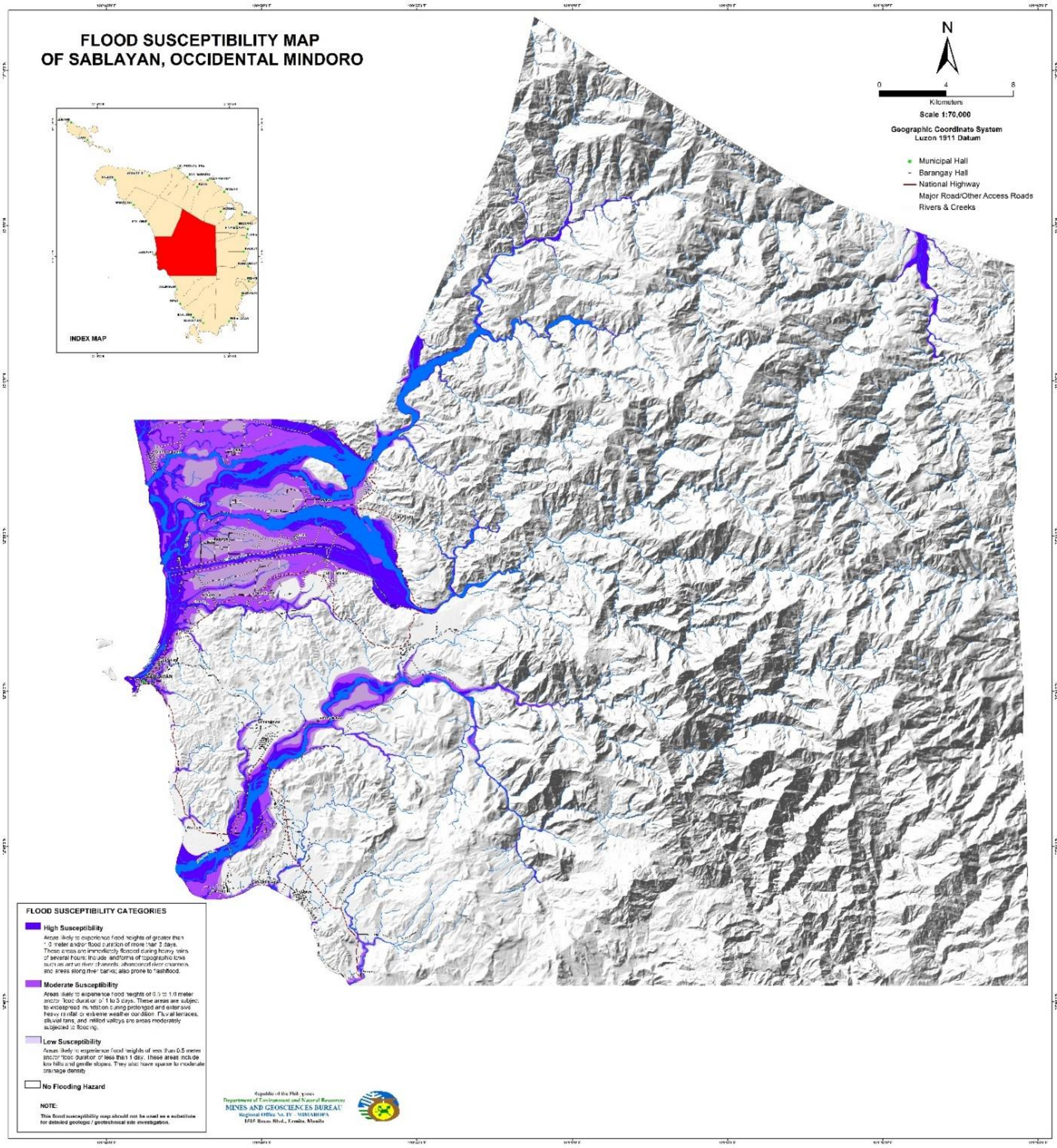


Figure 2-16. Flood Susceptibility Map of Sablayan

(Source: Mines and Geosciences Bureau)

2.1.11 Terrestrial Ecology

2.1.11.1 Introduction

144 Sablayan is located in the heart of Mindoro Occidental. It is bounded on the north by the municipality of Sta. Cruz; on the east by the province of Mindoro Oriental; on the south by the municipality of Calintaan; and on the west by Mindoro Strait. Sablayan in Occidental Mindoro has a total land area of 218,909 hectares mostly devoted to settlements and agriculture (CLUP Sablayan, 2015).

145 Aside from the coastal waters, Sablayan also has an abundance of freshwater resources such as springs, ground water, and surface waters. Springs are generally found on rolling slopes. Four major rivers carry headwaters to Mindoro Strait namely Amnay, Mompong, Patrick, and Busuangan. There are also lakes in the municipality (Libuao, Panikian, Tabtaban, and Yapang Lakes); and brackish ponds along coastal regions.

146 Sablayan is covered by ten watershed areas. Three of which are completely within the territorial jurisdiction of the municipality, namely: Mompong, Rayusan, and Busuangan River basins. Mompong, the biggest river, runs in abundance because of the healthy forests of Siburan.

147 The Mompong River Basin is a 3,380-hectare watershed located in Occidental Mindoro. It covers the barangays of Santa Lucia, Poblacion, San Nicolas, General Emilio Aguinaldo, Batong Buhay, Ligaya, San Francisco, Malisbong and Buenavista in Sablayan municipality (Paringit and Abucay, 2017). The DENR River Basin Control Office (RCBO) states that the Mompong River Basin has a drainage area of 353 km2 and an estimated 565 million cubic meters (MCM) annual run-off.

148 Meanwhile, its main stem, the Mompong River, passes through Santa Lucia, San Nicolas, Poblacion, Bagong Buhay, General Emilio Aguinaldo, Ligaya, San Francisco, and Malisbong in Sablayan municipality. According to the National Irrigation Authority, and also based on the field survey execution, Mompong River Irrigation System provides water to the barangays it traverses. There is a total of 29,179 persons residing within the immediate vicinity of the river, with Brgy. Poblacion is the most populated having 6,471 residents as of 2010 according to the Philippine Statistics Authority Census.

149 Literature also reports that Sablayan is rich in flora and fauna, most particularly in Mt. Siburan being less accessible to human exploitation. On contrary, the anthropogenic disturbances in Mompong River and the natural calamities occasionally visiting the river dredging the proposed project site affect its biodiversity. The whole Mompong river floodplain towards the mouth of the river from the bridge depicts a common grass-brush-dominated landscape.

150 This report provides information on the ecosystem/habitat types in the Mompong river floodplains, including the flora and fauna species composition, abundance, and diversity. Mitigation measures and management strategies during and after the implementation of the proposed river dredging project are also presented.

2.1.11.2 Flora and Fauna of Sablayan

151 Based on the baseline surveys and previous studies on the flora and fauna of Sablayan, there are about 378 species of flora, birds, mammals, reptiles, and amphibians, combined (HARIBON, 2004; WWF, 2009&2010). This number is further distributed in the following flora and faunal groups: flora (177 species); mammals (19 species); birds (154 species); and herps - reptiles and amphibians (28 species).

152 Analysis of endemicity shows that in Mt Siburan, Sablayan, the floral endemicity is more than 17%, and found relatively higher in the faunal groups, ranging from 22% to 32% (HARIBON, 2004).

153 Several notable species of flora are white lauan (*Shorea contorta*), rattan – yantok (*Calamus* spp.), while important faunal species include Mindoro hornbill – talusi/tariktik (*Penelopides mindorensis*), Mindoro bleeding heart pigeon - puñalada (*Galliculumba platenae*), Mindoro dwarf water buffalo – tamaraw (*Bubalus mindorensis*), golden-crowned flying fox – paniki (*Acerodon jubatus*), Philippine warty pig – baboy damo (*Sus philipinensis*). Other species include mottled-wing flying fox (*Pteropus leucopterus*), lowland striped shrew rat (*Chrotomys mindorensis*), and large flying fox (*Pteropus vampyrus*). With regards to aquatic resource, 26 families of coral species are found in the locality according to WWF study in 2009 and 2010. Sablayan was listed as one of key biodiversity areas in the Philippines.

154 Enumerated timber resources are: narra, guijo, malugai, anapla, apitong, banaba, lauan, ipil-ipil, bangkal, dao, kamagong, binunga, acacia, and mulawin. While non-timber forest products identified are: kawayan, cogon, buho, rattan, yantok, baging, buli/buri, anahaw, pulot, orchids, gabi, ube, nami, yantok. Other forest-based species, include: killawan, bato-bato, labuyo, tikling, paniki, patong gubat,

155 HARIBON (2004) highlighted the presence of 23 species of reptiles and amphibians, including a Caecilian of the genus Gymnophiona and the introduced species, Taiwan frog (*Hoplobatrachus rugulosus*). There was, however, no record of how the Taiwan frog was introduced to the area. Three of the species captured from the genera Platymantis, Leptobrachium, and Limnolectes are being investigated as possible new species. According to the local people, crocodiles might be present upstream at Buuayan Creek near the Malate River. This information, however, was not validated during the survey.

156 Five areas listed above (including Sablayan) were identified as extremely high critical while three areas were deemed to have insufficient data. Conservation efforts show the degree of intervention conducted at the identified locations.

157 A species of green-faced parrotfinch, a rare bird endemic to the Philippines and previously only found in Luzon and Negros were also found in Sablayan.

158 Further, ten of the bird species were recorded at Apo Reef Natural Park in Sablayan, Occidental Mindoro. These were: The migratory Oriental Cuckoo; Pacific Golden Plover; Oriental Pratincole; Barred Rail; the Brown Booby; the near-endemic Mantanani Scops Owl; the Hoopoe; the Black-crowned Night Heron; Black Bulbul; and Asian Paradise Flycatcher.

2.1.11.3 Exposure to Natural Calamities Sablayan affecting Biodiversity

159 The studies conducted by the Mines and Geosciences Bureau showed that the barangays of Santa Lucia, Poblacion, and Batong Buhay have a low to high risk of flooding while the rest of the barangays have no flooding risk. The field surveys conducted by the PHIL-LiDAR 1 validation team found that notable weather disturbances caused flooding in 2009 (Ondoy), 2011 (Dodong), 2014 (Glenda), and 2016 (Lawin) (Paringit and Abucay, 2017).

160 As for landslide susceptibility, Poblacion was classified to have low to moderate risk; Santa Lucia, San Nicolas, Batong Buhay, General Emilio Aguinaldo with low to high risk; and Ligaya, San Francisco, and Malisbong with moderate to high risk (Paringit and Abucay, 2017).

2.1.11.4 Methodology

2.1.11.4.1 Sampling Stations

161 The flora team was formed to conduct the floral and faunal assessment for the proposed Mompong River Dredging and Construction of Crushing Site project in Sablayan, Occidental Mindoro. The field data collection was done for 3 consecutive days from October 25-27, 2021, for one season of sampling. The purposive sampling technique was used in the field surveys. This field data collection technique was chosen to record as many wildlife species (plants and animals) as possible.

162 For flora, a total of 110 plots or quadrats were established all over the project area consisting of about 30 standard-sized plots (10 m x 10 m) and 80 smaller nested plots (2 m x 2 m). The standard (10 m x 10 m) plot was intended to facilitate the recording of trees and other erect plants with a diameter at breast height (DBH) of equal and more than 1 centimeter. The smaller nested (2 m X 2 m) plot at the center of each plot, on the other hand, was purposely utilized to facilitate the listing of ground vegetation and understorey plants with less than 1 cm DBH.

163 Apart from listing down plant names, bio-measurements such as diameter at breast height (DBH in cm) and total height (TH in m) were recorded at each standard plot. While for the ground vegetation and understorey plants in each nested plot, only the number of individuals and percent crown cover was recorded. In addition, other associated plant species not documented in sampling plots, however, seen in the vicinity, were also noted.

164 For fauna, different survey techniques were employed. About 3 mist-netting days for birds and 3 mist-netting nights for bats were carried out for 3 consecutive days and nights. Ten (10) metal traps with baits were installed in 3 days for small mammals, while the search method, on the other hand, was considered for amphibians and reptiles.

165 The locations of all the plots and stations are shown in **Figure 2-17** and Figure 2-18, while the records of their ground coordinates are presented in the Appendices.

2.1.11.4.2 Species Abundance

166 Species abundance in each area of interest was determined by computing the species importance value (IV). For this study, the importance value is considered as the sum of the relative frequency, relative density, and relative dominance combined as one.

167 The dominance indices and their corresponding formulas to derive the importance value [IV] (based on Brower, 1989 as cited by Fernando et al., 1998) are provided below:

168 For Large Plants (trees, shrubs, and erect large herbs):

$$Density = \frac{Total\ number\ of\ a\ species}{unit\ area} \tag{1}$$

$$n\ Relative\ Density = \frac{Density\ of\ species}{Total\ density\ of\ all\ species}\ x\ 100 \tag{2}$$

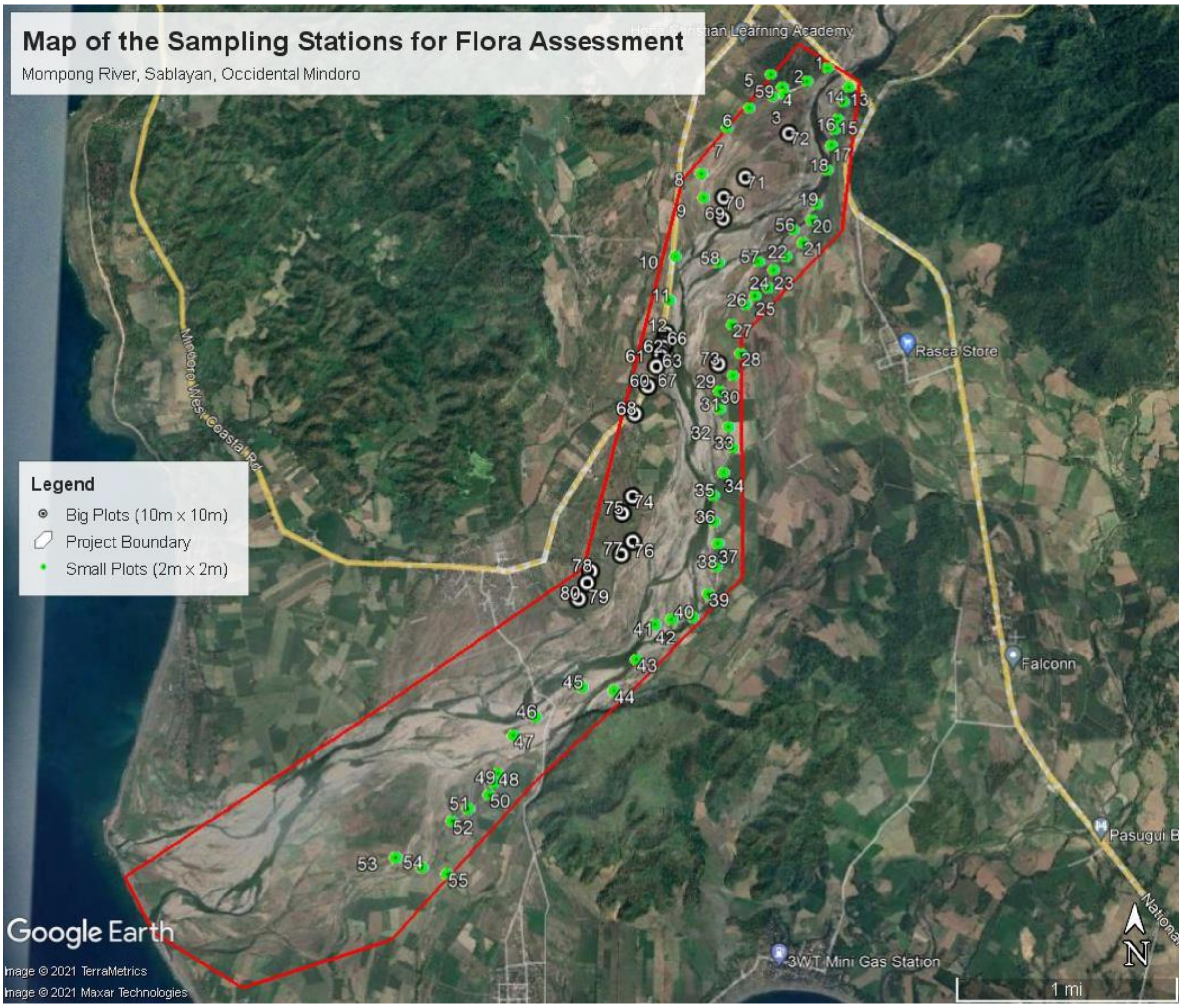


Figure 2-17. Map showing the location of flora sampling plots in the proposed project site

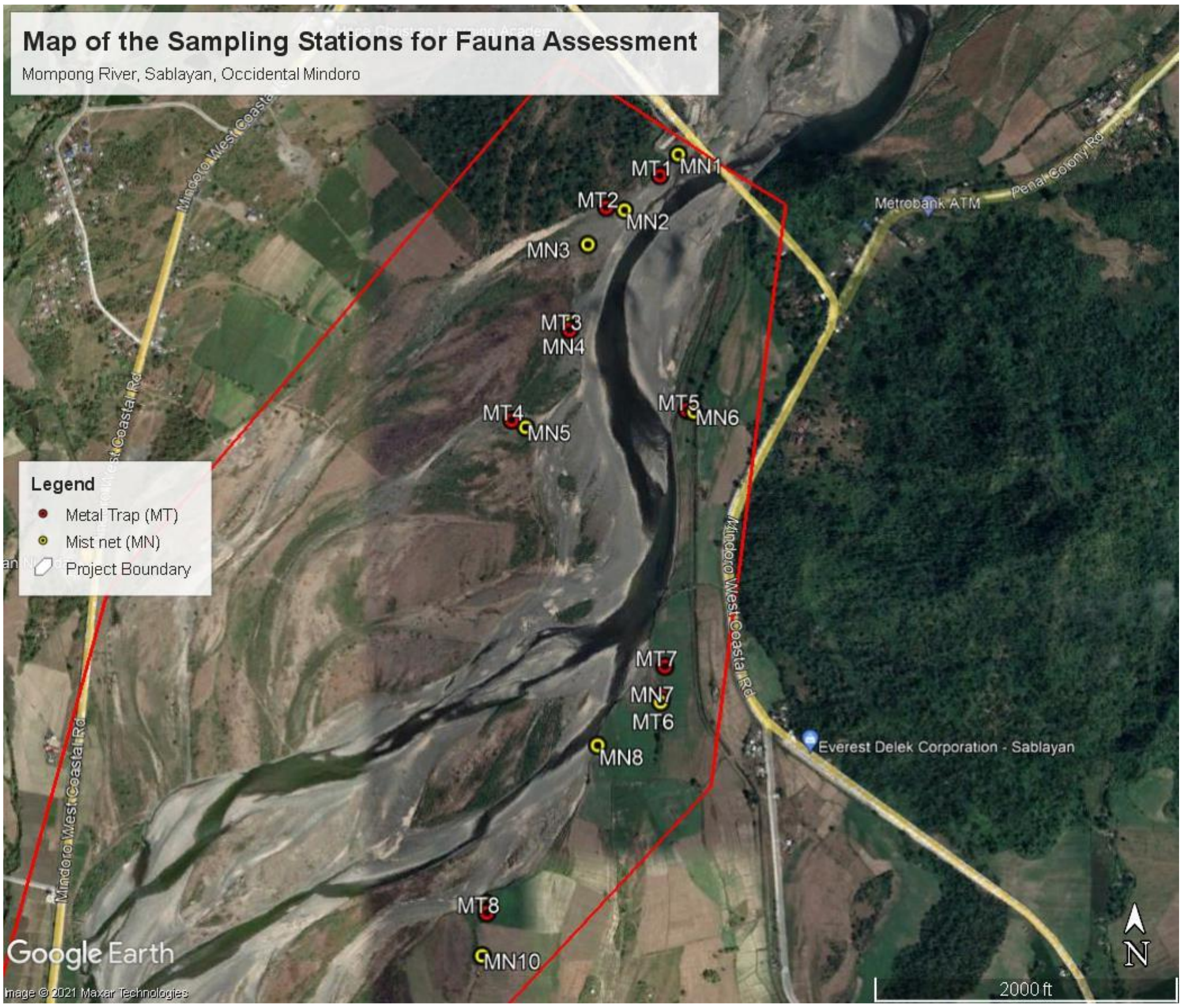


Figure 2-18. Map showing the location of fauna sampling stations and transects in the proposed project site

$$\boldsymbol{Dominance} = \frac{Basal\ area\ of\ a\ species}{Total\ area\ Sampled} \quad (3)$$

$$\boldsymbol{Relative\ Dominance} = \frac{Dominance\ of\ species}{Total\ dominance\ of\ all\ species}\ x\ 100 \quad (4)$$

$$\boldsymbol{Occurrence} = \ number\ of\ times\ a\ species\ appeared\ in\ the\ estalished\ plots \quad (5)$$

$$\boldsymbol{Frequency} = \frac{Number\ of\ Occurrences}{Total\ number\ of\ occurrences}\ x\ 100 \quad (6)$$

$$\boldsymbol{Relative\ Frequency} = \frac{Frequency\ of\ a\ species}{Total\ frequencies\ of\ all\ species}\ x\ 100 \quad (7)$$

$$\boldsymbol{Imporatance\ Value} = Relative\ Density + Relative\ Dominance + Relative\ Frequemcy \quad (8)$$

169 For Low Stature Plants (ground vegetation and understorey with DBH less than 1 cm):

170 The same equations presented above were used except for the computation of dominance.

$$\boldsymbol{Dominance} = \frac{Total\ crown\ area\ of\ a\ species}{Total\ area\ sampled} \quad (9)$$

171 Summary tables are presented in the main body of this report and the complete lists of plant species, all arranged in descending order of importance values, are provided in the appendices.

2.1.11.4.3 Diversity and Evenness Indices

172 On the other hand, diversity indices were also determined using the richness and dominance computation following the equations of Magurran (1988), and Brower (1989) as cited by Fernando et al. (1998). Species richness is measured by the Shannon-Weiner diversity index (H'), which assumes that individuals are randomly sampled from an indefinitely large population. It equally considers that all species are represented in the sample. This diversity index is supported by Simpson's Diversity and Gini-Simpson's Indices.

173 On the other hand, the evenness (E), which is a measure of overall evenness, is the ratio of observed diversity to maximum diversity.

174 The above was all assessed using the following equations:

$$\boldsymbol{Shannon - Weiner\ Diversity\ (H')} = \sum pi\ X\ LNpi \tag{10}$$

where:

$$\boldsymbol{pi} = \frac{IV\ of\ a\ species}{Total\ IVs\ of\ all\ species} \tag{11}$$

$$\boldsymbol{Evenness\ index\ (E)} = \frac{H'}{LN\ S} \tag{12}$$

where:

$$S = total\ number\ of\ species$$

175 The species diversity index is the ratio between the number of species or importance values that may be expressed as the number of individuals, biomass productivity, and the like (Odum, 1971). A high index value usually means a large number of rare species – "rare" in the sense that, it is represented by a low number of individuals as opposed to high counts for a few common species. The index of dominance, on the other hand, expresses the degree to which the dominance is concentrated in one, several, or many species (Odum, 1971). Fernando et al. (1998) has provided an ordinal classification of species richness and dominance indices for easy interpretation. **Table 2-7** shows the relative value rating for specific range of diversity and dominance indices.

Table 2-7. Ordinal Classification of Species Richness and Dominance Indices (adopted from Fernando et al., 1998)

Relative Value Rating	Species Diversity (H')	Evenness (E)
Very High	3.50 – 5.00	0.75 – 1.00
High	3.00 – 3.49	0.50 – 0.74
Moderate	2.50 – 2.99	0.25 – 0.49
Low	2.00 – 2.49	0.15 – 0.24
Very Low	0.00 – 1.99	0.05 – 0.14

2.1.11.5 Ecological Measurements for Fauna

2.1.11.5.1 Species Richness

176 Species richness means the total number of species counted in each animal group. This was determined by performing the following: (i) counting the number of species caught using mist nets and traps; (ii) counting the number of species observed walking, running, or flying; (iii) counting the number of species heard singing or vocalizing while perching.

2.1.11.5.2 Diversity and Evenness Indices

177 Species diversity computation was done only for birds since a sufficient number of observations for the calculation was achieved. However, descriptive analysis was performed for other faunal groups for the reason that only a few species and individuals were encountered during the field survey.

178 The equations which were used to determine the species diversity and evenness values of birds are provided below.

$$\boldsymbol{Shannon - Weiner\ Diversity\ (H')} = \sum pi\ X\ LNpi \tag{10}$$

where:

$$\boldsymbol{pi} = \frac{number\ or\ count\ of\ individual\ of\ a\ species}{Total\ counts\ of\ all\ species} \tag{11}$$

$$\boldsymbol{Evenness\ index\ (E)} = \frac{H'}{LN\ S} \tag{12}$$

where:

$$S = total\ number\ of\ species$$

2.1.11.6 Determination of Threatened (Conservation) Status and Endemicity

179 The global threatened status of each species was determined from the IUCN Red List of Threatened Species 2020 website using the link “http://www.iucnredlist.org/search” and from DAO 2017-11 and DAO 2019-09 for the lists of Philippine threatened species of flora and fauna, respectively.

180 Provided below are the definitions of nine (9) threatened and non-threatened categories (conservation status) of IUCN. Same definitions and interpretations are applied in the Philippines.

1. Extinct (EX)

181 A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon’s life cycle and life form.

2. Extinct in the Wild (EW)

182 A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon’s life cycle and life form.

3. Critically Endangered (CR)

183 A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered of IUCN, and it is therefore considered to be facing an

extremely high risk of extinction in the wild for the next 50 years or so.

4. Endangered (EN)

184 A taxon is said to be Endangered when it is likely to be extinct very shortly. It is the second most severe conservation status for wild populations in the IUCN's schema after CR.

5. Vulnerable (VU)

185 A taxon is Vulnerable (VU) if it has been categorized by IUCN as likely to become Endangered unless circumstances that are threatening its survival and reproduction improve.

6. Near-threatened (NT)

186 A category on the IUCN Red List of Threatened Species which indicates that a taxon has been evaluated against the Red List criteria and does not qualify for CR, EN, or VU status now, but is close to qualifying for, or is likely to qualify for, a threatened category shortly.

7. Least Concern (LC)

187 A species that has been categorized by the IUCN as not being a focus of species conservation. It does not qualify as either, threatened, near threatened or conservation dependent.

8. Data Deficient (DD)

188 It is the one that has been categorized by the IUCN as offering insufficient information for a proper assessment of conservation status to be made.

9. Not Evaluated (NE)

189 It has been categorized under the IUCN Red List of Threatened Species as not yet having been assessed by the IUCN.

2.1.11.7 Results and Discussion

2.1.11.7.1 Ecosystems and Vegetation Types in the Mompong River

190 The Mompong River within the proposed project site has three (3) distinct major vegetation types: (a) shrubland; (b) grass-dominated vegetation; and (c) agro-ecosystem. The last ecosystem type is further classified in this report, as follows: (i) banana farms, (ii) corn farms, (iii) vegetable farms, and (iv) rice paddies. These are presented in **Figure 2-22.**

2.1.11.7.2 Brushland/Shrubland

191 The brush/shrubland in Mompong River is found generally near the Mompong bridge (**Figure 2-19**), though small fragments of this vegetation type are also observed along the Mindoro West Coastal Road. There is a spot within the proposed project site where large trees are still apparent (**Figure 2-20**). Some of these recorded large trees in this spot include: molave (Vitex parviflora), dao (Dracontomelon dao), taluto (Pterocymbium tinctotium), bahai (Ormosia calavensis), anabiong (Trema orientalis), banato (Mallotus philippinensis), anapla (Albizzia saponaria), binuang (Octomeles sumatrana), raintree (Samanea saman), and batitinan (Lagestroemia piriformis). Similar species of trees were also seen in the "forest on a hill" adjacent to the proposed site and about 100 meters from the bridge (**Figure 2-21**).

Figure 2-19. A picture of brush/shrubland type of vegetation in the proposed project site near the Mompong bridge

Figure 2-20. Large trees seen along the Mindoro West Coastal Road within the proposed project site

Figure 2-21. Forest on a hill outside the proposed project site about hundred meters from the Mompong bridge

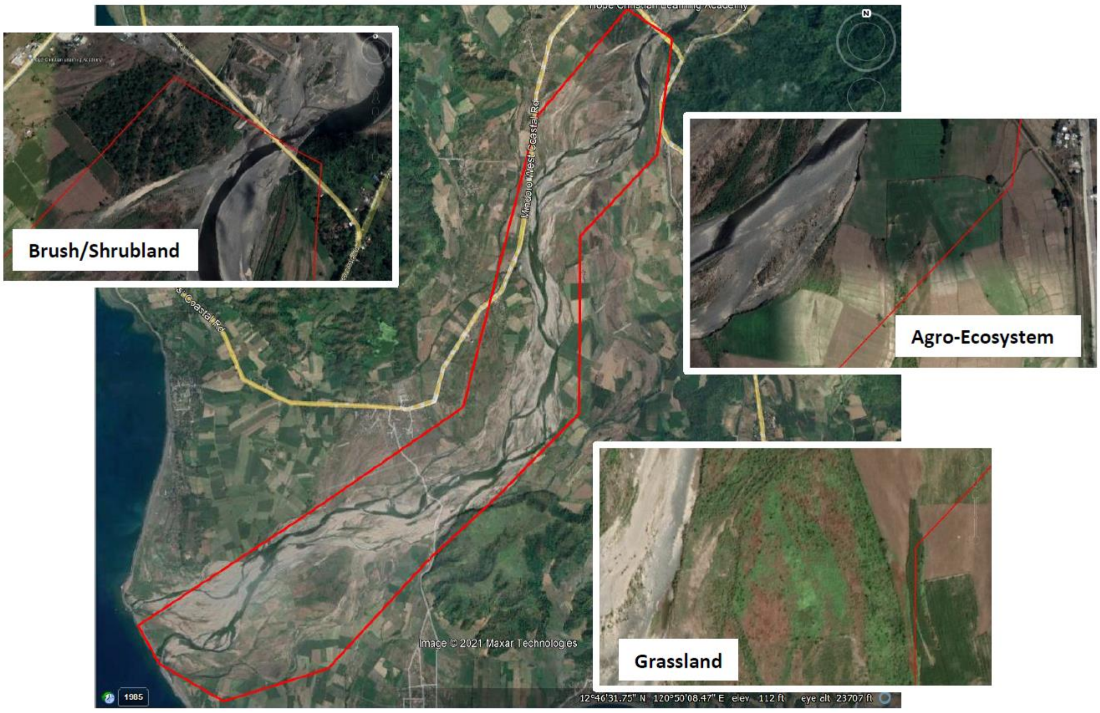


Figure 2-22. Major ecosystem (vegetation) types in the proposed project site

2.1.11.7.3 Grassland (grass-dominated vegetation)

192 The grass-dominated vegetation forms a considerable chunk of the vegetation in Mompong River (**Figure 2-23**). Even though there are large portions of the proposed project site without vegetation (e.g., river and dry floodplains of stones and sand), about 15% - 20% of the total land area is estimated to be covered by grasses. Frequently observed species of grasses noted are, as follows: talahib (*Saccharum spontaneum*), napier grass (*Pinnesetum purpurem*), aguingay (*Rottboellia conchinchinensis*), tambo (*Arundo donax*), and cogon (*Imperata cylindrica*).

193 Grasslands in Mompong River floodplains are utilized as pasture areas for cattle and other ruminants (**Figure 2-24**). This is evident in three (3) barangays: Malisbong, San Nicolas, and Tuban. Even so, no evidence of grassland fire was observed in the whole area. Grassland burning is a normal scenery in the country when this land use is being utilized for pasture. Burning is primarily done to promote the production of new grass shoots (tillers) for the livestock.

Figure 2-23. Extent of grassland in the Mompong River Floodplains

Figure 2-24. Portion of the grassland being utilized for pasture in the Mompong river floodplains

2.1.11.7.4 Agro-ecosystem

194 Agricultural farms are mostly concentrated in Barangays Malisbong and San Nicolas towards the mouth of the main channel. Cultivation of agricultural crops, such as rice/palay, banana/saging, corn, and vegetables in the Mompong river floodplains is a common practice since time immemorial (**Figure 2-25, Figure 2-26, Figure 2-27**). This is even floodplains are often visited by floods. Based on the key informant interviews with the residents within the proposed project site, they are used to the occurrence of natural calamities (e.g., strong typhoons and flooding). It can be sensed that resilience and adaptive capacity of residents to the impacts of these natural calamities are quite high.

195 The types of crops being grown are based on farmers' expert judgement and long-time experience in farming. Some of the crops being cultivated in the area, during the fieldwork, were rice/palay; corn; banana; and vegetables like okra (ladies' finger), string beans, mung beans, eggplant, tomatoes, chili pepper, watermelon, and sweet potato.

Figure 2-25. A picture of a newly harvested rice paddy in the Mompong river floodplains

Figure 2-26. A picture of cornfield in the Mompong river floodplains

Figure 2-27. A picture of an eggplant farm in the Mompong river floodplains

Figure 2-28. A picture of a string bean farm in the Mompong river floodplains

2.1.11.7.5 Overall Plant Species Richness (Flora)

196 A total of 101 species of plants were recorded in the proposed project area, all of which except two (2) were identified down to species level. These belong to 89 genera and 37 families. Three (3) major ecosystem types were observed, namely shrubland, grass-dominated vegetation, and agro-ecosystem. As shown in **Table 2-8** and **Figure 2-29.** Percent distribution of species by plant type**,** herbs dominate in terms of the number of species followed by trees and vines, among all other plant types.

Table 2-8. Number of Identified Species based on Plant Type

Plant Type and Habit	Number of Species
Herb	45
Tree	40
Vine	14
Shrub	1
Climbing palm	1
Total	**101**

Note: Total number of established plots (N) = 130

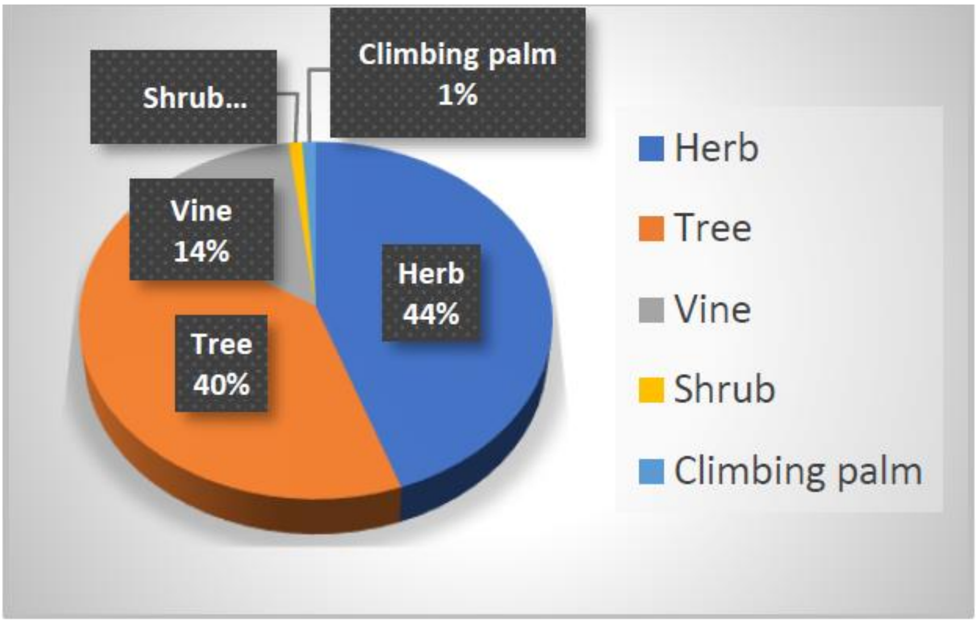


Figure 2-29. Percent distribution of species by plant type

197 The plant family with the greatest number of species were Poaceae (grasses) and Fabaceae (legumes) which normally thrive in areas regularly visited by floods and other disturbances

198 **Table** 2-9).

Table 2-9. Common Plant Families based on the number of Species and Genera

Family	Species	Genera
Poaceae	19	17
Fabacaeae	13	13
Asteraceae	7	7
Euphorbiaceae	6	5
Moraceae	6	3

Note: Plant families with > 5 species are included in the table (N = 37).

2.1.11.7.6 Overall Plant Species Composition and Abundance (Flora)

199 Computation of importance value, an indicator of species abundance, was done separately for large plants (≥ 1 cm DBH) and low stature plants (ground vegetation and understory plants <1 cm DBH). Summary results are provided in the tables below.

2.1.11.7.6.1 Large Plants

200 **Table 2-10** below presents the most common large plants in the proposed project site based on species abundance or importance value (IV). Out of 101 plants, 41 species were noted in the established 10 m x 10 m quadrats. Commonly recorded plants based on importance value (IV > 10%) were saging (*Musa sapientum*), yemane (*Gmelina arborea*), bangkal (*Nauclea orientalis*), ipil-ipil (*Leucaena leucocephala*), and himbabao (*Brousonnetia luzonica*).

201 Both *M. sapientum* and *G. arborea* are cultivated in the floodplains. Banana, in particular, is a good livelihood source of the residents in Sablayan. *Gmelina arborea*, on other hand, are planted as live boundary markers of the agricultural farms within the proposed project site. It is a fast-growing tree species which is also a good source of lumber for house construction.

202 Further, *N. orientalis, L. leucocephala,* and *B. luzonica* best thrive in the open landscapes of Mompong river floodplains. *Nauclea orientalis*, in particular, was observed near perennial streams. This species also dwells in forest edges, along rivers and on areas occasionally flooded by water (Reyes et al 2015). While *L. leucocephala* and *B. luzonica* are sun-loving species and are expected to thrive in the proposed site's present condition.

203 Some other notable plant species listed in the Appendix are the following: molave (*Vitex parviflora*), raintree (*Samanea saman*), manga (*Mangifera indica*), bahai (*Ormosia calavensis*), anabiong (*Trema orientalis*), binuang (*Octomeles sumatrana*), anapla (*Albizzia saponaria*), batitinan (*Lagerstroemia piriformis*), kamatchile (*Pithecelobium dulce*), and bayok (*Pterospermum diversifolium*). All of these trees were recorded in a more advanced stage of vegetation formation in a specific spot near the high-way (**Figure 2-20**). Based on the owner of the lot, he planted the trees more than three (3) decades ago and he has plantations of Gmelina and Swietenia at the back the hill (not included in the photo). The owner plans to cut the trees as soon as the river dredging project has been approved for operations.

Table 2-10. Dominant large plants (erect herb, and trees) in the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Saging	*Musa sapientum*	48.09	3.90	44.43	96.42
Yemane	*Gmelina arborea*	9.96	4.61	15.21	29.78
Bangkal	*Nauclea orientalis*	6.14	5.32	6.20	17.67
Ipil-ipil	*Leucaena leucocephala*	7.20	5.67	3.54	16.42
Himbabao	*Brousonnetia luzonica*	1.91	7.80	4.18	13.89

Note: Plants with more than 10% importance values are included in the table (n = 41).

2.1.11.7.6.2 Low Stature Plants

204 There are about 67 low stature plants, saplings and seedlings noted in the proposed project site. Talahib (*Saccharum spontaneum*) was among the most common low stature plants in the area, followed by napier grass (*Pinnesetum purpureum*), walis-walisan (*Sida acuta*), mala-makahiya (*Aeschynomene americana*), kudzu (*Calopogonium mucunoides*), and makahiya (*Mimosa pudica*) (**Table 2-11**).

205 All of the above species live naturally in open landscapes. *S. spontaneum* and *P. purpureum* usually dominate in sandy areas. The latter, though, has even more wide spread distribution as it can also thrive in clayey soils on forest edges (Reyes et al., 2015). The rest are found in small cohorts, except for *C. mucunoides* which may dominate the floodplain floor once thicker alluvial soils (sediments) accumulate as a result of occasional flooding.

206 Other usual prominent ground vegetation which were noted in the site, however found infrequent during the time of observation, are the following: hagonoi (*Chromolaena odorata*), tambo (*Arundo donax*), aguingay (*Rottboella conchinchinensis*), and coronitas (*Lantana cammara*). The frequent occurrences of flooding perhaps delimit the occurrence on these plants on more stable riverbanks.

207 The complete list of low stature plants, shrubs, saplings, and seedlings in the proposed project site is provided in Appendix.

Table 2-11. Dominant smaller plants (ground vegetation and other erect plants with less than 1 cm DBH) in proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Talahib	*Saccharum spontaneum*	11.96	12.01	26.93	50.89
Napier grass	*Pinnesetum purpureum*	8.04	7.86	9.95	25.85
Walis-walisan	*Sida acuta*	6.09	6.11	5.81	18.01
Makahiya-like plant	*Aeschynomene americana*	4.78	4.80	4.80	14.38
Kudzu	*Calopogonium mucunoides*	5.87	5.90	2.56	14.32
Makahiya	*Mimosa pudica*	4.13	4.15	1.93	10.21
Hagonoi	*Chromolena odorata*	3.70	3.71	2.69	10.10

Note: Plants with more than 10% importance values are included in the table (n = 67).

2.1.11.7.6.3 Overall Plant Species Diversity and Evenness

208 Moderate to high species diversity and evenness index values were computed for both large and low stature plants (**Table 2-12**). This only means that even occasional flooding, coupled with anthropogenic and exploitation activities (farming and pasture), are evident in some areas especially near the mouth of the main channel in Barangay San Nicolas, moderate to high diversity of species is still attained.

209 Variability in the species composition as listed in appendix is the main reason why moderate to high diversity values were computed

Table 2-12. Computed overall diversity and evenness index values

Plant Group	Shannon-Wiener Diversity (H')	Evenness Index (E)
Large Plants	2.69	0.72
Low Stature Plants	3.46	0.82

2.1.11.7.6.4 National Conservation Status

210 There were only four (4) plants encountered in the proposed project site which have national conservation status. These include: molave, (*Vitex parviflora*), dao (*D. dao*), tagbak (*Alpinia elegans*), and bikal (*Dinochloa acutiflora*). V. parviflora is categorized as endangered, the next two (2) species are listed in the "vulnerable" category, and the last species is classified under "other threatened species" (**Table 2-13**).

Table 2-13. List of plant species with Philippine Threatened Conservation Status

Species Name	Scientific Name	Philippine Threatened Status
Bikal	*Dinochloa acutiflora*	Other threatened species
Dao	*Dracontomelon dao*	Vulnerable
Tagbak	*Alpinia elegans*	Vulnerable
Molave	*Vitex parviflora*	Endangered

2.1.11.7.6.5 International Conservation Status (IUCN 2020)

211 From the 101 species of plants listed in Appendix, only two (2) species of plants have high international conservation status, namely is-is (*Ficus ulmifolia*) and lingatong (*Decdrocnide rigidifolia*) (**Table 2-14**). Though respectively considered vulnerable and endangered in the international community, both species are not classified in the list of Philippine threatened plants, DAO 2017-11. Althought *D. acutiflora, D. dao* and *A. elegans* are both listed as threatened species in the country (**Table 2-14**), they are not classified as threatened in the IUCN 2020.

212 Moreover, *F. ulmifolia* and *D. rigidifolia* are still common and can be found in most terrestrial ecosystems in the country.

Table 2-14. List of plant species with IUCN Threatened Conservation Status

Species Name	Scientific Name	International Threatened Status
Is-is	*Ficus ulmifolia*	Vulnerable
Lingatong	*Dendrocnide rigidifolia*	Endangered

2.1.11.7.6.6 Endemicity of Flora

213 Based on records, there were three (3) species of plants found to be endemic to the country which were documented in the proposed project site. These are the following: *A. elegans*, *D. rigidifolia,* and *F. ulmifolia*. All of these plants are quite common in specific areas; however, their habitats may be at the verge of immediate degradation since they are usually seen near human dwellings and open landscapes, except for *A. elegans* which can extend its occurrence in a more stable ecosystem.

Table 2-15. List of plant species endemic to the country

Species Name	Scientific Name
Tagbak	*Alpinia elegans*
Lingatong	*Dendrocnide rigidifolia*
Is-is	*Ficus ulmifolia*

2.1.11.7.7 Species Richness, Abundance, and Diversity (by ecosystems/habitat types)

214 The succeeding sections provide information on the species richness, abundance and diversity per ecosystem or habitat type. Similarly, the presentation of results is divided into two (2): large plants; and low stature plants (understory and ground vegetation).

2.1.11.7.7.1 Shrubland

2.1.11.7.7.1.1 Large Plants

215 Among the 35 species of large plants recorded in the shrublands, *G. arborea* stood as the most dominant tree based on importance value. Other common associates were *N. orientalis, L. leucocephala, S. saman, M. tanarius, B. luzonica* and *M. multiglandulosa* (**Table 2-16**).

216 *G. arborea* is a fast-growing, naturalized (introduced and well-adapted) tree species in the country. It was once used as a reforestation species all over the Philippines being a good source of lumber. This species is observed planted as boundary markers in agricultural farms and residential lots within the proposed project site.

217 *N. orientalis* is seen sporadically growing along the streambank of perennial streams and on the floodplains. While *L. leucocephala* and *S. saman* form thicket near the Mompong bridge and along the roadsides of Brgy. Tuban.

218 *M. tanarius*, *B. luzonica* and *M. multigladulosa* are pioneer sun-loving trees that dominate in an open landscape. These are common species along the roadsides as well.

219 The complete list of large plants in the shrublands of the proposed project site is provided in

Appendix.

Table 2-16. Dominant large plants (erect herb, and trees) in the shrubland of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Yemane	*Gmelina arborea*	19.51	10.09	27.55	57.16
Bangkal	*Nauclea orientalis*	13.66	11.01	12.78	37.45
Ipil-ipil	*Leucaena leucocephala*	14.15	10.09	6.37	30.61
Raintree	*Samanea saman*	6.34	4.59	9.35	20.28
Binunga	*Macaranga tanarius*	6.34	6.42	2.97	15.74
Himbabao	*Brousonnetia luzonica*	2.93	5.50	4.63	13.06
Alim	*Melanolepis multiglandulosa*	3.41	6.42	1.78	11.61

Note: Plants with more than 10% importance values are included in the table (total number of species = 35).

2.1.11.7.7.1.2 Understory and Ground Vegetation

220 A total of 41 species of ground vegetation and understorey plants were noted in the shrublands (**Table 2-17**). These include *S. saccharum, C. mucunoides, P. purpureum, C. odorata, S. acuta, S. nodiflora, A. donax, M. diplotricha, R. conchinchinensis, C. pubscens* and *L. leucocephala*.

221 *S. saccharum, P. purpureum, A. donax,* and *R. conchinchinensis* are among the ground vegetation that dominate in the whole Mompong river floodplains. But their extent goes even under the shade of trees in the shrubland. Associated species such as *S. acuta, S. nodiflora, M. diplotricha* and *C. pubescens*, on the other hand, are observed on the edges of the shrubland, while regenerants from *L. leucocephala* trees start to grow to form larger thickets (cohorts), perhaps in the next few years if will be left undisturbed.

Table 2-17. Dominant smaller plants (ground vegetation and other erect plants with less than 1 cm DBH) in the shrubland of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Talahib	*Saccharum spontaneum*	7.09	7.09	18.34	32.51
Kudzu	*Calopogonium mucunoides*	10.24	10.24	4.39	24.86
Napier grass	*Pinnesetum purpureum*	7.09	7.09	10.52	24.70
Hagonoi	*Chomolaena odorata*	5.51	5.51	6.31	17.34
Walis-walisan	*Sida acuta*	3.94	3.94	8.72	16.59
Tuhod manok	*Synedrella nodiflora*	6.30	6.30	3.61	16.21
Tambo	*Arundo donax*	3.15	3.15	7.22	13.52
Sampinit	*Mimosa diplotricha*	3.15	3.15	4.99	11.29
Aguingay	*Rottboella conchinchinensis*	2.36	2.36	6.31	11.04
Dilang butiki	*Centrosema pubescens*	4.72	4.72	1.38	10.83
Ipil-ipil	*Leucaena leucocephala*	3.94	3.94	2.71	10.58

Note: Plants with more than 10% importance values are included in the table (total number of species = 41).

2.1.11.7.7.2 Grassland

2.1.11.7.7.2.1 Large Plants

222 Few individual trees were noted in the grass-dominated vegetation within the proposed project site. These are listed in **Table 2-18,** as follows: *L. capitellata, M. tanarius, L. leucocephala, B. vulgaris, F. minahasae, F. variegata,* and *N. media.*

223 Among the seven (7) trees*, L. capitellata* stood as the most common since it can stand occasional flooding and grow best along the banks of large rivers. Other associated tree species in the list have somehow the same traits, though quite less prominent*. B. vulgaris*, in particular, has the capability of forming large clusters, though it was not apparent in the site.

Table 2-18. Dominant large plants (erect herb, and trees) in the grassland of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Alagasi	*Leucosyke capitellata*	38.46	14.29	42.48	95.23
Binunga	*Macaranga tanarius*	15.38	14.29	14.16	43.83
Ipil-ipil	*Leucaena leucocephala*	15.38	14.29	8.85	38.52
Bayog	*Bambusa vulgaris*	7.69	14.29	10.62	32.60
Hagimit	*Ficus minahasae*	7.69	14.29	8.85	30.83
Tangisang bayawak	*Ficus variegata*	7.69	14.29	8.85	30.83
Bangkal	*Nauclea media*	7.69	14.29	6.19	28.17

2.1.11.7.7.2.2 Ground Vegetation

224 About 49 species of ground vegetation were noted in the grasslands (**Table 2-19**). These are*: S. saccharum, P. purpureum, Aeschenomyne* sp*. S. acuta, M. pudica,* and *C. mucunoides*.

225 As described in the previous sections, *S. saccharum* and *P. purpureum*, are no doubt, the most dominant species in the Mompong river landscape in terms of number and ground cover dominance. Other associated species in **Table 2-19** are seen in many small patches, except for *C. mucunoides* which covered a large area along the established gabions near the roadsides.

226 The complete list of low stature plants, saplings and seedlings in the shrublands of the proposed project site is provided in Appendix.

Table 2-19. Dominant smaller plants (ground vegetation and other erect plants with less than 1 cm DBH) in the grassland of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Talahib	*Saccharum spontaneum*	14.92	15.04	31.98	61.94
Napier grass	*Pennisetum purpureum*	8.47	8.13	10.24	26.84
Mala-miimosa	*Aeschenomyne* sp.	8.06	8.13	7.72	23.92
Walis-walisan	*Sida acuta*	8.06	8.13	5.85	22.04
Makahiya	*Mimosa pudica*	4.84	4.88	2.07	11.79
Kudzu	*Calopogonium mucunoides*	4.44	4.47	2.22	11.13

Note: Plants with more than 10% importance values are included in the table (total number of species = 49).

2.1.11.7.7.3 Banana farms

2.1.11.7.7.3.1 Large Plants

227 Banana farms are among the agricultural farms common in the area. Four (4) species of trees were noted in this agro-ecosystem type such as *L. capitellata, M. multigladulosa, F.minahassae*, and *L. leucophala* (**Table 2-20**). All of these associates are sun-loving pioneer trees.

Table 2-20. Dominant large plants (erect herb, and trees) in the banana farms of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Saging	*Musa sapientum*	95.12	55.56	97.13	247.80
Alagasi	*Leucosyke capitellata*	3.41	11.11	1.51	16.04
Alim	*Melanolepis multiglandulosa*	0.49	11.11	0.59	12.19
Hagimit	*Ficus minahasae*	0.49	11.11	0.41	12.00
Ipil-ipil	*Leucaena leucocephala*	0.49	11.11	0.37	11.97

Note: Plants with more than 10% importance values are included in the table (total number of species = 5).

2.1.11.7.7.3.2 Ground Vegetation

228 There are about 25 species of ground vegetation in banana farms. The most common of which is *S. spontaneum*. Other frequent associates include: *P. purpureum, E. indica, C. odorata, S. nodiflora, C. mucunoides, P amarus, C. asiatica*, and *A. gerardii* (**Table 2-21**).

229 In addition, *Z. mays* was noted in a plot since few individuals were cultivated as intercrop.

Table 2-21. Dominant smaller plants (ground vegetation and other erect plants with less than 1 cm DBH) in the banana farms of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Talahib	*Saccharum spontaneum*	11.43	11.43	38.27	61.13
Napier grass	*Pinnesetum purpureum*	5.71	5.71	11.11	22.54
Corn/mais	*Zea mays*	2.86	2.86	11.11	16.83
Paragis	*Eleusine indica*	5.71	5.71	3.46	14.89
Hagonoi	*Chromolaena odorata*	5.71	5.71	3.21	14.64
Tuhod manok	*Synedrella nodiflora*	5.71	5.71	2.47	13.90
Kudzu	*Calopogonium mucunoides*	5.71	5.71	1.73	13.16
Iba-ibaan	*Phyllanthus amarus*	5.71	5.71	0.99	12.42
Tawa-tawa	*Centella asiatica*	5.71	5.71	0.74	12.17
Pana-pana	*Andropogon gerardii*	2.86	2.86	6.17	11.89
Note: Plants with more than 10% importance values are included in the table (total number of species = 25).					

2.1.11.7.7.4 Cornfield

2.1.11.7.7.4.1 Large Plants

230 There are few species of large plants recorded in the cornfields. These are usually found along the farm boundaries. Listed in Table 16 are the following: *M. sapientum, G. arborea, T. orientalis, F. nota, C. madurensis, L. leucocephala, A. saponaria, M. tanarius, S. cumini, C. papaya,* and *M. multiglandulosa.*

231 Several edible fruit-bearing trees noted in the area include: *C. madurensis, S. cumini*, and *C. papaya*.

Table 2-22. Dominant large plants (erect herb, and trees) in the cornfields of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Saging	*Musa sapientum*	51.02	11.76	42.95	105.74
Yemane	*Gmelina arborea*	14.29	11.76	18.93	44.98
Himbabao	*Brousennetia luzonica*	6.12	11.76	18.12	36.01
Anabiong	*Trema orientalis*	4.08	11.76	6.98	22.83
Tibig	*Ficus nota*	4.08	11.76	1.21	17.05
Calamansi	*Citrus madurensis*	6.12	5.88	2.82	14.82
Ipil-ipil	*Leucaena leucocephala*	4.08	5.88	1.88	11.84
Anapla	*Albizzia saponaria*	2.04	5.88	2.28	10.21
Binunga	*Macaranga tanarius*	2.04	5.88	1.74	9.67
Duhat	*Syzygium cumini*	2.04	5.88	1.07	9.00
Papaya	*Carica papaya*	2.041	5.88	1.07	9.00
Alim	*Melanolepis multiglandulosa*	2.04	5.88	0.94	8.86

2.1.11.7.7.4.2 Ground Vegetation

233 **Table** 2-23 presents some frequently observed ground vegetation which often considered weeds in the cornfields. These are the following: *S. spontaneum, S. nodiflora, C. benghalensis, P. purpureum, C. odorata, A. spinosa,* and *M. cordata*.

Table 2-23. Dominant smaller plants (ground vegetation and other erect plants with less than 1 cm DBH) in the cornfields of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Corn/mais	*Zea mays*	14.29	14.29	52.29	80.86
Talahib	*Saccharum spontaneum*	5.71	8.57	12.05	29.19
Tuhod manok	*Synedrella nodiflora*	5.71	8.57	5.06	22.20
Commelina (b)	*Commelina benghalensis*	5.71	8.57	3.61	20.76
Napier grass	*Pinnesetum purpureum*	5.71	5.71	3.61	15.04
Hagonoi	*Chromolaena odorata*	5.71	5.71	1.45	12.87
Kulitis	*Amaranthus spinosa*	5.71	5.71	0.48	11.91
Uoko	*Mikania cordata*	2.86	2.86	4.82	10.53

Note: Plants with more than 10% importance values are included in the table (total number of species = 22).

2.1.11.7.7.5 Rice Paddy

2.1.11.7.7.5.1 Ground Vegetation

234 About nine (9) species of ground vegetation were noted in the rice paddies. Similar to cornfields, those listed in Table 18 are considered weeds in the rice paddies, namely: *P. purpureum, S. spontaneum, E. indica, Dactyloctenium* sp., *D. ciliaris, C. mucunoides, M. pudica, M. diplotricha,* and *S. acuta*

Table 2-24. Dominant smaller plants (ground vegetation and other erect plants with less than 1 cm DBH) in the rice paddies of the proposed River Dredging Project Site arranged in descending order of importance values

Species	Scientific Name	Relative Density	Relative Frequency	Relative Dominance	Importance Value
Rice/palay	*Oryza sativa*	20	20	61.26	101.26
Napier grass	*Pinnesetum*	20	20	9.93	49.93
Talahib	*Saccharum*	13.33	13.33	11.59	38.26
Paragis	*Eleusine indica*	6.67	6.67	3.97	17.31
Dactyloctenium	*Dactyloctenium*	6.67	6.67	3.31	16.64
Digitaria (c)	*Digitaria ciliaris*	6.67	6.67	3.31	16.64
Kudzu	*Calopogonium*	6.67	6.67	1.66	14.99
Makahiya	*Mimosa pudica*	6.67	6.67	1.656	14.99
Sampinit	*Mimosa*	6.67	6.67	1.66	14.99
Walis-walisan	*Sida acuta*	6.67	6.67	1.66	14.99

2.1.11.7.7.6 Plant Species Diversity and Evenness (by ecosystem/habitat type)

235 **Table 2-25** reveals that the species diversity values calculated vary from very low to high depending on the type ecosystem or habitat assessed. Moreover, evenness index values ranged from moderate to very high.

236 High species diversity values were determined for both grassland and shrubland, particularly in low stature plants, however, very low and moderate in large plants, respectively. Such very low

species diversity for large plants in the grass-dominated vegetation and moderate diversity in the shrubland for large trees are expected due to natural and anthropogenic disturbance. Similarly, high species diversity is also expected since the area is rich of low stature plants typical in an open landscape of Mompong river floodplains.

237 The agro-ecosystems also had variable diversity (very low to moderate) in large plants and low stature plant groups. This only means that even occasional flooding, coupled with anthropogenic and exploitation activities (farming and pasture), are evident in some areas especially near the mouth of the main channel in Barangay San Nicolas.

238 Moderate to very high evenness index values were computed for both large and low stature plant groups in all ecosystem types (**Table 2-25**).

Table 2-25. Computed diversity and evenness index values

Ecosystem Type	Plant Group	Shannon-Wiener Diversity (H')	Evenness Index (E)
Shrubland	Large Plants	2.96[c]	0.83[e]
	Low Stature	3.31[d]	0.89[e]
Grassland	Large Plants	1.84[a]	0.35[c]
	Low Stature	3.17[d]	0.81[e]
Agro-ecosystem:	Large Plants	0.70[a]	0.43[c]
	Low Stature	2.97[c]	0.92[e]
Agro-ecosystem:	Large Plants	2.08[b]	0.60[d]
	Low Stature	2.70[c]	0.87[e]
Agro-ecosystem:	Low Stature Plants	2.01[b]	0.63[d]

Note: [a] very low; [b] low; [c] moderate; [d] high; [e] very high

2.1.11.7.8 Fauna

239 To extensively document the species of fauna in the proposed project site, several survey approaches were performed. Mist nets and traps were installed in strategic stations, ocular observations along the transects was carried out, and key informant interviews (KII) were conducted to residents within the proposed project site to augment the list of fauna.

240 There were about 34 faunal species recorded: 21 birds, seven (7) reptiles, four (4) amphibians, and two (2) bats. No rodents and other small mammals were caught using traps and baits. The complete list of faunal species is presented in Appendix.

2.1.11.7.8.1 Birds

241 Most birds are indicators of environmental health. This is why birds are usually considered as one of the most studied fauna in the country and the world.

242 Out of a total of 21 bird species, five (5) were caught using mist nets, nine (9) were observed either flying, perching and/or vocalizing, and the rest were documented through KII.

2.1.11.7.8.1.1 Birds caught in mist nets

243 **Table 2-26** shows the list of birds caught using mist nets in 10 stations. About five (5) individual birds were caught in the mist nets, two (2) individuals for chestnut munia (*Lonchura atricapilla*) in two (2) different occasions, and one (1) each for the following species: Javan short-wing (*Brachypteryx montana*), grey-cheeked bulbul (*Alophoixus tephrogenys*), and yellow-vented bulbul (*Pycnonotus goiavier*). All of these birds inhabit disturbed places near human habitations.

Table 2-26. List of birds caught in mist nets in the proposed project site

Common Name	Scientific Name	Family Name	Caught Date
Chestnut munia	*Lonchura atricapilla*	Estrildidae	Oct. 26,2021
Javan shortwing	*Brachypteryx montana*	Muscicapidae	Oct. 26,2021
Grey-cheeked bulbul	*Alophoixus tephrogenys*	Pycnonotidae	Oct. 26,2021
Yellow-vented bulbul	*Pycnonotus goiavier*	Pycnonotidae	Oct. 26,2021
Chestnut munia	*Lonchura atricapilla*	Estrildidae	Oct. 27, 2021

Figure 2-30. Retrieving mist net caught birds and bats

Figure 2-31. A bird caught on mist net

Figure 2-32. Grey-cheeked bulbul (*Alophoixus tephrogenys*)

2.1.11.7.8.1.2 Birds observed along the transects

244 About 9 species of birds were observed along the established transects. **Table 2-27** presents the recorded birds along the transects. These are: barn swallow (*Hirundo rustica*), black-naped oriole (*Oriolus chinensis*), brahminy kite (*Haliastur indus*), chestnut munia (*Lonchura atricapilla*), Chinese egret (*Egretta eulophotes*), Philippine coucal (*Centropus viridis*), Philippine duck (*Anas luzonica*), spotted dive (*Spilopelia chinensis*), and white-collared kingfisher (*Todiramphus chloris*). These birds are found frequently visiting thickets of trees near human habitations. A total of 84 individuals were seen flying and perching in the site, while 55 individuals were identified through their bird calls.

Table 2-27. List of birds observed along the transects laid in the proposed project site

Location of Station	Common Name	Scientific Name	Seen	Heard
Silong Riverbank (Right Side)	Black-naped oriole	*Oriolus chinensis*	3	5
	Brown shrike	*Lanius cristatus*	5	10
	Chestnut munia	*Lonchura*	10	10
	Brahminy kite	*Haliastur indus*	2	0
	Philippine duck	*Anas luzonica*	5	0
	Spotted dove	*Spilopelia*	3	0
	Chinese egret	*Egretta eulophotes*	20	20
Silong Riverbank (Left Side)	Spotted dove	*Spilopelia*	2	0
	Chestnut munia	*Lonchura*	10	5
	Brown shrike	*Lanius cristatus*	5	1
	Chinese egret	*Egretta eulophotes*	12	0
	Philippine duck	*Anas luzonica*	2	0
	Philippine coucal	*Centropus viridis*	1	1
	White collared	*Todiramphus*	3	2
	Barn swallow	*Hirundo rustica*	1	1
Total			84	55

2.1.11.7.8.1.3 Birds recorded through key informant interviews

245 Among the 15 recorded birds through KII, the most notable species are: colasisi (*Loriculus philippensis*), Japanese night heron (*Gorsachius goisagi*), brown-banded rail (*Lewinia mirificus*), Mindoro racket tail (*Prioniturus mindorensis*), Philippine duck (*Anas luzonica*), whistling green pigeon (*Treron formosae*), Chinese egret (*Egretta eulophotes*), Philippine megapode (*Megapodus cumingii*), bristle-thighed curlew (*Numenius tahitiensis*), and Luzon scops owl (*Otus longicornis*). These birds usually live in thickly vegetated habitat.

246 Most of the listed species in **Table 2-28** may have been encountered by the four (4) key informants in the proposed project site on occasions when these birds had lost their ways going back to their habitats. There is a suitable place near the proposed project site, about a hundred meters away, where these birds may have been dwelling.

Table 2-28. List of birds recorded through key informant interviews

Common Name	Scientific Name	Family Name
Bristle-thighed curlew	*Numenius tahitiensis*	Scolopacidae
Brown-banded rail	*Lewinia mirificus*	Rallidae
Chestnut munia	*Lonchura atricapilla*	Estrildidae
Chinese egret	*Egretta eulophotes*	Ardeidae
Colasisi	*Loriculus philippensis*	Psittacidae
Collared kingfisher	*Todiramphus chloris*	Alcedinidae
Japanese night heron	*Gorsachius goisagi*	Ardeidae
Luzon scops owl	*Otus longicornis*	Strigidae
Mindoro raket tail	*Prioniturus mindorensis*	Psittaculidae
Philippine coucal	*Centropus viridis*	Cuculidae
Philippine duck	*Anas luzonica*	Anatidae
Philippine megapode	*Megapodius cumingii*	Megapodiidae
Spotted dove	*Spilopelia chinensis*	Columbidae
Whistling green pigeon	*Treron formosae*	Columbidae
Yellow-vented bulbul	*Pycnonotus goiavier*	Pycnonotidae

Plate 16. Key informant interview in Brgy. Tuban

Plate 17. Key informant interview in Brgy. San Nicolas

2.1.11.7.8.2 Bats

247 There were only six (6) individual bats caught in mist nets belonging to two (2) species, namely: common short-nosed fruit bat (*Cynopterus brachyotis*) and greater musky fruit bat (*Ptenochirus jagori*). The characteristics of these bats are presented in **Table 2-29**.

Table 2-29. Characteristics of caught bat species in mist nets in the proposed project site

Common Name	Scientific Name	No. of Individuals	Adult Male	Adult Female	Juvenile Male	Post Lactating Female
Common short-	*Cynopterus*	4	1	1	1	1
Greater musky	*Ptenochirus*	2	2	0	0	0
Total		6				

248 The *C. brachyotis* can be found from habitats ranging from orchards, gardens to forested tracts. It roosts in palms especially seed clusters of palms either solitary or in small groups of a few individuals in rural and urban landscapes and in forested areas. It bears single young after a gestation period of 105-120 days. In South Asia, the species is believed to be more restricted to higher elevations when compared to *C. sphinx*, making it specifically a hill forest species.

249 The *P. jagori*, on the other hand, is frugivorous tree and cave roosting species which occurs from sea level to at least 1,950 m is abundant in primary forest and common in secondary forest. It is occasionally present in agricultural areas near forest and has been found in degraded habitats on Cebu and Negros; elsewhere it has been recorded from urban areas, including the suburbs of Manila and the campus of the University of the Philippines.

2.1.11.7.8.3 Other fauna recorded through key informant interviews

250 There were no other small mammals, reptiles and amphibians observed in the site during the field survey. The lists provided in the succeeding tables are results of the KII.

251 **Table 2-30** provides a short list of reptiles which were recorded to be present in the site in the past, while **Table 2-31** displays the frogs and toads still present in the site but were not observed during the fieldwork.

Table 2-30. List of reptiles recorded through key informant interviews

Common	Scientific Name	Family
Common rat	*Pantherophis*	Colubridae
Crocodile	*Crocodilus*	Crocodylid
King cobra	*Ophiophagus*	Elapidae
Luzon/marbled	*Varanus marmoratus*	Varanidae
Malayan turtle box	*Cuora amboinensis*	Geomydid
Philippine cobra	*Naja naja*	Elapidae
Philippine sailfin	*Draco rizalii*	Agamidae
Reticulated python	*Malayopython*	Pythonidae
Tokay gecko	*Gekko gecko*	Gekkonida

Table 2-31. List of amphibians recorded through key informant interviews

Common Name	Scientific Name	Family
Cane toad	*Rhinella marina*	Bufonidae
Common tree frog	*Polypedates*	Rhacophori
Panther flying frog	*Rhacophorus*	Rhacophori
Philippine narrow-mouth	*Kaloula conjuncta*	Microhylida

2.1.11.7.8.4 Fauna Endemicity

252 There are about 11 species of fauna which are determined endemic to the country **(Table 2-32**). One of which is a restricted range bird only found in the island of Mindoro, *Prioniturus mindorensis*. Though the Mindoro racket tail is not observed during the fieldwork, it is believed that the said species is present in the nearby forests of Mt. Siburan few kilometers from the proposed project site.

Table 2-32. List of endemic faunal species (including those recorded through KII) in the Mompong River, Sablayan, Oriental Mindoro Site

Type	Species	Scientific Name	Family
Birds	Philippine duck	*Anas luzonica*	Anatidae
	Philippine coucal	*Centropus viridis*	Cuculidae
	Philippine megapode	*Megapodius cumingii*	Megapodiida
	Colasisi	*Loriculus philippensis*	Psittacidae
	Brown-banded rail	*Lewinia mirifica*	Rallidae
	Luzon scops owl	*Otus longicornis*	Strigidae
	Mindoro racket tail	*Prioniturus*	Psittaculidae
Bats	Greater musky fruit bat	*Ptenochirus jagori*	Pteropodidae
Reptile: Lizard	Luzon/marbled monitor	*Varanus marmoratus*	Varanidae
	Philippine sailfin lizard	*Agamid lizards*	Agamidae
Amphibian:	Philippine narrow-mouth	*Kaloula conjuncta*	Microhylidae

2.1.11.8 Mitigation Measures and Management Strategies

2.1.11.8.1 Operation Phase

253 There is a need for a complete inventory of trees for immediate replacement in the pre-identified rehabilitation site. Identification of site for restoration, preferably near the proposed project site, should be done with the DENR.

254 A replacement of 100 seedlings per tree will be followed by the proponent. It is recommended to establish temporary plant nursery in areas where rehabilitation/restoration (i.e., tree planting, enrichment planting, assisted natural regeneration) will be conducted.

255 Riverbank stabilization should also be considered using engineering structures like concrete walls, gabions and the like should be constructed to prevent further scouring of soil.

2.1.11.8.2 Abandonment Phase

256 Continued implementation of streambank stabilization activities and planting of trees on the riverbank are recommended.

Table 2-33. Potential Impacts and Options for Prevention, Mitigation or Enhancement Land Use Classification

Potential Impact	*Pre-Construction*	*Construction*	*Operation*	*Abandonment*	Options for Prevention, Mitigation, or Enhancement
Change/Inconsistency in land use	✓				No change in land use, however ensure that dredging permitting and other relevant clearance have been obtained before operation.
Risk to safety and equipment damage due to flooding/Contribution to flooding	✓	✓			• Dredging will be compatible to mitigating measures that are in place. These will allow for stable flow regime and reduce incidence of flooding. Thus, the project will not contribute to flooding. • Precautionary measures should be taken upon occurrence of flooding to secure safety of personnel and equipment. • Detailed engineering design for the channelization must be approved and adhered to during pre-operations and operations, respectively.
Disturbance to wildlife due to site preparation and vegetation clearing activities	✓	✓			• Avoid unnecessary clearing, cutting of vegetation. • Replacement planting/ offsetting must be done in identified sites of restoration by DENR .
Change in surface landform/topography/ terrain/slope/Soil		✓	✓	✓	• No change in overall topographical/geomorphological aspect in surrounding areas of the site. • Only change will be topography of riverbed due to dredging. However, the change will accommodate volume of water. Only risk will be potential head cutting upstream. • Detailed engineering design must be adhered in order to minimize any erosion. • Riverbank stabilization should also be considered using engineering structures like concrete walls, gabions and the like should be constructed to prevent further scouring of soil
Loss of topsoil / Surface erosion and downstream sedimentation		✓	✓	✓	• No change in topsoil or soil at the surface shall occur. Only changes will be along th riverbed. • However, soil may be eroded at areas where channel may be cut. Necessary engineering measures may be conducted to stabilize ground.

					• Optimum project design to minimize the size of disturbed areas • Reuse of soils removed for restoration and landscaping • Proper disposal/stockpiling of surface materials. • Restoration, re-vegetation of disturbed areas.
Soil Quality / Land contamination due to improper solid waste disposal		✓	✓	✓	• Implement re-use and recycling of waste materials; • Implement proper segregation, collection, and disposal of domestic wastes in the project area; • Provide receptacles/bins for solid wastes; • Coordinate with the municipal / city waste collectors; • Daily inspection of waste/recycling bins for segregation; • Daily inspection for presence of mixed garbage in the project area; • Weekly inspection of waste accumulated • Proper maintenance of heavy equipment/vehicles (oil leaks)
Impairment of visual aesthetics		✓	✓	✓	• No significant impact on impairment on visual aesthetics of the area
Devaluation of land values		✓	✓	✓	• No significant impact considering that the project is along the river channel. • Coordination with LGU is advised with respect to the land values.

2.2 The Water

257 This section covers the investigation on the hydrology and limnology of the potentially-affected water bodies including its water quality. In particular, this section addressed the following:

- Site drainage assessment including mapping of the catchment area, flooding, and the effect of subsidence;
- Sediment transport in Mompong River;
- Determination of the existing water quality of the waterbodies; and
- Assessment of groundwater availability and usage.

2.2.1 Methodology

258 A site investigation is conducted to identify the hydrologic process of the waterbodies to be traversed/affected by the project. This is conducted to establish the erosion, landslide, sediment transport and flooding potential at the project site. Water sampling for laboratory analysis is also conducted to determine the baseline water quality for the assessment of the waterways' possible contamination from the project construction until its operation. Interview of local residents is also conducted to determine the water usage and flooding history in the area.

2.2.2 Hydrology

259 The Mompong River with catchment area of about 3,380 hectares is draining Mt. Siburan which is the largest tract of remaining lowland forest in Mindoro. Its headwater is dendritic consisting of two (2) major streams flowing west and northwest that converge to form the Mompong River (**Figure 2-33**). After the confluence, the stream flows southwest as it meanders towards its outlet or to Pandan Bay. The channel is relatively shallow but at least 100 m wide and still exhibits widening going downstream. The riverbed consists of cobbles, gravel and sand while grasses grow after the riverbanks. The water depth is shallow and is limited to the deeper section of the riverbed. The streamflow is turbulent with slightly turbid water.

260 Small-scale quarrying and pumping of water for irrigation are the observed usage of Mompong River during the fieldworks. The observed river characteristics are presented in **Figure 2-34**.

261 The Mompong River is ungauged. To determine the hydrologic regime and sedimentation in the river during extreme rainfall events, a hydrologic and sediment transport simulations were conducted. The primary inputs in the hydrologic simulation are the precipitation and watershed characteristics. The *Rainfall-Intensity-DurationFfrequency* (RIDF) from the nearest PAGASA Weather Station in San Jose, Occidental Mindoro (**Table 2-34**) is assumed to represent the hydrologic condition in the area and applied in the rainfall-runoff simulation.

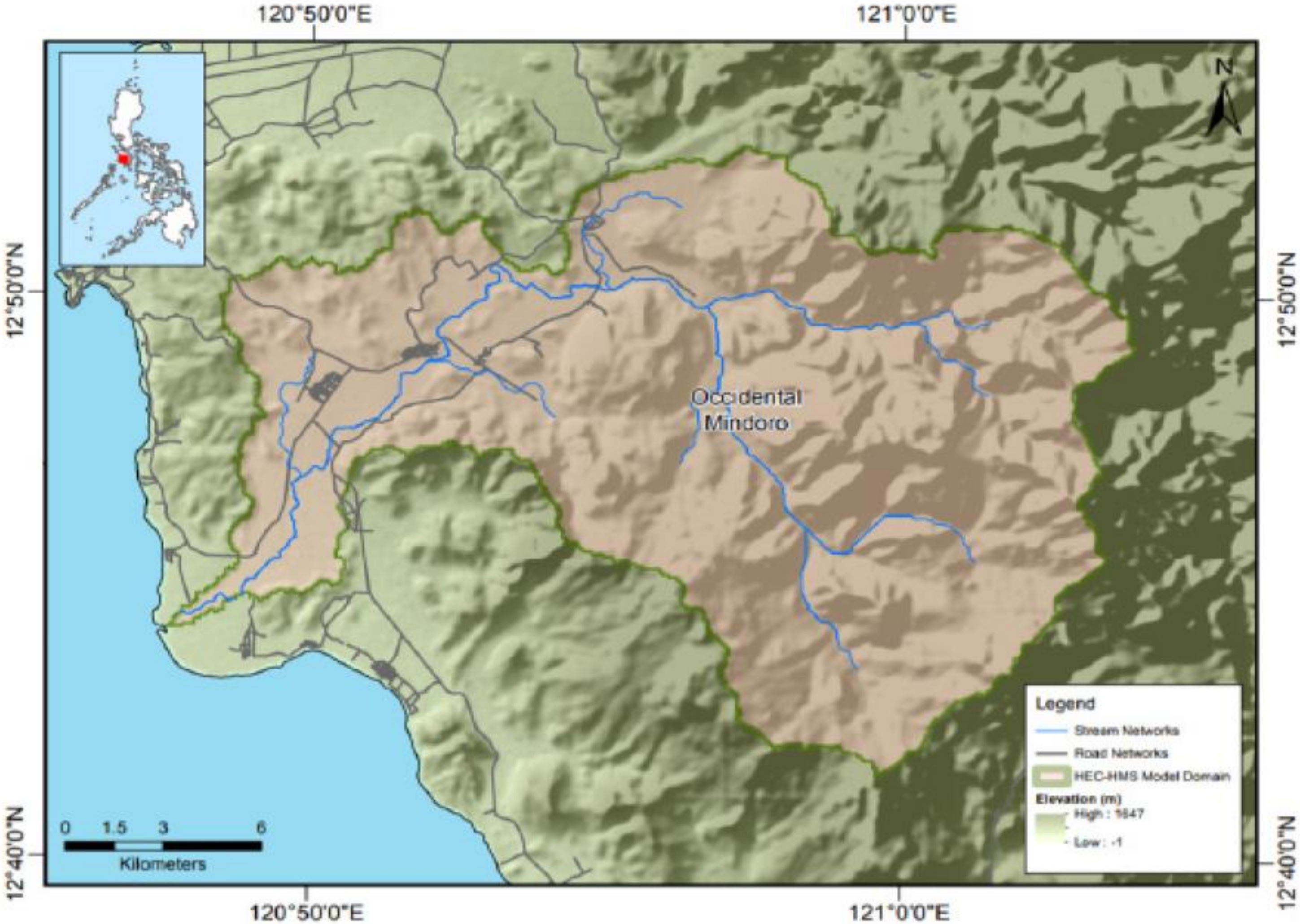


Figure 2-33. Project Area

Source excerpt from LiDAR Surveys and Flood Mapping of Mompong River.

Photo 1. Streamflow at the middle section of the riverbed of Mompong River

Photo 2. Turbulent flow of slightly turbid water

Photo 3. Cobbles and gravel at the riverbanks.

Photo 4. Riverbed with slightly mossy rocks

Photo 5. Irrigation pump structure as shown in the background

Photo 6. Small-scale quarrying in Mompong River

Figure 2-34. Features of Mompong River

Table 2-34. Computed Extreme Values of Precipitation in San Jose, Occidental Mindoro based on 28 years of record (in mm)

Return Period (Years)	Duration								
	10 mins	20 mins	30 mins	1 hr	2 hrs	3 hrs	6 hrs	12 hrs	24 hrs
2	20.8	31.3	39.4	55.4	70.3	79.2	99.6	118.9	138.4
5	26.8	40.2	50.3	72.6	101.5	116.8	143.9	173.5	195.8
10	30.8	46.2	57.6	84.1	122.1	141.8	173.3	209.6	233.8
25	35.8	53.7	66.8	98.5	148.2	173.3	210.3	255.3	281.8
50	39.5	59.3	73.6	109.2	167.5	196.7	237.9	289.2	317.4
100	43.2	64.8	80.3	119.8	186.7	219.9	265.2	322.8	352.8

Source: Hydro-Meteorology Division, PAGASA

262 The Kimijima equation determined the incremental rainfall distribution for 24-hour duration at 30-minute interval which is applied in the study. The equation represents the relationship of maximum rainfall intensity (as dependent variable) with other parameters of interest such as rainfall duration and frequency (as independent variables). It is expressed in the general form as follows:

$$I = \frac{a}{(t^n + b)}$$

Where	I	=	rainfall intensity (mm/hr)
	t	=	duration
	a, b, n	=	constant parameters

263 The constant parameters are determined using a curve-fitting tool that performs direct regression analysis.

264 The computed rainfall intensity for a given duration is converted to precipitation depth for the establishment of rainfall temporal pattern using the Alternating Block Method. This method specifies the precipitation depth occurring in *n* successive time intervals of duration Δt over a total duration $T_d = n\,\Delta t$.

265 **Figure 2-35** presents the rainfall distribution at different Rainfall Return Periods (RRPs).

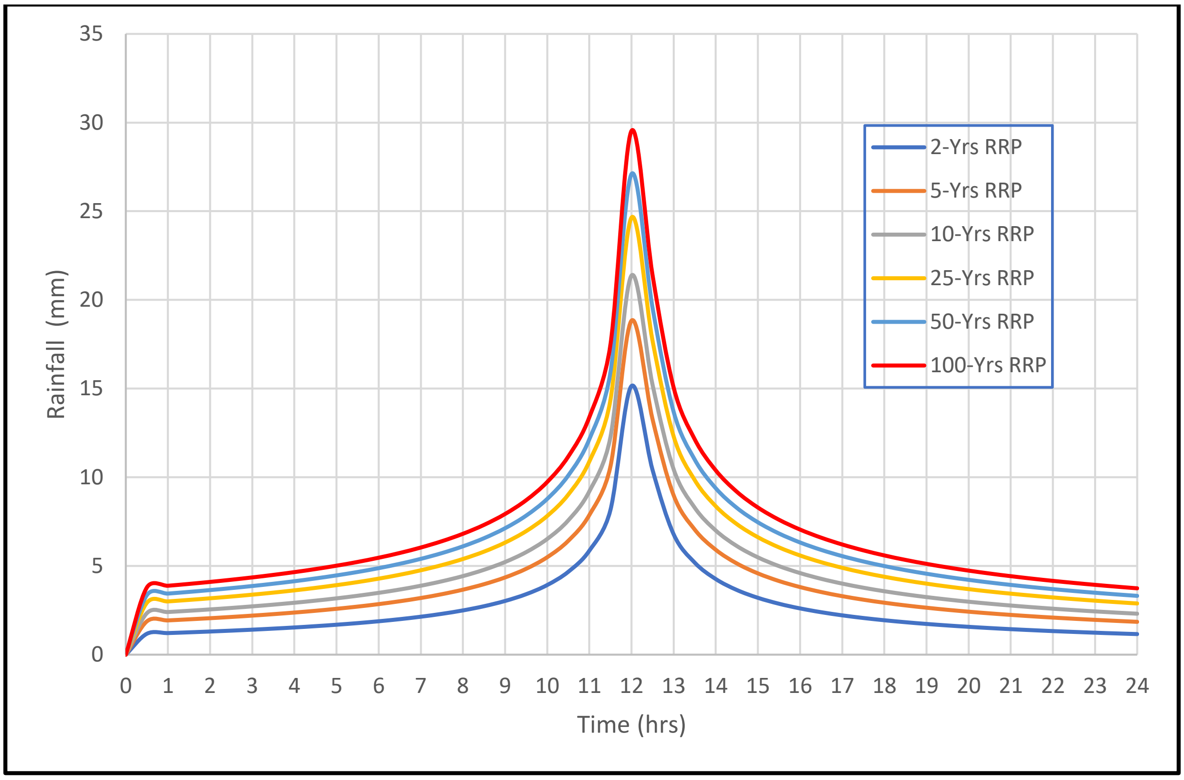


Figure 2-35. Incremental Rainfall Distribution at different RRPs

266 The catchment area of Mompong River is delineated and its hydrologic characteristics established from the digital elevation model (DEM) available from the GeoHECHMS which is the software used in the hydrologic simulation. The river bathymetry is also determined by appling the DEM which is verified and supported by the ocular inspection during the fieldworks. On the other hand, the project will dredge the Mompong River from Stn. 0+000 to Stn. 8+900 at depth of 10.0 m and side slope of 1 vertical to 2 horizontal (1V:2H). The river bottom width wil start from 300 m at Stn. 8+900 and widens to 600 m from Stn 2+300 until the rivermouth. The typical cross-section is shown in **Figure 2-36**.

267 On the other hand, the sediment transport simulation was conducted using the information from the initial sediment transport study (Annex G) which is part of the detailed enginerring design (*DED*).

268 The result of hydrologic simulation indicates an optimum flow of 589.34 m^3/s for 2-Yrs RRP and up to 1,863.87 m^3/s for 100-Yrs RRP (**Figure 2-37**). The optimum flow occurs 20 hours after the start of rainfall or a lag time of 8 hours from the peak rainfall. The gentle slope of the area, low drainage density or few streams receiving surface runoff draining to Mompong River, and the relatively long river channel are some of the factors that contribute to the longer lag time. The hydrograph's recession limb is longer than the rising limb and extends up to about 3rd quarter of the following day.

269 The result of hydrologic simulation indicates that flooding is expected at baseline condition from 2-Yrs RRP up to 100-Yrs RRP (**Figure 2-38** *to* **Figure 2-43**)**.** The projected inundated area is increasing with the higher rainfall return period and from upstream going downstream. The inundated area is wider at the floodplain on the left bank as compared to the right bank.

270 A community to the left of Mompong River and its adjacent agricultural area are expected to be flooded even at 2-Yrs RRP (**Figure 2-38**). The map shows that there are diverging streams upstream that flow towards the area. These diverging streams serve as the pathway of floodwater that inundates the community and its adjacent agricultural land.

271 In general, the extreme rainfall events will cause degradation or lowering of the invert elevation or riverbed in most sections of the Mompong River. The optimum lowering of the riverbed after extreme rainfall recession could reach between 0.74 m to 0.85 m (**Figure 2-44**). On the other hand, the optimum aggradation or sediment deposition could reach only up to 0.39 m for most of the extreme rainfalls investigated.

272 The predicted river aggradation and degradation will subsequently result to riverbed mass accumulation and loss, respectively. The mass gain and loss are expected to increase with higher rainfall return period. The optimum mass loss ranges from 58,607 tons at 2-Yrs RRP to 94,857 tons at 100-Yrs RRP while the accumulation is from 65,127 tons to 136,271 tons at 2-Yrs RRP and 100-Yrs RRP, respectively (**Figure 2-45**). Considering that the decrease in depth due to erosion is higher, it indicates that wider area is covered by the aggradation thus spreading the higher volume of sediments without resulting to significant increase in mass of the riverbed.

2.2.2.1 Impact Area

273 The direct impact area (DIA) encompasses the project area due to the expected change in its hydrologic characteristics particularly the widening and deepening of the river channel. The Indirect Impact Area (IIA) consists of the floodplain, coastal outlet of the river and agricultural lands that are using the river as source of water for irrigation. The potential impact areas are shown in **Figure 2-46**.

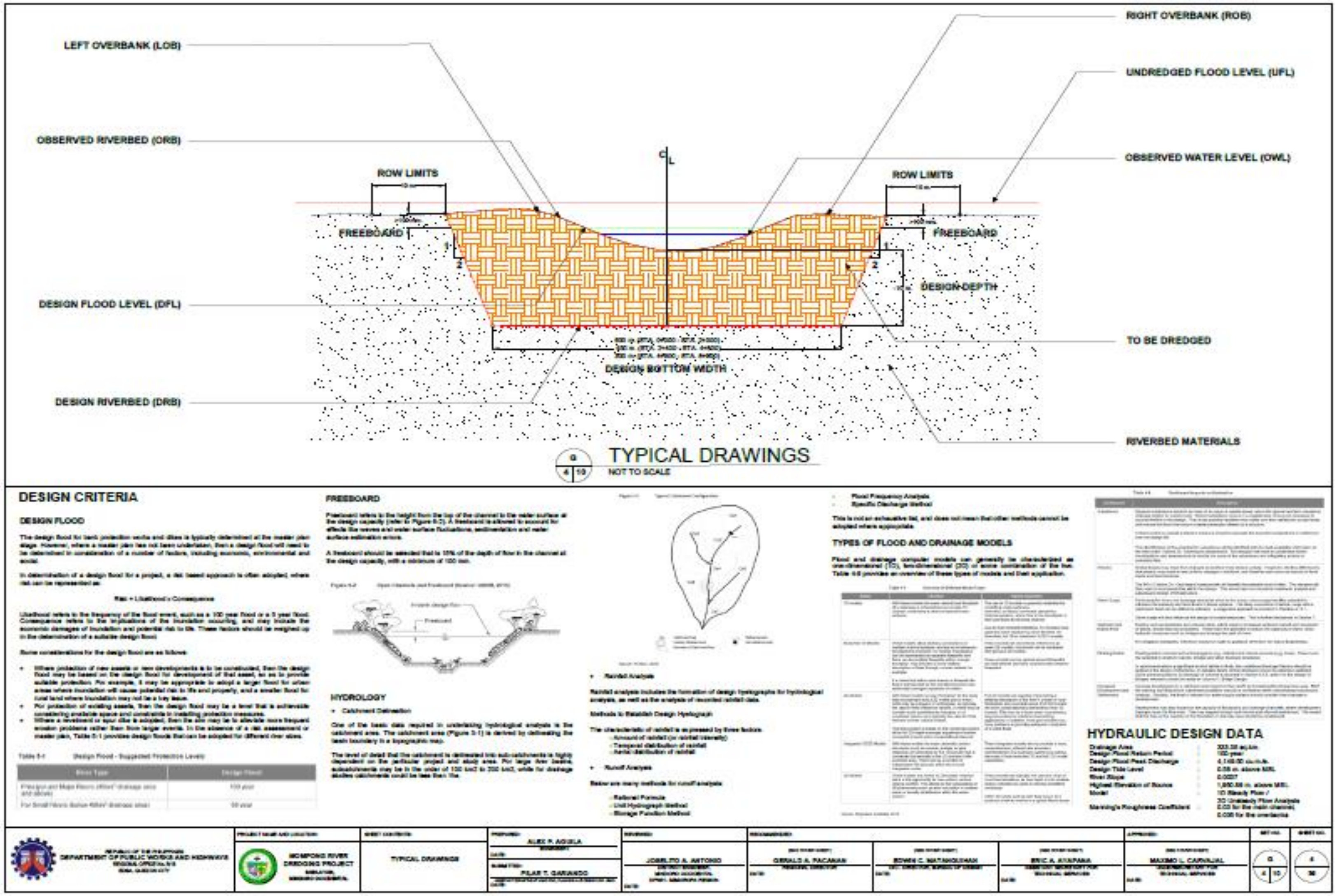


Figure 2-36. Incremental Rainfall Distribution at different RRPs

Source: excerpt from DED for Mompong River Dredging Project

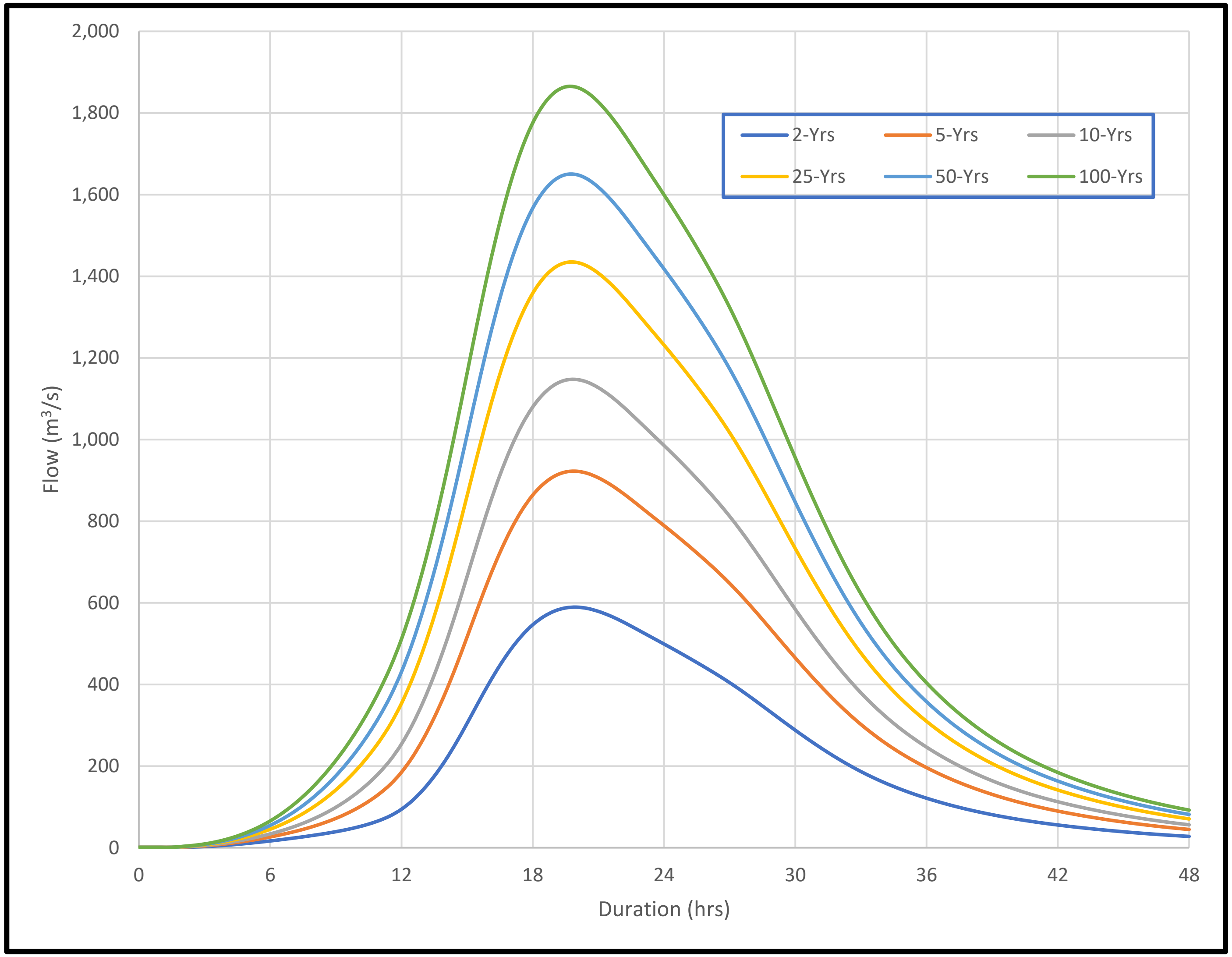


Figure 2-37. Flow Hydrograph at different RRPs

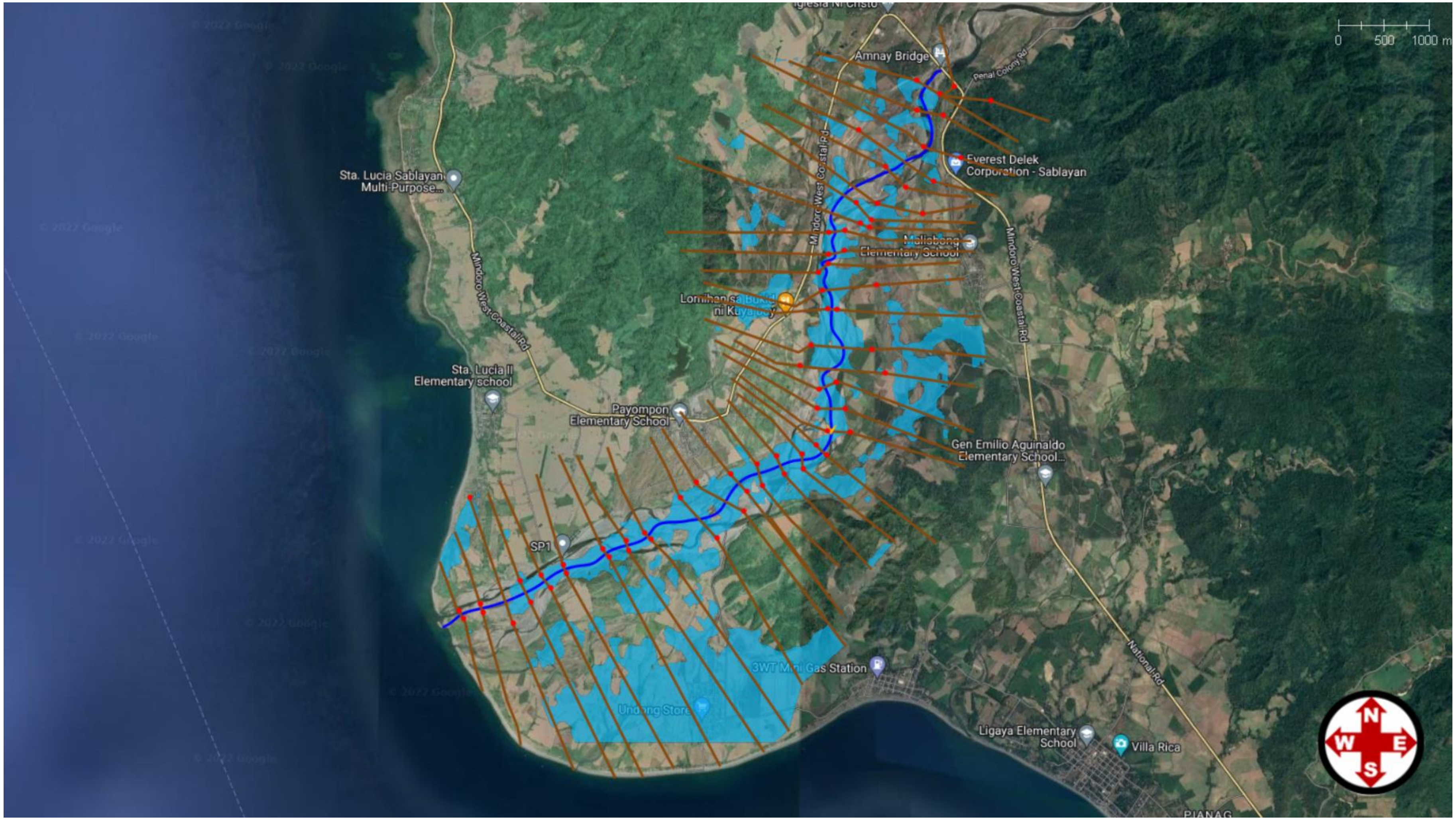


Figure 2-38. Flood Hazard Map at 2-Yrs RRP

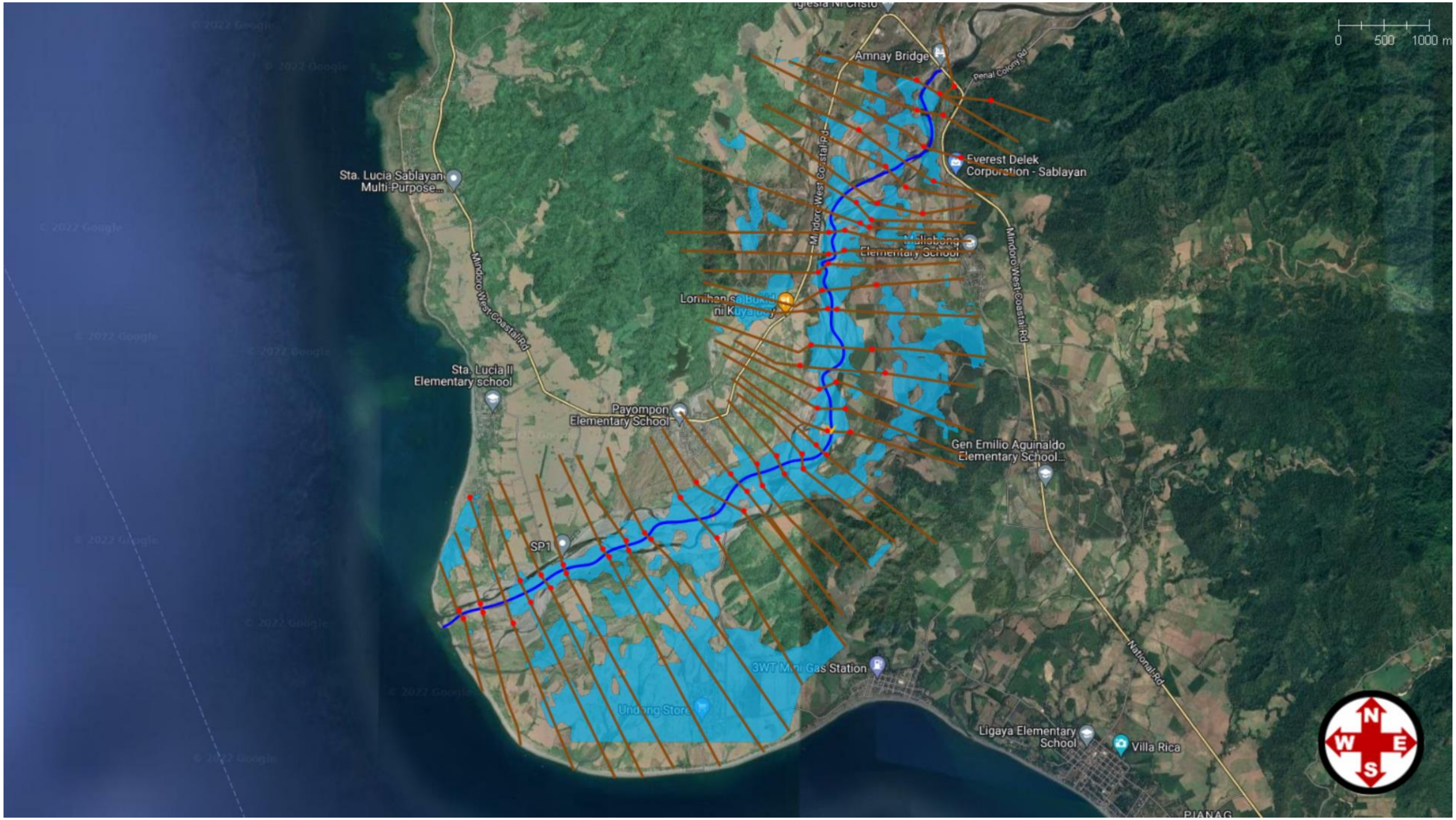


Figure 2-39. Flood Hazard Map at 5-Yrs RRP

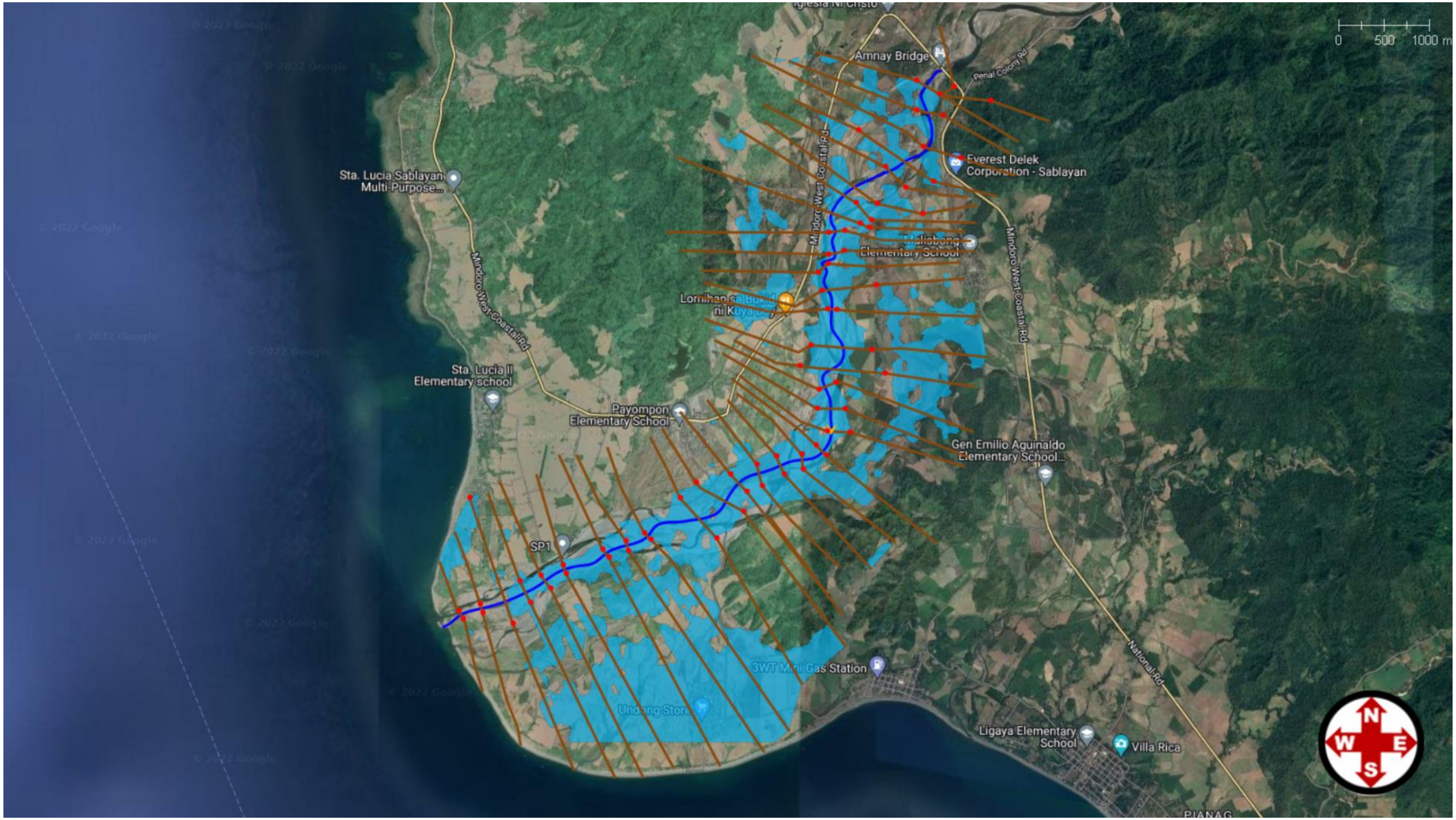


Figure 2-40. Flood Hazard Map at 10-Yrs RRP

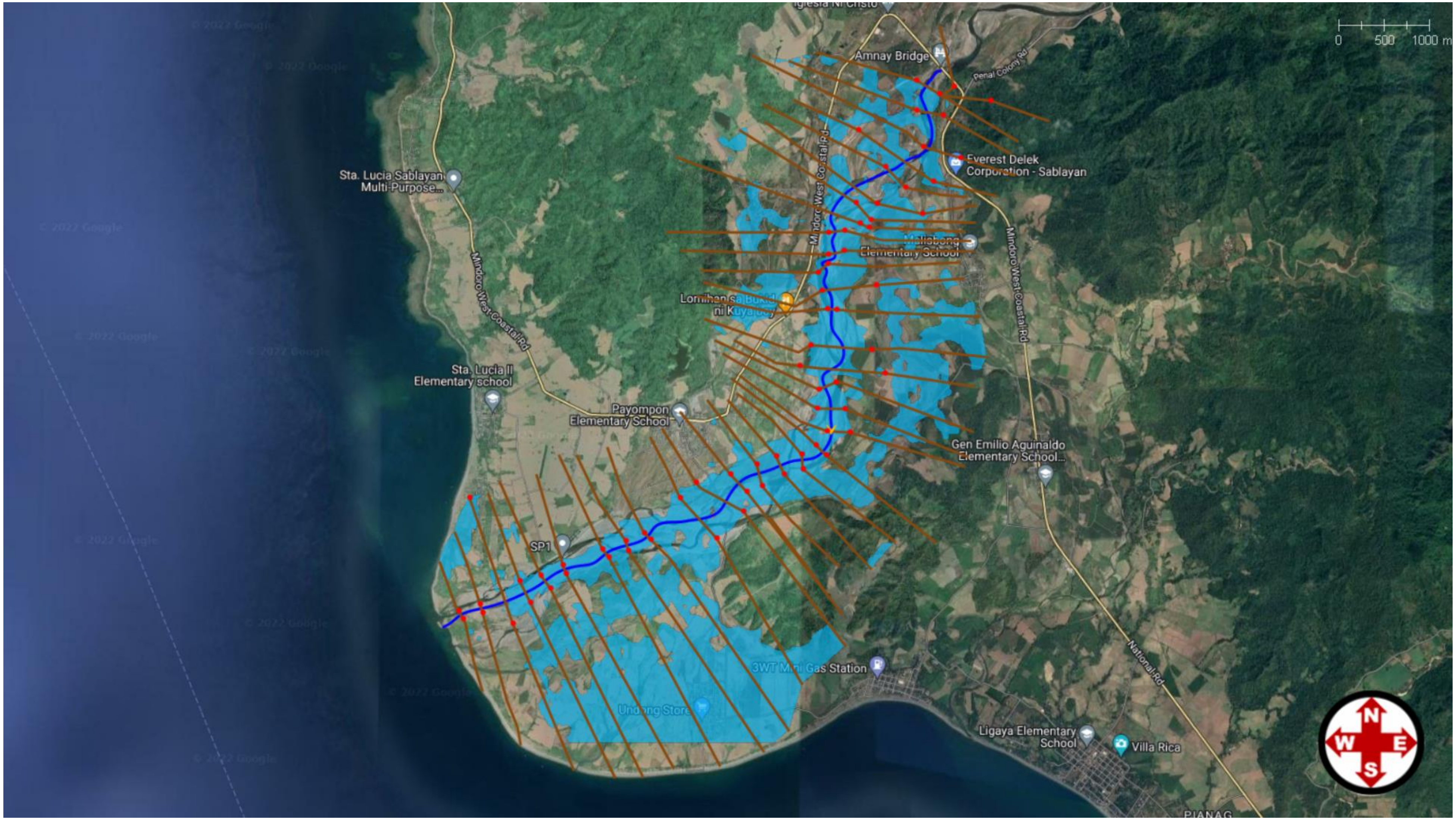


Figure 2-41. Flood Hazard Map at 25-Yrs RRP

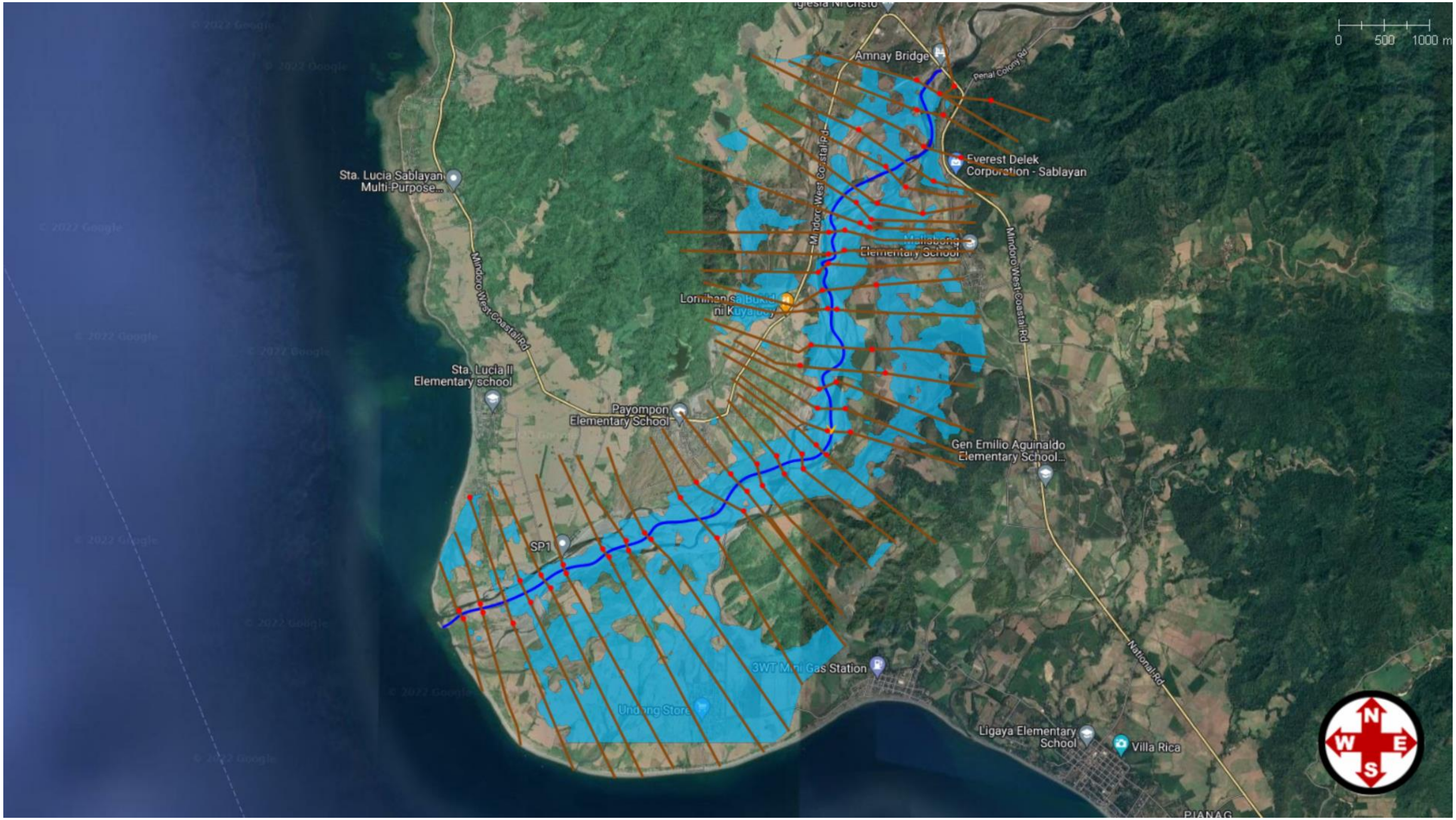


Figure 2-42. Flood Hazard Map at 50-Yrs RRP

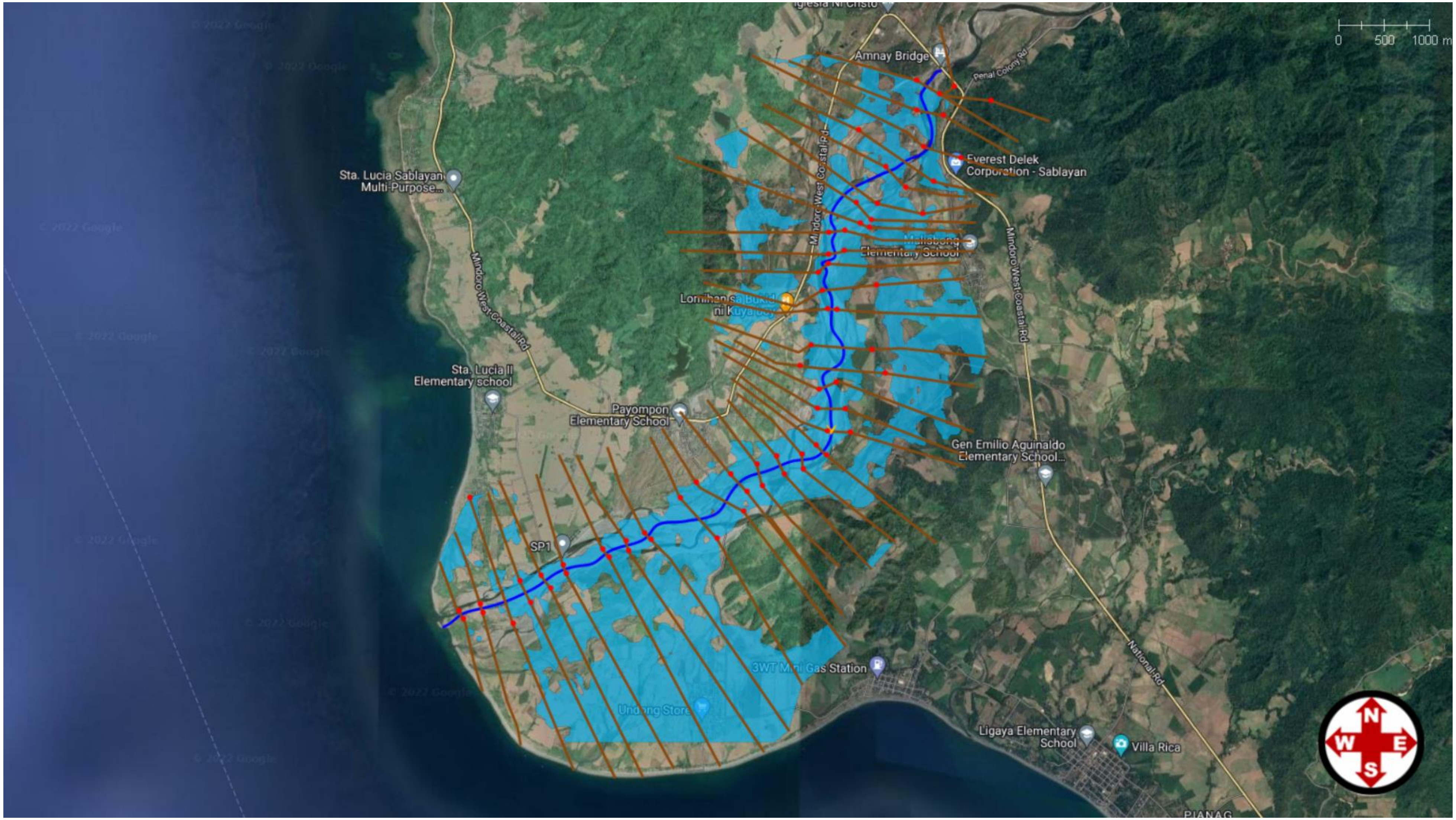


Figure 2-43. Flood Hazard Map at 100-Yrs RRP

Figure 2-44. Potential Impact Area

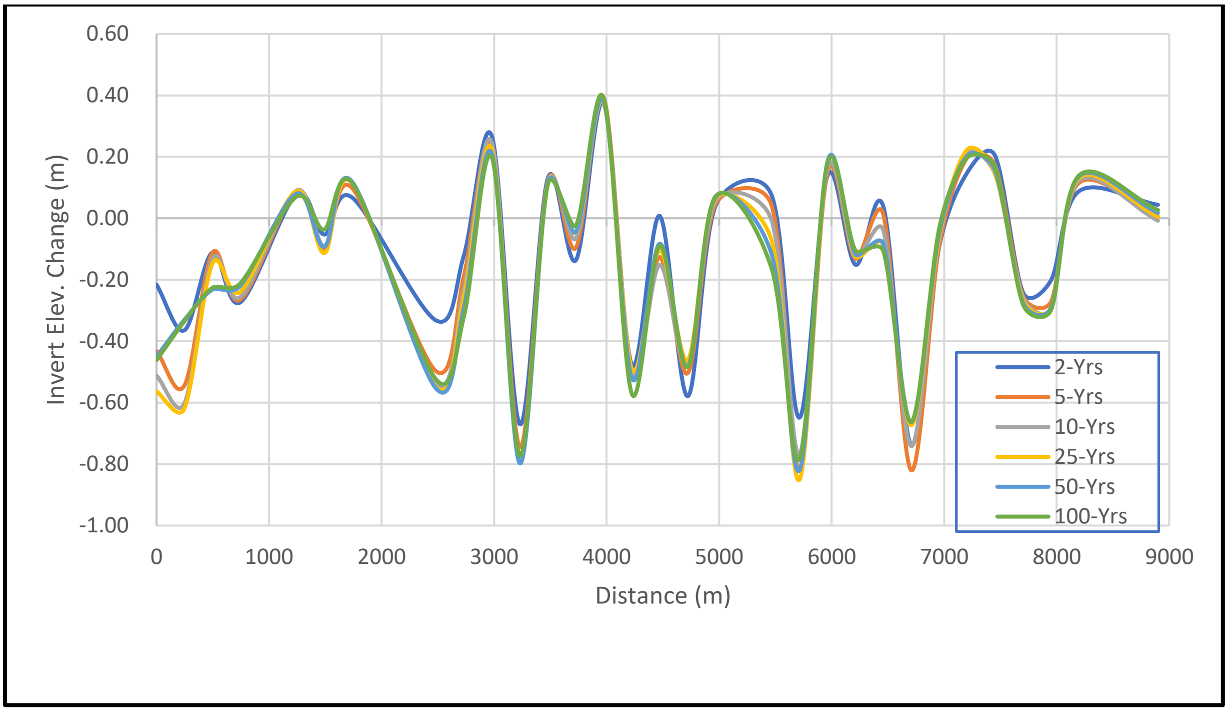


Figure 2-45. Change in Invert Elevation at Baseline Condition for different RRPs

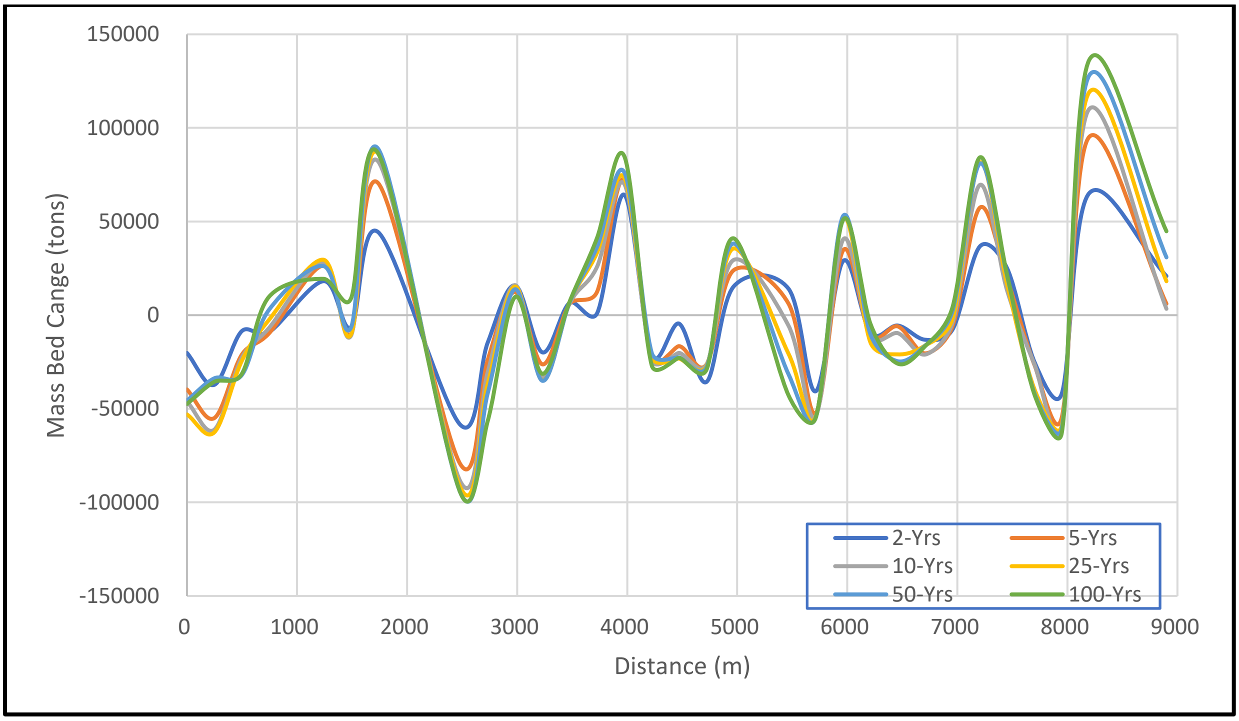


Figure 2-46. Change in Mass Bed at Baseline Condition for different RRPs

2.2.2.2 Potential Impacts and Mitigating Measures

2.2.2.2.1 Change in Drainage Morphology

274 The dredging or development phase will include activities such as excavation, hauling and storage of excavated materials to the stockpile area, and setting-up of area for site office, equipment terminal, and fuel farm. The widening and deepening of river channel thru dredging will directly change the drainage morphology. In addition, the development of support facility offsite will include removal of ground cover or vegetation, flattening, and compacting of ground surface, and concreting of area for the fuel farm and vehicle maintenance. The dredging or working area could block the streamflow and serves as detention pond or sump. In addition, the exposed ground surface could facilitate water infiltration and percolation during rainfall and possibly cause erosion and landslide upon saturation.

275 Re-routing of the streamflow away from the dredging area should be implemented to ensure unobstructed flow. A temporary channel could be constructed to divert the flow away from the dredging area. A sedimentation pond should be provided for the settling of sediments in the runoff from the dredging area. The settled sediments should be regularly collected and disposed in designated disposal site to prevent its resuspension in the streamflow. The excavated materials in the dredging activities should also be transported to designated stockpile area. The stockpile should be enclosed by a drainage system connected to the sedimentation pond prior to the discharge of the collected surface runoff to the river. In addition, a stockpile will also be assigned for the storage of waste materials to be generated from the ground clearing and preparation of the offsite support facility.

276 During operation or completion of river dredging, an unobstructed streamflow is expected due to widening and deepening of the river channel. The surface runoff from the catchment area could be contained within the river channel. The formation of diverging channels as currently observed will be stopped due to deepening of the main river channel.

277 The sediment transport will be greatly reduced during project operation. The projected change in invert elevation is less than 1.0 cm even at 100-Yrs RRP with no noticeable change in the depth of the riverbed at Stn 8+900 (**Table 2-35**)**.** In general, sediment scouring or degradation occurs at the upstream sections while aggradation is prevalent at the downstream section before the river mouth.

278 No significant net change in the mass bed is noted due to slight change in the invert elevation. The projected mass bed changes up to 50-Yrs RRP is below 10,000 tons for all the river sections (**Table 2-36**). This could be attributed to the widening of the riverbed wherein the aggradation or degradation is evenly distributed to wide area thus effecting slight change in the riverbed elevation.

Table 2-35. Change in Invert Elevation at Project Operation for different RRPs (m)

Station	2-Yrs	5-Yrs	10-Yrs	25-Yrs	50-Yrs	100-Yrs
Stn 0+000	0.003	0	0	0	0	0.004
Stn 2+300	0.004	0.008	0	0.003	0.003	0.002
Stn 2+400	0.000	-0.001	0.007	0.001	0.001	0.003
Stn 4+800	-0.001	-0.001	0.002	0	-0.002	0.004
Stn 4+900	-0.001	-0.002	0.002	0.003	-0.002	0.004
Stn 8+900	0	0	0	0	0	0

Table 2-36. Change in Mass Bed at Project Operation for different RRPs (tons)

Station	2-Yrs	5-Yrs	10-Yrs	25-Yrs	50-Yrs	100-Yrs
Stn 0+000	4032	207	18	2	-2	73087
Stn 2+300	1873	3855	655	4750	3678	75636
Stn 2+400	-591	-2473	9929	1347	1153	80018
Stn 4+800	-112	-174	2432	-3	-667	79474
Stn 4+900	-1888	-1968	2362	4807	-2402	76773
Stn 8+900	0	0	0	0	0	76773

2.2.2.2.2 Change in Stream Depth

279 Sedimentation could be associated with the dredging activity and generation of sediments from the stockpile area. Sedimentation of the riverbed will lead to shallowing of the channel. The transport of sediments could also result to erosion or cave-in of the channel banks which could aggravate shallowing of the river.

280 Provision of drainage system passing thru sedimentation pond or sump after the dredging and stockpile areas will minimize the re-suspension and transport of sediments to the river.

281 Lowering of the water level in the river is expected upon completion of dredging due to the resulting wide and deep river channel.

2.2.2.2.3 Reduction in Stream Volumetric Flow

282 The dredging area could serve as obstruction to the streamflow since it is along the river channel and a depression could be created during excavation. The depression could serve as water storage if not properly mitigated. Generation of sediments from the dredging and stockpile areas and its conveyance to the river could also cause reduction in volumetric flow due to potential shallowing of the river. As with the reduction in water depth, reduction in the volumetric flow could also adversely affect the aquatic habitat. This will result to decrease in dissolved oxygen, decrease in the area for aquatic habitat, and consequently an increase in resource competition among the aquatic organisms.

283 Re-routing of the streamflow by construction of temporary channel away from the dredging area will prevent the obstruction and reduction in the stream volumetric flow. Provision of drainage system passing thru sedimentation pond after the dredging and stockpile areas will control sedimentation and subsequent shallowing of the river.

284 The project completion is expected to increase the volumetric flow since the formation of diverging channels will be prevented and the entire streamflow will be draining to the main river channel.

2.2.2.2.4 Inducement of Flooding

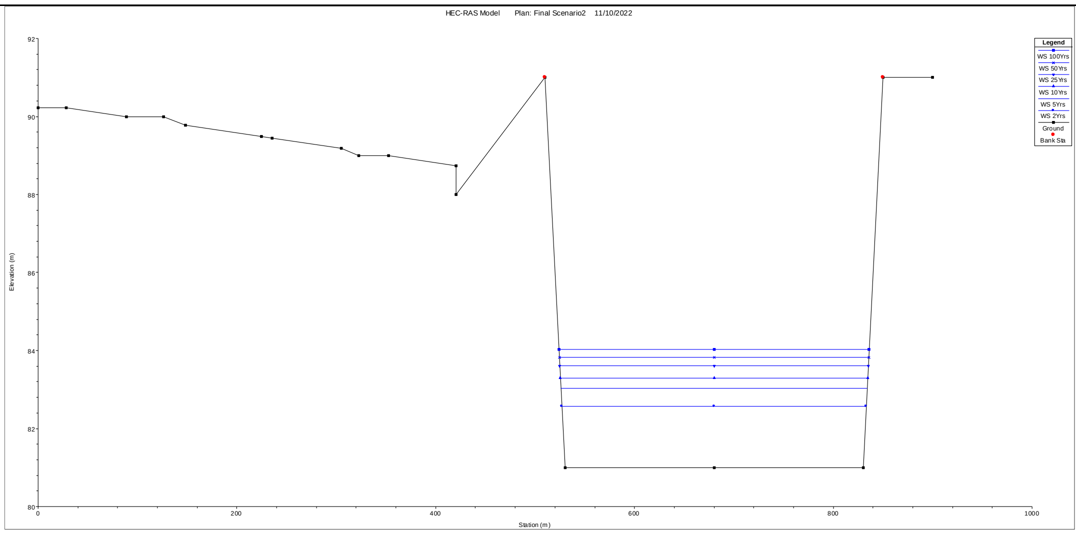
285 A depression could be formed in the dredging area that will store water and subsequently delay the flow. The depression could act like a reservoir that should be filled-up before water will flow downstream. The flattening of the ground surface offsite could hamper the conveyance of surface runoff and result to potential inundation of the area.

286 Re-routing of the streamflow by construction of temporary channel away from the dredging area will prevent water storage in the depression and the inducement of flooding particularly during rainfall. Leveling and compaction of the ground surface in the offsite area and provision of adequate drainage system should be implemented to prevent the inundation or flooding.

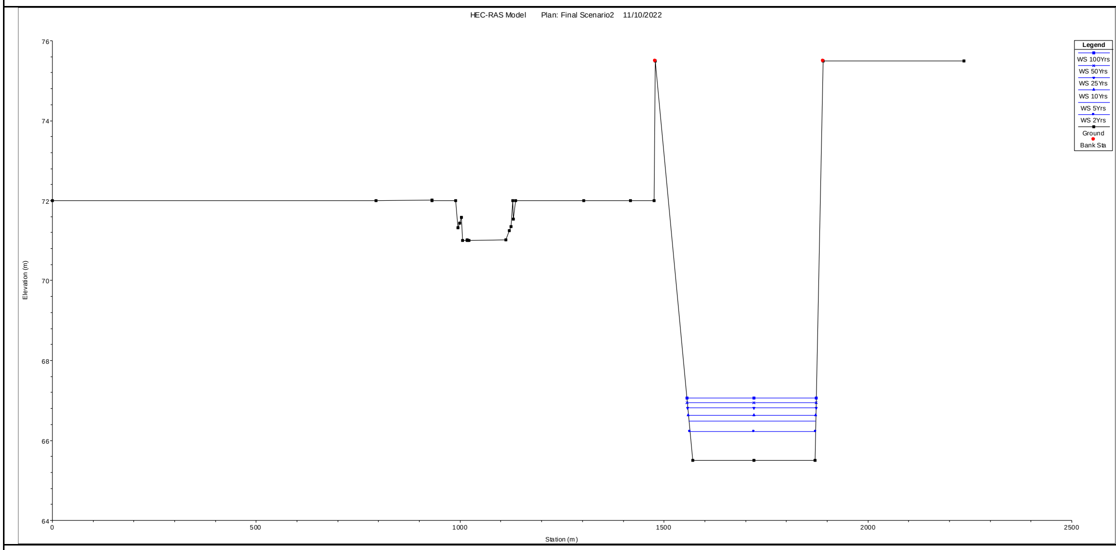
287 No flooding is expected during project operation since the flow could be fully-contained in the river channel. The water depth in the channel is highest at the start of the project or Stn 8+900 from 1.7 m at 2-Yrs RRP to 3.2 m at 100-Yrs RRP while it is only 0.60 m and 1.20 m at 2-Yrs and 100-Yrs RRP, respectively in the river mouth or Stn 0+000 (**Figure 2-47**).

2.2.2.2.5 Water Resource Competition

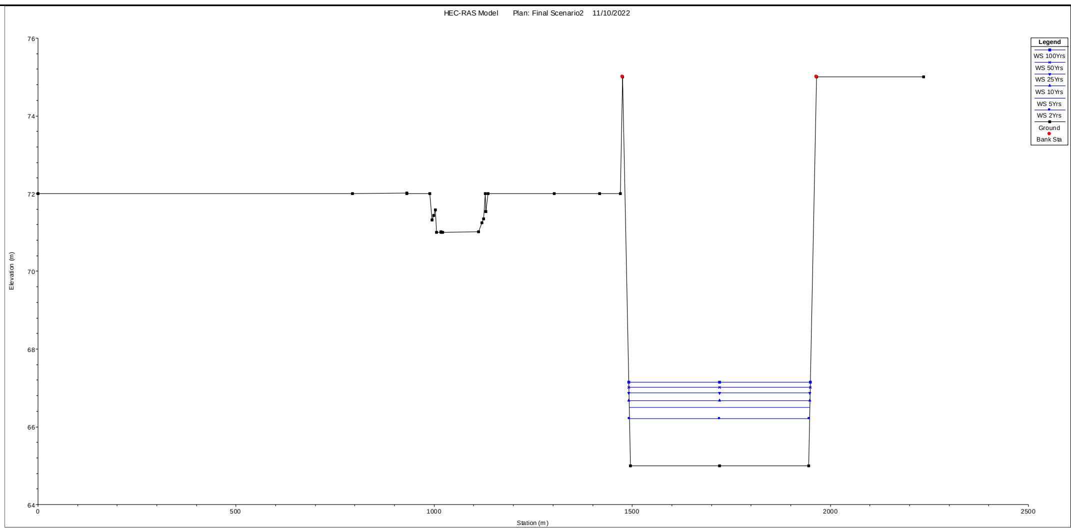
288 Mompong River is primarily use as source of water for irrigation. The downstream area not being served by NIA particularly downstream that could be affected by the project is using the diverging streams that is passing the agricultural land. The flow of water in these diverging streams will be stopped from construction until the project operation.



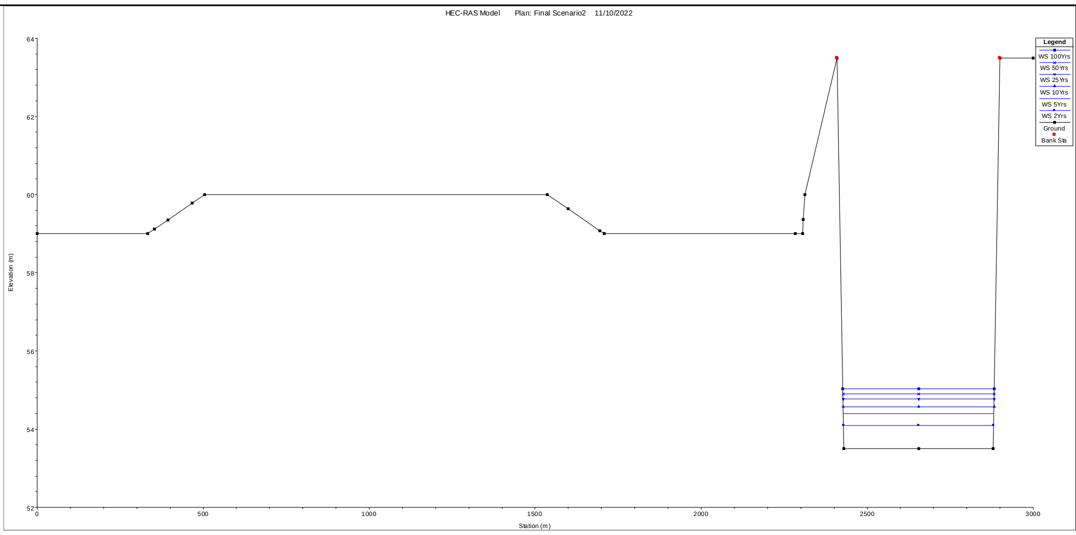
Stn 8+900



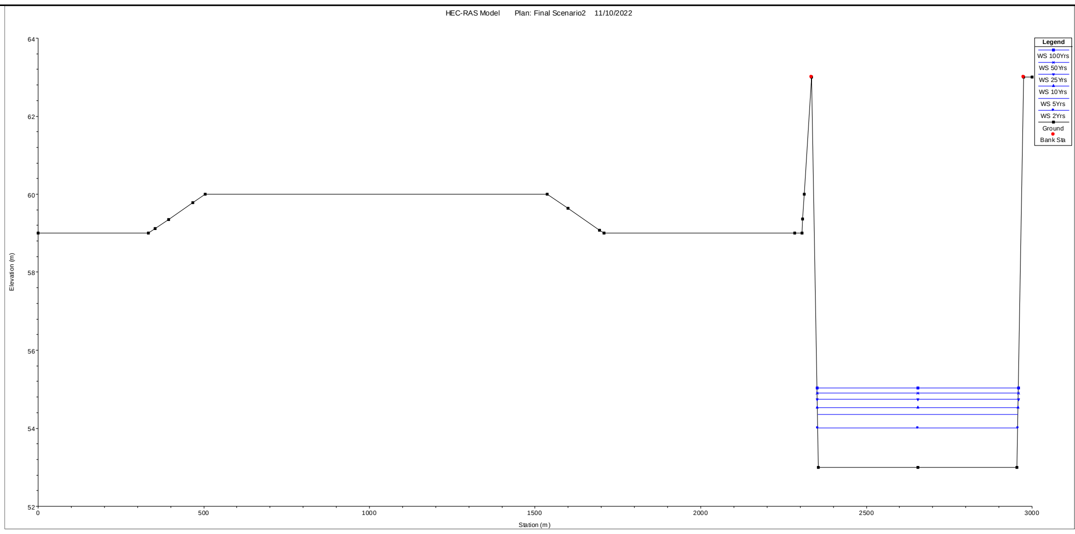
Stn 4+900



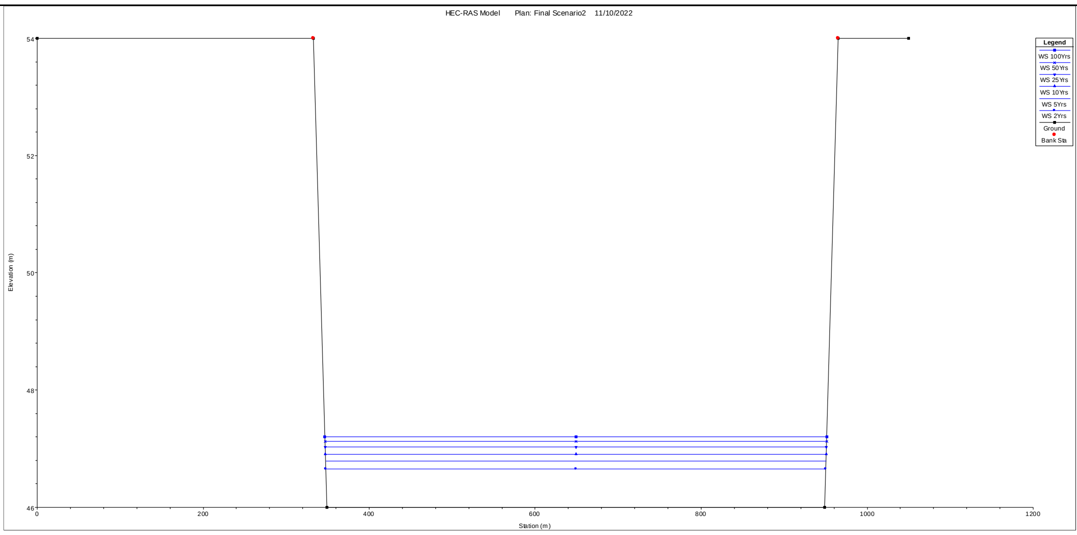
Stn 4+800



Stn 2+400



Stn 2+300



Stn 0+000

Figure 2-47. Water Level at Project Operation for different RRPs

289 The project proponent should provide alternative source of water for the current users of the diverging stream. They could possibly coordinate with the NIA, LGUs and the current water users on how the water requirement could be provided.

2.2.2.2.6 Reduction/Depletion of Groundwater

290 No groundwater source and/or users are observed within the project area that could be possibly affected by the project.

291 The summary of key potential impacts and proposed mitigating measures are given in **Table 2-37**.

Table 2-37. Key Potential Impacts on Surface Water and Mitigating Measures

Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement
Change in drainage morphology		x x x x			• Re-routing of streamflow away from the dredging area by construction of temporary channel • Provision of drainage system in the dredging area and the in stockpile that will discharge to sedimentation pond • Compaction and leveling of exposed ground surface • Construction and regular de-silting of sedimentation ponds
Change in stream depth		x x x x			• Re-routing of streamflow away from the dredging area by construction of temporary channel • Provision of drainage system in the dredging area and the in stockpile that will discharge to sedimentation pond • Compaction and leveling of exposed ground surface • Construction and regular de-silting of sedimentation ponds
Reduction in stream volumetric flow		x x x x			• Re-routing of streamflow away from the dredging area by construction of temporary channel • Provision of drainage system in the dredging area and the in stockpile that will discharge to sedimentation pond • Compaction and leveling of exposed ground surface • Construction and regular de-silting of sedimentation ponds
Inducement of flooding		x x x x			• Re-routing of streamflow away from the dredging area by construction of temporary channel • Provision of drainage system in the dredging area and the in stockpile that will discharge to sedimentation pond • Compaction and leveling of exposed ground surface • Construction and regular de-silting of sedimentation ponds
Reduction of groundwater		x			• No observed groundwater source or user
Water Resource Competition		x	x		• Provision of alternative source of water for the farmers using the diverging streams thru coordination with the NIA, LGUs and water users

P = Pre-Construction; C= Construction, O = Operation; A = Abandonment or Closure

2.2.3 Water Quality

2.2.3.1 Sampling Stations

292 Water quality sampling for laboratory analysis is conducted to determine the baseline water quality conditions of the waterbodies to be affected by the project. The water sampling is conducted on June 2, 2022 in a total of 6 sampling stations with 3 sampling stations along Mompong River and another 3 sampling stations for the marine water (**Figure 2-48**).

2.2.3.2 Baseline Water Quality

293 Except for fecal coliform, the 3 surface water sampling stations have met the DENR Water Quality Guidelines (WQG) for Class C Waterbody which is intended for agriculture, irrigation, boating, fishing and similar activities (**Table 2-38**). The birds and roaming animals in the area could have contributed to the fecal coliform detected in the 3 sampling stations. Most of the contaminants analyzed are quite low or not detected.

294 The marine water is suitable for primary contact recreation such as bathing and swimming (Class SB) with only MW1 exhibiting fecal coliform slightly above the WQG (**Table 2-38**). On the other hand, the relatively high temperature at MW3 could be partly attributed to the ambient condition during the sampling.

Figure 2-48. Water Quality Sampling Stations

Table 2-38. Baseline Water Quality

Parameter	Unit	DENR Water Quality Guidelines		SW1 Upstream	SW2 Mid-Stream	SW3 Downstream	MW1	MW2	MW3
		Class C	Class SB						
Date and Time of Sampling	-	-	-	June 2, 2022 10:40 AM	June 2, 2022 9:50 AM	June 2, 2022 8:47 AM	June 2, 2022 7:55 AM	June 2, 2022 7:59 AM	June 2, 2022 9:11 AM
pH	-	**6.5-9.0**	**7.0-8.5**	8.6	8.7	8.8	7.8	8.1	8.4
Temperature	˚C	**25-31**	**26-30**	28.8	28.0	28.5	29.1	29.1	31.7
Dissolved Oxygen (DO)	mg/L	**5 (minimum)**	**6 (minimum)**	17.2	9.3	8.1	7.0	7.1	7.6
Color	TCU	**75**	**50**	10	10	15	-	-	-
Biological Oxygen Demand (BOD_5)	mg/L	**7**	**N/A**	1	1	1	2	2	1
Oil & Grease	mg/L	**2**	**2**	1	<1	<1	2	<1	1
Total Suspended Solids (TSS)	mg/L	**80**	**50**	25	56	21	14	12	10
Chloride	mg/L	**350**	**N/A**	22	20	2	-	-	-
Nitrate as NO_3-N	mg/L	**7**	**10**	<0.003	0.077	0.060	0.174	0.066	0.032
Phosphate	mg/L	**0.5**	**0.5**	0.016	0.024	0.016	0.018	0.011	0.015
Surfactants (MBAS)	mg/L	**1.5**	**0.3**	<0.016	<0.016	<0.016	-	-	-
Fecal Coliform	MPN/100mL	**200**	**100**	230	490	330	490	23	79
Arsenic (As)	mg/L	**0.02**	**0.01**	<0.001	<0.001	<0.001	-	-	-
Turbidity	NTU	**-**	**N/A**	-	-	-	12.7	1.94	3.63

Remarks: Red font indicates nonconformance with DENR Guidelines

2.2.3.3 Water Pollution

295 The dredging activity could result to resuspension of sediments and increase in turbidity. Sediment could also be generated in the stockpile area upon occurrence of rainfall. The presence of workers in the dredging area and personnel at the site office may also affect the discharge of sewage and domestic wastewater to the river. Improperly disposed garbage could be carried by surface runoff to the river. There is also a possibility of oil contamination due to accidental oil spill, oil leaks from vehicle and heavy equipment, and improper disposal of oily materials including used oil during repair and maintenance.

296 A drainage system will be installed enclosing the stockpile area and after the dredging area which will be connected to sedimentation pond prior to final discharge to the river. The sedimentation ponds will be dredged regularly to maintain its holding capacity with the collected sediments to be transported and stored in a waste stockpile.

297 To avoid water contamination, no wastewater will be disposed without treatment. This will include the treatment of sewage through septic tank and interception of oil-contaminated wastewater to oil-water separator for oil recovery prior to disposal. A paved area will be designated for the repair and maintenance of vehicles and heavy equipment with the drain to be connected to the oil-water separator. All petroleum-based storage and handling areas will be paved with bund wall to prevent groundwater contamination and facilitate easy clean-up and recovery of spills.

298 Wastewater will be collected, treated (e.g., sewage through septic tank) or stored (e.g., used oil and lubricants) prior to disposal or transported to the approved disposal sites.

299 Increased generation of solid wastes may result from the presence of workers and project personnel. If proper waste management will not be implemented, the domestic wastes may eventually find its way in the river. A solid waste management plan should be implemented that includes waste segregation, recycling/reuse, storage and disposal.

2.2.3.4 Rainfall due to Climate Change

300 The projected climate change in Mindoro Occidental that includes Sablayan shows a general decrease in rainfall throughout the year at lower bound range and from June to November at median range both for moderate and high emission scenarios (**Table 2-39**). The highest decrease of more than 25% of the baseline rainfall is projected from June to August which is the wettest season. This could indicate possible reduction in the occurrence and intensity of rainfall during this period which could minimize flooding in the area.

301 On the other hand, an increase in rainfall could occur for the entire year at upper bound range for both emission scenarios and from December to May at median range (**Table 2-39**). The highest increase in rainfall is predicted from December to February which is the driest season. This could provide additional water which could be limited in the current condition.

Table 2-39. CLIRAM* for the projected seasonal change in total rainfall (in mm) in the mid-21st century (2036-2065) for Occidental Mindoro

Months	Observed (1971-2000)	Scenario	Moderate Emission (RCP4.5)			High Emission (RCP8.5)		
		Range	Lower Bound	Median	Upper Bound	Lower Bound	Median	Upper Bound
DJF	159.50	Percent Change	-1.7	13.2	52.3	-1.4	9.5	25.9
		Projected Value	156.8	180.6	242.9	157.3	174.7	200.8
MAM	265.90	Percent Change	-5.0	2.6	12.7	-18.3	-3.3	23.3
		Projected Value	252.6	272.8	299.7	217.2	257.1	327.9
JJA	1091.20	Percent Change	-25.1	-20.6	3.6	-28.1	-13.0	11.6
		Projected Value	817.3	866.4	1130.5	784.6	949.3	1217.8
SON	762.60	Percent Change	-19.5	-3.0	4.2	-18.1	-3.6	7.9
		Projected Value	613.9	739.7	794.6	624.6	735.1	822.8

Source: DOST-PAGASA, 2018: Observed Climate Trends and Projected Climate Change in the Philippines

Notes: DJF - December, January, February

MAM - March, April, May

JJA - June, July, August

SON - September, October, November

* *CLIRAM - Climate Information Risk Analysis Matrix*

2.2.4 Marine Ecology

302 Assessment of primary estuarine and coastal habitats and resources in the nearshore area fronting the BNRC Mompong River Dredging Project that can be potentially affected by the proposed dredging in 11 kilometers of the river was undertaken from 26 to 27 October 2021 by a team of fishery and marine biologists. The assessment covered a stretch of more than 1 kilometer of the inter-tidal zone in front of the estuary and about 500 meters of estuarine area inside the river mouth (**Figure 2-50**). The marine ecology baseline assessment also covered fisheries resources and resource use practices around the general impact area and the near-shore sea fronting the river estuary where pelagic fisheries by a sizeable number of local fishers provide the main source of livelihoods to the coastal barangays of Sta. Lucia, Tuban, and San Nicolas in Sablayan, Occidental Mindoro. Moreover, a rapid survey of possible bivalve habitats and stocks was conducted in front of the river mouth where sediment-laden water and potential waste streams from the dredging project can be carried down. According to key informants, both fish and bivalve fisheries are already under immense pressure from the loss of habitats and dwindling stocks.

303 The survey was conducted to establish the baseline condition of the primary impact area in the coastal waters and estuary of the Mompong River system where the dredging project is proposed to be undertaken. More importantly, the survey was undertaken to identify any susceptible coastal benthic habitat that can be subject to stresses from potential anthropogenic environmental impacts attributable to the project's establishment and operation and subsequently, enable the crafting of appropriate response measures to ensure that such impacts are mitigated over the long run and in the most effective manner. It is to be noted that the benthic environment in the estuary and coastal zone in front of the river has already been significantly altered due to constant sediment streams and accretions from the river over the years. Key informants reported that ecological changes brought about by rapid sediment invasion in areas where coastal habitats used to occur both in the intertidal and sub-tidal environs of the estuary have affected the configuration of the substrata and the resources that normally thrive in rich estuaries. Key informants further claimed that there are no coral reefs near the estuary; the only reef that exists is in an offshore shoal 1.5 km away from the estuary.

304 Sablayan is a 1st class municipality with twenty-two (22) barangays and a population of 92,598 (2020). The primary impact area is the stretch of sandy beach and nearshore waters facing the coastline of the proposed river dredging project. The coastal waters and seabed configuration is typical of a sloping sandy-muddy shelf, with deeper cuts in front of the estuary but this is already enveloped in sandy deposits. Strong monsoon currents normally sweep the area past the Sablayan cape in the southwest and this brings moderately strong flushing events. The Mompong River unloads huge amounts of sediments and silt into the coastal waters, carried ultimately to the marine coastal shelf. The estuary has been greatly altered by the accretion of sediments and it is evident that coastal habitats in the sea fronting the river system have been significantly affected or altered (**Figure 2-49**). Despite this, the estuary area remains a favored fishing ground of local fishers.

Figure 2-49. The Mompong River estuary and immediate coastal waters where marine ecology assessment was undertaken

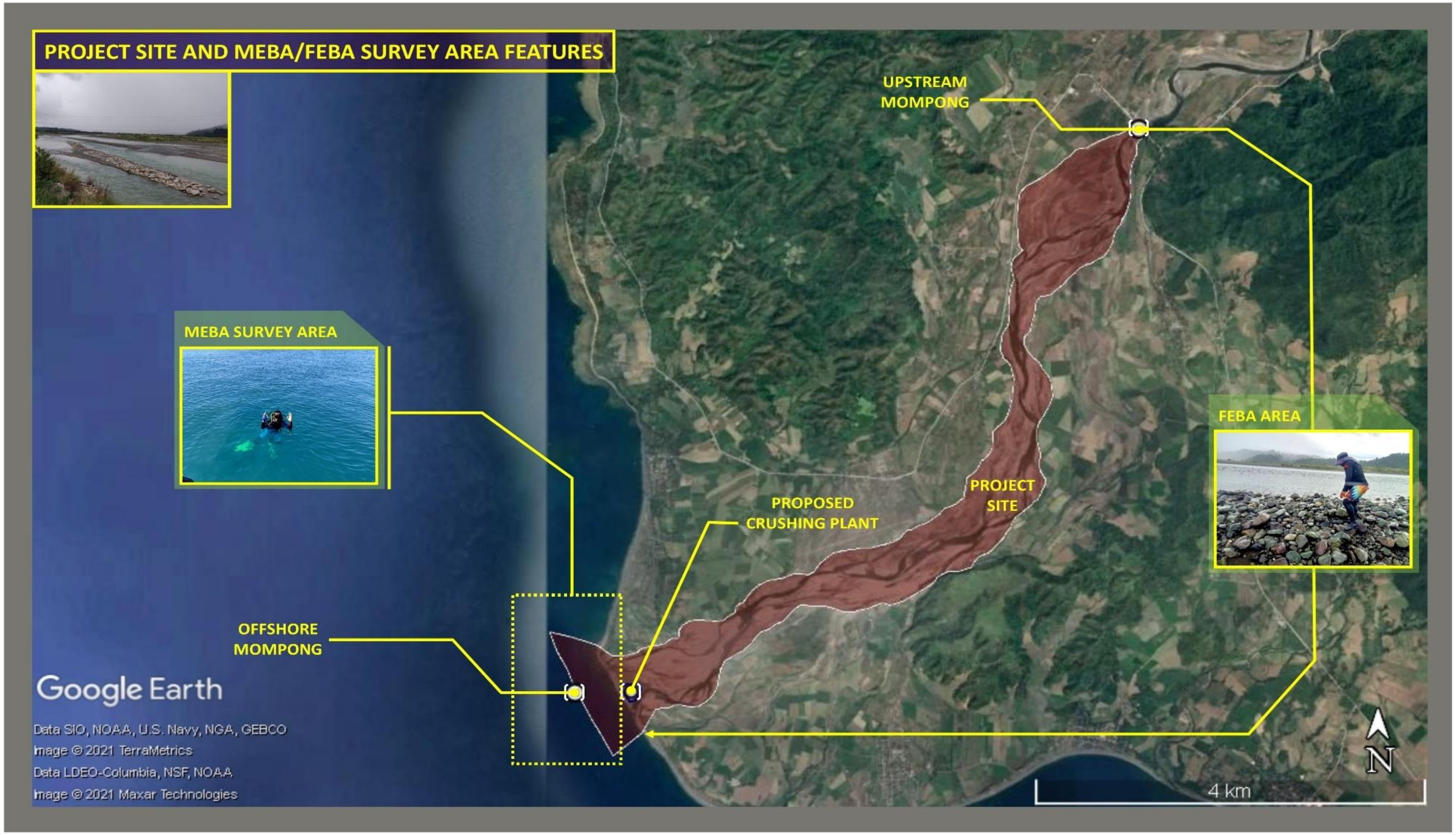


Figure 2-50. The Mompong River Dredging Project site with the river estuary (lower left, enclosed in a rectangle) was subjected to a marine ecology baseline assessment (Map prepared by Jose Rene Villegas, November 2021).

2.2.4.1 Objectives of the marine ecology assessment

305 This report presents the results of coastal habitat and fisheries assessments conducted by a team of fisheries specialists and marine biologists in the coastal impact area and contiguous environs of the estuary project site. The objective of the assessment is to generate an environmental profile and baseline data set of the coastal impact area, focusing on primary benthic habitats, its associated fisheries resources, resource use practices, and ecological functions that can be potentially disrupted or impaired by dredging in the river, scouring and sediment invasion, or be subjected to other stresses associated with potential anthropogenic environmental impacts attributable to the Project's operation. The characterization of susceptible endpoints and critical benthic habitats in the nearshore area, and identification of the causes and pathways that carry stressors will provide valuable data from where long-term environmental management measures can be drawn. Despite indications from nautical maps that notable coastal habitats, and therefore associated life forms, are not existing in the considerable distribution in the primary impact area, the conduct of the survey for typically susceptible coastal resources such as coral reefs, seagrass beds, and associated demersal fish species was nevertheless undertaken extensively to ensure a significantly accurate characterization of the coastal area in front of the project. Drawing from an actual in-situ condition in the impact area, the scope of the baseline assessment includes the following:

- Verification of the absence of corals and seagrass meadows in front of the estuary through spot dives.
- If present in the offshore shoal, coral distribution and composition will be assessed through the rapid survey.
- Where coral is present, species composition and diversity of dominant reef fish communities will be estimated through the rapid survey.
- Identification of commercially important macroinvertebrates in the inter-tidal areas of the proposed project;
- Rapid assessment of species composition, estimation of catch rates of primary target species of fish, and fishing gears employed in the area;
- Assessment of zooplankton and phytoplankton communities and the presence of HAB-causing organisms (harmful algal blooms);

306 Ultimately, the baseline profile will serve as the principal tool in determining possible environmental impacts of the project in the nearshore marine environment and subsequently, in crafting appropriate response measures to ensure that such impacts are mitigated over the long term and in the most effective manner. By obtaining data and variables of the same types and employing consistent survey protocols in future monitoring events, any deterioration, or improvements in specific habitats and ecological niches can be discerned.

307 The survey methods employed follow standard coastal resource survey techniques prescribed by English et. al. (1994) and modified in accordance with in-situ conditions employing prescriptions on rapid coastal assessment processes developed in the Coastal Resource Management Project (CRMP) and the Fisheries Improved for Sustainable Harvest (FISH) Project. Survey results give a snapshot of the current condition of the coastal environment and the marine biological resources present in the area at the time of sampling and cannot represent an irreversible situation. The data sets generated also do not signify or denote that the resources and habitats under study are directly susceptible to potential negative impacts arising from the proposed project but only suggest the

possibility of such habitats being negatively affected in the future if such resources are present in stressor pathways. Given the open-access nature of Philippine coastal environments, it is evident that the issues currently affecting coastal the environment are already diverse and this is apparent in the proposed project site, manifested in extensive sand intrusion into the coastal shelf.

308 A total of eight (8) manta tow stations, five (5) underwater spot dives, two (2) plankton community sampling stations, five (5) actual fishing documentation, and an opportunistic survey of macroinvertebrates were undertaken in the baseline study (no gleaning of shellfish/macro-invertebrates were seen during the survey). This was supplemented by extensive systematic snorkeling in various areas aimed to find patches of seagrass beds and coral life forms where they can viably exist. The assessment methodology includes:

2.2.4.2 Manta Tow Survey Method for Corals

309 A manta tow survey is a rapid broad area observation of an underwater area by a snorkeler who is being pulled by a small boat. Observations on the condition, distribution, and abundance of coral reefs are recorded in the slate at specific intervals. Manta tow is a useful method in generating a broad picture of a large segment of a coastal area as the conduct of numerous, contiguous survey stations can enable fairly accurate characterization of the types and distribution of significant habitats and resources in the area. In areas where significant coral reefs occur, results from a manta tow survey are used to pinpoint the location of specific stations where more detailed underwater coral characterization employing transects will be undertaken.

310 Manta tow surveys were conducted in continuous stations to determine the composition of benthic life forms and general substrate conditions over a broad area of the seabed in the impact area. Manta tow is a useful method in generating a general profile of benthic resources as it permits observation of the condition, distribution, and abundance of coral reefs, demersal fish species, and other significant biotic and abiotic facets of the seabed at specific intervals over a long stretch of the coastal area. Estimates of percentage distribution of coral reefs and associated benthos observed within the two stations are recorded in accordance with standard categories to document the distribution of coral life forms where they occur, and the collective picture generated can show a fairly accurate description of the state of the coastal area under study. In areas where significant coral reefs occur, results from a manta tow survey are used to pinpoint the location of specific stations where more detailed underwater coral characterization employing spot dives will be undertaken.

311 A total of eight (8) continuous manta tows were undertaken in front of the Mompong estuary, starting about 600 meters northwest of the river mouth and ending in the southern flank of the estuary (**Figure 2-51**), covering a total linear distance of almost 1 kilometer. The manta tows were limited due to the absence of corals reef.

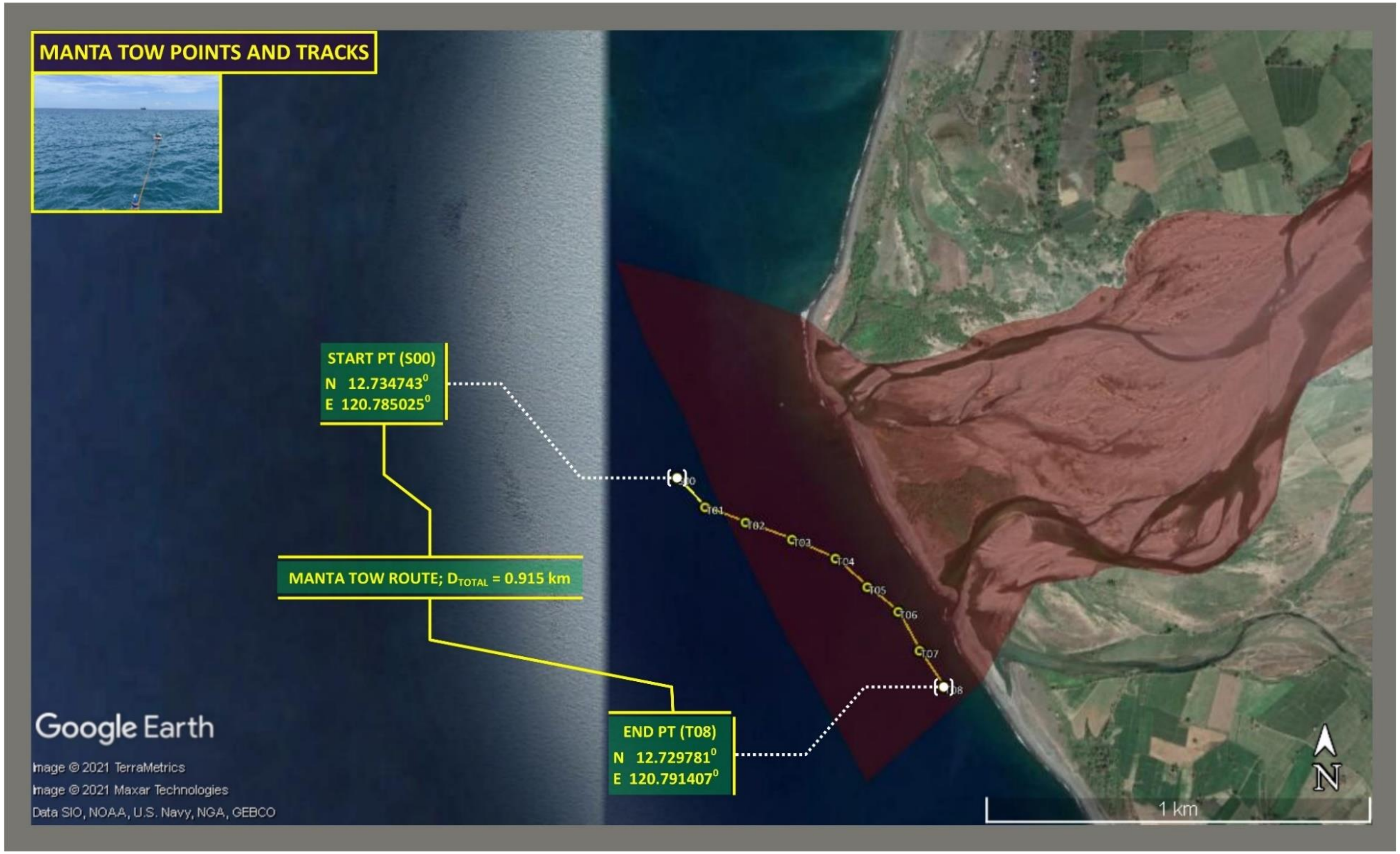


Figure 2-51. Manta tow pathways for broad area benthic profiling during marine ecology baseline assessment in the coastal impact area of the proposed Mompong River Restoration Project (Map prepared by Jose Rene Villegas, November 2021).

2.2.4.3 Spot dives

312 In the Mompong coastal baseline assessment, the absence of significant live coral cover in the sandy shelf in front of the project site as validated in manta tows and key informant interviews rendered the conduct of coral line intercept (LIT) surveys impractical. In lieu of the LIT method, a total of five (5) spot dives to validate the absence or presence of coral life forms on both flanks of the project site were undertaken (**Figure 2-52**). The shelf in the project site is relatively wide and gradually slopes to an average of 15 to 30 meters of sandy shelf about 1 kilometer from the shoreline. In front of the river, the estuary shelf is shallow and constantly affected by river outflows. Three (3) of the spot dives were located inside the primary while two (2) were outside. This includes a spot dive in the Sablayan Marine Protected Area which is 1.5 kilometers away northeast of the estuary where an offshore reef was observed. The coordinates of the spot dive stations are listed in **Table 2-40** while locations are shown in **Figure 2-53**.

Table 2-40. Coordinates of Spot dive stations undertaken marine ecology baseline assessment in the coastal impact area.

WP Code	Latitude	Longitude	Depth (m)	General Location
SPD1	12. 730860° N	120. 790590° E	4.10	The inside project site in front of the estuary of Mompong River along Dongon Bay, Barangay Santa Lucia, Sablayan
SPD2	12. 732960° N	120. 789670° E	3.20	Inside project site about 300 meters in marine waters north of the estuary of Mompong River along Dongon Bay, Barangay Santa Lucia, Sablayan
SPD3	12. 734380° N	120. 789440° E	6.50	Inside project site; 500 meters North of estuary of Mompong River along Dongon Bay, Barangay Santa Lucia, Sablayan
SPD4	12. 740610° N	120. 787770° E	4.70	Coastal waters about 800 meters North of Mompong River estuary along Dongon Bay, Barangay Santa Lucia, Sablayan
SPD5	12. 734580° N	120. 78839° E	5.9	1.50 kilometers NE from the Mompong River Estuary and inside the Sablayan Marine Protected Area (MPA) along Dongon Bay, Barangay Santa Lucia, Sablayan. Offshore shoal

313 Spot dives normally inspect bottom substrata in about a 10 square meter radius employing scuba. Where the seabed is not too deep, free dives using an underwater torch are normally practiced.

Figure 2-52. Spot dive being undertaken in front of the project site fronting the Mompong river estuary (left), and fine sandy substrate with pebbles seen in all the spot dive stations.

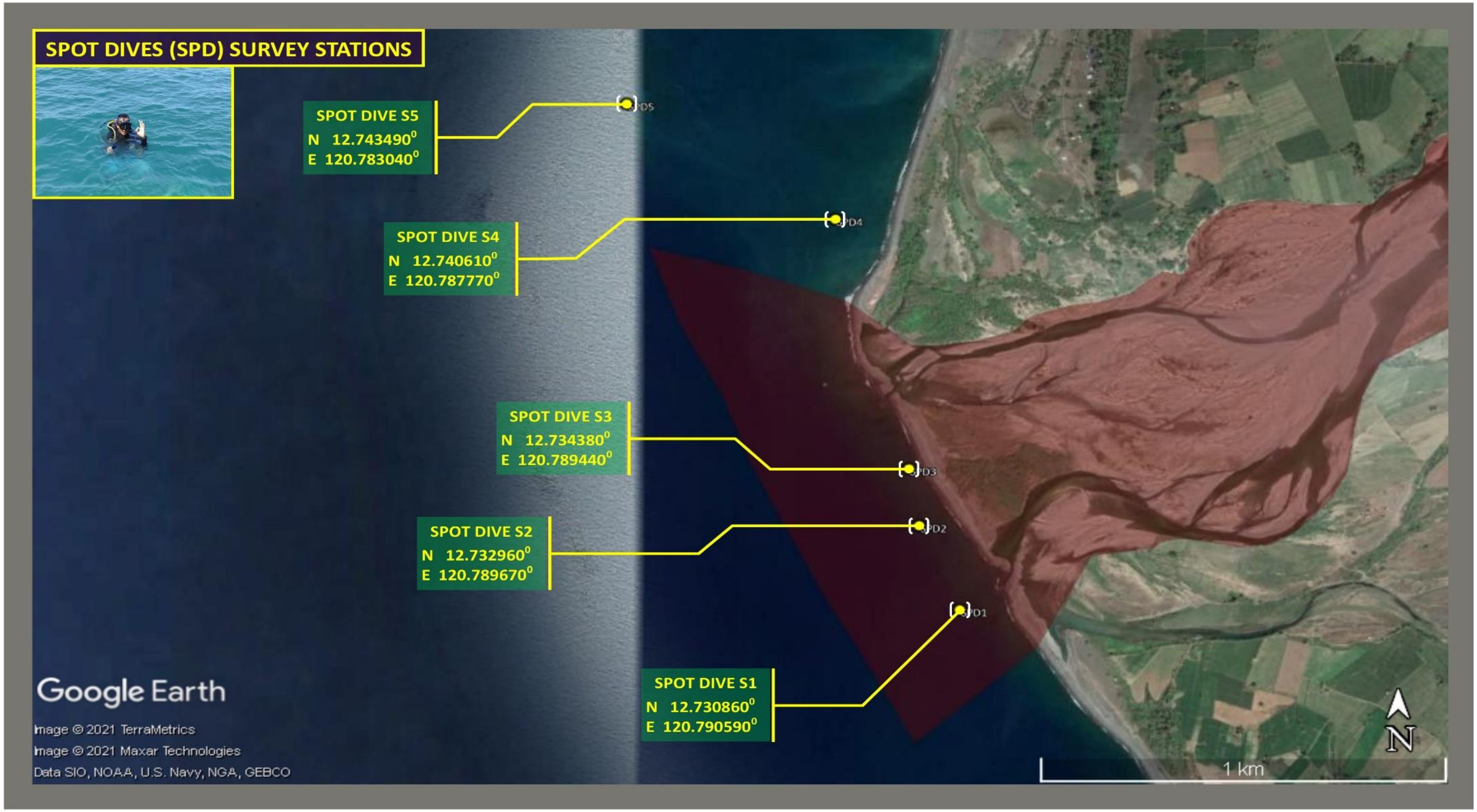


Figure 2-53. Location of spot dive stations during marine ecology baseline assessment in the coastal impact area of the proposed BNRC Mompong River Dredging and Construction of Crushing Plant Project; 27-28 October 2020. (Map prepared by Jose Rene Villegas (November 2021)

2.2.4.4 Assessment of demersal fish communities employing Fish Visual Census (FVC)

314 In the absence of coral line intercept surveys, fish visual census in transect lines were no longer undertaken. Fish species in the coral reef patch inside the Sablayan MPA were noted during scuba dives to estimate coral cover in the area. Fisheries productivity and catch composition in nearshore fisheries was investigated through documentation of actual fishing operations encountered during the survey. There were no fishing activities inside the MPA.

2.2.4.5 Rapid fisheries appraisals

315 Determination of catch composition and rates of municipal fisheries occurring in the dredging project site was undertaken through key informant interviews and documentation of actual fishing operations of four (4) fishing boats operating in the vicinity of the project site. Actual fishing operations were documented in situ in order to obtain real-time catch per unit effort (CPUE). The coordinates of actual fishing stations observed are listed in **Table 2-41** and the locations are shown in **Figure 2-55**. Please also see **Figure 2-54**.

Figure 2-54. Actual fishing operations being documented to determine real-time catch per unit effort

Table 2-41. Coordinates of actual fishing operations

WP Code	Latitude	Longitude	Remarks
AFO1	N 12.734310°	E 120.787900°	Encountered 2 fishers using cast net gear in front of estuary in the project impact area
AFO2	N 12.735670°	E 120.789290°	Encountered 1 fisher using bottom-set gill net gear in front of the estuary
AFO3	N 12.734540°	E 120.788450°	Encountered 1 fisher using spear gun in front of estuary in the project impact area
AFO4	N 12.733800°	E 120.790350°	Encountered 3 fishers using beach dragnet gear having a catch of various fish species in front of estuary in the project impact area

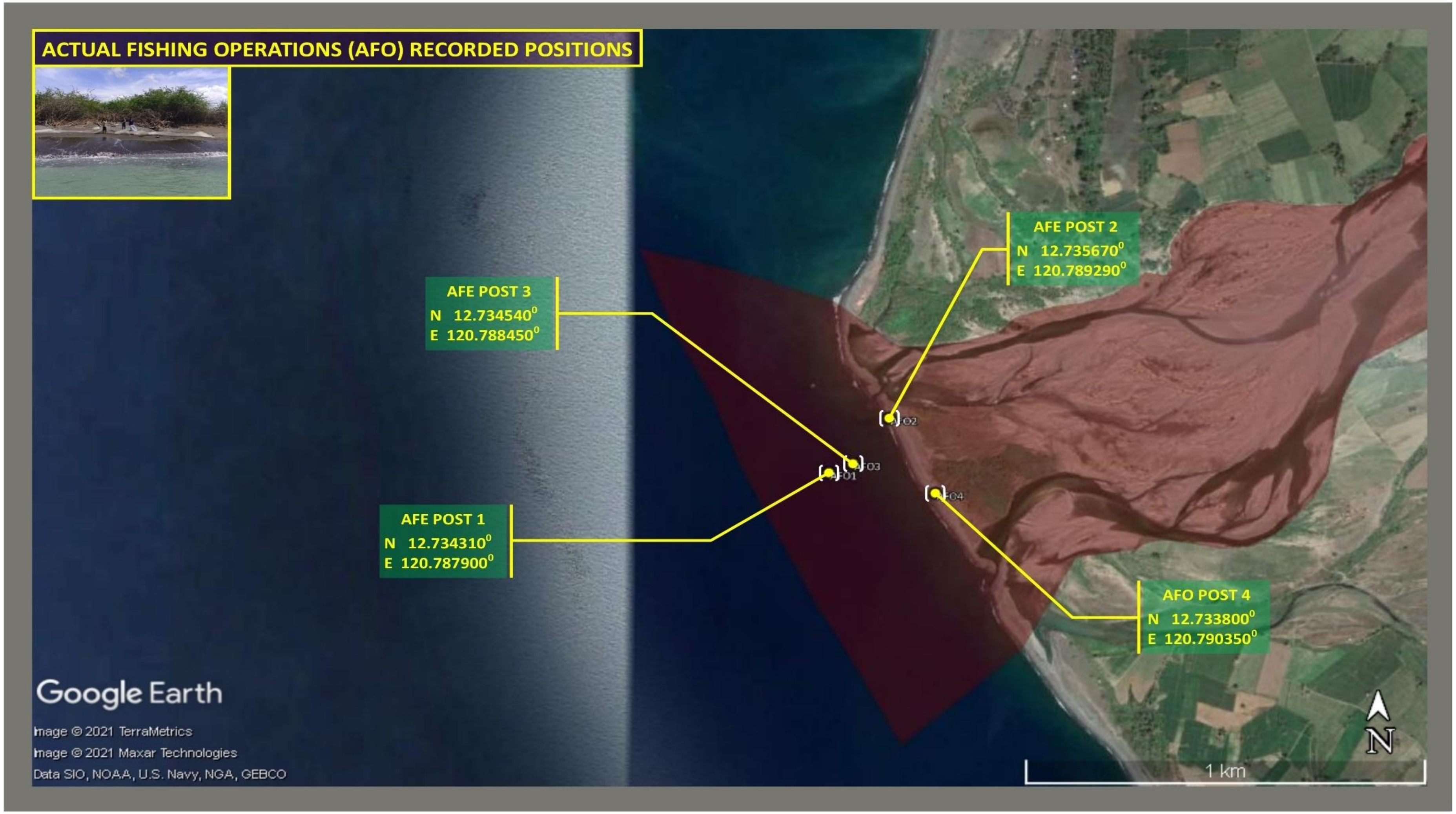


Figure 2-55. Location of actual fishing documentation stations during marine ecology baseline assessment. (Map prepared by Jose Rene Villegas)

2.2.4.6 Assessment of Seagrass

316 The survey plan called for the assessment of seagrass beds and associated macro-benthic algae using the Saito-Atobe transect-quadrat method (English et. al., 1994). However, manta tow surveys did not reveal any seagrass community in the survey sites and therefore the establishment of seagrass survey stations was deemed no longer necessary.

2.2.4.7 Mangrove survey

317 No mangrove stands occur in the coastal area of the project site.

2.2.4.8 Plankton communities

318 Species composition, abundance, and density of phytoplankton and zooplankton communities were determined using plankton net vertically lowered and towed from sub-surface depths. Shannon-Weaver Diversity/Evenness Indices and bio-assessment metrics are then derived from the results of the sampling. Identification of phytoplankton species that can enrich to become harmful algal blooms which may potentially cause paralytic shellfish poisoning (PSP) was also undertaken as algal blooms normally indicate hyper-nutrient levels in the sea sometimes triggered by problems of anthropogenic origin. Sampling stations were strategically chosen so that the stations are focused in the vicinity of the Ilijan LNG Facility project site. Apart from the three (3) plankton sampling stations conducted in the Mompong River, a marine plankton station was investigated in front of the estuary (**Figure 2-56** and **Table 2-42**).

Table 2-42. Coordinates of plankton sampling station investigated

WP Code	Latitude	Longitude	Remarks
PLK1	12. 734310° N	120. 787900° E	The primary impact area of the project in the Estuary / Mouth of Mompong River in Barangay Santa Lucia, Sablayan Occidental Mindoro
PLK2	12. 731322° N	120. 791147° E	The primary impact area of the project in the Estuary / Mouth of Mompong River in Barangay Santa Lucia, Sablayan Occidental Mindoro

2.2.4.9 Macro-Invertebrate survey in intertidal flats

319 An opportunistic survey for the presence of macro-invertebrates was conducted in random stations in the intertidal flats in front of the Mompong River estuary employing the core sampling method to account for both infaunal benthos and epi-faunal macro-invertebrates. Two (2) stations were investigated more closely, shown in **Figure 2-57**. Sandy intertidal flats are generated in areas where wave action is moderate and river inputs are extensive. Many of such areas are often components of estuaries and their sediments are mostly muddy to sandy, sometimes interspersed with rocky substrates. Intertidal flats and the soft-bottom communities are rich in dissolved nutrients, plankton, and organic debris, and sustain large communities of in-faunal and benthic invertebrates, including mollusks and edible shellfish that are collected for food and trade. Unfortunately, the constant alteration of the intertidal flat due to the invasion of sand and mud from the river has presumably led to the movement of macro-invertebrates away from the estuary zone.

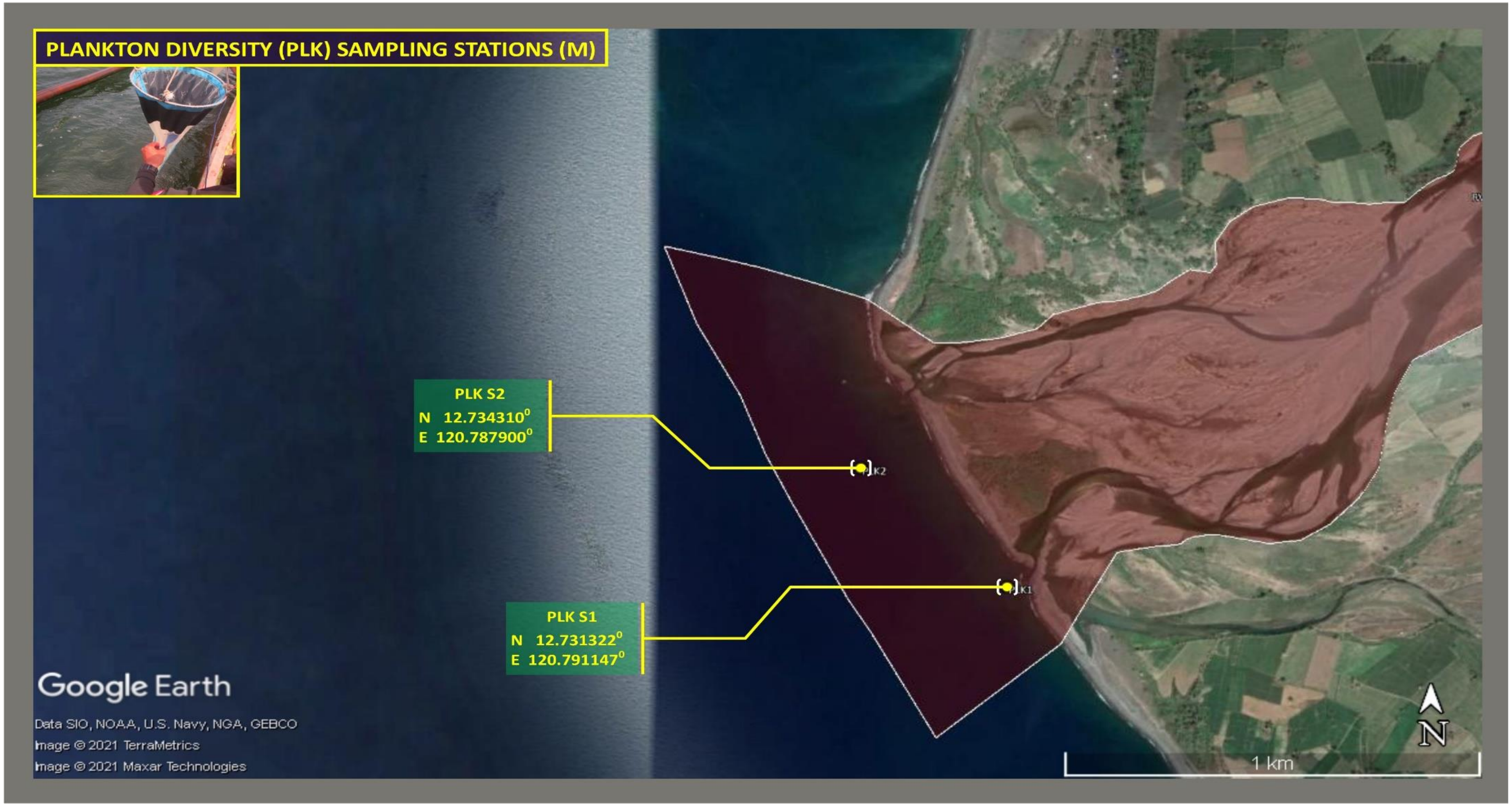


Figure 2-56. Location of plankton sampling station investigated during marine ecology baseline assessment in the coastal impact area of the proposed Mompong River Dredging Project; 27-28 October 2021. (Map prepared by Jose Rene Villegas, November 2021).

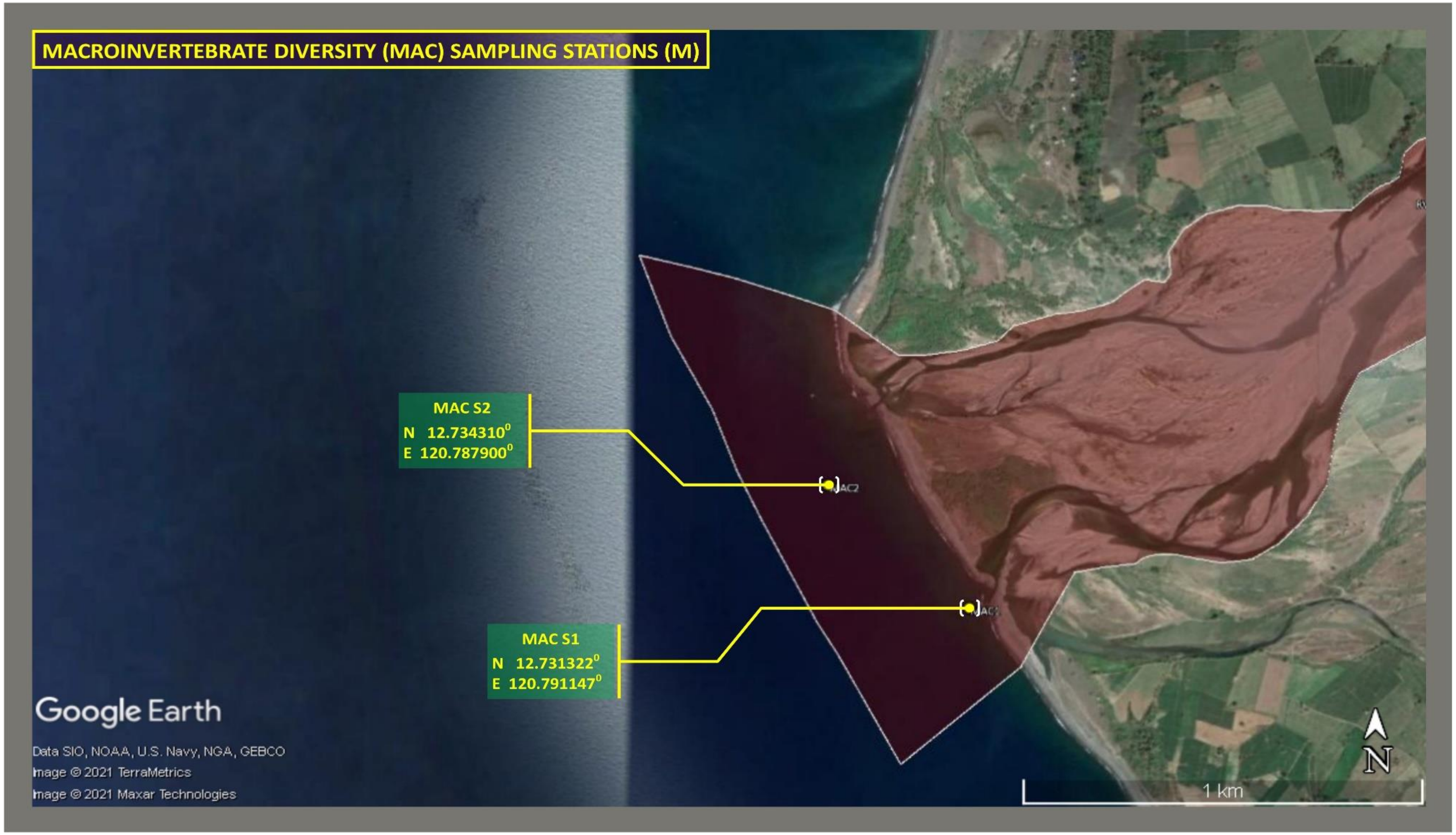


Figure 2-57. Location of macro-invertebrate sampling stations investigated during marine ecology baseline assessment in the coastal impact area of the proposed BNRC Mompong River Dredging Project; 27-28 October 2021. (Map prepared by Jose Rene Villegas, November 2021)

2.2.4.10 Information gathering on the occurrence of Megafauna

320 Key Informant Interviews (KII) for marine megafauna occurrence can generate important information on the potential impacts of the project on unique marine fauna. For the baseline survey, the information gathering focused only on commonly encountered megafauna – marine turtles and dolphins. Key respondents were requested to divulge personal observations of the presence of any of the five marine turtle species known to be present in the Philippines, i.e., the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*) and leatherback turtle (*Dermochelys coriacea*).

2.2.4.11 Threats to existence and/or loss of important local species and habitats; abundance, distribution, the density of economically and ecologically important species

2.2.4.11.1 Characterization of the benthic environment in the coastal impact area of the proposed dredging project Corals and benthic morphology – results of broad area profiling through manta tows and spot dives

321 The coastal impact area of the proposed Mompong River Project is dominated by a short sandy shelf that opens up to deep waters with a depth ranging from 20 to 30 meters about 1500 meters from the shore. There is only one reef patch, located in the Sablayan MPA almost 1.5 kilometers from the project site. In the nearshore impact area, seawater depths and bottom configuration have been altered and have become extremely shallower. The survey team believes that this condition will make it highly unlikely for biotic communities, including benthic macrofauna, to re-colonize what is heretofore a rich and robust ecological area nurtured by the Mompong river estuary. Settlement of coral planulae is highly unlikely in the absence of a firm substrate and in a highly turbid environment where sand deposition is incessant and photosynthetic functions are obviously affected.

322 Eight (8) manta tows in almost 1 kilometer of the nearshore seabed (**Table 2-43**) plus the conduct of exhaustive systematic snorkeling in shallow waters did not show any existence of coral reefs, coral rubble, or dead standing corals in both the primary and secondary impact areas of the dredging Project. Results of the tows, shown in **Table 2-43** (please also see **Figure 2-58, Figure 2-62** and **Figure 2-63**; manta tow track lengths and distance covered is shown in **Table 2-44**) indicate that the seabed fronting the project site is composed of sand and silt, with pebbles and stones near the river mouth, extending to an estimated distance of 1 kilometer from the shoreline. The seabed is completely devoid of coral reefs and associated life-forms. The bottom substrate is undulating but relatively firm in the less turbulent seabed, with only the upper silt layer being disturbed by waves and currents, and constant sand invasion. The absence of coral reef formations and associated benthic life forms was confirmed by interviews with fishers who claimed that the nearest reefs are found in an offshore reef in the Sablayan Marine Protected Area, some 1.5 kilometers northeast of the estuary project site The coastal waters are turbid and visibility in the water column and the bottom is poor (**Figure 2-58**). Wave action is very heavy during the northeast monsoon and undercurrents obviously can sweep whatever algae that grows on the inshore seafloor. In the same manner, exhaustive manta tows and snorkeling along shallow waters failed to reveal any existence of seagrass communities. Silt and sediments covered much of the areas suspected to have otherwise hosted seagrass resources. No coral fragments or dead standing corals occur within the shelf as far as 1 km from the shoreline of the estuary. Photographs of the substrata seen in the spot dives are displayed in **Figure 2-59.**

Table 2-43. Tabulated results of manta tows surveys for validation of the absence/presence of corals reefs in the coastal impact area

Tow points are expressed in Decimal Degrees WCS notation with reference to WGS84 Map Datum

Manta Tow Results for Reef and Substrate Survey								
Site name:		Coastal waters west of Sablayan, Mindoro Occidental						**Observers:**
Time / Date:		0915H-1037H / 26 October 2021						1. Benjamin Francisco
Tow Speed:		3.0 kmh (ave)						2. Victor Pantaleon 3. Ronald Pocon
Visibility:		Varying from ±10m						
Weather:		Sunny and Fair						
Wave:		Mild rolling crests of approx. ±30cm						
Current:		Varying from very mild to mild						
Tide:		Rising from 0.02m until reaching 0.10m as ref from Sablayan Tidal Station (WXTIDE32)						
Water Temp:		Approx. ±30°C						
Wind Speed:		Beaufort Scale #2						
Cloud Type(s):		Cumulo-nimbus Clouds						
Tow Coverage	**Location [DecDeg]**	**LHC**	**SC**	**DC**	**DCA**	**R**	**S**	**Remarks**
S00	N 12.734743° E 120.785025°	0	0	0	0	0	100	**Start of Tow**
S00-T01	N 12.734044° E 120.785696°	0	0	0	0	0	100	Mostly fine sand and silt
T01-T02	N 12.733683° E 120.786667°	0	0	0	0	0	100	Mostly fine sand and silt
T02-T03	N 12.733277° E 120.787777°	0	0	0	0	0	100	Mostly fine sand and silt
T03-T04	N 12.732826° E 120.788817°	0	0	0	0	0	100	Mostly fine sand and silt
T04-T05	N 12.732149° E 120.789580°	0	0	0	0	0	100	Mostly fine sand and silt
T05-T06	N 12.731563° E 120.790320°	0	0	0	0	0	100	Mostly fine sand and silt
T06-T07	N 12.730638° E 120.790829°	0	0	0	0	0	100	Mostly fine sand and silt
T07-T08	N 12.729781° E 120.791407°	0	0	0	0	0	100	Mostly fine sand and silt; **End of Tow**
Average Reef and Substrate Composition		**0**	**0**	**0**	**0**	**0**	**100**	

323 Reef and Substrate composition are expressed in (%) and described as follows:

- Live hard coral (LHC) - coverage of stony or hard corals on the bottom or part of the bottom
- Live soft coral - (SC) - coverage of soft corals attached to the bottom
- Dead coral (DC) - recently dead coral still attached and recognizable at the bottom in original upright position, color usually white with no living tissue
- Dead coral with algae (DCA) - corallites still visible, skeletal structure can still be seen but algae dominate the structure (often appears greenish to brownish)
- Coral rubble/rock (CR) - loose broken fragments of stony corals, consolidated hard bottom or large blocks of hard reef materials not attached or easily moved around
- Sand/silt (S)

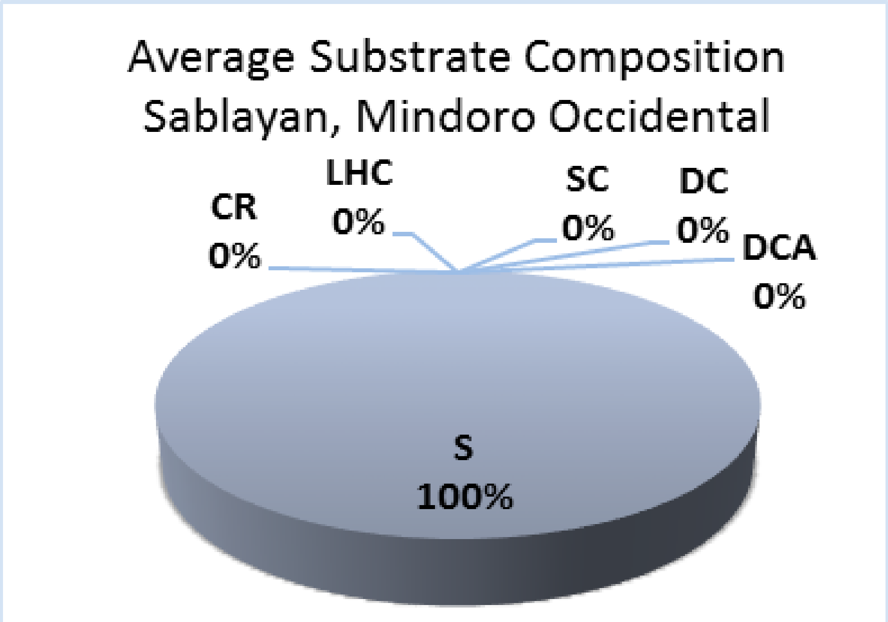


Figure 2-58. Substrate Composition in four spot dive stations surveyed during marine ecology baseline assessment for the assessed coastal waters

Table 2-44. Manta Tow Track Lengths and Total Tow Distance:

Track	Length (m)	Track	Length (m)
S00-T01	106	T04-T05	112
T01-T02	113	T05-T06	103
T02-T03	129	T06-T07	116
T03-T04	123	T07-T08	113
Total Distance = 915 m (~ 0.9 km)			

Figure 2-59. Fine sand and pebbles dominate the nearshore seabed in front of the Mompong River estuary as seen during 8 manta tows

324 On the other hand, five-spot dives conducted around the coastal impact are largely confirmed that the coastal impact area is comprised of a sandy seabed with pebbles and small boulders (**Figure 2-60**). As observed, the upper layer of the seabed is enveloped in fine silt and sand, disturbed by waves. No microalgae, coral life forms, seagrass, and schools of demersal fish were seen in all four spot dives in the primary impact area of the project.

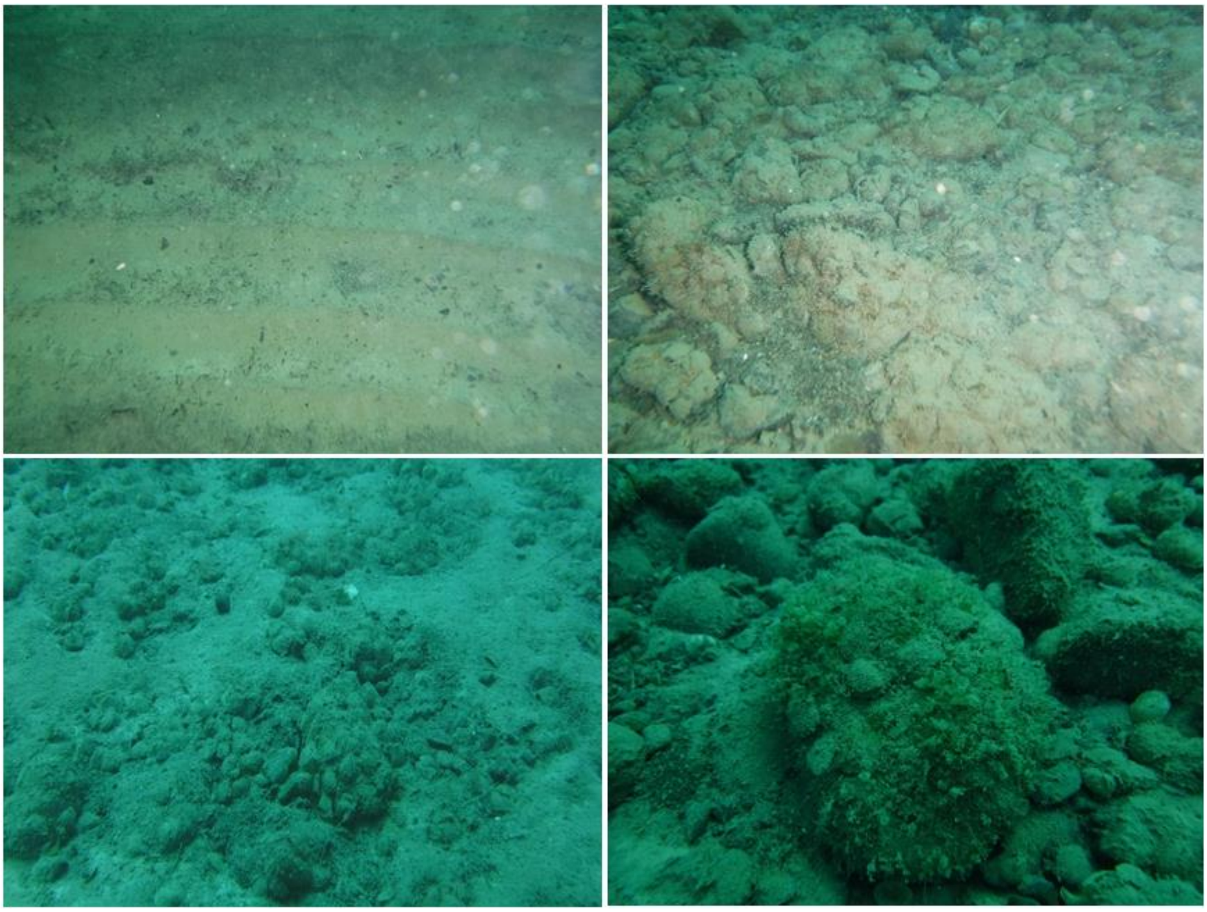


Figure 2-60. Sand, rocks, and pebbles dominate the nearshore seabed in front of the Mompong River estuary as seen in four (4) out of five-spot dives

325 The overall result of the assessments indicates that the primary coastal impact area of the proposed causeway project in Mompong, Sablayan is largely devoid of significant habitats and resources that can be negatively impacted by dredging, plant construction, vessel navigation, and project operations. Since the coastal area near the estuary is also a fishing ground for beach seining, it is unlikely that any benthic structure – either coral reefs or rocky outcrops, can be present in the area in as much as beach seines are active gears that are set in coastal waters and pulled to shore, in effect scraping all of the seabeds along its path. Such type of gear is set only in sandy substrates. Given the absence of reefs, demersal fish stocks are correspondingly absent and the few fish species observed do not indicate diversity and permanence.

326 The lone spot dive station where corals were observed is in the Sablayan MPA where live hard corals in a degraded reef were observed to occur some 1.3 to 2 km away from the estuary. Corals in the area consist mostly of the massive varieties (*Porites* spp.) mixed with dead coral formations that have been caused by dynamite blasts and cyanide burns in the past (**Figure 2-61, Figure 2-62**). Live corals were cataloged at 50% with mostly massive scleractinian corals, dead corals at 30%, and sandy substrate at 20 % (**Figure 2-63**). Due to its distance from the estuary, the corals in this area are unlikely to be affected by sediment streams from the dredging project.

Figure 2-61. Live hard massive corals, dead corals, and sand in spot dive station 4 in the vicinity of the Sablayan MPA; observed during marine ecology baseline assessment in the coastal area of the proposed Mompong River Dredging and Construction of Crushing Plant Project; 26-27 October 2021

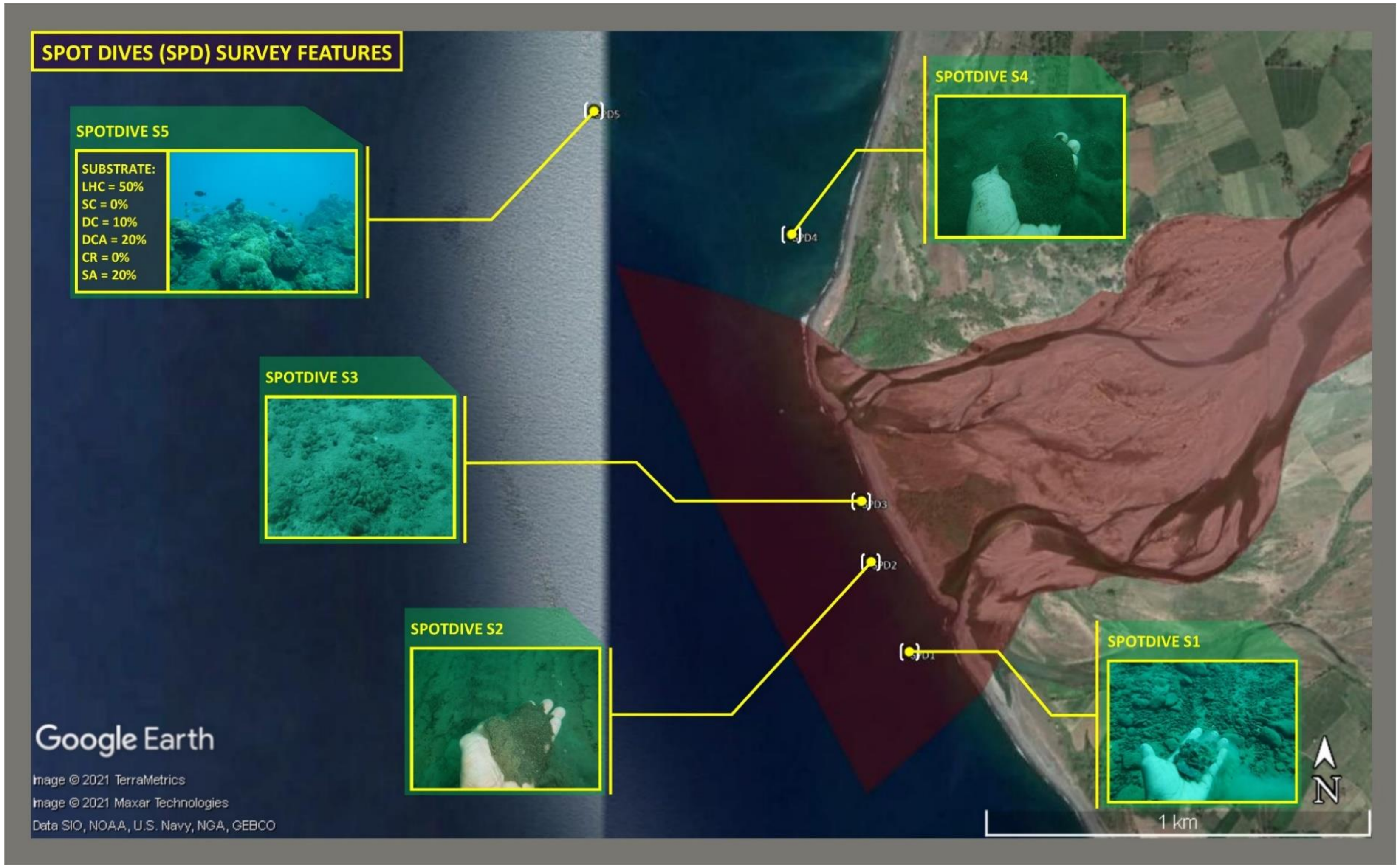


Figure 2-62. Highlights of five (5) spot dive undertaken in the impact area and the Sablayan marine protected area outside the project's impact area during marine ecology baseline assessment in the coastal area of the proposed Mompong River.

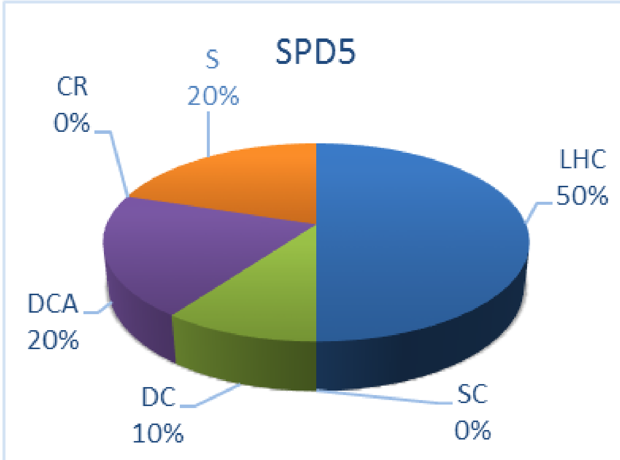


Figure 2-63. Coral profile in spot dive station 4 located in the Sablayan marine protected area outside the project's impact area

Highlights of the spot dive investigations are presented in **Table 2-45** below.

Table 2-45. Tabulated summary of results of surveys in five (5) spot dive surveys

WP Code	Latitude	Longitude	Remarks
SPD01	N 12.730860°	E 120.790590°	The substrate is comprised of fine sand, gravel, and stones without live or dead corals. The survey conducted was in 10 meters radius at a depth of 4.1 meters
SPD02	N 12.732960°	E 120.789670°	The substrate is comprised of fine sand, gravel, and stones without live or dead corals. The survey conducted was in 10 meters radius at a depth of 3.2 meters
SPD03	N 12.734380°	E 120.789440°	The substrate is comprised of fine sand, gravel, and stones without live or dead corals. The survey conducted was in 10 meters radius at a depth of 6.5 meters
SPD04	N 12.740610°	E 120.787770°	The substrate is comprised of fine sand without live or dead corals. The survey conducted was in 10 meters radius at a depth of 4.7 meters
SPD05	N 12.743490°	E 120.783040°	Around 1.30 kilometers away from the Mompong River Estuary and inside the Sablayan Marine Protected Area along Dongon Bay, Barangay Santa Lucia, Sablayan, Occidental Mindoro The survey conducted was in 10 meters radius at a depth of 5.9 meters

2.2.4.12 Fisheries

327 While the spot dives were conducted principally to further re-affirm results of manta tows that coral reef resources are absent in the coastal area fronting the project site, it was also conducted to locate some other benthic structures where fish visual census can be undertaken. Unfortunately, the spot dive surveys yielded the same negative results as no significant ecological niches of benthic nature which

could host populations of fish were found. Results of spot dive stations conducted within the general vicinity of the primary impact area showed a barren seabed, devoid of corals and with only a few in-transit demersal fish species. In offshore station 4, families of reef-associated fishes were observed but the distribution is unimpressive, indicating poor fisheries productivity and impaired ecological structure. Among the fishes encountered in the spot dive station, 4 were species belonging to *Labridae* (Wrasses), *Acanthuridae* (Surgeonfishes), *Carangidae* (Trevallies), *Pomacentridae* (Damsels), *Gobidae* (Goby), *Mullidae* (Goatfishes), *Chaetodontidae* (Butterflyfish), *Pinguipidae* (Lizardfish), and *Cirrhitidae* (hawkfish).

328 On the other hand, Barangay officials of Sta. Lucia alleged that more than 200 fishers operate in the estuary of the Mompong River, mostly employing hook and line, cast nets, gill nets, and small beach seine (*dragnet*). Catch rates and catch composition have allegedly declined and continue to steadily decrease. Fish traps are used to catch seasonal offshore squids 3 to 4 kilometers from the estuary, gill nets, cast nets and small hook and line are operated nearshore in the project's impact area to capture various species of fish that graze in brackish water. Small beach seines and drag nets that scrape the seabed and normally catch slipmouth, hairtail, mackerels, and anchovies. On the other hand, bottom-set gill nets are employed to capture seasonal occurrences of swimming crabs, shrimps, and small pelagic species dominated by mullets, mackerels, and small cavalla. Bigger boats fish offshore, commonly 5 to 8 kilometers from the shoreline, targeting large pelagic like tuna and dorado.

329 In all cases, most of the catch is composed of juvenile fishes with very low catch rates, e.g., 20 kilograms for a 5-hour beach seine operation employing 10 fishers. Fishers claim that the deterioration of catch rates is caused mainly by the unabated use of dynamite in fishing for small pelagic fishes in previous years but they also alleged that the pollution of seawater has depressed fish availability. Key informants are also aware that the capture of immature fish, principally caused by the use of beach seines, is not a sustainable practice and heavily affects recruitment capacity.

330 The immediate inference is that the fisheries in the study area are already over-fished and environmental disturbances such as sediment intrusion have exacerbated declines in yields. The fisheries in the coastal waters in front of the proposed causeway are large of pelagic nature as no benthic structures for cryptic species exist in the seabed. Pelagic fishes such as mackerels and anchovies are known to swim close to the shore in search of richer feeding areas. The presence of the estuary southwest of the site may be contributing to the discharge of organic nutrients that can cause periodic surges in phytoplankton populations that serve as food for small pelagics.

331 Results of actual fishing documentation confirm the low catch rate of 0.22 kg to 1.25 kg per fishing hour (**Table 2-46**). The dragnet – considered illegal in the Fisheries Code of the Philippines, posted the highest catch per unit effort.

Table 2-46. Results of actual fishing documentation in the coastal impact

Actual fishing station	Latitude	Longitude	Remarks
AFO1	N 12.734310°	E 120.787900°	Encountered 2 fishers using cast net gear having a catch of various fish species approx 2 kg in a span of 9 hrs fishing time; CPUE = 0.22 kg/fishing hour
AFO2	N 12.735670°	E 120.789290°	Encountered 1 fisher using bottom-set gill net gear having a catch of various fish species approx 0.75 kg in a span of 5 hrs fishing time; CPUE = 0.15 kg/fishing hour
AFO3	N 12.734540°	E 120.788450°	Encountered 1 fisher using speargun having a catch of Yellow-margined triggerfish (*Psuedobalistes flavimarginatus*) "*Pakol*", and Bigeye trevally (*Caranx sexfaciatus*) "*Talakitok*" fish species approx 5.5 kg in a span of 5 hrs fishing time; CPUE = 1.1 kg/fishing hour
AFO4	N 12.733800°	E 120.790350°	Encountered 3 fishers using beach dragnet gear having a catch of various fish species approx 2.5 kg in a span of 2 hrs fishing time; CPUE = 1.25 kg/fishing hour

332 Including species caught in the inner estuary, the common catch composition includes 17 species of food fish (**Table 2-47**, see also **Figure 2-64**).

Table 2-47. List of fish species caught in the Mompong River and IUCN status

English name	Local name	Scientific name	IUCN Status
Freshwater prawn	Ulang	Macrobrachium rosenbergii	*Least Concern*
Nile tilapia	Tilapia	Oreochromis niloticus	*Least Concern*
Endeavor shrimp	Pasayan/hipon	*Nematopalaemon tenuepsis*	*Not assessed*
Square-tail mullet	Banak	*Ellochelon vaigiensis*	*Least concern*
Largescale mullet	Banak	*Chelon macrolepis*	*Least concern*
Giant mottled eel	Igat/Kasili	*Anguilla marmorata*	*Vulnerable*
Freshwater catfish	Hito	*Ictalurus punctatus*	*Least concern*
Whipfin silver-biddy	Latab	*Gerres filamentosus*	*Data deficient*
Goatfish	Saramulyete/Bungutan	*Parupeneus barberinus*	*Least concern*
Freshwater giant prawn	Ulang	*Macrobrachium rosenbergii*	*Least concern*
Freshwater Snapper	*Lutjanus fuscescens*	*Gingaw*	*Least concern*
Siganid	Samaral	*Siganus spp*	*Least concern*
Trevally	Talakitok	*Caranx spp*	*Least concern*
Ponyfishes	Sap-sap	*Leiognathidae*	*Least concern*
Convex-lined theraponid	Bugaong	*Therapon sp*	*Least concern*
Brackishwater snapper	Mangagat	*Lutjanus argentimaculatuss*	*Not assessed*
Common whiting	Asohos	*Sillagosihama*	*Least concern*
Spotted mojaras	*Malakapas*	*Gerresfilamentosus*	*Least concern*
Emperor	*Kanupng*	*Letrinus sp*	*Least concern*
Frigate mackerel	*Tulingan*	*Auxisthazard*	*Least concern*

Figure 2-64. One (1) fisher coming from Barangay Santa Lucia, Sablayan, Occidental Mindoro using bottom-set gillnet "Pante" with an initial catch of 0.75 kilograms for five (5) hours - 10:00 A.M. to 3:00 P.M.; catch per unit effort (CPUE) was 0.15 kilogram per hour; and catch composition (from left to right): juvenile Common silver-biddy/mojarra (Gerres oyena) "Latab", Brassy trevally (Caranx papuensis) "Talakitok", Bluespot mullet (Crenimugil seheli) "Banak", Silver sillago (Sillago sihama) "Asohos/Asoos", and Giant freshwater prawn (Macrobrachium rosenbergii) "Ulang"

Three (3) fishers coming from Barangay Santa Lucia, Sablayan, Occidental Mindoro using Beach dragnet "Pante" with an initial catch of 2.50 kilograms for two (2) hours - 10:00 A.M. to 12:00 N.N.; catch per unit effort (CPUE) was 1.25 kilogram per hour; and catch composition (from left to right): Dash-and-dot goatfish (*Parupeneus barberinus*) "Salmunete/Timbungan", Silver sillago (*Sillago sihama*) "Asohos/Asoos", Brassy trevally (*Caranx papuensis*) "Talakitok", juvenile Barred queenfish (*Scomberoides tala*) "Lapis/Lari", juvenile

Bali sardinella (*Sardinella lemeru*) "Lupoy/Tamban) and Toothed ponyfish (*Gazza minuta*) "Sap".

2.2.4.13 Macro-invertebrates of commercial significance for food and trade

333 Macro-invertebrates are unimpressive in opportunistic surveys and to sampling sites investigated in front of the project site. A few macroinvertebrates of no commercial importance were found to be thriving in the inter-tidal area as revealed from core samples but other mollusks and crustaceans were absent in the seabed that was investigated during spot dives.

334 Most of the core samples collected featured only sand and small pebbles. In two samples, the only organisms isolated from the dominantly sandy area are the bottom-dwelling crablets and a gastropod which is not harvested for trade by the community. The edible sea urchin *Tripnuestes gratilla* was conspicuously absent in the sandy seabed. The absence of a significant population of mollusks or other macro-invertebrate species may be attributed to the harsh wave and tidal action in the coastline of the study area where the proposed port and facility will be located. A total of five species were observed in the survey (**Table 2-48**). Only two (2) species were actually seen in two sampling stations (**Figure 2-65**).

Table 2-48. List of macro-invertebrate species caught in the Mompong River estuary and nearshore marine waters during marine ecology baseline assessment.

Species Name	Common Name	Habitat	Group
Telescopium sp	Swamp cerith	Muddy substrate	Gastropod
Neritina turrita	Turreted nerith	Sandy substrate	Gastropod
Melanoides torulosa	Red rim melania	*Sandy substrate*	Gastropod
Sundathephusa monatanoanus	Freshwater crab	*Sandy shoreline*	Crustacean
Corbicula manilensis	Manila/Asian clam	*Sandy substrate*	Bivalve

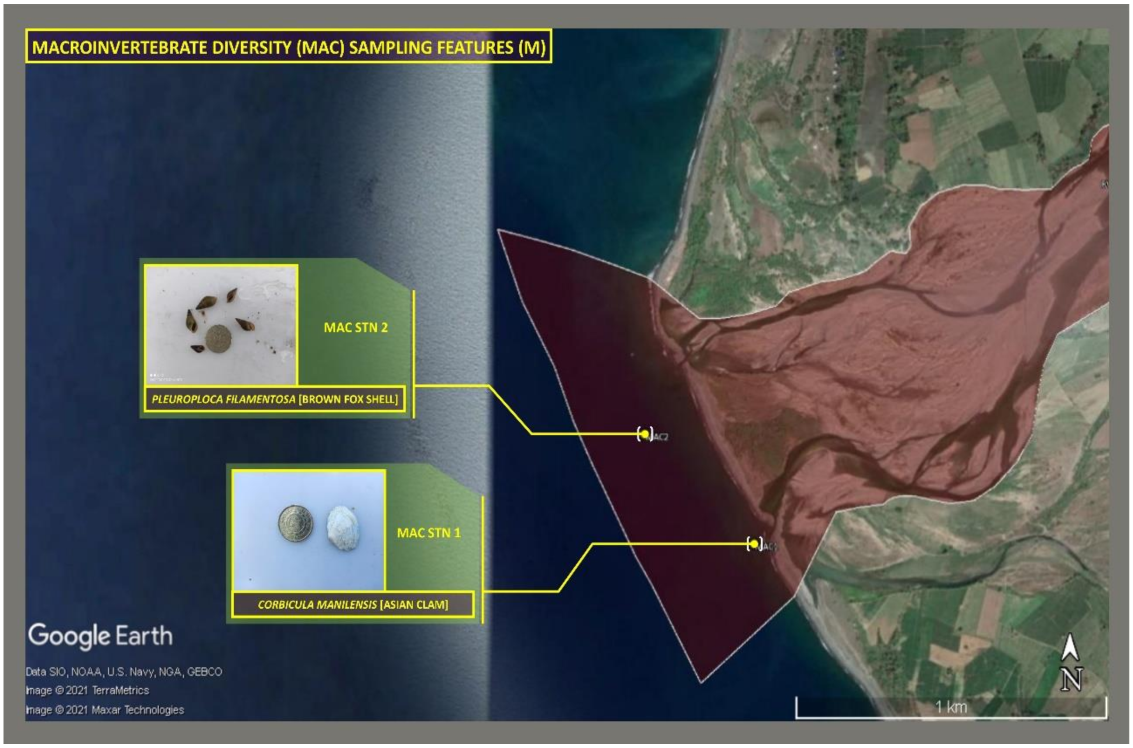


Figure 2-65: Few macro-invertebrates were encountered in two sampling stations in the coastal impact area during marine ecology baseline assessment

2.2.4.13.1 Seagrass communities

335 Manta tow surveys in 8 stations, spot dives, and systematic snorkeling over shallow waters did not indicate that seagrass meadows are existing in the area. The strong sand intrusion and wave action over the tidal flats that create disturbance to the sea bottom apparently do not favor the growth of seagrass colonies.

2.2.4.14 Mangroves

336 No mangrove trees occur in the coast fronting the project site impact area.

2.2.4.15 Plankton

Phytoplankton

337 A summary of the phytoplankton taxa recorded in two sampling points in the coastal waters within and near the mouth of Mompong River that could be potentially affected by the proposed dredging project in Sablayan, Occidental Mindoro is tabulated below (**Table 2-49**). Station MP1 is located at the estuary area, while station MP2 is slightly offshore the coast.

Table 2-49. Phytoplankton composition, abundance (cells/L), diversity, and distribution in two sampling stations within and near the proposed dredging project.

Taxa	Stations		Grand	Rel.
	MP1 (Estuary)	MP2 (Marine)	Total	Abund.
Diatoms	**260,481**	**323,746**	**584,227**	**98.73**
Amphora		147	147	0.02
Chaetoceros	259,333	322,051	581,385	98.25
Coscinodiscus	120	1,321	1,441	0.24
Ditylum	27		27	0.00
Leptocylindrus	200		200	0.03
Melosira	240		240	0.04
Pleurosigma	40		40	0.01
Pseudoniztchia	227		227	0.04
Rhizosolenia	67		67	0.01
Skeletonema		227	227	0.04
Synedra			0	0.00
Tabellaria			0	0.00
Thalassionema	107		107	0.02
Thalassiosira	120		120	0.02
Dinoflagellates	**1,909**	**5,579**	**7,487**	**1.27**
Ceratium	454	1,668	2,122	0.36
Dinophysis	93	93	187	0.03
Gonyaulax	214		214	0.04
Odontella		894	894	0.15
Prorocentrum	574	2,803	3,377	0.57
Protoperidinium	93	120	214	0.04
Scripssiella	480		480	0.08
Grand Total	**262,390**	**329,325**	**591,715**	**100.000**
Richness	**16**	**9**		
Evenness (J')	**0.008**	**0.059**		
Diversity (H')	**0.020**	**0.142**		

338 Overall, diatoms dominated the phytoplankton community constituting 98.7% of the total counts while dinoflagellates only accounted for 1.27%. Results of the analysis showed that phytoplankton density was high but the diversity was very low (<1) owing to the bloom of the *Chaetoceros* spp. Total cell densities varied from 262,390 cells per liter at station MP1 (estuary) to 329,325 cells per liter at station MP2. Taxa richness ranges from 9 to 16 taxa.

339 All sampled stations revealed the presence of both diatoms and dinoflagellates. A total of seventeen (19) genera was recorded. Among the diatoms, the pennate chain-forming taxa *Chaetoceros* spp. was the most abundant with a total recorded density of 581,385 cells per liter (98.25% of the total

composition). It was observed at the highest density in station MP2 (marine area) at 365,333 cells per liter. This species is quite typical of tropical marine waters and has a cosmopolitan distribution. Commonly found in warm tropical waters, these diatoms provide significant influences on the overall primary productivity in such marine environments. Furthermore, these are some of the major food sources of filter-feeding shellfish, which were found along the coastal waters of the survey area. Among the dinoflagellates, *Ceratium* spp. was the most abundant with a total cell density of 3,377 cells per liter (0.57% of the total composition).

340 The species identified in this sampling which is listed in the IOC-UNESCO Reference List of Harmful Microalgae (Moestrup et al., 2009) were *Dinophysis* spp. *Dinophysis* species identified here was *D. caudata* which is a toxic dinoflagellate capable of producing toxins associated with Diarrhetic Shellfish Poisoning (DSP) (FAO, 2004). It is a cosmopolitan species with wide distribution and is also associated with red tide resulting in mass mortality of fish in countries like the Gulf of Thailand and the Seto Inland Sea in Japan (Okaichi, 1967). In this survey, however, it was recorded at low density (93 cells per liter (0.036% of the total composition). Since there is no intensive and extensive shellfish farming in the area, major negative public health and economic impact is very unlikely but should not be ruled out. *Pyrodinium bahamense* var. *compressum*, the most notorious phytoplankton species to historically cause Paralytic Shellfish Poisoning (PSP) cases and deaths for contaminating shellfish in many coastal areas in the Philippines was not observed in this survey. Photomicrograph of dominant and common phytoplankton is shown in **Figure 2-66.**

341 Diversity Index (H) at the sampling locations showed values as low as 0.02 (site MP1) to an as high 0.142 (site MP2). The Evenness o index was quite similar with values ranging from 0.008 (Ph1) to 0.059 (MP2). The low species diversity and evenness were due to the high concentration of *Chatetoceros* spp. which dominated other taxa.

Zooplankton

342 A summary of zooplankton groups recorded in two sampling stations located nearby the proposed dredging project in Sablayan, Occidental Mindoro is tabulated as seen in **Table 2-50**. below. Station ZP1 is located in the estuary area, while station ZP2 is located slightly offshore.

Table 2-50. Zooplankton composition, abundance (ind/m^3), diversity, and distribution in two sampling stations within the proposed dredging project.

TAXA	STATIONS		Grand	Rel.
	ZP1 (Estuary)	ZP2 (Marine)	Total	Abund.
Adult forms	**144,144**	**302,970**	**447,114**	**43.85**
Calanoid copepod	42,709	190,858	233,567	22.91
Cyclopoid	89,423	104,104	193,527	18.98
Harpacticoid	12,012	8,008	20,020	1.96
Larvacean	0	0	0	0.00
Larval forms	**252,252**	**320,320**	**572,573**	**56.15**
Balanus nauplius	12,012	12,012	24,024	2.36
Bivalve veliger	16,016	10,677	26,693	2.62
Copepod egg	0	0	0	0.00
Copepod Nauplius and Copepodites	224,224	284,284	508,509	49.87

TAXA	STATIONS		Grand	Rel.
Gastropod veliger	0	6,673	6,673	0.65
Polychaete Trocophore	0	6,673	6,673	0.65
Grand Total	**396,396**	**623,290**	**1,019,686**	**100**
Richness	**6**	**9**		
Evenness (J')	**0.63**	**0.60**		
Diversity (H')	**1.11**	**1.35**		

343 Overall, larval forms dominated the zooplankton community which accounted for 52.6%. Adult forms, on the other hand, accounted for 43.85% of the total zooplankton abundance. Furthermore, results of the analysis showed that density is moderately high while taxa richness and diversity were low in both sampling locations b. Zooplankton density varied from 396,396 individuals per m^3 at ZP1, to 623,290 individuals per m^3 at ZP2. Taxa richness was comparable in both stations ranging from 6 to 9 taxes.

344 All the sampled stations were mostly composed of copepods, larvacean, polychaete, bivalve larvae, gastropod larvae, and *Balanus* larvae. A total of nine (9) zooplankton taxa were recorded. Among the larval forms, copepod nauplius and copepodite recorded the highest abundance with a total density of 508,509 individual per m^3 (49.9% of the total composition). It was observed at the highest density in station ZP2 (marine area) with 284,284 individuals per m^3. Among the adult forms, calanoid copepod recorded the highest abundance with a total density of 233,567 individua per m^3 (22.9% of the composition) and followed by cyclopoid copepod with 193,527 individuals per m^3 (18.9% of the composition). The highest concentration of cyclopoid and cyclopoid were found in station ZP2 with 190,858 individuals per m^3 and 104,104 individuals per m^3 respectively. Ecologically the planktonic copepods provide functionally important links in the aquatic food chain feeding on the microscopic algal cells of the phytoplankton and, in turn, being eaten by juvenile fish and other planktivores like sardines. Other zooplankton taxa that recorded relatively higher density were bivalve veligers (3%) and *Balanus* nauplii (2%). There were no fish larvae and decapod zone recorded in all the stations sampled during this survey.

345 Diversity Index (H) at the sampling locations showed values as low as 1.11 (sites ZP1) to as high as 1.35 (site ZP2). The Evenness of index was similar among stations ranging from 0.60-0.63. These indices indicate uneven zooplankton community in the area which could to the seasonality of zooplankton and the timing of the survey with the prevailing environmental condition. It is therefore important to interpret the result of this plankton analysis in conjunction with the physio-chemical parameters, as changes in the physical environment would eventually affect the ecology of the surrounding environment including plankton.

346 Photomicrographs of some plankton species observed are shown in **Figure 2-66** and **Figure 2-67**.

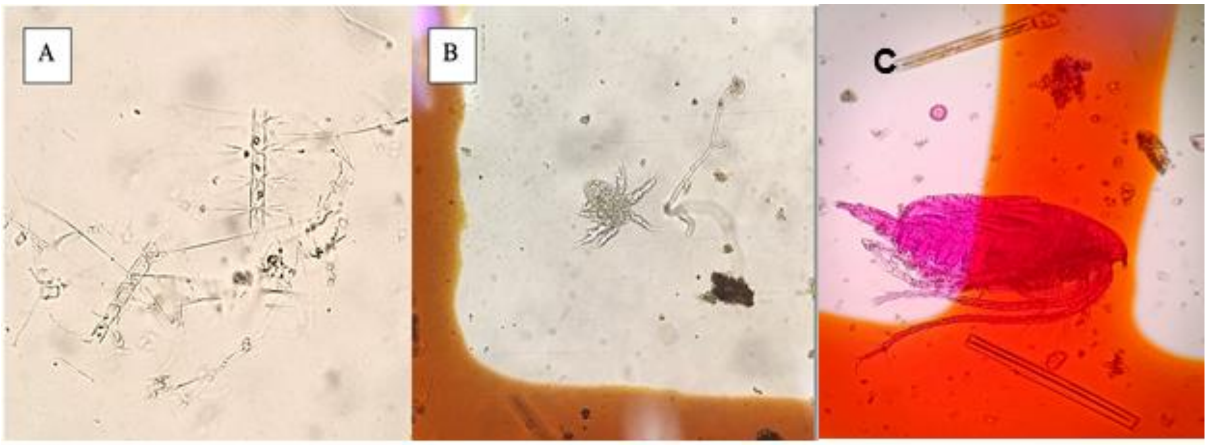


Figure 2-66. Photomicrographs of the common group during the sampling period in Mompong River (A) Chytotocerus; (B) Copepod Nauplius (C) Calanoid copepod

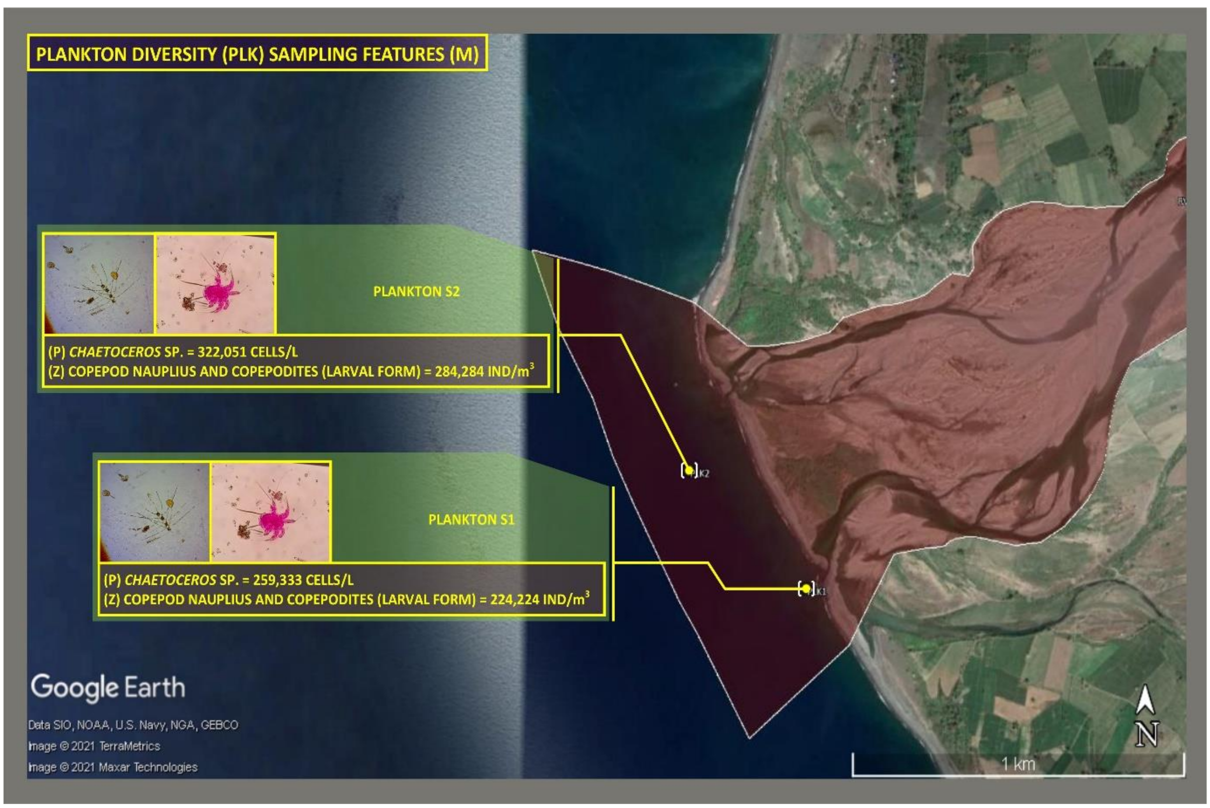


Figure 2-67. Dominant plankton species were observed in two sampling stations in the coastal impact area of the proposed BNRC Mompong River Dredging Project.

2.2.4.16 Predicted Environmental Impacts

347 To a significant extent, the existing environmental conditions in the coastal waters and contiguous environs fronting the proposed dredging project site are unlikely to improve due to the absence of sufficient ecological niches that can progressively nurture improvements in benthic habitats. The influx of sediment plumes from the river, as well as silt and soil run-off from inland waterways that eventually end up in the sea, can be anticipated to enhance degradation of seawater quality and reduce primary productivity in extreme events of turbidity. The settlement of coral planulae and seagrass shoots is unlikely to occur in view of the absence of firm substrates for attachment and colonization and the strong wave action that creates an incessant disturbance in seabed conditions. Consequently, fisheries productivity is expected to remain largely low due to superfluous fishing effort and the use of the active gear beach seine which is suspected to be a primary cause of growth overfishing. With this scenario, coastal ecosystem integrity and fisheries productivity are foreseen to further deteriorate and the absence of rehabilitation and sediment control measures in upstream areas far beyond the confines of the project area is expected to exacerbate the heavily stressed coastal environment near the project site.

348 Even as they possess poor ecological diversity, intertidal and sub-littoral habitats around the area may suffer from increased waste and pollutants, both from project facilities and foreseen labor in-migration as the operation of the Project is also seen to increase employment opportunities for skilled labor and provide certain food supply-based livelihood to local fishers and residents. The future scenario, with the dredging project in operation, will likely lead to the addition of sediment and oil spills if control measures are not effectively adopted both during the project construction and operations phase.

349 Silt and sediment waste from the dredging project, however, are large of temporary nature and the coastal environment is anticipated to improve after dredging.

2.2.4.16.1 Construction Phase

(i) Sediment fluxes in coastal waters

350 Earthmoving, dredging, and construction of support facilities in the project site will likely lead to sediment discharge into coastal waters. Notwithstanding the absence of critical and fragile coastal habitats in the project's coastal impact area, the possibility of enhanced sediment loading emanating from dredging and sand stock, fugitive construction wastes, and other coastal land disturbance and development such as access road development, will likely contribute to coastal water turbidity, in the form of total suspended solids (TSS), silt and sediment plumes. Extreme water turbidity can impair photosynthetic capacity and lead to the demise of micro-algae and this can have far-reaching impacts on both the primary productivity in the marine food chain as populations of larval stages of fish and crustaceans can be negatively affected by extremely turbid conditions in the water column as turbidity will reduce photosynthetic function which can affect microscopic primary producers of phytoplankton and dependent zooplankton communities, depress macro-benthic algae settlement, and further deteriorate dissolved seawater oxygen content. The impairment can lead to disruption of fish and crustacean feeding behavior and lead to poor prey visibility. Reproductive performance of fish and crustaceans, which may include disturbance to swimming crab population and dislocation of bivalve mollusks burrowed in the sandy-muddy substrate. Such a condition can also impair fish larvae output and result in reduced recruitment capacity of crabs and pelagic fish species. Further, the further alteration of benthic habitats due to sediment loading would most likely result in the longer movement of fish and fish recruits away from the coastal area affected by the Project. Grazing areas of demersal

species of fish and crustaceans, already few in numbers as indicated in the surveys, can be lost.

351 It is evident, however, that enhanced siltation and sedimentation from land clearing and earth-moving activities is a temporary and localized event.

2.2.4.16.1.1 Macro-benthos suffocation in cases of extreme episodes of sediment intrusion

352 The overall impression from the macroinvertebrate diversity assessment in the survey area is poor as indicated by the low diversity in sampling stations. Nevertheless, coastal and river dredging activities and shoreline modification will result in a significant increase in sediment deposition and re-suspension, particularly in the immediate vicinity of the estuary. Alteration of the inter-tidal zone can result in loss of infaunal benthic mollusks. Bivalve veligers in the inter-tidal area of the project site can be susceptible to sediment blanketing particularly during the intense dredging operation. However, the community of larger gastropods and bivalves farther away from the estuary can move out to undisturbed areas. Also, it is noted that few other macro-invertebrates were seen in the project site area. Any disturbance to the few benthic stocks of mollusks will be temporary and will have no lasting, far-reaching effects on macroinvertebrate growth and recruitment as the shelf is deep and sediment plumes will be readily swept into deeper slopes or completely cease after dredging is completed. Moreover, the macro-benthic community is also known to be resilient as some groups would migrate to less stressful areas, while a few tolerable organisms remain in the affected area; or replenishment of the community will occur with either the existing or new species establishing their population and niches through time.

2.2.4.16.1.2 Accidental oil spills and oily sludge

353 Accidental spillage of oil and grease from project facilities, disposal of oily wastes as well as spills of materials from project equipment can cause seawater pollution that can end up in substrates within the shelf. Such episodes can potentially contaminate benthic invertebrate populations, macro-benthos, and fish larvae in the area, even if such communities are few in the area fronting the project site. While these issues are to be strictly controlled so that such will not take place, oil slicks caused by unintentional spills in the project or from fuel dispensing may remain sequestered in coastal waters and can be dispersed in small blotches towards the direction of tidal movement affecting benthic niches and corals within its pathway, as well as fish nurseries and habitats for sedentary marine animals.

2.2.4.16.2 Operation Phase

354 As in the construction phase, the operation of the project may contribute to increased sediments, solid waste, and domestic wastewater contamination of nearshore waters, as well as accidental oil and grease spills project facilities. Pollution and degradation of seawater quality have far-reaching impacts on plankton communities and fish recruitment events. The risk of oil and grease contamination on nearshore waters can occur if disposal of fuel-based wastes is not undertaken properly, e.g., from the project's day-to-day dispensing of fuel and oil storage in the port and within ships. While the issue is not anticipated to be severe, oil slicks caused by inadvertent disposal may remain sequestered in waterways and drainage facilities or be carried by rainwater run-off to coastal waters and dispersed in small blotches towards the direction of tidal movement. During high tides and particularly during the southwest monsoon season, such slicks may be carried extensively towards the coastline where contaminants become mixed with various sediments. During heavy rainfall, fuel contaminated topsoil is normally carried by run-off, and eventually contaminates coastal waters.

2.2.4.16.3 Decommissioning Phase

355 The abandonment of the project is not expected to produce any impacts on the marine environment and associated biota.

2.2.4.17 Proposed Mitigation Measures

356 Even as there are no corals in front of the project site, as well as fish habitats, the objective is to reduce or altogether prevent sediment invasion to the highest degree possible. The project aims to formulate and implement a coastal environmental management regime that is directed at improving the quality of coastal waters in front of the site both for biodiversity and aesthetic values. The maintenance of a cleaner seawater condition will be an inherent and recurrent strategic initiative.

2.2.4.17.1 Prevention of siltation and sedimentation

357 The possibility of sediment streams spilling into coastal waters from project construction works, access road construction, and project facilities establishment can be prevented first and foremost by controlling sediment spills at the source, ensuring that any plumes or spillages are effectively captured, and diverting all loose or fugitive soil and sediments into a recovery weir. During construction and pile driving, silt curtains consisting of geotextile material are to be installed to filter the sediments on the seaward side of the estuary site. Loose materials shall be stockpiled in a landward area where control measures can easily be applied to prevent unnecessary dispersion. Replanting beach vegetation, as well as enhancing vegetation cover in open areas of the river and estuary will help significantly to minimize soil erosion and freshwater run-off. The planting of mangrove trees along the estuary of the river can be a worthy project of project.

358 In fact, all activities and structures that can potentially generate loose or fugitive soil and sediments will be subjected to silt curtains and geotextile sediment filters for effective recovery which will then be re-used. During the rainy season, escape of silt will be curtailed especially focusing on potential spill points of sand materials that can end up in coastal waters near the estuary, again using silt curtains where necessary. A primary goal is to prevent sediments from reaching corals in the Sablayan MPA.

359 Periodic environmental monitoring of TSS will be undertaken and results of monitoring are periodically fed into strategic improvement plans. However, enhanced siltation and sedimentation from the project's establishment is evidently a temporary event and will subside readily after dredging operations.

2.2.4.17.2 Prevention of domestic wastewater pollution

360 3-chambered septic tanks shall be installed in all project facilities where wastewaters are generated. Waste minimization will be practiced in all aspects of project operation.

2.2.4.17.3 Addressing disturbance to traditional fishing grounds in nearshore waters

361 The project will address the dislocation of traditional fishing practices due to potential limitations brought about by sediment streams in nearshore waters. While fisheries productivity and long-term viability is not an issue that should be directly addressed by project operations, the project will nonetheless support fisheries management and stock enhancement measures through collaboration with the local government and the Municipal Fisheries and Aquatic Resources Management Council, drawing strategic support institutions involved in coastal management initiatives. The objective is to make fisheries more productive. Support to locally organized fisher groups for the implementation of better fisheries law enforcement, advocacy against irresponsible fishing practices, and the implementation of

fish stock enhancement measures to protect fish growth, maturation, and recruitment will be supported by the project in ways that can be viably integrated into its social development plan.

2.2.4.17.4 Mangrove enhancement

362 Mangrove enrichment planting will be undertaken in the estuary employing suitable species.

2.2.4.17.5 Prevention of oil and grease spills

363 Potential risks of small oil spills will be addressed through strict fuel and oil dispersal protocols backed up by an oil/fuel spill contingency plan in accordance with IMO protocols. Oil depots will be located a good distance from the river and estuary. No oil wastes will be disposed into waterways or canals. In order to prevent intermittent oil spills from project facilities and dispensing, strict measures against wanton and irresponsible disposal of used oil will be undertaken properly and cleanup activities that focus on removing oil and oily debris from the project area will be undertaken forcefully if such spills accidentally occur. An oil and grease containment and waste containment plan will be formulated and enforced in all aspects of project operations.

364 Clean practices will be an underpinning responsibility in all aspects of project operations and instituted within all facilities managed by the project.

365 An oil and grease containment and recovery plan will be formulated and enforced in all aspects of project operations. Prohibition of disposal of shipboard wastes will be absolute and a rigid monitoring system around the port complex will be carried out constantly. A bilge and ballast water exchange system will be formulated following standard IMO protocols and a treatment system fitted with oil separators.

2.2.4.17.6 Presence of pollution indicator species

366 *Fish* – Marine fish species have not been used as indicators of pollution, except where biotoxins are involved (e.g., plankton-filtering fish species in PSP-affected areas). On the contrary, some species of fish have been used as “indicators” of a relatively good coral reef habitat and its ecosystem functions. In the case of the coastal area fronting the project site, indicator species are only found in the MPA some 1.3 kilometers away from the project site.

367 *Corals* – Corals thrive well in clear waters as their symbiotic relationship with a host alga requires that sustained sunlight penetration for food production is ensured. In this aspect, coral reefs are therefore sensitive to turbid waters that can be brought about by the introduction of sediment plumes. However, there are no corals colonies in front of the project site. The corals encountered in the center of the reef shoal some 1.5 km from the project site, many of which are dominated by dead corals with algae.

368 *Plankton* – No plankton blooms of significant proportion were observed in the survey although the presence of *Dinophysis* spp. which is listed in the IOC-UNESCO Reference List of Harmful Microalgae (Moestrup et al 2009). The *Dinophysis* species identified here as *D. caudata* is a toxic dinoflagellate capable of producing toxins associated with Diarhetic Shellfish Poisoning (DSP) (FAO, 2004) that can result in mass mortality of fish. In this survey, however, it was recorded at a very low density at only 90 cells/L (0.03% of the total abundance) and while there are no intensive shellfish farms on the site, continuous monitoring is recommended. In addition, there is no confirmed incidence of ASP and DSP cases in the Philippines.

2.2.4.17.7 Historical Occurrences of Red Tide, Fish Kill, or Any Related Event

369 No red tide episodes or fish kills triggered by harmful algal blooms were experienced in the vicinity of the project site in the last ten years.

2.2.4.17.8 Marine Megafauna

370 Key Informant Interviews (KII) were conducted onboard the survey boats. KIs divulged that no marine turtles use the coastal area near the Mompong River as nesting grounds. In the same manner, no dolphins were witnessed close to the shoreline but only occasionally in deep marine waters far from the Mompong River estuary.

Table 2-51. Environmental Management Plan – Mompong River (Marine Ecology)

Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
CONSTRUCTION PHASE: (Earthmoving, construction of facilities, soil compacting, and configuration of project base)	River water and nearshore seawater quality	Further increase in siltation/sedimentation loading in the river; increase in turbidity and suspended solids; Suffocation of fish and crustacean habitats Further impairment of plankton community; Disruption of fish and benthos larval growth;	• Installation of silt curtains where sediment spills can occur; • Immediate soil compacting in area of earthmoving activities; • Periodic environmental monitoring, i.e., to comparatively determine fish and crustacean population compared to baseline data. • Enhancement of fish stocks in the Sablayan MPA through technical assistance to strengthen MPA resilience
OPERATION PHASE (dredging and crushing plant operation)	Coastal waters and habitats of benthic organisms;	Inadvertent sediment streams reaching coastal waters; A spill of domestic wastewaters that can cause pollution; Spillage of oil and oily wastes	• Placement of silt curtains around the river mouth; • Establishment of sediment catchment ponds in the river where applicable; • Quick and efficient collection and removal of dredged materials • Stabilization of dredged portions of the river including riverbanks; • Revegetation of riverbanks; • Use of 3-chamber septic tanks in all project facilities; • Oil and grease contingency plan; • Adoption of clean practices by all project operating units and personnel; • Efficient waste retrieval system;

			• Greening of riverbanks and around project facilities; • Adoption of the most advanced system for septic tank waste treatment and filtration.
		Pollution and blockage of portions of the river due to solid wastes	• Implement a rigid solid waste collection and disposal system; • Collaboration with LGU on waste management and recovery.
		Leachate of crushing plant debris and spoils into nearshore waters;	• Plant litter recovery and recycling • Install weirs to efficiently collect plant operations wastes and debris.
	River biota	Loss of river fisheries Loss of macro-invertebrates	• Re-stock fish species in undisturbed portions; • Collect and re-stock macro-invertebrates; • Ensure replenishment of freshwater prawns by protecting/replenishing migration pathways and protecting maturing individuals

2.2.5 Freshwater Ecology

2.2.5.1 Introduction

371 The Mompong River system is the major freshwater surface water system that traverses Sablayan municipality. The Mompong River's headwaters emanates from the Mount Iglic-Bato Mountain range, meander for about 30 to35 km kilometers across the boundaries of five (5) Sablayan Barangays before emptying in an estuary in the Dongon Bay which is part of the greater Mindoro Strait. The river flows through low gradient meadows, most of which are barren and without dense households and settlements. The Mompong River is relatively wide, measuring between 60 to 100 meters in most portions but the river itself is low and narrow; broken up into several flowing waterways in many portions, many of which are constricted by sand bars and sediment accretions throughout, with the estuary itself broken up into two outfalls narrowed down by sand bars (**Figure 2-68**).

Figure 2-68. Portions of the Mompong River in Sablayan, Occidental, Mindoro

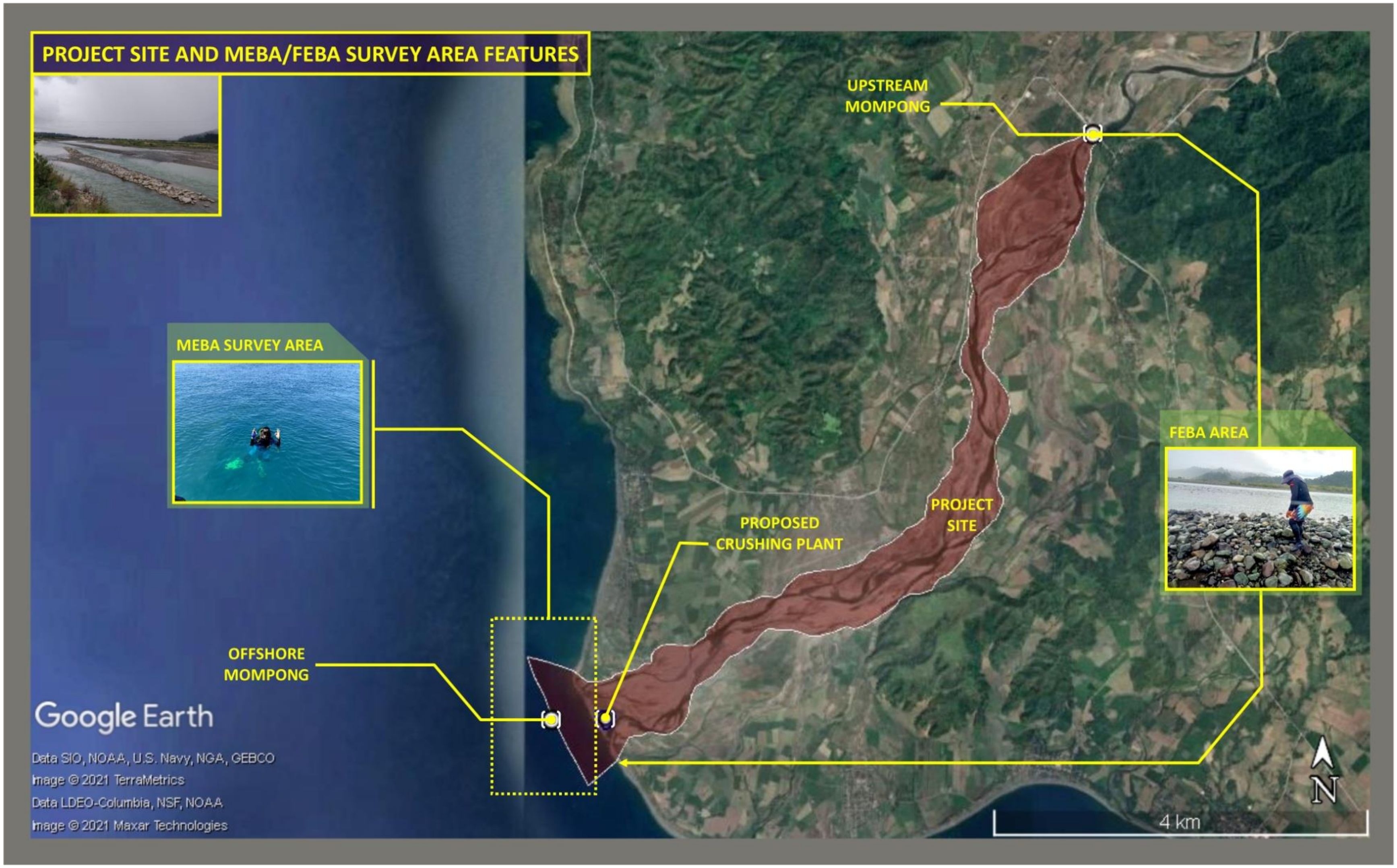


Figure 2-69. The Mompong River and dredging site (with both marine and freshwater/river survey areas indicated)

2.2.5.2 Objectives

372 River ecology surveys were conducted in four (4) stations along the Mompong River from 25-27 October 2021 consisting of upstream, midstream, and estuary stations in about 12 kilometers of the river system. The objective of the aquatic ecology baseline study is to determine the presence and species distribution of important aquatic biota, determining plankton community structure, macro-invertebrates, and fisheries resources and practices that can be susceptible to anthropogenic issues arising from river quarrying.

373 The objective of the assessment is to account for and describe the presence and species distribution of river life forms that can be potentially disrupted or impaired by project establishment, or be subjected to stresses associated with potential anthropogenic environmental impacts attributable to the Project's implementation. The underpinning goal of the assessment is mainly to document current fish biota in the project's primary impact areas so that these can be comparatively viewed in the future when the project is already operating. By obtaining data and variables of the same types and employing consistent survey protocols, susceptible endpoints and critical aquatic resources and habitats can be characterized in their current state, and identification of potential causes and pathways of stressors can be identified for future monitoring purposes. Ultimately, the baseline profile will serve as the principal tool in crafting appropriate response measures to ensure that such project impacts, if any, are mitigated over the long run and in the most effective manner.

2.2.5.3 Sampling Methodology

374 Freshwater and estuary fish species specimen documentation was undertaken through opportunistic observations in river pools and supplemented by actual observation of fishing operation in the estuary station where groups of fishers were encountered during the time of the survey in actual fishing operations. Transect swims for fish identification were not viable in deep and fast flowing portions of the river but only in shallow pools where river depth is viable and water is clear. Sizeable information on fish species present in the river was also derived through key informant interviews, principally amongst Barangay officials and survey guides. Catch composition and catch per unit effort (CPUE) of four fishers encountered doing actual fishing operations in the river estuary was documented. This was also supplemented with catch observations of fishers operating in the estuary. Four stations were investigated for freshwater fish biota and macro-invertebrates, listed in **Table 2-54**. Plankton community structure was determined from water samples taken in the upstream, midstream, and downstream stations listed in **Table 2-58**.

375 Investigation of the macro-invertebrates present in the river was undertaken in generally the same stations for fish biota investigations, employing core sampling in random stations along 100-meter transect walks in shallow portions of the river (Plate 2). The core samples were sifted for the presence of mollusks and other macro-invertebrates. Specimen collection was supplemented by actual observations of macro-invertebrates where they occur. Only macro-benthos visible to the naked eye were collected and identified.

376 Composition, abundance, and density of phytoplankton communities were determined using standard methodologies particularly the Shannon-Weaver Diversity/Evenness Indices and bio-assessment metrics. Plankton community quantitative and qualitative analysis was undertaken through water samples collected at the sampling sites by filtering ten 1-liter samples into a composite sample. Phytoplankton samples were then fixed using Lugol's solution; zooplankton samples were fixed with 10% buffered formalin. Samples were then sent to the UP MSI laboratory for counting and identification. Counting and identification of organisms were conducted using a Sedgwick-Rafter plate. For phytoplankton, a compound light microscope was used, while for zooplankton, a dissecting microscope. Phytoplankton was counted and identified to the lowest

taxonomic level (genera) possible while zooplankton was identified to major groups using available references. Phytoplankton and zooplankton densities are presented as a number of cells or organisms per liter.

Figure 2-70. Survey team doing macro-invertebrate specimen collection in core samples.

377 Basic river attributes in four stations were investigated, the locations of which are indicated in **Table 2-52**. Three stations were located in the upstream and downstream sections of the Mompong River relative to the project site, while a fourth station was investigated in the river estuary. The locations of the stations are shown in **Figure 2-71** (please also see Plate 2).

Table 2-52. Coordinates of river parameter sampling stations investigated in the Mompong River

WP Code	Latitude	Longitude	Depth (m)	Location
RVR1	12. 794010° N	120. 840810° E	0.70	Upstream of Mompong River in Barangay Tuban, Sablayan, Occidental Mindoro; 1 km from Tuban Bridge
RVR2	12. 755040° N	120. 825670° E	0.90	Midstream of Mompong River in Barangay Santa Lucia, Sablayan, Occidental Mindoro
RVR3	12. 755040° N	120. 825670° E	1.30	Midstream of Mompong River in Barangay Santa Lucia, Sablayan, Occidental Mindoro
RVR4	12. 734310° N	120. 787900° E	0.90	Estuary / Mouth of Mompong River in Barangay Santa Lucia, Sablayan Occidental Mindoro

378 Stations 1, 2, and 3 are located in the upstream and midstream portions of the Mompong River relative to the project site while station 4 is located in the estuary. The location of the river parameter sampling stations is displayed in **Figure 2-72**. The actual river width is about 200 to 300 meters but only about a third is inundated with water while the rest of the riverbanks are accumulated with sand accretions and colonized with grass and shrubs. River substrate is constantly disturbed and suspended by the strong river current flowing in an east-northwest direction. River current has been enhanced by strong precipitation days before the survey.

379 The upstream and midstream stations investigated are relatively similar in morphology but only portions are actually with flowing river water. Lengthy sandbanks and accretions are pervasive throughout the length of the river, some of which are vegetated with grass and shrubs. The survey

stations are characterized by low relief riverbanks regularly inundated by high flood water with few trees. Riverbanks in stations 1, 2, and 3 have been invaded by extensive shrubs and grassy vegetation. The depth in the survey stations is shallow, ranging from 90 to 130 cm. Boulders and gravel are found in most sections while some portions of the riverbanks are eroded and embedded by silt in their lower margins. There is a marked absence of riparian natural vegetation. Running river water is usually split into several branches and the surface water velocity is strong in the wider channels. Stream pools - areas normally frequented by fish and macro-invertebrates for grazing and nesting are few and far between. According to Barangay officials, upland erosion and pollution from both domestic and agricultural wastes have contributed immensely to the deterioration of river water quality and deforestation in the slopes of Mt. Iglit-Baco where the river's headwaters emanate has allegedly caused an extreme reduction in water discharge. Portions of the river are being tapped for irrigation; many portions with gravel and sand deposits are being quarried.

Figure 2-71. ***Freshwater ecology survey stations in the Mompong River – estuary (left) and midstream.***

380 Similarly, the estuary is constricted by sandbanks in the mouth of the river, and sand accretions and deposits have rendered portions of the river shallow such that fishers using cast nets can operate even in midstream sections. There are no mangroves and significant vegetation in the estuary banks; only aroma trees were observed and even these trees were not dense. Even in the absence of corals and seagrass meadows, the estuary is a favored fishing ground as many fish species that spend most of part of their life cycles in brackishwater environs have been traditionally captured in the estuary.

Figure 2-72. ***Location of freshwater ecology and fish biota survey stations in the Mompong River during freshwater ecology baseline assessment. Map prepared by Jose Rene Villegas***

2.2.5.4 Survey Results and Discussion

2.2.5.4.1 Freshwater aquatic Biota

381 Fish biota was observed in Roves Stations 1, 2, and 3 shown in a map in **Figure 2-72**. At the time of the survey, there were no fishing operations observed in river stations 1, 2 and 3 and Barangay officials claim that fishers rarely operate in the upstream river due to poor catch rate and species composition. Barangay officials further alleged that only *electrofishing* (an illegal method) is being undertaken in the river mainly to catch Tilapia, Dalag (Canidae), and Hito (Claridae). There were no other domestic uses (e.g. for clothes washing or bathing) nor fish culture (e.g., fish pens or cages) activities seen in the river at the time of the survey and this can be attributed to extremely decreased river water output in the past years.

382 More than 200 fishers from four Barangays allegedly operate in the river estuary and nearshore marine fishing grounds, employing gill nets, hook and line, fish pots, and cast nets. The presence of species of fish was detected in three stations, however most of which are in the estuary. Few small fish species (mostly Gobidae – less than a dozen were seen in one pool), several freshwater shrimps (*Macrobrachium* sp – three specimens were collected in Station 1; none in stations 2 and 3) were observed in the upstream and midstream stations but no fishers were encountered (Plate 4). Mullets (Mugilidae) were observed in one fisher in the estuary, with only 3 specimens caught in 3 hours. Unlike some freshwater fish that normally seek calm river pools, *Macrobrachium* is a crustacean that can tolerate highly turbid waters and usually migrates upstream where they grow to adults before moving back downstream in brackish water. The freshwater prawns observed in the Mompong River are all juveniles and adult prawns were seen. Likewise, there were no fishers encountered that seek to catch the lucrative shrimps. The prawn is omnivorous- feeding on plants, algae, mollusks, worms, and small fish. The fast-flowing river water in portions of the river has restricted the grazing grounds of the prawns, as well as feeding areas of Tilapia and gobies that normally seek calmer river pools. The absence of fish in a freshwater system like the Mompong River is unusual as species of the *Channidae* and *Clariidae* families (native Dalag and Hito) are normally tolerant of spoiled conditions in a muddy substrate. Also, due to the absence of riverbank vegetation, it is evident that periphyton is limited.

383 Sand and gravel quarrying were evident and at least four (4) quarry operations were witnessed during the survey. The present quarrying operations have presumably already disturbed many habitats and shelters of fish and shrimps in the river. Barangay officials confirmed that there are no longer fisheries practices occurring in the upstream stations apart from occasional electrofishing.

Figure 2-73. Some species of fish and crustaceans were observed in the Mompong River during freshwater ecology baseline assessment; top left to right: tilapia, goby; bottom left to right: mullet (estuary station), freshwater shrimp.

384 Compared to fisheries in the estuary and nearshore marine environment, the dearth of fish specimens observed signifies poor fisheries profile in the Mompong River. It is presumed by the survey team that sediment blanketing of riverbeds has significantly inhibited the existence of fish species. Moreover, the absence of fish and crustacean species partly supports allegations that electrofishing has caused an extensive loss in the recruitment of local fish populations. But despite the absence of fisheries uses, Barangay officials and key informants declare that some fish species still exist in the Mompong River. Moreover, the survey observed that the river's estuary is an important habitat and nursery for various species of fish and crustaceans that normally seek brackishwater shelters and feeding grounds. Aggregations of the mangrove snapper (Mangagat; *Lutjanus argentimaculatus*) and small groups of the convex-lined Theraponid (*Therapon jarbua*) are allegedly seen in the estuary of the Mompong River during episodes of grazing during the rainy season. Key informants also claim that lucrative shrimps (mainly *Nematopaleomon* sp; pasayan) and juveniles of the seabass (apahap, *Lates calcarifer*) are being caught in the river, albeit infrequently. All in all, information from key informants and results of actual fishing documentation indicate that sixteen (16) species of fish and two (2) species of crustaceans exist in the Mompong River, mostly in the estuary and downstream sections. The midstream and upstream sections of the project site are poorly populated with fish species. Nevertheless, barangay officials also claim that the rare tapiroid grunter *Mesopristes cancellatus* or Pigok, a catadromous species rarely caught, occurs in the river system but is rarely seen. Moreover, the species profile includes Bangus fry which is seasonally harvested in the estuary. The fish species, and their respective IUCN ratings, are listed in **Table 2-53** below. Dominant species observed in the

river stations are displayed in **Figure 2-73**.

Table 2-53. List of fish species caught in the Mompong River and IUCN status; freshwater ecology baseline assessment.

English name	Local name	Scientific name	IUCN Status
Freshwater prawn	Ulang	*Macrobrachium rosenbergii*	*Least Concern*
Nile tilapia	Tilapia	*Oreochromis niloticus*	*Least Concern*
Philippine catfish	Pantat	*Clarias batrachus*	*Least Concern*
Endeavor shrimp	Pasayan/hipon	*Nematopalaemon tenuepsis*	*Not assessed*
Goby	Biya/Kalimbong	*Glossogobiussp*	*Not assessed*
Glass perchlet	Ibis	*Ambassis buruensis*	*No data*
Freshwater endeavor shrimp	Pasayan/hipon	*Nematopaleomon tenuepsis*	*Not assessed*
Lobed river mullet	Pigok	*Mesopristes cancellatus*	*Data defficient*
Snakehead mudfish	Dalag	*Channa striata*	*Least concern*
Square-tail mullet	Banak	*Ellochelon vaigiensis*	*Least concern*
Largescale mullet	Banak	*Chelon macrolepis*	*Least concern*
Giant mottled eel	Igat/Kasili	*Anguilla marmorata*	*Vulnerable*
Freshwater catfish	Hito	*Ictalurus punctatus*	*Least concern*
Whipfin silver-biddy	Latab	*Gerres filamentosus*	*Data deficient*
Glass perchlet	Ibis	*Ambassis buruensis*	*No data*
Giant Gourami	Gurami	*Osphronemus septemfasciatus*	*Least concern*
Spotfin river goby	Bunog	*Awaous ocellaris*	*Not assessed*
Freshwater giant prawn	Ulang	*Macrobrachium rosenbergii*	*Least concern*
Some species observed in the estuary that enters the river system			
Siganid	Samaral	*Siganus spp*	*Least concern*
Trevally	Talakitok	*Caranx spp*	*Least concern*
Ponyfishes	Sap-sap	*Leiognathidae*	*Least concern*
Convex-lined theraponid	Bugaong	*Therapon sp*	*Least concern*
Brackishwater snapper	Mangagat	*Lutjanus argentimaculatuss*	*Not assessed*
Square-tail mullet	Banak	*Ellochelon vaigiensis*	*Least concern*
Largescale mullet	Banak	*Chelon macrolepis*	*Least concern*

385 Compared to the inner reaches of the river, the catch rates for hook and line and gill net operation from actual fishing encounters in the estuary yielded better catch rates and more lucrative species. Catch per unit effort (CPUE) ranged from .22 kilograms per hour for hook and line and about .75 to 1 kg per hour for bottom set gill net. On a per-day basis, the catch rate for hook and line fishing will translate to about 2 to 4 kilograms per day. Documentation of actual fishing of two-gill net fishers fishing near the Mompong River estuary revealed a catch rate of about 4.5 kilograms of assorted fish and lucrative shrimps (*Nematopaleomon tenuepsis)*. The fishers operate an average of 6 hours per day with three net settings. Finfish included mullets (*Mugilidae*), small "Talakitok" (*Caranx* sp), ponyfish (Sap-sap; *Leiognathidae*), and ponyfishes (*Leiognathidae*) (**Table 2-53 and Figure 2-73**). Cast nets, operated by fishers from sand bars, yielded a catch composition of only 2 kilograms assorted species in nine (9) hours fishing time, or a meager CPUE of 0.22 kg per fishing hour (**Figure 2-74**).

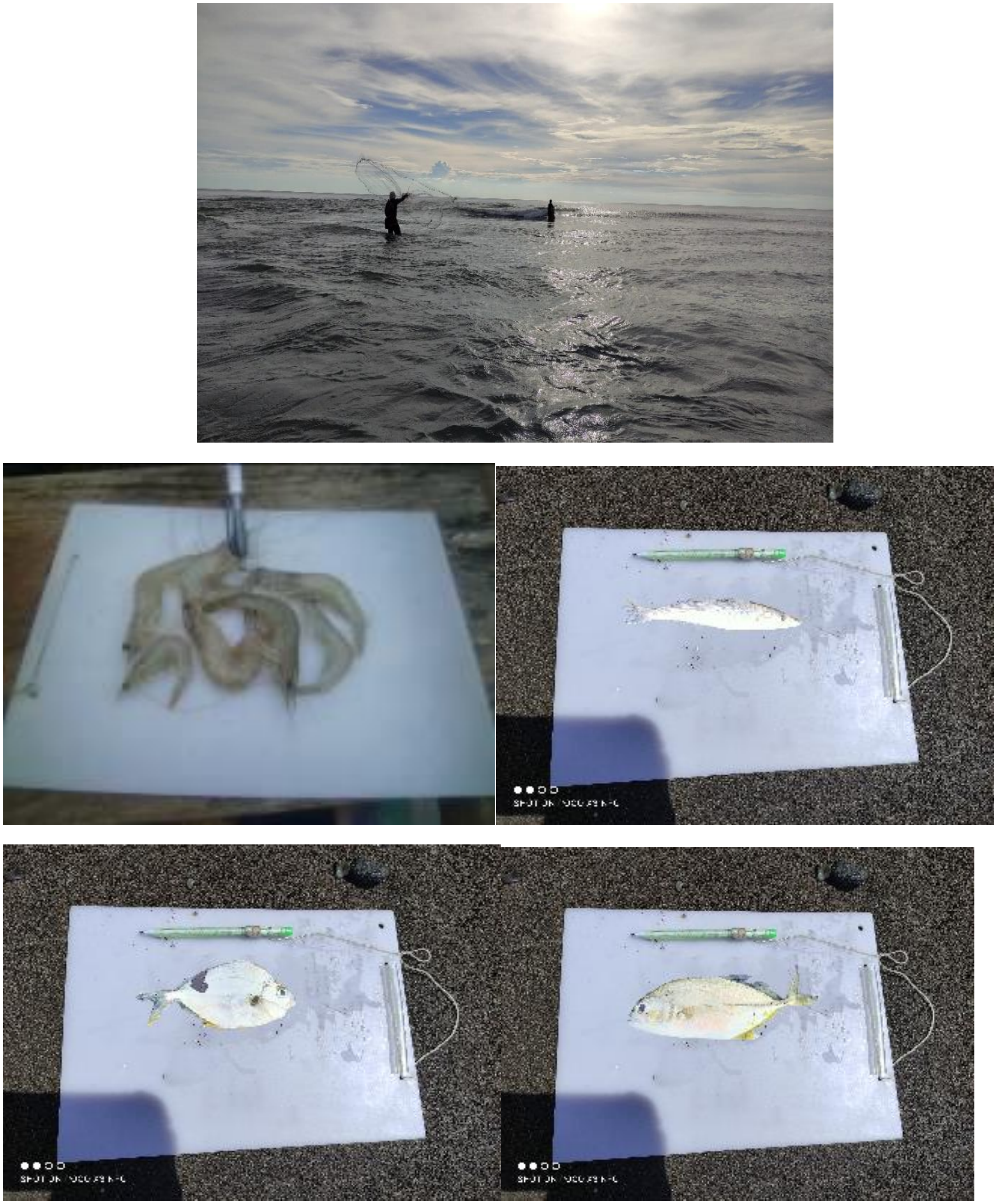


Figure 2-74. Two (2) fishers coming from Barangay Santa Lucia, Sablayan, Occidental Mindoro using Cast Net "Laya" with an initial catch of 2.00 kilograms for nine (9) hours - 6:00 A.M. to 3:00 P.M.; catch per unit effort (CPUE) was 0.22 kilogram per hour; and catch composition (top to bottom, from left to right): Silver sillago (*Sillago sihama*) "Asohos / Asoos"; endeavot shrimp (*Nematopaleomon tenuepsis*), toothed ponyfish (*Gazza minuta*) "sapsap", and brassy trevally (*Caranx papuensis*) "talakitok" caught near the river estuary.

2.2.5.4.2 Macro-invertebrates

386 Benthic macro-benthos was collected through a core sampling of benthic and epibenthic benthos using a scoop net and shovel in the same stations as plankton community sampling. Identification of other macro-invertebrates, particularly those with significant economic value for food and trade was supplemented through opportunistic surveys along the riverbanks of the estuary. The coordinates of stations for macro-benthos sampling are listed in **Table 2-54**; the location of the benthos stations is presented in **Figure 2-75**. Photographs of macro-invertebrate sampling and species encountered are also presented in **Figure 2-76.**

Table 2-54. ***Sampling stations for macro-benthos community diversity during the freshwater ecology baseline assessment in the Mompong River***

WP Code	Latitude	Longitude	Depth (m)	Location
MAC1	12. 794010° N	120. 840810° E	0.70	Upstream of Mompong River in Barangay Tuban, Sablayan, Occidental Mindoro; 1 km from Tuban Bridge
MAC2	12. 755040° N	120. 825670° E	0.90	Midstream of Mompong River in Barangay Santa Lucia, Sablayan, Occidental Mindoro
MAC3	12. 755040° N	120. 825670° E	1.30	Midstream of Mompong River in Barangay Santa Lucia, Sablayan, Occidental Mindoro
MAC4	12. 734310° N	120. 787900° E	0.90	Estuary / Mouth of Mompong River in Barangay Santa Lucia, Sablayan Occidental Mindoro

387 Macro-invertebrates, as an indicator of ecosystem health, can be categorized based on their tolerance to pollution conditions (IOWATER, 2012). Group 1 (sensitive) are organisms that cannot survive under polluted conditions thus their presence indicates good water quality. Group 2 (facultative) are organisms that can exist under a wide range of water quality conditions than sensitive organisms can. Group 3 (tolerant) are organisms that are tolerant of pollution, in large amounts; they point to poor water quality conditions but can also be present in good and fair water quality (IOWATER, 2012). In this survey, most of the macroinvertebrates fit in Group 1 and 2 categories.

388 However, it is noted and emphasized that very few macro-invertebrates were cataloged in all the river stations. Station 1 yielded a dense community of the golden apple snail *Pomacea canicolata* and the invasive Asian freshwater clam *Corbicula fluminea* (Plate 6) *Corbicula* clams are known to be prolific but local key informants did not affirm seasonal outbursts of the bivalve in the Mompong River. In the midstream area, however, a category 3 macro-invertebrate specifically *Melanoides* sp. was recorded but this is still an indication of pollution since they are just tolerant of highly polluted areas. Near the estuary, key informants claim that the gastropod *Thiaridae* is also present in the river mouth as well as freshwater nerith (*Nerita* sp). Thiarids snails are considered invasive herbivores and bioturbators. In terms of conservation status, it is categorized as “least concern” according to the IUCN red list of threatened species indicating that no conservation action is needed. Ecologically, both species are very adaptable and resilient in various environmental conditions with species commonly found in rivers including tidal areas, and lakes, and a wide variety of anthropogenic habitats including pools, and canals.

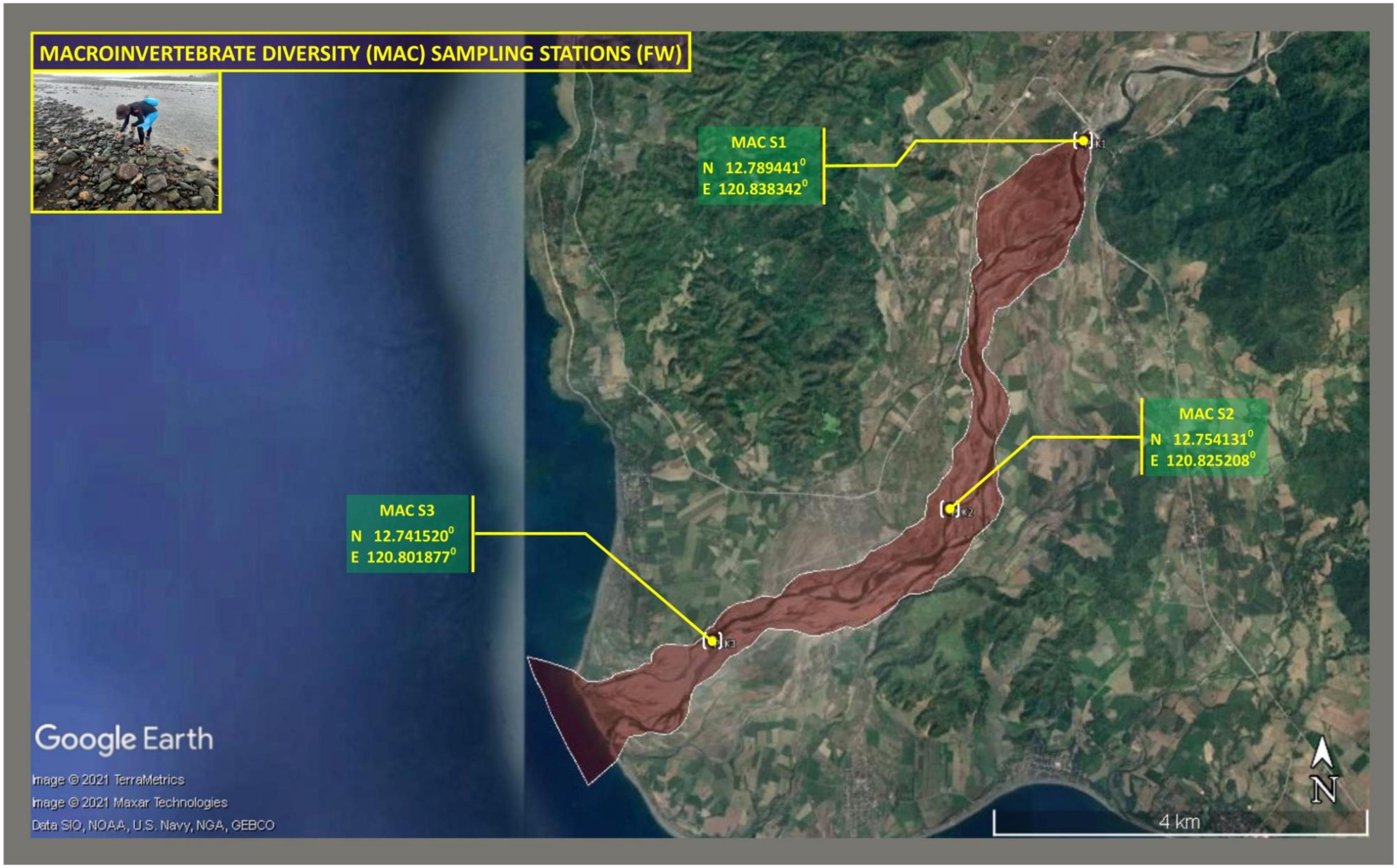


Figure 2-75. Location of sampling stations for macro-benthos community diversity during the freshwater ecology baseline assessment in the Mompong River.

389 The assessment reveals very poor macro-invertebrate aquatic biota diversity consisting of approximately 43 individuals in eight taxa – five gastropods, two bivalves, and one penaeid crustacean. *Pomacea* gastropods dominated the river system. In terms of richness, the highest recorded number of species was found in the upstream station while no taxa were observed in the lower downstream station. The constant flow of sandy substrate, sediment loading, and blanketing that alter riverbed crustacean habitats, erosion, and river water pollution caused by domestic wastes are suspected to be the contributing factors to the scarcity. Moreover, no macro-invertebrate of high commercial value for trade was seen. The list of macro-invertebrates is shown in **Table 2-55**; with some species shown in **Figure 2-76** and displayed in **Table 2-56.**

Table 2-55. Macro-invertebrates cataloged in the Mompong River system during freshwater ecology baseline assessment.

Species Name	Common Name	Habitat	Group
Pomacea canaliculata	Golden apple snail	Sandy-muddy riverside	Gastropod
Nerita costata	Costate nerite	Muddy estuarine flats	Gastropod
Pitar herbraeus	Venus clam	Sandy shelves in estuary	Bivalve
Corbicula manilensis	Manila clam	Sandy riverbeds	Bivalve
Pleuroploca filamentosa	Brown fox seashell	Estuary mud flats	gastropod
Melanoides maculate	Trumpet snail	Sandy-muddy riverside	Gastropod
Pilsbryconcha exilis	Tropical freshwater mussel	Estuary mud flats	Gastropod
Macrobrachium rosenbergii	Freshwater prawn	Sandy riverbed	Crustacean

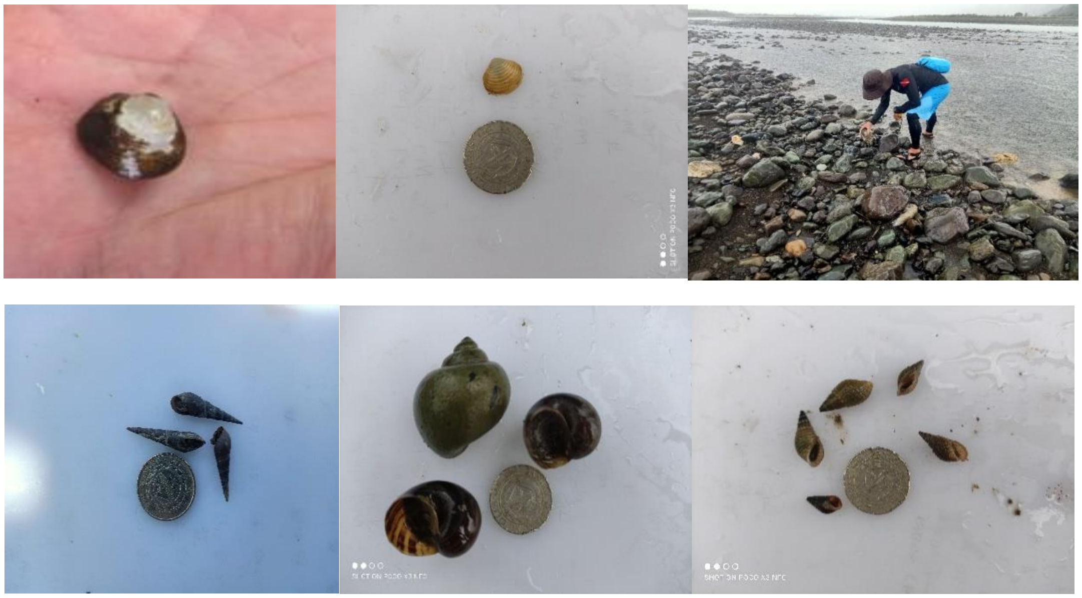


Figure 2-76. Macroinvertebrates cataloged in four (4) stations in the Mompong River and its estuary: (top row from left to right): survey team member doing macro-invertebrate core sampling in the upstream station; Asian clam (*Corbicula manilensis*), Venus clam (*Pitar herbraeus*), brown fox seashell (*Pleuroploca filamentosa* or "Susu"), black melania/trumpet snail (*Melanoides maculate* - "Susu"), golden apple snail (*Pomacea canaliculata*- "Kuhol").

390 Based on a simple scoring system of the National Water Council (**Table 2-56**) using an abundance of macro-invertebrates (**Table 2-57**) as an indicator of water quality in the river, the Mompong River can be rated as 'Moderate" or "moderately disturbed" (**Table 2-57**). It is believed that the disturbance is caused by incessant sand and mud movement in the riverbed, disrupting in fish and macro-invertebrate spawning and loss of nesting burrows.

Table 2-56. Table of BMWP score categories based on (National Water Council, 1981)

BMWP Score	Category	Interpretation
0-10	Very poor	Heavily polluted
11--40	Poor	Polluted or impacted
41-70	Moderate	Moderately impacted
71-100	Good	Clean but slightly impacted
>100	very Good	Unpolluted/unimpacted

Table 2-57. Water quality indices of macro-invertebrates in waterways near Candelaria, Quezon during the July 9, 2017 sampling.

Macro-benthos	Mompong River Sampling
Ampullariidae	**10**
Pomacea sp.	
Atyidae	**5**
Freshwater shrimp	
Cichlidae	**-**
Thiaridae	
Melanoides sp.	8
Tarebia granifera	
Corbicula sp	≈20
Gobiidae	
Oligochaeta (family)	**-**
BMWP Score	**43**

391 The few species of macro-invertebrates cataloged in the Mompong River during freshwater ecology baseline assessment are shown in **Figure 2-77**.

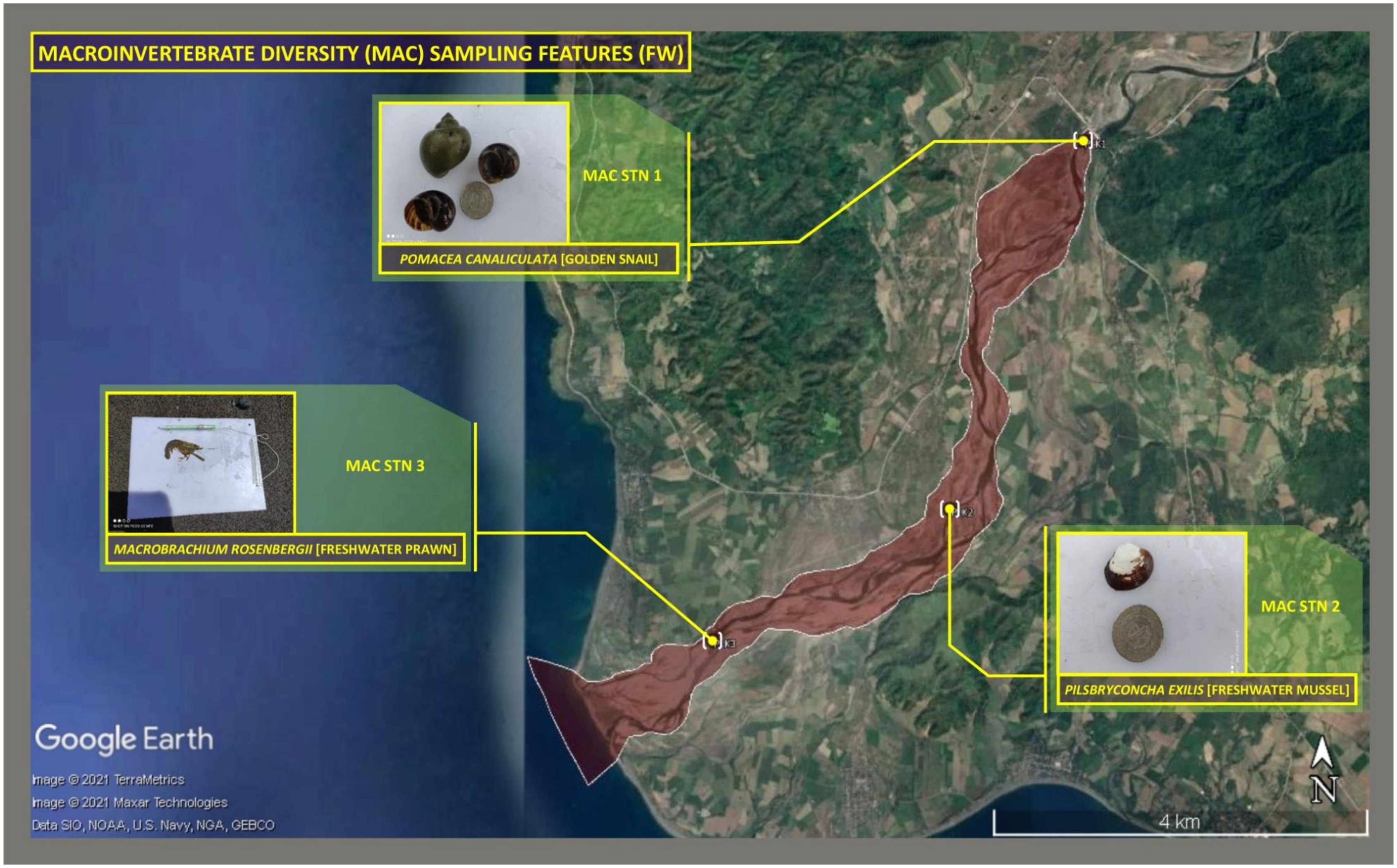


Figure 2-77. Location of few macro-invertebrates were cataloged in three survey stations in the Mompong River.. Map prepared by Jose Rene Villegas.

2.2.5.4.3 Plankton

392 Plankton is free-drifting organisms typically found in the upper layers of the water column. They are often important components at the lower base of the marine and aquatic food webs. However, planktons are not known to proliferate in fast-moving lotic environs and the sampling stations chosen were areas of relatively slow current. Changes in ecological conditions in a stream often lead to changes in the community structure of planktons and benthic animals. Epibenthic fauna (macro-invertebrates or macro-benthos), on the other hand, serve a number of ecosystem roles at various levels of the food chain, ranging from consumers of plant material to prey for fish. Due to their filter-feeding nature, macro-invertebrates are good indicators of environmental conditions over time and can be used as indicators of water quality and the degradation of the aquatic environment. Benthic or bottom-dwelling animals constitute a major part of the diet of many benthic and bottom-dwelling fishes and crustaceans. Many of the bivalves in riverine and estuarine systems are also edible invertebrates collected for food and sustenance trade.

393 Plankton community sampling was conducted in three river stations listed in **Table 2-58** and shown in **Figure 2-78;** (Plate 7; the plankton station number 4 is integrated into the marine ecology report).

Table 2-58. Coordinates of plankton community sampling stations in the Mompong River during freshwater ecology baseline assessment.

WP Code	Latitude	Longitude	Depth (m)	Location
PLK1	12. 794010° N	120. 840810° E	0.70	Upstream of Mompong River in Barangay Tuban, Sablayan, Occidental Mindoro; 1 km from Tuban Bridge
PLK2	12. 755040° N	120. 825670° E	0.90	Midstream of Mompong River in Barangay Santa Lucia, Sablayan, Occidental Mindoro
PLK3	12. 755040° N	120. 825670° E	1.30	Midstream of Mompong River in Barangay Santa Lucia, Sablayan, Occidental Mindoro

Figure 2-78. Plankton sampling and freshwater fisheries station in the upstream and midstream stations in the Mompong River in Barangay Tuban, Sablayan, Occidental Mindoro.

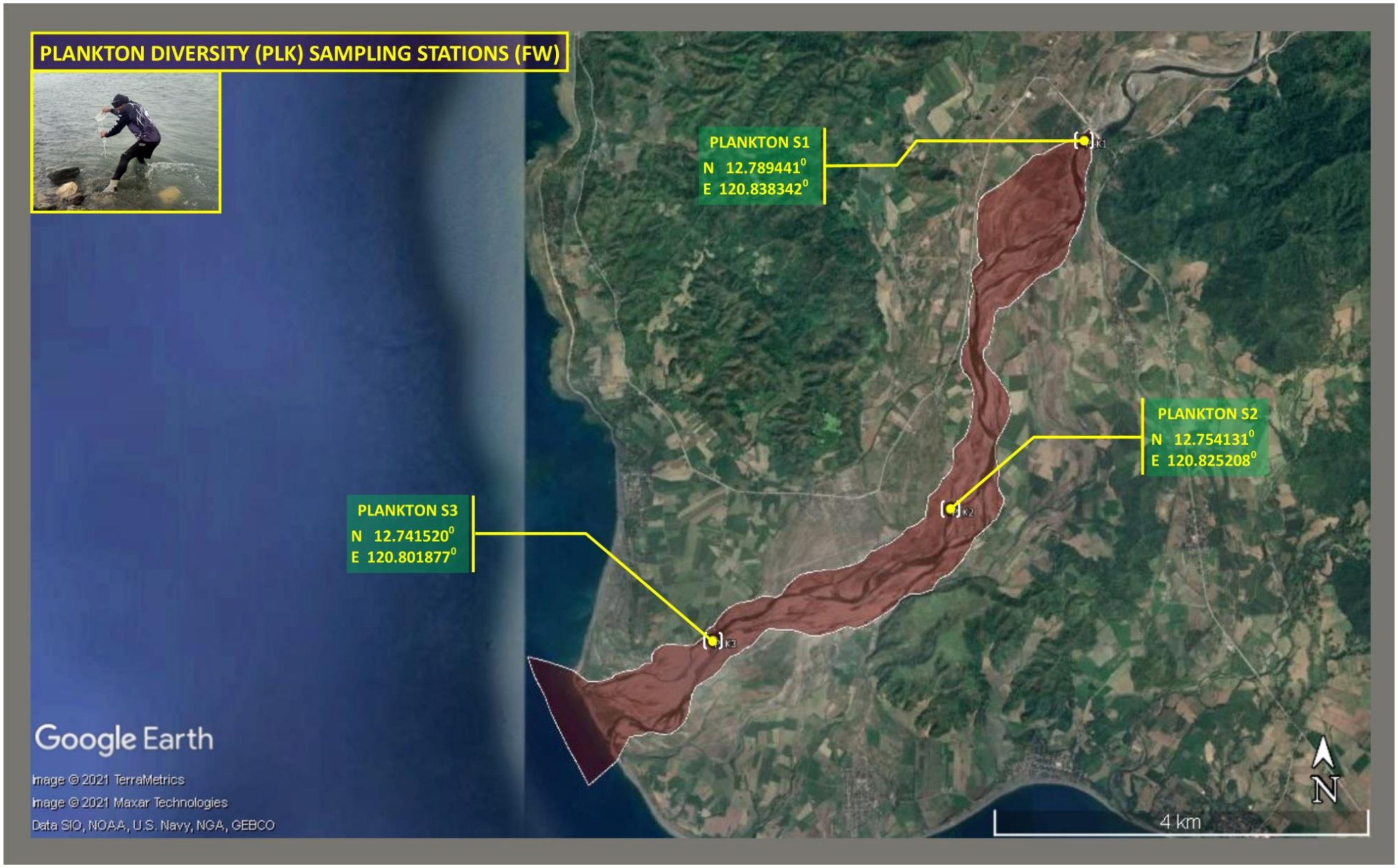


Figure 2-79. Location of plankton community sampling stations in the Mompong River during freshwater ecology baseline assessment. Map prepared by Jose Rene Villegas, November 2021.

2.2.5.4.3.1 Phytoplankton

394 A summary of the phytoplankton genera identified in three stations sampled along the Mompong river is tabulated below (**Figure 2-80; Table 2-59**). Station PH1 is located in the upstream area of the river while stations PH2 and Ph3 are located midstream and downstream respectively.

Table 2-59. Phytoplankton composition, abundance (cells/m^3), diversity, and distribution in three sampling stations in Mompong River during freshwater ecology baseline assessment.

TAXA	STATION			Grand Total	Rel. Abund.
	PH1 (Upstream)	PH2 (Midstream)	PH3 (Downstream)		
Cyanobacteria			**298,500**	**298,500**	3.32
Merismopedia			298,500	298,500	3.32
Diatoms	**1,286,667**	**520,000**	**729,800**	**2,536,467**	28.18
Chaetoceros		20,000	19,900	39,900	0.44
Coconeis	53,333	73,333	13,267	139,933	1.55
Diploneis			19,900	19,900	0.22
Fragillaria	326,667	26,667	331,667	685,000	7.61
Gomphonema	273,333	53,333		326,667	3.63
Melosira	26,667	13,333		40,000	0.44
Navicula	253,333	180,000	33,167	466,500	5.18
Nitzschia	313,333	33,333	26,533	373,200	4.15
Pinnularia	13,333			13,333	0.15
Pleurosigma			6,633	6,633	0.07
Rhabdonema	26,667	73,333	26,533	126,533	1.41
Surirella		40,000	152,567	192,567	2.14
Synedra			26,667	26,667	0.30
Terpsinoe		6,667	72,967	79,633	0.88
Dinoflagellates	**1,150,000**	**1,560,000**	**3,004,900**	**5,714,900**	63.49
Peridinium	1,150,000	1,560,000	3,004,900	5,714,900	63.49
Euglenoid		**6,667**	**6,633**	**13,300**	0.15
Phacus		6,667	6,633	13,300	0.15
Green Algae	**173,333**		**265,333**	**438,667**	4.87
Closterium			13,267	13,267	0.15
Cosmarium			33,167	33,167	0.37
Scenedesmus	13,333			13,333	0.15
Spirogyra	66,667		132,667	199,333	2.21
Stauroneis	93,333		86,233	179,567	1.99
Grand Total	**2,610,000**	**2,086,667**	**4,305,167**	**9,001,833**	**100**
Richness	**14**	**12**	**17**		
Evenness (J')	**0.72**	**0.43**	**0.44**		
Diversity (H')	**1.78**	**1.07**	**1.28**		

395 Overall, dinoflagellates dominated the phytoplankton community constituting 64% of the total density. This was followed by diatoms with 28% and other groups (cyanobacteria, euglenoids, and green algae) contributing 8% of relative abundance. Results of the analysis showed that phytoplankton density was high yet the diversity was low (<1), due to the high density of the dinoflagellate *Peridinium* sp. Total cell densities varied from 2.1 x 10^6 cells per m^3 in station Ph1 to 4.3 x 10^6 cells per m^3 cells in station Ph3. In terms of taxa richness, station PH3 had the highest number of genera with seventeen (17) while station Ph2 only had twelve (12) genera.

396 Diatoms and dinoflagellates were commonly present in all stations while other groups were only found in some stations. Overall, twenty-two (22) phytoplankton genera were identified. The only genus of dinoflagellate present during the sampling period was *Peridinium* spp. which recorded a total of 5.7 x 10^6 cells per m^3. Blooms of this species are commonly recorded in other countries such as Mexico and Israel but have not been reported to cause major fisheries damage (Hickel and Pollingher, 1988; Garater-Lizarraga and Muneton-Gomez, 2008). Among the diatoms, the pennate chain-forming taxa *Fragillaria* spp. was the most abundant with a total recorded density of 685,001 cells per m^3 (8% of the total composition). These species are quite common in tropical waters and have a cosmopolitan distribution. These taxa provide significant influences on the overall primary productivity in such aquatic environments. Among the green algae, *Spirogyra* spp. was the most abundant with a total cell density of 199,334 cells per m^3 (2% of the total composition). Other phytoplankton taxa with relatively relative abundance were *Navicula* sp. (5%) and *Surirella* sp. (2%) and the rest of the phytoplankton taxa accounted for less than 8% of the total abundance. There are no toxic phytoplankton species identified during this sampling.

397 Diversity Index (H) at the sampling locations showed values as low as 1.07 (site Ph2) to as high as 1.78 (site Ph1). The Evenness index was variable with values ranging from 0.43 (Ph2) to 0.72 (Ph1). The low species diversity and evenness were due to the high concentration of *Peridinium* spp. which dominated other taxa.

2.2.5.4.3.2 Zooplankton

398 A summary of zooplankton groups recorded in three stations sampled along the Mompong river is tabulated below (**Table 2-60**). Station ZP1 is located in the upstream area of the river while station ZP2 and ZP3 are located midstream and downstream respectively.

Table 2-60. Zooplankton composition, abundance (ind/m^3), diversity, and distribution in three sampling stations in Mompong River.

Taxa	Station			Grand Total	Rel. Abund.
	ZP1 (Upstream)	ZP2 (Downstream)	ZP3 (Downstream)		
Cladocera		**933**		**933**	**3.51**
Copepoda	**300**	**5,133**	**2,600**	**8,033**	**30.22**
Copepod calanoid	300		400	700	**2.63**
Copepod nauplius		5,133	2,200	7,333	**27.59**
Insecta		**3,033**	**400**	**3,433**	**12.92**
Chaoboridae		233		233	**0.88**
Mayfly Larvae		1,867	400	2,267	**8.53**
Midges Larvae		933		933	**3.51**
Mollsuks			**800**	**800**	**3.01**
Bivalve veliger			800	800	**3.01**
Polychaete			**400**	**400**	**1.50**
Polychaete trophocore			400	400	**1.50**
Protozoan	**900**			**900**	**3.39**
Arcellidae	900			900	**3.39**
Rotifer	**4,050**	**4,433**	**3,600**	**12,083**	**45.45**
Bdelloid rotifera			1,200	1,200	**4.51**
Lecane sp.	1,950	1,633	2,400	5,983	**22.51**
Ploesoma sp.	2,100	2,800		4,900	**18.43**
Grand Total	**5,250**	**13,533**	**7,800**	**26,583**	**100.00**
Evenness (J')	**0.80**	**0.77**	**0.70**		
Divesity (H')	**1.11**	**1.50**	**1.36**		

399 Overall, rotifers were the most dominant group accounting for 45% of the total zooplankton abundance. This was followed by copepods which contributed 30% and insects with 13%. Furthermore, the results of the analysis showed that density, richness, and diversity were generally low in all sampling locations. Zooplankton density varied from 7,800 individuals per m^3 at ZP3, to 13,533 individuals per m^3 at ZP3. The most taxa-rich station was observed in stations ZP2 and ZP3 with 7 while the lowest was observed in stations ZP1 with 4.

400 Rotifers were commonly encountered in all stations whereas other groups (insects, mollusks, cladocerans, annelids, protozoans) were only present in one or two stations. Overall, eleven (11) zooplankton were identified belonging to the aforementioned groups. Among the rotifers, *Lecane* sp. recorded the highest abundance with a total density of 5,983 individuals per m^3 (28% of the total composition). It was observed at the highest density in station ZP3 with 3,200 individuals per m^3. Ecologically, they are beneficial in stabilizing organic wastes, stimulating microfloral activity and

decomposition, enhancing oxygen penetration, and recycling mineral nutrients. Among the copepods, copepod nauplii recorded the highest abundance particularly in the downstream area of the river with 7,333 individuals per m^3 (28% of the composition) and followed by calanoid copepod with 700 individuals per m^3 (3% of the composition). Other zooplankton taxa that recorded relatively higher density were protozoans (3 %) and mayfly larvae (9%). There were no fish larvae and decapod zone recorded in all the stations sampled during this survey.

401 Diversity Index (H) at the sampling locations showed values as low as 1.11 (sites ZP1) to as high as 1.50 (site ZP2). The Evenness Index was almost similar in all stations ranging from 0.70 to 0.80. These indices indicate a relatively balanced zooplankton community in the area.

402 Photomicrographs of some of the plankton species identified are shown in **Figure 2-80** below. The highlight of the plankton diversity survey is also displayed in **Figure 2-81.**

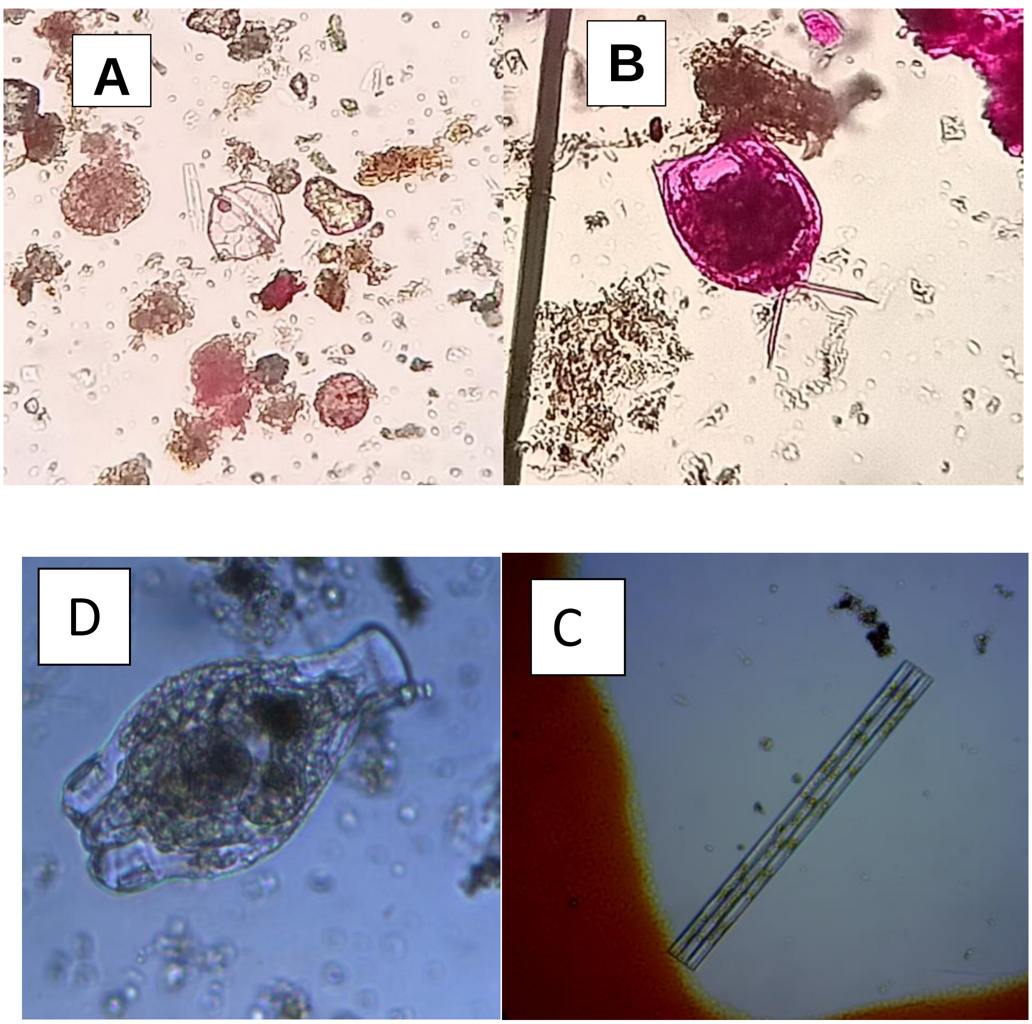


Figure 2-80. Common Plankton identified in the Mompong River: (A) *Peridium* sp. (B) *Rotifier Lecane* sp. (C) *Fragillaria* (D) *Bdelloid rotifier*

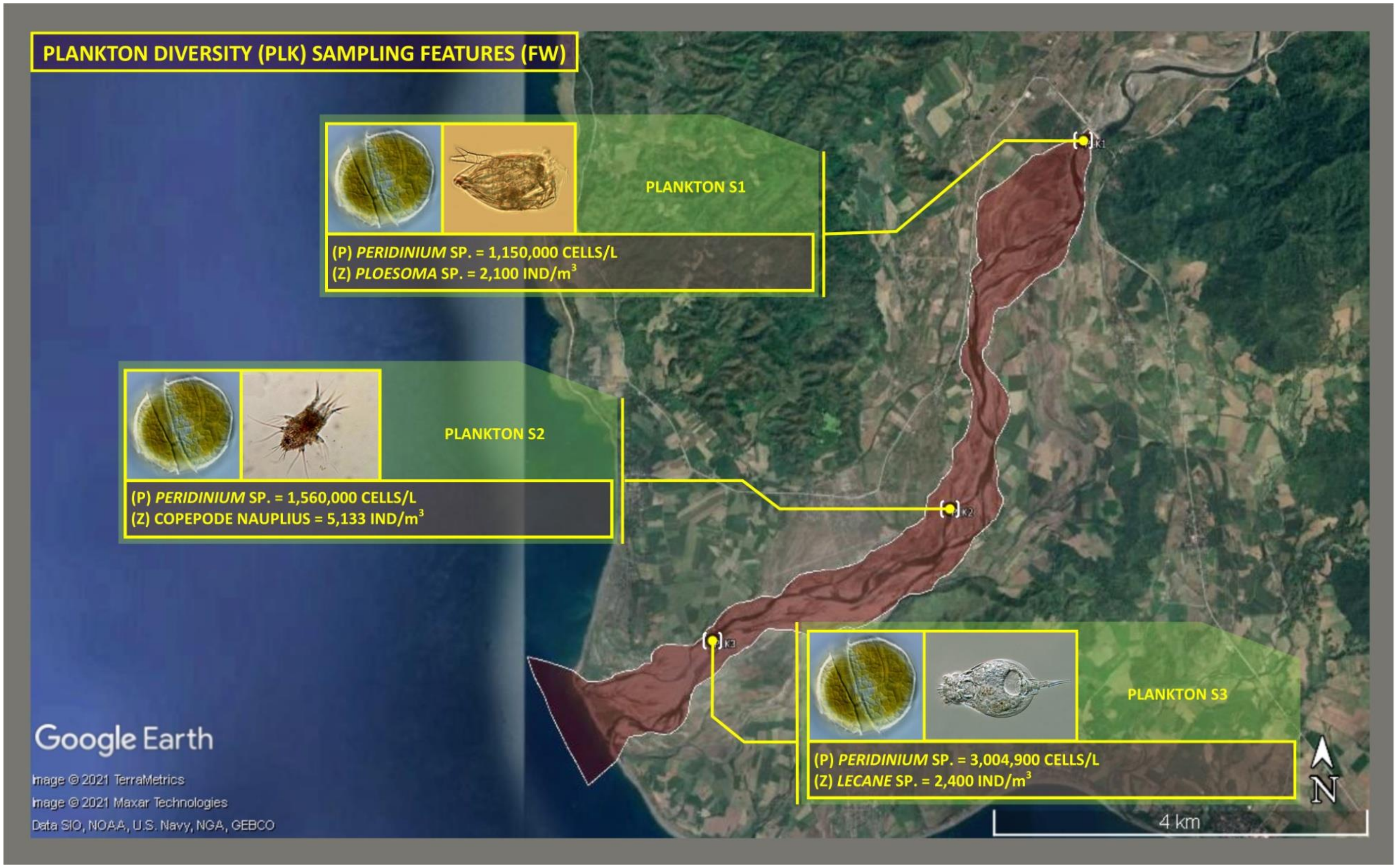


Figure 2-81. Plankton dominance distribution in three river sampling stations in the Mompong River. Map prepared by Jose Rene Villegas.

2.2.5.5 Threat to existence and/or loss of important local species and habitat

2.2.5.5.1 Summary of endemicity/conservation status

403 The freshwater prawn and brackish water fishes and crustaceans documented in the Mompong River are of high conservation value, although they are not reported as threatened and endangered. None of the species cataloged are endemic. These species, however, are of important commercial value as fish food, particularly the freshwater prawn in upstream and estuary stations. Mudfishes and catfishes, as well as the lobed river mullet (*Mesopristes cancellatus*) were reported to inhabit the Mompong River many years ago but were not seen during sampling activities and observation of actual test fishing.

2.2.5.5.2 Abundance of ecologically and economically important species (fishes, benthos, planktons)

404 All of the fish observed to be caught in the Mompong River including those captured by fishers in the estuary are food fishes but most are of juvenile sizes, indicating growth overfishing most probably caused by extensive use of fine mesh nets and alteration of riverbed habitats. In spite of the diversity of fish caught in the estuary, the low species density and abundance of fish and crustaceans are indicative of a deteriorating habitat condition and diminishing standing stocks, evidently brought about by increasing sediment loads and loss of habitats and shelters for fish reproduction and grazing. The test fishing operations in the upstream portions using cast net and gill net yielded only 1 species of crustacean and this is attributed to the extremely muddy and polluted waters that now characterize the river. A low number of plankton species and taxa identified in the plankton surveys are indicative of low diversity and unfavorable environmental conditions.

2.2.5.5.3 Presence of pollution indicators species

405 Marine fish and shellfish species have not been used as indicators of pollution, except where biotoxins are involved (e.g., plankton-filtering fish species in PSP-affected areas). Apart from the few bivalves observed, there were no species of fish or shellfish encountered in the sampling stations that can be employed as indicators of pollution. In particular, mussels, ark shells, and through the shell, although not encountered in the survey, can be susceptible to plankton blooms that can trigger paralytic shellfish poisoning.

406 Plankton blooms as indicators of hyper-organic nutrient loading, pollution, records show that the occurrence of harmful algal blooms (HABs) in the Philippines has been associated with the onset of the southwest monsoon but there has been very little evidence attributing extensive siltation as a primary and sudden trigger of HABs. In many cases, increased nutrient loading through sediment transport has been observed to be a more likely pathway for the occurrence of HABs in coastal areas if the suspended organic matter (OM) causes hyper-nutrient levels and eutrophication. The pollution of coastal waters is believed to stimulate bursts in populations of microscopic and macroscopic algae as various pollution-supplied substances fertilize the water column and bottom substrate and provide the nutrients that trigger algal bloom proportions. Because of this, harmful or toxic algal species become more abundant and more noticeable. Currently, the densities of plankton groups observed in the coastal area within the vicinity of the project site do not indicate proportions that can risk the occurrence of HABs. Nevertheless, constant monitoring of the cell counts of bio-toxin-carrying species needs to be undertaken.

407 The overall impression from the results of the phytoplankton survey is that the plankton community in

the river ecosystem based on overall diversity, richness and total abundance is relatively low. A threshold of algal blooms, especially harmful algal bloom-causing organisms was not detected as the population of a species of *Nitzchia and Fragilaria* was relatively low. *Fragillaria* is a freshwater diatom that forms an important component of the food chain, especially in the production of primary organic material. Excessive diatom blooms, however, are known to cause eutrophic conditions and the free-flowing nature of the river system needs to be sustained in this regard. In conclusion, the present plankton community in the project area signifies normal but poor levels of these organisms in the river. The likelihood of algal blooms is ruled out by the findings in the study, due to the extremely low number of HAB-causing plankton.

408 Similarly, it is important to note that the zooplankton community in three sampling stations was generally low in terms of abundance, richness, and diversity and potential threat/impacts would be minimal but the project should adopt measures that will not significantly obstruct the free flow of the river. No fish larvae were seen in the three stations surveyed.

409 Epibenthic fauna (macroinvertebrates or macro-benthos), on the other hand, serve a number of ecosystem roles at various levels of the food chain, ranging from consumers of plant material to prey for fish. Macro-invertebrates are good integrators of environmental conditions over time and can be used as indicators of heavy metal pollution, especially sessile, filter-feeding macro-invertebrates. Shellfish species such as oysters and epibenthic bivalves can be utilized for biotoxin analysis, including the detection of cyanide in bivalve tissue. However, the low diversity of epibenthic and infaunal benthos in the sampling areas already indicates a stressed riverine environment. Moreover, no significant population of bivalves have been observed in the river estuary and were completely absent in the upstream portions.

2.2.5.5.4 Predicted impacts of the project on the freshwater ecology

2.2.5.5.4.1 Sediment spills and degradation of freshwater quality in the river system due to quarry and operations.

410 Protection of the integrity, enhancement of aquatic species and promotion of improvement and maintenance of water quality in the Mompong River must be pursued.

411 Sand quarrying and moving will result in sediment spills into the river system and widespread modification of riverbed, altering fish and crustacean habitats, blockage of migration pathways of few freshwater shrimps, and fish feeding grounds; all of which will lead to the significant decline in fish and crustacean populations and ultimately, loss of incomes of local fishers fishing in the river and estuary. The resulting changes and widening of the river can cause inadvertent changes in the river channel attributes, a process that results in stream bank erosion and river base scouring that will cause massive sediment loading of coarse and fine sediments in the river channel downstream. The estuary will be likewise disturbed with sediment streams enveloping the coastal shelf and if left uncontrolled, may reach coral colonies 1.5 km away from the estuary. Sediments carried down from soil erosion and earth moving due to quarry and crushing plant operations and construction-related activities such as land clearing and soil stockpiling may end up as runoff to the river systems especially during a storm and heavy rains. This may adversely cause water turbidity and streamflow obstruction and affect fish and the remaining few macro-benthos faunas. Sediment erosion in freshwater bodies can cause localized mortality of aquatic larval forms of bivalves and gastropods, as well as impair the nesting grounds of fish. Larger sediment grains and loose soil can be retained in deeper portions of the river systems and this can disturb fish breeding and grazing areas for bottom-dwelling biota. If erosion and

loose soils cannot be effectively controlled, the effect will be progressive siltation in the river systems. Changes in ecological conditions in a stream often lead to changes in the community structure of benthic animals. It is presumed that previous quarry operations and flash floods have carried significant debris that altered the riverbed conditions resulting in a highly degraded macroinvertebrate community. This poor condition of the fish and macroinvertebrate community is likely related to sedimentation, erosion, and run-off from large upland areas that have been cleared of vegetation. The introduction of disturbances to which river organisms have had no previous exposure can significantly alter the habitat and behavior of river organisms and disrupt grazing and migration pathways leading to failure of recruitment or massive migration of fish species into areas of better water quality and lesser disturbance. Siltation may increase water turbidity, resulting in decreased light penetration and a decrease in photosynthetic function of primary producers such as phytoplankton and benthic algae and this will affect fish fry feeding regimens.

2.2.5.5.4.2 Degradation of Water Quality from Wastewaters

412 Increased human presence and settlements in the 11 kilometer dredging area during project establishment and operations can lead to river water pollution, and disrupt fish and crustacean life cycles and larval survival. Poorly-managed waste disposal and dust accumulation can lead to contaminants and infiltration of various waste streams generated during equipment mobilization, as well as domestic wastes generated in all phases of project development and operations. A poorly-managed waste disposal system can lead to solid and liquid wastewater contamination in the river or its tributaries, with waste streams generated during quarrying operations itself, construction, and operation of facilities. This may include coliform and surfactants from disposed of laundry soap due to the increase in personnel in the plant site. This may further adversely affect water quality in the river system surveyed. Domestic wastewater pollution can lead to hyper-nutrient loading and trigger algal blooms in times of high river water. Moreover, further water quality degradation may affect the abundance and survival of zooplankton, macro-benthos, and fish.

2.2.5.5.4.3 Discoloration of the river and coastal waters

413 With the presence of suspended mud and sand in river waters during flooding events, the color of river water can drastically change from greenish to rusty brown. Discoloration destroys the aesthetic condition of the river and possibly even in coastal water, and may cause the displacement of both pelagic and demersal species of fish seeking refuge and feeding grounds in the estuary.

2.2.5.5.4.4 Oil and grease contamination

414 The risk of oil and grease contamination of the river can only occur if disposal of fuel-based wastes from dredging equipment is not undertaken properly and accidental spills near waterways that drain into the river happen. From portions of the river, oily sludge, processing slurry, and hazardous wastes can be inadvertently carried to coastal waters if containment, recovery, and treatment systems are not efficiently established and maintained. Such fugitive wastes will have far-reaching and irreversible impacts on benthic communities in the estuary, resulting in contamination of grazing areas that may depress fish growth and recruitment, and loss of fish habitats. Oily wastes can be carried to the Sablayan Marine Protected Area and may cause coral mortality.

2.2.5.5.4.5 Increased exploitation of river fish species

415 Increased human presence in the river dredging sites can lead to a commensurate increased demand and consumption of fish. An increase in fishing effort targeting river fish stocks that are already heavily

exploited poses risks on standing stock resilience.

2.2.5.6 Mitigating measures

416 To minimize or prevent sediment spills and degradation of the river, the following measures will be adopted:

2.2.5.6.1 Sediment and silt sequestration

417 The primary mitigation strategy to prevent fugitive sediments and disturbed riverbed materials from being carried into the estuary and in gullies and small tributaries is the establishment of a series of sediment mitigation structures, including catchment and sand/silt - filtering curtains, in strategic points to ensure that loose sand, silt, and sediments will not wantonly flow into the estuary but are immediately collected and disposed into stockpiles. Where necessary if river streams are flowing rapidly during the rainy season, the measures will include the installation of catchment basins where sand-laden waters are diverted and contained for sediment extraction. Loose soil run-off and sediments from water run-off from riverside facilities will be sieved through filters and geotextile materials before water is discharged into project diversion waterways. Such loose soils will be piled up and re-used in reforestation areas in riverbanks. This will be supported by state-of-the-art erosion control measures that will include trench diaphragms, revegetation activities in slopes, and open areas along the riverbanks. The stabilization of river water where quarrying has occurred will be enhanced through the improvement of river flow velocity through riverbed compacting and slope stabilization. Construction of sediment controls such as silt fencing or revetments that will prevent riverside scouring and collect soil particles in loose river bends and in sluggishly flowing portions will be instituted where required.

2.2.5.6.2 Loss of aquatic fauna

418 Fish and crustacean species in the quarry site should be collected (live) before project ope4ration and re-stocked in undisturbed portions. Re-stocking of tilapia and the freshwater giant prawn can be adopted to enhance fish biota replenishment. Regular *in-situ* monitoring of river water quality and the state of habitats and diversity of aquatic fauna will be conducted.

2.2.5.6.3 Construction stockpiles shall be covered and rigidly bundled away from areas where spillage onto the river systems can occur.

419 Sand stockpiles will be located away from the riverbanks and stabilized to prevent spillage. Construction stockpiles shall be covered and rigidly bundled.

2.2.5.6.4 Slurry from construction equipment and stockpiles.

420 Heavy equipment areas will be located away from waterways where erosion control measures can be easily applied. As a precautionary approach, slurry walls will be built around areas where such slurries can emanate extensively.

2.2.5.6.5 Abstraction of river water; blocking and congestion of streamflow

421 There will be no abstraction of river water and no materials will emanate from the project that can cause river blocking. In upstream river sections past the quarry site, no freshwater fishes, habitats, and migration pathways of fish and crustaceans will be affected.

2.2.5.6.6 Control and treatment of liquid wastewater

422 Modern wastewater treatment facilities and a solid waste management plan will be implemented and

strictly enforced as mitigation to potential waste disturbances. This will include the setting up of a wastewater treatment facility in premises where project offices, personnel quarters, and mess halls are to be located. State-of-the-art modern sanitation facilities with 3-chambered septic tanks will be installed in all project latrines.

2.2.5.6.7 Prevention of oil and grease spills

423 An oil and grease containment and oily waste containment and recovery plan will be formulated and enforced in all aspects of project operations. Remediation will include recovery and treatment of sludge. Carpools will be located farthest from river systems and all vehicle oil discards will be recovered and discarded in inland waste management systems.

Table 2-61. Environmental Management Plan

Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
CONSTRUCTION PHASE: (earthmoving, construction of facilities, soil compacting, and configuration of project base)	River water quality	Further increase in siltation/sedimentation loading in the river; increase in turbidity and suspended solids; Suffocation of fish and crustacean nesting grounds Further impairment of plankton community; Disruption of fish and benthos larval growth;	• Provision of sediment pools to capture fugitive sediments; • Provision of series of sediment basins with efficient filtration systems in strategic points in the river where applicable; • Installation of silt curtains where sediment spills can occur; • Immediate soil compacting in area of earthmoving activities; • Periodic environmental monitoring, i.e., to comparatively determine fish and crustacean population compared to baseline data.
OPERATION PHASE (dredging and crushing plant operation)	River water Coastal waters and habitats of benthic organisms;	Inadvertent sediment streams reaching coastal waters; A spill of domestic wastewaters that can cause pollution	• Establishment of silt curtains and sediment catchment ponds; • Quick and efficient collection and removal of dredged materials • Stabilization of dredged portions of the river including riverbanks; • Revegetation of riverbanks; • Use of 3-chamber septic tanks in all project facilities;

Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
			• Adoption of clean practices by all project operating units and personnel; • Efficient waste retrieval system; • Greening of project's compound; • Adoption of the most advanced system for septic tank waste treatment and filtration.
		Pollution and blockage of portions of the river due to solid wastes	• Implement a rigid solid waste collection and disposal system; • Collaboration with LGU on waste management and recovery.
		Leachate of crushing plant debris and spoils;	• Plant litter recovery and recycling • Install weirs to efficiently collect plant operations wastes and debris.
	River biota	Loss of river fisheries Loss of macro-invertebrates	• Re-stock fish species in undisturbed portions; • Collect and re-stock macro-invertebrates; • Ensure replenishment of freshwater prawns by protecting/replenishing migration pathways and protecting maturing individuals

2.3 The Air

2.3.1 Meteorology and Climatology

424 This section focuses on the following:

- Change local micro-climate (or local climate); and

425 The methodology involved the following process:

- Selection of secondary meteorological data representative of the location of the proposed project site, including the nearest synoptic meteorological station of PAGASA and other sources;
- Description of climatological normals and extremes, particularly on long-term and short-term average rainfall, air temperature, and wind speeds and wind directions;

426 **Table 2-62** lists the references and sources of meteorological data used in this study. **Figure 2-83** shows that the location of the nearest PAGASA meteorological station in San Jose, Occidental Mindoro is about 50 km SSE of the Project Site. In line with this, and to obtain a representative meteorological data estimates at the project area, a 10-year (2011 to 2020) Historical Forecast Weather (HFW) was generated from World Weather Online (WWO). The data was used for the data trend comparison with the available PAGASA data in San Jose, Occidental Mindoro.

427 **(n)** shows the project area where HFW data is forecasted and not from actual data i.e. the data has been forecasted through the in house weather forecasting application of WWO by taking raw data from different agencies like European Centre for Medium-Range Weather Forecasts, World Meteorological Organization, NASA weather satellite imagery, NOAA GFS2 model and JMA model. It then applies terrain, population, altitude and other factors before providing final forecast data.

Table 2-62. List of meteorological data and source of information

Description	Period Covered	Source/Remarks
Climate Map of the Philippines	Metadata as of 2015	PAGASA
Climatological Normals for San Jose, Occidental Mindoro	1980-2012	PAGASA
Climatological Extremes for San Jose, Occidental Mindoro	1980-2021	PAGASA
Historical Forecast Weather at the Project Site*	2011-2020	World Weather Online

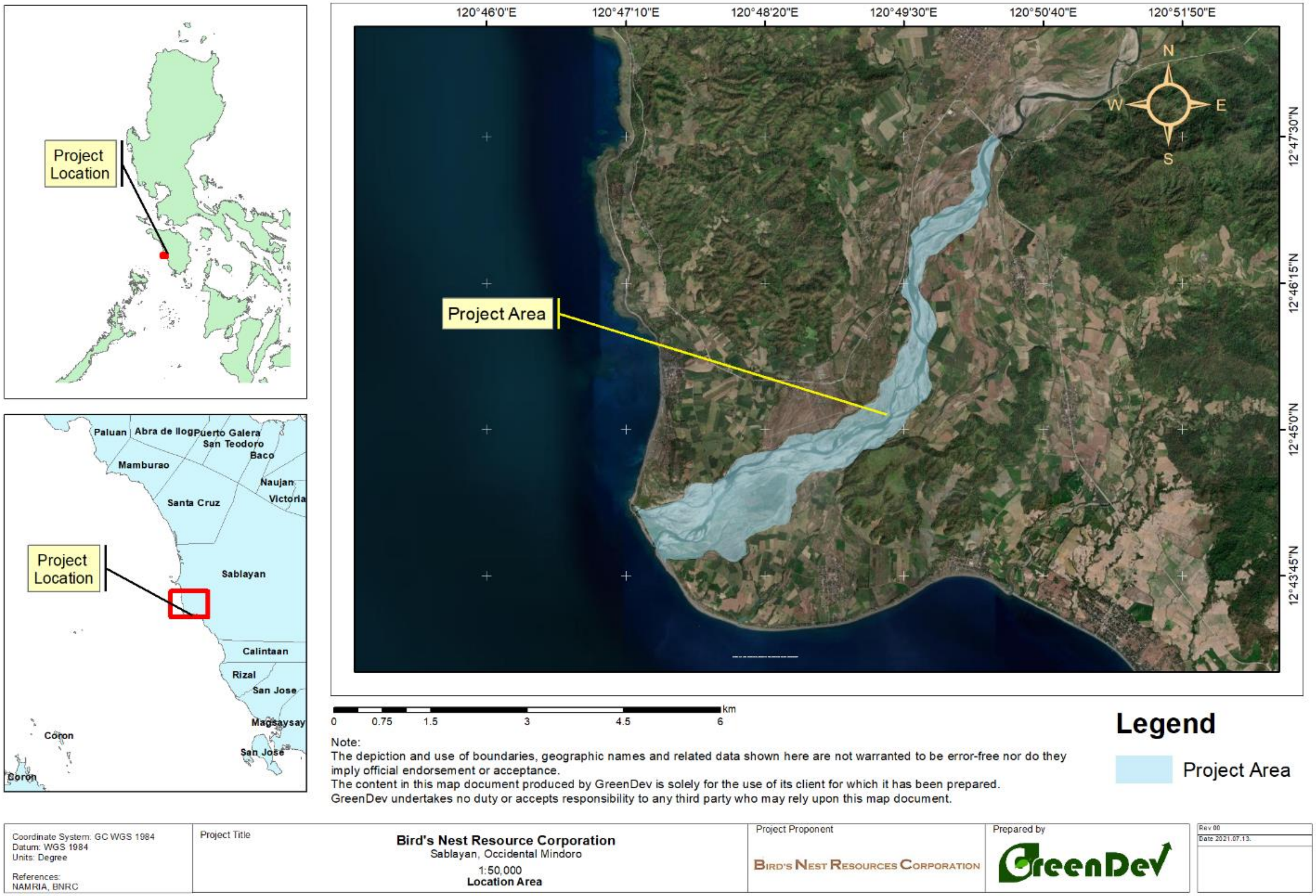


Figure 2-82. Project Area in Sablayan, Occidental Mindoro

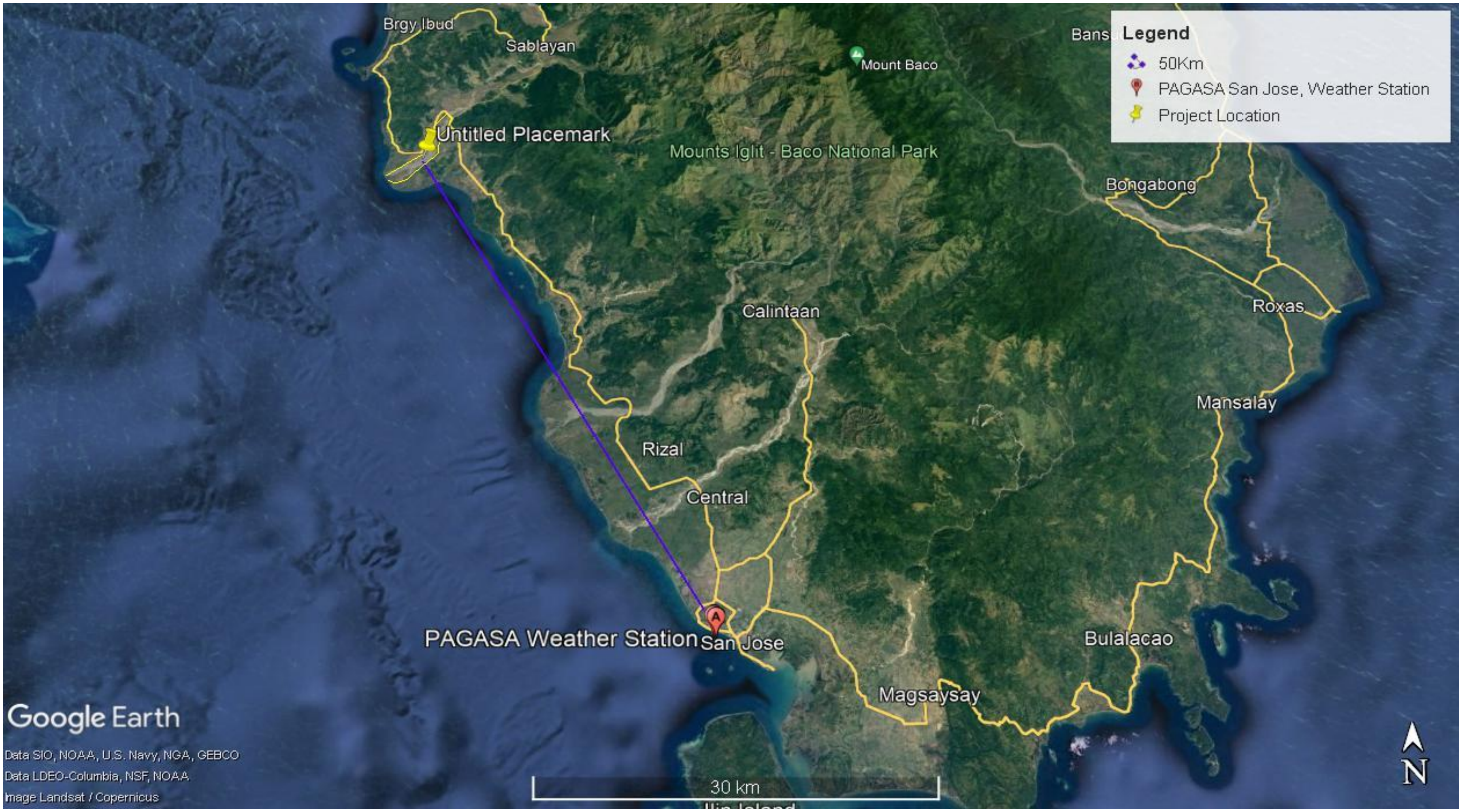


Figure 2-83. Location of PAGASA Meteorological Station in San Jose, Occidental Mindoro relative to the Project Location

2.3.2 Climate Type

428 There are four (4) climate types in the Philippines, according to the Modified Corona's Classification of Climate. These are the Types I, II, III, and IV. This system of climate classification was devised by Fr. J. Corona in 1920 (Lantican, 2001) and is based on average monthly rainfall. Accordingly, a dry month is one with less than 50 mm of rainfall but also considers wet a month having more than 100 mm of rainfall that comes after three or more very dry months.

429 Sablayan, Occidental Mindoro, where the project is located, is characterized by Type I climate based on the Modified Corona Climate Classification system (**Figure 2-84**). There are two pronounced seasons throughout the year, typically dry from November to April and wet during the rest of the year. The months of June to October generally receive the most amount of rainfall.

2.3.3 PAGASA Climatological Normals and Extremes

430 San Jose, Occidental Mindoro is the nearest meteorological station of the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) to the proposed Project site and is about 50 km SSE of the proposed project site**.**

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436 show the Climatological Normals and Extremes from the station.

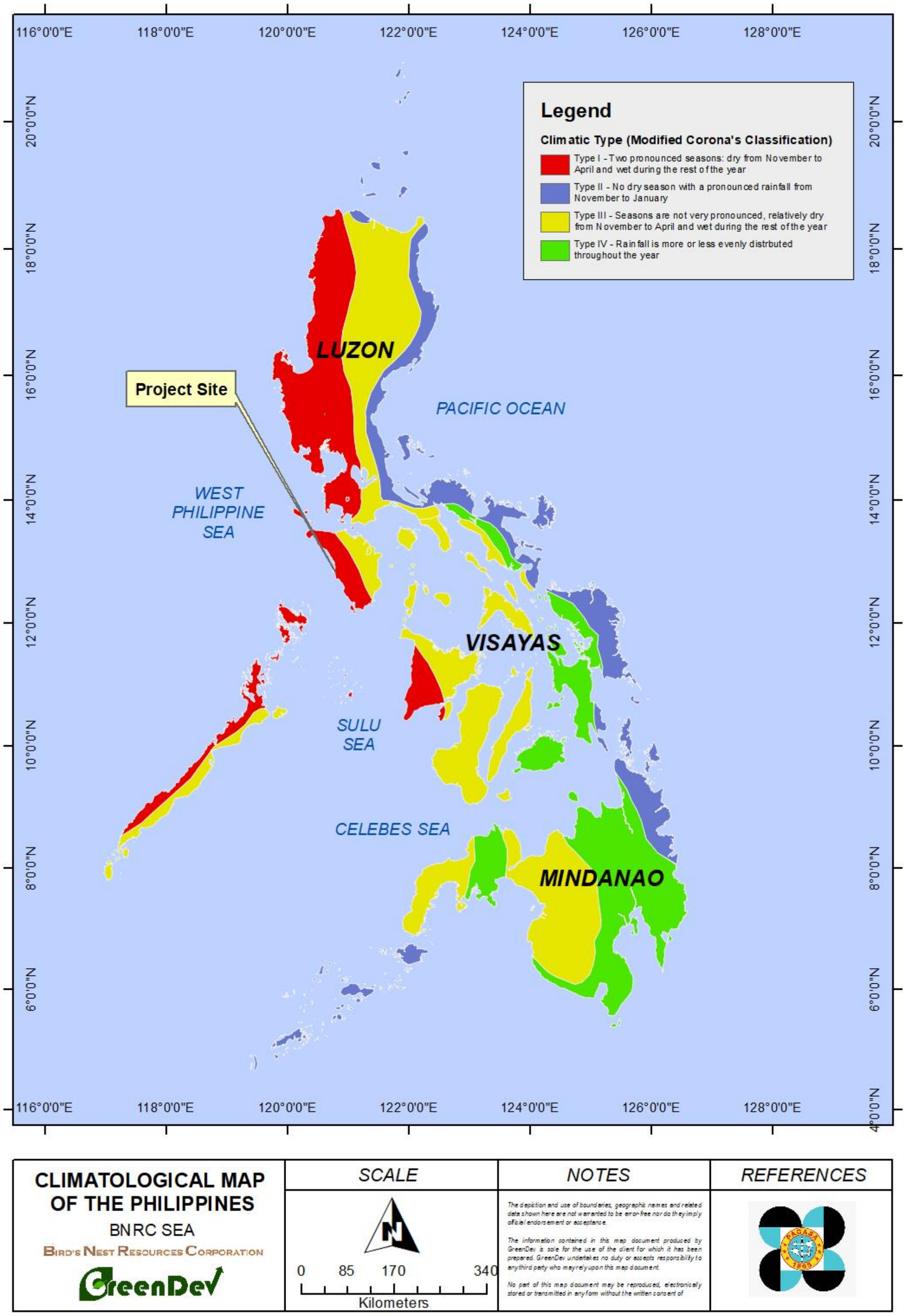


Figure 2-84. Climatological Map of the Philippines

Table 2-63. 1991-2020 Climatological Normals in San Jose, Occidental Mindoro (Source: PAGASA)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16a)	(16b)
MONTH	RAINFALL		TEMPERATURE						VAPOR PRESS. (mbs)	RH (%)	MSLP (mbs)	WIND		CLOUD AMT. (okta)	NO. OF DAYS W/	
	AMOUNT (mm)	NO. OF RD	MAX (°C)	MIN (°C)	MEAN (°C)	DRY BULB (°C)	WET BULB (°C)	DEW POINT (°C)				DIR (16pt)	SPD (mps)		TSTM	LTNG
JAN	13.0	3	32.5	21.9	27.2	27.4	23.5	22.0	26.4	73	1010.9	E	3	4	1	2
FEB	11.8	2	33.0	22.9	27.9	27.7	23.7	22.1	26.6	72	1011.3	E	3	4	1	2
MAR	11.8	2	34.0	23.8	28.9	28.7	24.4	22.8	27.7	71	1010.6	E	4	3	2	3
APR	31.6	3	34.9	24.3	29.6	29.6	25.4	23.9	29.7	72	1009.6	E	3	3	4	7
MAY	166.4	9	34.1	24.6	29.4	29.4	26.1	25.0	31.6	78	1008.7	E	3	4	13	18
JUN	325.5	15	32.5	24.4	28.4	28.3	26.0	25.2	32.1	84	1008.4	W	2	6	15	20
JUL	507.3	20	31.0	23.9	27.5	27.4	25.6	25.0	31.8	87	1008.1	W	3	6	14	16
AUG	469.0	20	31.0	23.9	27.5	27.4	25.8	25.2	32.1	88	1008.1	W	3	6	14	16
SEP	436.1	18	30.9	23.8	27.3	27.2	25.6	25.0	31.8	89	1008.5	W	2	6	13	15
OCT	244.0	13	31.7	23.6	27.7	27.5	25.5	24.8	31.4	86	1008.6	NE	2	5	13	17
NOV	97.4	7	32.8	23.7	28.2	28.1	25.1	24.1	29.9	79	1008.9	E	3	5	5	11
DEC	74.8	5	32.6	23.6	28.1	27.8	24.4	23.1	28.3	76	1009.7	E	3	5	2	5
ANNUAL	**2,388.7**	**117**	**32.6**	**23.7**	**28.1**	**28.0**	**25.1**	**24.0**	**30.0**	**80**	**1009.3**	**E**	**3**	**5**	**97**	**132**

Table 2-64. 1980-2021 Climatological Extremes in San Jose, Occidental Mindoro (Source: PAGASA)

MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		STRONGEST WINDS (mps)			SEA LEVEL PRESSURES (mbs)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	35.5	01-11-1990	15.5	01-09-1985	28.1	01-21-2008	20	ENE	01-16-2001	1018.1	01-31-1998	1002.6	01-06-1999
							20	NE	01-01-2021				
FEB	36.5	02-09-2019	15.4	02-15-1982	50.4	02-22-1986	26	NE	02-18-2008	1018.7	02-15-2017	1002.7	02-08-1986
MAR	37.6	03-28-1992	18.5	03-09-2019	69.8	03-27-1982	22	E	03-26-1991	1017.1	03-03-1987	999.0	03-30-1995
			18.5	03-11-2019									
			18.5	03-01-2020									
			18.5	03-01-2021									
APR	39.0	04-20-2020	18.8	04-09-2020	90.0	04-15-2014	20	E	04-04-2008	1016.1	04-04-1998	1000.6	04-28-1995
	39.0	04-25-2020											
MAY	38.5	05-04-1993	20.5	05-27-1986	214.4	05-12-2006	35	WNW	05-12-2006	1013.8	05-20-1994	996.1	05-12-2006
	38.5	05-09-2016											
	38.5	05-11-2020											
JUNE	39.2	06-03-2019	18.0	06-19-1981	273.4	06-27-1988	30	SSW	06-21-2008	1015.0	06-31-1995	996.6	06-06-1989
JULY	37.4	07-18-1998	20.0	07-30-1980	198.0	07-15-2014	28	W	07-24-2004	1014.2	07-27-2015	996.6	07-14-1983
AUG	35.0	08-02-1998	18.0	08-29-1980	187.2	08-25-2001	26	W	08-26-2002	1019.6	08-02-1980	996.5	08-12-1987
SEP	35.6	09-08-2020	19.0	09-17-1980	198.4	09-08-1982	35	E	09-02-1984	1019.9	09-20-1980	999.0	09-30-1995
OCT	36.0	10-30-1990	19.0	10-10-1983	286.7	10-21-1998	30	SW	10-25-2020	1015.4	10-05-1987	990.0	10-26-2020
			19.0	10-13-2019									
NOV	38.0	11-14-1989	18.8	11-06-2019	178.0	11-07-1988	34	W	11-20-2004	1015.6	11-03-1994	989.0	11-07-1988
DEC	36.0	12-07-1991	17.5	12-29-1996	256.6	12-11-1998	42	S	12-25-2019	1017.3	12-27-2001	980.6	12-10-2006
	36.0	12-24-2021											
ANNUAL	**39.2**	**06-03-2019**	**15.4**	**02-15-1982**	**286.7**	**10-21-1998**	**42**	**S**	**12-25-2019**	**1019.9**	**09-20-1980**	**980.6**	**12-10-2006**
Period of Record	**1980 - 2021**				**1980 - 2021**		**1980 - 2021**			**1980 - 2021**			

2.3.3.1 Rainfall

437 The 1991 to 2020 climatological data gathered from the PAGASA San Jose, Occidental Mindoro station, and the WWO HFW at the Project Site shows that the rainiest months are between June to October.

438 On the other hand, WWO HFW generated Precipitation Intensity Distribution in **Figure 2-85** shows that dry events account for 81.8% of hourly records from 2011 to 2020. This is followed by light rains (0.5 to 2.0 mm/hr) comprising 15.2% of the simulated hourly events; moderate rains (2.5 to 7.50 mm/hr) at 2.8%, and Heavy rains (greater than 7.50 mm/hr) accounting for only to 0.2%. The majority of rainfall in the area is brought by the southwest monsoon, as shown in the Rainrose Diagram in **Figure 2-86.**

439 The highest number of rainy days per month occurs from June to October, ranging from 13 to 20 days. The heaviest rainfall was reported during these months, averaging from 187 to 286 mm of rainfall per month. Throughout these months, a strong likelihood that rainfall will transport a large amount of silt and sediments in the project area.

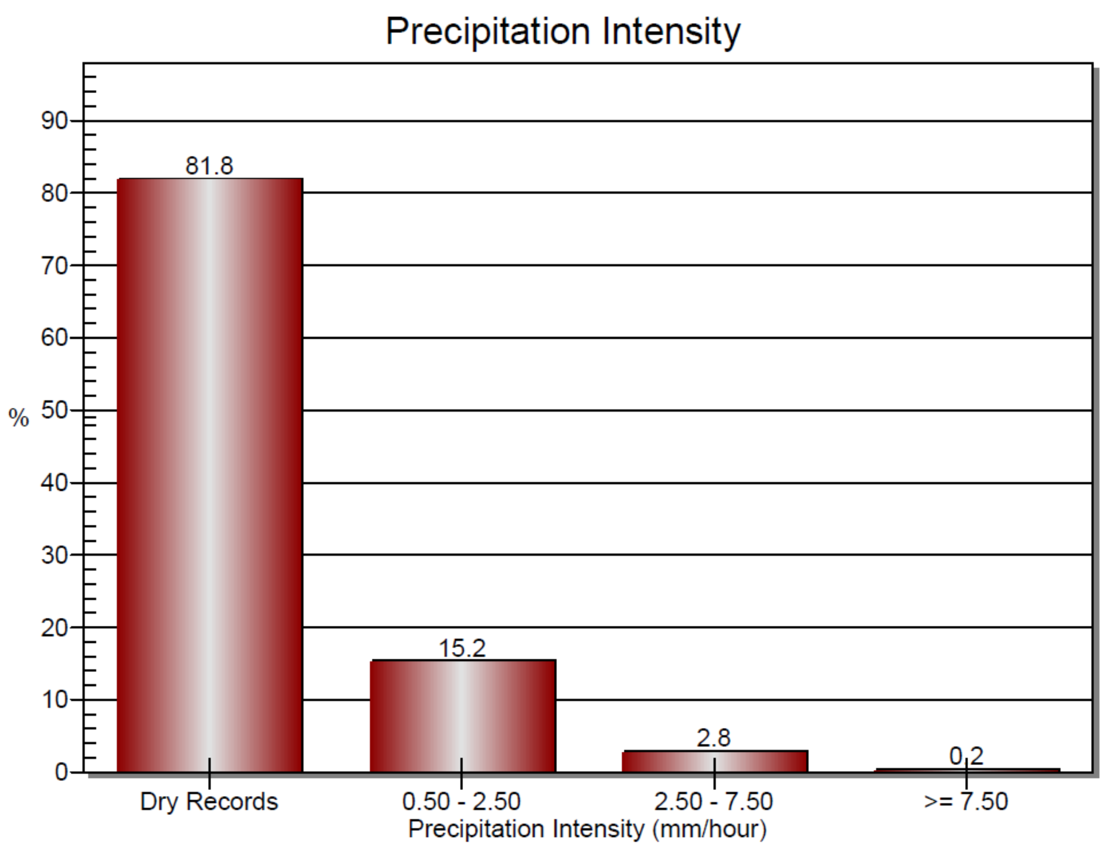


Figure 2-85. Precipitation Intensity Distribution

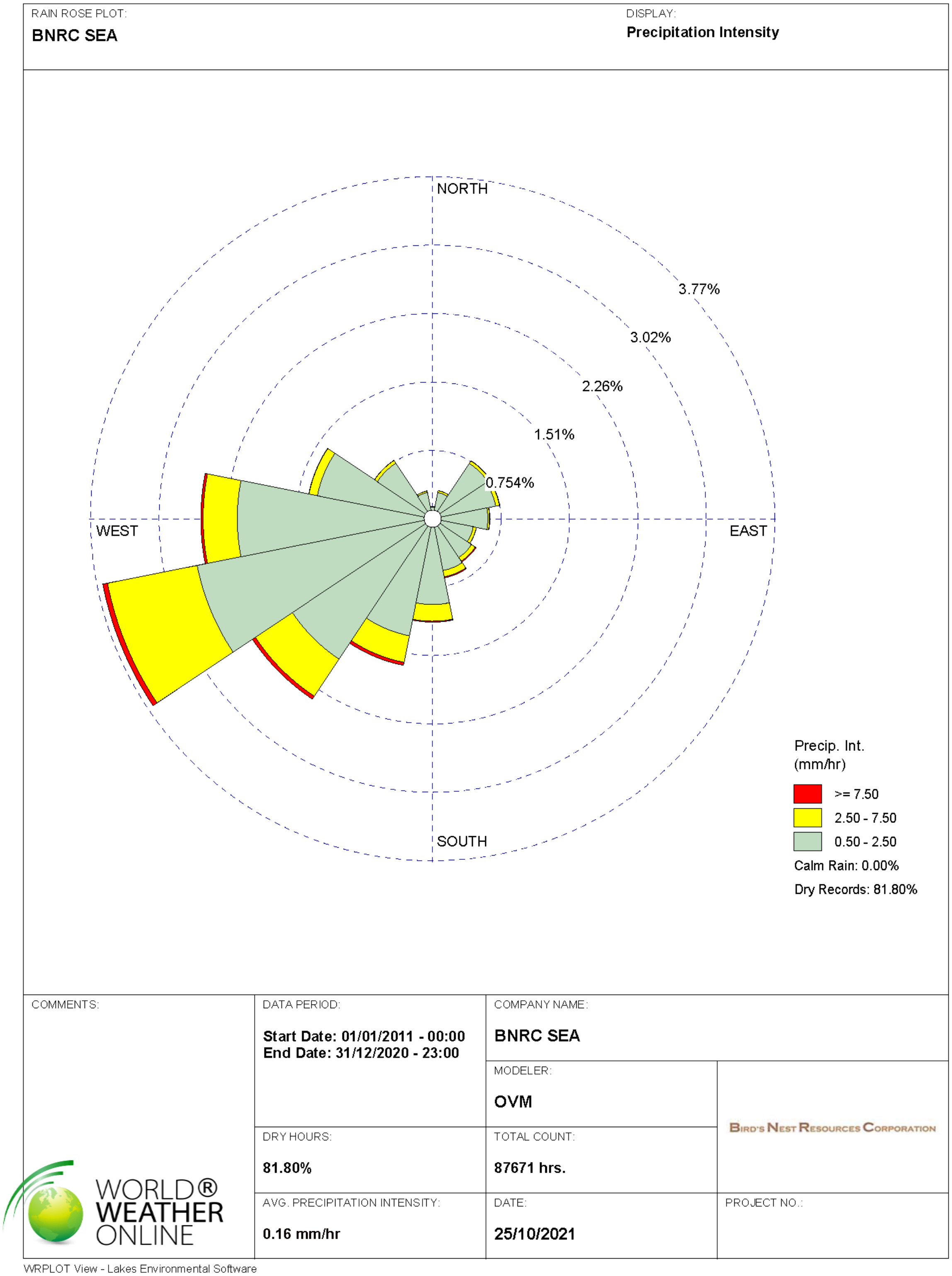


Figure 2-86. Rainrose Diagram

2.3.3.2 Temperature

440 Based on the same climatological data, the mean annual temperature in San Jose, Occidental Mindoro is 28.1°C. Similarly, 2011-2020 WWO HFW generated data at the project site returned a mean annual temperature of 27.79°C. The coolest months fall in July and August, while the warmest months occur in April and May. The highest recorded temperature was 38.5°C on June 3, 2019 (Table 2-64).

Table 2-65. Average Monthly Temperature

Month	WWO[1]	PAGASA[2]
JAN	26.73	27.5
FEB	26.75	27.6
MAR	27.57	28.8
APR	28.58	29.6
MAY	29.38	29.3
JUN	28.65	28.2
JUL	27.61	27.4
AUG	27.61	27.4
SEP	27.55	27.3
OCT	27.66	27.7
NOV	27.91	28
DEC	27.49	27.8
Mean Annual Temperature	**27.79**	**28.05**

[1]Period of Record: 2011-2020
[2]Period of Record: 1980-2010

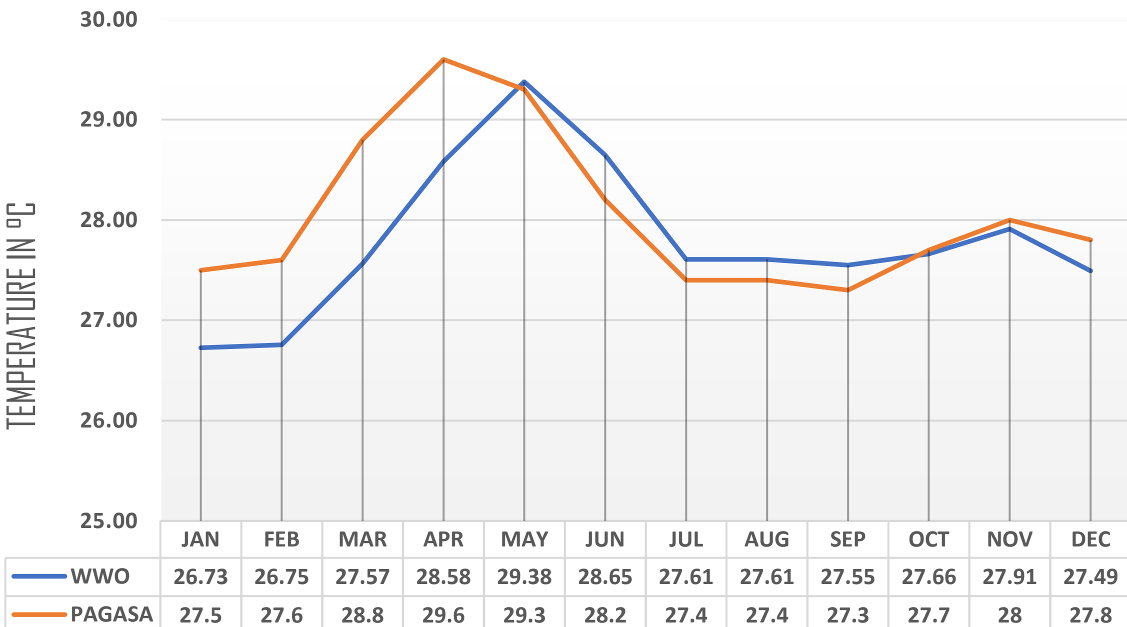
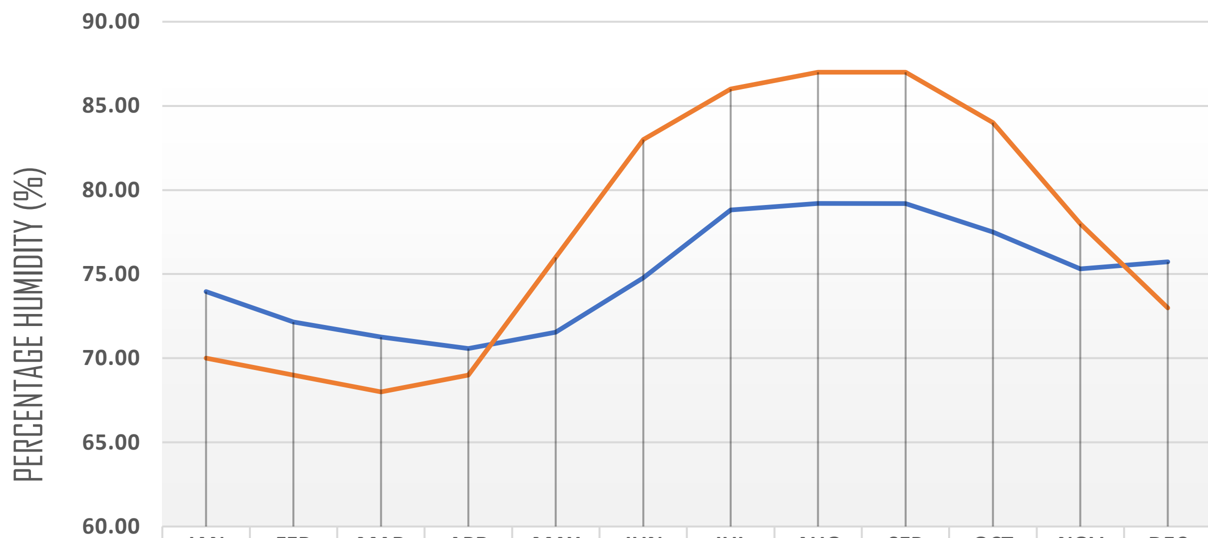


Figure 2-87. Average Monthly Temperature

2.3.3.3 Relative Humidity

441 According to PAGASA, the months of June to October registered to be the most humid months, with mean values ranging from 83 to 87 percent, while March and April registered to be the least humid (see **Figure 2-88**).

442 Additionally, historical forecasts show that light winds (0 to 5 m/s) generally prevail at 72.4% of the time over the project area. Wind aids in the drying of water vapor which enables smooth transport of dust and particulate matter by the wind. This indicates that 72.4% of the time, air composition over the project area will highly have a chance to contain large amount of dust and other particulate matter (see **Figure 2-89**).



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
WWO	73.95	72.16	71.27	70.58	71.54	74.78	78.82	79.20	79.19	77.50	75.32	75.74
PAGASA	70	69	68	69	76	83	86	87	87	84	78	73

Figure 2-88. Average Monthly Relative Humidity

2.3.3.4 Wind Regime

443 The monthly normal and extreme wind speed and direction reckoned at the synoptic station at the San Jose, Occidental Mindoro PAGASA Station are shown in **Table 2-66**. Westerly winds generally prevail throughout the year.

Table 2-66. Monthly Normal and Extreme Wind Speed and Direction Records of San Jose, Occidental Mindoro

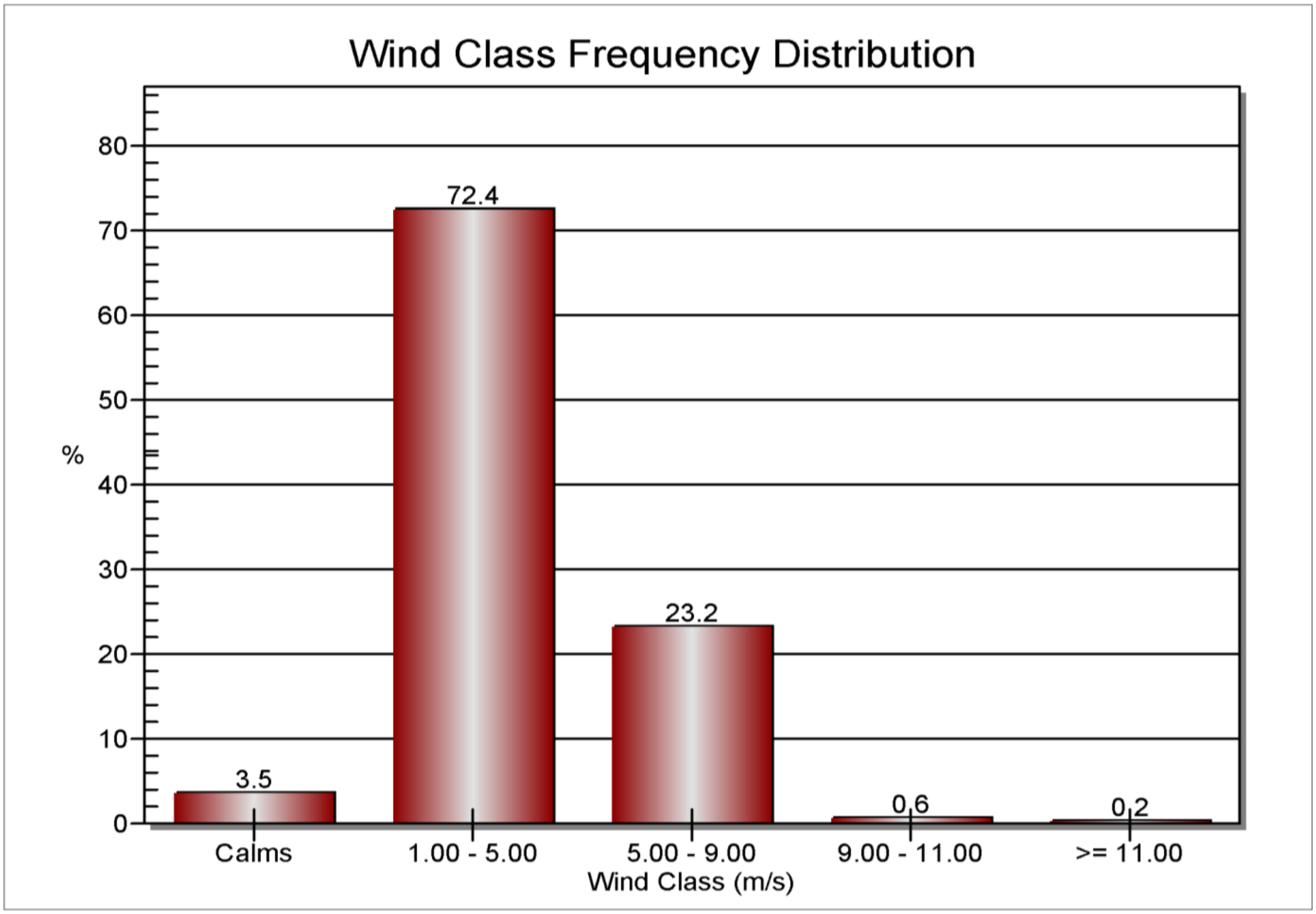
Wind	NORMAL[1]											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Speed, m/s	3	3	3	3	3	2	3	3	2	2	3	3
Direction	E	E	E	E	E	SW	W	SW	W	W	E	E
Wind	**EXTREME[2]**											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Speed, m/s	20	26	22	20	35	30	28	26	35	28	34	33
Direction	ENE	NE	E	E	WNW	SSW	W	W	E	SW	W	E

[1]Period of Record: 1981-2010;

[2]Period of Record: 1980-2010

444 A wind rose diagram in **Figure 2-90** generated from the 2011-2020 WWO HFW data shows that prevailing winds at the project area is east-northeasterly during the northeast monsoon. Winds from the northeast comprise about 25.2% of the hourly events at the site followed by east-northeast wind of about 20.1%.

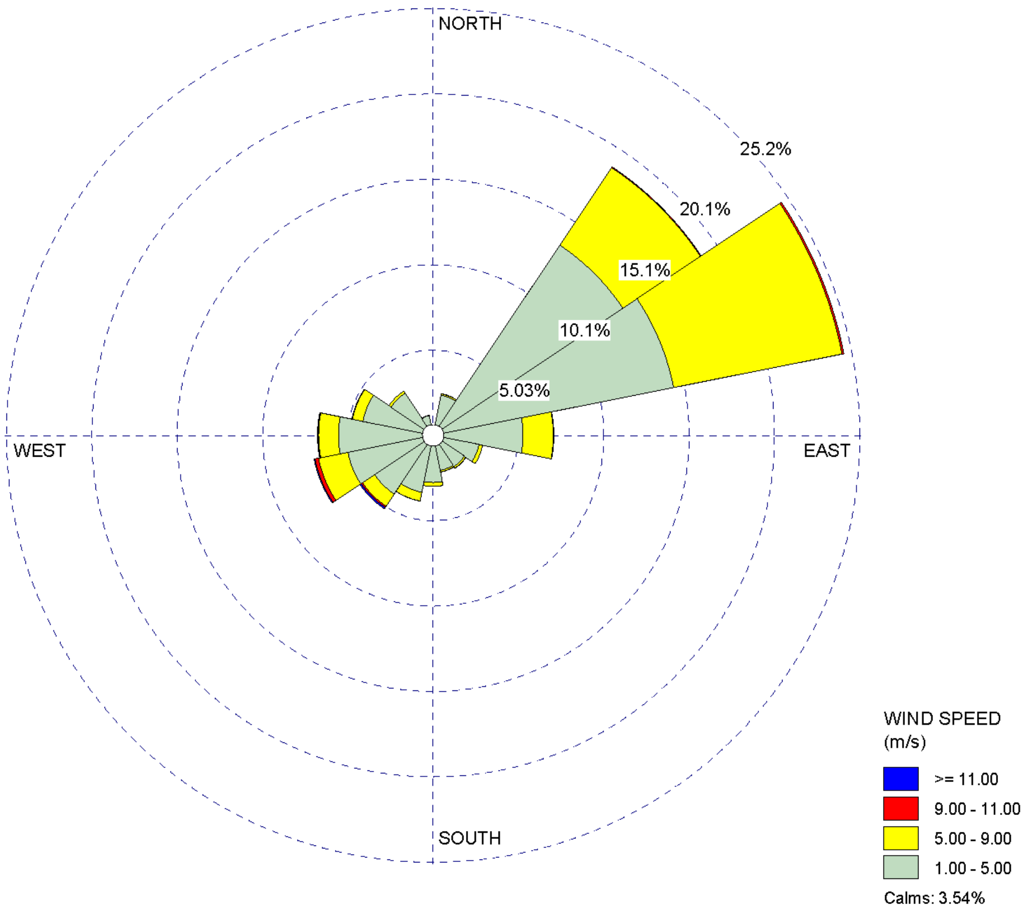
445 The wind class frequency distribution graph in **Figure 2-89** generated from the same foregoing dataset, shows that light winds (1 to 5 m/s) generally prevail at 72.4% of the time over the project area. Moderate winds (5 to 9 m/s) occurred about 23.2% while Fresh winds (less than 1 m/s) account for 3.5%.



WRPLOT View Freeware 8.0.2 - Lakes Environmental Software

Figure 2-89. Wind Class Frequency Distributions

WIND ROSE PLOT:	DISPLAY:
BNRC SEA	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 01/01/2011 - 00:00 **End Date: 31/12/2020 - 23:00**	**BNRC SEA**	
		MODELER: **OVM**	Bird's Nest Resources Corporation
	CALM WINDS: **3.54%**	TOTAL COUNT: **87671 hrs.**	
	AVG. WIND SPEED: **3.61 m/s**	DATE: **25/10/2021**	PROJECT NO.:

WRPLOT View - Lakes Environmental Software

Figure 2-90. Windrose Diagram

2.3.3.5 Tropical Cyclones

446 The proposed project location is located in an area with a medium incidence of typhoon incidence (**Figure 2-91**), and that risk to typhoons is medium level (**Figure 2-92**).

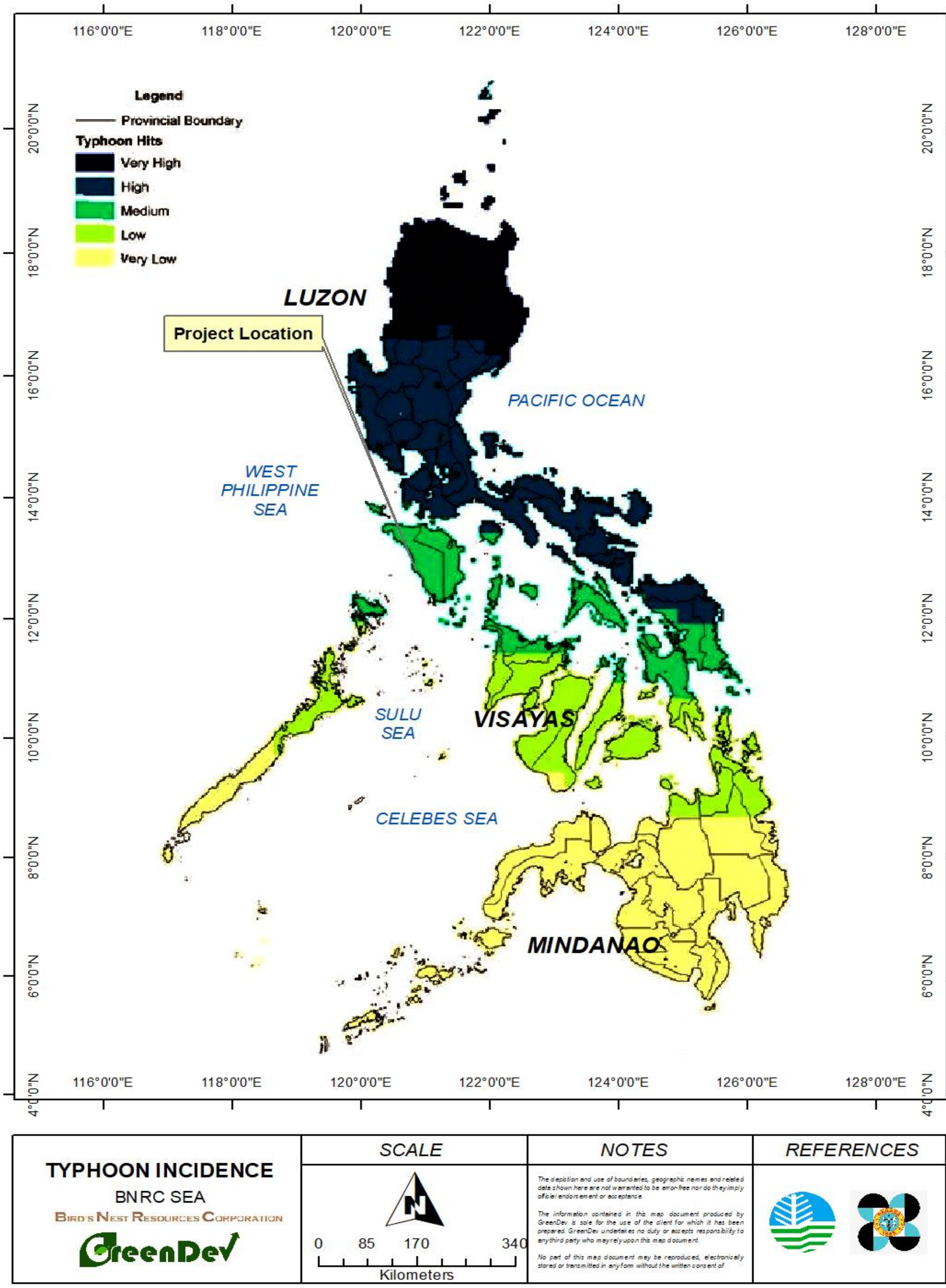


Figure 2-91. Typhoon Frequency Map in the Project Location

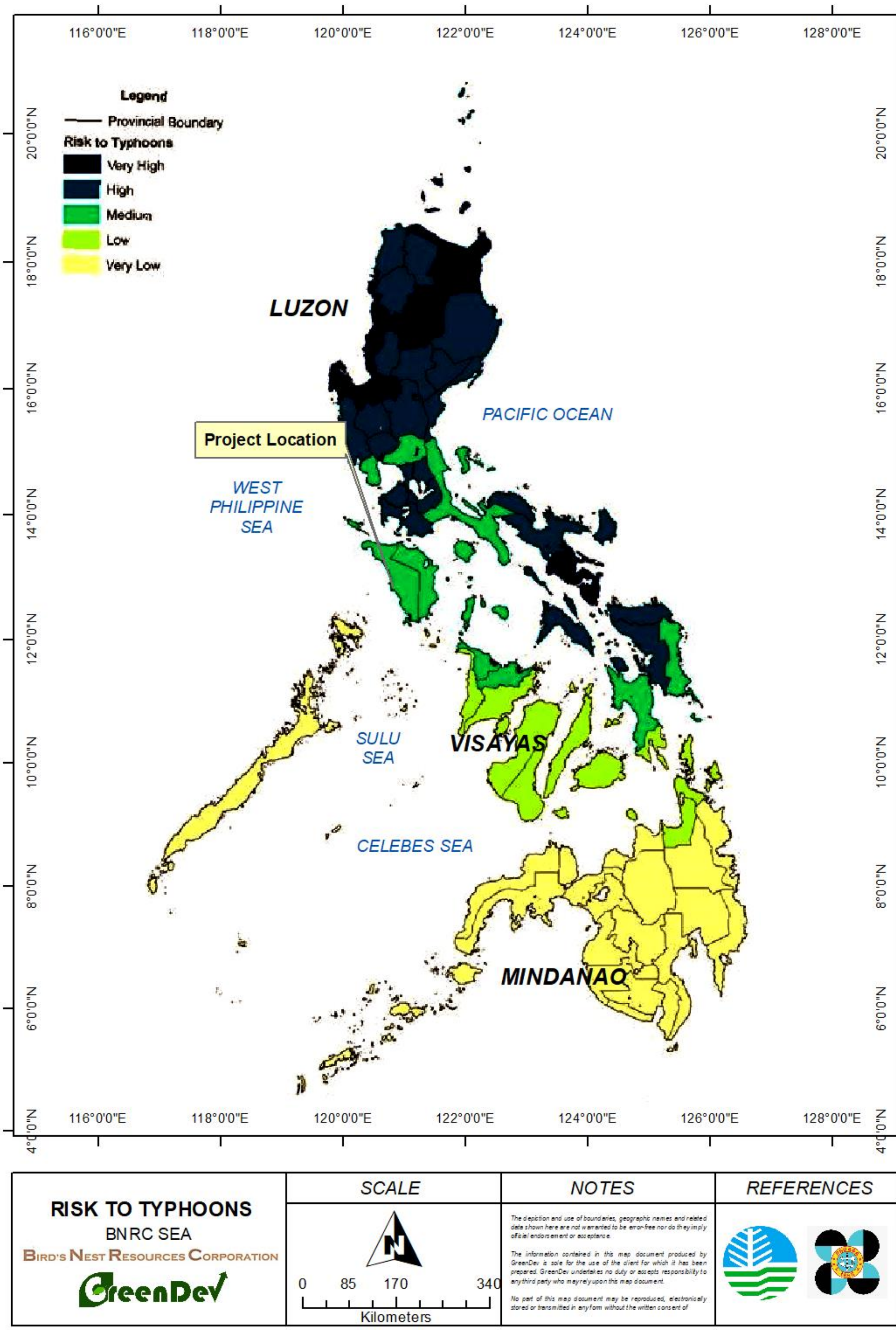


Figure 2-92. Risk to Typhoon in the Project Location

2.3.4 Ambient Air Quality

447 This section presents the procedures and results of the ambient air quality and noise level monitoring conducted on the identified stations of GreenDevelopment Sustainable Solutions, Inc. for the Mompong River Restoration Project situated in Sablayan, Occidental Mindoro. The pollutants considered for the ambient air quality monitoring were total suspended particulates (TSP), Particulate Matter Less than 10 (PM10), sulfur dioxide (SO2) and nitrogen dioxide (NO2). Three (3) designated sampling stations at the vicinity of the project were tested for TSP, PM10, SO2 and NO2. In addition, noise level measurements were also undertaken at the same stations.

448 The purpose of the sampling was to establish baseline ambient air quality and noise level and compare the results with the ambient air quality standards of the Department of Environment and Natural Resources (DENR) Administrative Order No. 2000-81 (Implementing Rules and Regulations of the Philippine Clean Air Act of 1999), and with the noise level standards of the National Pollution Control Commission (NPCC) Memorandum Circular 002 Series of 1980.

2.3.4.1 Methods of Sampling and Analysis

449 The methods of sampling and analysis of TSP, SO_2, $PM_{10,}$ and NO_2 for the ambient air quality monitoring were based on the DENR standards. The methodologies discussed in this section are presented in **Table 2-67**.

Table 2-67. Methods of Ambient Air Sampling and Analysis

Parameter	Sampling Methodology / Analysis
Total Suspended Particulates (TSP)	High Volume - Gravimetric Method
Particulate Matter Less than 10 (PM10)	Low Volume Sampler - Gravimetric Method
Sulfur Dioxide (SO,)	Bubbler - Pararosaniline Method
Nitrogen Dioxide (NO,)	Bubbler - Griess-Saltzman Reaction Method

Reference: USEPA 40 CFR, Part 50

2.3.5 Noise Measurement

2.3.5.1.1 Methodology

450 A direct-reading sound level meter (in A-weighting mode) was used to collect noise level data at each sampling station. A-weighted (dBA) scale was selected as required by the 1978 NPCC and the 1980 NPCC standards were also based on the same weighting network. A-weighting network most closely approximates the human ear's response to various sound frequencies.

451 The procedure used followed that of Wilson (1989), in which at least a total of fifty (50) readings were recorded in order to increase the confidence limits of the data. Procedures outlined by Wilson (1989) were adopted in the monitoring as the time interval, duration of sampling, size of data needed, and methods of noise level analysis were not specified in the 1978 NPCC.

452 For daytime ambient monitoring, data were collected between 0900H–1800H. According to the provision provided in the NPCC Memorandum Circular 002 (1980), the arithmetic median of seven (7)

maximum-recorded noise levels is regarded as the noise level comparable to the standard. Field observations during the monitoring were also noted so as to identify the primary sources of noise in each area.

2.3.6 Results and Discussion

2.3.6.1 Ambient Air Quality

453 Three (3) designated sampling stations were assessed with TSP, PM10, S02, and NO_2. **Table 2-68** provides the listing and the corresponding Global Positioning System (GPS) coordinates of each sampling station assigned by GreenDevelopment Sustainable Solutions, Inc.

Table 2-68. Monitoring Stations Identification for 1-Hour Monitoring

Station	Location	GPS Coordinates	
		Latitudes	Longitudes
AAS1	In front of Payompon Elementary School	12°45'17"N	120°48'48"E
AAS2	Beside Brgy. Hall Sta. Lucia	12°45'23"N	120°48'38"E
AAS3	Kalahi Brgy. Hall Basketball Court	12°43'39"N	120°48'57.8"E

454 **Table 2-69** summarizes the results of the 1-hour ambient air quality monitoring. The DENR National Ambient Air Quality Standards (NAAQS) for Source Specific Air Pollutant are presented along with the results for comparison.

455 The pollutant concentrations, as presented in **Table 2-69**, were below with the DENR National Ambient Air Quality Standards (NAAQS) for Source Specific Air Pollutants based on 60 minutes averaging time of 300 µg/Ncm for TSP, 200 µg/Ncm for PMID, 340 µg/Ncm for $S0_2$, and 260 µg/Ncm for $N0_2$.

Table 2-69. Measured Ambient Air Concentrations of TSP, PM_{10}, SO_2, and NO_2

Station	Location	Time of Sampling (June 1, 2022)	TSP (µg/Ncm)	PM_{10} (µg/Ncm)	SO_2 (µg/Ncm)	NO_2 (µg/Ncm)
AAS1	In front of Payompon Elementary School	1224H-1324H	< 1.7	< 1.1	3.0	4.0
AAS2	Beside Brgy. Hall Sta. Lucia	1357H-1457H	< 1.7	< 1.1	3.0	5.8
AAS3	Kalahi Brgy. Hall Basketball Court	l 007H- l 107H	25.5	4.2	4.2	4.1
DENR National Ambient Air Quality Standards for Source Specific Air Pollutants based on 60 minutes Averaging time			300	200	340	260

Note: For non-detect values, the detection limit in µg was divided by the total normal volume of air sampled

456 Sampling observations and photo documentations are summarized in **Table 2-70**. Also, location map of the sampling stations is shown in **Figure 2-93** in the succeeding page. Moreover, the summary of results including the gathered meteorological data, laboratory certificate of analyses, and calibration records of the equipment used were attached in Annex J, respectively.

Figure 2-93. Location Map of Ambient Air Quality Monitoring

Table 2-70. Sampling Observations and Photo Documentation

Station	Sampling Observations	Photo Documentation
AAS1 In front of Payompon Elementary School (June 1, 2022) 1224H-1324H	The station was situated on a wet concrete basketball court beside a corn-drying bed near Payompon Elementary School. Trees and small shrubs are apparent at a distance from the station premise. One (1) light vehicle passed by during the sampling period. The weather was humid, with mostly cloudy skies. Winds were blowing from the northeast at light air conditions. No occurrence of rainfall was observed during sampling. The average ambient air temperature was 31.0ºC.	 
AAS2 Beside Brgy. Hall Sta. Lucia (June 1, 2022) 1357H-1457H	The station was situated on a wet concrete basketball court beside Sta. Lucia Barangay Hall. Trees and small shrubs are apparent at a distance from the station premise. One (1) light vehicle passed by during the sampling period. The weather was humid, with mostly cloudy skies. Winds were blowing from the northeast at light air conditions. No occurrence of rainfall was observed during sampling. The average ambient air temperature was 29.8ºC.	 

Station	Sampling Observations	Photo Documentation
AAS3 Kalahi Brgy. Hall Basketball Court (June 1, 2022) 1007H-1107H	The station was situated on cemented basketball court in near Emilio Aguinaldo Barangay Hall. Trees and small shrubs are apparent at a distance from the station premise. One (1) light vehicle and one (1) motorcycle passed by during the sampling period. The weather was overcast with winds blowing from southwest at light air conditions. Occurrence of light to heavy rainfall was observed during the sampling period. Average ambient air temperature was 28.6ºC.	 

2.3.6.2 Ambient Noise Level

457 Three (3) designated stations at the project's periphery were monitored for ambient noise level and the results are presented in **Table 2-71,** while the primary sources of noise are summarized in **Table 2-72**. For Station N1, the applicable standard for Class AA areas measured during daytime is 50 dBA as per NPCC Memorandum Circular 002 Series of 1980. However, a correction factor of +5 dbA was applied for Station *N1* since the location directly faced a 2-lane road, as imposed in the NPCC Memorandum. Since Stations *N2* and *N3* were classified as Class A areas, the applicable standard for Class A areas measured during daytime is 55 dBA as per NPCC Memorandum Circular 002 Series of 1980.

Table 2-71. Ambient Noise Level Monitoring Results

Station No.	Location	Time of Sampling (June 1, 2022)	Noise Level (LAeq)	Monitoring Period	NPCC Standard
N1	In front of Payompon Elementary School	1324H - 1334H	67	Daytime	55[AA**]
N2	Beside Brgy, Hall Sta, Lucia	1457H - 1507H	61	Daytime	55[A]
N3	Kalahi Brgy, Hall Basketball Court	1107H - 1117H	58	Daytime	55[A]

Class AA - a section or contiguous area which requires quietness, such as an area within 100 m from school sites, nursery schools, hospitals and special homes for the aged.
Class A - a section or contiguous area which is primarily used/or residential purposes.
**Median of seven highest recorded noise levels (NPCC, 1978).*
** *With correction factor of +5 dbA applicable for areas directly facing a 2-lane road*

458 Results have indicated that the ambient noise levels at all stations have exceeded their designated standards. Observed primary sources of noise are presented in **Table 2-72,** The equipment calibration certificate of the noise meter used during the measurement is attached in Annex J.

Table 2-72. Primary Sources of Noise

Station No.	Location	Sources of Noise
N1	In front of Payompon Elementary School	Children playing basketball, blowing of horn
N2	Beside Brgy, Hall Sta, Lucia	Children playing basketball
N3	Kalahi Brgy, Hall Basketball Court	Light to moderate rainfall and animal calls (crowing roosters, choiring birds)

2.4 The People

459 This section will present an assessment of the socio-economic impact of the Mompong River Restoration Project on the host communities. This report is based on the People Module of the Technical Scoping Checklist anchored on the guidelines set by PD 1586 Philippine Environmental Impact Statement System, DENR DAO 30-2003 Revised Procedural Manual, and DENR MC 005-14 Revised Guidelines for Coverage Screening and Standardized Requirements. While other sections of this study have focused on the geophysical, biological, and environmental conditions that are present in the vicinity of the Project, this section will delve into the impact the Project may have on the population of the host communities, the livelihoods of those residing in the impact barangays, their access to basic services and how the people are able to meet their minimum basic needs. Measures to mitigate possible adverse impacts and enhance existing programs will be suggested for implementation upon undergoing the Environmental Management Bureau's (EMB) Assessment Review Process.

2.4.1 Methodology

460 The study area consists of four rural barangays: Tuban, Santa Lucia, San Nicolas, and Malisbong which are all located in the Municipality of Sablayan, Province of Occidental Mindoro. The socioeconomic profile of these communities is presented and formed from the combination of primary and secondary data obtained through both quantitative and qualitative methods. Primary information was obtained through informal interviews and socioeconomic and perception surveys. The survey was conducted to develop an appreciation of the communities' perceived positive and negative impacts of the Project and to serve as a platform for the host communities to provide their suggestions and recommendations to the project implementers. On the other hand, secondary information used in the assessment are mostly from available local development plans and relevant literature.

461 With the established baseline conditions, key socioeconomic impacts were identified, based on the following:

- In-migration/ Proliferation of informal settlers
- Displacement of Settlers
- Threat to delivery of basic services/ resource competition
- Cultural/Lifestyle Change
- Threat to public health and safety
- Generation of local benefits from the project
- Traffic congestion

462 Once the impacts were identified, mitigating and enhancement measures were formulated and consulted to ensure appropriateness and effectiveness of the identified measures.

2.4.2 Baseline Condition

2.4.2.1 Demographic Characteristics

463 Sablayan is a first-class coastal municipality in the province of Occidental Mindoro. It has a total land area of 229,559.1741 hectares subdivided into its 22 barangays, three of which are classified as urban while the remaining 19 are all rural. Sablayan's administrative jurisdiction covers almost 39% of Occidental Mindoro's total land area. According to the Philippine Statistics Authority (PSA), the Municipality posted a total population of 92, 598 in 2020. This represented 17.63% of the total population of the province, or 2.87% of the overall population of the MIMAROPA Region. Based on these figures, the population density is computed at 42 inhabitants per square kilometer. It must be noted that from the total population in 2015, which is 83,169, an increase of 11.34% and an annual population growth rate of 2.29% was recorded. In the same year, the population of Sablayan is mostly comprised of an economically active population, roughly equivalent to the potential or active members of the workforce at 49, 624 or 59.67% of the total population. Detailed population characteristics of Sablayan is summarized in **Table 2-73**.

Table 2-73. Population Characteristics of the Municipality of Sablayan

Profile Feature	Municipality of Sablayan
Population (2015)	**83,169**
Population (2020)	**92,598**
Population Change (2015-2020)	**11.34%**
Annual Population Growth Rate (2015-2020)	**2.29%**
Population Density (2020)	**42 / km^2**
Household Population (2015)	**80,610**
Number of Households (2015)	**18,558**
Average Household Size (2015)	**4.34**
Population Age Group (2015) • Under 1 – 14 • 15 – 64 • 65 and above	 **30,483** **49,624** **3,062**
Median Age (2015)	**22.14**
Total Dependency Ratio (2015	**67.6**
Youth Dependency Ratio (2015)	**61.43**
Old Age Dependency Ratio (2015)	**6.17**

Source: Philippine Statistics Authority, 2015 and 2020

464 In reference to the 2015 census, Santa Lucia posted the most significant increase at 17.38%, while Malisbong recorded the lowest increase at 4.60%. Aside from owning the highest population count in 2020 and number of households in 2015, Santa Lucia was also identified to have the highest percent share among the four host communities in the total population of Sablayan at 6.08%. Similar to the municipal level representation of age groups, all barangays are mostly comprised of an economically active population (15-64). In addition, the calculated median age is lowest at San Nicolas and highest at Malisbong at 18.362 and 38.04, respectively. Summarized demographic characteristics of the four impact barangays is presented in **Table 2-74**.

Table 2-74. Population Characteristics of the Four Impact Barangays

Profile Feature	Malisbong	San Nicolas	Santa Lucia	Tuban
Population (2015)	**3,998**	**1,964**	**4,800**	**2,969**
Population (2020)	**4,262**	**2,171**	**5,634**	**3,398**
Population Change (2015-2020)	**6.60%**	**10.54%**	**17.38%**	**14.45%**
Percent Share in the Municipal Population (2020)	**4.60%**	**2.34%**	**6.08%**	**3.67%**
Annual Population Growth Rate (2015-2020)	**1.36%**	**2.13%**	**3.43%**	**2.88%**
Household Population (2015)	**1,590**	**1,964**	**4,750**	**2,961**
Number of Households (2015)	**402**	**415**	**1,058**	**680**
Average Household Size (2015)	**3.96**	**4.73**	**4.49**	**4.35**
Population Age Group (2015) • Under 1 – 14 • 15 – 64 • 65 and above	 **628** **3,301** **69**	 **830** **1,078** **56**	 **1,848** **2,808** **144**	 **1,169** **1,699** **101**
Median Age (2015)	**38.04**	**18.62**	**19.93**	**20.39**
Total Dependency Ratio (2015	**21.11**	**82.18**	**70.94**	**74.75**
Youth Dependency Ratio (2015)	**19.02**	**76.99**	**65.81**	**68.81**
Old Age Dependency Ratio (2015)	**2.09**	**5.19**	**5.13**	**5.94**

Source: Philippine Statistics Authority, 2015 and 2020

2.4.2.2 Indigenous People Community

465 There are no existing parcels of land with Certificate of Ancestral Domain Claims and Titles (CADC/CADT) within the project area (**Figure 2-94**). The nearest zone with CADT (Reference Number: R04-SAB-0309-098) is approximately 10 km from the project site. During the informal dialogues with the locals, few Mangyans reside in the upland areas of Santa Lucia and Tuban, which are relatively distant from the project site.

2.4.2.3 Socio-cultural Profile

466 In terms of socio-cultural and economic profile, Sablayan is predominantly a Tagalog speaking locale. The majority of its members speak the dialect followed by Ilocano, Cebuano, and Mangyan. A significant number of the total population belongs to the Roman Catholic sect of the Christian religion. According to the history, the Alangan and Tau-Buid tribes of the Mangyan people are the original inhabitants of Sablayan. In the Community-Based Monitoring System (CMBS), conducted in 2012, their population was identified at 6,697 or nine percent of the total population of the municipality in that year. They are nomadic in nature and are highly dependent on forest resources for subsistence. In general, the primary source of livelihood in Sablayan is agriculture (farming and fishing), followed by services.

Figure 2-94. Certificate of Ancestral Domain Title Surrounding the Project Site Map
(Source: Geoportal.gov.ph)

2.4.2.4 Education

467 According to the Annual Report of Sablayan LGU in 2017, the Municipality's literacy rate is 93%. It has a total of 80 schools, both public and private,53 of which are for elementary education, 23 for secondary, three for tertiary, and one for Technical-Vocational curriculum. According to the Municipal Ecological Profile in 2020, the total enrolment for the academic year 2019- 2020 at all school levels is 31,059 with an enrolment participation ratio (EPR) of 47%. EPRs are computed using a projected population based on an annual growth rate of 1.78% for the year 2015 (**Table 2-75**).

Table 2-75. Enrollment Participation Ratio (EPR) in the Municipality of Sablayan, AY 2017-2018

Level	School-going Population	Number of Enrollees			EPR
		Public	Private	Total	
Pre-School	11776	1948	182	2130	18
Elementary	40430	14004	716	14720	36
Secondary	6524	10322	1245	11567	1
Tertiary/Vocational	6726	2219	423	2642	39
Total	**65456**	**28493**	**2566**	**31059**	**47**

Source: Municipal Ecological Profile 2020 & Comprehensive Development Plan 2020-2025

468 Aside from the respective daycare centers, there are only ten schools present in the four impact barangays. Two of which are secondary schools (one public and private) while all remaining eight are public elementary schools. The list of schools within the four impact barangays is identified in **Table 2-76**Error! Reference source not found.**.**

Table 2-76. Inventory of Existing Schools in the Four Impact Barangays

Name of School	Location	Type
Elementary		
Malisbong Elementary School	Malisbong	Complete Elementary
Payompon Elementary School	Santa Lucia	Complete Elementary
Sahing Elementary School	Santa Lucia	Complete Elementary
San Nicolas Elementary School	San Nicolas	Complete Elementary
Santa Lucia I Elementary School	Santa Lucia	Complete Elementary
Santa Lucia II Elementary School	Santa Lucia	Complete Elementary
Tuban Elementary School	Tuban	Complete Elementary
SPPF Elementary School	SPPF, Malisbong	Complete Elementary
Secondary		
Santa Lucia National High School Annex	Santa Lucia	General Public High School Annex
D-SHEP Foundation Academy	Santa Lucia	Private

Source: Municipal Ecological Profile 2020 & Comprehensive Development Plan 2020-2025

469 The three tertiary schools operating in the Municipality are Colegio De San Sebastian (CDSS), Occidental Mindoro State College (OMSC), and Polytechnic University of the Philippines (PUP) - Sablayan Campus. Residents of the four impact barangays usually enter these colleges if they are not pursuing college and university degrees outside the province.

470 During the height of the COVID-19 pandemic, the country implemented an Enhanced Community Quarantine (ECQ) on March 16, 2020 to slow down the spread of virus. This has affected the face-to-face educational set up of Primary, Secondary, and Tertiary Schools in the country. The

Department of Education (DEPED) and Commission on Higher Education (CHED) implemented the blended learning mode of learning through online class meetings and printed modules.

2.4.2.5 Healthcare

471 As of 2019, there are three Rural Health Units (RHUs) in Sablayan, which are located in the Barangays of Buenavista, Ligaya, and Pag-asa. These RHUs cater to the public's general health concerns through the services provided by healthcare personnel such as doctors, nurses, and midwives. In total, there are 24 medical doctors who serve the Municipality of Sablayan. Eleven of them work in government hospitals, Rural Health Units and Basic Emergency Obstetrics and Newborn Care (BEMONC) Facilities, while the remaining half are doing their practice in private clinics and hospitals. On the other hand, there are 53 registered and practicing nurses in Sablayan. Forty-eight of which works for the government and ten in private institutions. There are also a total of 37 midwives in Sablayan who are mostly working in the government sector.

472 Aside from the mentioned medical practitioners, there are also Barangay Health Workers and Barangay Nutrition Scholars, actively operating in each barangay. These health personnel manage the medical complaints and provide first aid treatment and carry out the health programs of the DOH to the residents. Those patients who are in need of further evaluation and management are referred to the Rural Health Unit in the town proper. Patients who are critically ill or require more diagnostic work-up are referred to bigger and more equipped hospitals in the nearby towns.

Table 2-77. Medical Facilities and Personnel in the Four Impact Barangays, 2018

Barangay	Facilities		Personnel							
	Type	Public/Private	Doctors	Nurses	Midwives	Sanitary Inspector	BHW	BNS	Pharmacists	Total
Malisbong	BHS	Public	0	0	1	1	19	1	0	22
	Infirmary, SPPF	Public	1	3	0	0	0	0	1	5
San Nicolas	BHS	Public	0	0	1	1	21	1	0	24
Santa Lucia	BHS with lying in	Public	0	0	1	1	20	1	0	23
Tuban	BHS	Public	0	0	1	1	21	1	0	24

Source: Municipal Ecological Profile 2020

473 COVID-19 manifested in the country, including Sablayan in 2020. Healthcare workers or the so-called frontliners have undergone several capacity trainings in handling and managing the said virus. The LGU of Sablayan strictly implemented necessary measures to prevent the virus from entering its premises, yet cases have been raised. The Municipality has established its proactive measures to combat the virus, which include the preparation of facilities, vehicles, and human resources to be utilized during lockdown, testing, and management of COVID-19 patients. In addition, the Municipal Health Office (MHO) acquired an amount of 12, 189,46 PHP combined from Bayanihan grant and LGU funds to implement programs to minimize health risk for Sablayenos as well as provide just compensation to the frontliners.

Nutritional Status of Children

474 In the four impact barangays, there are records of prevailing malnutrition among children. According to the most recent information gathered from the LGU, Tuban has the greatest number of malnourished children within the study area. The significant increase in terms of malnutrition status can be ascertained from the reference year 2018 up to 2020, as presented in **Table 2-78.**

Table 2-78. Number of Malnourished Children in the Four Impact Barangays, 2018-2020

Barangay	2018	2019	2020
Malisbong	**35**	**0**	**27**
San Nicolas	**15**	**17**	**30**
Santa Lucia	**39**	**25**	**37**
Tuban	**6**	**11**	**77**

Source: Municipal Ecological Profile, 2020

Leading Causes of Mortality and Morbidity

475 From 2016 to 2018, acute and upper respiratory illness and animal bite have been consistently on the record as leading causes of morbidity in the Municipality of Sablayan (**Table 2-79**). Moreover, identified causes of deaths in the same periods vary yearly as presented in **Table 2-80.**

Table 2-79. Top Ten Leading Causes of Morbidity for the Past Three Years, 2018-2020

2018		2019		2020	
Causes	Number of Cases	Causes	Number of Cases	Causes	Number of Cases
Upper Respiratory Tract Infection (URTI)	2161	URTI/ARI	3477	URTI/ARI/ AURI	1858
Animal bite	1046	Animal bite	1282	Animal bite	822
Community Acquired Pneumonia	657	Hypertension	500	Hypertension	343
Urinary Tract infection (UTI)	284	UTI	408	Non-Ulcer Dyspepsia	331
Gastritis	275	Non-Ulcer Dyspepsia	379	UTI	322
Osteoarthritis	272	Age with No and some DHN	343	Pulmonary Tuberculosis	294
Acute Gastroenteritis with No Dehydration	218	Osteoarthritis	314	Wound (All Kinds)	277
Pulmonary Tuberculosis - Adult	196	Gastritis	250	Age with No and some DHN	236
Systemic Viral Illness	183	Pulmonary Tuberculosis	199	Osteoarthritis	145
Oral Thrush Oral Thrush	169	Community Acquired Pneumonia	183	Oral Thrush	138

Source: Municipal Ecological Profile, 2020

Table 2-80. Top Ten Leading Causes of Mortality for the Past Three Years, 2018-2020

2018		2019		2020	
Causes	**Number of Cases**	**Causes**	**Number of Cases**	**Causes**	**Number of Cases**
Pneumonia	17	Community Acquired Pneumonia	19	Cerebrovascular Accident	26
Cerebrovascular Accident	14	Natural Cause of Death	17	Hypertension	16
Myocardial Infraction	14	COPD	15	Undetermined	13
Senility	13	Severe Traumatic Head Injury	15	Community Acquired Pneumonia	9
Cancer (All Types)	10	Pulmonary Tuberculosis - Adult	13	T/C Myocardial Infraction	7
Pulmonary Tuberculosis - Adult	9	Myocardial Infraction	9	Congestive Heart Failure	6
Cardiovascular Disease	8	Cardiovascular Disease	8	Myocardial Infraction	6
Acute Renal Failure	5	Colon Cancer	8	Diabetes Mellitus Type II	6
Shock	5	Hypovolemic Shock	6	Senility	6
Upper GL Bleeding	4	Liver Cirrhosis	6	COPD	5

Source: Municipal Ecological Profile, 2020

2.4.2.6 Water and Sanitation

Water Sources

476 According to the 2019 Integrated Sanitation and Water Supply Report of Sablayan, the total number of Level I water supply systems in the Municipality accounts for 10,603 units, being shared by 14,973 individuals. In the four impact barangays and at the municipal level, Santa Lucia was recorded to have the greatest number of shallow wells used for domestic purposes with 1,145 units. The detailed list of the number of units serving the impact barangays is presented below.

Table 2-81. Level I Water Supply System by Type and Population Served in the Impact Barangays, 2019

Barangay	Number of Shallow Wells	Number of Households Served
Malisbong	**408**	**408**
San Nicolas	**458**	**458**
Santa Lucia	**1145**	**1145**
Tuban	**207**	**870**

Source: Municipal Ecological Profile, 2020

477 There are six barangays which utilizes Level II water supply for their daily living. Among the four barangays, only Tuban is dependent on this type, with one pump and ten communal faucets serving a total of 105 households. At the municipal level, 3015 households are directly benefiting from this type of source. Sablayan Water District provides Level III water supply in the urban core (Buenavista, Poblacion and Santo Nino), and another seven rural barangays (Ligaya, Ibud,

Tagumpay, Santa Lucia, San Francisco, San Vicente, and Tuban) serving a total of 5,080 households, 313 commercial establishments, and 85 with various type of uses. Still, there are households, particularly in the rural areas, who are still dependent on natural water sources such as springs, lakes, rivers and wells. The most common means of extracting ground water is the pitcher pump.

Toilet Facility

478 In the whole municipality, the most dominant type of toilet facility is the poured flush type used by 70,727 households, while the least is the pail system with only 168 households practicing it. Based on the 2010 Census of the National Statistics Office (NSO), the total number of households in Sablayan with toilet facilities is 12,741. Those unaccounted are in the Indigenous People (IP) communities.

2.4.2.7 Power

479 Power in the whole municipality is provided by the Island Power Corporation (IPC) and the National Power Corporation (NPC) through the Occidental Mindoro Electric Cooperative (OMECO). As of 2020, 85.75% of the total household population of Sablayan is served by OMECO. In the four impact barangays, the majority of the households have access to this supply, Santa Lucia having the most number with connections and Malisbong having the least. The detailed number of households enjoying the service of OMECO is summarized in **Table 2-82.**

Table 2-82. Households Served by OMECO in the Four Impact Barangays, 2020

Barangay	Estimated Number of Households	Served	%	Unserved	%
Malisbong	417	311	74.58	**106**	**25.42**
San Nicolas	422	302	71.56	120	28.44
Santa Lucia	1089	970	89.07	119	10.93
Tuban	703	577	82.08	126	7.92

Source: Municipal Ecological Profile, 2020

2.4.2.8 Communication

480 In addition to courier services such as LBC and JRS, postal service is still offered by the Philippine Post (PHILPOST) in Sablayan. There are also existing television cable providers such as Cignal, Sky direct, Gsat, L & S CATV, and Capitol CATV which are found in the town proper. *Radio Natin* is the sole radio station originating from the municipality. Other means of communication such as newspapers, magazines, and other printed media are also in circulation.

481 Four telecommunication companies serve the municipality. These include the following: Globe Telecommunications Company (with cellular site in Santa Lucia), Sun Telecommunications Company, Smart Telecommunications Company, and Digital Telecommunications Company (with cellular site in Tuban). These networks offer nationwide and international calls, text and mobile internet.

2.4.2.9 Road Network and Transportation

Roads and Bridges

482 Sablayan is traversed by a national road linked to the municipalities of Abra de Ilog in the north and Magsaysay in the south, both located within the Province of Occidental Mindoro. The stretch of the national road is mostly concrete paved with patches of all-weather pavement in critical areas. In the

urban core, the road network is made up of asphalt and concrete. Bridges along the national road are mostly made of concrete while those which are located inlands are either bailey or timber bridges. According to the 2020 Ecological Profile of Sablayan, the LGU is continuously identifying roads to be improved, rehabilitated, upgraded or to be introduced, especially those needed in the production and settlement areas. Inventory of roads by system classification and type of pavement within Sablayan is summarized in **Table 2-83**.

Table 2-83. Inventory of Road by System Classification and Type of Pavement

Roads by System Classification	ROAD SURFACE TYPE													
	ROW	Total Length (km)	Concrete			Asphalt			Gravel			Earth		
			km	%	C	km	%	C	km	%	C	km	%	C
Barangay	8	340.010	16.821	4.94	G				247.378	72.76	P	73.094	21.49	P
Municipal	10	11.613	11.613	100.0	G									
Provincial	10	8.500	0.880	1.30	G				6.280	80.24	P	0.800	9.41	P
National	30	83.039	74.082	89.00		0.3	1		8.657	10.00				

Source: Municipal Ecological Profile, 2020

Mode of Transportation

483 The municipality is accessible by sea from Batangas, Manila, and the Visayan Islands; by land from north and south sections of the province; and by air via private aircraft. In the urban area, aside from private vehicles, common means of public transportation is the tricycle, while in the rural areas are, motorcycle, jeepneys, and mini-trucks.

484 During the height of the COVID-19 pandemic, the transportation sector and its underlying operations were greatly affected. The government banned all travel outside and inside the municipality unless concerns are about health and well-being. Passenger vans, and buses are converted into cargo vehicles to continue activity. The sudden stoppage of travel affected the livelihood of owners and operators as well as business movement in the area.

2.4.2.10 Traffic Impact Assessment

2.4.2.10.1 Background of the Study

485 The conduct of a Traffic Impact Assessment (TIA) for any development or project is a necessary approach to determine the effect towards the local traffic situation. The traffic generated by such developments or projects can be identified through a systematic study and the impact caused by future traffic generated by such developments in the area can then be properly planned and mitigated accordingly.

486 The Mompong River Restoration Project aims to increase the capacity of the discharge flow and to minimize the amount of silt accumulation in the river mouth. This will be done through dredging an area of 532 hectares as recommended by the Mines and Geosciences Bureau-MIMAROPA (MGB-MIMAROPA) together with the Occidental Mindoro Provincial Government Environment and Natural Resources Office (PGENRO) who conducted the assessment of possible River Dredging Zones. Due to this project, several heavy equipment and trucks will be brought in causing increase in traffic along Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road. It is in this basis that this traffic impact study be conducted for the purpose of securing necessary clearance from the Local Government, the Environmental Management Bureau as well as other government agencies, if so required.

2.4.2.10.2 Objectives of the Study

487 The primary objective of this study is to develop a responsive and comprehensive traffic impact study that will guide the project proponent and the government in determining the need for any improvements to the affected roadway system, particularly the implementation of traffic management measures to alleviate traffic congestion brought about by the project by maintaining a satisfactory level of service and appropriate access provisions of the proposed project. This traffic impact study specifically:

- Evaluates the current traffic conditions on the road network within the study area.
- Estimates the future traffic volumes within the study area taking into consideration the proposed project and normal growth of existing traffic.
- Evaluates the traffic impact of the proposed land use development on the surrounding road network.
- Identifies and conceptually elaborates on possible traffic management improvement schemes and measures to address potential traffic congestion problems.
- Formulates appropriate traffic mitigating measures.

2.4.2.10.3 Study Area

488 **Figure 2-95** below presents the study area wherein the proposed Mompong River Restoration Project (indicated by the enclosed red shape) will be located, this is in the municipality of Sablayan, Mindoro Occidental. The main roadway affected is the Mindoro West Coastal Road as well as the JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road. These roads also serve as the only access to the project.

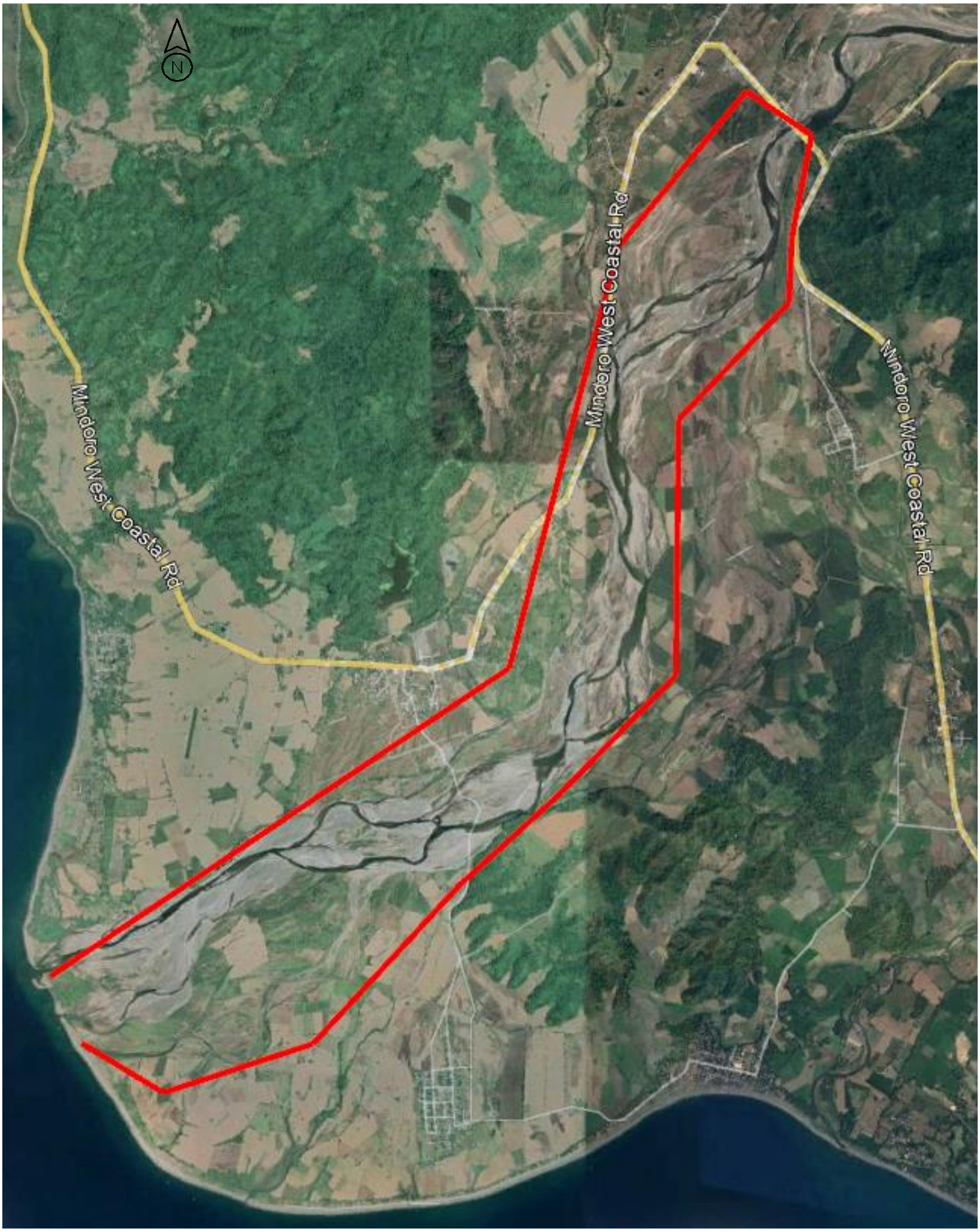


Figure 2-95. Study Area Coverage

2.4.2.10.4 Baseline Traffic Conditions

489 This section discusses existing traffic conditions along the roads within the identified study area. This covers inventory of roads and traffic performance measures such as volume and road Level of Service (LOS).

2.4.2.10.4.1.1 Road Inventory and Traffic Condition

490 Physical characteristics of the roadways within the study area, such as road function type, carriageway width, number of lanes, road pavement type, and other conditions were observed and recorded.

491 Identified roads in **Table 2-84** will be primarily affected by the project during the river restoration for a short period. The Mindoro West Coastal Road where the access to the project is located will be mainly affected during the river restoration period.

Table 2-84. Inventory of Roads

Road	Classification	Carriageway Width	Pavement Type	Roadside Friction
Mindoro West Coastal Road	National Secondary	6.7 m (2 lanes)	Concrete	Minimal
JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road	National Tertiary	6.7 m (2 lanes)	Concrete	Minimal

492 The Mindoro West Coastal Road (**Figure 2-96**) is a 2 way-2 lane roadway with a 6.7-meter carriageway width. It is classified as a National Secondary Road based on the Road Traffic Information of the DPWH.

493 On the other hand, the JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road (**Figure 2-97**) is also a 2 way-2 lane roadway with a 6.7-meter carriageway width but classified as a National Tertiary Road based on the Road Traffic Information of the DPWH.

494 An adequate shoulder of 2 meters is provided for both roads. Centerline is also well defined. Since there are few communities along the affected roads, roadside friction is minimal.

Figure 2-96. Mindoro West Coastal Road

Figure 2-97. JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road

2.4.2.10.4.2 Traffic Volume

495 There are 2 DPWH Traffic Survey Sites adjacent to the project area. These are SV42037MR_MC (purple circle) and SV42020MR_AC (green circle) shown in the figure below.

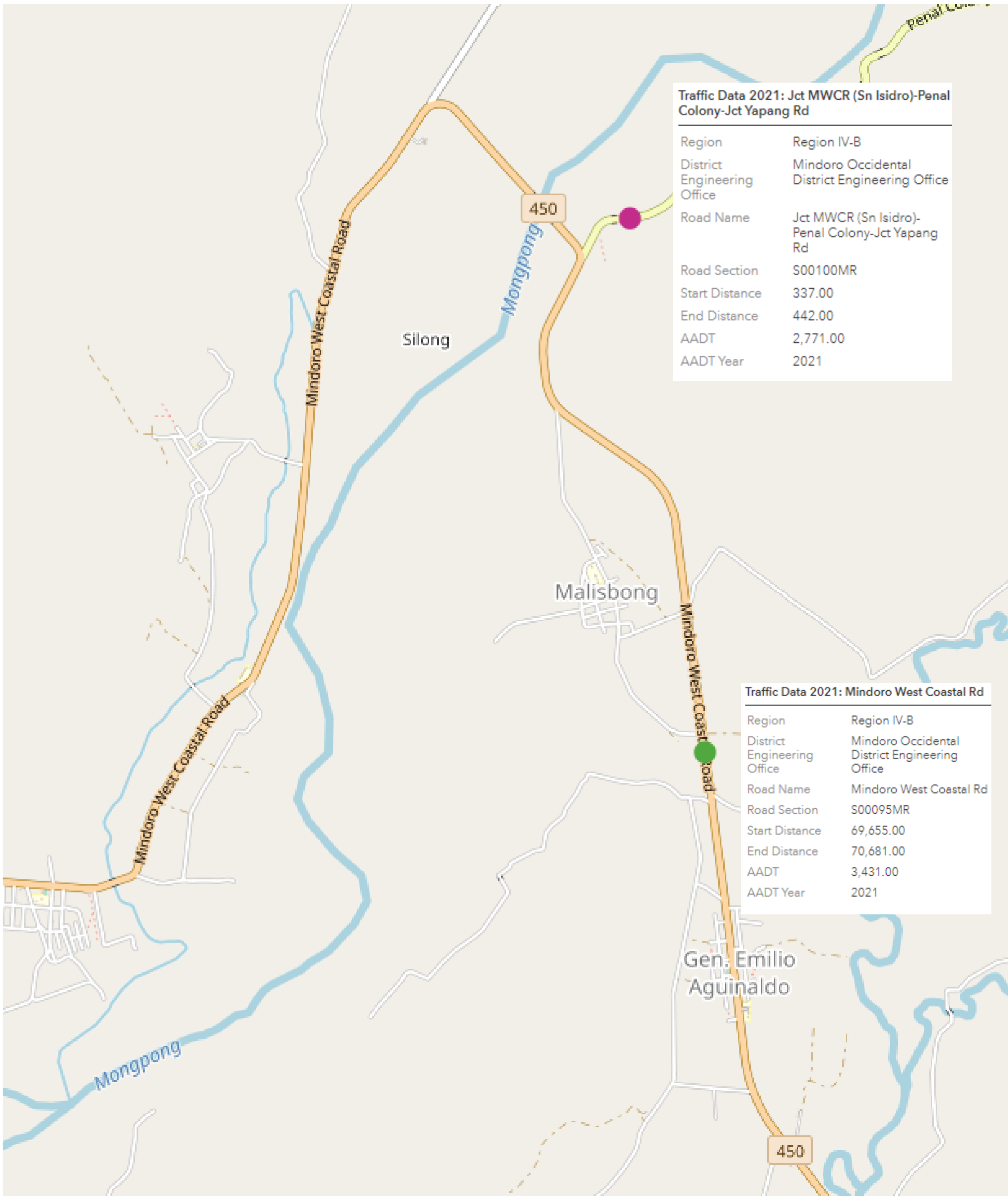


Figure 2-98. DPWH Traffic Survey Stations

496 According to the 2019 Annual Average Daily Traffic (AADT) from the DPWH records, there are 6,724 vehicles along Mindoro West Coastal Road while there are 1000 vehicles along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road. Out of the total vehicles, the portion of truck traffic is 5.1% along Mindoro West Coastal Road while 7.5% is along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road. However, the greater truck volume still exists along Mindoro West Coastal Road than along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road (343 vs 75). The table below presents the breakdown of vehicles for year 2019.

Table 2-85. Annual Average Daily Traffic (AADT)

Road Name	AADT	MOTOR-TRICYCLE	PASSENGER CAR	PASSENGER UTILITY	GOODS UTILITY	SMALL BUS	LARGE BUS 11 or 12	RIGID TRUCK (2 axles) 11	RIGID TRUCK (3+ axles) 12 or 22 or 13	TRUCK SEMI-TRAILER (3 and 4 axles) 12-1t	TRUCK SEMI-TRAILER (5+ axles) 12-2	TRUCK TRAILERS (4 axles) 11-11	TRUCK TRAILERS (5+ axles) 11-12
Mindoro West Coastal Rd	6724	4995	736	188	370	17	75	12	60	221	25	14	11
Jct MWCR (Sn Isidro)-Penal Colony-Jct Yapang Rd	1000	684	144	3	92	0	2	50	18	1	0	0	6

497 Furthermore, as previously presented in **Figure 2-98**, it can be noticed that the AADT along Mindoro West Coastal Road dropped in 2021 from 6,724 vehicles in 2019 to just 3,431 vehicles. While AADT along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road increased in 2021 from 1,000 vehicles in 2019 to 2,771 vehicles. Although, the decrease in vehicles can be attributed to the effect of the Pandemic, it still cannot be deduced that these changes in traffic volume are solely due to the pandemic since the opposite is observed along JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road.

498 Due to these inconsistencies in growth of traffic volume, the 2021 AADT will be utilized as the base volume for traffic forecast without relating the volume to other historical data.

2.4.2.10.4.3 Travel Speed

499 Travel speed is an important measurement that can be related to the observed volume of vehicles in order to identify the lane or road capacity in urban streets. The Figure below shows the relationship between speed, flow and density.

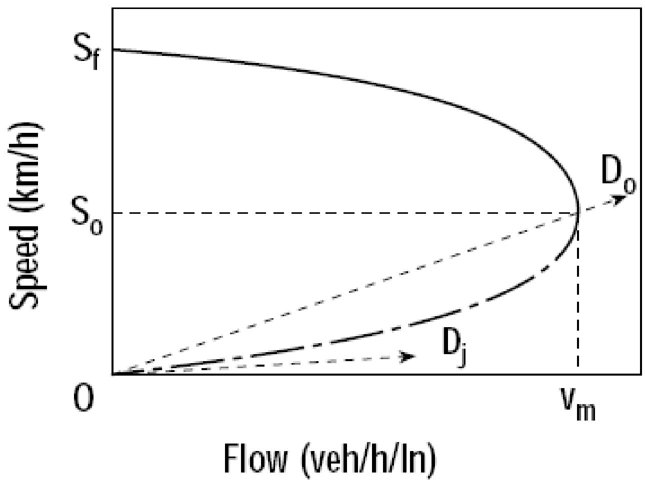


Figure 2-99. Speed-Flow Relationship

500 This means that critical speed occurs at critical density and maximum flow. So, during congestion, which may be due to several factors such as roadside friction, speed and flow are significantly lower that also relates to a low vehicle volume count.

501 The average travel speed along Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road are presented in the table below

Table 2-86. Average Travel Speed Along Observed Roads

Road	Average Speed (km/hr)
Mindoro West Coastal Road	57.5
JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road	47.0

2.4.2.10.4.4 Road Level of Service

502 Vehicle Capacity Ratio (VCR) is an indicator for road congestion level analysis. VCR can be computed by dividing the actual traffic volume (converted to Passenger Car Units – PCU) per hour by the estimated road capacity per hour. The computed VCR, depending on the range as shown in the table below, has corresponding Level of Service (LOS), that ranges from A to F**. Table 2-87** below shows the relationship between VCR and LOS.

Table 2-87. Volume Capacity Ratio and Level of Service

VCR	Characteristics	Level of Service (LOS)
0.00 – 0.19	Condition of free-flow with high speeds & low traffic volume	A
0.20 – 0.44	Stable Flow	B
0.45 – 0.69	Stable Flow; Drivers are restricted to select their speed	C
0.70 – 0.84	Approaches unstable flow with nearly drivers restricted	D
0.85 – 1.00	Flow unstable with momentary stop	E
> 1.00	Forced or congested flow at low speeds. Long queue and delays	F

Source: Highway Capacity Manual

503 Furthermore, to convert the traffic volume count data into passenger car units (PCU), the following factors were used as shown in the table below.

Table 2-88. Passenger Car Unit (PCU) Equivalent Factors

Motorcycle	Private Car	PU Van	PU Jeepney	PU Bus	Truck	Tricycle
0.5	1	1.5	1.5	2.5	2.5	0.7

504 The estimated peak hour volume is presented in the table below assuming a 10% peak hour volume based on the 2021 AADT. Both roads have very good level of service due to the low traffic volume.

Table 2-89. Average Travel Speed Along Observed Roads

Road	Peak Hour Volume (PCU)	VCR	LOS
Mindoro West Coastal Road	272	0.07	A
JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road	240	0.06	A

2.4.2.10.5 Expected Future Traffic Impact

2.4.2.10.5.1 Generated Trips from the Project

505 Considering the low volume along the Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road both having an LOS A, the future traffic especially during the project duration will mostly be increased by the truck trips and other project related trips but not significantly from the normal growth of traffic.

506 According to the Project Description, the project mine production will have 6.4 cubic meters of dredged materials/sand per year. The dredged materials will also be transported from the cutter dredging vessel and loaded to barges. Utilization of dump trucks will also be within the project site and the dump trucks may utilize the public roads during mobilization/demobilization and for some unplanned trips from time to time which if considered on a daily basis is not that significant to worsen the volume along Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road.

507 Moreover, for the purpose of assessment and impact mitigation, a worst-case scenario can be considered whereby 100% of the dump trucks will travel during the off-peak period. Granting that 10% of the AADT is usually observed during a particular peak hour (morning or afternoon), then 80% of the AADT may be distributed for the rest of the day. This 80% traffic can also be distributed on an hourly basis and on the average, 3.64% of the AADT can be allocated per hour. The table below presents the additional volume during off-peak hours.

Table 2-90. Generated Trips

Generator	Quantity	Average Off-Peak Hourly Trip	Total Daily Trips
Dump Truck	40	40	40 vehicle trips
Workers	19	0	0
Pick-up	3	3	6 vehicle trips

2.4.2.10.5.2 Traffic Growth Rate

508 In order to estimate future traffic demand, transport demand-income elasticities are set based on regional statistics and the result of traffic surveys. The transport demand-income elasticity is the rate of change of quantity of transportation services demanded with respect to rate of change in per capita income, and the idea is similar to income elasticities used in economics. The equation is expressed as follows:

$$TGR = \left[CPGR\left(\frac{I * E}{100} + 1\right) - 1\right] * 100$$

Where:
TGR : Traffic Growth Rate
$CPGR$: Compounded Population Growth Rate
I : Real Income Growth Rate (GRDP)
E : Passenger Transport Demand-Income Elasticity

509 This is the same formula applied in the Department of Public Works and Highway (DPWH) Highway Planning Manual.

510 The per capita GRDP and population growth rates are presented in the table below. These are

based on the data from the Philippine Statistics Authority. Moreover, the population growth rates considered are the average rates for the whole of Mindoro Island while the GRDP growth rate considered are for the whole MIMAROPA Region.

Table 2-91. Growth Rates of Per Capita GRDP and Population

Year	Population	Per Capita GRDP	GR (%)
2015	1,331,473	92	-
2020	1,407,623	109	3.52
2025	1,478,834	131	3.65
2030	1,542,856	157	3.79
2035	1,599,010	191	3.93
2040	1,646,817	233	4.06
2045	1,684,815	286	4.20

511 The following demand-income elasticities per vehicle type are presented as follows:

Table 2-92. Passenger Transport Demand-Income Elasticity Rates

Public Transport	1.246
Private Transport	1.412
Trucks	1.000

512 These rates are pre-calculated by DPWH based on household income and expenditure survey data from the Philippine Statistics Authority.

513 The estimated traffic growth rates are presented in the table below.

Table 2-93. Traffic Growth Rates

	2015-2020	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045
Public Transport	5.4%	5.6%	5.8%	6.0%	6.1%	6.3%
Private Transport	6.0%	6.2%	6.4%	6.6%	6.8%	7.0%
Trucks	4.6%	4.7%	4.8%	5.0%	5.1%	5.3%

514 An average growth rate of 5.9% is computed for public transportation, 6.5% for private transportation, and 5.3% growth rate is computed for trucks. Instead of the individual period growth rate by transport sector, the average is utilized to simplify the presentation of forecast.

2.4.2.10.6 Forecast

515 The forecast presents the traffic during a typical off-peak hour since project related trips will most likely happen during the off-peak periods. The table below assumes that the project will start in year 2023 up to year 2028. The succeeding table also presents the volume-capacity ratio and the equivalent level of service. All roads will be able to accommodate the volume of trips generated by maintaining a good level of service, A.

Table 2-94. Traffic Volume Forecast, Years 2021-2028

Road	Without Project		With Project					
	2021	2022	2023	2024	2025	2026	2027	2028
Mindoro West Coastal Rd	99	105	217	223	230	237	244	252
Jct MWCR (Sn Isidro)-Penal Colony-Jct Yapang Rd	87	92	203	209	215	221	227	234

Table 2-95. Level of Service, Years 2021-2028

Road	Without Project		With Project					
	2021	2022	2023	2024	2025	2026	2027	2028
Mindoro West Coastal Rd	0.02 (A)	0.03 (A)	0.05 (A)	0.06 (A)	0.06 (A)	0.06 (A)	0.06 (A)	0.06 (A)
Jct MWCR (Sn Isidro)-Penal Colony-Jct Yapang Rd	0.02 (A)	0.02 (A)	0.05 (A)	0.05 (A)	0.05 (A)	0.06 (A)	0.06 (A)	0.06 (A)

2.4.2.10.7 Traffic Recommendation

516 Based on the forecast, the project will minimally affect the road level of service. An additional of 40 truck trips (100 PCUs) during the off-peak period is assumed as the worst-case scenario that will be added to the existing traffic volume along Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road together with the 3 pick-up vehicles equivalent to 6 vehicle trips generated during the same off-peak period.

517 Although, Mindoro West Coastal Road and JCT MWCR (San Isidro)-Penal Colony-Jct Yapang Road will be able to maintain the LOS A for the whole 5-year project duration, it is still recommended to monitor the traffic condition especially in terms of safety and proper trip scheduling.

518 Thus, it is important that heavy equipment and vehicles be guided accordingly either through the traffic project personnel or through the assistance of any traffic enforcer from the Barangays or local government. The impact towards the road pavement should also be considered since additional pavement loading may be impleted which may shorten the road's durability.

2.4.2.10.8 Peace, Order, and Safety

2.4.2.10.8.1 Operation of the Women and Child Protection Unit

519 The Women and Child Protection Unit has been actively operating and functioning in the Municipality of Sablayan. As part of the program implemented by the Municipal Social Welfare and Development, in coordination with relevant offices, all victim-survivors who were placed in temporary custody underwent a series of counseling sessions involving members of their families. Also, part of the recovery program for sexually abused children, is referred to the Philippine Mental Health Center in Mandaluyong City for psychiatric and psychological evaluation.

520 The conduct of continuous information and education campaign activities such as Gender Sensitivity training for barangay officials, Barangay GAD Focal Point Systems, and LGU Frontliners has strengthened the advocacy for the prevention of child abuse. The unit also adheres to the provisions of various laws including, RA 9262, also known as Anti Violence against Women and their Children, RA 9344, also known as the Juvenile Justice Welfare Act, RA 9208, also known as the Anti Trafficking in Persons Acts of 2006, RA 7610, known as the Special Protection of Children against Child Abuse, Exploitation and Discrimination, and RA 8353, also known as the Anti Rape

Law.

2.4.2.10.8.2 Police

521 Aside from the Tanods, roaming around each barangay, Sablayan maintains peace, order, and safety through the provision of protective services. Crime incidents recorded by the police station in the year 2020 dropped to 55.73% or 85 crimes in total compared to 192 crime incidences of 2019. The inventory of protective services by facilities and equipment in Sablayan is presented in **Table 2-96,** while the recorded crime incidences in the four impact barangays are summarized in **Table 2-97.**

Table 2-96. Protective Services by Facilities and Equipment

Types Of Services	Location	Area (m^2)	Number of Personnel	Personnel to Population Ratio	Facilities/ Equipment	Condition
Police						
Head-Quarters	Buenavista	600	55	1; 1,152	3 Units Toyota Hi-Lux Patrol Vehicles 3 Units Patrol Motorcycles	HQ Demolished, Vehicle Serviceable
Sub-Station						
Outpost						
Traffic						
Women Detention Cell	Buenavista					Temporary HQ For PNP Personnel
PNP SAF	Sto. Nino	5,000	Classified	1:1,279		Temporary HQ
PNP RMFB	Sto. Nino	2000	Classified	1:884		Dilapidated Ceiling
Coast Guard	Poblacion	39	4	1/1 KM Coastline	Aluminum Boat	Serviceable
Philippine Army	Burgos	250	Classified	1:799		Temporary HQ
Substation	Pag-Asa	50	Classified			Temporary HQ
Fire Protection	Sto. Nino					
Head- Quarters	Buenavista	36	12	1:6,930	2 Units Firetrucks	Serviceable
Substation						
Jail Management						
Municipal Jail	Buenavista	39	1	1:83,169		
Women And Children Protection Unit	Buenavista		7	1:11,881	Fully Furnished	Serviceable

Source: Municipal Ecological Profile, 2020

Table 2-97. Crime Incidence in the Four Impact Barangays from 2018-2020

Barangay	2018	2019	2020
Malisbong	**6**	**24**	**0**
San Nicolas	**1**	**2**	**0**
Santa Lucia	**7**	**13**	**4**
Tuban	**3**	**0**	**0**

Source: Municipal Ecological Profile, 2020

2.4.2.10.8.3 Fire Protection

522 The Bureau of Fire Protection (BFP) in Sablayan was established in 1996. The bureau has two units of firetrucks which are both serviceable and in good condition. Activities regularly undertaken by the BFP include fire education campaign per barangay; conduct of safety inspection of establishments, implementation of Presidential Decree 1185 or the Fire Code of the Philippines; and fire volunteer brigade organization.

2.4.2.10.9 Local Economy

523 The economic base of Sablayan lies in its primary sector. Sablayan is traditionally an agricultural surplus area. It supplies the consumption requirements of neighboring Visayan Region and Metro Manila. Similarly, all impact barangays are also dependent on agriculture. There are three major crops produced in the municipality, such as rice, corn and banana. Except for Barangay Buenavista, all barangays produce rice and corn. Other crops being produced for commercial purposes include vegetables, mungbeans, and mangoes. Existing agricultural facilities and services in the four impact barangays are shown in **Table 2-98.**

Table 2-98. Existing Agricultural Facilities and Services in the Four Impact Barangays, 2020

Barangay	Post-harvest Facilities and Support Facilities
Malisbong	Multi-purpose drying pavement,
San Nicolas	Milling, Multi-purpose drying pavement, Mechanical Dryer, Warehouse
Santa Lucia	Milling, Multi-purpose drying pavement, Mechanical Dryer, Mobile Dryer, Warehouse
Tuban	Milling, Multi-purpose drying pavement, Mechanical Dryer, Mobile Dryer, Flat bed dryer, Warehouse

Source: Municipal Ecological Profile, 2020

524 Sablayan maintains a constantly increasing number of livestock and poultry production for the year 2020. All impact barangays are economically active in the following activities: piggery, cattle and goat raising, and poultry. Also, fishing is a way of life in Sablayan. The fishing industry has three sub-sectors: marine fisheries, aquaculture, and lakes. According to the records of the Office of Municipal Agriculture (2020), Barangays Santa Lucia, San Nicolas, and Tuban have existing fishing grounds and aquaculture production. In addition, existing industries which include fabrication of hollow blocks, rice mills and bagoong processing contribute to Sablayan's local economy. Based on the records, Santa Lucia is home to two manufacturing companies which produce hollowblocks and culverts.

525 According to the Ecological Profile of Sablayan (2020), the Municipality is endowed with various attractions both natural and man-made (beach resorts, restaurants, and other recreational facilities). At present, there are existing tourism sites in town that offer relaxation and recreation. These include Apo Reef Marine Natural Park, Pandan Grande Beach Resort, beach resorts, Mounts Iglit-Baco National Park, Pandurucan Falls, Mindoro Pines, Karungkaban Cave, Sablayan Museum, Presing Park Libuao Lake, Siburan Forest, Lumang Simbahan, Dugoy Festival, and Mangran Community.

526 In terms of the tertiary sector, Sablayan has six savings banks and 23 cooperatives offering credit and financial services to the residents. Moreover, there are only 19 barangays with established commercial areas which include the host communities of the project, except for Malisbong. Business and trade establishments engaged in retail merchandising are concentrated in the town proper, particularly at the market site. In the town proper alone, several establishments are carrying

out retail businesses such as sari-sari stores, dry goods stores, petroleum/gasoline filling stations, and marketing. Flea markets are also a common site in the town and even at the barangays.

2.4.2.10.10 Socioeconomic and Perception Survey

527 A socio-economic and perception survey was performed on the four direct impact barangays to determine the knowledge and sentiments of these communities towards the project. The perception survey was held last January 15 and 16, 2021 along with the information and education campaign (IEC) activities. Barangay health workers were tapped as enumerators, taking advantage of their superior knowledge of their own communities and neighborhoods. These local health workers were oriented about the project description and trained on answering the designed survey instrument.

528 A total of 348 respondents were interviewed on a face-to-face and one-to-one basis to gather basic information about their households and their views on the proposed project. Samples were taken from each purok or sitio of each host barangay to ensure that the survey would be as comprehensive as possible in terms of its reach. Sampling was done only during daylight hours and in light of safety and security considerations. The sample size was determined with a margin of error of ± 5 with a confidence level of 95%. Respondents were chosen in the following order of preference:

- Household head (who may be male or female but always a resident-household member who makes the major household decisions or is perceived to do so; the household head is usually the father but may also be the mother or the eldest child who is of majority age (18 years old);
- Spouse of the household head;
- Son or daughter who is at least 18 years old of the household head; or
- Other relative who is at least 18 years old of the household head.

529 In general, the survey aimed to develop appreciation of the communities' perceived ideas on the project and to serve as an avenue for the host communities to provide initial suggestions and recommendations to the project proponent.

2.4.2.10.10.1 Gender

530 There were generally more females (61.21%) than males (38.79%) who were interviewed for the survey. Among the four barangays, only Sta. Lucia posted a slightly higher number of male respondents than females (**Table 2-99**).

Table 2-99. Gender Profile of the Respondents

Gender	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
Male	30	27.03	11	21.15	60	53.57	34	46.58	135
Female	81	72.97	41	78.85	52	46.43	39	53.42	213
Total	111	100.00	52	100.00	112	100.00	73	100.00	348

2.4.2.10.10.2 Age

531 In terms of age, most respondents are within the range of 30-34 (16.09%). The least significant number of respondents was recorded both within the youngest (15-19) and the eldest range (>75) at 0.86%. As shown in **Error! Reference source not found.**, Malisbong and San Nicolas' r espondents are mostly within the age range of 40-44, Sta. Lucia at 30-34, and Tuban at 35-39.

Table 2-100. Age Profile of the Respondents

Age	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
15-19	1	0.90	1	1.92	0	0.00	1	1.37	3
20-24	7	6.31	3	5.77	9	8.04	5	6.85	24
25-29	7	6.31	3	5.77	8	7.14	10	13.70	28
30-34	16	14.41	10	19.23	19	16.96	11	15.07	56
35-39	16	14.41	5	9.62	14	12.50	14	19.18	49
40-44	17	15.32	12	23.08	18	16.07	3	4.11	50
45-49	13	11.71	4	7.69	15	13.39	11	15.07	43
50-54	10	9.01	4	7.69	5	4.46	7	9.59	26
55-59	9	8.11	4	7.69	5	4.46	6	8.22	24
60-64	6	5.41	4	7.69	12	10.71	4	5.48	26
65-69	6	5.41	1	1.92	5	4.46	0	0.00	12
70-74	2	1.80	0	0.00	1	0.89	1	1.37	4
>75	1	0.90	1	1.92	1	0.89	0	0.00	3
Total	111	100.00	52	100.00	112	100.00	73	100.00	348

2.4.2.10.10.3 Civil Status

532 The majority of the interviewed individuals in all barangays were married (73.28%), widow (7.47%), and single (6.90%). The highest number of separated respondents was recorded at Tuban (5.4%), while those who are in a live-in relationship were recorded at 4.60%. Only 2.01% of the total respondents did not declare their civil status (**Table 2-101**).

Table 2-101. Civil Status of the Respondents

Civil Status	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
Single	3	2.70	6	11.54	10	8.93	5	6.85	24
Married	83	74.77	40	76.92	80	71.43	52	71.23	255
Widow	11	9.91	4	7.69	8	7.14	3	4.11	26
Separated	1	0.90	0	0.00	3	2.68	4	5.48	8
Others	8	7.21	2	3.85	2	1.79	0	0.00	12
No Response	5	4.50	0	0.00	1	0.89	1	1.37	7
Common-law/ Live-in	0	0.00	0	0.00	8	7.14	8	10.96	16
Total	111	100.00	52	100.00	112	100.00	73	100.00	348

2.4.2.10.10.4 Highest Educational Attainment

533 As presented in **Table 2-102,** half of the respondents from the four barangays were able to enter primary schooling and almost 40% reached high school. Tuban and Malisbong posted the highest number of respondents who went through college, at 16.44% and 11.71%, respectively.

Table 2-102. Highest Educational Attainment of the Respondents

Highest Educational Attainment	Malisbong	%	San Nicolas	%	Santa Lucia		Tuban	%	Total
None	0	0	1	1.92	0	0	2	2.74	3
Elementary	37	33.33	22	42.31	70	62.5	45	61.64	174
High School	54	48.65	21	40.38	29	25.90	7	9.59	111
Vocational	7	6.31	2	3.85	2	1.79	7	9.59	18
College	13	11.71	6	11.54	11	9.82	12	16.44	42
Total	111	100.00	52	100.00	112	100	73	100.00	348

2.4.2.10.10.5 Religion

534 Roman Catholicism (RC) is the predominant religion in all four impact barangays. This is followed by Iglesia ni Cristo (12.93%), which is also the only religion identified in Malisbong, aside from RC. Other religions present in the areas are enumerated in **Table 2-103.**

Table 2-103. Religious Affiliations of the Respondents

Religion	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
Roman Catholic	70	63.06	47	90.38	94	83.9	61	83.56	272
Protestant	0	0.00	1	1.92	4	3.6	2	2.74	7
Baptist	0	0.00	1	1.92	0	0.0	1	1.37	2
Iglesia Ni Cristo	41	36.94	2	3.85	2	1.8	0	0.00	45
Adventist	0	0.00	0	0.00	3	2.7	0	0.00	3
Born Again Christian	0	0.00	0	0.00	1	0.9	4	5.48	5
Four square	0	0.00	0	0.00	3	2.7	2	2.74	5
Shepperd of my soul	0	0.00	0	0.00	0	0.0	2	2.74	2
United Church of Christ in the Philippines	0	0.00	0	0.00	0	0.0	1	1.37	1
Others (unspecified)	0	0.00	1	1.92	5	4.5	0	0.00	6
Total	111	100.00	52	100.00	112	100.0	73	100.00	348

2.4.2.10.10.6 Length of Residency

535 Almost 30% of the respondents reside in their respective barangays for about 31-40 and 41-50 years. This is also true for the respondents from Sta. Lucia and Tuban. Most of these residents are naturally born in the same areas of their current residency. At the barangay level, many respondents from Malisbong (28.83%) and San Nicolas (26.92%) have indicated that they have been living in the same places for 41-50 years (**Table 2-104**).

Table 2-104. Length of Residency of Respondents in Respective Communities

Length of Residency in the area (years)	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
0-10	7	6.31	9	17.31	18	16.07	10	13.70	44
11-20	18	16.22	3	5.77	7	6.25	9	12.33	37
21-30	24	21.62	13	25.00	17	15.18	9	12.33	63
31-40	23	20.72	11	21.15	34	30.36	25	34.25	93
41-50	32	28.83	14	26.92	20	17.86	7	9.59	73
50 and above	5	4.50	1	1.92	13	11.61	11	15.07	30
No Response	2	1.80	1	1.92	3	2.68	2	2.74	8
Total	111	100.00	52	100.00	112	100.00	73	100.00	348

2.4.2.10.10.7 Household Size and Primary Source of Income

536 During the survey, each respondent was also asked the total number of household members. The highest calculated household size was determined in San Nicolas at 5.3, followed by Malisbong and Tuban at 5.1, and Sta.Lucia at 4.8. The average household size for these barangays is 5.2. As presented in **Table 2-105**, nearly half of the respondents' primary source of income within their household comes from farming (45.9%). Other identified sources include retail businesses (14.66%), fishing (12.93%), and other informal jobs with no fixed tenure or pay (9.77%), such as scrap collectors, tricycle drivers, construction workers, laundry, etc.

Table 2-105. Primary Source of Household Income

Primary Source of Household Income	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
Regular Employment	4	3.60	1	1.92	3	2.68	17	23.29	25
Contractual Employment	6	5.41	0	0.00	0	0.00	0	0.00	6
Retail Business	14	12.61	8	15.38	14	12.50	15	20.55	51
Fishing	1	0.90	10	19.23	33	29.46	1	1.37	45
Farming	70	63.06	18	34.62	42	37.50	30	41.10	160
Family Business	4	3.60	1	1.92	7	6.25	10	13.70	22
Remittances	1	0.90	0	0.00	4	3.57	0	0.00	5
Others, not specified	11	9.91	14	26.92	9	8.04	0	0.00	34
Total	111	100.00	52	100.00	112	100.00	73	100.00	348

2.4.2.10.10.8 Household and Community Concerns

537 In the four impact barangays, common household problems raised by the respondents are mostly focused on their socioeconomic condition, such as:

- Lack of livelihood opportunities and sustainable sources of income
- Financial instability
- Continuous increase in food and commodity prices
- Inaccessible healthcare services

- Impacts of the current pandemic

538 On the other hand, pressing community problems that were identified during the survey are multifaceted issues, which include the following:

- Impacts of climate change
- Immense flooding in the area
- Inadequate water supply during dry seasons
- Low crop production and altered cropping pattern
- Poor waste management practice
- Limited financial resources of majority of the residents
- Limited job opportunities for the locals
- Slow development
- Child labor
- Early marriage and pregnancy
- Political disputes of officials
- Inaccessible healthcare services
- Impacts of the current pandemic

2.4.2.10.10.9 Perceptions about the Project

539 As revealed by the results, more than half (67.24%) of the respondents were still uninformed of the project. None of the respondents from Malisbong were aware of it, whereas the highest level of project awareness was identified in Tuban at 45. 21%.

Table 2-106. Awareness on the Project

Project Awareness	Malisbong	%	San Nicolas	%	Sta Lucia	%	Tuban	%	Total
Aware	0	0.00	21	40.38	29	25.9	33	45.21	83
Unaware	88	79.28	30	57.69	76	67.9	40	54.79	234
No response	23	20.72	1	1.92	7	6.3	0	0.00	31
Grand Total	111	100.00	52	100.00	112	100.0	73	100.00	348

540 For the respondents who were affirmative when asked if they were aware of the project, 42.17% of them had learned the information from barangay officials and 28.92% from their neighborhoods. The other 25.30% had heard about the project from other sources which they do not want to disclose, while the remaining 3.61% got their ideas from the initial IEC activities of the proponent (**Table 2-107**).

Table 2-107. Sources of Information

Source of Information	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
Neighbors	5	23.81	15	51.7	4	12.12	24
Barangay Officials	13	61.90	12	41.4	10	30.30	35
IEC Activities of the Proponent	0	0.00	1	3.4	2	6.06	3
Others, not specified	3	14.29	1	3.4	17	51.52	21
Total	21	100.00	29	100.0	33	100.00	83

541 According to **Table 2-108**, employment opportunities (28.82%), effective flood mitigating measures (22.60%), development of livelihoods and relevant business (19.98%), and road and other infrastructure improvements (18.34%) were the leading perceived project benefits by the respondents.

Table 2-108. Perceived Project Benefits

Perceived Project Benefits	Malisbong	%	San Nicolas	%	Santa Lucia	%	Tuban	%	Total
Employment opportunities	106	21.33	40	34.19	64	41.29	54	36.73	264
Development of livelihoods and relevant businesses	106	21.33	27	23.08	17	10.97	33	22.45	183
Influx of tourists	78	15.69	2	1.71	4	2.58	4	2.72	88
Road and other infrastructure improvements	108	21.73	21	17.95	23	14.84	16	10.88	168
Effective flood mitigating measure	98	19.72	27	23.08	43	27.74	39	26.53	207
Others, not specified	1	0.20	0	0.00	4	2.58	1	0.68	6
Total	497	100.00	117	100.00	155	100.00	147	100.00	916

542 Aside from the discussed project benefits, the respondents are also expecting adverse impacts during project implementation. These impacts include issues of health and safety (42.54%) and environmental degradation (35.07%). Concerns from the former were anchored on possibilities of drowning due to change in river depth and health-related problems due to the increase in level of air and noise pollutants during mobilization of equipment and actual operation. For the latter, disturbance of faunal species and their habitat (both in land and water) and change in fresh water quality were considered.

Table 2-109. Perceived Adverse Project Impacts

Anticipated Adverse Project Impacts	Malisbong	%	San Nicolas	%	Sta Lucia	%	Tuban	%	Total
Health and safety concerns	1	3.33	36	39.13	27	48.21	50	55.56	114
Environmental degradation	29	96.67	23	25.00	9	16.07	33	36.67	94
Waste management issues	0	0.00	9	9.78	14	25.00	6	6.67	29
Loss of livelihood	0	0.00	23	25.00	6	10.71	1	1.11	30
Others	0	0.00	1	1.09	0	0.00	0	0.00	1
Total	30	100.00	92	100.00	56	100.00	90	100.00	268

543 The overall project impression was asked to each respondent by rating their general perception towards it. The rating was guided by the question, "*Do you think the project is geared towards the betterment of the community? Kindly rate your impression from 1-10, where "10" means that the project is generally promising while "0" means that the project is nonsense at all."* According to the computed average ratings, respondents from Malisbong generally perceived the project as beneficial and promising since it was seen as an effective measure to mitigate flooding problems and a magnet of employment opportunities for the locals. For San Nicolas and Tuban, a neutral grade of 5 was given due to the respondents' mixed sentiments on the project's benefits and adverse impacts. The said impression may also be attributed to the respondents' lack of knowledge and deeper understanding of the project. The same remark is also true for the calculated rate, 6, in Sta. Lucia. The slightly skewed rating for the latter may also be linked to the comments, "*Although I do not have much knowledge of the project, I think the positive impacts will come through if proper implementation is managed and observed*." Therefore, continuous IEC and public consultation activities should be done to fully further the stakeholders' understanding and appreciation of the project. The detailed rating justifications are summarized in **Table 2-110.**

Table 2-110. General Comments on the Project

Reasons for High Ratings	Reasons for Low Ratings
• Flood mitigation • Erosion control • Employment opportunities • Boost local economy • Possible improvement of roads and other infrastructure • Entails significant positive impacts when properly implemented	• Disturbance on the livelihood of fisherfolks and farmers • Entry of private entities in the communities • Scarcity of sand and gravel after project implementation • Saline intrusion • Disturbance of faunal species • Lack of consultation and knowledge on the project • Change in river depth may cause health and safety issues

2.4.2.10.11 Key Informant Interview (KII) and Informal Community Dialogues

544 Key informant interviews (KII) and Informal Community Dialogues were conducted among residents and sectoral representatives of the four impact barangays along with the conduct of IEC activities last January 15 and 16, 2021. Pre-formulated questions were asked to these respondents to solicit their awareness, knowledge, and perceptions towards the project and its underlying aspects. The highlights of findings are summarized in **Table 2-111.**

Table 2-111. Findings of KII and Informal Community Dialogues

Aspects	Key Findings
Awareness and knowledge on the Project	• Majority of the respondents are unaware of the project • Only a few have little and insufficient knowledge of the proposed undertaking.
Anticipated Project impacts	• Health and safety of residents within the vicinity of the project area • Air and noise pollution • Environmental degradation • Change in the depth of the river • Loss of livelihood of fisherfolks
Proposed mitigation on the identified impacts	• Employment of applicable technology • Livelihood opportunities initiated by the proponent • Use of environmental-friendly engineering measures • Provision of signages and signals during operation • Provide and implement environmental management plan and social development plans.
Perceived Project benefits	• Employment for the locals • Flood control • Improvement of infrastructures
General Perception on the Project	• Respondents have mixed sentiments towards the project • Extremes and neutral ratings towards the perceived benefits of the project are observed for several reasons, which include: political influence, impact on the environment and the quality of life of the residents, and zero to little knowledge of the Project, including its processes.

2.4.3 Impact Assessment

2.4.3.1 In-migration/ Proliferation of informal settlers

545 A temporary influx of workers can be expected during the operation phase of the Project, which may lead to the proliferation of informal settlers in the impact barangays. To ensure maximum benefit for the host community, it is recommended to the Proponent or its contractors to prioritize qualified local residents as their workers (of any type) during project implementation. The proponent will encourage migrant workers to participate in social activities and social development programs to interact with the community. On the other hand, coordination with the barangays and LGU will be undertaken to monitor and prevent the encroachment of informal settlers within the vicinity.

2.4.3.2 Displacement of settlers

546 There are no existing settlements on the river where the dredging activity will take place. Thus, the project has no involuntary resettlement impacts.

2.4.3.3 Threat to delivery of basic services/ resource competition

547 Community operations will not be significantly affected during the whole project implementation. Service utilities will not be disrupted once the project is in operation. The power, water and other utilities requirements of the project will be integrated into implementation plan and would not deprive the public to access to such utilities. In addition, the project will even augment the services and resources of the host communities because of the revenue and development programs that it will bring to the barangays and municipality.

2.4.3.4 Cultural/Lifestyle Change

548 Nuisance and alteration in the routine of the residents and circulating population in the project's area of influence are expected during the operation phase. As a response, the following measures must be implemented:

- Implement and continuously monitor the effectiveness of the measures for managing the impacts of increased levels of noise and vibration, changes in air and water quality, ensuring the minimization of potential discomfort to the neighbors of the site during the operation phase;
- Implement actions to proactively communicate changes and annoyances to the neighbors of the site during the operation phase through the social management and development plan; and
- Monitor the stakeholders' grievances related to the project's operation, through a grievance redress mechanism, and implement specific measures to manage impacts to reduce the number of manifestations.

549 On the other hand, implementation of the project will improve the standard of living of some residents in the host locations brought about by additional jobs and higher household incomes. As a result, the affected families will be capable of giving their children proper education and widen their opportunities. The only possible negative impact of having increased financial resources is to be lured to vices like gambling, drinking or even illegal drugs, which will may lead to more serious problems.

2.4.3.5 Threat to public health and safety

550 Given the temporary influx of workers during the operation phase, daily interactions between non-locals and locals are expected to occur. The presence of such non-local workers in this Project is unlikely to cause the prevalence of new diseases on the local community or social problems. However, as the interaction with non-local workers will not be limited, mitigation measures should be adopted to manage social ills, conflict and the spread of communicable diseases.

551 Aside from noise, potential air and water pollutants that will be generated during project implementation may bring adverse impacts on the health and safety of the workers and residents of nearby communities. To respond to these, preparation and implementation of an Environmental Management Plan and Social Development and Management Plan will be done by the proponent. In addition, workers may be exposed to ergonomic stress and increased levels of noise and heat, as well as physical hazards associated with moving heavy equipment and vessels. An Occupational Health and Safety Management Plan will be implemented by the proponent during the operations stage.

2.4.3.6 Generation of local benefits from the project

552 Direct benefits would include employment opportunities for local skilled and unskilled workers during the operation phase. Hiring information including minimum employment requirements for local hires will be provided to the LGU and the local barangay officials to ensure that local workers are given the chance to be employed by the Project. Although there are employment opportunities which may be brought by implementing the project, residents whose livelihoods are dependent on the water bodies may be greatly affected during and after the project's operation. Thus, a community-driven social development and management plan must be prepared to incorporate their needs and recommendations.

553 In general, improvement in demand for local services and commerce is expected during project operations. When the mobility and demands for goods and services boomed as a spill-over impact of the project, taxes, incentives, and fees from the project during its operation phase will absolutely increase the revenue generated by the LGU. This impact is a natural consequence of the project's development. Thus, no enhancement measure is recommended.

2.4.3.7 Traffic congestion

554 Traffic congestion is not a significant concern since the project will not utilize inland road networks. All equipment that will be used will be brought via dredger vessels. Transportation of dredged materials will also be done via sea travel. However, transport of provisions such as food and other operational needs will follow a regular road network and other existing access points. A traffic protocol coordinated with concerned barangays and LGU will be established and will be adopted as part of operational procedures.

2.4.4 Summary of Potential Impacts/ Options for Prevention or Mitigation or Enhancement for People

Potential Impact	Phases			Prevention, Mitigation and Enhancement Measures
	Preconstruction	Development and Operation	Abandonment	
In-migration/		√		Prioritize hiring of qualified local residents.
Proliferation of informal settlers		√		Coordination with the barangays and LGU to monitor and prevent the encroachment of informal settlers within the vicinity.
Threat to delivery of basic services/ resource competition		√		The project will even augment the services and resources of the host communities because of the revenue and development programs that it will bring to the barangays and municipality
Cultural/Lifestyle Change		√	√	Implement and continuously monitor the effectiveness of the measures for managing the impacts of increased levels of noise and vibration, changes in air and water quality, ensuring the minimization of potential discomfort to the neighbours of the site during the operation phase; Implement actions to proactively communicate changes and annoyances to the neighbours of the site during the operation phase through the social management and development plan; and Monitor the stakeholders' grievances related to the project's operation, through a grievance redress mechanism, and implement specific measures to manage impacts to reduce the number of manifestations.
Threat to public health and safety		√	√	Utilization of appropriate technologies and engineering measures during project implementation; Preparation and implementation of the Environmental Management Plan, Social Development and Management Plan, and Occupational Health and Safety Plan.
Generation of local benefits from the project		√	√	Community-driven social development and management plan for residents whose livelihoods are dependent on the water bodies.
Traffic congestion		√	√	Establishment of traffic protocol coordinated with concerned barangays and LGU for the transport of provisions such as food and other operational needs.

3 ENVIRONMENTAL RISK ASSESSMENT

555 Environmental Risk Assessment is an evaluation tool for an activity that determines the level of hazard that it may pose to humans, properties, and to the environment. In the RPM of DAO 2003-30, it is defined as an *"assessment through the use of universally-accepted and scientific methods, of risks associated with a Project."* It gives emphasis to the determination of the probability of occurrence and magnitude of consequences of accidents (e.g., failure of containment or exposure to hazardous chemicals or situations).

556 In the context of the Philippine EIS System, this ERA primarily focused on safety risks characterized by low probability, high consequence, accidental nature, and acute effects.

557 For the Project, an ERA is unnecessary since its activity does not qualify within the criteria as indicated in Section II-A of Annex 2-7e of the DAO 2003-30 or the Revised Procedural Manual. **Table 3-1** shows the applicability of risk screening to the Project.

Table 3-1. Risk Screening Applicability

<table>
<tr><th colspan="4">Activities Requiring Risk Screening Exercise</th><th>ERA Applicability to the Proposed Project</th></tr>
<tr><td colspan="4">1) Facilities for the production or processing of organic/inorganic chemicals using:</td><td>Not Applicable</td></tr>
<tr><td>Alkylation
Amination
Carbonylation
Condensation
Dehydrogenation</td><td>Esterification
Halogenation
Hydrogenation
Hydrolysis
Oxidation</td><td>Polymerization
Sulphonation
Desulphurization
Nitration
Phosphorus prod.</td><td>Distillation
Extraction
Solvation
Pesticides & pharmaceutical prod.</td><td>Not Applicable</td></tr>
<tr><td colspan="4">2) Installations for distillation, refining, and other processing of petroleum products</td><td>Not Applicable</td></tr>
<tr><td colspan="4">3) Installations for total or partial disposal of solid or liquid substances by incineration or chemical decomposition</td><td>Not Applicable</td></tr>
<tr><td colspan="4">4) Installations for the production or processing of energy gases (i.e., LPG, LNG, SNG)</td><td>Not Applicable</td></tr>
<tr><td colspan="4">5) Installations for the dry distillation of coal or lignite</td><td>Not Applicable</td></tr>
<tr><td colspan="4">6) Installations for the production of metals and non-metals by wet process or electrical energy</td><td>Not Applicable</td></tr>
<tr><td colspan="4">7) Installations for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 29)</td><td>Not Applicable</td></tr>
<tr><td colspan="5">CONCLUSION: Risk screening level exercise is not applicable</td></tr>
</table>

4 ENVIRONMENTAL IMPACTS MANAGEMENT PLAN

558 The Environmental Impacts Management Plan (EIMP) provides the Project's key components that will likely be affected and the corresponding mitigation and enhancement principles, practices, and technologies aimed to minimize and/or to eliminate the potential impacts to the environment. The proposed Project will inevitably create various impacts, both positive and negative, throughout the Pre-Construction, Construction, Operations, and Abandonment phases (abbreviated as P, C, O, A, respectively, in the table). This EIMP will aim to mitigate and enhance the negative and positive impacts of the Project, respectively. Error! Reference source not found. shows the Impact M anagement Plan.

Table 4-1. Impact Management Plan

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
LAND										
Land Use Conversion	Land Use	Change/ Inconsistency in land use	✓				• No change in land use, however ensure that dredging permitting and other relevant clearance have been obtained before operation	BNRC	Included in Project Cost	Securing Proper Clearance and Permits
Access Road Preparation	Terrestrial Ecology	Disturbance to wildlife due to site preparation and vegetation clearing activities	✓	✓	✓		• Avoid unnecessary clearing, cutting of vegetation. • Replacement planting/ offsetting must be done in identified sites of restoration by DENR	BNRC	Included in Project Cost	Securing Proper Tree Planting Permits and other clearances
Disposal of solid and hazardous waste	Soil Quality and Fertility	Soil Quality / Land contamination due to improper solid waste disposal		✓	✓	✓	• Implement re-use and recycling of waste materials; • Implement proper segregation, collection, and disposal of domestic wastes in the project area; • Provide receptacles/bins for solid wastes; • Coordinate with the municipal / city waste collectors; • Daily inspection of waste/recycling bins for segregation;	BNRC	Included in Project Cost	Include accomplishment to SMR

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
							• Daily inspection for the presence of mixed garbage in the project area; • Weekly inspection of waste accumulated • Proper maintenance of heavy equipment/vehicles (oil leaks)			
WATER										
Dredging Operations	Hydrogeology	Risk to safety and equipment damage due to flooding/Contribution to flooding	✓		✓		• Precautionary measures should be taken upon occurrence of flooding to secure safety of personnel and equipment.	BNRC and its contractors	Included in Project Operations Cost	Preparation of Emergency Response Plan
Dredging Operations	Water Quality	Water quality degradation, Turbidity			✓		• Installation of Silt Curtain in case of necessity	BNRC and its contractors	Included in Project Operations Cost	Include accomplishments in CMR
Dredging Operations	Water Quality	Oil Contamination in the river		✓	✓	✓	• Dredging equipment must be designed and • maintained to reduce the possibility of silt, sediments, contaminants, or other pollutants being discharged elsewhere than the intended area or dispersed into the water body.	BNRC and its contractors	Included in Project Operations Cost	Include accomplishments in CMR and SMR

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
Dredging Operations	Water Quality	Water quality degredation due to improper domestic waste disposal		✓	✓		• Setting-up proper and adequate sanitary facilities; • Strictly require the workers to observe proper waste disposal and proper sanitation; • Strictly observe proper waste handling and disposal;	BNRC and its contractors	Included in Project Operations Cost	Include accomplishments in CMR and SMR
AIR										
Release of Air pollutants from Vehicles and Construction Equipment	Air Quality	Air pollution source installations (heavy equipment and Vehicles for Transport)	✓	✓	✓	✓	• Properly operate and maintain all emission sources pursuant to the Philippine Clean Air act of 1999 (R.A. 8749) and its Implementing Rules and Regulations (DAO 2000-81); • Strictly enforce good housekeeping practices to minimize/control emission of air pollutants • Regular maintenance of heavy equipment, service vehicles, and other motor vehicles to be used during project construction and operation	BNRC and its contractors	Included in Project Operations Cost	Include accomplishments in CMR and SMR Inclusion of equipment maintenance in contracts with contrators

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	C	O	A				
Increase in dust from construction activities	Air Quality	Generation of suspended particulates caused by construction and demolition activities		✓		✓	• Provision of appropriate covers for haul trucks hauling debris excavated materials and other materials that likely generate fugitive emissions • Strictly enforce good housekeeping practices to minimize/control emission of air pollutants; • Regular watering in the demolition area to prevent dust from accumulating; • Provide containment barriers within the project site to contain the generation of dust and other air pollutants caused by demolition activities; and • Regularly monitor presence/absence of complaints	BNRC and its contractors	Included in Project Operations Cost	Include accomplishments in CMR and SMR Inclusion of equipment maintenance in contracts with contrators
Increase in noise levels from construction activities and decommissioning activities	Noise	Noise generated by construction and operation activities of the project		✓	✓	✓	• Impose speed limits at access roads and within the construction site • Regulate or reduce use of equipment at nighttime, especially equipment that emits high noise levels	BNRC and its contractors	Included in Project Operations Cost	Include accomplishments in CMR and SMR Inclusion of equipment maintenance in contracts with contrators

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
							• Properly operate and maintain all noise sources (e.g., vehicles, generator, etc.); • Install when applicable, the appropriate noise control device/s (e.g., mufflers, silencer, sound barriers, etc.); • Implement appropriate operating hours of noisy equipment to prevent nuisance to the surrounding community; and • Regularly monitor presence/absence of complaints			
PEOPLE										
Economic Benefits	Socio-Economics	Project Benefits	✓	✓	✓		• Support to LGU's Development Plan. • Coordinate with the LGU to enhance local benefits; Updating of Provincial Plan and LGU CLUPs & CDPs to enhance local benefits; Preparation of Barangay Development Plan to identify local projects that would respond to local needs and enhance local benefits of the project	BNRC and its contractors	Included in Project Cost	Included in the SDP Include accomplishment to SMR

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
Economic Benefits	Socio-Economics	Generation of employment and taxes		✓	✓		In order for the community to benefit from the Project, the proponent will do the following: • Prioritize local residents for employment; • Initiate livelihood and business opportunities • Promptly pay local taxes and other financial obligations; • Regularly monitor presence/absence of complaints; and • Regularly coordinate with the Local Government Unit	BNRC and its contractors	Included in Project Cost	Included in the SDP Include accomplishment to SMR
Cessation of project activities	People	Loss of employment/ possible retrenchment of personnel due to business closure				✓	• Provide proper compensation and/or alternative livelihood and training programs to retrenched employees Coordinate with LGUs for possible employment and/or livelihood training.	Contractor Environment and Community Relation (ComRel) Group/ BNRC	Cost to be determined during preparation of Abandonment/ Decommissioning Plan	Included in the SDP Include accomplishment to SMR
Securing of right-of-way property acquisition	Infrastructure	Displacement and loss of livelihood of residents during ROW land acquisition.	✓				• Preparation of Resettlement Action Plan (RAP), Securing Right of Way (ROW), and Land Acquisition. • Coordination with LGU's regarding RAP and compensation will facilitate clearing of affected areas.	Contractor Environment and Community Relation (ComRel) Group/ BNRC	Part of LGU negotiations Included in Project Cost	Include accomplishment to SMR

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
Construction of access roads, and Dredging Operations.	Public Health and Safety	Exposure of workers and employees and (potentially) the local community on health and safety risks		✓	✓	✓	The following can minimize the exposure of workers, employees, and community to health and safety risks: • Provide appropriate warning signs, lighting, and barricades, whenever practicable, to minimize safety risks to the community and workers; • Observe proper housekeeping in the project site; • Provide on-site medical services for any emergency; • Participate in public awareness programs on health and safety; • Implement appropriate safety programs for both community and workers; • Strictly comply with fire, safety and similar regulatory requirements; • Strictly comply with requirements of RA 6969; • Monitor presence/Absence of complaints; • Regularly coordinate with the Local Government Unit and regularly submit monitoring results to the concerned agencies; and	BNRC	Included in Project Cost	Include accomplishment to SMR

Environmental Aspect	Environmental Component Likely to be Affected	Possible Environmental and Social Impacts	Phases				Options for Prevention, Mitigation, or Enhancement	Responsible Entity	Cost	Guarantee Financial Arrangements
			P	*C*	*O*	*A*				
							• Provide the appropriate personal protective equipment (PPE) to all workers within the project site pursuant to the Philippine Occupational Safety and Health Standards of BWC-DOLE • Compliance with DOE DC No. 2012-11-0009: Renewable Energy Safety, Health and Environment Rules and Regulations (RESHERR)			
Construction and Dredging operations	Public Safety	Increase in injury and/or accident as a result of increased vehicle activities		✓	✓		• Installation of warning signs in construction areas. • Implement speed limits in the project area. Limit access to construction areas.	BNRC	Included in Project Cost	Include accomplishment to SMR
Construction and Dredging operations	People	Threat to workers safety		✓	✓		• Implement Road Transport Safety Program • Regular inspection of equipment; proper PPE and health standards	BNRC	Included in Project Cost	Include in Construction Contract Preparation of Safety and Health Policy

5 SOCIAL DEVELOPMENT AND IEC FRAMEWORK

5.1 Social Development Plan Framework

559 The Social Development Plan Framework (SDPF) is intended to address the issues, concerns and impacts identified in the consultations, discussions and surveys with the affected Barangays. It will incorporate the proposed interventions based on needs of various stakeholders of the project.

560 The SDP framework is based on the sustainable development and self-reliance approaches. The goal is to allow communities and stakeholders to undertake sustainable development initiatives even after the completion of the project.

561 The benefits of the project should be able to reach the most disadvantaged and vulnerable sectors of affected communities. The involvement of these sectors (youth, women, elderly, persons with disability, fishermen, farmers, indigenous people and enterprise owners, etc.) as partners of development activities in the affected Barangays should be ensured from the planning, implementation to evaluation of identified projects.

562 The SDP should be able to complement the existing Municipal Development Plans and consider the urgent priorities identified by the LGUs, and more importantly, the project stakeholders' concerns and issues.

Table 5-1. Indicative Social Development Framework

Concern	Responsible Community Member / Beneficiary	Government Agency/ Non-government Agency and Services	Proponent	Indicative Timeline	Source of Fund
Gender Responsive Livelihood / Employment (Men, Women, Youth and elderly)					
Skills training	-Barangay kagawad for livelihood -Qualified Project Affected Men, Women, Youth and Elderly	LGU – Planning and Development Coordinator MSWD MAO TESDA	Community Relations	Pre-construction Construction Operation	Part of Project Budget Allocation
Health and Safety					
IEC on safety for employees IEC on safety for residents DRRM and Emergency Response	-Barangay Kagawad for Health -Barangay Health Workers -Project Affected Community	Proponent LGU MHO/RHU Barangay Disaster Management	Community Relations	Pre-construction Construction Operation	Part of Project Budget Allocation
Environment and Sanitation					
	-Barangay Kagawad for Environment -Project Affected Community	MHO/RHU MENRO Solid Waste Management Health and Sanitation program	Community Relations/ Environmental Unit	Pre-construction Construction Operation	Part of Project Budget Allocation
Peace and Order					
Entry of migrant workers	-Barangay Kagawad for Peace and order -Project Affected Community	LGU PNP	Community Relations	Pre-construction Construction Operation	Part of Project Budget Allocation
Affected Fisherfolks					
Loss of livelihood/ source of income	-Affected fisher folks within the area -Qualified identified workers within the area who will be affected by the project.	MSWD MAO Proponent Livelihood restoration measures	Community Relations	Pre-construction Construction Operation	Part of Project Budget Allocation

563 The proposed Mompong River Dredging and Quarry Project will primarily dredge the heavily silted Mompong River, starting at the estuary and moving upstream to clean up the river stream channel that has made its way to neighboring properties and causes flooding during heavy downpours. It will also focus on the following key areas:

- **Community Development** - increase in revenue and operating expenses of the company will also significantly increase the Social Development Management Program (SDMP);
- **Taxation** - increased collection of taxes and fees due to both the National and Local Government Units;
- **Employment** - additional employment opportunities for the local communities. Provision of employment in rural areas will help ease the pressure of major cities due to influx of migrating workers; and
- **Socio-Economic Benefits** - downstream business will thrive with increasing economic activities. Local communities will be the recipients of livelihood programs and skills development that can be used for economic gains, both technological and technical skills.

5.2 SOCIAL DEVELOPMENT AND MANAGEMENT PROGRAM

564 (CDAO No. 2010-21, Chapter XIV) - Source of Fund: 1.5% of the operating cost during operation (SDMP). This fund will be allocated for IEC Programs, Programs for the development of Mining and SDMP as seen in the distribution in **Figure 5-1**.

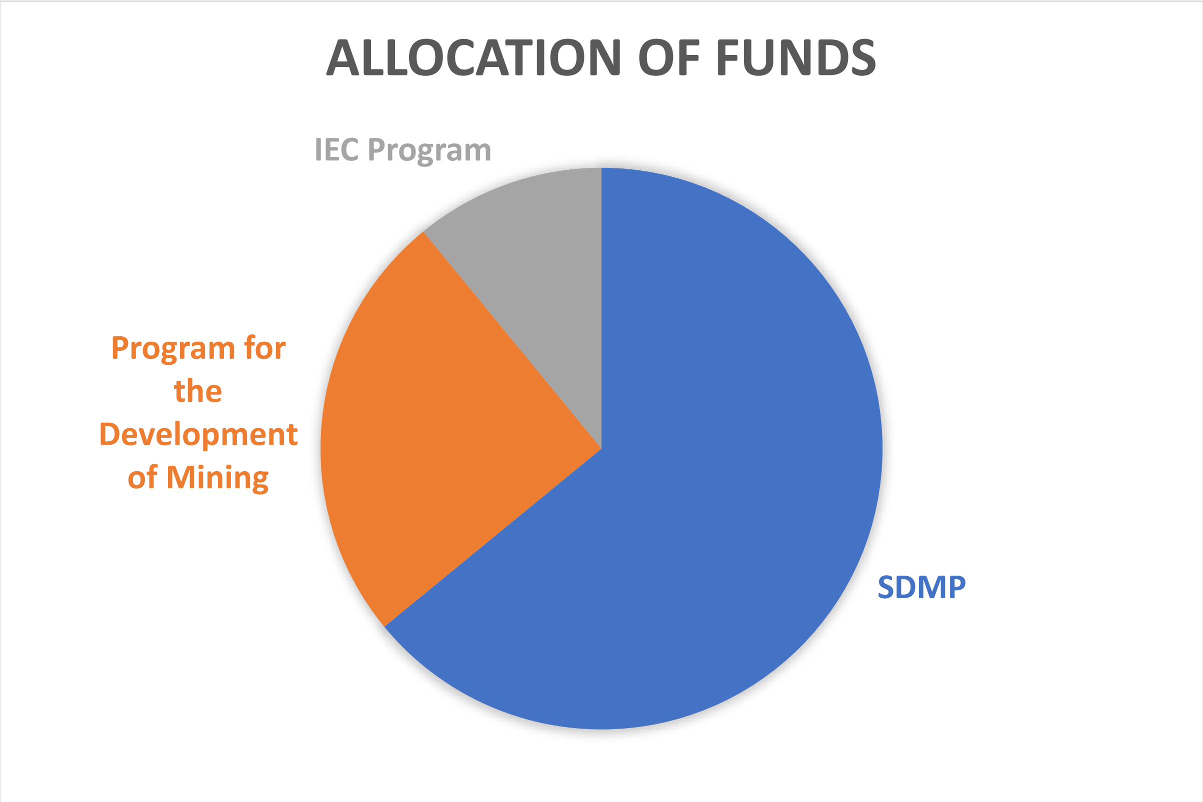


Figure 5-1. Allocation of Funds for SDP, IEC and Development Program

565 The Barangay and Municipal Officials, Government Agencies, and the Company shall work with the community to identify and carry out SDMP Community Projects. The Multi-Partite Monitoring Team will monitor the SDMP.

5.3 Information and Education Campaign

566 The Information and Education Campaign (IEC) Plan Framework is a vital instrument in improving the relationship between the proponent and project stakeholders. It opens the line of interaction that will identify critical issues and concerns on the part of stakeholders and the development of responsive mitigation measures. The IEC plan should go beyond providing information or conducting mass-information activities. It should focus on providing ongoing communication between the Proponent and stakeholders during the construction, operation, and decommissioning phases. It provides information on the milestones and progress of development and issues during the implementation stages. More meaningfully, the IEC program will inculcate value formation by making the community and residents aware of their roles as project stakeholders. When the IEC program is conducted effectively, it is a significant confidence and trust-building tool for both the project stakeholders and the project proponent. The IEC program should also consider new means of information dissemination in the wake of experiences during the pandemic and the ongoing State of National Public Health Emergency as a result of COVID-19.

Table 5-2. Indicative Information, Education and Communication Plan Framework

Target Sector Identified as Needing Project IEC	Major Topics of Concern in Relation to Project	IEC Scheme/Strategy/ Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
Residents of Affected Barangays	Project description and status Objective of EIA study/EIA Findings Issues and concerns about the project Building Trust and confidence Rights and responsibilities of stakeholders/pro-active response to project operations:	Community assemblies Group discussions Deployment of staff for continuing dissemination of information/ Online meetings	Invitation letters Primer about the project Hand-outs on MMT creation, task and responsibilities Public Information Brochure	Pre-construction During the Conduct of EIA Study Pre-construction Construction Phase (monthly) Operation Phase (monthly) Decommissioning Phase (quarterly)	Php 100,000
LGU: Provincial, Municipal and Barangay Units	Project description and status Project Impact Objective of EIA Study/EIA Findings Issues and concerns about the project Mitigation measures Building Trust and Confidence that mitigation measures will be undertaken Rights and responsibilities of stakeholders/pro-active	Group workshops Group discussion Interpersonal/ CO approach One-on-one meetings Group workshop/ discussion Online meetings	Invitation Letters One-on-one meetings Primer about the project and EIA study	Pre-construction During and after EIA Study Pre-construction Construction Phase (monthly) Operation Phase (monthly) Decommissioning Phase (quarterly)	Php 100,000

Target Sector Identified as Needing Project IEC	Major Topics of Concern in Relation to Project	IEC Scheme/Strategy/ Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
	response to irrigation operations:				
Sectoral Groups (farmers, fishermen, women, etc.)/NGOs, POs	Project description and status Project Impact Objective of EIA Study/ EIA Findings Concerns about the project's potential negative impact Project benefits (community assistance, training, enterprise development, livelihood and employment, etc. Rights and responsibilities of stakeholders/pro-active response to project operations:	Group methods Community Consultations/ assemblies Group Discussion Online meetings	Invitation Letters One-on-one meetings Primer about the project and EIA study Hand-outs on MMT creation, task and responsibilities	Pre-construction Construction Phase (monthly) Operation Phase (monthly) Decommissioning Phase (quarterly)	Php 100,000
Concerned agencies (DOE, NCIP, DENR, etc.)	Project Description and Status Project Impact Issues and Concerns about the project Mitigation Measures Rights and responsibilities of stakeholders/pro-active response to project	Community assembly Group workshop/ discussion Online meetings	One-on-one meetings Primer about the project and objectives of EIA SDP presentation Study tours to sites with good practice Hand-outs on MMT creation, task and responsibilities	Pre-construction Construction Phase (monthly) Operation Phase (monthly) Decommissioning Phase (quarterly)	Php 100,000

Target Sector Identified as Needing Project IEC	Major Topics of Concern in Relation to Project	IEC Scheme/Strategy/ Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
	operations: Monitoring/creation of		Flyers/Billboards/ Public Information Brochure		

6 ENVIRONMENTAL COMPLIANCE MONITORING

6.1 Self-Monitoring Plan

567 The table below is the Self-Monitoring Plan as per Annex 2-20 of RPM for DAO 2003-30. For the EQPL-Environmental Quality Performance Level, it is defined as:

Table 6-1. Environmental Quality Performance Level

EQPL Level	Description
Alert of Red Flag	Early warning
Action Level	Point where Management measures must be employed so as not to reach the regulated threshold or limit level, or to reduce deterioration of affected environmental component to pre-impact or optimum environmental quality
Limit Level	Regulated threshold of pollutant (standard that must not be exceeded); point where emergency response measures must be employed to reduce pollutants to lower than standard limit.

568 Provided in Error! Reference source not found. is the Environmental Monitoring Plan (EMoP) with E nvironmental Quality Performance Levels (EQPLs). The EQPL Criteria/Guideline above are interim.

Table 6-2. Environmental Monitoring Plan

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
Pre-Construction Phase													
The Pre-construction phase covers activities like planning, feasibility study, drawing of plans, surveys, and permit procurement. Earth moving activities, delivery of materials and similar activities are included in the Construction Phase.													
Removal of vegetation	Increased soil erosion due to unnecessary vegetation clearing	Vegetation Cover	Ocular	Monthly	Vegetation surrounding the river	BNRC. / Contractor	50,000.00	0.5 hectare	0.8 hectare	1 hectare	Locate bare areas and revegetate	Focus on site development plan. Locate bare areas and revegetate.	Stop project activities, and revegetate bare areas
Construction Phase													
Land													
Terrestrial flora	Removal of vegetation (i.e., tree cutting)	Volume of trees to be removed	Inventory	Once prior to construction	Project footprint	Forester to be engaged by BNRC	50,000.00	10% decline in baseline species richness and abundance	30% decline in baseline species richness and abundance	50% decline in baseline species richness and abundance	Investigate if decline is related to project or not	If project related, inform project management; if not, inform LGU or DENR	If project related, evaluate existing rehabilitation measures being implemented; Implement a more effective rehabilitation; if not, inform LGU or DENR
Clearing and removal of vegetation in the surrounding river	Exposure of bare soil to rainfall leading to increased Soil Erosion	Vegetation Cover	Ocular	Monthly	Road and bridge alignment	BNRC / Contractor	50,000.00	0.5 hectare	0.8 hectare	1 hectare	Locate bare areas and revegetate	Focus on Site development plan. Locate bare areas and revegetate.	Stop project activities, and revegetate bare areas
Site preparation for Tempfacil	Loss of topsoil	Volume of spoils in designated transfer/spoil disposal areas (DTA)	Visual (spot checking)	Weekly	Designated transfer areas	BNRC EHS / Contractor	To be included in engineering cost	70% of DTA	80% of DTA	90% of DTA	Continue monitoring	Identify new DTA	Limit removal of soils until new DTA is available
Earthworks, construction activities and movement of	Surface erosion and	Performance of erosion and sediment control	Visual (spot checking)	Daily	All active project areas	BNRC.EHS /	To be included in	Changing weather conditions, changing	Wear and	Ineffective / damaged ESCM	Monitor performance of ESCM	Timely maintenance of ESCM	Provide construction contingencies; immediate

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
heavy equipment	sedimentation	measures (ESCM)				Contractor	engineering cost	earthwork activities, construction traffic activity	tear of ESCM				repairs and adjustments or additional ESCM
	Influx of Workers	Disposal of domestic wastes	Visual (spot checking)	Daily	All active project areas	BNRC.EHS / Contractor	To be included in engineering cost	50% of maximum storage capacity	80% of maximum storage capacity	Maximum storage capacity	Ensure proper Storage and segregation of wastes	Monitoring of Trash bins	Proper disposal of solid wastes
	Encroachment of wildlife to communities due to increased noise and vibration	Reports on wildlife encroachment	Desktop review	Monthly	Road and bridge alignment	BNRC.EHS / Contractor	50,000.00	1 report	2 reports	3 reports	Locate reported area and monitor	Locate reported area; implement silencers and mufflers to equipment	Stop project activities, locate reported area; implement silencers and mufflers to equipment
	Creation of unstable slopes susceptible to rain- and earthquake-induced mass movement	Critical, unstable slopes	Visual inspection	After heavy rain or typhoon	Project sites	PCO	Part of duties and responsibilities	Noticeable slight mass movement	Small debris slides, rock falls	Occurrence of landslides	Monitor and apply necessary slope stabilization measures if needed	Apply slope stabilization measures (flattening of slopes, engineering intervention) to eliminate the hazard	Apply slope stabilization measures (flattening of slopes, engineering intervention) to eliminate the hazard
Water													
Water quality degradation / contamination / Earthworks, exposure of loose soil and construction of roads	Siltation of nearby waterbodies	TSS	Water sampling and laboratory analysis by accredited laboratory.	Quarterly or as necessary	Water bodies traversing the project	BNRC.EHS / PCO	10,000.00 per station	TSS ≥ 40 mg/L in the adjacent waterbody	TSS ≥ 50 mg/L in the adjacent waterbody	TSS ≥ 80 mg/L in the adjacent waterbody	Inspection and control of possible source of sediments	Check effectivity of silt containment facility	Removal and proper disposal of sediments to the waste stockpile

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
Water quality degradation / contamination	Degradation of the water quality of waterbodies	Oil & Grease, DO, BOD, Fecal Coliforms			Critical water bodies traversing the project	BNRC.EHS / PCO	40,000.00 per station	Oil & Grease ≥ 1.0 mg/L DO ≤ 6.5 mg/L BOD ≥ 3.0 mg/L	Oil & Grease ≥ 1.5 mg/L DO ≤ 6.0 mg/L BOD ≥ 4.0 mg/L	Oil & Grease ≥ 2.0 mg/L DO ≤ 5.0 mg/L BOD ≥ 5.0 mg/L	Inspection and clean-up of oil-water separators Checking of solid waste management implementation and drainage system in the area	Re-orientation on solid wastes and wastewater management. Regular monitoring of in-placed solid wastes management facility and drainage system	Preventive maintenance and review/ update the design of drainage system and strict implementation of solid waste management
		Drinking Water: Fecal Coliform			Filtered Water for Drinking Purposes	BNRC.EHS / PCO	5,000.00 per station	1.1 MPN/100mL (PNSDW)			Maintain regular monitoring of water filtration system	Maintain regular monitoring of water filtration system	Maintenance measures of the filtration system / replacement as needed
Air													
Air quality	Generation of fugitive dusts from construction activities	Total Suspended Particulates (TSP)	Ambient air sampling	As required by EMB / Quarterly	Nearby settlements	BNRC.EHS / PCO	50,000 per station	Complaints / 70% of Limit (210 µg/Ncm)	Resolve Complaints / 80% of Limit (240 µg/Ncm)	Implement corrective actions as necessary / TSP 300 µg/Ncm	Complaints / Identify potential source/s	Resolve Complaints / Employ applicable management measures (e.g. reduction of internal combustion engine load/s, check maintenance program for equipment)	Implement corrective actions as necessary / Suspend identified activity/ source of exceedance until corrective action has been proven effective
Ambient Noise	Generation of noise	Background Noise Level (L_{90})	Continuous noise measurements	Monthly or as frequent as necessary	Nearby settlements	BNRC.EHS / PCO / Contractor		Negative Feedback	Resolve Complaints	Multiple complaints lodged by the community	Identify the source of noise (if	Check equipment, or implement or install noise control.	Lessen noise generating activities or check the

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
										/ Background Noise (L_{90}) > 55 dBA	from project site)	Notify and coordinate with the barangay and nearby residents about the project activities.	efficiency of the noise control
People													
Generation of employment	Increase in employment	Number of hired employees	Employment records	Monthly	Project Site / Contractor's field office	BNRC.HR Personnel	100,000.00	Negative feedback reported to the proponent	Complaint lodged by the community	Multiple complaints lodged by the community	Proponent to investigate / inspect subject of negative feedback	Proponent to investigate and address complaint	Investigate and address complaints and reconsider operation protocols and procedures as necessary
Occupational Safety and Health	Exposure of workers to health and safety risks	Safe man-hours	Survey, incident reporting and documentation	Monthly	Project Site	BNRC.EHS / Contractor	100,000.00	Negative feedback reported to the proponent	Complaint lodged by the community	Multiple complaints lodged by the community	Proponent to investigate / inspect subject of negative feedback	Proponent to investigate and address complaint	Investigate and address complaints and reconsider operation protocols and procedures as necessary
Public health	Threat to public health	Health Records	Grab sampling	Monthly	Sewage outfall	BNRC./ PCO	100,000.00	Negative feedback reported to the proponent	Complaint lodged by the community	Multiple complaints lodged by the community	Proponent to investigate / inspect subject of negative feedback	Proponent to investigate and address complaint	Investigate and address complaints and reconsider operation protocols and procedures as necessary
Peace and order	Potential damage to property, fire, accidents, injury and loss of life	Number of complaints and accidents/incidents	Survey, incident reporting and documentation	Daily	Affected barangay	BNRC.CSR, PNP, Barangay Tanod	50,000.00	Negative feedback reported to the proponent	Complaint lodged by the community	Multiple complaints lodged by the community	Proponent to investigate / inspect subject of negative feedback	Proponent to investigate and address complaint	Investigate and address complaints and reconsider operation protocols and procedures as necessary
Operations Phase													

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
Land													
Terrestrial flora	Pruning of vegetation within the project area and along the access road	Pruning permits and records		As needed		BNRC.	Minimal						
Displacement of Birds	Encroachment of wildlife to communities	Reports on wildlife encroachment	Desktop review	Monthly	Road and bridge alignment	Contractor	50,000.00	1 report	2 reports	3 reports	Locate reported area and monitor	Locate reported area; implement silencers and mufflers to equipment	Stop project activities, locate reported area; implement silencers and mufflers to equipment
Solid wastes	Land and water degradation	Volume of solid wastes	Visual inspection / weighing	Daily	Trash bins / Storage Facility	BNRC.EHS / PCO	30,000.00	60% of storage capacity	70% of storage capacity	80% of storage capacity	No action required	Inform responsible person and prepare disposal measures	Dispose wastes according to applicable regulations.
Location of facility in a moderate flood susceptible area	Flooding potential	Condition of drainage systems	Inspection and maintenance	Annually	Drainage systems within the project site	BNRC.EHS / PCO	100,000.00	Temporary, non-destructive overflowing of the drainage systems	Recurring, non-destructive overflowing of the drainage systems	Destructive inundation of drainage systems	Maintain regular monitoring activity	Maintenance measures; Prepare flood emergency plans	Installation of additional protection equipment/structures (e.g. additional canals, water pumps, etc.)
Water													
Water quality degradation / contamination	Siltation of waterbodies	TSS	Water sampling and laboratory analysis by accredited laboratory.	Quarterly or as necessary	Critical water bodies traversing the project	BNRC.EHS / PCO	10,000.00 per station	TSS ≥ 40 mg/L in the adjacent waterbody	TSS ≥ 50 mg/L in the adjacent waterbody	TSS ≥ 80 mg/L in the adjacent waterbody	Inspection and control of possible source of sediments	Check effectivity of silt containment facility	Removal and proper disposal of sediments

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
Wastewater Generation / Effluents from septic tanks / Fuel and Oil Leaks	Degradation of the water quality of waterbodies	Oil & Grease, DO, BOD, Fecal Coliforms				BNRC.EHS / PCO	40,000.00 per station	Oil & Grease ≥ 1.0 mg/L DO ≤ 6.5 mg/L BOD ≥ 3.0 mg/L Treated Drinking Water Fecal Coliform above limit	Oil & Grease ≥ 1.5 mg/L DO ≤ 6.0 mg/L BOD ≥ 4.0 mg/L Treated Drinking Water Fecal Coliform above limit	Oil & Grease ≥ 2.0 mg/L DO ≤ 5.0 mg/L BOD ≥ 5.0 mg/L Treated Drinking Water Fecal Coliform: < 1.1 MPN/100 mL (PNSDW)	Inspection and clean-up of oil-water separators Checking of solid waste management implementation and drainage system in the area	Re-orientation on solid wastes and wastewater management. Regular monitoring of in-placed solid wastes management facility and drainage system	Preventive maintenance and review/ update the design of drainage system and strict implementation of solid waste management
Air													
Air quality degradation	Generation of fugitive dusts from using the access roads	TSP	Ambient air sampling	As required by EMB	Existing Stations	BNRC.PCO	50,000.00 per station	TSP 250 µg/Ncm	TSP 275 µg/Ncm	TSP 300 µg/Ncm	Identify potential source/s	Employ applicable management measures (e.g. reduction of internal combustion engine load/s, check maintenance program for equipment)	Suspend identified activity/ source of exceedance until corrective action has been proven effective
People													

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
Generation of employment and taxes	Community benefits from the project	Number of hired employees	Employment records	Annually	Project Site	BNRC,	Minimal	Negative feedback reported to the proponent	Complaint lodged by the community	Multiple complaints lodged by the community	Proponent to investigate / inspect subject of negative feedback	Proponent to investigate and address the complaint	Investigate and address complaints and reconsider operation protocols and procedures as necessary
		Taxes and fees paid	Data from BNRC,.	Annually	Project Site	BNRC.							
Activities associated with operations of the project	Exposure of workers and employees and (potentially) the local community on health and safety risks	Safe man-hours	Incident reporting and documentation	Monthly	Project Site	BNRC.EHS / PCO	50,000.00	Negative feedback reported to the proponent	Formal complaints lodged by employees and community	Philippine Occupational Safety and Health Standards of BWC-DOLE	Investigate / inspect the subject of negative feedback	Investigate and address complaints; complaints related to health and safety will be handled by the PCO	Philippine Occupational Safety and Health Standards of BWC-DOLE; Investigate and address complaints and reconsider operation protocols and procedures as necessary
Peace and order	Potential damage to property, fire, accidents, injury and loss of life	Number of complaints and accidents/ incidents	Survey, incident reporting and documentation	Daily	Affected barangay	BNRC. CSR, PNP, Barangay Tanod	50,000.00	Negative feedback reported to the proponent	Complaint lodged by the community	Multiple complaints lodged by the community	Proponent to investigate / inspect subject of negative feedback	Proponent to investigate and address complaint	Investigate and address complaints and reconsider operation protocols and procedures as necessary

Key Environmental Aspects / Activities per Project Phase	Potential Impacts per Environmental Sector	Parameter to be Monitored	Sampling and Measurement Plan			Lead Person	Annual Estimated Cost (PHP)	Environment Quality Performance Level Management (EQPL) Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
Abandonment Phase													
Land and Water													
Decommissioning of project facilities and removal/dismantling of infrastructures	Land and water contamination; Generation of solid wastes and demolition spoils caused by dismantling of infrastructure	Volume of wastes generated	Visual inspection / weighing	Weekly	Project site	BNRC.EHS / PCO	Part of Abandonment Budget	Will be based on the approved Abandonment Plan					
	Water Contamination or pollution	Total Suspended Solids	Laboratory - Gravimetry	As required by EMB	Project site	BNRC.EHS / PCO	Part of Abandonment Budget	Will be based on the approved Abandonment Plan					
Air													
Air quality degradation	Generation if suspended particulates from demolition activities	TSP	Ambient air sampling	As required by EMB	Nearby settlements	BNRC.PCO	Part of Abandonment Budget	Will be based on the approved Abandonment Plan					
People													
Activities associated with decommissioning and closure of the project	Exposure of workers and employees and (potentially) the local community on health and safety risks	Safe man-hours	Incident reporting and documentation	Weekly	Project Site	BNRC.EHS / PCO / Contractor	Part of Abandonment Budget	Negative feedback reported to the proponent	Formal complaints lodged by employees and community	Philippine Occupational Safety and Health Standards of BWC-DOLE	Investigate / inspect subject of negative feedback	Investigate and address complaint; complaints related to health and safety will be handled by the PCO	Philippine Occupational Safety and Health Standards of BWC-DOLE; Investigate and address complaints and reconsider operation protocols and procedures as necessary

7 EMERGENCY RESPONSE POLICY

7.1 General Information

569 Emergency preparedness plan describes how personnel in an organization will systematically respond to emergency situations that could affect its operation. This section presents the a) policy of BNRC related to health and safety of its workers, and b) emergency guidelines adopted for this project for the purpose of initially providing an emergency response plan.

7.2 Safety and Health Policy

570 **BIRD'S NEST RESOURCES CORPORATION** gives high regard to occupational safety and health, thus is committed to ensuring a safe and healthy environment for all its stakeholders, and adhering to all legal requirements pertaining to mine safety and health. The company commits to continually improve occupational safety and health management strategy to achieve the highest level of safety and health in the workplace.

571 In the implementation of the Safety and Health Program (SHP), BNRC aims to:

a. Comply ith all standards and legal requirements in accordance with JMC No. 2019-01, or the Guidelines on the Issuance of Clearance and/or Permit for Dredging within Waterways or other Inland Bodies of Water, DAO No. 2000-98 or the Mine Safety and Health Standard, CDAO No. 2010-21 or the Revised Implementing Rules and Regulations of RA No. 7942, and all applicable laws, rules, and regulations pertaining to mine safety and health;

b. Acknowledge the company's obligation and responsibilities to provide appropriate funds for implementing the SHP including the orientation and training of its employees on safety and health, dissemination of IEC materials on safety and health, provision of Personal Protective Equipment (PPE), and other safety and health activities

c. Conduct risk assessment as required to prevent workplace accidents as well as comply with other provisions of the SHP; and

d. Fully implement the Company Safety and Health Policy in the different aspects of the operation.

7.3 Emergency Response and Preparedness

7.3.1 Emergency Response and Preparedness Program (ERPP)

572 To prevent incidents and ensure the safety of the employees and all personnel in the area, an appropriate and systematic response will be implemented during emergency situations involving loss of life or damage to property, a comprehensive and thoroughly devised plan and system will be documented, communicated and personnel will be trained on the emergency response and procedures. These procedures will outline the actions to be taken when specific emergency situations arise.

573 Equipment needed in cases of emergencies will be identified, acquired, and provided in sufficient quantity such as alarm systems, emergency lighting, power, means of escape, safe refuge, firefighting equipment, and first aid kits will be readily available and stored in a readily-accessible area.

574 Periodic emergency drills will be conducted to test the procedures and the readiness of emergency response teams.

575 For each type of emergency, a documented and updated procedure shall govern the response and measures. All of the procedures are subject to periodic drills and training.

7.3.2 Emergency Contact Hotlines

576 BNRC and its Safety and Health Committee will closely coordinate with Local Government Units and the community emergency services in cases of emergency especially when the threats are high and the safety of the community is at stake. The BNRC team will also be in close coordination with the Barangay Disaster Risk Reduction Council (BDRRC) of the Direct Impact Barangays of Tuban, San Nicolas, Sta. Lucia, and Malisbong, as well as the Municipal Risk Reduction Council of Sablayan, Occidental Mindoro.

577 Philippine National Police

578 Sablayan MDRRMO

579 Sablayan Fire Station

580 Sablayan Hospital

7.3.3 Emergency Preparedness and Response for Accidents at Work

581 In case of first aid incident occurred in the workplace, the person who witnesses the incident, the site Nurse and the Emergency first aiders shall act on the following instructions

7.3.3.1 General Instructions in Giving First Aid

1. Survey the scene if the place is safe to give first aid.
2. Call for help and or send someone to call through mobile phone or telephone and tell the following:
    a. Nature or extent of the injury,
    b. Inform them if first aid is given, and
    c. The exact location of the accident and phone number.
3. Keep the person lying down and keep his/her head level to the ground.
4. Check the victim and give first aid for his/her priority needs.
    a. Open blocked airway
    b. Restore breathing and circulation
    c. Control Bleeding
    d. Immobilize fracture
5. Keep the injured person warm and guarded against chilling.
6. Wait for help.

7.3.3.2 Transporting an Injured Person

1. Give the necessary first aid then loosen any tight clothing or article. If possible, control the bleeding, maintain breathing, and splint all suspected fracture sites before moving the injured person.
2. Do not move the injured person before a physician or experienced ambulances crew arrives unless there is a real danger of receiving further injury by being at the accident site.
3. Use suitable method of transportation depending on the type and extent of injury.
4. Seriously injured person shall be transported on a stretcher or carried in a lying position.
5. For serious injury to the back of the head, victim shall be laid on his back.
6. In carrying the injured person to an area where stretcher can be easily manipulated, use either one, two, or three-man carry method depending on the type and severity of the injury. The one

and two-man carry systems are ideal in transporting an unconscious person from asphyxiation, but unsuitable for carrying a person suspected of having fractures or other severe injuries.

7. For victims with fractures or other severe injuries, use the three-man carry system. An effective stretcher can be made by buttoning two shirts or a coat over two sturdy branches or poles.
8. Inside the ambulance or any vehicle, the victim shall be placed on a flat surface while being transported to the nearest hospital.
9. The company nurse or the incident commander shall accompany the victim to the nearest hospital.

7.3.3.3 Emergency Preparedness and Response for Natural Disasters

7.3.3.3.1 Earthquake

582 By definition, an earthquake is a sudden movement of the earth's lithosphere. It is caused by the release of built-up stress within rocks along geologic faults or by the movement of magma in volcanic areas. Earthquakes are usually followed by aftershocks.

583 Shaking may last from a few seconds to as long as five minutes, most casualties occur during intensity six (6) and higher which are usually caused by collapsed of building, falling of objects, and mass movement or landslides

584 Precautionary Measures:

7.3.3.3.1.1 During Earthquae

1. In the event of earthquake, if inside the building, do not panic and stay calm. Look for sturdy furniture and take cover underneath. Do the DROP, COVER and HOLD procedure.
2. Stay at the center of the building and stay away from glass windows, doors, mirrors and other objects that may easily flown or detached. Stay indoors until shaking stops and make sure it's safe to exit.
3. If outdoors/outside, stay on wide open space away from buildings, trees, power lines and other structures and sit down or lay flat on the ground if shaking becomes severe.
4. If inside the vehicle or if driving an equipment, stop and stay in the car until the shaking stops and exit the vehicle or the equipment.

7.3.3.3.1.2 After an Earthquake

1. The incident commander shall coordinate with the auxiliary group to sound the alarm and activate the emergency response team through the two-way radio to act for possible result of the aftershock. He shall maintain communications with the leaders of ERT.
2. If assessed that it is safe to do so, the incident commander shall direct everybody to the evacuation areas with the aid of Emergency Response Team (ERT). The safety officer shall then report the incident immediately to the concerned Government agencies.
3. Assess yourself and the surroundings.
4. Inspect for damages on Buildings, Mechanical/ Electrical installations and equipment.
5. Apply first aid and treat wounded person if any.
6. Stay outside the building until advised that building is safe for entry.
7. Report all damages observed.
8. Clear the road and the area of rocks and/or debris and do housekeeping, if necessary.

7.3.3.3.2 Fire/Explosion

585 The exploration manager, through its safety officer and the Firefighting, search and rescue team will direct the overall responsibility of seizing-up the situation, order the rescue of firefighting operation and shall direct other section or other officers to coordinate the movement of the rescue operation, actual firefighting activities and maintenance of order to prevent loss of lives and

properties in the event of fire.

1. Any employee upon noticing or seeing unusual fire no matter how small it maybe within exploration area, shall immediately report the situation to the office or to any supervisor. The employee who had seen the fire shall give the following information:
    a. Location of the Fire
    b. Intensity of the fire
    c. Object of the fire
    d. Cause of fire (if known).

    Simultaneously, the said employee should shout ''FIRE" or ''SUNOG'' repeatedly. Anyone getting the information should quickly pass the information to spread the fire alarm widely and rapidly.
2. Every employee or individual nearest to the fire scene is responsible to take all the steps to put out the fire.
3. The incident commander shall inform the radio operator to sound the alarm and inform all personnel of the situation.
4. Upon receipt the information of fire, the firefighting, search and rescue team shall assemble and proceed to the fire scene.
5. Upon hearing the alarm or the information, the security force shall immediately proceed to the fire scene to maintain order and control the crowd. An electrician should cut-off the electrical power to the structure on-fire.
6. Medical Personnel upon knowledge of the situation should also proceed to the area on-standby to assist in case their service is needed.

7.3.3.3.3 Landslide

586 A geological phenomenon which includes the movement of rock, earth or debris down a slope section of land. This phenomenon often requires a trigger before being released. Some of which are rain, earthquakes, volcanoes and other factors that make the slope unstable.

587 Landslide is a dangerous occurrence, thus, knowing what to do in the event of one will help limit any danger they pose.

588 In the event of landslide, the following will be carried out.

1. Every Employee shall:
    a. Stay alert and vigilant.
    b. Listen to the radio for announcements.
    c. Listen for unusual sounds that might indicate movement, such as cracking of trees, falling or flowing of mud.
    d. Watch the road or walkway areas for collapsed, fallen rocks and other indications of debris flows.
    e. Be prepared to move quickly. Do not delay. Save yourself, not your belongings.
2. After the landslide, the incident commander will activate the Emergency Response Team to act on the possible effects of the landslide. He shall maintain close coordination with the ERT officers and leaders. If it safe to do so, he shall direct all employees to the assembly area with the aid of ERT and support groups.

7.3.4 Evacuation Of People

1. An Evacuation Plan Diagram shall be made available for every building and work area. It shall include emergency and back up exit routes to the assembly area and manual alarms.
2. Tactical evacuation should be employed when the emergency does not allow for any warnings

to prepare for evacuation due to threat to life safety

3. During the alarm, workers should prepare to evacuate the area. Personal items must be gathered. Electrical appliances should be shut down. Workers with mobility impairments should be assisted for evacuation.
4. If ordered to evacuate, the workers should proceed to the assembly area and follow instructions of the ERT.
5. The Evacuation Group shall account every employee present onsite and report missing employees to On-Scene Commander

7.3.5 Systematic Shutdown of Operatio

1. Employees must be properly briefed on the process of operations shutdown upon the emergency alarm.
2. Isolation of services must be immediately done especially electrical systems on affected areas

7.3.6 Removal Of Protection Of Vital Equipment And Supplie

1. An Emergency Supply Storage shall be at the placed at every building. These include first aid kits and burn kits among others.
2. Fire extinguishers shall be placed for every building and be checked periodically.
3. Fire hose shall be available for Class A fires. Fire blankets for Class F fire

7.3.7 Designation Of Command Control Area

589 The designated Command Control Area shall be at the Safety Office

7.3.8 Search And Rescue Plan

590 The Search and Rescue Group shall handle all search and rescue operations led by the Safety Officer

1. The Search and Rescue Group shall assist in the clearance of Surface Casualties.
2. The Search and Rescue Group shall be involved in rescuing lightly trapped individuals and searching of slightly damaged buildings to ensure no casualties within are unattended.
3. Once casualties are seen or heard, the member shall maintain contact until casualties are released.
4. Careful examination of the damaged structures is needed to determine the safest approach for rescue.
5. If casualties are located, the recovery will entail removing debris according to location of the casualty, the nature of injuries if known, the building layout, and the way in which the debris has collapsed.
6. Total debris clearance shall be done if all missing person have not been accounted for.

7.3.9 All Clear and Re-Entry Procedure

591 Once the ERT has determined that it is safe to enter working areas and resume operations, an All-Clear notification from the On-Scene Commander shall be given to all employees.

592 Supervisors shall take charge on the systematic reentry to premises.

7.3.10 Emergency Response Team

593 Emergency Response Team to execute the emergency response procedures shall be composed of the following members

1. **Incident Commander** – shall be represented by the highest officer onsite, the Exploration Manager. He shall hold the responsibility in ensuring the development and effective implementation of the Emergency Response and Preparedness Program. He shall inform the Head Office, concerned local government agencies, and other stakeholders.
2. **Fire Fighting Group** – shall be composed of the Safety Officer, who shall act as the On-Scene Commander, and his appointed Safety Men. If needed, additional manpower shall be provided by the auxiliary group. They are responsible for the emergency response procedure for fire-related emergencies.
3. **Search and Rescue Group** – shall be composed of the Safety Officer, who shall act as the On-Scene Commander, and his appointed Safety Men. If needed, additional manpower shall be provided by the auxiliary group. They are responsible for the emergency response procedure for search and rescue-related emergencies.
4. **Emergency First-Aid Group –** shall be composed of the Company Nurse, who shall act as the On-Scene Commander, and trained first-aiders. If needed, additional manpower shall be provided by the auxiliary group. They are responsible for the emergency response procedure for emergencies needing basic first-aid.
5. **Evacuation Group –** shall be composed of the Operations Supervisor, who shall act as the On-Scene Commander, and security coordinators. If needed, additional manpower shall be provided by the auxiliary group. They are responsible for the emergency response for emergencies needing evacuation procedures.
6. **Auxiliary Group –** shall be composed of the Operations Supervisor, who shall act as the On-Scene Commander, and radio operators. They are responsible for the emergency response for emergencies needing auxiliary operation procedures such as communication and facilities such as emergency power supply, water supply, etc.

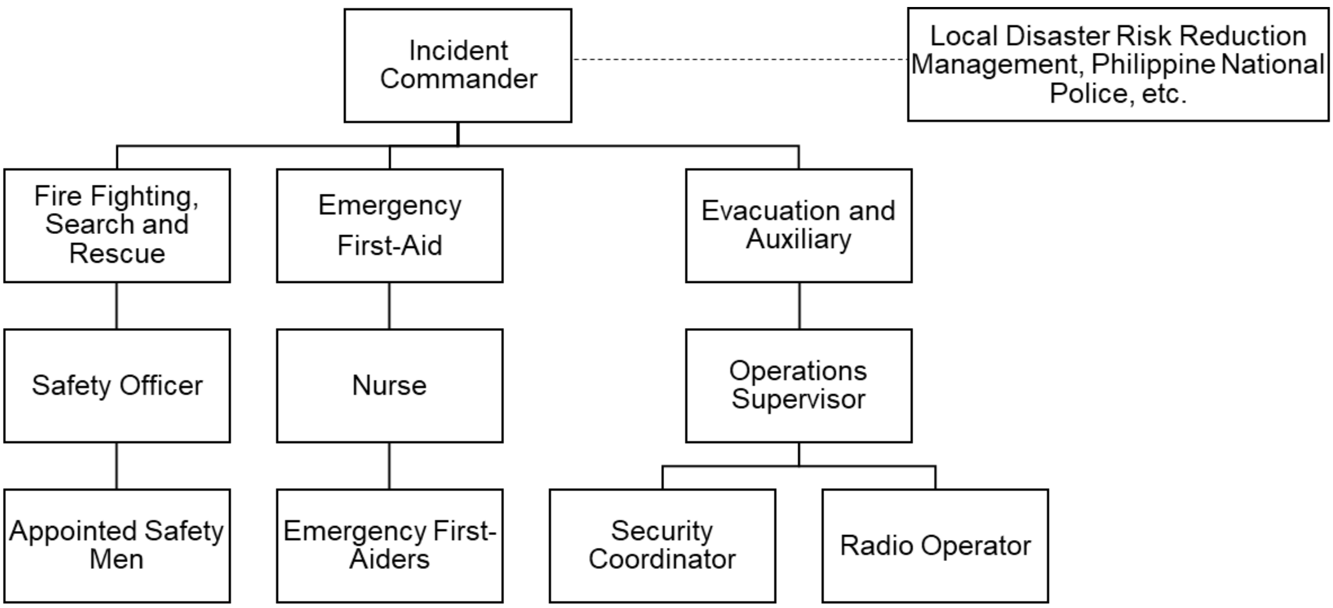


Figure 7-1. Emergency Team Organizational Structure

7.3.11 Emergency Dril

594 In order to minimize the impact of emergencies, especially those threatening the safety and health of workers, it is necessary to conduct emergency drills. These will enhance workers' knowledge and execution of emergency responses. These will also reveal holes in the emergency procedure which should be used to improve the ERPP.

595 The following shall be observed during the emergency drill: communication channels, entrance and exit routes, assembly areas, emergency signage, coordination of emergency teams, comprehension of alarms, emergency equipment, timing of drills, and participation.

1. Emergency drill plan

Type of Drills	Date	Responsible Person
Fire Drill	Quarterly*	ERT, Safety Officer
Search and Rescue Drills	Quarterly*	ERT, Safety Officer
First-Aid Drill	Quarterly*	ERT, Company Nurse
Evacuation Drill for Natural Disasters such as Earthquake, Landslide, Tsunami	Quarterly*	ERT, Operations Supervisor

** Drills may be held at unexpected times and varying conditions to simulate unusual conditions that occur in case of emergency*

2. Emergency Drill Evaluation and Assessment

596 The ERT and responsible person shall conduct a checklist of activities during the dill exercises as required in the ERPP.

The emergency drill shall evaluate and assess:

a. The adequacy of the evacuation plan and the effectiveness of the workers' ability to evacuate from their working areas to the assembly area;
b. The workers' ability to recognize emergency alarms;
c. The workers' ability to take appropriate actions upon hearing the emergency alarms;
d. The workers' ability to begin evacuation process as per ERPP; and
e. The workers' ability to provide assistance to individuals who are experiencing difficulty in performing the drill exercise.

3. Emergency Drill Reporting

597 Emergency Drill Evaluation Checklist shall be filled by the responsible person during the exercise. The checklist must show the type of drill conducted, date and time, the number of occupants vacated, the elapsed time, weather conditions, and the overall assessment such as signage posted, alarm systems, communication systems such as radios, fire containment, evacuation process, utilities such as electrical equipment and water system.

598 Documentation of the drill exercise shall be kept for records.

8 DECOMMISSIONING / ABANDONMENT PLAN

599 Abandonment refers to either the cessation of activities when a project approaches the end of its economic life or the ceasing of operations before that point caused by any force majeure event.

600 Abandonment/decommissioning may not be undertaken until the approval of the EMB of the submitted plans, which may include

- Environmental Site Assessment to determine contaminants left by the construction;
- The monitoring of any residual effects and;
- Legal commitments if any

601 Decommissioning and Abandonment Plan (DAP) outlines Infineum's management approach for the suspension, decommissioning, demolition and/or abandonment of assets within the Infineum's Project Area. The DAP should be formulated and submitted to DENR EMB six (6) months prior to actual abandonment activities.

8.1 Purpose

602 BNRC has both legal and social responsibility to decommission (including demolition) and/or abandon assets associated within the Mompong River Restoration Project. This DAP has been prepared to satisfy

603 The objectives of the DAP are to:

- Undertake decommissioning and/or abandonment activities in a manner that meets stakeholders' expectations
- Leave a landform which is safe, stable and non-polluting and compatible with the intended post-closure land use and enable effective transfer to third parties, such as landholders
- Provide for the retention and beneficial reuse of infrastructure constructed by Infineum to third parties (e.g., landholders, authorities), where there is an appropriate agreement in place.

8.2 Management of Decommissioning, Demolition, and Abandonment Activities

8.2.1 Scope of Decommissioning, Demolition, and Abandonment Activities

604 The purpose of preparing a scope of works is to ensure that decommissioning, abandonment and demolition activities occur in a manner that avoids, minimizes and manages health and safety and environmental risks. Potential health and safety and environmental risks or impacts will be specific to each asset to be decommissioned, abandoned, or demolished. The required management measures will therefore be specific to that asset.

605 The following principles shall be considered in the development of the scope

- Health and safety of future alternative uses of the area
- Current environmental standards of the area
- Cost effectiveness of remediation measures
- Existing and future use of the area
- Extent of decontamination and remediation of service areas
- Current and potential regulatory standards and legislations

8.2.2 Preliminary Decommissioning

606 Prior to the final decommissioning and/or abandonment of assets, preliminary decommissioning of assets may be required. Preliminary decommissioning typically occurs when an asset is no longer required for the production or unlikely to return to production, however final abandonment is not yet practicable. The activities are undertaken as required to manage health, safety and environmental risks.

8.2.3 Final Decommissioning

607 Once the generation capacity of the plant is realized, final decommissioning activities can commence, including abandonment and/or demolition activities. All decommissioning activities will be documented as required and be subject to routine inspections, patrols and monitoring to ensure health, safety and environmental issues are minimized and managed as appropriate.

9 INSTITUTIONAL PLAN FOR EIMP IMPLEMENTATION

608 The implementation of the EMP will be the primary responsibility of Bird's Nest Resource Corporation (BNRC). An Environmental, Health, and Safety Manager, who reports administratively to the Operation's Manager will serve as the immediate focal person in charge of the facility's environmental and safety management and compliance.

609 The Pollution Control Officer shall ensure compliance with environmental regulations and standards and shall maintain reports to be submitted to internal and external agencies, together with the Assistant Pollution Control Officer.

610 The Safety Officer shall be responsible for the handling of the occupational and environmental management systems and requirements of DOLE on occupational safety and health. The Emergency Response Team shall implement emergency response procedures.

611 The Community Relations Officer shall oversee the overall function of the Community Social Responsibility and Public Relations Department regarding community relations, design, training, and implementation of programs developed for Stakeholders in the host community.

612 All employees, including contractors, shall be supervised to operate according to the relevant environmental standards and protocols required of the EMP during construction and throughout the life of the project. A preliminary organizational structure for the project is shown in **Figure 9-1**

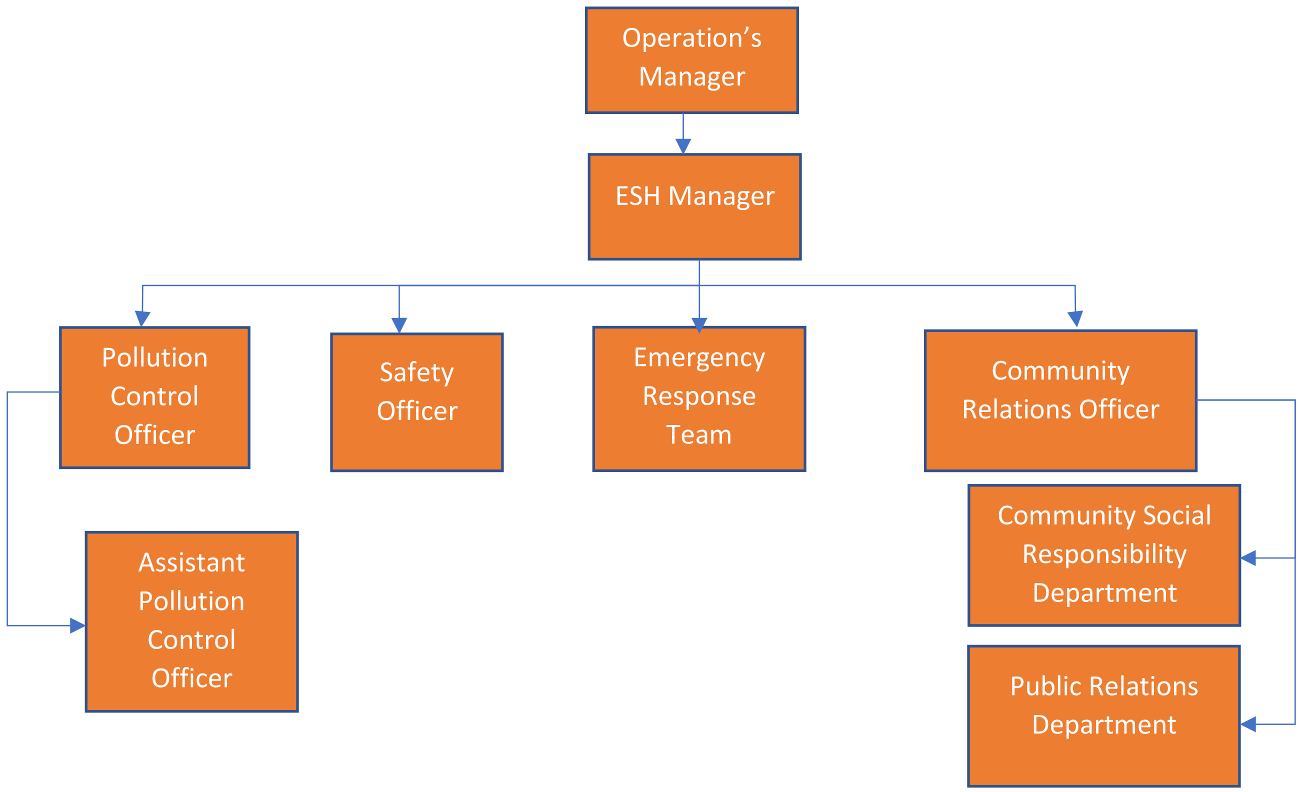


Figure 9-1. Preliminary Organizational Structure