

ENVIRONMENTAL IMPACT STATEMENT

Scrap Recycling Steel Mill for Structural Shapes and Sections Project

Brgys.Mataas na Bayan and Balanga, Lemery, Batangas





Prepared by: *Mediatrix Business Consultancy*



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EXECUTIVE SUMMARY

Project Fact Sheet / PD Summary

Project Information	
Name of Project	Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project
Location	Brgys. Mataas na Bayan and Balanga, Lemery, Batangas
Project Proponent	SteelAsia Manufacturing Corporation
Principal Office Address	B2 Bldg., Bonifacio High Street, BGC, Taguig, Metro Manila
Contact Person and Details of Proponent's Authorized Representative	Mr. Roberto Cola Vice President Contact Details: +639178675921 Email address: RMCola@steelasia.com
Background and Nature of Project	TheproposedScrap Recycling Steel Mill Project is a new Project of Steel Asia Manufacturing Corporation (SAMC). SAMC has been manufacturing steel for more than 51 years. The Philippines' largest steel company, SAMC is comprised of steel bar manufacturing companies and 1 melt shop. From 1966 to present, it has built and operated rolling mills across the archipelago. Currently, six SteelAsia Group rolling mills cover the major island groups of Luzon, Visayas and Mindanao with a combined manufacturing capacity of 2.3 million tons per year.
	 SAMC set the standard for modernization in the steel industry by being technologically at par with the best in the world. The SteelAsia Group's operation systems have been internationally certified to: ISO 9001 Quality Management ISO 14001 Environmental Management OHSAS 18001 Occupation Health and Safety ISO 17025 Testing Laboratory UK Certification Authority for Reinforcing Steel (UK CARES) British Standard
Project Description and Location	Procedural Manual of DENR Administrative Order No. 30 Series of 2003. The Project is a rebar and wire-rod mill with a new generation scrap recycling mini-mill that SteelAsia will construct. The Scrap recycling or smelting will produce billets and ultimately light and heavy sections which is an input to countless uses, such as building and construction of houses, infrastructure and different concreted works. SAMC will use "state of the art" technologies for this project because in the longrun it will provide the lowest operating cost. It will be the first steel mill in the Philippines to manufacture light and medium sections, and merchant bars (currently 100% imported). It will be
Size and Scale	a joint venture with Yamato Kogyo, SYS, and Mitsui while the technology will come from one of the top steel equipment companies, SMS Group of Germany, with a record of accomplishment of 140 years, and Fives Stein of France with a track record of 205 years in equipment design and engineering and manufacturing. 1,200,000 MTPY for rolling mill (light to heavy sections) and 800k MTPY
	new generation scrap recycling in an area of more than 80 hectares



Project Information	
Rationale	The steel industry in the Philippines is one of the most significant growth industries. Steel constitutes a basic industry prerequisite in a country's pursuit of development and industrialization. The central role of the industry stems from its linkages with numerous sectors, where its products serve as an essential input to countless uses, such as building and construction, automotive, shipbuilding and repair, electronics, packaging, etc. and it is equally important contributions to employment generation, growth, and promotion of industrial activity, etc. Therefore, ensuring a strong domestic steel and steel-based industry is vital in developing the competitive edge of a country in meeting the challenges of globalization.
	 With the boost in infrastructure industry in the country together with the rehabilitation activities in some parts of the country, there will be a bigger demand for reinforcing steel bars. Some of these infrastructure growth areas are in: South Luzon as seen in the coming years New infrastructure will spur additional growth in housing, retail, tourism and industrial construction New construction will require more steel products, best supplied by a local/ community steel mill. Supply of products for industrial use.
	 This project will also provide support to: SLEX Toll Road 4 Expressway Laguna Lake Highway PNR South Commuter and South Long Haul Project Quezon-Bicol Expressway (QuBex) Cavite-Laguna Expressway (CALAX) Cavite Industrial Area Flood Risk Management Project (CIA-FRMP) Camarines Sur Expressway
Project Components	 Scrap Recycling: Electric Arc Furnace Ladle Furnace Continuous Casting Machine
	 Shapes and Sections: Reheating furnace Rolling train Block mill Quenching Cooling bed Bundling Straightener
	 Ancillary equipment and Pollution Control System: Water treatment plant Rainwater collection reservoir Compressed air Power substation QA laboratory Roll shop Oxygen Plant



Project Information	
Manpower	During Construction, an estimated manpower of 1,000 workers for the project will be required where 3 are directly hired by SAMC while 997 will be employed by the Contractor.
	During Scrap Recycling operations, another 1500 workers will be required which will be directly hired by SAMC in coordination with the Public Employment Service Office (PESO) of Lemery.
	During decommissioning, work will be outsourced to contractors supervised by the PCO and Plant Manager of SAMC.
	The Company complies with the equal opportunity principle in hiring persons with disability (PWD) as well as women. This means that the Company gives employment opportunities to PWDs and women provided the person is qualified to the position. A qualified employee, whether a woman or with disability is subject to the same terms and conditions of employment and the same compensation, privileges, benefits, incentives and allowances as any qualified employee of the Company.
	For plantilla-based/regular employees, monthly salaries or wages for services rendered by an employee are timely paid twice a month via bank transfer. For transparency, the said payments are duly acknowledged by the employees through electronic and/or manual payslips. Thirteenth month pay is likewise paid to all qualified employees in compliance with the relevant laws, rules and regulations. Qualified employees also enjoy various benefits such as vacation leaves, sick leaves, overtime pay, health insurance, health plan, separation pay, retirement plan and allowances, as well as safety provisions like Personal Protective Equipment (PPE) and personal emergency kits, contributions and remittances for SSS, Philhealth and PAG-IBIG fund and other welfare benefits. Employees who have queries on the salaries or benefits they receive or are entitled to may bring their concerns with the Human Resources Department.
	For contractors or manpower agencies who engage contractuals, the Company undertakes an accreditation process wherein contractors are required to submit documents to establish that they are duly registered with the Securities and Exchange Commission or Department of Trade and Industry and with the Bureau of Internal Revenue and that they have substantial capital and/or investments to ensure that they can perform the work to be done and are compliant with relevant laws and regulations, specifically on the prohibition against labor-only contracting. Without this accreditation, the Company will not engage the services of the contractor and ensure compliance by the contractors with all the rights and benefits under labor laws, rules and regulations. The Company strictly enforces such contractual provisions in order to ensure that the contractor's employees are paid all statutory benefits and that the contractor comply with all the requirements as provided by law.
	For all of these manpower requirements, applicants from the host community are given priority subject to the qualifications of the applicant to the position. Job vacancies/openings are posted in the barangay and municipal bulletin boards for qualified locals to have an opportunity to work for SAMC. Local officials sometimes provide recommendations for qualified workers.
Duration of Project	The project is expected to operate for a period of at least 40 years.
Project Schedule	Project operation will commence 19 months after securing all necessary



ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project SteelAsia Manufacturing Corporation

Brgys. Mataas na Bayan and Balanga, Lemery Batangas

Project Information

permits, licenses and approvals.

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Cost Estimated at PhP 25,000,000,000.00.

Process Documentation of the Conduct of EIA

The EIA Team

SteelAsia Manufacturing Corporationengaged the services of Mediatrix Business Consultancy to conduct the EIA for the project and to prepare the EIS Report. The EIA team, composed of professional experts on their respective fields and with the coordination and the technical people from the proponent, were organized based on the project's EIA needs.

NAME	DESIGNATION	EIA Registration No.	EXPERTISE	PARTICIPATION
Matilde Fernando	Project Manager / EIA Team Leader	IPCO-035	Legal Framework, Socio- Economics, Public Participation and Community engagement	Preparation of Study/ Report and consolidation of documents for the whole project study; conduct and facilitation of public participation and community engagement
Ria Caramoan	Assistant Team Leader	IPCO-106	Air and water	Preparation of Project Description and water module
Reynaldo Tejada	Air Quality Expert	IPCO-036	Air and water module	Preparation of Air and water modules including air dispersion and noise attenuation modeling
Alexis Fernando	Researcher	IPCO-034	Research and community engagement	Gathering of secondary information
Juvinal Esteban	Social Worker	IPCO-091	Socio-economics, community engagement and IEC	Preparation of socio module
Benjamin Francisco		IPCO-038	Identification of plankton	
Michael Chester		IPCO-040	community structure,	
Francisco			presence of fish biota,	Preparation of Freshwater
Victor Pantaleon		NA	macro-benthos and	Ecology Module
Rowena Quimpo		NA	fisheries resources	
Jose Rene Villegas	Coologist		Coology and Coopazard	Propagation of Coology
nemani bayani	Geologist	IPCO-56	Geology and Geonazard	Module
Allyana Marie Bermudez	Research Assistant	NA	Community engagement	Conduct of perception survey
Patrick Kenneth Fernando	Admin. Assistant	NA	Field Assignments	Gathering of secondary information

Table ES2: EIA Team

Table ES2A: Proponent Representatives assisting the EIA Team

Technical Person from Proponent	Areas of Expertise
Benjamin Magalong	Senior Vice President for Operations
Roberto Cola	Vice President for Industry Affairs
Ronald Magsajo	Project Manager
Eustaquio Alipio, Jr.	Chief Engineer
Reginald Nolido	Legal Counsel



Allan Christopher Agati	Legal
Anna Isabel Galvez	Legal
Janine Marie Soliman	Executive Assistant of the SVP for Operations

EIA Study Period/Schedule

Mediatrix Business Consultancy was engaged by SteelAsia Manufacturing Corporationin September 2017. The project proponent and the EIA Preparers proceeded in coordinating with the stakeholders on the proposed project especially with LGUs concerned on October 30 and November 04, 2017 as IEC. Stakeholder profiling proceeded immediately to prepare for the initial EIA processes. **Public Scoping** was conducted on December 14, 2017 while the **Technical Scoping** was conducted last January 22, 2018. EIA baseline studies and impact assessment were conducted in May and the EIA Report was completed within three months.

EIA Activity/Stage	Date
EIA Planning, Project and Stakeholder Profiling	October 2017
Preliminary IEC and consultation with the officials of Lemery	October 30 and November 04, 2017
Public Scoping	December 14, 2017
Technical Scoping	January 22, 2018
Baseline studies	September 2017 to June 2018
EIA study, impact assessment and mitigation plan	
EIS Report Preparation	
Report Submission to EMB	August 2018

EIA Study Area

Figure 0.1 presents the project site area. An enlarged map is provided separately.

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Figure 0.1: Study Area



ENVIRONMENTAL IMPACT STATEMENT Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections P SteelAsia Manufacturing Corpor Brgys. Mataas na Bayan and Balanga, Lemery Bata

ASIA STEEL



EIA Methodology

The EIA was prepared in accordance with the prescribed standards and procedures under the Philippine Environmental Impact Statement System. Table below presents the detailed EIA methodology per environment sector/component.

EIA Study Module	Parameters/Scope	Baseline Sampling and				
Land						
Geology/Geomor phology, Pedology, Land Use & Classification	Reconnaissance, land use, land classification assessment, slope, soil types and classification, erosion	Secondary data, soil sampling and testing, review of geological reports and maps, soil site assessment				
Terrestrial Biology – Wildlife and VegetationFlora and fauna species inventory, species endemicity and conservation status, species abundance, frequency and distribution		Use of secondary dataand inventory				
Water	T					
Hydrology/Hydrog eology	Regional hydrogeology, catchment and drainage system	Spring & well inventory, flow measurements, use of secondary data, water balance analysis, flow duration and water flow analysis and groundwater recharge and productionanalysis, interviews				
Water Quality	Physico-chemical and bacteriological characteristics of rivers, wells, springs, and coastal water	Primary data were secured through water sampling and laboratory analysis				
Freshwater Ecology	Full accounting of all existing benthic habitats, species, composition, density, and diversity of sea grass resources and associated macro benthic algae in front of the project site, commercially-important macro invertebrates in the inter-tidal areas, plankton community	Use of primary and secondary data and interviews				
Air						
Air Quality	Ambient air quality and noise levels	Primary data through aampling and laboratory analysis				
Meteorology/Clim atology	Monthly average rainfall, climatological normal and extremes, wind rose diagrams, and frequency of tropical cyclones	Use and review of secondary data				
Air Dispersion Modeling	Worst case scenario identification, use of meteorological data	Use of AEROMOD Model				
Noise		Sampling station noisein receptor areas				
Climate Change						
Temperature changeSeasonal Temperature increase (in °C) in 2020 and 2050 under medium range emission scenario in Batangas		Effects of Temperature Increase				
	Monthly Average Temperature without					

Table ES3: EIA Methodology



Brgys. Mataas na Bayan and Balanga, Lemery Batangas

EIA Study Module	Parameters/Scope	Baseline Sampling and Methodology				
	Climate Change					
	Monthly Average Temperature with Climate Change (2006-2035)					
Rainfall change	Seasonal rainfall change (in %) in 2020 and 2050 under medium range emission scenario in Batangas	Effects of change in rainfall pattern				
	Monthly Average Rainfall without Climate Change (1980-2010)					
	Monthly Average Rainfall with Climate Change (2006-2035)					
	Monthly Average Rainfall with Climate Change (2006-2065)					
Greenhouse as Assessment	GHG Emissions based on IPCC 2006 Guidelines and USEPA Procedure	Bunker oil consumption vs GHG emissions				
People: Socio-Ecor	nomic, Health					
Public health and Demography	Morbidity and mortality trends, Demographic data of impact area: - Number of households and household size - Land area, - Population, - Population density /growth - gender and age profile, - literacy rate, profile of educational attainment	Interviews with key elected officials of the barangays (from barangay captains to councilors and the social welfare barangay officers/ barangay health workers); analysis of secondary health data; Use of secondary data from RHU and NSO; Interviews with the locals; household-level survey				
Socio-economics	Socioeconomic data: Main sources of Income, Employment rate/ profile, sources of livelihood, Poverty incidence, commercial establishments and activities, banking and financial institutions	Perception surveys, Interviews with municipal and barangay officials; analysis of secondary data; analysis of survey results				
		a traffic management plan				
		Provision of housing options for workers within the vicinity				
Environmental Risk Assessment						
Risk Assessment	Safety risks and physical risks	Consequence and Frequency analyses to be undertaken using the methodology described in the Revised Procedural Manual for DAO 2003-30				

Public participation, scoping and consultation in the conduct of the EIA Study As provided in DAO 2003-30, MC 14 Series of 2010 and DAO 2017-15, public participation is mandatory for this project. SteelAsia Manufacturing Corporationconducted a series of pre-scoping IEC through public consultation, formal and informal discussions with the Lemery Officials from July 2017 and continuing regarding the project proposal.

Mediatrix Business Consultancy was engaged by SteelAsia Manufacturing Corporation in September 2017. The project proponent and the EIA Preparers proceeded in coordinating with the stakeholders on



the proposed project especially with LGUs concerned on October 30 and November 04, 2017 as IEC. Stakeholder profiling proceeded immediately to prepare for the initial EIA processes. **Public Scoping** was conducted on December 14, 2017 while the **Technical Scoping** was conducted last January 22, 2018. EIA baseline studies and impact assessment were conducted in May and the EIA Report was completed within three months.

Description of Key EIA Methodologies

Summary of Baseline Characterization

Information below summarizes the salient findings of the baseline information/data for the land, water, air and people components.

Environmental	Key Findings
component	
Physical Environment—Land	The land classification of the project area is Alienable and Disposable according to NAMRIA. As per Lemery's land use plan, it is still agricultural. However, the LGU of Lemery issued a Certification that this Project is compatible with the proposed rezoning and amendment of Zoning Ordinance 2012-2021.
Physical Environment—Air	The climate of the proposed site belongs to Type III as referred to the climate map of the Philippines based on the Modified Coronas system of classification. The Type III climate is not very pronounced maximum rain period with a short dry season from November to April and wet during the rest of the year.
Physical Environment—Water	Based on the assessment of the project site, Balayan Bay is located Just beside the Project Site.
Biological Environment	Balayan Bay is just beside the project area.
	The vegetation in the project areais commonly described as 'parang vegetation' with is completely devoid of forests patches. There are no ridges, creeks or other natural waterways that pass through the site. The parang vegetation is best characterized as marginal areas with widespread grassland and some sparsely scattered trees. In the case of the project site, the dominant grasses are Cogon (<i>Imperata cylindrica</i>) and Talahib (<i>Saccharum spontaneum</i>) and the only tree species that was observed to thrive with these grasses is the Ipil-ipil. It is also evident that the area has been previously cleared of vegetation to pave the way for the building of concrete structures that have been ultimately decommissioned during abandonment. The remaining trees are located mostly in the eastern periphery of the project site.
Socioeconomic and Cultural Environment	Perception surveys were done in 2017. A total of 595 households were randomly interviewed and surveyed, which corresponds to 20% of the estimated household population of Brgy. Mataas na Bayan and Balanga.Details of the perception survey are provided under People Module of this EIS.

Table ES4: Summary of Findings

Impact, Mitigation and Monitoring Summary Provided below is the Impact, Mitigation and Monitoring Summary.

Table ES5: Impact, Mitigation and Monitoring Summary

Major Activities Description/Details key environmental aspects or activities	Potential Impact, nature and estimate of major emissions	Impact mitigation, built-in management measures and facilities planned		
Preconstruction Phase				
Land	Restriction on the	The land use is classified as industrial. Provided in		



	land use classification of Project site	Annex G is the LGU Certification of compatibility with proposed rezoningand amendment of Zoning Ordinance 2012-2021.	
	Project's general impacts to the environment	Environmental impact assessment and acquisition of Environmental Commitment/Compliance Certificate	
Construction Phase			
Generation of domestic wastewater	Contamination of water quality	Provision of septic tanks and implementation of septage management	
Solid waste generation	Accumulation of solid wastes	Provision of Material Recovery Facility (MRF)	
Chemicals and hazardous wastes generation	Contamination of land and water	 Securing of Hazardous Waste Generation ID Provision of hazardous waste storage area Treatment and disposal with Certificate of Treatment by DENR-accredited third party treaters 	
Use of domestic water	Water resource use of competition	Provision of water from water utilityNo extraction of groundwater	
Construction of the steel mill complex	Air emission (TSP, PM10, PM2.5, SOX, NOX) and noise pollution from equipment and vehicles.	 Training on power equipment and vehicle use and speed Proper maintenance, designation of no idling zone Good house keeping Water sprays, use of enclosures, barriers and buffer zones Implementation of Reforestation and Carbon-sink Program: tree planting within the perimeter 	
	Potential health and safety hazards for construction workers	 Health and safety policies Employee safety inspections and toolbox meetings Regular APE and use of PPEs First aid training 	
Operations Phase			
	Effect on public health due to dust and emissions brought about by the project	Coordinate with Rural Health office for the implementation of programs related to community health.	
	Water pollution	 Zero effluent Provision of Rain catchment reservoir Provision of Water Treatment Facility for process water 	
Rebar operation	Air emission and noise pollution	 Training on power equipment and vehicle use and speed Water sprays, use of enclosures, barriers, and buffer zones. Proper maintenance, designation of no idling zone 65 meters stack height Routine plant maintenance and good house keeping Use of low sulfur fuel (LSFO or mixing with Diesel) Training on proper equipment use and speed 	



	Employment	Preference will be given to qualified residents of Brgy.	
	gonoration	of Lemery as a whole.	
	Increase in economic oppurtunities through associated incomes and taxes	These are predominantly positive effects, no mitigation measures necessary.	
Solid waste generation	Accumulation of solid wastes	Provision of Material Recovery Facility (MRF)	
Chemicals and hazardous wastes generation	Contamination of land and water	 Securing of Hazardous Waste Generation ID Provision of Hazmat Storage Facility Treatment and disposal with Certificate of Treatment by DENR-accredited third party treaters 	
	Health and safety hazards (e.g. heat and hot liquids)	 Health and safety policies Installation of proper ventilation Implementation of safety buffer zones to separate areas where hot materials are handles and stored. Employee safety inspections and toolbox meetings. Regular APE for employees Use of PPEs First aid training Provision of 24-Hour Clinic Provision of Ambulance Spills containment of fuel 	
Storage, handling	Traffic and road accidents	 Implementation of Traffic Management Plan Provision of proper road signages. Designation of marshalling/holding area offsite Observe traffic rules and load limit requirement 	
and transport of rebars	CO ₂ emissions	 Utilize thermally-efficient heating process equipment Explore the viability of using inline Electric Induction heating process after the reheating furnace Engage in carbon sequestration projects such as tree planting and use of electricity from renewable energy sources such as geothermal, etc. 	
	Noise	 AC motors Enclosed facility Tree buffer zone Insulate structures 	
	Water collection and operational treatment	 Zero water discharge Water is recycled and re-circulated within the Water Treatment Facility, which consists of grease/oil skimming, scale inhibitors plus filtering and bio/algaecide 	
Abandonment Phase			
 Removal of wastes and oil spills if any Removal of all equipment, Actual Rehabilitation 	 Change in land use Loss of jobs and community programs 	 Turn over of the facilities which can still be used by the new project especially drainage system and rain collection Adaptation to the industrial land use of the new project Grading and drainage stabilization works including leveling of sediment trap and settling ponds 	



ENVIRONMENTAL IMPACT STATEMENT (EIS) STEEL

SteelAsia Manufacturing Corporation Brgys. Mataas na Bayan and Balanga, Lemery Batangas

	 Soil conditioning Planting or reforestation of endemic species Retrenchment package Labor support programs 	
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Figure 0.2: Water Collection and Operational Treatment

Key Monitoring Plans Provided below is the matrix of Enviornmental Monitpring Plan.

Table ES6: Environmental Monitoring Plan					
Monitoring	Potential	Parameters	DAO 2016-	Sampling	
Objectives	Impact		08 Limit Level for Compliance	Station Location	Frequency
Monitor the water quality and the impact of rolling mill and protect the ambient water quality	Surface water quality degradation or pollution	TSS Oil and grease Cr ⁺⁶ Pb Hg T. coliform Fecal coliform DO pH BOD	80 mg/L 2 0.01 0.05 0.002 5000 200 5 6.5-9.0 7	 Surface Water Downstream of Balayan Bay Surface Water Upstream of Cotcot River 	Quarterly during construction and operation
	Groundwate r quality degradation	TDS Cr ⁺⁶ Oil and grease Pb Hg T. coliform Fecal coliform pH	500 0.01 1 0.01 0.001 0.01 <1.1 6.5-8.5	 Along Mataas na Bayan and Balanga Barangay Road Along Mataas na Bayan and Balanga Barangay Road Along Mataas na Bayan and Balanga Barangay Road Along Mataas na 	Quarterly during construction and operation



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Brgys. Mataas na Bayan and Balanga, Lemery Batangas

Monitoring	Potential	Parameters	DAO 2016-	Samplin	g
Objectives	Impact		08 Limit	Station	Frequency
			Level for	Location	
			Compliance		
				Bayan and Balanga	
	Describely		000	Barangay Road	O
Monitor the air	Possible	ISP/PM ₁₀	230 ug/ncm	At the basketball	Quarterly
quality as well	of the		(13P) /150	court	
and the impact	airguality in			• In front of Chapper,	
of the rolling	the areas	SO ₂	(1 1010)	•	
mill and		002	180 ua/ncm		
protect the		NO ₂			
ambient air		-	150 ug/ncm		
quality			-		
		Sound levels	Daytime: 70		
			dB (Class C)		
			Morning/		
			Evening:65		
			UB (Class C)		
			dB (Class C)		
Ensure the	Effects on	Iniurv.	0 fatality	Work areas	Quarterly
safety and	human	Accidents, or	- ,		,
health of the	health and	safety reports			
workers	safety	statistics and			
		medical			
		records or			
		Safety			
		performance			
Monitor the	Increase in	Household	Increase by	Community, Barangay	Annually
socio-	economic	income,	0.5% or	Mataas na Bayan and	
economic,	activities	Literacy and	more of the	Balanga	
cultural and	and	employment	baseline		
Health impact	developmen	statistics,	value of		
of the project	t, increase	Number of	some		
	of employed	economic	indicators in		
	locals Incre	Taves	the		
	ase skills	generated and	municipality		
	and	basic services,			
	capacity	, Health			
	among	statistics			
	locals,Incre				
	ase in the				
	average				
	monthly of				
	households				

Environmental Monitoring Fund (EMF) and Environmental Guarantee Fund (EGF) Commitments The establishment of the appropriate EMF and EGF schemes will be in accordance with the prescribed guidelines and procedures of the DENR Administrative Order No. 2003-30 and its procedural manual. The amount of the EGF will be based on the risk and hazards that will associate with the project's implementation and will be negotiated between SteelAsia Manufacturing Corporation and the DENR-EMB Central office. The proposed EGF amount will be PhP500,000.00Trust Fund and PhP500,000.00Cash Fund which is the current EGF baseline amount for similar SAMC projects.



The EMF to be established immediately after the Memorandum of Agreement (MOA) on EGF and EMF is based on the activities and programs of the Multi-partite Monitoring Team (MMT), is around PhP300,000.00. The EMF can be replenished once the amount of PhP300,000.00is less than 50%.

EIA Summary

Summary of Alternatives Considered in terms of Siting, Technology Selection/Operation Processes and Design

Following were the criteria used:

Technology/Operation Process

This Project will be the first steel mill in the Philippines to manufacture light and medium sections, and merchant bars (currently 100% imported) - Joint venture with Yamato Kogyo, SYS, and Mitsui. The Technology from one of the top steel equipment companies, SMS Group of Germany, with a track record of 140 years, and Fives Stein of France with a track record of 205 years in equipment design and engineering and manufacturing. It will use the new generation scrap recycling mini-mill technology.

Resources

In terms of water source, rainwater collection is the primary water source. For make-up water, an alternative source is river water. Deep well is also not an option since it may affect the supply of those nearby residential communities whose water supply is coming from their own deepwell. In terms of power supply, the Electric Cooperative will supply the required power. Standby generator sets with a capacity equivalent to the mill's cranes and critical water pump power requirement will be installed.

Logistics

Steel manufacturing is essentially a transportation business as it requires a lot of moving & handling for its raw materials and finished goods. The plant should be sited near the port, major highways and customers to optimize the logistics cost. The port to be used is Batangas Port.

Manpower Availability

Scrap Recycling and Rebar manufacturing needs around 1,000 direct and 5,000 indirect vocational and technical personnel to run and maintain the facilities 24/7.

Land

The land area must accommodate all the facilities needed in a contiguous manner. In addition it should not require a long time for land conversion and expensive site development. It should have sufficient elevation for flooding.

Carbon footprint

The proponent's policy is to adopt practices to minimize fuel use. These include optimized trip planning/routing to increase fuel efficiency, reducing the number of kilometers each truck travels daily and minimizing travel time.

The following locations below were evaluated using these criteria.

- Salong, Calaca, Batangas
- Camastilisan, Calaca, Batangas

Environmental Impacts of Each Alternative

In terms of location, the potential impacts in all locations are the same. However, other areas were not considered because of existing mangrove plantation, lack of sustainable water and power sources and the land classification is not yet industrial.

Environmental characteristics of the project site were also considered in the site selection. The proposed location is considerably clear and flat area. Being in a topographically flat area, hazards associated with slope instability, erosion and mass wasting are expected to be nil.

The project's potential impact to people, biodiversity, water (ground water, surface and marine) were also considered in the site selection. In terms of biodiversity, the project site is just in front of Balayan



Bay and beside a mangrove area. Balayan Detailed study on Balayan Bay's resources are provided in this EIS under Chapter 2 on Marine Ecology.

The proposed location of the project facilities was also evaluated in terms of geohazard susceptibility based on information from government agencies such as the Mines and Geosciences Bureau (MGB) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS). Generally, the project area's susceptibility to earthquake-triggered slope failure and rainfall-triggered slope failure are low. With regard to seismic vulnerability and liquefaction potential, the potential ground-shaking and liquefaction susceptibility of the project site is also low. The impacts are discussed and summarized in the next two chapters.

No Project Option

If the proposed rolling mill project will not materialize, employment opportunities and social development such as livelihood projects, skills training, scholarship programs and medical assistance for the residents of Brgy. Mataas na Bayan and Balanga in particular will not be realized. Also, the prospective LGU increase in revenue, multiplier effect of the project such as business opportunities, support to basic services like infrastructure and medical assistance and other opportunities for the community and LGU will likely lose when the project is not pursued.

Concise integrated summary of the main impacts and residual effects after applying mitigation

The Project's major impact given in a worst case scenario of drought is water resource use competition. However, when that time comes, the Project will be forced to stop its operation because it will not be feasible to operate in such worst case scenario.

Risks and Uncertainties relating to the findings and implications for decision-making

Based on the EIA conducted, there are insignificant risks and uncertainties for the Project because mitigation and management plans have been laid down and the Proponent's mother company, the SteelAsia Group of Compnies has been in the business for 50 years now.

Bigyo: matado na Bayan ana Balanga, zomory Bata

CHAPTER I: PROJECT DESCRIPTION

SteelAsia Manufacturing Corporation (SAMC) is the only company that operates modern steel rolling mills in the Philippines. SAMC has been manufacturing rebar for 51 years. It is the largest steel company in the Philippines, the largest job provider and highest taxpayer in the Philippine Steel Industry.

SteelAsia is a provider of rebar solutions. As a manufacturer, it is part of the solution to country growth, expanding to meet the growing needs of the country. SteelAsia has grown as the largest manufacturer of rebar in the Philippines with a total annual production capacity of 2.1 MTPY, and anticipating a multidecade growth trajectory for the country, has another 2.5 million tons of capacity in its expansion pipeline in several locations. Locating across the archipelago near economic and logistic hubs is solution that makes rebar products accessible, not to mention the significant cost savings from the elimination of sea freight. Production sites in five sites (and three upcoming sites) in all the major island groups is an enabler of country development, and lowers cost for both the large corporate property developer and the small home builder. Investment in technological solutions has enabled SteelAsia to produce the full specification range of rebar products, creating a one-stop-shop service. Technology has also helped the company push the cost of rebar down through its productivity, efficiencies and scale. Downstream added value technologies such as create handling and wastage savings. These advances put SAMC industry and its service capabilities at par with the best in the world.

Copy of the SEC Registration is attached as Annex A.

1.1 Project Location and Area

1.1.1 Project Location

Shown in Figure 1.1.1 is the map showing the project's location.

Impact Area Delineation

The guidelines provided by the Revised Procedural Manual relevant to this project are used for the delineation of the Direct Impact Area (DIA) and Indirect Impact Area (IIA):

- a) Direct impact area (DIA) is the area where ALL project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken. For most projects, the DIA is equivalent to the total area applied for an ECC.
- b) Indirect Impact Area (IIA) is an area which can be the stretch of the river/s OUTSIDE the project area but draining the project site which can potentially transport Total Suspended Solids and other discharges from the project towards downstream communities.

On the basis of the foregoing guidelines, impact areas were delineated as follows:

1. Direct Impact Area - The Project site itself and the air receptor within 1 km due to the expected air emissions from the existing steel mill complex including the access road immediately adjacent to the site.

Based from air quality monitoring results, High Street was able to maintain and regulate pollutant measurements because of the existing environmental safeguards that High Street has faithfully established. and air dispersion modeling

2. Indirect Impact Area – the hauling route of construction materials during construction and of billets and finished products during operations phase and the community at the periphery of the project site.

The map of the DIA and IIA overlaid in the google map based on air dispersion modeling is shown in Figure 1.1.2.



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Figure 1.1.1: Project Location Map superimposing the project site

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Figure 1.1.2: Impact area Delineation (source: Google Earth Map)



1.1.2 Geographic coordinates of the Project Site

Provided in Table 1.1.2.1 and Figure 1.1.2.1 below are the geographic coordinates of the project site.

Table 1.1.2.1: Coordinates of the Project Site			
Point	Latitude	Longitude	
1	13.908707°	120.862554°	
2	13.910848°	120.867157°	
3	13.910147°	120.870227°	
4	13.912550°	120.874490°	
5	13.904750°	120.866039°	
6	13.907875°	120.869144°	
7	13.904694°	120.872605°	
8	13.905278°	120.875792°	



Figure 1.1.2.1: Geographical coordinates of the Project Site

Shown in Figure 1.1.2.2 is the vicinity map.

ENVIRONMENTAL IMPACT STATEMENT (EIS Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Projec SteelAsia Manufacturing Corporatio Brgys. Mataas na Bayan and Balanga, Lemery Batanga



Figure 1.1.2.2: Vicinity Map

STEEL



1.1.3 Dicussion on the Accessibility of the Project Site/Area

The Project Site is located in Lemery, Batangas. The distance from Alabang South Luzon Expressway (SLEX) Toll Gate to Brgy. Mataas na Bayan is more than 90 km.

All forms of land transportation are available in BarangaysMataas na Bayan and Balanga which can be used in going to and from the site of SAMC.

1.2 Project Rationale

Following are the major rationale for the project:

- Import substitution
- Infrastucture growth South Luzon region are seen in the coming years. With this, demand for rebars will increase
- To support housing construction in the region. A number of housing projects is expected to be implemented thus the demand for rebars and steel products.
- Support construction of power plants, BPO, office spaces and tourism projects. Same with housing projects, construction of power plants, BPO, office spaces and tourism projects is expected to increase the demand for rebars and steel products.
- Support the South Luzon construction projects

In summary, new construction will require more REBARs which are best supplied by a local/community steel mill thus the objective to locate the mill near the area where these developments are expected. The steel industry in the Philippines is one of the most significant growth industries. Steel constitutes a basic industry prerequisite in a country's pursuit of development and industrialization. The central role of the industry stems from its linkages with numerous sectors, where its products serve as an essential input to countless uses, such as building and construction and it is equally important contributions to employment generation, growth, and promotion of industrial activity, etc. Therefore, ensuring a strong domestic steel and steel-based industry is vital in developing the competitive edge of a country in meeting the challenges of globalization.

With the boost in infrastructure industry in the country together with the rehabilitation activities in some parts of the country, there will be a bigger demand for reinforcing steel bars in the future. The proponent is investing for the establishment of a steel manufacturing facility in Lemery, Batangas. The equipment to be used shall be among the most modern steel bar rolling facility in the world featuring new technologies. Its features give the advantage in terms of productivity and efficiency over competitors' facilities.

1.3 Project Alternatives

1.3.1 Criteria Used In Determining Preliminary Options

Following were the criteria used in determining project options:

Siting

The following site locations were evaluated using the following factors significant to the selection:

- Brgy. Salong, Calaca, Batangas
- Brgy. Camastilisan, Calaca, Batangas

Technology/Operation Process

This Project will be the first steel mill in the Philippines to manufacture light and medium sections, and merchant bars (currently 100% imported) - Joint venture with Yamato Kogyo, SYS, and Mitsui. The Technology from one of the top steel equipment companies, SMS Group of Germany, with a track record of 140 years, and Fives Stein of France with a track record of 205 years in equipment design and engineering and manufacturing. It will use the new generation scrap recycling mini-mill technology. The basis for technology selection is the efficiency of the technology to produce the target production rate at the equipment's rated capacity.

The use of an electric arc furnace (EAF) for the melt shop is the most appropriate steelmaking route to produce guality steel for the Philippines. It capitalizes on the abundance of steel scraps in the country, of which substantial quantity is exported. As the cities growor renew, generation of steel scraps (among



other wastes) will grow. Harnessing the locally generated scraps, and efficiently converting to useful steel befits the nation's agenda of green economy.

There are various technologies available for the EAF to capture waste heat generated during the melting process. A waste heat recovery system makes use of the waste heat to preheat the in-feeding scrap so that it attains around 500 to 600°C before being charged into the furnace. The feeding system is specially constructed to divert the hot waste gases from the EAF to heat the scrap before being ducted to the fume treatment plant (FES). Benefiting from the scrap preheating system, electrical energy consumption can be reduced to 350kW-hours per tonne of liquid steel; as compared to 550kW-hours per tonne for most of the conventional EAF's in the ASEAN region.

Resources

In terms of water source, the best option to consider is rainwater collection since the climate at the proposed Project site falls under the category of Type 1 climate which is characterized by two (2) pronounced seasons, dry from November to April and wet from May to October with maximum period from June to September. Areas under this type of climate are generally exposed to the southwest monsoon during rainy season and get a fair share of rainfall as brought about by the tropical cyclones occurring during the maximum rainy period. Rainfall ranges from 17.4 to 429.4 mm, with an annual total of 2,026.8 mm. Least number of rainy days per month occurs in February to April; while the highest number or rainy days per month occurs from December to March.

Logistics

Steel manufacturing is essentially a transportation business as it requires a lot of moving & handling for its raw materials and finished goods. The plant should be sited near the port, major highways and customers to optimize the logistics cost.

Manpower Availability

Rebar manufacturing needs around 1,000 direct and 5,000 indirect vocational and technical personnel to run and maintain the facilities 24/7.

Land

The land area must accommodate all the facilities needed in a contiguous manner. In addition it should not require a long time for land conversion and expensive site development. It should have sufficient elevation for flooding.

Carbon footprint

The proponent's policy is to adopt practices to minimize fuel use. These include optimized trip planning/routing to increase fuel efficiency, reducing the number of kilometers each truck travels daily and minimizing travel time.

Social

Social environment was also considered in the project alternatives. The project area was considered compatible with land use although an industrial project because the LGU is in the process of converting the area to an industrial area.

Environment

Environmental characteristics of the project site were also considered in the site selection. The proposed location is considerably clear and flat area. Being in a topographically flat area, hazards associated with slope instability, erosion and mass wasting are expected to be nil. The proposed location of the project facilities was also evaluated in terms of geohazard susceptibility based on information from government agencies such as the Mines and Geosciences Bureau (MGB) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS). Generally, the project area's susceptibility to earthquake-triggered slope failure, rainfall-triggered slope failure, and flooding are low. With regard to seismic vulnerability and liquefaction potential, the potential ground-shaking and liquefaction susceptibility of the project site is also low.

Environmental Impacts of Each Alternative

In terms of location, the potential impacts in all locations are the same. However, other areas were not considered because of existing mangrove plantation, lack of sustainable water and power sources and the land classification is not yet industrial. The impacts are discussed and summarized in detail in the next two chapters.



1.3.2 No Project Option

If the proposed rolling mill project will not materialize, employment opportunities and social development such as livelihood projects, skills training, scholarship programs and medical assistance for the residents of Brgy. Mataas na Bayan and Balangain particular will not be realized. Also, the prospective LGU increase in revenue, multiplier effect of the project such as business opportunities, support to basic services like infrastructure and medical assistance and other opportunities for the community and LGU will likely lose when the project is not pursued.

The possibility of expanding and upgrading LGU's basic infrastructure services and facilities and strengthening of LGU's capacity in municipal governance, investment planning, revenue generation and project development and implementation will not also be realized. This may also include possibility of enhancing their capabilities for local leadership because the project may provide technical support and assistance to local leaders to training, seminars and workshops. All of these may be provided by the project thru its tax payments, permits and clearances and Social Development Program.

Another opportunity that the local government and the community may miss if the project will not be realized is the possibility of constructing additional infrastructure projects like roads and bridges, increasing school classrooms and improving school facilities and medical assistance such as provision of medicines, medical supplies and medical missions.

Also, flooding may be continuously be experienced from the open project area because there are no mitigating measures installed unlike if the project will be implemented, proper drainage system will beinstalled so as not to affect the neighboring communities.

1.4 Project Components

The Project's components are subdivided into the following:

- A. Light Section Mill
- B. Heavy Section Mill
- C. Melt Shop for Light Section Mill
- D. Melt Shop for Heavy Section Mill

Provided below is the matrix of the project's components and the area allocaton for each component.

No.	Component	Area (in sqm)
1	Small Section Rolling Mill	60,250
2	Small Section Meltshop	66,200
3	Medium Section Rolling Mill	88,900
4	Medium Section Meltshop	69,200
5	Finish Goods Warehouse 1	29,350
6	Finish Goods Warehouse 2	95,000
7	Scrap Yard	135,000
8	Water Treatment Plant 1	18,000
9	Water Treatment Plant 2	18,930
10	Scale & Waste Area	4,800
11	Slag Cooling Area	20,580
12	Gas Station	4,100
13	Scrap Operation	29,270
14	Retention Pond	21,380
15	Reservoir	100,070
16	Offices	21,900
17	Truck Parking	20,350
	TOTAL	808,280

Table 1.4.1: Project Components



DISCUSSION OF COMPONENTS

A. Light Section Mill

A.1 Major components

A.1.1 100t per hour Walking Beam Reheating Furnace

A.1.2 Rolling Mill

- Eighteen (18) horizontal (H) and vertical (V) stands
- High-pressure water jets (260 bar approx.) are located at reheating furnace exit to remove the scales.
- Pinch-roll with an emergency snapshear to assure safe operation.
- The roughing and intermediate mills
- Cooling bed for product cooling after cutting to length.
- 1 Cold shear and two metallic disc saws are provided for cutting the cooling bed layers into finished commercial lengths
- Sawing equipment
- The stacking station equipped with automatic counting system.
- Bundling and tying equipment
- Electric overhead cranes

A.2 Other Ancillary Facilities

A.2.1 Electrical Substation:

1. HVPOWER DISTRIBUTION

SteelAsiawill install a substation with demand capacity of 30 MW. The main transformer output is 6.6kV, 3-phase, 60Hz for internal distribution.

2. MV POWER DISTRIBUTION

One 6.6kV MV power distribution room is located in the main building.

A.2.2 Water Catchment Pond

This collecting pond has a volume of 5,000 cu.m.

A.2.3 Drainage System- The main water source of the WTP plant is rainwater and well water. The storm drainageis connected to the Water Catchment Pond to accumulate water to serve as make-up water totheWTP.Advanced water treatment system to ensure that no production waste water discharge to the outside of the plant.

A.2.4 Compressed Air Station-Compressed air is being used as atomizer of the fuel for complete combustion in the furnace, also used in pneumatics for instrumentation and controls of equipment. Capacity 3,000 m3/h at 8 Bars.

A.2.5 Cranes- Cranes will be used in the rolling mill with a mix of Overhead Cranes and Semi- Gantry Cranes with capacity ranging from 10 tons to 30Tons, and 6 to 20 tons under magnet.

A.2.6 Firefighting and FDAS- Sprinkler firefighting system is located in the Admin bldg., General Stores, Canteen, Locker rooms, etc. The system shall conform to the provision of the National Fire Protection Association. Location of water source and fire pump shall be coordinated with WTP design. Size of nozzles shall conform to pipe schedules as delineated in NFPA 13.

A.2.7 Fuel Tank- for storing Low Sulfur Fuel Oil (LSFO).

A.2.8 Generator set/Emergency power system- this will serve as an emergency power of the rolling mill if there is power outage. There is a generator with a diesel engine in this plant and a capacity of 1MVA/800kW standby power to supply cooling water for all key equipment and lighting, cranes to ensure all deliveries are in time to make customer satisfied. The generator set is also set with compatible cooling system, noise reduction system, intake and exhaust system, and electronic control system.



A.3 Pollution Control Devices

A.3.1 Circulating Water Treatment Plant (WTP)

Zero wastewater discharge is envisaged. The Water Treatment Plant shall include5 systems as follows:

(1) Make Up Water System (Capacity: 50 m3/h) and Fire Protection Water System (Capacity: 576 m3/h)

The source for makeup water is surface water to avoid water resource use competition.

(2) Indirect Cooling Water System (Capacity: 950 m3/h)

The circulation water quantity of ICW is 950m3/h is used mainly for the reheating furnace, lubrication system, hydraulic system, stand motors, etc. There are 2 sets of cooling tower adopted in this system, each capacity is475m3/h. To ensure water quality and stability,corrosion-preventionand scalingof equipment and pipeline,there are 2 sets of chemical dosing device. Dosing device dispendscorrosion-scale inhibitor and biocide.

(3) Direct Cooling Water System (Capacity: 1,700 m3/h)

The circulation water quantity of DCW is 1700m3/h, and the main users areRolling mill and QTB area, etc.There are 2 sets of cooling tower adopted in this system. One is for rolling mill, the capacity is 900m3/h. The other is for QTB, the capacity is 800m3/h. The coolingtower is reinforced steel structures.

(4) Sludge Treatment System

The mainsources of this system are the backwash waterof filters, sludgefrom chemical degreasing device, etc. Auxiliary systems of filter press include: lime dosing facilities, sludge storagehopper and automatic control equipment, etc. This water treatment system guarantees zero discharge of industrial waste water.



A.3.2 Sewerage Treatment Plant

The Water Treatment Plant of M9 project has a sewage and sludge treatment system. The system can guarantee that no wastewater discharge from the site.

A.3.3 Flue Stack-The height of chimney is more than 50 meters and with sampling points according to the regulations of the government to ensure emission quality.

A.3.4 Waste Management System-Disposal procedures of hazardous, solid and domestic wastes are as follows:

- Scales is formed on the outer surfaces of plates, sheets or profiles when they are being produced by rolling red hot steel billets in rolling mills. Mill scale is composed of iron oxides mostly ferric and is bluish black in color. It is usually less than 1 mm thick and initially adheres to the steel surface andretardsfurther oxidation. Scales will be collected in containers and will be for sale abroad for recycling in sinter plants.
- **Used oil** will be collected and put inside sealed drums, stored in a company designated Material Recovery Facility (MRF) inside the plant. It will be transported and treated by a DENR accredited TSD facility.
- **Busted Fluorescent Bulbs** will be put in a container, stored inside the plant MRF in accumulation until there are sufficient inventory for proper disposal through a DENR accredited TSD facility.
- **Contaminated rags and gloves** will also be put in bags, stored inside the plant MRF in Accumulation until there is sufficient inventory for proper disposal through a DENR accredited TSD facility.
- Used automotive batteries will be traded-in to designated suppliers.
- Solid Wastes will be properly segregated and to be disposed in the Material Recovery Facility of Lemery
- **Domestic Waste** will be treated through the proposed Sewerage Treatment Plant.
- Industrial waste water: this water treatment system guarantees zero discharge of industrial waste water.

B. Heavy Section Mill

The M11 project of SteelAsia is 0.6 MTPY HEAVY SECTION MILL. The HEAVY SECTION MILL makes use of latest state-of-the-art rolling technology from Europe. It will have the following major components: Walking Beam Reheating Furnace, Breakdown Mill and Tandem Mill, Wastewater Treatment Plant and an Electrical substation.

Main products are: Round shafts: 100-250mm; H-Beam: 140-750mm; Angle:100-200mm; Channel: 160-400mm; Flat:150-800mm; Sheet piles: 400x85-400x170mm.

100% of the products produced in this line are imported from abroad. It therefore plays a significant role in the development of Philippines steel industry.

B.1 Major Components

B.1.1 120t per hourWalking Beam Reheating Furnace



Figure B.1.1.1: Illustration of Walking Beam reheating Furnace

B.1.2 Breakdown Mill





Figure B.1.2.1: Illustration of Breakdown Mill

B.1.3. Cooling Bed for Big Rounds



Figure B.1.3.1: Illustration of Cooling Bed for Big Rounds





Figure B.1.4.1: Illustration of Tandem Mill

B.1.5 Cooling bed area for sections



Figure B.1.5.1: Illustration of Cooling Bed Area for Sections



B.1.6 Straightening area for section



Figure B.1.6.1: Illustration of Straightening area for section

B.1.7 Finishing area for section



Figure B.1.7: Illustration of Finishing area for section

B.2 Ancillary Faclities and Pollution Control System

B.2.1 Circulating Water Treatment Plant (WTP)

The company invests extensively in the water treatment system that aims to recirculate all process water. Zero wastewater discharge is envisaged. The Water Treatment Plant shall include 5 systems, as described below.

A. Make Up Water System, Capacity: 60 m3/h and OneFire Protection Water System (Capacity: 576 m3/h)



The source for makeup water is surface water. Water is pumped at flow rate 60m3/h, with pressure of 0.2MPa. There are two groups of pumps at the makeup-water pool.

The makeup water supply pumps which lift water to the whole makeup water network of the plant.
 The fire hydrant water supplypumps that lift water to the whole fire protection water network of the plant.

Makeup water treatment process is as follow:



- Raw water (in raw water pool) →lifting pumps→ filter → makeup water pool→ makeup water supply pumps → makeup water network of the plant
- The same as the previous → makeup water pool → fire hydrant water supplypumps→fire protection water network of the plant

This system adopts Manganese sand filter.Makeup water pool is cleaned regularly. Residue from filter in thissystem flow into the mud regulation tank of ST for combined treatment. Sodium hypochlorite (NaClO) is added at the exit of makeup water pool to inhibit bacterial growth.

B. Indirect Cooling Water System (Capacity: 1200 m3/h)



The circulation water quantity of ICW is 1200m3/h is used mainly for the reheat furnace, lubrication system, hydraulic system, stand motors, etc. In the ICW system, the circulating water is primarily performing heatexchange and the water quality is not contaminated by the process.

There are 2 sets of cooling tower adopted in this system, each capacity is475m3/h. The cooling tower is reinforced steel structures. In order to reduce the content of suspended solids in water circulation, part of the circulating return water flow to homogeneous sand filter.



C. Direct Cooling Water System (Capacity: 1,700 m3/h)



The circulation water quantity of DCW is 1700m3/h, and the main users areRolling mill and Tandem mill area.

D. Sludge Treatment System

The main sources of this system are the backwash water of filters, sludgefrom chemical degreasing device, etc. This water treatment system guarantees zero discharge of industrial waste water.





E. Electrical Substation

1. HVPPOWER DISTRIBUTION

SteelAsia will install a substation with demand capacity of 30 MW. The main transformer output is 6.6kV, 3-phase, 60Hz for internal distribution.

2. MV POWER DISTRIBUTION

One 6.6kV MV power distribution room is located in the main building. The MV Step-down Transformersused to reduce the incoming voltage to the adequate voltage level, suitable for the downstream MV distribution services. The MV switchboard is Metal Clad air insulated type composed of a set of standard sections assembled to form a single line-up. Each section is divided in segregated compartments.

- F. **Water Catchment Pond-**There is1 collecting pond to mitigate the use of water. This collecting pond has a volume of 5,000 cu.m. Its main purpose is to provide make-up water for the evaporation process that takes place in the rolling mill area.
- G. **Drainage System-** The main water source of the WTP plant is rainwater and well water. The storm drainage is connected to the Water Catchment Pond to accumulatewater to serve as



make-up water to the WTP.Advanced water treatment system to ensure that no production waste water discharge to the outside of the plant.

- H. **Compressed Air Station-**Compressed air is being used as atomizer of the fuel for complete combustion in the furnace, also used in pneumatics for instrumentation and controls of equipment. Capacity 3,000 m3/h at 8 Bars.
- I. **Cranes-** Cranes will be used in the rolling mill with a mix of Overhead Cranes and Semi- Gantry Cranes with capacity ranging from 10 tons to 30Tons, and 6 to 20 tons under magnet. Overhead cranes will be used in the installation, production, and in maintenance, Semi-gantry cranes will be used for lifting the raw material from the truck to the piles of billet then lift to charge the rolling mill. Cranes with magnet will help to store raw materials and finish products faster and safer.

J. Sewerage Treatment Plant

The Water Treatment Plant of M11 project has sewage and sludge treatment system. The system can guarantee that no wastewater discharge from the site.

- K. Firefighting and FDAS- The firefighting system will take place at the rolling mill area wherein series of firehoses areinstalled in all areas of the mill. Sprinkler firefighting system is located in the Admin bldg., General Stores, Canteen, Locker rooms, etc. The system shall conform according to the provision of the National Fire Protection Association. The works shall be executed in close coordination with all trades. Location of water source and fire pump shall be coordinated with WTP design. Size of nozzles shall conform to pipe schedules as delineated in NFPA 13. Pipe supports, hangers and bracing shall be of the approved type and shall be independent from ceiling and duct supports.
- L. Fuel Tank- for storing Low Sulfur Fuel Oil (LSFO).
- **M. Flue Stack-**The height of chimney is more than 50 meters and with sampling points according to the regulations of the government to ensureemission quality.
- N. Generator set/Emergency power system- this will serve as an emergency power of the rolling mill if there is power outage. There is a generator with a diesel engine in this plant and a capacity of 1MVA/800kW standby power to supply cooling water for all key equipment and lighting, cranes to ensure all deliveries are in time to make customer satisfied. The generator set is also set with compatible cooling system, noise reduction system, intake and exhaust system, and electronic control system.
- **O. Waste Management System-**Disposal procedures of hazardous, solid and domestic wastes are as follows:
 - Scales is formed on the outer surfaces of plates, sheets or profiles when they are being produced by rolling red hot steel billets in rolling mills. Mill scale is composed of iron oxides mostly ferric and is bluish black in color. It is usually less than 1 mm thick and initially adheres to the steel surface andretards further oxidation. Scales will be collected in containers and will be for sale abroad for recycling in sinter plants.
 - Used oil will be collected and put inside sealed drums, stored in a company designated Material Recovery Facility (MRF) inside the plant. It will be transported and treated by a DENR accredited TSD facility.
 - Busted Fluorescent Bulbs will be put in a container, stored inside the plant MRF in accumulation until there are sufficient inventory for proper disposal through a DENR accredited TSD facility.
 - Contaminated rags and gloves will also be put in bags, stored inside the plant MRF in accumulation until there is sufficient inventory for proper disposal through a DENR accredited TSD facility.
 - Used automotive batteries will be traded-in to designated suppliers.
 - **Solid Wastes** will be properly segregated and to be disposed in the Material Recovery Facility of Lemery
 - o Domestic Waste will be treated through the proposed Sewerage Treatment Plant.
 - Industrial waste water: this water treatment system guarantees zero discharge of industrial waste water.



C. Melt Shop for Light Section Mill

The M9 meltshop project of is 600,000tonnes per yearbilletproducer that feeds the operational demand of the M9 small section mill. The melt shop is equipped with the latest melting and casting technologies, embedded in the system for preheating of scrap-based raw material to produce steels of the highest quality for the country. Conscious efforts are made to implement the steelmaking processes with low carbon footprint and care for the environment. The melt shop will consist of the following major metallurgical equipment.

- 1. Electric Arc Furnace (EAF);
- 2. Scrap Preheating and Fume ExtractionSystem (FES);
- 3. Secondary Metallurgy Ladle Furnace (LF);
- 4. Continuous Casting Machine (CCM);
- 5. Water Treatment Plant (WTP);and
- 6. Power Distribution Substation (PD).

D. Melt Shop for Heavy Section Mill

The M11melt shop project produces 600,000 tonnes per year blooms and beam blanks semi-finished material for downstream rolling into heavy structural sections for construction industry. The melt shop is equipped with the latest melting and casting technologies, for melting of scrap-based raw material and metallic iron units to produce steels of the highest quality for the country. Conscious efforts are made to implement the steelmaking processes with low carbon footprint and care for the environment. The melt shop will consist of the following major metallurgical equipment.

- 1. Electric Arc Furnace (EAF)
- 2. Scrap Preheating and Fume ExtractionSystem (FES)
- 3. Secondary Metallurgy Ladle Furnace (LF)
- 4. Continuous Casting Machine (CCM)
- 5. Water Treatment Plant (WTP)
- 6. Power Distribution Substation (PD)

Production Capacity and Product Mix

Designed capacity of the melt shop is 536,120 tonnes per annum liquid steel. The steel grade is largely low-to-medium carbon blooms and beam blanks of the following specifications:

- Beam blanks:350x686×12,000mm;350x430×12,000mm;205x292×12,000mm;
- Blooms: 430×160×12,000mm;
- Billets: 200x200x12,000mm; and
- Slabs: 800x200x12,000mm(reserved).

1.4.1 General lay-out of facilities

Shown in Figure 1.4 is the general lay-out of facilities under the Site Development Plan.

1.4.2 Map showing the location and boundaries of project area, location and footprint of main and support facilities and proposed buffers

Provided in the succeeding pages are the folloowng Figures:

- Figure 1.4.2.1: Location Map
- Figure 1.4.2.2: Vicinity Map
- Figure 1.4.2.3: Site Development Plan
- Figure 1.4.2.4: Site Drainage Plan.


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Figure 1.4.2.2: Vicinity Map

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Figure 1. 4.2.1: Site Development Plan

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Figure 1.4.2.2: Site Drainage Plan





In summary, following are the project's components:

Table 1.4: Summary of Project Components			
Components	Description / Capacity		
1. Rolling Mill			
REHEATING FURNACE	Low thermal losses and recovery of energy by combustion thru air recuperator to guarantee low fuel consumption, low mechanical maintenance and high level technological automation resulting to lowest emission.		
ROLLING MILL	Consists of roughing, intermediate and finishing stands, is composed of 14 rolling stands. It has 2 convertible stands for flexibility and ease of the rolling process. It has on-board utilities such as air, oil, water, power and hydraulics to minimize downtime during size change.		
TWIN FINISHING BLOCKS	Twin 6-stand tungsten carbide monoblock that enables high speed manufacturing of PNS 211 and 49 rebars with high strength and high precision.		
QTB WATER QUENCHING LINE	This is a twin tempcore quenching system wherein the two-line steel bar passes where it is rapidly cooled by a high pressure spray of water. This process increases the yield and tensile strength of the rebar.		
COOLING BED	A "start-stop walking beam" type cooling collecting and cooling the bars in multiples coming from the dividing shear. It is fitted with variable speed driving group and multi-groove lining-up rollers		
HEAVY DUTY STATIONARY SHEAR	This is the bar cutter which can cut up to 7 different commercial lengths of rebar, i.e. 6m, 7.5m, 9m, 10.5m, 12m, 13.5m and 15m.		
 HYDRAULIC BUNDLING MACHINES 	These are rebars bundlers using standard count for easy storage and handling.		
2 Substation			
Power Transformer	31.5MVA		
High Voltage Three Pole Horizontal Disconnect Switch with Earthing Blades			
 Gas Insulated Inductive Voltage Transformer 	SF6		
Gas Insulated Current Transformer	SF6		
Gas Insulated Power Circuit Breaker, Live Tank Type	Three Pole SF6		
 Surge Arresters with metal oxide resistors without spark gap direct molded silicone housing 			
 Lightning Arresters with counter 			
Neutral Grounding Resistor AC Auxiliary Service Distribution Panel			
 DC Auxiliary Service Distribution Panel 			
 Set of Automation Panel with remote I/O 			
Protection Relay Panel			
Energy Measurement Panel			
Harmonic Filter			
Primary and Secondary Earthing System			



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•	Medium Voltage Panel with electronic protection relays		
•	Auxiliaries		
3.	Circulating Wastewater Treatment Plant	3000 m3/h and covers an area of about 5900 sqm	
4.	Rainwater collection reservoir	3 collecting ponds with a volume of 30,000 cu.m, 3,400 cu.m, 26,600 or a total of 60,000 cu.m.	
5.	Generator set/Emergency power system	closed type mobile generator set with a diesel engine and a capacity of 1MVA/800kW standby power	
6.	Compressed Air Station	Capacity 5,710 m3/hr at 8 Bars	
7.	Cranes: Overhead Cranes	capacity ranging from 10 tons to 25Tons and 6 to 20 tons	
	and Semi- Gantry Cranes	under magnet	
_	with Overhead cranes		
8.	Fuel Storage	Low Sulfur Fuel Oil (LSFO)	
9.	Smoke Stack		
10.	Pumping Station and	approximately 2.75 KMs	
	water pipes from		
	Balayan Bay to		
44	proposed Project Site		
11.	QA laboratory		
12.	Machine shop		
13.	PriceProtectionSystem		
14.	System		
	System		
	• Water Treatment System		
	• Solid Wasto		
	• Solid Waste Management		
	Svstem		
	Hazardous Waste		
	Mangement		
	System		

1.5 Process /Technology

1.5.1 Processing/Manufacturing Technology

The Project's processes will be subdivided into the following sections:

- A. Light Section Mill and Heavy Section Mill
- B. Meltshop for Light and Heavy Section Mill

Discussion of Process/Technology

Light and Heavy Section Mill

Provided in Table 1.5.1.1 iand Figure 1.5.1.1 are the Operations Process Flow.

	PROCESS	DESCRIPTION		
1	BILLET CHARGING	The hot or cold billets are feed into reheating furnace according to rolling cycle time.		
2	REHEATING	The process of reheating takes place in the furnace. The Billets will be reheated to 1150-1250 °C, suitable for rolling.		
3	DESCALING	To remove the scale on the surface of billet.		
4	ROLLING	The billet passes through a series of rollers which reduces the cross- section, and in the process, elongates the bar. At the end of this process, the final profiles and lengths are generated.		
5	SLITTING (just for rebar)	The single line is split into two during operation.		

Table 1.5.1.1: Operation / Process Flow

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PROCESS		DESCRIPTION
6	UNIVERSAL STANDS ROLLING	The billet passes through universal stand rolling. This is a new technology in the Philippines and enables the manufacturing of sections as required by customers.
7	QUENCHING (just for rebar)	Rebar passes through a twin tempcore quenching system where it is rapidly cooled by a high-pressure spray of water. This process increases the yield and tensile strength of the rebars to conform to PNS49 requirements.
8	COOLING	Heat is dissipated from the process of cooling so that bars are not easily bent or damaged by succeeding processes.
9	CUTTING	Sections are cut to 2 different commercial lengths – 6 meters, and 12 meters by saw or cold shear. Rebars are cut to 7 different commercial lengths – 6 meters, 7.5 meters, 9 meters, 10.5 meters, 12 meters, 13.5 meters and 15 meters by cold shear.
10	STACKING AND BUNDLING	The stacking station is equipped with automatic bar counting system. I t make section into square package, then the package is bundled into a standard count for easy storage and handling. Re-bars are bundled into a standard count for easy storage and handling.



Figure 1.5.1.1: Light and Heavy Section Mills Process Flow



Shown in Figure 1.5.1.2below is the process flow sheet showing materialbalance of the Section Mills. This will be duplicated as the Mill is composed of Light and Heavy Section Mill at 600,000 MTPY capacity each.

BILLET			
612,078			
↓			
REHEATING	0.50%	LOSSES(Mill scale)	Collected for sale and
612,078		3045.2	Recycling
↓			
ROLLING	0.40%	LOSSES(Mill scale)	Collected for sale and
609,032		2426.4	Recycling
↓			
QUENCHING	0.10%	LOSSES(Mill scale)	Collected for sale and
606,606		606.0	Recycling
•			
CUTTING	1.00%	LOSSES(Mill scale)	Collected for sale and
606,000		6000.0	Recycling
\checkmark			
PRODUCT			
600,000			

Figure 1.5.1.2: Process flow sheet with material balance

Provided in Figure 1.5.1.3 below is the water balance of Section Mills. Same as the material balance, this will be doubled as the Mill is composed of Light and Heavy Section Mill.

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Meltshop for Light and Heavy Section Mill

Flow sheet

(1) <u>Steelmaking Process</u> The end-product is for steel light structural sections. The steelmaking process flow is: 100% scrap – EAF – LF – CCM.

Technologycharacteristics of steelmaking

(1) Electric Arc Furnace (EAF)

The use of an EAF is the most appropriate steelmaking route to produce quality steel for the Philippines. It capitalizes on the abundance of steel scraps in the country, of which substantial quantity isexported. As the cities growor renew, generation of steel scraps (among other wastes)will grow. Harnessing the locally generated scraps, and efficiently converting to useful steel befits the nation's agenda of green economy.

TheEAFmakes use of electric arcs that emit extremely high heat at 6000^CC in the furnace. The intense heat is sufficient to melt any steel scrap brought into contact. The continuous striking of the arcs melts all the scrap, and the bath temperature is steadily brought to around 1600^CC, ready for tapping. Structure of the EAF is shown below. High electrical power is connected to a set of 3 graphite electrodes suspended from above the furnace. The furnace is a refractory-lined vessel that holds measured quantity of scrap or molten steel. The graphite electrode mast is controlled up and downthe furnace so that predetermined arc currents will flowwhen in contact with the scrap. Shown in Figure below is an illustration of an EAF.



Figure 1.5.1.4: Illustration of an EAF

There are various technologies available for the EAF to capture waste heat generated during the melting process. A waste heat recovery system makes use of the waste heat to preheat the in-feeding scrap so that it attains around 500 to 600⁻⁻C before being charged into the furnace. The feeding system is specially constructed to divert the hot waste gases from the EAF to heat the scrap before being ducted to the fume treatment plant (FES). Benefiting from the scrap preheating system, electrical energy consumption can be reduced to 350kW-hours per tonne of liquid steel; as compared to 550kW-hours per tonne for most of the conventional EAF's in theASEAN region. Figure below shows a conceptual description of how the scrap is preheated before being charged into the EAF.





Figure 1.5.1.5: Conceptual description of how the scrap is preheated before being charged into the EAF

This advance scrap preheating technology has brought about many advantages that a conventional EAF does not provide. These are summarized below.

- 1. The entire EAF-preheater system is predominantlykept closed for most of the melting cycle; ascompared tobatch-charging sequences for conventional EAF's. Much lesser fumes and heat escape from the furnace, allowing a cleaner and safer workenvironment. Less arcing noise is also felt by workers around the furnace. The in-factory environment becomes more pleasant, as shown in photo below.
- 2. The furnace can be made to operate under flat-bath condition, whereby electric arcs are generated under the protection of a layer of slag. By so doing, the arcs become more stable hence imposing less power demand from the grid.
- 3. With proper tuning of the waste gas temperatures, all volatile gases can be completely oxidized along the scrap preheater system, hence negating the formation of dioxins in the stack emission.

The FES is adequately sized to provided sufficient suction and to handle the dust being collected from the process. Hot gas is drafted from the EAF through the scrap preheater at flow rate more than 300,000 Nm^3/h . Thereafter, the flue gas flows into a combustion chamber for complete oxidation of the remaining combustibles. Larger particulates are settled at this station. The gas is further drafted to a heat exchanger to cool the temperature down to below 140^{-2}C , before going into the baghouse for dust removal. In the baghouse, the gas is distributed into a series of long filter bags. Dust particles gather at one side of the filter and clean gas passes through the filtermedium. Gas velocity is controlled at around 1 meter per second to allow for maximum capture. Discharge dust concentration will be less than 10mg per Nm^3 , belowNational Standards set-limits. The gas is subsequently discharged into the atmosphereconforming to the National Clean Act, 1999 (RA8749).

(2) Ladle Furnace (LF)

After EAF tapping, the molten steel is tapped into ladle, and being transportedinto the ladle furnace area for secondary metallurgical refining processes. The aim is to achieve clean steel of high quality at the LF station as well as attaining the precise finalchemistryfor the heat. Where needed, argon bubbling will be used to float out all impurities. For further raising and adjusting the melt temperature, the LF is provided with a set of arcing electrodes to control the amount of heat from the top surface of the molten steel.

To adjust the exact chemistry needed for the final physical properties of the material, ferroalloys are added in the LF station. Alloy addition is achieved completely remote and automatic. Recipes of alloys are already predetermined by the software and requires minimal human intervention. A schematic



diagram of the alloy charging system is shown below. The system is also equipped with dust control mechanism inside and around the alloy charging system to minimize fugitive dust.



Figure 1.5.1.6: Schematic diagram of the alloy charging system

The combined action of heat input, alloys and argon stirring result in the ultimate optimization of quality and casting needs of the melt ready to be cast into billets at the continuous casting machine.

(3) Continuous Casting Machine (CCM)

When the molten steel is ready for casting, the ladle is lifted by overhead electric crane onto a rotating turret in preparation for subsequent teeming. The cast flows from the ladle into a high capacity tundish that can hold around 14-18tonnes of steel. Streams of molten steel are made to follow into four separate molds for solidification. The high capacity tundish ensures temperature homogeneity and chemistry consistency to assure the eventual product steel quality.

The mold is made of a precision-finished copper mold tube that governs the exact shape of the eventual billet. Heat is evenly extracted from the four faces of the square mold tube by pressurized water flow through the mold assembly. The gradual formation of the shell from molten steel to solid billet comes slowly out of from the bottom of the mold passing into the secondary water spray region. Uniform heat extraction ensures good billet geometry and eliminates crack formationin any part of the material. Automatic mold level control technology and special mold oscillation mechanism are deployed. Radioactive source is used to detect and control the mold level to achieve good ferro-static pressure inside the mold. Drawing speed per casting strand is more than 3 meters per minute to ensure high productivity. The caster has a casting radius of 9 meters.



1.5.2 Ancilary Facilities, Pollution Control Devices and Waste Management System

A. FOR LIGHT AND HEAVY SECTION MILL

A.3.1 Circulating Water Treatment Plant (WTP)

The Water Treatment Plant shall include 5 systems, as described below.

1. Make Up Water System (Capacity: 50 m3/h) and Fire Protection Water System (Capacity: 576 m3/h)







The source for makeup water is surface water.

The makeup water supply pumps which lift water to the whole makeup water network of the plant.
 The fire hydrant water supplypumps that lift water to the whole fire protection water network of the plant.

Makeup water treatment process is as follow:

Raw water (in raw water pool) \rightarrow lifting pumps \rightarrow filter \rightarrow makeup water pool \rightarrow makeup water supply pumps \rightarrow makeup water network of the plant

The same as above \rightarrow makeup water pool \rightarrow fire hydrant water supplypumps \rightarrow fire protection water network of the plant

This system adopts Manganese sand filter.Makeup water pool is cleaned regularly. Residue from filter in thissystem flow into the mud regulation tank of ST for combined treatment. Sodium hypochlorite (NaClO) is added at the exit of makeup water pool to inhibit bacterial growth.

2. Indirect Cooling Water System (Capacity: 950 m3/h)





The circulation water quantity of ICW is 950m3/h is used mainly for the reheat furnace, lubrication system, hydraulic system, stand motors, etc. In the ICW system, the circulating water is primarily performing heatexchange and the water quality is not contaminated by the process. Thewater returns to the cooling towersfor cooling. The water can then be used again for all the heat exchange. Process route if as below.

Cold waterpool \rightarrow circulating pump \rightarrow user \rightarrow cooling tower \rightarrow cold water pool. Furnaceand other equipment set different pumps.

There are 2 sets of cooling tower adopted in this system, each capacity is475m3/h. The cooling tower is reinforced steel structures. In order to reduce the content of suspended solids in water circulation, part ofthe circulating return water flow to homogeneous sand filter. Thefiltratereturns to the cold-water pool. To ensure water quality and stability, corrosion-prevention and scaling of equipment and pipeline, there are 2 sets of chemical dosing device. Dosing device dispendscorrosion-scale inhibitor and biocide.



3. Direct Cooling Water System (Capacity: 1,700 m3/h)

The circulation water quantity of DCW is 1700m3/h, and the main users areRolling mill and QTB area, etc.

The Rolling mill return-water flows to the underground scale pit by gravity. Part of the DCW water is pumped to flush the exit furnace which is about200m3/h. The rest of DCW water is pumped to chemical degrease device to removesome suspended solids and grease, before being collected at the hot water pool. The water is then pumped to the cooling tower by lift pumps.

The QTB return water flow to the underground return water pool by gravity. After that, part of the water is filtered. Then all the water flow to the cooling tower. After cooling down, there are two groups of pumps installed.one is for lowpressure of 5 bar users; another is for 12 bar users. Basic process is as follows.

Return water \rightarrow scale pit (water collecting pit for quenching) \rightarrow lifting pump \rightarrow chemical degrease device \rightarrow cooling tower \rightarrow cold water pool \rightarrow circulating pump \rightarrow self-cleaning filter \rightarrow user \rightarrow return water.



Chemical degreasing device deals with lowering concentration of oil by dosing chemicals. Reaction is by coagulation, flocculation and sedimentation to treat the process water. Efficiency is high, and the system footprint issmall. Sludge produced from chemical degreasing device flows into the sludgeregulation tank of ST.

There are 2 sets of cooling tower adopted in this system. One is for rolling mill, the capacity is 900m3/h. The other is for QTB, the capacity is 800m3/h. The coolingtower is reinforced steel structures.

A.3.2 Sludge Treatment System

The mainsources of this system are the backwash waterof filters, sludgefrom chemical degreasing device, etc. The wastewater with sludge firstly enter inthe mud regulation tank, which will be pumped to the concentrated pool. There are 2 setsof concentrated pool. The surface fluid of concentrated pool overflowsintothe underground scale pit of DCW. The sludge settledfrom concentrated pool is lifted by pumps to filter press fordewatering, followed bydehydration. The dewatered sludge cake Isaround65% dryness. The cakes arecollected in a cake hopper forstorage before being trucked out of the plant.

Auxiliary systems of filter press include: lime dosing facilities, sludge storagehopper and automatic control equipment, etc. There are two sludge hopperscorresponds with the filter presses. The press is fully automatic. The filtrate and cloth wash wateris recirculated to the underground scale pit of DCW. In order to accelerate sludge flocculation and sedimentation, and promote thethickening and dewatering effect, two sets of dosing device are used.



This water treatment system guarantees zero discharge of industrial waste water.

A.3.3 Sewerage Treatment Plant

The Water Treatment Plant of M9 project havesewage and sludge treatment system. The system can guarantee that no wastewater discharge from the site.

A.3.4 Flue Stack-The height of chimney is more than 50 meters and with sampling points according to the regulations of the government to ensure emissionquality.

A.3.5 Waste Management System-Disposal procedures of hazardous, solid and domestic wastes are as follows:

• Scales is formed on the outer surfaces of plates, sheets or profiles when they are being produced by rolling red hot steel billets in rolling mills. Mill scale is composed of iron oxides mostly ferric and is



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bluish black in color. It is usually less than 1 mm thick and initially adheres to the steel surface andretards further oxidation. Scales will be collected in containers and will be for sale abroad for recycling in sinter plants.

- **Used oil** will be collected and put inside sealed drums, stored in a company designated Material Recovery Facility (MRF) inside the plant. It will be transported and treated by a DENR accredited TSD facility.
- **Busted Fluorescent Bulbs** will be put in a container, stored inside the plant MRF in accumulation until there are sufficient inventory for proper disposal through a DENR accredited TSD facility.
- Contaminated rags and gloves will also be put in bags, stored inside the plant MRF in accumulation until there is sufficient inventory for proper disposal through a DENR accredited TSD facility.
- Used automotive batteries will be traded-in to designated suppliers.
- Solid Wastes will be properly segregated and to be disposed in the Material Recovery Facility of Lemery.
- **Domestic Waste** will be treated through the proposed Sewerage Treatment Plant.
- **industrial waste water:** this water treatment system guarantees zero discharge of industrial waste water.

B. MELT SHOP FOR LIGHT AND HEAVY SECTION

B.1 Circulating Water Treatment Plant (WTP)

The Water Treatment Plant shall include5 systems. Shown below are brief descriptions of the treatment process.

1. Make Up Water System, Capacity: 70m3/h and OneFire Protection Water System



The source for makeup water is underground water. Water is pumped at flow rate70m3/h, with pressure of 0.2MPa. There are two groups of pumps at the makeup-water pool.

1) The makeup water supply pumps which lift water to the whole makeup water network of the plant.

2) The fire hydrant water supplypumps that lift water to the whole fire protection water network of the plant.

- Raw water (in raw water pool) →lifting pumps→ filter → makeup water pool→ makeup water supply pumps → makeup water network of the plant
- The same as above \rightarrow makeup water pool \rightarrow fire hydrant water supplypumps \rightarrow fire protection water network of the plant

This system adopts Manganese sand filter.Makeup water pool is cleaned regularly. Residue from filter in thissystem flow into the mud regulation tank of ST for combined treatment. Sodium hypochlorite (NaClO) is added at the exit of makeup water pool to inhibit bacterial growth.

2. Soft water cooling water system.

Soft water, after ion exchange, is used for conducting arms cooling of EAF and LF electrode masts as well as the copper molds in CCM. Total soft water flow rate is 480m3/h. The circulating watertemperature rises during the process. This is returned to the soft-water pool for cooling by heat exchanger with indirect cooling water. Basic process is as following.

• Soft water pool - circulating pump - user heat exchanger - soft water pool. To ensure water quality and stability, and prevent corrosion and scaling of equipment and pipelines, there are 2 sets of dosing devices for corrosion inhibitor and biocide.



3. Indirect Cooling Water System



The circulation water quantity of ICW is 1500m3/h is used mainly for the EAF, FES, LF, Caster machinery, heat exchangers of lubrication and hydraulic systems, air conditioners, etc. In the ICW system, the circulating water is primarily performing heatexchange and the water quality is not contaminated by the process. Thewater returns to the cooling towers for cooling. The water can then be used again for heat exchange. Process route if as below.

• Cold waterpool \rightarrow circulating pump \rightarrow user cooling tower \rightarrow cold water pool.

To reduce the content of suspended solids in water circulation, part of the circulating return water flow to homogeneous sand filter. After filter, the lean water returns to the cold-water pool. To ensure water quality and stability, corrosion-prevention, and scaling of equipment and pipelines, there are 2 sets of chemical dosing device. Dosing devices control corrosion, scale inhibitor and biocide. Sludge produced from filter in this system flow into the mud regulation tank of ST.



4. Direct Cooling Water System







The circulation water quantity of DCW is 720m3/h. This water ismainly used for the CCM secondary spray system, where billet surfaces are cooled directly by jets of water. Process water (DCW) flows to anunderground scale pit by gravity. Part of the DCW water is pumped to scrap ditch at flow rate of about 120m3/h. The rest is pumped to chemical degreasing device to remove suspended solids and oil. Then it is pumped to the cooling tower for cooling. Basic process is as following.

Process water - scale pit (water collecting pit for quenching) - lifting pump - chemical degrease device - hot water pool filter- cooling tower - cold water pool - circulating pump - user - return. Sludge produced from filters in this system flow into the sludge regulation tank of ST.

5. Sludge Treatment System

The main sources of this system are the backwash waste of filters, sludgefrom chemical degreasing device, etc. The wastewater with sludge firstly enter in the mud regulation tank, which will be pumped to the concentrated pool. There are 2 setsof concentrated pool. The surface fluid of concentrated pool overflows into the underground scale pit of DCW. The sludge settled down from concentrated pool is lifted by pumps to filter press fordewatering, followed bydehydration. The dewatered sludge cake is then formed, with 65% dryness. The cakes are collected in a cake hopper forstorage before being trucked out of the plant.

Auxiliary systems of filter press include: lime dosing facilities, sludge storagehopper and automatic control equipment, etc. There are two sludge hopperscorresponds with one filter press each. The press is fully automatic. Each press has duty cycle of 8 to 16 hours per day, depending on quantity of sludge generated. The filtrate and cloth washing-water is recirculated to the underground scale pit of DCW.To accelerate sludge flocculation and sedimentation, and promote thethickening and dewatering effect, two sets of dosing device are used. There is nowaste water for discharge.





Power to the meltshop is supplied by overhead lines, at high voltage 138kV from power company. The requiredpower need for the meltshop is estimated at 80MVA.

The power distribution network voltages are described as shown below.

- AC 138kVreceiving voltage
- AC 22kVEAF/LF distribution voltage
- AC 3.3kVmain distribution voltage
- AC 440V(3phase) low-voltage utilization voltage (low voltage for motors)
- AC 460V(3phase) low-voltage supply voltage (transformer's secondary side rated voltage)
- AC 230V(3phase) low-voltage of illumination
- DC 110 V DC control voltage of the switchgear

B.3 Dedusting system

The system consists of thewater-cooled flue duct, combustion chamber, natural air cooler, pulse-jet bag filter, fume exhaust fan, fume exhaust device and chimney, etc. It is located at the primary fume exhaust pipeline, as well as above the EAF for emission capture.

- Inlet fume flow is 300,000Nm3/h.
- Inlet fume temperature 1300°C.
- Clean gas dust content <10mg/Nm³



B.4 Slag treatment system

The melting process generates slag, which is collected beneath the EAF in a slag pot. The slag car transports the pot full of slag to theslag bay. The 40/10t metallurgical crane in the bay lifts the pot onto a truck, to be transferred to an external treatment area. At the slag treatment area, the hot slag is poured into a holding area and being sprayed-cooled by measured quantity of water. A special excavator, fitted with high temperature protection shields, works on the slag by mixing, churning, and eventually scooped to be curedfor 24 hours. After the slag is cooled to atmospheric temperature, magnetic lumps are recovered by magnets for charging back into the EAF. The remaining slag granules can be crushed to be made into road stones and bricks. The slag treatment area is equipped with ventilators to prevent spread of fugitive dusts.

B.5 Water Catchment Pond

There is a collecting pond to collect rain water to minimize usage of potable water. This collecting pond has a volume of 35,000 cubic meters. Its main purpose is to provide some of make-up water for the evaporation losses within the pant.

B.6 Drainage System

The main water source of the WTP plant is rainwater and deep well water. The storm drainageconnected to the Water Catchment Pond to accumulate an amount of water to serve as make-



up water to the WTP.Advanced water treatment system to ensure that no water discharge to the outside of the plant.

B.7 Compressed Air Station

The compressed air is being used as atomizer of the fuel for complete combustion in the furnace, also used in pneumatics for instrumentation and controls of equipment. Capacity is 5,000 m3/h at 8 Bars.

B.8 Oxygen

It can be known from the list of oxygen consumers and consumption that oxygen will be used at around 38 Nm3/tonneon the steelmaking production line. The main oxygen pipe will be from supplier's station.

B.9 Nitrogen

It can be known from the list of nitrogen consumers and consumption that nitrogen will be used at 9Nm3/tonnein the steelmaking workshop. The main Nitrogen pipes will be from supplier's station.

B.10 LPG/LNG

The system consists of the LPG/LNG tank, unloading device, gasification unit, piping with supports, fire protection system and control system, etc.

B.11 Generator set/Emergency power system

This will serve as an emergency power of the plantif there is power outage. There is a generator with a diesel engine in this plant and a capacity of 2,000kW standby power to supply cooling water for all key equipment and lighting, cranes to ensure all deliveries. The generator set is also set with compatible cooling system, noise reduction system, intake and exhaust system, and electronic control system.

1.5.3 Operations and Maintenance of Facility

Operations and Maintenance is subdivided into 2 areas:

- Light and Heavy Section Mill
- Meltshop for Light and Heavy Section Mill

1.5.3.1 Light and Heavy Section Mill

Provided below is the Operations and maintenance of the Light Section Mill.

1.5.3.1.1 Operations and maintenance of the Light and Heavy Section Mill

Table 1.5.3.1.1.1: Operations and maintenance of the Furnace Section

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
	Monitoring of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Daily
	Lubricating of wheel, and rotating joints.	Weekly
Billet Handling (Loading Table)	Replacement of tilting arm pusher, wheel, and bearing. (Based also on the condition of tilting arm pusher, wheel, and bearing)	2 Years
	Replacement of hydraulic cylinder, and solenoid valve. (Based also on the condition of hydraulic cylinder)	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
	Tightening of bolts and lubricating of bearing housing.	Daily
Roller Table 1	Replacement of rollers. (Based also on the condition of roller)	2 Years
(Charging Billet)	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 5 years, no need to dismantle. Base on monitoring)	2 Years
Roller Table 2 (Charging Billet	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
Tilter), Roller Table 3	Inspection of hydraulic cylinder, solenoid valve, hose, and	Weekly



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	tube/pipe.	
	Tightening of bolts and lubricating of bearing housing.	Daily
	Replacement of hydraulic cylinder, and solenoid valve.	2 Years
	(Based also on the condition of hydraulic cylinder)	
	roller)	2 Years
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 5 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of hydraulic cylinder, solenoid valve, and hose.	Daily
Disappearing Stopper	Tightening of bolts and lubricating of pin/bushing.	Daily
	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Monitoring of pump temperature, noise, and vibration.	Daily
Main Fuel Pump,	Tightening of bolts.	Daily
Zone Pump	Replacement of pump. (Based also on the condition of pump)	2 Years
	Monitoring of bearing housing temperature, lubrication, noise, and vibration.	Daily
Combustion Air Fan,	Inspection of belt and pulley.	Weekly
Fan	Tightening of bolts and lubricating of bearing and pin/bushing.	Daily
	Replacement of belt.	Yearly
	Monitoring of air pressure and lubrication at FRL, pulley, and chain.	Daily
Discharging Door	Inspection of chain, and door.	Weekly
Bioonarging Boon	Tightening of bolts and lubricating of pulley.	Daily
	Replacement of pneumatic cylinder, and solenoid valve.	2 Years
	Monitoring of air pressure and lubrication at FRL, chain, and cooling.	Daily
	Inspection of sprocket, chain, wheel and billet detector rod.	Weekly
Billet Detector	Tightening of bolts and lubricating of roller.	Daily
	Replacement of chain, and sprocket.	2 Years
	Replacement of pneumatic cylinder, and solenoid valve.	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
Roller Table (Exit Roller)	Tightening of bolts and lubricating of bearing housing.	Daily
	Replacement of rollers. (Based also on the condition of roller)	Yearly
	Replacement of bearing. (Based also on the condition of bearing)	Yearly
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 5 years, no need to dismantle. Base on monitoring)	2 Years

Table 1.5.3.1.1.2: Operations and maintenance of theRolling Mill Section

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Descaler	Inspection of solenoid valve, tube, and nozzle.	Monthly



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	Monitoring of bearing housing temperature, lubrication pressure and temperature, gear coupling temperature, noise, and vibration.	Daily
	Inspection of oil spray nozzles.	Monthly
Gearbox of stands	Tightening of bolt and lubricating of drive gear coupling.	Weekly
	Dismantle of gearbox assembly. Inspection of bearing, gear and shaft condition. Replacement of driveshaft bearing and oil seal. (Note: Depends on the years of service, for less than 5 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of spindle carrier bearing housing temperature, air/oil lubrication, noise, and vibration.	Daily
	Monitoring of gear coupling, spindle, and cross joint.	Daily
	Monitoring of hydraulic oil pressure, temperature, and level.	Daily
Stand Assembly	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
·····,	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Monitoring andlubricating of all spindle carrier bearing.	Daily
	Tightening of bolt, and lubricating of spindle, and cross joint.	Weekly
	Dismantle of spindle carrier assembly. Inspection of bearing, and seal. Replacement of bearing and oil seal. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of shear blade, bearing housing temperature, lubrication pressure and temperature, gear coupling temperature, noise, and vibration.	Daily
Fly Shear	Inspection of oil spray nozzles.	Monthly
	Monitoring of brake assembly.	Daily
	Tightening of bolt and lubricating of drive coupling.	Weekly
	Monitoring and lubricating of roller bearing and pin/bushing at channel.	Daily
	Replacement of roller. (Based also on the condition of the roller).	Yearly
	Monitoring of blade & assembly.	Daily
	Replacement of shear blade.	As and when needed
	Monitoring of air pressure and lubrication at fiber-reinforced lining (FRL).	Daily
	Inspection of pneumatic cylinder, solenoid valve, and hose.	Daily
	Replacement of cylinder, and solenoid valve.	Yearly
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of air pressure and lubrication at FRL.	Daily
Loop Forming Device	Monitoring of pneumatic cylinder, valve, and hose.	Daily
	Replacement of cylinder, & solenoid valve.	Yearly

For Auxiliary Section

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Quenching system	Monitoring of valves, tube, and nozzle.	Daily
	Monitoring of nozzle bores	Daily



	Replacement of nozzle bores	As and when needed
	Monitoring of pin housing, pin; air pressure and lubrication at FRL and accumulator tank.	Daily
Roller Table (Run in /	Inspection of rollers, pins, pneumatic cylinder, regulator, and hose.	Daily
Sliding Apron)	Tightening of bolts and lubricating of pin/bushing.	Daily
	Replacement of rollers. (Based also on the condition of roller)	Monthly
	Replacement of hydraulic cylinder, and regulator.	Yearly
	Replacement of pin & bearing.	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, noise, and vibration.	Daily
	Monitoring of brake and rollers assembly.	Daily
Pake Section (Fixed	Tightening and lubricating of drive coupling and spindle.	Weekly
& Moving)	Monitoring and tightening of rake.	Daily
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of rollers, pillow blocks, chains, and sprockets.	Daily
Roller Table	Tightening of bolts and lubricating of pillow blocks.	Daily
(Aligning Rollers)	Replacement of rollers. (Based also on the condition of roller)	2 Years
	Replacement of pillow blocks, chain, and sprockets	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, chain, sprocket, noise, and vibration.	Daily
	lightening and lubricating of drive coupling, sprocket, and shaft.	Weekly
Chain Transfer	Tensioning and lubricating of chain.	Daily
System, Feeding	Monitoring and lubricating of plumber block.	Daily
Storage Chain	condition of sprocket and chain)	2 Years
Conveyor	bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, chain, sprocket, noise, and vibration.	Daily
	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
	Tightening and lubricating of drive coupling, sprocket, and shaft.	Weekly
Trolley Transfer	Tensioning and lubricating of chain.	Daily
System, Dual Section Trolley Transfer System	Monitoring and lubricating of plumber block and pillow block.	Daily
	Replacement of sprocket and chain. (Based also on the condition of sprocket and chain)	2 Years
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less	2 Years



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	than 2 years, no need to dismantle. Base on monitoring)	
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
Roller Table (Run	Monitoring and lubricating of plumber block.	Daily
	Replacement of rollers. (Based also on the condition of roller)	2 Years
out)	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of spindle lubrication and vibration.	Daily
	Monitoring of hydraulic oil pressure, temperature, and level.	Daily
	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
Straightening	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
machine	Tightening of bolt, and lubricating of spindle, and cross joint.	Weekly
	Dismantle of spindle carrier assembly. Inspection of bearing, and seal. Replacement of bearing and oil seal. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of bearing housing temperature, lubrication pressure and temperature, gear coupling temperature, noise, and vibration.	Daily
	Inspection of gear oil spray nozzles.	Monthly
	Tightening of bolt and lubricating of drive gear coupling.	Weekly
	Monitoring of brake assembly.	Daily
	Monitoring of lubricating of bearing, pin and bushing.	Daily
	Replacement of roller. (Based also on the condition of roller)	Yearly
	Monitoring of shear blade & assembly.	Daily
	Replacement of shear blade.	As and when needed
	Monitoring of air pressure and lubrication at FRL.	Daily
Cold Shear	Inspection of pneumatic cylinder, solenoid valve, and hose.	Weekly
	Replacement of pneumatic cylinder, and solenoid valve.	2 Years
	Monitoring of hydraulic oil pressure, temperature, and level.	Daily
	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
	Replacement of hydraulic cylinder, and solenoid valve.	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gear and shaft condition. Replacement of driveshaft bearing and oil seal. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Replacement of shear blade. [Note: Depends on the blade life (Tons produce) and also condition of blade. Shear = 300,000 MT	Blade Life (MT)
	Monitoring of air pressure and lubrication.	Daily
Gauge Stopperfor	Monitoring of pneumatic cylinder, solenoid valve, and hose.	Daily
cold shear and saws	Tightening of bolts and lubricating of pin/bushing.	Daily
	Replacement of pneumatic cylinder, and solenoid valve.	Yearly
Transfor	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, chain, sprocket, noise, and vibration.	Daily
110115161	Tightening and lubricating of drive coupling, sprocket, and shaft	Weekly



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	Tensioning and lubricating of chain.	Daily
	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Replacement of sprocket and chain. (Based also on the condition of sprocket and chain)	2 Years
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
	Monitoring and lubricating of plumber block.	Daily
Run out Roller Table for Transfer and Saws	Replacement of rollers. (Based also on the condition of roller)	2 Years
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of the pressure of lubrication and hydraulic.	Daily
	Monitoring of gear box condition, noise, and vibration.	Daily
	Monitoring of main shaft condition, noise, and vibration.	Daily
Cold Saws	Tightening of bolt and lubricating of drive coupling.	Weekly
	Monitoring andlubricating of roller bearing and pin/bushing at channel.	Daily
	Replacement of cylinder, and solenoid valve.	Yearly
	Replacement of saw blade. [Note: Depends on the blade life (Tons produce) and condition of saw blade. Typical = 200.000 MT	Blade Life (MT)
	Tightening and lubrication of coupling, plumber block, and pillow block.	Weekly
Bar Counting System	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, chain, sprocket, noise, and vibration.	Daily
	Tightening and lubricating of drive coupling, sprocket, and shaft.	Weekly
	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
Magnetic Stacker	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Tightening and lubrication of coupling, plumber block, and	
Collecting Cradles	pillow block.	vveekiy

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	tube/pipe.	
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
	Monitoring and lubricating of plumber block.	Daily
	Replacement of rollers. (Based also on the condition of roller)	2 Years
Roller Table before tying	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years
	Monitoring of hydraulic oil pressure, temperature, and level.	Daily
	Cleaning and lubricating of bearing, pin and bushing.	8 Hours
	Replacement of roller. (Based also on the condition of roller)	2 Years
	Replacement of bearing. (Based also on the condition of bearing)	Yearly
Tying Machine	Inspection of tying wire shear blade & assembly.	Daily
	Inspection of hydraulic cylinder, hydraulic motor, solenoid valve, hose, and tube/pipe.	Weekly
	Replacement of hydraulic filter.	Quarterly
	Replacement of hydraulic cylinder, hydraulic motor, and solenoid valve.	2 Years
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, chain, sprocket, noise, and vibration.	Daily
	Tightening and lubricating of drive coupling, sprocket, and shaft.	Weekly
	Tensioning and lubricating of chain.	Daily
	Inspection of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Weekly
Lifting Table Chain Bundle Transfer Devices	Replacement of hydraulic cylinder, and solenoid valve.	Yearly
	Replacement of sprocket and chain. (Based also on the condition of sprocket and chain)	2 Years
	Replacement of bearing. (Based also on the condition of bearing)	2 Years
	Dismantle of gearbox assembly. Inspection of bearing, gears and shaft condition. Replacement of driveshaft bearings and oil seals. (Note: Depends on the years of service, for less than 2 years, no need to dismantle. Base on monitoring)	2 Years

Table 1.5.3.1.1.3: Operations and maintenance of theUtiities Section

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Air Compressor & Dryer	See below	
Crane	See below	
Water Treatment Plant (WTP)	See below	
Lubrication Unit	Monitoring of oil (pressure, temperature, level, and color),	Daily



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	cooling temperature, filter, pump temperature, noise, and vibration.	
	Inspection of pump, filter, hose, and pipe/tube.	Weekly
	Replacement of filter.	2 months
	Replacement of pump, and valves. (Based also on the condition of pump and valve)	3 Years
	Change oil. (Based also on the monitoring)	3 Years
	Monitoring of oil (pressure, temperature, level, and color), cooling temperature, filter, pump temperature, noise, and vibration.	Daily
	Inspection of pump, filter, hose, and pipe/tube.	Weekly
Hydraulic	Replacement of filter.	2 months
	Replacement of pump, and valves. (Based also on the condition of pump and valve)	3 Years
	Change oil. (Based also on the monitoring)	3 Years
Hydraulic Valve Stand	Cleaning and servicing (stop leaks).	Weekly
Cylinder, Solenoid Valve, Flow Control	Replacement (Recondition - cleaning and replacement of seal)	Yearly
Air Tank Receiver	Inspection and cleaning of tank and valves.	Yearly



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Table 1.5.3.1.1.4: Operations and maintenance Compressor/Dryer Section

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Compressor	Change Oil.	6,000 running hours
	Replacement of oil filter.	
	Replacement of oil separator.	
	Replacement of air filter.	3,000 running
	Inspection of belt/coupling.	hours
	Inspection of valve.	12,000 running
		nours
Dryer	Replacement of oil filter.	6,000 running
		nours

Table 1.5.3.1.1.5: Operations and maintenance of Overhead Crane and Semi-Gantry CraneSection

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Wire Rope	Checking by sight for any deformation, wear kinks and element disconnection. Measurement of wire rope diameter. Greasing.	Monthly
Rope Drum	Checking by sight for any deformation, wear, crack and looseness. Measurement of groove.	Monthly
Wheel and bearing	Checking of any deformation, abnormal noise. Measurement of wheel dimension (diameter, width, lip thickness).	Monthly
-	Greasing of bearing.	Weekly
Frame	Check for cracks on the running saddle and girder. Inspection of hook using crack detection dye. Tightening of bolt.	Monthly
Bottom block and pulley	Greasing of bearing. Inspection of pulley groove.	Monthly
Crane Hoist	Overhauling. Pull out the hoist and inspect all parts. Replace all wheel, hoist and gearbox bearings.	2 Years

Table 1.5.3.1.1.6: Operations and maintenance of Water Treatment Plant (WTP)

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY	
	Monitor Temperature	Daily	
	Visually inspect the lifting chain/rope	Every 4,000 operating hours	
Pumpe	Check the mechanical seal leakage	Every 10,000 operating hours	
Fullips	Lubricate the bearings	Every 10,000 operating hours	
	General Overhaul and change impeller	Every 5 years	
	Manual greasing motor bearings	Every 3000 operating hours	
	Monitor Temperature	Daily	
	Monitor Pressure	Daily	
Cooling Tower	Lubrication	Every 3000 operating hours	
	Check the tightening of the bolts.	Every 6 Months	
	Check the fan blades to ensure their structural integrity	Every 6 Months	
	Cleaning of blades	Every 6 Months	
	Sedimentation	Every 72 operating hours	
	Air Removal	Every 72 operating hours	
Sand Filter	Drain	Every 72 operating hours	
	Backwash	Every 24 operating hours	
	Air and Water Backwash	Every 24 operating hours	
	Filling	Every 24 operating hours	



1.5.3.1.2 Operations and maintenance of the Melth Shop for Light and Heavy Section Mill

Table1.5.3.1.2.1:For Main Section			
EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY	
	Monitoring of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Daily	
Soron observing	Monitoring of bearings.	Daily	
scrap charging svstem	Monitoring of lubricating of all rotating joints.	Weekly	
System	Replacement of hydraulic cylinder, and solenoid valve, bearing.	Based also on the condition used	
	Monitoring of belt	Daily	
Auviliary matorial	Monitoring of bearings.	Daily	
charging system	Monitoring of lubricating of all rotating joints.	Weekly	
-Belt conveyor	Replacement of belt, bearing.	Based also on the condition used	
Auxiliary material	Monitoring of springs.	Daily	
charging system -Vibrating feeder	Replacement of springs.	Based also on the condition used	
	Monitoring of hydraulic cylinder, solenoid valve, and hose.	Daily	
	Monitoring of bearings.	Daily	
	Monitoring of lubricating of all rotating joints.	Weekly	
	Monitoring of refractory.	Daily	
EAE	Monitoring of water cooling cable.	Daily	
EAF	Water Cooling piping	Daily	
	Replacement of refractory	Based also on the	
		Based also on the	
	Replacement of water cooling cable and pipe.	condition used	
	Replacement of hydraulic cylinder, and solenoid valve, bearing.	Based also on the condition used	
	Monitoring of hydraulic cylinder, solenoid valve		
	and hose.	Daily	
	Monitoring of bearings.	Daily	
	Monitoring of lubricating of all rotating joints.	Weekly	
	Monitoring of refractory.	Daily	
LF	Monitoring of water cooling cable.	Daily	
	Water Cooling piping	Daily	
	Replacement of refractory	Based also on the condition used	
	Replacement of water cooling cable and pipe.	Based also on the condition used	
	Replacement of hydraulic cylinder, and solenoid valve, bearing.	Based also on the condition used	
Bloom CCM	Monitoring of bearing housing temperature, lubrication, noise.	Daily	
-Mold oscillating	Monitoring of lubricating of all rotating joints.	Weekly	
device	Replacement of bearing and sealing.	Based also on the condition used	
Bloom CCM -Straightening	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers,	Daily	



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machine	noise, and vibration.	
	Monitoring of bearingsand gear box.	Daily
	Monitoring of lubricating of all rotating joints.	Weekly
	Replacement of hydraulic cylinder, and solenoid	Based also on the
	valve, bearing.	condition used
Dia any COM	Monitoring of hydraulic cylinder, solenoid valve, hose, and tube/pipe.	Daily
BIOOM CCM	Monitoring of bearingsand gear box.	Daily
chamber	Monitoring of lubricating of all rotating joints.	Weekly
	Replacement of hydraulic cylinder, and solenoid valve, bearing.	Based also on the condition used
	Monitoring of bearing housing temperature, lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
Bloom CCM	Monitoring of bearingsand gear box.	Daily
-Roller Table	Monitoring of lubricating of all rotating joints.	Weekly
	Replacement of hydraulic cylinder, and solenoid valve, bearing.	Based also on the condition used
	Monitoring of nozzle and control valve.	Daily
Bloom CCM	Monitoring of bearings.	Daily
- Cutting torch	Monitoring of lubricating of all rotating joints.	Weekly
	Replacement of hydraulic cylinder, and solenoid	Based also on the
	valve, bearing.	condition used
	lubrication, gear coupling temperature, rollers, noise, and vibration.	Daily
BloomCCM	Monitoring of bearings and gear box.	Daily
- Cooling bed	Monitoring of lubricating of all rotating joints.	Weekly
	Replacement of hydraulic cylinder, and solenoid	Based also on the
	valve, bearing.	condition used
Auxiliary process	Monitoring of refractory.	Daily
-Ladle	Replacement of refractory	condition used
Auxiliary process	Monitoring of nozzle and control valve.	Daily
equipment	Monitoring of lubricating of all rotating joints.	Weekly
-Ladle preheater	Replacement of solenoid valve, bearing.	Based also on the condition used
Auxiliary process	Monitoring of refractory.	Daily
equipment -Tannish	Replacement of refractory	Based also on the condition used
	Monitoring of pneumatic cylinder, solenoid valve, hose, and tube/pipe.	Daily
Dedusting system	Lubricating of all rotating joints	Maaldu.
- Pulse bag filter	Eubricating of all rotating joints.	vveekiy
Ū	Replacement of solenoid valve, bearing.	Based also on the condition used
	Replacement of solenoid valve, bearing. Replacement of filter.	Based also on the condition used Based also on the condition used
Deducting	Replacement of solenoid valve, bearing. Replacement of filter. Monitoring of bearings.	Based also on the condition used Based also on the condition used Daily
Dedusting system -Fan	Replacement of solenoid valve, bearing. Replacement of filter. Monitoring of bearings. Lubricating of rotating.	Based also on the condition used Based also on the condition used Daily Daily
Dedusting system -Fan	Replacement of solenoid valve, bearing. Replacement of filter. Monitoring of bearings. Lubricating of rotating. Replacement of solenoid valve, bearing.	Weekly Based also on the condition used Based also on the condition used Daily Daily 1 year
Dedusting system -Fan Dedusting system -Water-cooled sleeve flue	Replacement of solenoid valve, bearing. Replacement of filter. Monitoring of bearings. Lubricating of rotating. Replacement of solenoid valve, bearing. Replacement of solenoid valve, bearing. Replacement of refractory	Weekly Based also on the condition used Based also on the condition used Daily Daily 1 year Based also on the condition used 0 1 year 0 0 0 1 year 0 0 1 year 0 0 2 years



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-Combustion settling chamber		
Dedusting system -Water-cooled flue		
	Monitoring of belt	Daily
Dedusting system -Dust conveying facilities	Monitoring of bearings.	Daily
	Monitoring of lubricating of all rotating joints.	Weekly
	Replacement of belt, bearing.	Based also on the condition used

For Utilities Section

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Air Compressor & Dryer	See below	
Crane	See below	
Water Treatment Plant (WTP)	See below	
	Monitoring of oil (pressure, temperature, level, and color), cooling temperature, filter, pump temperature, noise, and vibration.	Daily
Lubrication Unit	Inspection of pump, filter, hose, and pipe/tube.	Weekly
	Replacement of filter.	2 months
	Replacement of pump, and valves. (Based also on the condition of pump and valve.)	3 Years
	Change oil. (Based also on the monitoring.)	3 Years
	Monitoring of oil (pressure, temperature, level, and color), cooling temperature, filter, pump temperature, noise, and vibration.	Daily
	Inspection of pump, filter, hose, and pipe/tube.	Weekly
Hydraulic Unit	Replacement of filter.	2 months
	Replacement of pump, and valves. (Based also on the condition of pump and valve.)	3 Years
	Change oil. (Based also on the monitoring.)	3 Years
Hydraulic Valve Stand	Cleaning and servicing (leak removal).	Weekly
Cylinder, Solenoid Valve, Flow Control, FRL	Replacement (Recondition - cleaning and replacement of seal)	Yearly

Table 1.5.3.1.2.2: For Compressor/Dryer

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Compressors	Change Oil.	
	Replacement of oil filter.	6,000 running
	Replacement of oil separator.	nouis
	Replacement of air filter.	3,000 running
	Inspection of belt/coupling.	hours
	Inspection of valve.	12,000 running hours



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Table 1.5.3.1.2.3: For Overhead Crane and Semi-Gantry Crane

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
Wire Rope	Checking by sight for any deformation, wear kinks and element disconnection. Measurement of wire rope diameter. Greasing.	Monthly
Rope Drum	Checking by sight for any deformation, wear, crack and looseness. Measurement of groove.	Monthly
Wheel and bearing	Checking of any deformation, abnormal noise. Measurement of wheel dimension (diameter, width, lip thickness).	Monthly
	Greasing of bearing.	Weekly
Frame	Check for cracks on the running saddle and girder. Inspection of hook using crack detection dye. Tightening of bolt.	Monthly
Bottom block and pulley	Greasing of bearing. Inspection of pulley groove.	Monthly
Crane Hoist	Overhauling. Pull out the hoist and inspect all parts. Replace all wheel, hoist and gearbox bearings.	2 Years

Table 1.5.3.1.2.4: For Water Treatment Plant (WTP)

EQUIPMENT	MAINTENANCE ACTIVITIES	FREQUENCY
	Monitor Temperature	Daily
	Visually inspect the lifting chain/rope	Every 4,000 operating hours
Pumps	Change the lubricant	Every 10,000 operating hours
	Check the mechanical seal leakage	Every 10,000 operating hours
	Lubricate the bearings	Every 10,000 operating hours
	General Over Haul	Every 5 years
	General inspection	Daily
	Operating checks	Daily
	Inspection of ropes and hooks	Daily
Hoist	Greasing	Every 3 Months
	Check the condition of the main power line	Every Year
	Check pulleys for wear	Every Year
	Change Gear Oil	Every 4 Years
	Replacement oil filter cartridge	Every 400 operating hours
	Replacing the hydraulic oil and clean the tank	Every 3000 operating hours
Bucket for Scale Removal	Pins with lubrication pump in possession of such a connection point	Every 65 operating hours
	Filling the tank automatic centralized lubrication.	Every 600 operating hours
	Manual greasing motor bearings	Every 3000 operating hours
	Monitor Temperature	Daily
CoolingTowers	Monitor Pressure	Daily
	Lubrication	Every 3000 operating hours



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	Check the tightening of the bolts.	Every 6 Months	
	Check the blades to ensure their structural	Every 6 Months	
	Cleaning of blades	Every 6 Months	
	Sedimentation	Every 72 operating hours	
	Air Removal	Every 72 operating hours	
Sand Eiltar	Drain	Every 72 operating hours	
Sand Filter	Air Backwash	Every 72 operating hours	
	Air and Water Backwash	Every 72 operating hours	
	Filling	Every 72 operating hours	

During these maintenance activities for equipment/machine, there will be insignificant increase in waste generation because of contaminated rugs with used oil and lubricants and wastewater contaminated with oil that may be generated. Since these are hazardous wastes, these wastes will be disposed to DENR-accredited third party treaters. There will there be slight increase in water consumption because water will be used during maintenance activities.

1.6 Project Size

The annual production capacity is 1,200,00MT in total for two rolling mills, i.e. one mill for light (500,000 MTPY) and one mill for heavy sections (700,000 MTPY) with 800k MT scrap recycling in an area of more than 80 hectares) property of SteelAsia Manufacturing Corporation.

1.7 Development Plan, Description of Project Phases and Corresponding Timeframes Provided in Figure 1.4.2.1 is the Site Development Plan.

Pre-Construction

Prior to the implementation of the project, conduct of significant studies will be done. These include preliminary design, detailed engineering study, impact study to include geohazard identification and environmental impacts assessments for securing necessary permits and clearances such as Environmental Compliance Certificate, Building Permit, etc.

All the necessary information, plans and designs will be gathered and prepared relative to the requirements and 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 completed.

Construction

Development phase is comprised mostly of civil works construction. It is estimated that the construction of all the necessary structures will be finished in approximately one and a half year. The major activities are as follows:

- land/site clearing •
- land development
- provision of services for the workforce such as temporary housing and toilet facilities •
- transport of materials
- mobilization of personnel and equipment
- finishing
- equipment installation

An established guideline for contractors is set by SAMC. During construction, all contractors are required to have their safety officer on site. The DOLE standard for construction (DO 13-98) should also be complied with by all of the contractors.

Operation

This phase involves the processing of desired product. Detailed process is shown in the illustrationin

Section 1.5 on Process Technology. Target start of the operation will be in 2020 provided all the necessary permits will be secured.

The proposed facility is light and heavy sections at an annual capacity of 1,200,00MT light and heavy sections with 800k MT scrap recycling.

In order to produce rebars, billets shall be reheated then shall undergo the size reduction in a series of mill stands through rolling process. Each stand contains a pair of rolls that shall be set-up in accordance with the desired bar diameter. The rolls need to be reset each time a new bar diameter is desired. Larger size rebars shall require less number of passes through the stands while smaller ones shall require more passes. Hence, smaller diameter rebars takes longer time to be produced.

After passing through the rolling stands they passed through a quenching water box to impart the target mechanical properties and temporarily stored in the cooling bed. Bars are air-cooled while on cooling bed. Chains carry the bars and transport them to the conveyor. Slow speed of chains allows sufficient time for bars to cool down. The cooled rolled bars shall then be cut to the desired lengths. The ends of the bars are sheared off by a shearing machine. Ends are sheared because they are often bent or cracked.

The finished product shall then be sorted, bundled and stocked prior to delivery.

Abandonment

The formulation of the detailed decommissioning plan will be done by the proponent within the specified timeframe as part of the post-ECC requirement. It will be submitted for approval to the LGU and government agencies concerned on the activities such as Environmental Site Assessment to determine contaminants left by the operation, method and equipment to be used for dismantling of structures, clean-up plan and demobilization scheme before proceeding.

Demobilization during post construction will be conducted by the Proponent with the contractors as per EMB requirements which include all activities and costs for transport of all construction equipment used, all excess materials, disassembly and transport of temporary facilities (office, stock room, quarters, etc.) used during construction, removal and disposal of all construction debris and general clean up of construction site. SAMC will also require its contractor to post performance bond together with the 10% retention to take care of any defects and damages left behind after demobilization.

Considering that the project has a lifespan of at least 40 years, continuous maintenance, enhancement and upgrading will be done to ensure high production efficiency, environmentally compliant and safe facility. Structures and plant equipment will be assessed regularly for the project to continue its operation beyond its lifespan.

1.8 Manpower

Provided below is the manpower requirement during construction and operations phases of the project.

Pre-Construction/ Construction

Pre-construction manpower will be dedicated to the miscellaneous activities associated with project development, planning and the securing of various governmental permits. Construction requirements for manpower will largely depend on the schedule of workers that will be put up by the Contractor(s) which at this time is identified to be at least 1,500 workers where 3 are directly hired by SAMC while 1497 will be employed by the Contractor. Depending on the construction tasks/jobs that will be undertaken at a given time, the peak manpower complement could reach up to 2,000 personnel.

Operation

A total of 1500 personnel will be hired to fill in the regular job positions for the plant operation. Provided below is the tabulation of manpower requirement which do not discriminate against sex and age as long as the worker is qualified and fit to work. Also, preference will be given to the host barangay and municipality which will be directly hired by SAMC in coordination with the Public Employment Service Office (PESO) of Lemery.

Table 1.8.1: Manpower Requirements



Г

	Labor Type	Skill / Designation	Employee Type	No. of Personnel	
	Safety	Safety Officer / Engineer	Plantilla Position	3	
	Project Management	Project Manager / Engineer	Plantilla Position	1	
	Civil / Structural Foreman	Civil Engineer	Outsourced	15	
	Scaffolder	Certified Scaffolder	Outsourced	175	
	Scaffolders Helper	Trained / Experienced Scaffolder	Outsourced	90	
ı Stage	Steel man / Fabricator	Engineering Undergrad / Experienced Fabricator	Outsourced	241	
	Steel man / Fabricator Helper	Experience Fabricator	Outsourced	195	
	Carpenter	High School Graduate / Experienced Carpenter	Outsourced	150	
uctio	Mason	High School Graduate / Experienced Mason	Outsourced	265	
str	Crane Operator	Certified Crane Operator	Outsourced	15	
no	Rigger	Certified Crane Rigger	Outsourced	35	
0	Mechanical Foreman	Mechanical Engineer	Outsourced	20	
	Mechanical Fitter	Engineering Undergrad / Experience Mechanical Fitter	Outsourced	35	
	Welder	Certified Welder	Outsourced	65	
	Mechanical Helper	High School Graduate / Experience Mechanical Fitter	Outsourced	120	
	Electrical Foreman	Electrical Engineer	Outsourced	25	
	Master Electrician	Certified Master Electrician	Outsourced	15	
	Electrical Helper	Undergrad Electrical Technician	Outsourced	35	
	Total Ma	anpower		1500	
	Labor Type	Skill / Designation	Employee Type	No. of Personnel	
		Section : Human Resou	rces		
	Staff 1	Degree in BS/BA Psychology or any related	Plantilla Position		
	Supervisor	Degree in BS/BA Psychology or any related	Plantilla Position	200	
	Supervisor	Section : Plant Administ	ration		
ge		Degree in BS/BA	Plantilla Position		
oerations Sta	Assistant Supervisor	Psychology or any related course			
	Debug	Must have a five (5) years experience in driving; with Professional Driver's	Plantilla Position	375	
0	Health & Safety Officer		Plantilla Position	-	
	Treatur & Salety Officer	Building & Grounds Maint	enance		
		BS Engineering or a BS Engineering or at least	Plantilla Position		
	Ruilding & Essility Engine	Technical course graduate t least Technical course		375	
	Building & Grounds	BS Engineering or at least	Plantilla Position	-	



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Maintenance Personnel	Technical course graduate		
	Department : Plant Accor	unting	
01 11	With a Degree in Bachelor	Plantilla Position	60
Staff	of Science in Accountancy		
De	Dartment : Materials, Planning	g and Control	
Stoff	with a Degree in Bachelor	Plantilla Position	
Siali	With a Degree in Rechaler		250
Store Keeper	of Science in Accountancy	Plantilla Position	
·	Department : Information Te	chnology	
	Degree in BS Information		
	Technology or any related	Plantilla Position	
Systems Technician	course		
<u> Department : Mechanical</u>		Plantilla Position	
<u>Maintenance</u>			
Assistant Supervisor	BS Electrical / Electronic Engineering or BS Mechanical Engineering	Plantilla Position	
	BS Electrical / Electronic Engineering or BS Mechanical Engineering	Plantilla Position	90
Maintenance Project	BS Electrical / Electronic Engineering or BS Mechanical Engineering	Plantilla Position	
Mechanic	At least vocational course on Mechanical Technology	Plantilla Position	
Senior Supervisor	BS Electrical / Electronic Engineering or BS Mechanical Engineering	Plantilla Position	
Technician	2-year vocational course on Industrial Electronics or Industrial Electricity	Plantilla Position	
	Department : Electrical Main	ntenance	
Assistant Supervisor	BSME Graduate or Any Related Technical Course.	Plantilla Position	
Manager	BSME Graduate or Any Related Technical Course.	Plantilla Position	250
Planner	BSME Graduate or Any Related Technical Course.	Plantilla Position	
lanpower			1500
During decommissioning, the Resident Manager and	work will be outsourced to co Plant Manager of SAMC.	ontractors supervi	sed by th

1.9 Indicative Project Investment Cost The indicative project cost is PhP 25,000,000,000.00.


CHAPTER II: ASSESSMENT OF ENVIRONMENTAL IMPACTS

2.1 LAND

2.1.1 Land Use and Classification

Impact on compatibility with existing land use

The land classification of the project area is agricultural. However, the LGU of Lemery issued a Certification that this Project is compatible with the proposed rezoning and amendment of Zoning Ordinance 2012-2021.

Provided in Figure 2.1.1 is the Land Use Map of Lemery superimposing the project site.

Shown in Annex G is the Lemery LGU Certification that this Project is compatible with the proposed rezoning and amendment of Zoning Ordinance 2012-2021.

Impact on compatibility with classification as an Environmentally Critical Areas ECA

As provided under DAO 2003-30, provided below is the Summary List of Environmentally Critical Project (ECP) Types and Environmentally Critical Area (ECA) Categories.

 Table 2.1.1.1: Summary List of Environmentally Critical Project (ECP) Types and Environmentally

 Critical Area (ECA) Categories

	List of ECPs					
As declared by Proclamation No. 2146 (1981)						
1.	Heavy Industries- Non-ferrous Metal Industries, Iron and Steel Mills, Petroleum and Petro-					
	chemical Industries including Oil and Gas, Smelting Plants					
2.	Resource Extractive Industries- Major Mining and Quarrying Projects, Forestry Projects (logging,					
	major wood processing projects, introduction of fauna (exotic animals) in public and private					
	forests, forests occupancy, extraction of mangrove products, grazing), Fishery Projects (dikes for/					
	and fishpond development projects)					
3.	Infrastructure Projects- Major Damns, Major Power Plants (fossil-fueled, nuclear fuelled,					
	hydroelectric or geothermal), Major Reclamation Projects, Major Roads and Bridges					
As d	eclared Proclamation No. 803 (1996)					
4.	All golf course projects					
A. L	ist of ECA Categories – As declared by Proclamation No. 2146 (1981)					
1.	All areas declared by law as national parks, watershed reserves, wildlife preserves, sanctuaries					
2.	Areas set asides as aesthetic potential tourist spots					
3.	Areas which constitute the habitat of any endangered or threatened species of Philippines wildlife					
	(flora and fauna)					
4.	Areas of unique historic, archaeological, or scientific interests					
5.	Areas which are traditionally occupied by cultural communities or tribes					
6.	Areas frequently visited and/or hard-hit by natural calamities (geologic hazards , floods, typhoons,					
	volcanic activity, etc.)					
7.	Areas with critical slopes					
8.	Areas classified as prime agriculture lands					
9.	Recharged areas of aquifers					
10.	Water bodies characterized by one or any combination of the following conditions: tapped for					
	domestic purposes; within the controlled and/or protected areas declared by appropriate					
	authorities; which support wildlife and fishery activities					
11.	Mangrove areas characterized by one or any combination of the following conditions: with primary					
	pristine and dense young growth, adjoining mouth of major river systems: near or adjacent to					
	traditional productive fry or fishing grounds; areas which act as natural buffers against shore					
	erosion, strong wind and storm floods; areas on which people are dependent for their livelihood.					
12.	Coral reefs characterized by one or any combination of the following conditions: With 50% and					
	above live coral cover; Spawning and nursery grounds for fish; act as natural breakwater of					
	coastlines.					

ECA Determination: Any one (1) confirmed ECA among the 12 categories renders a project location on ECA. However, before a project location is considered in a Non-ECA (NECA), all of the relevant ECA



categories (e.g. ECA category of "coral reefs" and "mangrove areas" are not relevant for a project proposed to be located up in the mountains) have to be confirmed by Proponent through the mandated agencies.

The Project is an ECP based on the nature of the Project and its annual production capacity. There is no ECA within the Project site but Balayan Bay in just in front of the project site and a mangrove area is located just beside the project site. This renders the Project an ECP in an ECA.

Shown below are photograpgs of the Balayan Bay and the mangrove area.



Plate 1: Balayan Bay (water) on the right side and mangrove area (greens) on the left



Plate 2: Balayan Bay

Shown in the succeeding pages are the following Figures:

- 2.1.1.1: Land Classification Map
- 2.1.1.2: Land Cover Map
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Figure 2.1.1.1: Land Classification Map





Figure 2.1.1.2: Land Cover Map



Impact Assessment and Mitigation

Being an ECP in an ECA which is visited by at least 2 per year based on the Typhoon Frequency Map, the site is beside a mangrove area and in front of Balayan Bay. These sites shall be protected. Although the project is zer effluent, these areas shall be monitored regularly for all aspects especially solid waste and water quality. Also, god drainage designs must be provided and maintained so as to avoid blockageof water flow in the mangrove area.

Impact in existing land tenure issue/s

There are no possible land issues since the area of the project site is already owned by the proponent. Transfer of title is now on process.Contract to Sell and TCTs are attached in the Annexes.

Impairment of visual aesthetics

There will be no impairment of visual aesthetics because the project is located in an area classified as heavy industrial area and the Plant site will be designed to suit the aesthetic perspective. Moreover, the Project and the Proponent will cooperate and coordinate with the LGU of Lemery if there will be plans and programs with respect of the LGU's Tourism Plan.

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

There will be no devaluation of land value as a result of improper solid waste management and other related impacts because the Project will implement Solid Waste Management Plan which will include an area for Material Recovery Facility and Hazardous Waste area for used oil and batteries and busted bulbs. These are among the associated facilities of the Plant.

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Figure 2.1.1.3: Land Use Map of Lemery (Source: Lemery MPDO)





2.1.2 Geology/Geomorphology

2.1.2.1 General Geology

2.1.2.1.1 Tectonic Setting

The study area is found within a tectonically active region known as the Philippine Mobile Belt (PMB). In Luzon Island, PMB is bounded by two oppositely dipping subduction zones; namely, the Manila Trench on the west and the Philippine Trench-East Luzon Trough on the east. The Manila Trench is the morphological expression of the eastward subduction of the South China Sea marginal basin lithosphere beneath the Philippine Mobile Belt (Barrier et al, 1991). The Philippine Trench-East Luzon Trough, on the other hand, represents the westward oblique subduction of Eocene Philippine Sea Plate (Cardwell *et al.*, 1980; Fitch, 1972 and Hamburger et al., 1983 in Aurelio; Sajona et al., 1993). Convergence of the Philippine Mobile Belt and the surrounding blocks is associated with seismicity and formation of volcanic chains in the region (Barrier et al, 1991; Daligdig and Besana, 1993).

The deformation of the Philippine Mobile Belt is further influenced by movement along the Philippine Fault Zone. This fault system, the movement of which is generally considered to be left-lateral, extends more than 1,200 kilometers, transecting the Philippine archipelago from Luzon to Eastern Mindanao (Aurelio, 1996). Its age of initiation is still controversial, although extensive studies (e.g. Barrier et al, 1988 and Aurelio et al, 1990 and Barrier et al., 1991) of the fault in Luzon and Visayas indicate that fault activity began during the Pliocene. The trace of the Philippine fault is defined by young geomorphic features including fault scarps, sinistral stream offsets, fault parallel ridges and narrow, elongated troughs (Barrier et al, 1991).

The province of Batangas including the project is geologically situated on the southern part of Luzon Island. It is bordered by the Manila Trench on the west and by the Philippine Trench on the east. Philippine Fault System that has a general trend of north to northwest transected the region. The proposed project located at Barangay Mataas na Bayan and Barangay Balanga of Lemery Batangas is approximately 28.10kilometers north of an Unnamed Fault near Calatagan and Maricaban Island, 40.00 kilometers north of Lubang Verde Fault, 34.90 kilometers south of the southern extension of Valley Fault and 106.00 kilometers westof Philippine Fault (Figure 3.2.1.1).



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Figure 3.2.1.1. Tectonic Map of the Philippines (Aurelio 2000)



Batangas is a portion of uplifted South Luzon Mobile Belt (Gervasio 1971). All of its exposed rocks were deposited during Pliocene-Pleistocene of Quaternary period. The most dominant rock underlying the area is the Taal Tuff, which consist of fine to medium grain, thin to medium bedded basaltic tuff. Dips are generally gentle ranging from 2 - 5 degrees

Quaternary Alluvium (QAI), generally found near shores including the proposed project site and consists of unconsolidated silt, sand and gravel.



Figure 2.2.1.2. General Geology of Lemery, Batangas (MGB 1986)

2.1.2.1.2a Surficial Deposit and Engineering Characteristics

There were no borehole and test pits conducted in the area, however as observed during mapping, a tuffaceous sandstone is exposed at the surface of the property (See photographs below). This type of rock is a good founding material. A geotechnical study is however, be undertaken to determine the engineering properties of the underlying rock.





Photo 1. Shows is the flat terrain of the proposed Lemery Merchant Mill for Structural Shapes and Section at Lemery Batangas



Photo 2. Shown is a tuffaceous sandstone exposed at the surface of the proposed site

2.1.2.1.3 **Geologic Structure**

The most prominent geologic structure in the region nearest to the project area is the west northwest trending unnamed Fault near the Calatagan and Maricaban Island located 28.1 kilometers southwest of the site (Refer to Phivolcs certification). Other active major faults in the region proximal to the project site include the Valley Fault (south extension), Philippine Fault, and Aglubang Fault.



Figure 3.2.1.3. Active Faults and Trenches of Luzon Province (Phivolcs 2000)

2.1.2.2 Change in surface landform/ topography/ terrain/slope

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Lemery, Batangas including the project area is characterized by generally flat to undulating terrain and has an elevation ranging from 0 meters to 6meters above sea level and is drained by unnamed Creek, which discharges its loads to Balayan Bay (Figure 2.2.1.4).



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Figure 2.2.1.4. Topographic Map of the Project Site (NAMRIA 1983)

2.1.2.3 Hazard Maps and Discussions of Impacts/Effects of Natural Hazards on the Project

"Hazard is a potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. It can include latent conditions that may represent future threats and can have origins, natural (geological, hydrometeorological and biological) and/or induced by human processes (environmental degradation and technological hazards)"



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"Natural Hazards" are the natural processes or phenomena occurring in the biosphere that may constitute a damaging event. It can be classified by origin: geological, hydrometeorological or biological.



Figure 2.2.1.5.1.1Tephra and ballistic fall risk map for eruption column greater than 3000 meters. Shaded portion is the high risk areas, while unshaded portion is the medium risk areas. High risk could receive more than 10 centimeters while medium risk areas could receive from1 to 10 centimeters of ashfall (Arboleda and Ruelo, 1992) and poisonous gas.

2.1.2.3.1 **Geologic Hazard**



2.1.2.3.1.1 Volcanic Hazard

The danger posed by volcanic eruption depends upon the magnitude of its explosion. The types of hazards resulting from volcano eruption are classified as base surge, airfall, lava flow and poisonous gas. The area studied falls under a high risk zone for tephra and ballistic fall wherein it could receive at least 10 centimeters thick ash from Taal Volcano (*Figure 3.2.1.5.1.1*).

2.1.2.3.1.2 Earthquake Hazards

Earthquake is the perceptible trembling to violent shaking of ground caused by either tectonic movements or volcanic activity. The Philippines is located near or along the so called "earthquake belt" and is prone to seismic hazards. Areas that are susceptible to this seismic hazard are those underlain by unconsolidated soils and sediments deposited on the low-lying areas (*Figure 2.2.1.5.1.2*).

The area investigated is prone to ground shaking hazards due to the presence of several earthquake generators in and near the region. These possible seismogenic structures include the active Lubang/Verde Passage Fault, Valley Fault and the Manila Trench (Punongbayan, 1989). The site has experienced Intensity VI during the July 1990 Luzon Earthquake(*Figure 2.2.1.5.1.2b*).



Figure 2.2.1.5.1.2 Generalized Relationship Between Near Surface Earth Material and Amplification of Shaking During a Seismic Event (Keller E. A. 1985)



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Figure 2.2.1.5.1.2b. Intensity Map of 16 July 1990 Luzon Earthquake (Phivolcs 1992)

2.1.2.3.1.3 Ground Acceleration

Ground acceleration caused by earthquakes may result to great damage and destruction to property and infrastructure accompanied by loss of life. Factors that influence the intensity of ground shaking include the magnitude of the earthquake, distance of the site in relation to the earthquake generator, characteristics of the underlying rocks, and the soundness of the building. The Philippines is a tectonically active place with noted active faults that are usually the source of major earthquakes. The



reason why the Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the United States Geological Survey (USGS) conduct ground motion hazard mapping in terms useful to engineering design using modern probabilistic methodology. In the study, the peak horizontal ground accelerations that have a 10 % probability of being exceeded in 50 years have been uniformly estimated for rock, hard soil, medium soil, and soft soil site condition. Result of the study shows an estimate on rock ranging from a low of 0.11g in Visayas to a high of 0.30g in the vicinity of Casiguran fault zone in eastern Luzon (Thenhaus et al, 1994). Estimates for soft soil conditions are considerably higher and range between 0.27g for Visayas and 0.80g along the Casiguran fault zone.

The project site is underlain mainly by tuffaceous sandstone covered by thin alluvial deposits mostly sandy silt being located on the near Balayan Bay and fall under the 0.60g and 0.39g for Soft Soil and Medium Soil, respectively (Figure 2.2.1.5.1.2.1).

Using the deterministic method of Tanaka and Fukushima with the following attenuation relation:

$Log_{10}A=0.41M-log_{10} (R + 0.032 \times 10^{0.41M}) - 0.0034R = 1.30$

Where : A= mean of the peak acceleration from two horizontal site (cm/sec²)

R= shortest distance between site and fault rupture (km)

components at each

M= surface-wave magnitude



Figure 2.2.1.5.1.2.1. Maps Showing Peak Horizontal Acceleration Amplitude on Bedrock, Medium Soil and Soft Soil for the Philippine Region (Thenhaus et al, 1994)





Figure 2.2.1.5.1.2.1b. Phivolcs Fault Certification

and considering an earthquake magnitude of 7.2 and distance of the site of 28.10 kilometers from an Unnamed Fault (Phivolcs Certification), the following peak ground acceleration (PGA) values of 0.155g, 0.224g, and **0.358g** for bedrock, medium soil and *soft soil*, respectively. The project falls on the medium soil condition.



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Figure 2.2.1.5.1.2.2. Active Faults and Liquefaction Susceptibility Map of Region 4 (Downloaded from phivolcs.dost.gov.ph)

2.1.2.3.1.4 Liquefaction

Liquefaction occurs when a water-saturated cohesionless soil loses its strength and liquefies when subjected to intense and prolonged ground shaking. Reyes et al, of UP-Engineering Research and

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Development Foundation, Inc., in their soil study of areas that liquefy during the 16th July 1990 Luzon earthquake came out with the following soil conditions for the potential liquefiable layers:

- (1) loose soil classification;
- (2) upper layers of the surveyed areas;
- (3) water table near the ground surface;
- (4) N-value of less than 30 using the American Association of State Highway and Transportation Officials (AASHTO) method and less than 35 using the Japan Society of Civil Engineers (JSCE) method; and
- (5) 50% passing (D50) of approximately 0.001-1.8mm.

Based on the field observation the proposed project site is underlain by tuffaceous sandstone with thin soil cover and is not prone to liquefaction. The project site fallsoutside the delineated liquefaction prone areas by Philippine Volcanology and Seismology. (Figure 2.2.1.5.1.2.2).

2.1.2.3.1.5 **Ground Rupture**

Ground rupture occurs when a new rupture is created or when renewed movement of old fractures takes place (Punongbayan, 1994). PHIVOLCS is recommending a buffer zone of at least 5 meters on both sides of a fault trace or from the edge of deformation zone. This hazard is seemingly absent in the project area since the nearest active Unnamed Fault is found about 28.10 kilometers south of the project site.

2.1.2.3.1.6 **Hydrologic Hazard**

2.1.2.3.1.6.1 Flood Hazard

Floods usually occur during or after heavy rainfall wherein the river channels are saturated with water resulting to river swelling and overflowing of floodplains.

The project area located near the Balayan Bay with elevation ranging from 0 to 6 meters above sea level and falls on high susceptibility to flooding as delineated by Mines and Geosciences Bureau (Figure 2.2.1.5.2.1). The project site, however could experience "localized flooding" if the drainage systems are inadequate and not fully maintained.





Figure 2.2.1.5.2.1.Flood Susceptibility Map of Lemery Quadrangle, Batangas (MGB 2006)

2.1.2.3.1.6.1 Tsunamis

Tsunamis are giant sea waves generated by under the sea earthquakes and volcanic eruptions. All coastal areas in the region are susceptible to tsunami.

Figure 3.2.1.5.2.2 shows the tsunami prone areas and occurrences in the region. From this map is seen that the project site falls under the delineated potentially high historical tsunami.

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Figure 2.2.1.5.2.2Tsunami Prone Areas and Occurrences Map (Downloaded from phivolcs.dost.gov.ph)

2.1.2.3.1.6.3 Scouring

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The site is located adjacent to the Balayan Bay and is highly susceptible to coastal erosion and scouring. Shorelines embankments must be protected by riprap, and reinforced concrete. Good drainage designs must be provided and maintained.

2.1.2.3.1.6.3 Typhoons

The relevance of typhoons to the project/project site is reckoned from the following hazards:

- Rain-induced localized floodings
- Risks to personnel

Figure 2.2.1.5.2.3 below shows the tropical cyclone frequency map while Figure 3.2.1.5.2.3b shows the normal path of typhoons. From these maps is sen that the project site is not vulnerable to typhoons.



Figure 2.2.1.5.2.3. Typhoon Frequency Map

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Figure 2.2.1.5.2.3b Map of Path of PhilippineTyphoons

2.1.3 Pedology

In general, Lemery has a rolling terrain with slope ranging 0 to above 18%. The topography of the town shows that the total land area, 26.8% belong to the slope 0 to 3%, 20.7% to 3.8%, 17.5% have slopes 8-18% while the rest which is above 18% constitute 35.0%. The overall terrain is suitable for pasture, tree crops and other agriculture development

Soil Erosion/loss of topsoil/overburden

There will be no soil erosion or loss of topsoil/overburden involved in this project because the project involves scrap recycling and not mining. However, during construction since backfilling will be undertaken, proper construction methods and procedures will be implemented to avoid soil erosion on site.

Change in soil quality/fertility

There are three soil types that can be found in Lemery, namely:

- Sibul clay
- Taal loam which is located in the northern portion of the municipality covering an area of 7,889.66 hectares. This soil type came from weather materials from pass-based surges of pass eruption of



Taal Volcano. It is generally gravish brown to light grav when dry and dark brown when wet. This type of soil should have limited cultivation and requires very careful and land management;

Taal Sandy loam on the other hand can be found in the southern portion of the municipality, and covers an area of 3,381.28 hectares. This soil requires careful land management.

Physiography

The Physiography of Lemery is of three types: Scarpment, Broad Alluvial Plains, Volcanic Hills and Mountain. The coastal ecosystem of Lemery is located along the broad alluvial plains. The lowland ecosystem is located mainly along broad alluvial plain while some portions are along volcanic hills. Majority of the upland ecosystem, lies along volcanic hills and some belong to the mountain type.

Permeability

Permeability is the property of soil to allow air and water to move into the soil layers.

The coastal ecosystem in front of the project site has moderately slow permeability. This is due to slope level of 0-3% and its soil type, which is mostly sandy in nature. Water from the uplands generally retains in this area therefore making it flood prone.

The lowland ecosystem, which has a slope level of 3-8% and a soil type of Taal loam has moderate to moderately rapid permeability.

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2.1.4 Terrestrial Biology

The Porject site is located beside a mangrove area. This mangrove area is outside the project site but just beside the project area of SAMC.

Mangrove assessment employing the standard transect-quadrat method was conducted in two quadrates in the inner patch of mangroves located along the banks of the Wawa River in Barangay Mataas na Bayan, Lemery Batangas on 16 December 2017 and 19 January 2018. The mangrove area straddles the main development project site of Steel Asia, Inc. This is the only mangrove patch in the coastal zone of Barangays Mataas na Bayan and Sinisian East. The coordinates of the mangrove survey station is N 13.905798° and E 120.869867°.

The mangrove area in the project site measures about 6.5 hectares of mixed old growth and replanted trees. There are four species of true mangroves in the area - Avicennia marina (Api-api/Bungalon), Bruguiera cylindrica (Pototan), Rhizopora apiculata (Bakawang Ialaki) and Ceriops decandra (Malatangal). Dense Aroma trees and the mangrove-associate Nipa fruticans dominate the riverbanks while true mangrove species occupy the inner flank. Cultivated fields abruptly fringe the north and northwestern boundary of the mangrove swamp. Enhancement of mangrove cover through assisted natural regeneration, and monitoring of the area to prevent poaching is being undertaken by an organization named Coastal Green Crusade (actually a husband-and-wife team living in the outer periphery of the mangrove swamp). The PO president – Mr. Ronald Ricalde – personally tends mangrove replanting. The area used to be a small mangrove forest that has been logged over and rehabilitated through the National Greening Program of the CENRO in Calaca municipality in 2016 (Plate 4).



Plate 4. Mangrove signboard and survey team member in the mangrove transect.

A total of thirty-six (36) trees were catalogued in two quadrants laid across one transect about 10 meters from the widest breadth of the river. The density was rather sparse, catalogued at an average of 18 trees/quadrate or 0.18 tree/m². The first quadrate hosted twenty-two (22) trees or 61% of the mangrove community in the area surveyed, entirely consisting of *A. marina* species. The second quadrate in the inner portion hosted lesser number of mangroves with only 14 trees consisting of three species that were relatively larger than

those found in the outer portion (Table 7 and Figure 8; also see Figure 12). The fourth species – *Rhizopora apiculata* were encountered as well but the species consisted of a few trees that were outside of the quadrates.



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Figure 1.1.2: Project Site showing the mangrove area outside the project site (source: Google Earth Map)





Figure 8. Species diversity and relative abundance of mangrove trees catalogued in two quadrants in the mangrove area along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.

In spite of the small area of the mangrove patch, the mangrove crown cover is robust, recorded at 96.5 % canopy, considered as 'excellent' cover (Table 7 and Figure 9). Crown cover is dominated by the *Avicennia* species, typically broad trees, averaging 5.77 meters, indicating relatively old trees. Crown cover of *Bruguiera cylindrica* and *Ceriops decandra* were catalogued at 1.77 m and 2.45 m, respectively; indicating smaller trees (Figure 9).

Avicennia marina also completely dominated hieght of the trees, averaging 5.86 meters (Plate 5). A. marina is a widely distributed species whose wood is often sought for use as firewood and timber. Its leaves can be used to supplement feeds for livestock. Api-api is one of the sturdiest mangrove tree that can arrest coastal eorsion. The rest of the other mangroves species have hieghts, ranging from an average of 3 to 3.5 meters (Figure 10). The overall average heigth, recorded at 5. 77 meters, is considered as 'excellent' condition.

There were twenty-eight (28) seedlings and six (6) saplings catalogued in six (6) plots during the survey, translating to a regeneration capacity of $9.33/m^2$ (Table 7 and Figure 11). The recuitment capacity is rated as 'excellent'. No evidence of mangrove cutting was seen.





Figure 9. Crown cover of mangrove species catalogued in two quadrates in the mangrove area along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.



Figure 10.Average height of mangrove trees in two quadrates surveyed in the mangrove area along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.

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Figure 11. Proportion of trees, seedlings and saplings in mangrove patch surveyed in two quadrates along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.

2.2 WATER

2.2.1 Hydrology/Hydrogeology

2.2.1.1 Drainage Morphology/Inducement of Flooding/Reduction in Stream

Drainage Morphology

The hydrologic feature which affects the Project is the Balayan Bay (Figure 3.2.1). Balayan Bay is a large bay of Luzon. The bay is between 23 to 28 kilometers wide with a catchment area of more than 700 square kilometers. Some of the major sub-catchments of Balayan Bay are Taal Lake catchment that drains into the bay through Pansipit River, Binambang-Molina Watershed, and Bolbok Watershed.

The other major sub-catchment with corresponding area coverage within the Balayan Bay catchment is provided in the table below.

Table 5-2.1 Major Sub-caterinents within the Dalayan Day Saterinent				
Watershed Name	Area, (km ²)			
Binambang-Molino Watershed	104			
Bolbok Watershed	22.3			
Colongcolong Watershed	12.9			
Dacanlao Watershed	41.1			
Gimalas Watershed	13			
Lagnas Watershed	14.9			
Navotas Watershed	13.1			
Santiago Watershed	16.2			
Taal-Pansipit Watershed	644			

Table 3-2.1 Major Sub-catchments within the Balayan Bay Catchment



Pansipit River

The Pansipit River is an 8.2-kilometer-long river located between municipalities of Agoncillo and San Nicholas on the south-western shore draining to Balayan Bay. According to the Philippine National Water Resources Board (NWRC, 1983) the average outflow rate of the Pansipit River is $15 \text{ m}^3 \text{s}^{-1}$ based on a time series of 12 years. The monthly average outflow is range from 7.0-7.5 m³s⁻¹ in April and May to 20-23 m³s⁻¹ during September to November.



Figure 3.2-1 Batangas Bay Catchment Map (Source: Batangas Province Local Climate Change Action Plan 2017-2023)

Streamflow

There is no comprehensive measurement of discharges of the rivers in the Balayan Bay catchment except for the major river system such as Pansipit, Dacanlao, and part of Binambang River System (Molino-Obispo). Tabulated below are the estimated discharges of these river systems.

Table 3-2.2 Annual Discharge and Mean Annual Run-off in Selected Rivers							
River System Name	Annual Discharge, (M m ³ /s)	Mean Annual Run-off, (mm)					
Pansipit	36.81	57.15					
Dacanlao	5.46	146.06					
Molino-Obispo	15.8	106.99					

Table 3-2.2 Annual Discharge and Mean Annual Run-off in Selected Rivers

Source: Batangas Province Local Climate Change Action Plan 2017-2023



2.2.1.2 Hydrogeology

Based on the 1997 Groundwater Availability Map of the Philippines, the Project Site falls under fairly extensive and productive aquifers which is shown in Figure 3.2-2. This classification is attributed to a fair-level wells in the area. There are several wells observed within the project site. The groundwater occurs under unconfined conditions within the interstices of consolidated pyroclastics and tuffaceuous sedimentary rocks. The water table occurs at the estimated depth range of 6 m near and within valleys and flat areas to 15 m at the lower and middle slopes. The thickness of the aquifer is not known. The aquifer in these segments is tapped by shallow wells which are pumped manually or with the aid of low capacity centrifugal pumps.

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Figure 3.2-2 Groundwater Availability Map



Flooding

Flood is the abnormal rising and overflowing of a body of water. It usually results from high precipitation caused by excessive and continuous downpour brought about by typhoons or monsoon rains. Factors that affect the vulnerability of an area to flooding are surface geology, topography, amount and duration of rainfall, vegetation and land cover.

Figure 3.2-3 presents the Flood Susceptibility Map of Region 4-A prepared by the Mines and Geosciences Bureau (MGB) which classifies susceptibility to flooding as follows:

Areas with Low Susceptibility to Flooding experience floods with heights of less than or equal to 0.5 meter. Areas with Moderate Susceptibility to Flooding attain flood heights from 0.5 to one (1) meter. This condition is attained during prolonged and extensive heavy rainfall or extreme weather occurrences.

Areas with High Susceptibility to Flooding attain flood heights which exceed one (1) meter. These areas area is usually flooded for several hours during heavy rains. These include topographic lows such as active river channels, abandoned river channels and areas along river banks.



Figure 3.2-3 Flood Susceptibility Map

The proposed project site is high susceptible to flooding based on the map shown in the figure above. Drainage systems will be installed in accordance to the comprehensive hydrological study to address flooding. The well-designed drainage system can also accommodate the highest peak of rainfall data.

Impact Identification, Prediction and Assessment, and Mitigation



Pre-Construction and Construction Phase

Change in Drainage Morphology/Inducement of Flooding

The construction of the proposed project, specifically during site preparation, land clearing, excavation and earthworks may potentially induced flooding and cause inundation due to sediment run-off, siltation and drainage overflow. Improper handling, storage and hauling of demolition debris/excavated materials and solid wastes, may clog drainage system. A proper temporary drainage system shall be installed in order to address the issue of flooding. Minimizing the removal of vegetation during construction will alleviate flooding.

The Project will ensure that appropriate measures are in put place and strictly complied with. Aside from the installation of the proper drainage systems, the proponent will prepare and implement Waste Management Plan that includes contractor's commitment the proper disposal of demolition debris, construction spoils and solid wastes.

Change in Stream and Lake Water Depth

The proposed project is not expected to affect the depth of Balayan Bay.

Depletion of Water Resources/Competition in Water Use

The major water requirement during construction is the concreting works. Concreting of buildings, roads, and other necessary structures will bring about increase in water consumption. The amount of water will depend on the size of the structure that will require concreting. However, the project concrete requirement will be provided by a batching plant contractor near the area. Therefore, water requirement of the project will be minimal as the water will only be use for cleaning the entire project site during and after concrete pouring and domestic water use for the workers.

Operation Phase

Change in Drainage Morphology/Inducement of Flooding

The frequency of typhoons as well as the slope and drainage characteristics of the areas where the proposed project is to be located is susceptible to flooding and inundation. This will affect the operation activities due to drainage overflows, surface run-off and siltation. This will be eliminated with the proper drainage design though the detailed engineering design study for the project. However, in case of extreme events (strong typhoon, extreme flooding), operation schedules may be affected. The operation of the plant may be disrupted and cancelled. As such, necessary adjustments are to be taken. It is significant that the project will regularly monitor weather bulletins issued by PAGASA and get their advice on necessary actions.

Change in Stream and Lake Water Depth

The proposed project will not bring about a change in the depth of Balayan Bay.

Depletion of Water Resources/Competition in Water Use

Domestic water is the main uses of water in the project area with ground water as the main source. Domestic water supply in Lemery Batangas is provided by Lemery Water District. As of December 31, 2017, the District was serving a total of 10,891 active concessionaires classified as residential, domestic, commercial, and industrial.

Water Usage and Water Source. The project will require about 60 m3/hr make up water system; 576 m3/hr fire protection water system; 1200 m3/hr for indirect cooling water system; and 1700 m3/hr direct cooling water system. A deep well will be drilled to a depth of 50 to 90 meters and designed not to extract water from the shallow aquifers that are utilized by the surrounding communities. A permit from the NWRB will be secured.

Circulating Wastewater Treatment Plant. The project will invest extensively in the water treatment system that aims to recirculate all process water. Zero wastewater discharge is envisaged.



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Water Catchment Pond. A water catchment pond will be constructed by the project to collect rain water to minimize usage of potable water in the cooling system. The collecting pond has a volume of 35,000 m3. Its main purpose is to provide make up water for the evaporation losses within the plant operation. The storm drainage is connected to the water catchment pond for storing rainwater.

Steel Asia already practicing a water catchment pond system in their existing steel mill plants e.g. Davao Plant. With the use of circulating wastewater treatment plant and water catchment pond, depletion of wastewater resources and competition with its use is not expected as a result of the project.

Water Quality

Water Sample Collection

Primary data gathering was conducted to assess the baseline water quality of the water bodies within the project site. Samples were collected in each sampling station for freshwater water quality and groundwater sampling monitoring. The collected samples were subjected to physical, chemical, microbiological, nutrient and heavy metal analyses. Water samples were preserved in iced boxes prior to transport to the laboratory facility for analysis.

Parameters	Method of Analysis			
рН	Electrometric			
Total Suspended Solids (TSS)	Gravimetric			
Oil & Grease	Petroleum Ether Extraction			
Biochemical Oxygen Demand (BOD ₅)	Azide Modification (Dilution Technique)			
Chemical Oxygen Demand (COD)	5220 B. Modified Open reflux Dichromate			
Dissolved Oxygen (DO)	Dissolved Oxygen Meter			
Temperature	Alcohol-filled Thermometer			
Lead	Flame AAS-EPA Method 7420			
Mercury	Flame AAS-EPA Method 7420			
Cadmium	Flame AAS-EPA Method 7130			
Chromium Hexavalent	Diphenylcarbazide-SM Method 3500CrB			
Copper	Flame AAS-EPA Method 7210			
Arsenic	Colorimetry- SDDC SM Method 3500			
Fecal Coliform	Multiple tube Fermentation – Method 9221B&E			
Total Coliform	Multiple tube Fermentation – Method 9221B&E			
Source: DAO 34 Series of 1990, Approved Methods of Applysic				

Table 3.2-2. Water	⁻ Quality Parameters and	Corresponding N	Methods of Analysis
		, .	

Source: DAO 34 Series of 1990, Approved Methods of Analysis

Water Quality Sampling Stations

Groundwater, sea water, and freshwater sampling were conducted on April 3, 2018 to assess the physico-chemical property of the water around the project site. Three (3) groundwater, two (2) sea water, and three (3) freshwater sampling stations were established to characterize water quality in the area.

The samples for the analysis of microbes were collected into sterilized small glass bottles and wrapped with aluminum foil. The samples for the analyses of organics were collected into amber glass bottle. The samples for the analysis of other parameters were collected into Polyethylene Terephthalate (PET) bottles. The collected samples were labeled, stored in ice-chest and submitted to AERONICS, Inc., a DENR recognized laboratory.

The station identification, description and geographical coordinates of the sampling site is provided in the table below is the water quality sampling map.


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		UTM Coordinates		
Station	Description	Easting, (m)	Northing, (m)	
GW-1	Hand pump tube well in Barangay Sinisian West	268924.77	1538722.19	
GW-2	Hand pump tube well in Barangay Mahayahay	270773.66	1539491.12	
GW-3	Hand pump tube well in Barangay Balanga	271808.20	1538378.30	
SW-1	Surface Water Downstream of Balayan Bay	270465.33	1537646.28	
SW-2	Surface Water Upstream of Balayan Bay	269048.45	1538048.14	
FW-1	Surface Water Calbangan River in Barangay Sinisian	269214.35	1538363.30	
FW-2	Surface Water Bakawan Swamp in Barangay Mataas na Bayan	269684.97	1538268.09	
FW-3	Surface Water Matingain River in Barangay Balanga	271578.40	1538200.80	

Table 3.2-3. Location of Groundwater and Freshwater Sampling Station

Source: Mediatrix, 2018





Figure 3.2-4 Location of Water Quality Monitoring Station



Applied Standard

The Department of Health (DOH) Administrative Order (DAO) No. 2017-0010 otherwise known as Philippine National Standards for Drinking Water (PNSDW) of 2017 establishes the criteria for drinking water quality was applied for groundwater quality while DAO 2016-08 Water Quality Guidelines (WQG) waters will be used for water sample collected. The river where freshwater sample is collected are not yet classified, therefore standard use is for Class C water.

Water Sampling Results and Analysis

The depth of the wells ranges from 7m to 31m. The structures were built as early as 1960 to recent 2017. The usage varies from community drinking water supply and use for cooking, bathing, and watering in residential and commercial garden. As such, drinking water generally comes from the commercial "mineral" water or from the local water utility.

Collectively, there is a high 85% conformance of the eight (8) sampling sites with 16 parameters covered by PNSDW and the DENR Class C guidelines. Out of 128 measurements, only 16 or 13% cases of varying non-conformance by water sample are attributed to metals. A summary of the results is presented in Table 3.2-4 for groundwater, Table 3.2-5 for fresh water, and Table 3.2-6 for sea water.

Parameters/ Station	GW-1	GW-2	GW-3	PNSDW 2017
Date and Time of Sampling	April 3, 2018/ 1030H	April 3, 2018/ 1145H	April 3, 2018/ 1310H	
рН	6.75	7.14	7.11	6.5-8.5
Color (Apparent)	69	20	20	10
TSS, mg/L	<1	6	5	-
Oil and Grease, mg/L	1.23	1.58	1.75	-
Chlorides, mg/L	69	56	31	250
Nitrates, mgNO ₃ - N/L	10.11	5.16	10.757	50
Phosphate, mg/L	0.208	0.093	0.565	-
Temperature, C	21.4	22.5	22.3	-
Copper, mg/L	0.0213	0.0343	0.0294	1
Iron, mg/L	0.1446	0.5425	0.0959	1
Fecal Coliform, MPN/100ml	<1.1	<1.1	<1.1	<1
Total Coliform, MPN/100 ml	>8	4.6	>8.0	<1.1
Benzene	ND	ND	ND	0.01
Toluene	ND	ND	ND	0.7
Ethylbenzene	ND	ND	ND	0.3
Xylene	ND	ND	ND	0.5

Note: ND-below the method detection limit: Red color are the results that exceed the limit.

Table 3.2-5 Result of Fresh Water Sampling Analysis

Parameters/ Station	FW-1	FW-2	FW-3	DENR Standard for Class C Waters
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Date and Time of Sampling	April 3, 2018/ 1400H	April 3, 2018/ 1500H	April 3, 2018/ 1530H	
рН	6.82	7.11	7.87	6.5-8.5
Color (Apparent), PCU	125	125	125	75
TSS, mg/L	11	62	4	<30 mg/L increase
Oil & Grease, mg/L	3.64	3.85	3.01	2
COD, mg/L	24	1,680	8	-
Chlorides, mg/L	717	21,391	34	250
Nitrates, mgNO ₃ - N/L	1.417	1.084	6.055	7
Phosphate, mg/L	0.056	< 0.003	0.709	0.5
Temperature, °C	20.2	22.3	22.4	25-31
Copper, mg/L	0.031	0.0245	0.0229	0.02
Iron, mg/L	0.1815	0.0893	0.1381	1
Fecal Coliform, MPN/100ml	130	79	220	200
Total Coliform, MPN/100 ml	2,400	350	2,400	3,000
Benzene	ND	ND	ND	0.01
Toluene	ND	ND	ND	0.7
Ethylbenzene	ND	ND	ND	0.3
Xylene	ND	ND	ND	0.5

Note: ND-below the method detection limit: Red color are the results that exceed the limit.

Parameters/ Station	FW-1	FW-2	DENR Standard for Class C Waters
Date and Time of Sampling	April 3, 2018/ 0830H	April 3, 2018/ 1500H	
рН	7.73	7.45	6.5-8.5
Color (Apparent), PCU	10	10	75
TSS, mg/L	1	2	<30 mg/L increase
Oil & Grease, mg/L	1.05	1.15	2
Chlorides, mg/L	39,307	22,482	250
Nitrates, mgNO ₃ - N/L	0.1	0.645	7
Phosphate, mg/L	<0.003	<0.003	0.5
Temperature, °C	20.2	20.5	25-31
Copper, mg/L	0.0132	0.0164	0.02
Iron, mg/L	0.0498	0.0893	1
Fecal Coliform, MPN/100ml	130	79	200
Total Coliform, MPN/100 ml	350	130	3,000



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Parameters/ Station	FW-1	FW-2	DENR Standard for Class C Waters
Date and Time of Sampling	April 3, 2018/ 0830H	April 3, 2018/ 1500H	
Benzene	ND	ND	0.01
Toluene	ND	ND	0.7
Ethylbenzene	ND	ND	0.3
Xylene	ND	ND	0.5

Note: ND-below the method detection limit: Red color are the results that exceed the limit.

Impact Identification, Prediction, Assessment and Mitigation

Pre-Construction and Construction Phase

Degradation of Water Quality

Wastewater generated during construction and operational phase which include domestic wastewater may enter groundwater through seepage or through freshwater bodies as surface runoff. This wastewater may degrade water guality in these areas and may increase fecal contamination. levels of heavy metals. turbidity and TSS.

The Project will provide wastewater management plan that should be in place and should be strictly implemented. Monthly monitoring of quality of groundwater and fresh water should be conducted.

Storm runoff will be directed through the siltation pond system prior to discharge to the channel. Contaminated rainwater in the maintenance area will be directed to the oil and water separator before discharged to the drainage system.

A regular inspection and maintenance of the siltation pond will be conducted to avoid leakage, which can pollute the drainage and the coastal waters.

Freshwater Ecology

During construction, waste water generated by the increased number of workers will cause deterioration of the existing water quality if inadequate portable toilets are not provided at the construction site. Fuel, lubricant and hydraulic oil discharges from poorly maintained construction equipment, machineries and heavy vehicles will also impact on water quality. During repair of equipment and machinery, containers/drip trays will be used to collect leakage. Any spilled or spent oil will be collected and disposed by an accredited waste hauler and transporter.

Scheduling of excavation activities during dry season and tide consideration whenever possible will be applied to reduce impact of soil erosion and sedimentation of waterways. A surface water and effluent quality monitoring will be conducted during construction.

Operation Phase

Degradation of Water Quality

The significant impact on groundwater quality during operation is the long-term overland discharge of untreated wastewaters from the proposed project. Wastewater would typically contain wash water and used oil. As a mitigation measure, the use of 3-chambered septic tanks shall be installed in all project facilities where wastewaters and other effluents are generated. Waste minimization will be practiced in all aspects of project operation. The objective is to ensure that pollution-causing effluents that can be



potentially carried downstream are treated at the source. The project is envisaged for a zero-waste discharge where a circulating wastewater treatment plant and a water catchment pond will be installed.

Prevention of Oil and Grease Spill

Clean practices in oil and fuel dispersal will be strictly enforced in the fuel dispensing facilities. Fuel and oil-based residues will be collected and disposed of properly. An oil and grease containment and fuel waste contingency plan will be formulated and enforced in all aspects of project operations.

2.2.2 Freshwater Ecology

Freshwater ecology assessment was conducted in three stations along the Wawa River in Barangay Mataas na Bayan in Lemery Batangas on December 16, 2017 in conjunction with environmental baseline assessment for the Steel Asia project proposed to be established in Lemery, Batangas. The river subjected to ecological assessment is considered a primary impact area of the proposed Steel Asia facility within the geographical region of Barangay Mataas na Bayan and Barangay Sinisi-an East. The Wawa River and its mangroves fringing both riverbanks and the backside of the river are located about 300 meters from the southern periphery of the project site and are therefore considered susceptible ecological niches within proximal distance of possible anthropogenic issues arising from the operation of the project. Barangay Mataas na Bayan proper lies about 600 meters east of the river and estuary, while a hot spring vent is located about 700 meters west of the estuary (Figure 2.4.1).

The objective of the aquatic ecology baseline study is to establish baseline parameters of the river system and to determine the presence of important aquatic biota that can be susceptible to anthropogenic that can arise during the establishment and operation of the project. The assessment was focused on determining plankton community structure, presence of fish biota, macro-invertebrates, macro-benthos, mangroves and river fisheries resources that can be susceptible to the operation of the steel mill.

The river ecology survey also intended to document fishing practices in the river system through observance of actual fishing operations but no fishers were encountered during the survey, even in the estuary. However, the Wawa River, as well as the tributaries investigated around the project site, were to shallow and narrow, rendering the operation of net fishing gear inapplicable. Similarly, transect swims for fish identification was not viable due to shallow river depth and extremely turbid condition. In this case, opportunistic documentation of fish species encountered during the survey was undertaken and key informants were interviewed to identify species of fish in the river system. For plankton communities, three stations were subjected to biotic sampling that included phytoplankton, zooplankton, and epibenthic benthos. Macro-invertebrates of significant economic value for food and livelihood were also catalogued where they occurred.





Figure 2.4.1. The coastal impact area in the vicinity of the proposed Steel Asia facility in Barangays Mataas na Bayan and Barangay Sinisi-an East subjected to baseline ecological assessment focusing on river ecology, mangroves, plankton, macro-benthos and corals; December 16 2017 and January 19, 2018.



2.4.1. Survey methods and survey stations

(i) Plankton

Phyto-and zooplankton were collected at the river sampling sites by filtering 1 liter samples into a composite sample. Phytoplankton samples were filtered through a 20 µm mesh sieve; zooplankton were filtered through a 33 µm mesh sieve. 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 were counted and identified to the lowest taxonomic level (genera) possible while zooplankton were identified to major groups using available references. Phytoplankton and zooplankton densities are presented as number of cells or organisms per liter.

The coordinates of the plankton and macro-benthos sampling stations are listed in Table 2.4.1 and shown in Figure 2.4.2.

Table 2.4.1.Coordinates of the location of plankton and macro-benthos sampling stations investigated during the river ecology baseline assessment in the Wawa River and its estuary, Lemery, Batangas; 16 December 2017.

WP Code	LATITUDE	LONGITUDE	REMARKS
PLK1	N 13.905579°	E 120.869777°	Dominant phytoplankton <i>Fragilaria</i> spp. at 1,450 cells/L, while dominant zooplankton Bdelloid rotifer (larval form) at 1,415 indiv/m ³
PLK2	N 13.905333°	E 120.868674°	Dominant phytoplankton <i>Coscinodiscus</i> spp. at 3,450 cells/L, while dominant zooplankton Arcellinida (adult form) at 2,223 indiv/m ³
PLK3	N 13.904109°	E 120.869009°	Dominant phytoplankton <i>Chaetoceros</i> spp. at 10,875 cells/L, while dominant zooplankton Cyclopoid copepod (adult form) at 13,339 indiv/m ³

Where it is viable, identification of freshwater fish species was generally conducted in the same sampling sites for plankton and macro-benthos. For fish biota, presence of fish and crustacean species, as well as macro-invertebrates of significant value for food, was identified *in-situ* through opportunistic observation in the same stations with at least two stations subjected to actual fishing operation employing a scoop net.





Figure 2.4.2. Location of plankton, macro-benthos and freshwater aquatic biota sampling stations investigated during the freshwater ecology baseline assessment in the Wawa River in the coastal impact area of the proposed Steel Asia project in Lemery, Batangas; 16 December and 19 January 2018;(Map prepared by Jose Rene Villegas).



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Plate 2.4-1. The Wawa River (with LGU MENRO staff observing the survey team; upper left photo) and its estuary (upper right photo); and the survey team doing plankton and macro-benthos sampling (bottom photos).

(ii) Mangroves

Mangrove assessment employing the standard transect-quadrat method was conducted in two quadrates in the inner patch of mangroves located along the banks of the Wawa River in Barangay Mataas na Bayan, Lemery Batangas on 16 December 2017 and 19 January 2018. The mangrove area straddles the main development project site of Steel Asia, Inc. This is the only mangrove patch in the coastal zone of Barangays Mataas na Bayan and Sinisian East. The coordinates of the mangrove survey station is N 13.905798° and E 120.869867°; shown in Figure 2.4.3.

(iii) River Profiling

Characterization of the Wawa river was undertaken in three stations - upstream, midstream and downstream. The coordinates of the river profiling station are listed in Table 2.4.2 and locations are displayed in Figure 2.4.4. The downstream station is located in the river estuary. Investigation of fish biota was undertaken in all stations with the use of a scoop net and through actual observations of fish and crustacean species. A swim transect was not viable due to the shallow depth.

WP Code	LATITUDE	LONGITUDE	Remarks
RVR1	N 13.905579°	E 120.869777°	Upstream of Wawa River: Date and time of sampling: 1130H 12/16/2017
RVR2	Ν	E	Midstream of Wawa River: date and time of sampling: 1240H

Table 2.4.2. Coordinates of the location of river profiling stations investigated during freshwater ecology baseline assessment in the Wawa River and its estuary, Lemery, Batangas; 16 December 2017.



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	13.905333°	120.868674°	12/16/2017
	N	E	Downstream of Wawa River: Date and time of sampling:
11113	13.904798°	120.868680°	1348H 12/16/2017

(iv) River Macrobenthos

Benthic macrobenthos were collected in the three stations employing the standard kick net (see Plate 2.4 -1). The net is thrust into productive habitats and substrates (*e.g.*, riffle areas, flooded vegetation, submerged root mats and other woody debris) to collect specimens. Macro-benthos was identified up to species level. Coordinates of thee stations are listed in Table 2.4.3

Table 2.4.3.	Coordinates of the location of stations investigated for macrobenthos communities during
freshwater	ecology baseline assessment in the Wawa River and its estuary, Lemery, Batangas; 16
	December 2017.

	2000///2011						
WP Code	LATITUDE	LONGITUDE	REMARKS				
BNT1	N 13.905579°	E 120.869777°	Total Density = 56 individuals with <i>Cerithium</i> sp. (F Cerithiidae) dominant @ 24 individuals				
BNT2	N 13.905333°	E 120.868674°	Total Density = 30 individuals with <i>Melanoides</i> sp. (F Thiaridae) and oligochaetes (C Oligochaeta) both relatively highest @ 6 individuals each				
BNT3	N 13.904798°	E 120.868680°	Total Density = 10 individuals with <i>Macrobrachium</i> sp. (F Palaemonidae) relatively highest @ 3 individuals				

(v) River water salinity

Salinity in four (4) stations along the river was measured using an Atago refractometer. The station coordinates are listed in Table 2.4.6 below and shown in Figure 2.4.5.

Table 2.4.4. Coordinates of stations for measurement of river water salinity undertaken during freshwater ecology baseline assessment in the Wawa River and its estuary, Lemery, Batangas; 16 December 2017

WP Code	LATITUDE	LONGITUDE	Remarks
WQL1	N 13.905579°	E 120.869777°	same location as RVR1 (riverine water)
WQL2	N 13.905333°	E 120.868674°	same location as RVR2 (riverine water)
WQL3	N 13.904109°	E 120.869009°	same location as PLK3 (estuarine water)
WQL4	N 13.904798°	E 120.868680°	same location as RVR3 (riverine water)





Figure 2.4.3: Location and coordinates of mangrove survey station during freshwater ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018; (Map prepared by Jose Rene Villegas).





Figure 2.4.4: Location and coordinates of river profiling stations during freshwater ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018; (Map prepared by Jose Rene Villegas).





Figure 2.4.5: Location and coordinates of stations for measurement of river water salinity during freshwater ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018; (Map prepared by Jose Rene Villegas).



(vi) Macro-invertebrates of significant value for food and collection for livelihood

Although no gleaning activities were witnessed during the survey in as much as the mangrove warden in the area allegedly prohibits such activity, macro-invertebrates were seen and catalogued in a lone station. The location is shown in Figure 2.4.6 and listed in Table 2.4.5. The coordinates are: N 13.905526° and E 120.869759°.

Figure 2.4.6. Location of stations where macro-invertebrates of significant value for food were cataloguedduring freshwater ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018; (Map prepared by Jose Rene Villegas).





2.4.2 Abundance, distribution, density of economically and ecologically important species

2.4.2.1 Wawa River profile

The Wawa River is a perennial system located about 600 meters north-northwest of Barangay Mataas na Bayan proper, meandering through a mangrove forest and dissipating in cultivated fields after running a bee line of about 1 kilometer inside the mangroves. The river is fed by various springs, rice paddy waters and irrigation systems in fields around the mangrove area and empties into the nearshore waters of Balayan Bay. Seawater penetrates most of the river during high tide.

Three stations investigated for river properties revealed that the Wawa River is a narrow system with a breadth of 4-6 meters. The riverbanks, as well as bottom substrate is comprised of coarse dark sand and mud, with Aroma trees lining up most of the outer length of the river (Plate 2.4 - 2). The river forks into a series of smaller creeks, winding through a mangrove swamp of mostly *Avicennia* species. At the time of the survey, river flow was very sluggish but it can be discerned that tidal flushing during low tide is modestly profound as branches of trees are wedged in some portions of the river. The substrate is mostly dark sand and muddy sediments, with most of the riverbanks stabilized by dense vegetation. The muddy substrate creates turbid waters that subsequently render coastal waters in the estuary equally turbid, with suspended silt vividly affecting nearby coral colonies in the MPA about 800 meters away.

No fishing activities or collection of edible macro-invertebrates were encountered during two days of survey. A couple who lives beside the mangrove swamp and who are the designated "stewards" of the reforested mangrove patch in the Wawa River claim that only mangrove crabs are being collected in the area by permission from them but no fishing operations is taking place in spite of the evident presence of various species of finfish and crustaceans in the river.



Plate 2.4-2. More views of the Wawa River with dense Aroma vegetation (left); survey team member recording depth (right).

The summary or river characteristics measured in three stations – upstream, midstream and in the estuary – is presented in Table 2.4.5 and featured in Figure 2.4.7.

Tab	le 2.4.5. P	hysical p	propertie	s of the	Wawa	River	measu	red d	during	g river	ecolog	y base	line	asses	sment
on 1	9 January	/ 2018; E	Barangay	Mataa	s na Ba	ayan, L	_emery,	Bat	anga	S.					
			<u></u>			•	, in the second s		~			<u></u>	~		

Parameter	Station 1- upstream	Station 2 -midstream	Station 3 - estuary
Width	5.4 meters	6.5 m	5.3 m
Depth	0.6 meter	0.4 m	0.7 m
Substrate	mud and sand	Mud and coarse sand	mud, pebbles,
			sand.



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Color	Dark green	Dark green	Green
Stream Flow	0.03m/s	0.35m/s	0.09m/s,
Riverbank	Aroma trees and few	Aroma trees and few	Aroma trees
vegetation	<i>Avicennia</i> sp	<i>Avicennia</i> sp	
Salinity	8 ppt	7 ppt	20 ppt



Figure 2.4.7. Salient characteristics of the Wawa River as measured in three stations during river ecology baseline assessment in the coastal impact area of the proposed Steel Asia project site Barangay Mataas na Bayan, Lemery Batangas; 16 December 2017.

2.4.2.2 Aquatic Biota – Fish and commercially important macro-invertebrates

The aquatic biota observed during the survey is modestly diverse, with ten (10) finfish species and three (3) crustaceans, including some lucrative species of fish and penaeid shrimps. Prominent are the schools of the mangrove snapper, *Lutjanus* sp, obviously seeking shelter and nursery in the river, as well as the giant freshwater prawn, *Macrobrachium* sp, whose habitats are the submerged plants and roots along the banks of the river. The aquatic biota catalogued from opportunistic surveys and actual fishing in two stations using a scoop net is detailed in Table 2.4.6 (also see Plate 2.4-3).



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 Table 2.4.6. List of fish and crustacean species catalogued in the Wawa River, Barangay Mataas na

 Bayan, Lemery Batangas during freshwater and coral/marine ecology assessment for the proposed Steel

 Asia project: 16 December 2017 and 19 January 2018.

Species common name	Local Name	Scientific Name	Observed relative
			occurrence
Mangrove snapper	Mangagat	Lutjanus argentimaculatus	abundant
Flathead river mullet	Banak	Mugil cephalus	abundant
Goby	Biya	Glossogobius sp	abundant
Tilapia	Tilapia	Oreochromis nilotica	abundant
Eel	Igat/Kasili	Anguilla marmorata	few
Spotted scat	Kikiro	Scatophagus argus	few
Needlefish	Balo	Strongylura incisa	few
Common whiting	Aso-os	Sillago sihama	few
Convex-lined therapon	Tunghod/Bugaong	Therapon jarbua	few
Spotted mojarras	Latab	Gerres filamentosus	Few
Giant freshwater prawn	Ulang	Macrobrachium rosenbergii	Abundant
Penaeid shrimp	Pasayan	Metapenaeus sp	few
Mangrove crab	Alimango	Scylla spp	

Macro-invertebrates of significance for food and trade were modesty diverse in the confines of the river and adjacent mangroves. At the time of the survey, a total of twelve (12) species were recorded, all of which are considered edible; including five (5) species of bivalves, four (4) gastropods, and three (3) crustaceans. The most common species encountered in the survey consisted of colonies of the swamp cerith *Tereblralia palustris* and the edible exoctic clam (Kibaw) *Polymesoda erosa*. The list of commercially-important macro-invertebrates encountered during the survey is presented in Table 2.4.7 and Figure 2.4.8; see also Plate 2.4-3.

Table 2.4.7. List of commercially-significant macro-invertebrates catalogued during river ecology and mangrove survey in the Wawa River, Barangay Mataas na Bayan, Lemery Batangas for the proposed Steel Asia project; 16 December 2017 and 19 January 2018.

Species Name	Common Name	Habitat	Group
Mactra luzonica	Throughshell	Sandy-muddy littoral	Bivalve
Nerita costata	Costate nerite	Mangrove flats	Gastropod
Polymesoda erosa	Mangrove venus clam	Mangrove mud flats	Bivalve
Anadara antiquata	Ark shell	Sandy substrate	Bivalve
Mangrove crab	Alimango	Mangrove mud flats	Crustacean
Littoria scabra	Perwinkle	Mangrove	Gastropod
Tereblralia palustris	Swamp cerith	Muddy substrate	Gastropod
Crassostrea iredalei	Cup oyster	Mangroves	Bivalve
Terebralia palustris	Mud creeper	Muddy susbtrate	Gastropod
Macrobrachium rosenbergii	Giant freshwater prawn	River substrate	Crustacean
Telescopium telescopium	Swamp cerith	Mangroves	Bivalve
Carcinus sp	common shore crab	Muddy substrate	Crustacean



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Plate 2.4-3. Fish species and commercially-significant macro-invertebrates catalogued during river ecology and mangrove survey in the Wawa River, Barangay Mataas na Bayan, Lemery Batangas; 16 December 2017 and 19 January 2018. Top row: river mullet, gobies and shrimp; middle: spotted mojaras, mangrove crab and common whiting; bottom: ark shell, mangrove venus clam and oysters.

The fish, crustacean and macro-invertebrate species catalogued in the Wawa River at the time of the surveys indicate a modestly diverse community with important economic and ecological value. The presence of juvenile foodfish and crustaceans implies that the mangrove and the river are favored fish and crustacean nursery grounds in the area.





Figure 2.4.8. Some macro-invertebrates catalogued during freshwater ecology survey in the Wawa River, Barangay Mataas na Bayan, Lemery Batangas for the proposed Steel Asia project; 16 December 2017 and 19 January 2018



2.4.2.3 Mangroves

The mangrove area in the project site measures about 6.5 hectares of mixed old growth and replanted trees. There are four species of true mangroves in the area - *Avicennia marina* (Api-api/Bungalon), *Bruguiera cylindrica* (Pototan), *Rhizopora apiculata* (Bakawang Ialaki) and *Ceriops decandra* (Malatangal). Dense Aroma trees and the mangrove-associate *Nipa fruticans* dominate the riverbanks while true mangrove species occupy the inner flank. Cultivated fields abruptly fringe the north and northwestern boundary of the mangrove swamp. Enhancement of mangrove cover through assisted natural regeneration, and monitoring of the area to prevent poaching is being undertaken by an organization named Coastal Green Crusade (actually a husband-and-wife team living in the outer periphery of the mangrove swamp). The PO president – *Mr. Ronald Ricalde* – personally tends mangrove replanting. The area used to be a small mangrove forest that has been logged over and rehabilitated through the National Greening Program of the CENRO in Calaca municipality in 2016 (Plate 2.4-4).



Plate 2.4-4. Mangrove signboard and survey team member in the mangrove transect.

A total of thirty-six (36) trees were catalogued in two quadrants laid across one transect about 10 meters from the widest breadth of the river. The density was rather sparse, catalogued at an average of 18 trees/quadrate or 0.18 tree/m². The first quadrate hosted twenty-two (22) trees or 61% of the mangrove community in the area surveyed, entirely consisting of *A. marina* species. The second quadrate in the inner portion hosted lesser number of mangroves with only 14 trees consisting of three species that were relatively larger than those found in the outer portion (Table 2.4.8 and Figure 2.4.9 also see Figure 2.4.13). The fourth species – *Rhizopora apiculata* were encountered as well but the species consisted of a few trees that were outside of the quadrates.





Figure 2.4.9. Species diversity and relative abundance of mangrove trees catalogued in two quadrants in the mangrove area along Wawa River during freshwater ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.

In spite of the small area of the mangrove patch, the mangrove crown cover is robust, recorded at 96.5 % canopy, considered as 'excellent' cover (Table 2.4.8 and Figure 2.4.10). Crown cover is dominated by the *Avicennia* species, typically broad trees, averaging 5.77 meters, indicating relatively old trees. Crown cover of *Bruguiera cylindrica* and *Ceriops decandra* were catalogued at 1.77 m and 2.45 m, respectively; indicating smaller trees (Figure 2.4.10).

Avicennia marina also completely dominated hieght of the trees, averaging 5.86 meters (Plate 2.4-5). A. marina is a widely distributed species whose wood is often sought for use as firewood and timber. Its leaves can be used to supplement feeds for livestock. Api-api is one of the sturdiest mangrove tree that can arrest coastal eorsion. The rest of the other mangroves species have hieghts, ranging from an average of 3 to 3.5 meters (Figure 2.4.11). The overall average heigth, recorded at 5. 77 meters, is considered as 'excellent' condition.

There were twenty-eight (28) seedlings and six (6) saplings catalogued in six (6) plots during the survey, translating to a regeneration capacity of $9.33/m^2$ (Table 2.4.8 and Figure 11). The recuitment capacity is rated as 'excellent'. No evidence of mangrove cutting was seen.





Figure 2.4.10. Crown cover of mangrove species catalogued in two quadrates in the mangrove area along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.



Figure 2.4.11.Average height of mangrove trees in two quadrates surveyed in the mangrove area along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.





Figure 2.4.12. Proportion of trees, seedlings and saplings in mangrove patch surveyed in two quadrates along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.



Table 2.4.8 : Mangrove Habitat Assessment Data Sheet – species diversity and distribution of mangroves surveyed in two quadrants										
Location: Bar	angay I	Mataas Na Bayan, Le		Coordinates:						
Observers:	Rower	na Quimpo, Benjamin	Francisco and Michael Chester F	rancisco	Tropost 4					
Date:	Decen	nber 16, 2017/January	/ 19, 2018				13.905/98 E 120.80980/			
Transact # 1	Tree	Substrate		Ht (m)	Crown D (m	iameter)	Observations			
fransect#1	#	Substrate	Species		Reading (Ave.)	C.Cove r				
	1	muddy; sandy	Avicennia marina (Bungalon; Api-api)	6	2	3.14	Mangrove crabs and bivalve			
	2	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5.5	4	12.57	macro-invertebrates (e.g., <i>Polimesoda erosa</i> or Kibaw)			
Quadrat # 1	3	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	1	0.79	being collected in the mangroves.			
10mx10m	4	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	2	3.14	Colonies of small cup oyster,			
	5	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	1	0.79	swamp cerith			
	6	muddy; sandy	Avicennia marina (Bungalon; Api-api)	7	4	12.57	No evidence of cutting;			
	7	muddy; sandy	Avicennia marina (Bungalon; Api-api)	7	3	7.07	Mixed reforested mangroves and original growth			
	8	muddy; sandy	Avicennia marina (Bungalon; Api-api)	8	5	19.64	mangroves			
	9	muddy; sandy	Avicennia marina (Bungalon; Api-api)	7	2	3.14	Seedlings-15 Sapling-0			
	10	muddy; sandy	Avicennia marina (Bungalon; Api-api)	3	1	0.79				
	11	muddy; sandy	Avicennia marina (Bungalon; Api-api)	3	2	3.14				
	12	muddy; sandy	Avicennia marina (Bungalon; Api-api)	9	4	12.57				
	13	muddy; sandy	Avicennia marina (Bungalon; Api-api)	7	4	12.57				



			Avicannia marina (Rungalon:	Q	2		
	14	muddy; sandy	Avicennia manna (Bungalon, Api-api)	0	3	7.07	
	15 muddy; sandy		Avicennia marina (Bungalon; Api-api)	8	2	3.14	
	16	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	1	0.79	
	17	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	2	3.14	
	18	muddy; sandy	Avicennia marina (Bungalon; Api-api)	3	5	19.64	
	19	muddy; sandy	Avicennia marina (Bungalon; Api-api)	7	2	3.14	
	20	muddy; sandy	Avicennia marina (Bungalon; Api-api)	6	3	7.07	
	21	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	1	0.79	
	22	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	2	3.14	
	23	muddy; sandy	Avicennia marina (Bungalon; Api-api)	9	3	7.07	
	24	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	2	3.14	
	25	muddy; sandy	Avicennia marina (Bungalon; Api-api)	6	2	3.14	
Quadrat # 2 10mx10m	26	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	3	7.07	
	27	muddy; sandy	Avicennia marina (Bungalon; Api-api)	8	2	3.14	Coodling 12
	28	muddy; sandy	Avicennia marina (Bungalon; Api-api)	5	1	0.79	Sapling-6
	29	muddy; sandy	Avicennia marina (Bungalon; Api-api)	6	3	7.07	
	30	muddy; sandy	Avicennia marina (Bungalon; Api-api)	4	2	3.14	
	31	muddy; sandy	Avicennia marina (Bungalon; Api-api)	6	3	7.07	
	32	muddy; sandy	Avicennia marina (Bungalon;	4	2	3.14	



			Api-api)					
	33	muddy; sandy	Ceriops decandra (Malatangal)	3	1.5	1.77		
	34	muddy; sandy	Ceriops decandra (Malatangal)	3	2	3.14		
	35	muddy; sandy	Bruguiera cylindrica (Pototan)	3	1.5	1.77		
	36	muddy; sandy	Bruguiera cylindrica (Pototan)	4	1.5	1.77		
Total	36			200.5		193.01	Seedlings- 28 6	Saplings-
			SUMMARY RES	ULTS:				
			TOTAL CROWN COVER:			193.0 [,]	1	
			PERCENT CROWN COVER: 1	193.01/(2 q	uadrats x 10	0 sq.m.) = 9	96.51% (Excellent	condition)
		то	TAL HEIGHT OF ALL TREES:			200.5	;	
			AVERAGE HEIGHT: 2	200.5/ 36 Tre	ees = 5.57 m	neters (Exc	ellent condition)	
			Total	Regenerati	on Count			
		Regeneratio	n Per Square Meter =					
	Total Number of Regeneration Plots							
		28 Seedlings /3 Plo	ots (3 plots per quadrat) = 9.33 re	egeneration	per m² (Ex	cellent con	di <u>tion)</u>	



The Wawa River and adjacent mangrove patch in Mataas na Bayan serve as habitat to an array of

economically important species of fish and macro-invertebrates. Schools of young mangrove snapper (*Lutjanus argentimaculatus*; "Mangagat") were encountered in the river by the survey team, as well as Mullets (*Mugil* sp), and penaeid shrimps. Bivalves included the exotic edible "Kibaw" (*Polymesoda erosa; Plate 2.4-5*) and cup oysters.



Plate 2.4-5. Avicennia marina, Bruguiera cylindrica, Rhizopora apiculata and the edible bivalve "Kibaw" found in the mangroves surveyed in Mataas na Bayan, Lemery, Batangas.





Figure 2.4.13. Dominant species and relative abundance of mangrove trees catalogued in two quadrates assessed in the mangrove area along Wawa River during river/marine ecology baseline assessment in the proposed Steel Asia project site in Lemery, Batangas; 16 December 2017 and 19 January 2018.



2.4.2.4 Plankton

Phytoplankton

The plankton abundance, composition, distribution and diversity in sampling stations along the Wawa River near the proposed Steel Asia project site in Baranday Mataas na Bayan and Sinisian, Lemery, Batangas during the December 2017 is shown in Table 12. Three sampling stations were surveyed covering the upstream, midstream stations and estuary of the river (please see Figure 2.4.2). Result of microscopy analysis revealed a total of twenty-seven (27) phytoplankton genera belonging to Bacillariophytes (diatoms) with seventeen (17) genera, Dinophytes (dinoflagellates) with four (4) genera, Cyanophytes (blue-green algae) with three (3) genera and Chlorophytes (Green Algae) with two (2) genera (Table 2.4.9). Diatoms totally dominated the phytoplankton community accounting for 92% of the phytoplankton abundance (Figure 2.4.14). This was followed by blue green algae which constituted 3.31%, dinoflagellates with 3.17% and green algae with 2 %. The centric, chain-forming diatom, Chaetoceros spp. were the most abundant diatom taxa which accounted for 40%. Other diatom taxa with high relative abundance include Coscinodiscus spp (18%), Fragillaria (10%), Pseudonitzschia (3%), Pinnularia (3%), Surirella (3%), Thalassionema (2%), Pleurosigma (2%), and Amphora (2%). Coscinodiscus spp. was the most frequently occurring species as the species was observed in all sampling stations. These diatom genera are commonly found in warm tropical aguatic environments and play a major role in the overall primary productivity of the marine environment in the area. The pollution tolerant genera observed in this survey include Scendesmus and Oscillatoria which were mostly observed in upstream and midstream stations. Other important phytoplankton genera include Synedra, and Fragillaria. Blooms of these genera, in most cases triggered by hyper-nutrient loading, can block canals and clog filters especially in water treatment facilities.

The potentially harmful phytoplankton species observed were *Pseudonitzschia* spp., and *Oscillatoria*. Some species of *Pseudonitzschia* are known to produce domoic acid, a toxin associated with Amnesic Shellfish Poisoning (ASP). Cyanobacteria belonging to genus *Oscillatoria* are also reported to produce cyanotoxins that have negative health effect to human and animals (EPA, 2017). However, cell densities observed during the sampling was relatively low compared to areas where blooms of these organisms have been reported. However continued monitoring is highly recommended in order to implement environmental safety nets during blooms of this potentially harmful species.

The photomicrograph of dominant and common phytoplankton is shown in Plate 2.4-6.



Figure 2.4.14. Percentage composition of major phytoplankton groups in three stations surveyed near the proposed Steel Asia project site in Lemery Batangas during the December 2017 survey; (Garry Benico).

ΤΑΧΑ	, <u>,</u>	STATION		Grand	Rel.
	Upstream	Midstream	Downstream	Total	Abund.
Cyanobacteria	700	120	140	960	3.31
Merismopedia	230	120	0	350	1.21
Oscillatoria	470	0	0	470	1.62
Trichodesmium	0	0	140	140	0.48
Diatoms	4,600	6,440	15,495	26,535	91.48
Amphora	140	140	220	500	1.72
Chaetoceros	560	140	10,875	11,575	39.91
Chroococcus	160	160	0	320	1.10
Corethron	0	0	220	220	0.76
Coscinodiscus	1,220	3,450	670	5,340	18.41
Melosira	130	180	180	490	1.69
Navicula	120	240	260	620	2.14
Nitzchia	40	340	110	490	1.69
Pinnularia	340	130	330	800	2.76
Pleurosigma	130	230	160	520	1.79

Table 2.4.9.	Phytoplankton composition a	and abundance (ce	ells/L) sampled i	in three stations	near the
proposed St	eel Asia project site in Lemer	y Batangas during	the December	2017 survey.	



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Pseudonitzschia	0	260	680	940	3.24
Rhizosolenia	0	130	130	260	0.90
Surirella	220	60	450	730	2.52
Synedra	90	110	150	350	1.21
Thalassionema	0	0	130	130	0.45
Thalassiosira	0	0	450	450	1.55
Fragilaria	1,450	870	480	2,800	9.65
Dinoflagellates	200	330	390	920	3.17
Ceratium	40	120	80	240	0.83
Peridinium	160	210	120	490	1.69
Prorocentrum	0	0	60	60	0.21
Protoperidinium	0	0	130	130	0.45
Green Algae	380	210	0	590	2.03
Closterium	340	210	0	550	1.90
Scenedesmus	40	0	0	40	0.14
Total Cells (N)	5,880	7,100	16,025	29,005	100
Richness (S)	18	18	21		
Evenness (I')	0.82	0.70	0.50		
Diversity (H")	2.38	2.03	1.52		

Generally, the mean cell density of all the phytoplankton across the three stations was 9,668 cells/L. In terms of spatial distribution, the downstream stations had the highest phytoplankton abundance with 16,025 cells/L while the most taxa-rich station was also observed in downstream with twenty-one (21) taxa (Figure 2.4.10). The lowest total phytoplankton density was observed in the upstream station with 5,880 cells/L; while relatively poor taxa were observed in both in the upstream and midstream stations, with eighteen (18), respectively. The upstream station and the midstream stations was dominated with Coscinodiscus spp. with cell density ranging from 1,220 -3450 cells/L while the downstream station was dominated by Chaetoceros spp. Generally, the computed diversity values based on Shannon-Weiner was low (<3) with the highest values computed in upstream station with 2.38 while the lowest values was observed in downstream station with 1.52. The index of evenness based on Pielou's Index was also generally high with computed values ranging from 0.5 to 0.82. This indicates that the phytoplankton community is evenly distributed with no species dominating relative to general species diversity. The poor diversity measurement is indicative of stressful condition unfavorable to the proliferation of phytoplankton organisms. The overall impression of the phytoplankton community during the survey is poor due to low number of taxa observed and relatively low phytoplankton abundance during the sampling period. However, the presence of potentially harmful species should require a good monitoring system after the project has been successfully established.



Figure 2.4.10. Taxa richness and total phytoplankton density in three sampling stations surveyed during marine ecology baseline assessment in coastal waters near the proposed Steel Asia project site in Lemery Batangas on December 2017.



Plate 2.4-6. Photomicrographs of phytoplankton identified and recorded in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017. **Top**: (A) Chaetoceros spp. (B) Pseudonitzschia spp. (C) Oscillatoria spp.; **Bottom**: (D) Coscinodiscus spp. (E) Fragilaria spp. (F) Scenedesmus spp.



Zooplankton

A total of 46,279 ind/m³ distributed among fifteen (15) zooplankton groups (in adult and larval forms) were identified and recorded from three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas on 16 December 2017. All sampling stations were positioned at pre-determined locations by GIS similarly for the phytoplankton sampling on the upstream (PLK1), midstream (PLK2), and estuary (PLK3) of the riverine waters in order to assess and compare the microscopic biota in the said survey area. Table 2.4.11 and Figure 2.4.15 features the zooplankton groups composed of:

- Copepods in adult forms; i.e., **cyclopoid** (13,945 ind/m³), **calanoid** (2,425 ind/m³), and **harpacticoid** (1,011 ind/m³), with a collective total of 17,381 ind/m³ at ~37%composition;
- Other adult forms such as **arcellinida** = testate amoebae (2,627 ind/m³) at 5.68% composition, and **larvacean tunicates** (1,213 ind/m³) at 2.62% composition;
- The larval forms of **nauplius and copepodites**, being the most abundant in this subgroup with 6,871 ind/m³ at 14.85% composition;
- Larval forms of bivalve veligers (6,265 ind/m³) at 13.54% composition, gastropod veligers (3,637 ind/m³) at 7.86% composition, rotifers (collective 3,840 ind/m³) at ~8% composition, unidentified egg (1,819 ind/m³) at 3.93% composition; and,
- Other remaining larval forms such as decaped zoae, fish larvae, insect larvae, and nematode larvae with a total density of 2,626 ind/m³ at ~6% composition.

Overall, recorded zooplankton consisted of 45.85% (21,221 ind/m³) adult forms and 54.15% (25,058 ind/m³) larval forms of the total zooplankton count. The survey revealed that there are relatively more larval forms than the adult forms.

The adult zooplankton forms are comprised of 5 groups, while the larval zooplankton forms are comprised of 10 groups as recorded during this survey. A large portion of the adult forms was represented by Cyclopoid copepods with 13,945 ind/m³ at 30.13% composition, while the larval forms was dominated by nauplius and copepodites with a total of 6,871 ind/m³ at 14.85% composition. The cyclopoid copepods are also the most abundant for the whole documented zooplankton population within the survey area (Table 2.4.11). 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.

As previously stated, the larval form groups were dominant than the adult forms supplemented by gastropod and bivalve veligers, decapod zoeae, fish larvae, insect larvae, loricate and bdelloid rotifers, nematode larvae, an unidentified egg, and fish larvae. The fish larvae are speculated to be the progenies of the fish species observed and collected in the sampling for macrobenthos, which indicates a replenishment of fish stocks in the area. The presence of gastropod and bivalve veligers attribute to the findings of the macrobenthos sampling where fifty-one (51) individuals of these mollusks have been identified. Rotifers, which are found in many different types of water, including waste water, were mostly confined in the upstream sampling station PLK1 numbering by the thousands. Studies have shown that these organisms are beneficial in stabilizing organic wastes, stimulating microfloral activity and decomposition, enhancing oxygen penetration, and recycling mineral nutrients. Completing the zooplankton composition in the survey site are other adult forms such as larvacean tunicates which filter feeds on algae, bacteria, and protists; and arcellinids – testate amoebae which are commonly found in soils, leaf litter, peat bogs and near/in fresh water.

There were no rare or endemic zooplankton species in the area, and majority of the zooplankton groups are generally common and cosmopolitan in distribution.

Photomicrographs of zooplankton groups recorded in the survey area are shown in Plates 2.4-7A to 2.4-7F.



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Table 2.4.11. Zooplankton composition and abundance (ind/m³) in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017; (Researcher: Garry Benico)

	STATIONS			Grand	Pol
ТАХА	PLK1	PLK2	PLK3	Total	Abund
Adult forme (E)	Upstream	Midstream	Estuary	24 224	4E 9E
Adult forms (5)	404	2,829	17,988	21,221	45.85
Arcellinida	404	<mark>2,223</mark>	0	2,627	5.68
Calanoid Copepod	0	0	2,425	2,425	5.24
Cyclopoid Copepod	0	606	<mark>13,339</mark>	<mark>13,945</mark>	<mark>30.13</mark>
Larvacean tunicates	0	0	1,213	1,213	2.62
Harpacticoid Copepod	0	0	1,011	1,011	2.18
Larval forms (10)	4,851	7,274	12,933	<mark>25,058</mark>	54.15
Bdelloid Rotifer	<mark>1,415</mark>	606	0	2,021	4.37
Bivalve veliger	0	1,819	4,446	6,265	13.54
Decapod zoae	0	0	606	606	1.31
Fish larvae	0	0	202	202	0.44
Gastropod Veliger	0	808	2,829	3,637	7.86
Insect larvae	606	808	0	1,414	3.06
Loricate Rotifer	1,011	808	0	1,819	3.93
Nauplius and Copepodite	808	1,213	4,850	6,871	14.85
Nematode larvae	0	404	0	404	0.87
Unidentified egg	1,011	808	0	1,819	3.93
Total Abundance (N)	5,255	10,103	<mark>30,921</mark>	46,279	100
Mean Abundance =					
15,426					
No. of Rep Groups = 15			•		
Richness (S)	6	<mark>10</mark>	9		
Mean Richness = 8					
Diversity (H")	1.72	<mark>2.17</mark>	1.70		
Evenness (I')	<mark>0.96</mark>	0.94	0.77		





Figure 2.4.15. Percentage composition of major zooplankton groups in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017.



Plates 2.4-7A-2.4-7F. Photomicrographs of zooplankton identified and recorded in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017. **Top:** (A) Calanoid copepod (B) Cyclopoid copepod (C) Harpacticoid copepod; **Bottom:** (D) Fish Larvae (E) Loricate rotifer (F) Bdelloid rotifer


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The mean estimate of abundance for the zooplankton community was 15,426 ind/m³ recorded for all three sampling stations during this survey (Figure 2.4.16). In terms of spatial distribution, the most number of population counts is attributed to the estuarine sampling station PLK3 with a density of 30,921 ind/m³, as dominated by cyclopoid copepods (13,339 ind/m³). In terms of species richness, the midstream sampling station PLK2 had the relatively highest record of 10 representative zooplankton groups as compared to the other three sampling stations.

In contrast, the lowest zooplankton abundance was recorded in the upstream sampling station PLK1 with 5,255 ind/m³ while also having the relatively lowest number of taxa having six (6) representative groups.

It should be noted that the abundance of zooplankton numbers increases from the upstream portion to the estuarine area of the Wawa River, similar to the trend in phytoplankton densities.



Zooplankton Density and Richness

In reference to Table 2.4.11, diversity measurements based on the Shannon-Weiner Index were low (<2.0) in sampling stations PLK1 and PLK3. The relatively highest value of 2.17 is attributed to sampling station PLK2, while the relatively lowest at 1.70 was determined to be at sampling station PLK3. As previously discussed in the phytoplankton section, diversity index values that are greater than 2.0 indicates normal conditions for aquatic biota and the associated habitat. Values above 3.0 indicate that the habitat structure is stable and balanced, while values midway from 1.0 to 2.0 describe a threatened condition: furthermore, values lower than 1.0 indicates pollution and degradation occurring in the habitat structure (Goncalves and Menezes, 2011); the Diversity Index however, very rarely exceeds a 4.5 value.

In terms of evenness, the computed indices for the three sampling stations is not that variable ranging with the lowest at 0.77 in sampling station PLK3 to the highest at 0.96 in sampling station PLK1.

Figure 2.4.16. Total and mean phytoplankton abundance and richness in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017; (Garry Benico).



It should also be noted that sampling station PLK3 though having the abundant counts has the lowest computed diversity and evenness values, indicating dominance of a particular group, which in this case are the cyclopoid copepods present with high individual counts as compared to the densities of the other

are the cyclopoid copepods present with high individual counts as compared to the densities of the other larval and adult forms for all sampling stations. The Shannon index decreases as the evenness of the community decrease is observed in this case.

The computed diversity and evenness indices indicate that the zooplankton communities in the area are however, characterized as low based on the Wilhm criteria (1975), classifying the diversity index <3.0 as having low community stability.

The dominant plankton taxa catalogued during the freshwater ecology survey is also featured in Figure 2.4.17.





Figure 2.4.17. Diversity of plankton groups sampled in three stations in the Wawa River during freshwater ecology baseline assessment in the proposed Steel Asia project site Barangay Mataas na Bayan in Lemery Batangas during the December 2017 survey; (Garry Benico).



2.4.2.5 Macrobenthos Diversity

The macrobenthic community diversity, abundance, and relative composition were determined in three sampling stations along the Wawa River within the impact area of the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas on 16 December 2017. All sampling stations were positioned at pre-determined locations by GIS on the upstream (BNT1), midstream (BNT2), and downstream (BNT3) of the riverine waters for purposes of determining the freshwater and estuarine benthic biota in the said survey area.

A total of ninety-six (96) individuals belonging to 16 phyletic groups were quantified for all three sampling stations. These identified taxonomic groups likewise belong to four major phyla; namely Mollusca, Arthropoda, Chordata, and Annelida. Among these, the highest number of individuals is attributed to Mollusca with fifty-one (51) individuals (53% composition); followed by Arthropoda with twenty-one (21) individuals (22% composition), Annelida with fourteen (14) individuals (15% composition), and Chordata with ten (10) individuals, having the least at 10% of the total sampled composition (Figure 2.4.18).





Mollusca also had the most representation with seven (7) family taxa out of the sixteen (16) categorized phyletic groups. Within this group, gastropods are the most abundant with a collective density of fortyeight (48) individuals comprising 50%, while bivalves have a mere density of three (3) individuals comprising 3% out of the total sampled benthic organisms. Among the gastropods, *Cerithium* sp. of the Family Cerithiidae (ceriths) comprised half of the counts having twenty-four (24) individuals (25% of the overall count) of the soft bottom community. In addition, *Melanoides* sp. (F. Thiaridae) with ten (10) individuals (10.42%) and *Clithon* sp. (F. Neritidae) with seven (7) individuals (7.29%) also recorded significant relative abundances. Both are also commonly found in sandy bottoms, reef flats or reef rocks covered with sand and algae in marine tropical waters. Among the bivalves, only two representatives were recorded – *Corbicula* sp. (= "basket clams", F. Corbiculidae) with one (1) individual (1.04%) and Pisidium sp. (= "pea clams", F. Sphaeriidae) with two (2) individuals (2.08%). Generally, bivalves are most abundant in, and just beneath the tidal zones, where the most abundant quantities of food may be found. However, the species recorded are limited in freshwater and brackish habitats. Most of the molluscs



nile forms of hivalves and gastronods, which indicate a favorable continuity and

obtained were juvenile forms of bivalves and gastropods, which indicate a favorable continuity and recruitment of the benthic population.

From the Annelids, polychaetes only had three (3) representatives (3.13%) from the Family Nereididae (rag worms or clam worms) were recorded. Polychaetes are opportunistic species that are able to proliferate in increasing organic matter (GIAGRANDE, ET AL., 2005). This animal group include active predators, scavengers, and grazers of algae. Many polychaetes are eaten by other polychaetes and other marine invertebrates as well as fish and wading birds. As such, polychaetes occupy several levels within the food chain. Polychaetes include many species whose sensitivity to reduced oxygen levels or to heavy metals is well understood, and they can be useful pollution indicators.

For the Arthropods, *Macrobrachium* sp. (F. Palaemonidae) was abundant for this phyletic group having seventeen (17) individuals (17.71%), and was concentrated in the upstream sampling station (BNT1). This is a genus of freshwater prawns or shrimp characterized by the extreme enlargement of the second pair of "walking legs" in males. Complimenting the total abundance for arthropods at twenty-one (21) individuals (22%) are associated freshwater insects such as dragonflies (F. Anisoptera) with one (1) individual (1.04%), damselflies (F. Zygoptera) with two (2) individuals (2.08%), and diving beetles (F. Dytiscidae) also with two (2) individuals having a similar 2.08% composition as damselfies.

Noteworthy are the presence of Chordata as represented by three family taxa. One is *Oreochromis* sp. = "nile tilapia" (F. Cichlidae) having five (5) individuals (5.21%), which may have wandered along channels in tributaries where these are also cultured from fishponds in the area. The other are gobies (F. Gobiidae) having three (3) individuals (3.13%), which are generally distributed worldwide in tropical and temperate near-shore marine, brackish, and freshwater environments. Completing the roster for Chordata are Syngnathus sp. = "pipefish" (F. Syngnathidae) having two (2) individuals (2.08%), characterized by their elongated snouts, fused jaws, and by thick plates of bony armor covering their bodies. The genus Syngnathus sp. is found in marine, brackish, and sometimes fresh water of the Atlantic, Indian, and Pacific Ocean, and thus is interesting to have been recorded in the survey area. These mentioned chordate family taxa have considerable tolerance to environmental stressors, such as organic and inorganic contaminants. However, the presence of these organisms alone does not indicate that the waters are either clean or polluted (rock.geo.csuohio.edu/norp/bmi2.htm), data must however be integrated with physico-chemical parameters in order to have a holistic view of the ecosystem health.

Data on the composition, abundance and diversity of the macrobenthos community recorded in the three sampling stations as previously discussed are summarized in Table 2.4.12 and Figure 2.4.18. Images of selected phyletic groups and economically-important macrobenthos encountered in this survey are shown in Plates 2.4-8 to 2.4-8F.

Table 2.4.12. Macrobenthos composition, abundance and diversity (# of individuals) in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017.

		STATIONS		Grand	Rol
ΤΑΧΑ	BNT1 Upstream	BNT2 Midstream	BNT3 Downstream	Total	Abund
Phylum Arthropoda (T=21)				21	
Class Insecta (ST=4)					
Order Odonota (3)					
F.Anisoptera (dragonflies)		1		1	1.04
F.Zygoptera (damselflies)		2		2	2.08
Order Coleoptera (1)					
F.Dytiscidae (diving beetles)		1		1	1.04
Class Malacostraca (ST=17)					



Orden Desenado (47)					
Order Decapoda (17)	40	0	-	47	47.74
F.Palaemonidae (<i>Macrobrachium</i> sp.)	12	2	<mark>3</mark>	1/	1/./1
Phylum Mollusca (T=51)				<mark>51</mark>	
Class Gastropoda (ST=48)					
Order Caenogastropoda (40)					
F.Cerithiidae (<i>Cerithium</i> sp.)	<mark>24</mark>			<mark>24</mark>	25.00
F.Planaxidae (<i>Planaxis</i> sp.)	1	5		6	6.25
F.Thiaridae (<i>Melanoides</i> sp.)	4	<mark>6</mark>		10	10.42
Order Neritoidea (7)					
F.Neritidae (<i>Clithon</i> sp.)	3	2	2	7	7.29
Order Panpulmonata (1)					
F.Planorbidae (<i>Planorbis</i> sp.)		1		1	1.04
Class Bivalvia (ST=3)					
Order Veneroida (3)					
F.Corbiculidae (<i>Corbicula</i> sp.)		1		1	1.04
F.Sphaeriidae (<i>Pisidium</i> sp.)	2			2	2.08
Phylum Chordata (T=10)				10	
Class Actinopterygii (ST=10)					
Order Perciformes (5)					
F.Cichlidae (<i>Oreochromis</i> sp.)	2	1	2	5	5.21
Order Gobiiformes (3)					
F.Gobiidae (gobies)	3			3	3.13
Order Syngnathiformes (2)					
F.Syngnathidae (<i>Syngnathus</i> sp.)		2		2	2.08
Phylum Annelida (T=14)				14	0.00
Class Polychaeta (ST=3)					
Order Phyllodocida (3)					
F.Nereididae	3			3	3.13
Class Oligochaeta (ST=11)	2	<mark>6</mark>	3	11	11.46
Total Abundance (N)	<mark>56</mark>	30	10	<mark>96</mark>	100
Mean Abundance = 32					
Species Richness (S)	10	<mark>12</mark>	4		
Mean Species Richness = 9					
Diversity (H')	1.78	<mark>2.23</mark>	1.37		
Evenness (I')	0.77	0.90	0.99		



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Plates 2.4-8A-2.4-8F. Images of recorded macrobenthos in three sampling stations along the Wawa River within the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017. Top: (A) Chordata [F. Cichlidae – Oreochromis sp.] (B) Chordata [F. Syngnathidae – Syngnathus sp.] (C) Mollusca [F. Cerithiidae – Cerithium sp.]; Mid: (D) Annelida [F. Nereididae – "rag or clam worm"] (E) Arthropoda [F. Palaemonidae – Macrobrachium sp.] (F) Annelida [Class Oligochaeta – "earth worms"]; Bottom: (G) Mollusca [F. Corbiculidae – Corbicula sp.] (H) Arthropoda [F. Anisoptera – "dragonflies"] (I) Mollusca [F. Planorbidae – Planorbis sp.]

The abundance and density of macrobenthos as recorded in the three sampling stations are shown in Figure 27 wherein the mean density was thirty-two (32) individuals. Spatially, sampling station BNT1 yielded the highest count of macrobenthos with 56 individuals, while sampling station BNT2 has the most number of representation with 12 taxonomic groups. In contrast, sampling station BNT3 had the relatively lowest abundance and representation with 10 individuals and four phyletic groups. In general, this survey revealed a decreasing abundance from the upstream to the downstream sampling stations. As previously discussed, all sampling stations are dominated by mollusks. Taxa richness is the total number of distinct taxa in a sample. The relative abundance of each taxa presented is essential as a community that is dominated by a relatively few species may indicate environmental stress. This reflects the health of the macrobenthic community through measurement of the variety of taxa present that generally increases



with increasing water quality (PLAFKIN ET AL., 1989). A high percent contribution by a taxon generally indicates community imbalance (BODE, 1988).



Figure 27. Total macrobenthos abundance and richness in three sampling stations along the Wawa River in the impact area of the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017.

In reference to Table 15, diversity measurements based on the Shannon-Weiner Index are quite interesting; revealing the relatively highest value of 2.23 attributed to sampling station BNT2, while the lowest diversity value at 1.78 was determined to be at sampling station BNT1. In normal conditions for aquatic biota and the associated habitat, the diversity index value is more than 2.0. Values above 3.0 indicate that the habitat structure is stable and balanced, while values midway from 1.0 to 2.0 describe a threatened condition; furthermore, values lower than 1.0 indicates pollution and degradation of habitat structure (GONCALVES AND MENEZES, 2011); the Diversity Index however, very rarely exceeds a 4.5 value.

In terms of evenness, the computed Pielou's Index among the three sampling stations was also noteworthy ranging with the lowest at 0.77 in sampling station BNT1 to the highest at 0.99 in sampling station BNT3. This indicates that the benthic community in the sampling stations is quite evenly distributed with corresponding number of individuals and representative organisms, even though some genera are dominant as relative to others, which is in this case are the mollusks.

Noteworthy to mention that sampling station BNT2 had the highest species richness with 12 representative groups and the highest computed diversity index, which indicates a balance of the population and the number of species recorded. However, based on the Wilhm criteria (1975), these diversity values are poor since this criteria classified the diversity index <3.0 as low and indicates low community stability. Sampling station BNT 2 is remarkable as its Diversity Index is in normal conditions and its Evenness Value is not that low. More importantly, there were no rare, endemic, or threatened organisms present, as the identified groups are common and cosmopolitan in distribution.





Figure 28: MAcrobenthos Sampling Station Map (Source: Garry Benico)

2.4.2.6 River water salinity

The results of salinity measurements in foru river stations is shown in Figure 2.4.19.





Figure 2.4.19. River water salinity in four stations surveyed along the Wawa River during freshwater ecology baseline assessment in the impact area of the proposed project site of Steel Asia Manufacturing Corporation in Barangay Mataas na Bayan, Lemery, Batangas; 16 December 2017



2.4.3. Summary of endemicity/conservation status

Of the species of freshwater aquatic biota encountered in three river sampling stations, only the freshwater prawn and mangrove crab are of high conservation value. The freshwater prawn – *Macrobrachium rosenbergii* is rated as "Least Concern" in the IUCN Red List. Although they are not reported as threatened and endangered, indications of over-harvesting and loss of habitats are posing risks too natural populations. None of the species catalogued are endemic. The finfish species, however, are of important commercial value as foodfish, particularly the mangrove snappers, freshwater prawn and estuary shrimps in upstream and estuary stations. Endemic mudfishes and catfishes were reported to inhabit the Wawa River many years ago but were not encountered during sampling activities and test fishing. The caretaker of the mangrove area also reported that such species have vanished in the river.

2.4.4 Summary of abundance of ecologically and economically important species (fishes, benthos, planktons)

The sizes of fish and crustaceans catalogued during the river ecology survey indicate the dominance of juvenile populations in what appears to be a favoured nursery ground. All of the fish caught during fish biota sampling and those captured during benthos kick sampling in the river and estuary are food fishes but the dominance of juvenile sizes may be indicative of growth overfishing. However, residents along the mangrove swamp claim that very few fishers venture into the river, aware that the mangroves are managed through a DENR project. In spite of the diversity of fish caught in the river, the low species density and abundance of fish and crustaceans is indicative of a stressed habitat and diminishing standing stocks, evidently brought about by increasing sediment loads and alteration of fish shelters for fish reproduction and grazing. The test fishing operations in the upstream portions using scoop net yielded only few juvenile species of fish and crustacean.

2.4.5 Possible Threats to the Benthic Community

The overall impression of the phytoplankton community during the survey is poor due to low number of taxa observed and relatively low phytoplankton abundance during the sampling period. The variability of macrobenthic organisms are generally affected by abiotic factors such as substrate types, salinity, water temperature, and dissolved oxygen. Biotic factors like recruitment, predation, and natural mortality could also affect the changes in macrobenthic community. Other disturbances on the habitat in either anthropogenic or natural in origin, like water pollution and displacement of bottom sediments that may cause severe depletion on their population. Macrobenthic organisms, because of their contact with sediments reflect that their relative abundance, ubiquity, and sedentary nature, are considered to be suitable bio-indicators of the long-term environmental status of sediments contaminated by hydrophobic organic micropollutants. (LOUATI ET AL., 2014).

The overall impression for the macrobenthic diversity assessment in the survey area is moderately good as indicated by the presence of some economic and ecologically notable organisms. However, the low diversity as analyzed is indicative of an introduced localized disturbance which may be natural or anthropogenic. Moreover, the presence of pollution-tolerant shells (F. Thiaridae) along the Wawa River should be looked upon to as it indicates that there is a factor causing the situation.

Conversion of the habitat by mechanical and anthropogenic means would cause sediment discharge and disturbance of the bottom substrate that would lead to turbidity of the water column and displacement of benthic organisms and alteration of their habitat. It should be observed that project activities be designed, planned, and conducted in an environmentally suitable process so as not to pose a significant impact on this aquatic community.



2.4.6 Presence of pollution indicators species

No significant pollution indicator species occurred in the fish and macrobenthos biota sampled in the Wawa River. The few bivalves and gastropods encountered in the river can be susceptible to occurrence of algal blooms but such episodes seldom occur in shallow river systems. In particular, the ark shell and through shell can be susceptible to plankton blooms that can trigger paralytic shellfish poisoning.

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 occurrence of HABs in coastal areas if the suspended organic matter (OM) causes hyper-nutrient levels and euthrophication. The pollution of coastal waters is believed to stimulate bursts in populations of microscopic and macroscopic algae as various pollution-supplied substances fertilize the water column and bottom substrate and provide the nutrients that trigger algal bloom proportions. Because of this, harmful or toxic algal species become more abundant and more noticeable. Currently, the densities of plankton groups observed in the coastal area within the vicinity of the project site do not indicate proportions that can risk the occurrence of HABs. Nevertheless, constant monitoring of the cell counts of bio-toxin carrying species needs to be undertaken.

The potentially harmful phytoplankton species observed were *Pseudonitzschia* spp., and *Oscillatoria*. Some species of *Pseudonitzschia* are known to produce domoic acid, a toxin associated with Amnesic Shellfish Poisoning (ASP). Cyanobacteria belonging to genus *Oscillatoria* are also reported to produce cyanotoxins that have negative health effect to human and animals. However, risks of algal blooms, especially harmful algal bloom-causing organisms, were not detected amongst the plankton population. The diatoms *Chaetoceros* spp *and Fragillaria*, on the other hand, are diatoms that form an important component of the food chain, especially in the production of primary organic material. Excessive diatom blooms, however, are known to cause euthrophic 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.

Similarly, it is important to note that zooplankton community in three sampling stations was generally low in terms of abundance, richness and diversity on the Wilhm criteria (1975) and potential threat/impacts would be minimal but the project should adopt measures that will not significantly obstruct the free flow of the river.

Epibenthic fauna (macroinvertebrates or macrobenthos), 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 detection of cyanide in bivalve tissue. However, the low diversity of epibenthic and in-faunal benthos in the sampling areas already indicate a stressed riverine environment. Moreover, apart from the population of ceriths, no significant population of bivalves was observed in the River estuary. It is worthwhile to mention however, that the presence of the lucrative mangrove clam *Polimesoda erosa* ("kibaw") in two stations is an important factor as these bivalves command high selling price in institutional markets in Metro Manila.

2.4.7 Predicted major impacts of project establishment and operation on freshwater ecology. *Construction and operation stage*

Potential degradation of freshwater ecology of the Wawa River.



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The Wawa River is the only major river system in Barangay Sinisian East and Mataas na Bayan that can be influenced by project establishment and operation. The potential disturbance that can emanate from the proposed project would be limited to the uncontrolled streams of sediments and loose soil carried down from soil erosion and earth moving due to construction-related activities such as land clearing activities and poorly-maintained stockpiles. Enhanced substrate infiltration can further reduce river water quality and alter riverbed structure resulting to loss of grazing areas and habitats for bottom dwelling aquatic biota. Extreme sediment blanketing in the freshwater systems can cause localized mortality of aquatic larval forms of benthic organisms and impair the few remaining nesting grounds of freshwater prawn and disrupt fish species migration into the river.

Moreover, land conversion of the river's sources of water can lead to reduced stream flow and affect mangrove growth and habitats of freshwater and brackishwater fish and crustaceans that inhabit the river system.

Pollution due to liquid wastes and domestic wastewater

During the project's construction phase, poorly-managed waste disposal system can lead to solid and liquid wastewater contamination in the river carried by various waste streams generated during construction. This may further adversely affect water quality and reduce stream flow. Domestic wastewater pollution can lead to hyper-nutrient loading and trigger algal blooms. It is to be noted however, that because sediments serve as a sink for various nutrients, sediment-associated environmental problems is an issue that cannot be attributed to single point source alone but to a broad range of sources, in many instances, domestic wastewater from households, open latrines, fertilized croplands, and denuded watersheds.

Spillage of steel mill wastes

Spillage of waste materials including debris and litter generated from steel milling is highly unlikely due to stringent recovery and recycling measures. However, inadvertent spillage can occur and such wastes can be discharged into waterways and reach the river system especially during the rainy season.

Marine pollution of mangrove stands and corals in the MPA- wastewaters, oil and grease

Wastewater from the project's facilities, combined with organic wastes and debris, can end up in waterways if wastewater containment facilities are inadequate. The risk of oil and grease contamination of nearshore waters can occur if disposal of fuel-based wastes is not undertaken properly and accidental spills in the causeway berthing area happens. 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. Fugitive wastes will have far-reaching and irreversible impacts on benthic communities in the nearshore area and in the MPA, possibly resulting to seagrass die-out, demise of coral polyps, contamination of mangrove stands and depressing recruitment and growth, and Shipboard oil and bilge water can add to oil contamination in the water column. loss of fish habitats. While such issues are not anticipated to be severe, oil slicks caused by unintentional spills may remain sequestered in waterways and drainage facilities or carried by rainwater run-off to coastal waters that can eventually end up in the coastline or contaminate sandy substratum as well inter-tidal flats that host populations of seagrass and various macro-invertebrates. Oil residues in seagrass beds will be extremely detrimental to the seagrass and associated epiphytes.

River water use competition

No part of the river will be used by the project for industrial applications. There is no significant water use competition for the Wawa River: either for fisheries or for domestic uses.

Decommissioning Phase

Abandonment of the project, with land restoration, re-vegetation and remediation works already in place, is not expected to produce any impacts to coastal habitats and associated biota.



2.4.8 Mitigating measures

Sediment and silt sequestration

The improvement and maintenance of better river water quality will be the underpinning goal of the project backed up by LGU collaboration on coastal resource management. The primary mitigation strategy to prevent fugitive sediments and terrigenous material generated during Project establishment from infiltrating coastal waters or being carried to the Wawa River is the establishment of a series of sediment mitigation structures in strategic locations to ensure that silt and sediments will not wantonly pollute waterways or drain into the river. This will include installation of silt traps and screens in project areas where liquid waste and fugitive soil run-off can occur, and establishment of settling ponds to contain sediments before they are discharged into project diversion waterways. In heavy construction areas, loose materials shall be stockpiled in areas away from waterways and where erosion control measures can be easily applied. Construction stockpiles shall be covered and rigidly bundled. As a precautionary approach, the stabilization of areas where earth moving and construction has occurred will be undertaken in appropriate areas through extensive vegetation cover enrichment in order to increase sediment amalgamation capacity and soil compacting.

Blocking and congestion of stream flow

Sources of river water will be delineated and disruption of water inputs will be avoided to the greatest extent. No part of the river will be blocked and the project will install appropriate weirs to ensure fluid discharge of water from the steel mill and to trap any fugitive steel mill litter.

Control and treatment of liquid wastewater

A sound wastewater and solid waste management plan will be implemented and strictly enforced as mitigation to potential waste disturbances, which will include the setting up of a wastewater treatment facility. State-of-the art modern sanitation facilities and wastewater disposal systems will be installed. The use of 3-chambered septic tanks shall be adopted in all project facilities where wastewaters and other effluents are generated both during construction and operations phase.

Regular *in-situ* monitoring of water quality and the state of habitats for aquatic fauna, particularly for *Macrobrachium* species, will be conducted.

Solid waste management, including prevention of steel mill waste materials

A solid waste management system will be instituted, incorporating waste recovery and re-cycling of steel mill debris and spoils. The Project will consult the local government unit in Barangay Mataas na Bayan to formulate and implement measures that will improve solid waste collection, impoundment and dispersal.

Protecting mangrove resources

A critical strategy is the enhancement and protection of mangrove forests. Mangrove forests are natural filters and enhancers of sediment accretion and the Project will therefore support mangrove rehabilitation projects employing community-based instruments in collaboration with the LGU MENRO and the CENRO. Mangrove reforestation and management will be reinforced with programs to supplement rural incomes in community groups participating in such efforts.

Prevention of oil and grease spills

An oil and grease containment and 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 coastal influences and all vehicle oil discards will be recovered.

Protecting macro-invertebrates

Sustaining the population of benthic and epi-benthic macro-invertebrate communities in the Wawa River and its estuary will be a special concern in preventing sediment run-off. Areas in the river that serve as



breeding grounds for the "Kibaw", as well as breeding areas for freshwater prawn, if any, shall be identified and delineated for protection and stock enhancement activities.

Regular coral monitoring

Monitoring of the condition of corals in the MPA, employing consistent scientific methods and comparable data sets, will be undertaken regularly in order to monitor the state of corals in the MPA to compare with 'before the project' conditions. The parameters will include degree of live coral cover, abundance and species richness of reef-associated fish species.

2.2.3 Marine Ecology

The marine ecology survey focusing on diversity and distribution of corals inside the Barangay Sinisi-an East Marine Protected Area, located in coastal waters 700 meters from the estuary of the Wawa River, was conducted on 19 January 2018. The reef subjected to baseline ecological assessment is considered a secondary impact area in the proposed Steel Asia facility to be established in Lemery, Batangas, particularly within the geographical region of Barangay Mataas na Bayan and Barangay Sinisi-an East. The coastal areas where the corals are located are considered susceptible ecological niches within proximal distance of possible anthropogenic issues arising from the operation of the project, if any. The baseline assessment focused on the coral reef found within the Barangay Sinisi-an East and Mataas na Bayan Marine Protected Area. No other coral formation existed in the general vicinity of the two Barangays. Barangay Mataas na Bayan proper lies about 600 meters east of the river and estuary, while a hot spring vent is located about 700 meters west of the estuary (Figure 2.5.1). The reef flat is located about 500 meters Northwest of the Wawa River estuary and about 700 meters from the project site inland; while the reef edge is about 1000 meters South of the river. The reef is narrow, with a breadth of about 300 meters of compact reef and a scattering of coral colonies interspersed with wide sandy flats. The slope is found in deep water of more than 10 meters depth.

2.2.3.1 Survey methods and survey stations

In as much as coastal waters were turbid, coral diversity and distribution was assessed through the standard line intercept transect method supplemented by a spot dive in the coral slope.

2.2.3.2 Corals – Line Intercept Transect

Assessment of coral life forms, reef abiotics and benthic substrate composition was undertaken employing the line intercept transect in two stations positioned inside the Sinisian East/Mataas na Bayan MPA. The objective is to characterize reef habitat conditions by estimating the cover of various coral life forms utilizing standard categories in representative sampling sites. The line intercept transect survey is the standard method being used to catalogue coral cover in areas of significant coral diversity and aims to more precisely estimate the degree of live coral cover in survey stations that can be monitored in the future to determine if there are changes in live coral cover. Data generated from line-intercept method for coral reef assessment provides more accurate information on percentage of live coral cover as well as species distribution that can be ultimately used for comparative evaluation if the same survey stations are monitored in the future. The categories utilized for classifying coral cover follow standard ratings used for live coral distribution, i.e., 76-100% live coral cover = Excellent; 51-75% coverage live coral cover = Good, 26-50% coverage live coral cover = Fair, and 0-25% coverage live coral cover = Poor coral cover (Gomez, et al., 1981). The first station was laid out in a diverse section along the crest of the reef inside the MPA while a second station was positioned in the reef slope with less diverse coral colonies. The surveys in these stations were supplemented by spot dives to record other relevant information.

The station coordinates are listed in Table 2.2.3.1 and depicted in Figure 2.2.3.1; also see Plate 1.





Figure 2.2.3.1. The coastal impact area in the vicinity of the proposed Steel Asia facility in Barangays Mataas na Bayan and Barangay Sinisi-an East subjected to baseline ecological assessment focusing on river ecology, mangroves, plankton, macro-benthos and corals; December 16 2017 and January 19, 2018.





Figure 2.2.3.2: Map showing location of two line intercept stations investigated for coral life form diversity and distribution inside the Sinisi-an East/Mataas na Bayan Marine Protected Area in Barangay Mataas na Bayan, Lemery, Batangas; 19 January 2018 (map prepared by Jose Rene Villegas).



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Table 2.2.3.1: Coordinates of LIT stations surveyed for coral communities inside the Sinisian East/Mataas na Bayan marine protected area (MPA) located in coastal waters in the vicinity of the proposed Steel Asia project site in Lemery, Batangas; 19 January 2018.

WP Code	LATITUDE	LONGITUDE	Remarks
LIT1	N 13.898951°	E 120.868200°	Located inside the MPA in the reef crest about 500 meters SE of the Wawa River estuary. Coral colonies interspersed with sandy substrate.
LIT2	N 13.900533°	E 120.872062°	Located inside the MPA in the reef slope about 700 meters SE of the Wawa River estuary. Diverse and dense coral colonies.

2.2.3.3 Corals – Spot Dive

A spot dive was undertaken to verify extent and diversity of coral cover in the reef crest and to pinpoint the most likely location of the line intercept stations for detailed coral cover assessment. The spot dive involved observation of coral cover in a 10-meter benthic radius around the dive point. The spot dive was undertaken on 16 December 2017 in the coordinates below (please also see Figure 2.5.3).

Table 2.2.3.2: Coordinates of the spot dive station surveyed for coral communities inside Sinisian East/Mataas na Bayan marine protected area (MPA) located in coastal waters in the vicinity of the proposed Steel Asia project site in Lemery. Batangas: 19 January 2018.

WP Code	LATITUDE	LONGITUDE	REMARKS
SPD1	N 13.900411°	E 120.871957°	Survey conducted at a 10m radius from obtained coordinates at a depth of 4.5m. LHC=50%, SC=0%, DC=0%, DCA=20%, SAND=30%. Visibility=2m

2.2.3.4 Reef-associated fish assemblages

Fish species richness and abundance of reef-associated species of fish was estimated in two stations through standard fish visual census (FVC). The conduct of FVC is designed to document a fairly accurate picture of demersal fish population along a 10-meter belt following a 50-meter transect laid over representative coral reef stations species diversity. In this case high values for these principal variables in a 500-meter survey corridor can indicate the overall ecological condition of a reef area and can give a glimpse of ecosystem function and integrity. Collectively, the results of coral reef assessments and fish visual census are used as reference points for comparative monitoring of changes in spatial distribution and diversity of benthic life forms in periodic environmental impact monitoring - before and after the project is operating.FVC surveys document mostly demersal, reef-associated species of fish that normally indicates the robustness of a coral reef ecosystem. In healthy reefs, the fish species diversity may include both commercially important fish (e.g., Groupers, Snappers) and reef-dependent species (Angelfishes and Butterfly fishes).

Fish species encountered in the FVC transects are categorized as target, major or indicator species based on categories recommended in FishBase (2004). Target species are economically important food fish that are normally sought by fishers for trade of for food. In reef areas, such demersal species may include high value groupers (Ephinephalidae), snappers (Lutjanidae), jacks (Carangidae) and some species of surgeons (Acanthuridae). Fish that belong to the major fish category are considered to be ecologically important because they occupy unique niches and sometimes symbiotic relationships in the coral reef ecosystem. Many of these species are represented by members of the damselfishes (Pomacentridae) and wrasses (Labridae). Indicator species are coral-feeders whose presence, variety and abundance in a reef area may give an indication of the robustness and diversity of corals present in the reef. These are mostly comprised of the magnificently-colored butterflyfishes (Chaetodontidae), species of Angelfishes and the lone damsel species popularly known as Moorish Idol.

The FVC station coordinates are shown in Table 2.2.3.3 below; location of the stations is shown in Figure 2.2.3.3; also please see Plate 1.



Table 2.2.3.3: Coordinates of fish visual census stations for fish species richness and abundance

 surveyed inside the marine protected area located in coastal waters near the proposed Steel Asia project

 site in Lemery, Batangas; 19 January 2018.

WP Code	LATITUDE	LONGITUDE	Remarks			
FVC1	N 13.898951°	E 120.868200°	Same location as LIT1 with a depth of 3-10m. FVC station covered 10 x 50 meters (500 square meters) of survey corridor. Census covered all species of fish encountered in the belt.			
FVC2	N 13.900533°	E 120.872062°	Same location as LIT2 with a depth of 3-10m. FVC station covered 10 x 50 meters (500 square meters) of survey corridor. Census covered all species of fish encountered in the belt.			



Plate 1. Diver doing coral survey through the line intercept transect method (left) and transect line over a tabulate coral inside the Sinisi-an East MPA; January 2018.





Figure 2.2.3.3. Map showing location of spot dive station investigated for coral life form diversity and distribution inside the Sinisi-an East/Mataas na Bayan Marine Protected Area in Barangay Mataas na Bayan, Lemery, Batangas; 19 January 2018 (map prepared by Jose Rene Villegas).





Figure 2.2.3.4: Map showing location of stations surveyed for fish species richness and abundance inside the Sinisi-an/Mataas na Bayan Marine Protected Area during mangrove and coral baseline assessment in the coastal area of the proposed steel Asia project in Barangay Mataas na Bayan, Lemery, Batangas; 19 January 2018 (map prepared by Jose Rene Villegas).



2.2.3.5 Threats to existence and/or loss of important local species and habitats

2.2.3.5.1 Abundance, distribution, density of economically and ecologically important species

(i) Coral diversity

The two LIT stations for recording of detailed coral cover and benthic life form assessment were laid out in the reef crest and sandy reef flat inside the Sinisi-an East Marine Protected Area about 800 meters south of the Wawa River estuary (Please see Figure 2.2.3.5.1).

The Sinisian East/Mataas na Bayan MPA was declared through Municipal Ordinance 08-128, January 2009 and Barangay Resolution No. 020-2008 of Bgy Sinisian East and Bgy Resolution No. 12-08 of Bgy Mataas na Bayan. It is located in a shoal southwest of the Wawa River, with a total of 6.2 hectares area placed under the MPA declaration. A 100-meter buffer zone surrounds the MPA. Half of the MPA is in the jurisdiction of Barangay Mataas na Bayan while the other half is within the jurisdiction of Barangay Sinisi-an East. MPA management is jointly undertaken by both Barangays through the Sinisian East/Mataas na Bayan Management Council. An MPA Management Plan has been formulated for 2016-2019, with the primary goal to restore the corals inside the MPA which has allegedly been damaged by destructive fishing practices. Spot dives indicate that extensive patches of corals run through the MPA, interspersed with sandy substrate, some of which lie in more than100 feet of water. The most diverse part of the coral reef is situated in the reef crest in middle of the 6.2 hectare protected area; the edges of the shoal have lesser coral cover and more extensive sandy substrate.

Key informants claim that the MPA sustain robust fisheries in nearshore fishing grounds. Gill nets are the main fishing gear, targeting pelagic species such as big eye scad (*Matangbaka*), hairtail (Espada) and trevallies (*Talakitok*). Demersal fish species, caught through hook and line around the MPA, consist mainly of snappers (*Lutjanidae*), emperors (*Letrinidae*) and trevallies (*Carangidae*).

Across the two stations, the average live coral cover was documented at 63.4% which is categorized as "Good" coral cover under standard rating system for corals (Table 2.2.3.5.1 and Figure 2.2.3.5.2 and Figure 2.2.3.5.3). It is interesting to highlight that the diversity of the coral colonies is impressive, with a total of fifty-four (54) species recognized during the survey along the transect lines in two stations (Table 2.2.3.5.2). Across the two survey corridors, branching *Acropora* corals – among others, *Acropora formosa* (staghorn corals) and *Acropora hyacinthus*, branching *Montipora spp* (e.g., velvet branching corals), and *Seriatopora hystrix* (bird's nest branching corals) were common. The branching corals accounted for 21.6 % of the coral community. Tabulate corals – mostly large colonies of *Acropora indonesia* and *Acropora donei*, among others, were also consistent, occupying 12.6% of the community across the two stations (Table 2.5.4 and Figure 2.5.5). Foliose varieties of *Montipora sp* accounted for 7.20% of the population while massive corals of *Porites spp*, *Leptoria sp* and *Pavona sp* was recorded at 8% of the community.

Dead corals (DC) and dead corals with algae (DCA) were minimal – catalogued at only 1.8 % and 5.3%, respectively; indicating minimal disturbance to the MPA and its corals. Soft corals were less than 1%; sandy substrate was documented at 26.6% while coral rubble was negligible (Figure 2.5.6). Coral rubble is evidently old and no new coral damage caused by destructive methods or from extreme suffocation due to silt and sediments were observed. Overall, the live coral cover averaged from the two (2) stations was rated as in the upper "Good" category; the diversity is remarkable.



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Table 2.2.3.5.1. Distribution of coral cover (in average percentage of total survey area) of the different coral lifeform categories across two (2) LIT transects located in the coastal waters across the proposed Steel Asia project site [within the MPA] in Barangay Mataas na Bayan, Lemery, Batangas Province, January 19, 2018. (Observers: Michael Chester V. Francisco, Victor L. Pantaleon and Ronald T. Pocon)

ACB	21.6
	21.0
ACE	4.40
ACS	2.7
ACD	0.50
ACT	12.10
СВ	1.50
CE	2.40
CF	7.20
СМ	8.00
CS	1.70
oral CMR	0.30
ral CME	1.00
AL (LHC) COVER	63.40 - Good Condition
DC	1.80
DCA	5.30
SC	0.80
SP	0.50
ОТ	1.40
S	26.60
R	0.20
	ACE ACS ACD ACT CB CE CF CM CS oral CMR ral CME AL (LHC) COVER DC DCA SC SP OT S R

Status Category: Poor = 0 - 24.9; Fair = 25 - 49.9%; Good = 50 - 74.9%; Excellent = 75 - 100% (Gomez et al. 1981)

On a per station basis, Station 2, located in the reef crest of the MPA in shallow waters between 3 to 6 meters, hosted a diverse and "excellent" coral cover recorded at an average of 89.4 % across the 50-meter station. Robust branching, tabulate and foliose corals dominated the community with vivid recruits of coral colonies in spite of the turbid waters (Table 2.5.4; Figure 2.5.7 and Plate 2).

In Station 1, located about 400 meters southwest of the Station 2, the average live hard coral cover was documented at 37.4%, ("fair" condition), with tabulate corals, branching, encrusting and massive corals distributed in almost equal proportions from 6% to 7.5% of the substrate. Dead corals and dead corals with algae dominated the substrate in station 1, covering 48% of the surveyed area (Figure 2.5.7). Coal mortality appears to be caused by destructive fishing methods many years ago.





Figure 2.2.3.5.1: Distribution of coral cover (in average percentage of total survey area) of the different coral lifeform categories across two (2) LIT transects surveyed inside the MPA in coastal waters in the vicinity of the proposed Steel Asia project site in Barangay Mataas na Bayan, Lemery, Batangas Province, January 19, 2018. (Observers: Michael Chester V. Francisco, Victor L. Pantaleon and Ronald T. Pocon)



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Table 2.2.3.5.2: Coral species encountered in two (2) LIT stations observed in the Sinisi-an MPA in coastal waters across the proposed Steel Asia project site; Barangay Mataas na Bayan, Lemery, Batangas Province, January 19, 2018. (Observers: Michael Chester V. Francisco, Victor L. Pantaleon and Ronald T. Pocon)

Maaaiya	Propohing	Massive, Tabulate, Mus <u>hroom,</u>
	Branching	Foliose and Others Fauna
		(Hydroids & Sponge)
Diploria clivosa	Acropora formosa (staghorn)	Acropora humulus
Euphyllia glabrescens	Acropora florida	Acropora digitifera
Favia speciosa	Acropora inermis	Montipora hirsuta
Leptoria species	Acropora microphthalma	Montipora samarensis
Montastrea cavernosa	Acropora nobilis	Acropora palifera
Pavona venosa	Acropora parahemprichii	Colpophyllia natans
Physogyra lichtensteini	Acropora prolifera	Montipora capitata
Porites astreoides	Acropora robusta	Montipora danae
Porites densa	Montipora digitata	Montipora palawanensis
Porites lobata	Montipora hirsute	Montipora verucosa
Porites lutea	Montipora porites	Porites vaughani
Porites solida	Pocillopora elegans	Montipora cactus
	Porites nigrescens	Acropora clathrata
	Anacropora pillai	Acropora cytherea
	Seriatopora hystrix	Acropora divaricata
	Seriatopora caliendrum	Porites rus
		Acropora donei
		Acropora indonesia
		Acropora hyacinthus
		Acropora plana
		Acropora plumosa
		Acropora valenciennesi
		Fungia danai
		Fungia moluccensis
		Cycloseris patelliformis
		Acropora branchi
		Acropora orbicularis
		Millepora platyphylla
		Millepora alcicornis
		Clavularia viridis
		Aglaophenia cupressina
		Xestospongia muta

ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project STEEL ASIA **SteelAsia Manufacturing Corporation** Brgys. Mataas na Bayan and Balanga, Lemery Batangas Rubble, 0.20% A. Branching, 21.60% Sand, 26.60% A. Encrusting, 4.40% Hydroids, 1.40% 01/9010 19-91 Sponge, 0.50% Soft Coral, 0.80% Dead Coral with Algae, 5.30% A. Sub-massive, 2.70% Dead Coral, 1.80% Millepora _ A. Digitate, 0.50% Coral, 1.00%

 Mushroom
 A. Tabulate, 12.10%

 Coral, 0.30%
 C. Sub-massive, 1.70%

 C. Sub-massive, 1.70%
 C. Foliose, 7.20%

 C. Massive, 8.00%
 C. Encrusting, 2.40%

Figure 2.2.3.5.2: Distribution of coral life form categories in two (2) LIT stations surveyed inside the Sinisian MPA located in coastal waters across the proposed Steel Asia project site in Barangay Mataas na Bayan.

Lemery, Batangas Province, January 19, 2018.

(Observers: Michael Chester V. Francisco, Victor L. Pantaleon and Ronald T. Pocon)

Table 2.2.3.5.3: Distribution (in % of total cover) of coral lifeforms per station in two LIT survey stations inside the Sinisi-an East MPA located in coastal waters across the proposed Steel Asia project site in Barangay Mataas na Bayan, Lemery, Batangas Province, January 19, 2018. (Observers: Michael Chester V. Francisco, Victor L. Pantaleon and Ronald T. Pocon).

Name of Site: Barangay Mataas na Bayan.			Municipality & Province: Lemery, Batangas				
Date: January 19, 2018			Observers: Michael Chester V. Francisco, Victor L. Pantaleon & Ronald T. Pocon				
Location:					Depth (in meters)		
Survey Station 1: Start: N13.898951° E120.868200°; End: N13.899333° E120.868500° 8 - 1					8 - 10		
Survey Station 2:Start: N13.900533 ⁰ E120.87206			End: N13.900793 ⁰ E120.871	685 ⁰	3 - 6		
LIFE CATEGORIES COD			DISTRIBUTION per TRANSECT(in %)				
			1	2			
Acropora	Branching	ACB	6.20 3		37.00		
	Encrusting	ACE	7.60 1.20				
	Sub-massive	ACS	2.20		3.20		
	Digitate	ACD			1.00		



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	Tabulate	ACT	7.40	16.80
Non-Acropora Branching		CB	1.40	1.60
	Encrusting	CE	0.80	4.00
	Foliose	CF	1.40	13.00
	Massive	СМ	7.00	9.00
	Sub-massive	CS	1.40	2.00
	Mushroom Coral	CMR	0.60	
	Millepora Coral	CME	1.40	0.60
			_	
AVERAGE % L	IVE HARD CORAL O	OVER	37.40 (Fair)	89.40 (Excellent)
AVERAGE % L Dead Coral	IVE HARD CORAL O	DC	37.40 (Fair) 3.20	89.40 (Excellent) 0.40
AVERAGE % L Dead Coral Dead Coral with Alg	IVE HARD CORAL (DC DC	37.40 (Fair) 3.20 7.20	89.40 (Excellent) 0.40 3.40
AVERAGE % L Dead Coral Dead Coral with Alg Other Fauna	IVE HARD CORAL C ae Soft Coral	DC DC DCA SC	37.40 (Fair) 3.20 7.20 1.40	89.40 (Excellent) 0.40 3.40 0.20
AVERAGE % L Dead Coral Dead Coral with Alg Other Fauna	IVE HARD CORAL C ae Soft Coral Sponge	DC DC DCA SC SP	37.40 (Fair) 3.20 7.20 1.40 0.20	89.40 (Excellent) 0.40 3.40 0.20 0.80
AVERAGE % L Dead Coral Dead Coral with Alg Other Fauna	IVE HARD CORAL C ae Soft Coral Sponge Hydroids	COVER DC DCA SC SP OT	37.40 (Fair) 3.20 7.20 1.40 0.20 2.80	89.40 (Excellent) 0.40 3.40 0.20 0.80
AVERAGE % L Dead Coral Dead Coral with Alg Other Fauna Abiotic	IVE HARD CORAL C ae Soft Coral Sponge Hydroids Sand	COVER DC DCA SC SP OT S	37.40 (Fair) 3.20 7.20 1.40 0.20 2.80 47.80	89.40 (Excellent) 0.40 3.40 0.20 0.80

Status Category: Poor = 0 - 24.9; Fair = 25 - 49.9%; Good = 50 - 74.9%; Excellent = 75 - 100% (Gomez et al. 1981)



Transect No.: 1 Location: Start: N 13.898951[°] E 120.868200[°]; End: N 13.899333[°] E 120.868500[°] Barangay Mataas na Bayan, Lemery, Batangas



Figure 2.5.7: Results from line intercept survey for benthic life form distribution along two (2) survey stations in the coastal waters across the proposed Steel Asia project site [within the MPA] in Barangay Mataas na Bayan, Lemery, Batangas Province, January 19, 2018. (Observers: Michael Chester V. Francisco, Victor L. Pantaleon and Ronald T. Pocon)



Plate 2. Photographs of dominant live hard coral, associated fishes, sponge and other fauna in the survey site (images taken on January 19, 2018, Chester Michael V. Francisco, Victor L. Pantaleon and Ronald T.



corals (Acropora indonesia and

Acropora donei); Staghorn coral (Acropora formosa); Velvet branch coral (Montipora cactus) & Tabular coral (Acropora hyacinthus); Sunray lettuce coral (Leptoseris cucullata); Anchor coral (Euphyllia glabrescens); Velvet coral (Montipora palawanensis with Moorish idol, Heniochus accuminatus, and Pearl bubble coral (Physogyra lichtensteini) with anemonefish, Amphiprion chrysopterus and Angelfish Pocon). L-R, T-B: Tabular (Centropyge



tibicen); and a barrel sponge, Xestospongia muta.



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Plate 3. Underwater survey with scuba using the line intercept method in reefs found inside the Sinisian East/Mataas na Bayan MPA in coastal waters across the proposed Steel Asia project project site in Lemery, Batangas, January 19, 2018. The low to high values for live coral, soft coral, and other faunal cover indicates the reef is in fair to good condition.



(ii) Spot Dives for Coral Diversity

Results of the spot dive in a single station in between line intercept stations 1 and 2 corroborate the overall findings from the detailed coral survey. The spot dive station was located in the reef crest and revealed a live coral cover of 50%, dead coral with algae at 20% and sandy substrate at 30% of the survey sphere (Figure 2.5.8).



Figure 2.5.8. Observations from a spot dive inside the Sinisian East/Mataas na Bayan MPA in Lemery Batangas reveal good coral cover of up to 50% live corals.

(iii) Survey Results for Associated Reef Fish Communities

The fish visual census stations were laid out in the same LIT stations, shown in the map in Figure 2.5.4.



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Fish visual census in the two stations counted a total of 746 individuals with twenty-one (21) species in seventeen (17) families (Table 2.5.7; Figure 2.5.9; please also see Figure 2.5.12). The abundance recorded is not impressive compared to the good coral cover encountered in the reef. In fact, fish abundance was boosted by the presence of a school of stripe eel catfish Plotosus lineatus numbering about two hundred (200) individuals and cardinalfish Apogon cookii with about one hundred fifty (150) individualshovering above the reef in Station 1. Without the catfish and the cardinalfish, abundance would decrease to only 396 individuals, certainly a poor level in a 1000 square meter of reef area surveyed. Moreover, most of the fish were encountered in Station 1, accounting for 728 of the 746 fish individuals catalogued during the survey, or 97.5% of the population. In station 2, only eighteen (18) individuals in three (3) species were counted inside the transect corridor. It should be noted that station 1 hosted much lesser coral cover (37 % live coral cover) than in station 2 which had 89% live coral cover.

In fact, only five (5) species comprised 89% of the population – the striped eel catfish, the cardinalfish, fairy basslets (Anthniiae), sweepers (Pemperidae) and the damselfishes.



2.5.9. Abundance of reef-associated fish species by family catalogued during marine ecology baseline assessment in coastal waters around Steel Asia Project site Barangay Mataas na Bayan, Lemery, Batangas Province; January 19, 2018

Target species consisted of seventy-six (76) individuals in nine (9) species (Figure 2.5.10), with a sparse density of 0.07 fish/m² of surveyed area. Among the target species, it was noted that the coral breams, emperors and rabbitfishes were of near-mature sizes while parrotfishes were mostly mature individuals indicating existence of a spawning population. Species in the "other" category" - consisting of the cardinalfish, basslets, blennies, and the damselfishes, was comprised of nine (9) species with a density of 0.44 individuals/m2. The damselfishes (*Pomacentrids*) in particular; principallythe yellow chromis Chromis analis and the Indo-pacific sergeant Abudefduf vaigiensis, numbered 150 individuals, or 20% of



Brgys. Mataas na Bayan and Balanga, Lemery Batangas

the community. The indicators species consisted of angelfishes, butterflyfish and the Moorish idol with a total of eighteen (18) individuals accounting for only 2% of the community. The overall density across the entire 1000 sqm survey area is 0.74 individuals per square meter.

The low abundance and thin density has subsequently resulted to low biomass levels at the time of the survey, recorded at $1.30 \text{ kg}/500\text{m}^2$ for target species; $2.99\text{kg}/500\text{m}^2$ for species on the 'other' category, and $0.11\text{kg}/500\text{m}^2$ for indicator species (Figure 2.5.11).



Figure 2.5.10.Abundance of reef-associated fish species by category in two stations surveyed during marine ecology baseline assessment in coastal waters around Steel Asia Project site Barangay Mataas na Bayan, Lemery, Batangas Province; January 19, 2018



Figure 2.5.11. Biomass of reef-associated fish species by category in two stations surveyed inside the MPA during marine ecology baseline assessment in coastal waters around Steel Asia Project site Barangay Mataas na Bayan, Lemery, Batangas Province; January 19, 2018



Table 2.5.7. Fish species catalogued in two stations investigated inside the Sinisian East/Mataas na Bayan MPA during marine ecology baseline assessment in coastal waters near the proposed Steel Asia project site in Lemery, Batangas; 19 January 2018

FISH ABUNDANCE D	ATA FORM								
Site Name: Sinisian East/Mataas na Bayan MPA Municipality & Province: Lemery, Batangas Province									
Date: January 19, 2018 Observers: Victor L. Pantaleon and Ronald T. Pocon									
Time: 1400H-1600H			Depth:	3- 10 meters					
Location	FVC Station 1 - Start: N13.89	98951 ⁰ E120.86820	10° ; End: N13.899333° E120.868500°						
Coordinates	FVC Station 2 - Start: N13.90	00533 ⁰ E120.8720	62 ^º ; End:	: N13.900793 ⁰ E120.87168	5°				
					Stat	ion 1	Stat	ion 2	
FAMILY	SCIENTIFIC NAME	COMMON NA	ME	LOCAL NAME	# of Ind	Size (cm)	# of Ind	Size (cm)	Total # of individu als
Anthiinae	Pseudanthias tuka	Yellowstriped fair basslet	у	Gabot-gabot	60	10			60
Apogonidae	Apogon cookii	Cook's cardinalfis	sh	Dangat	150	7			150
Blenniidae	Plagiotremus rhinorhynchos	Bluestriped fangb	lenny	Palog/Tambaliyog	2	10			2
Chaetodontidae	Chaetodon kleinii	Sunburst butterfly	/fish	Paru-paro	3	5			3
Labridae	Thalassoma lunare	Moon wrasse		Bankilan/Bunak/Labyan	30	9	8	9	38
Lethrinidae	Lethrinus lentjan	Pink ear emperor		Katambak	3	15			3
Mullidae	Parupeneus barberinus	Dash-and-dot goa	atfish	Saramulyete	3	15			3
Nemipteridae	Scolopsis lineatus	Striped-monocle I	bream	Baruba	5	12			5
Nemipteridae	Scolopsis margantifera	Pearly monocle b	ream	Silay	5	9			5
Pempheridae	Pempheris oualensis	Silver sweeper		Tabas	90	8			90
Pinguipedidae	Parapercis nebulosa	Barred sandperch	ו	Dapa-dapa/Tuko	5	8	4	8	9
Pomacanthidae	Pomacanthus imperator	Emperor angelfisl	h	Paru-paro	2	12			2
Pomacentridae	Dascyllus aruanus	Three-stripe dame	sel	Bika-bika	30	5			30
Pomacentridae	Dascyllus trimaculatus	Three-spotted damselfish		Bika-bika	40	5			40
Pomacentridae	Abudefduf vaigiensis	Indo-pacific serge	eant	Kapal	20	10			20
Pomacentridae	Chromis analis	Yellow chromis		Puyong Dagat	60	5			60
Plotosidae	Plotosus lineatus	Striped eel catfish	ו	Hito	200	5			200
Scaridae	Chlorurus sordidus	Daisy parrotfish		Loro	5	25			5
Serranidae	Epinephelus merra	Honeycomb grou	per	Pugapo	1	18			1
Siganidae	Siganus guttatus	Orange-spotted spinefoot		Samaral	7	20			7

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Figure 2.5.12. Highlights of survey of species richness and abundance of reef-associated fishes during marine ecology baseline assessment in coastal waters around Steel Asia Project site Barangay Mataas na Bayan, Lemery, Batangas Province; January 19, 2018



2.5.3 Summary of endemicity/conservation status

None of the species catalogued in the fish visual census and coral survey are endemic. The finfish species, however, are of important commercial value as foodfish, particularly target fish species which are experiencing population declines due to overfishing and loss of habitats. Of the seventy (70) species of corals catalogued across two stations, two (2) species have been listed in the IUCN Red List as "Threatened", twelve (12) were classified as "Near Threatened" and seven (7) were "Vulnerable" (Table 2.5.8).

Table 2.5.8 Conservation status (IUCN) of coral species recorded inside the Sinis-an
East/Mataas na Bayan MPA during marine ecology baseline assessment in coastal waters in
the vicinity of the Steel Asia Project in Lemery, Batangas,

Threatened	Near Threatened	Vulnerable
Poritea lobata	Acropora hyacinthus	Acropora indonesia
Montipora palawensis	Seriotopora caliendrum	Pavona venosa
	Acropora digitifera	Acropora plumosa
	Acropora divaricata	Pocillopora elegans
	Acropora plumose	Montipora samarensis
	Acropora formosa	Montipora cactus
	Acropora florida	Acropora donei
	Montipora porites	
	Montipora capitata	
	Montipora hirsute	
	Euphyllia glabrescens	
	Pavona venosa	

2.5.4 Presence of pollution indicator species

Corals require clear water with string sunlight penetration and are normally affected by extreme turbidity and sediment intrusion. Branching and tabulate corals, including *Acropora spp* and *Montipora spp* species listed above are usually the most vulnerable to progressive demise of coral planulae due to sediment blanketing.

2.5.5 Historical occurrences of red tide, fish kill or related events

No red tide episodes have been recorded in coastal waters fronting Barangay Mataas na Bayan in Lemery, Batangas. Marine fish and shellfish species have not been used as indicators of pollution, except where biotixins 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.Inside the MPA, dead standing corals overgrown with algae appear to have been caused by the use of cyanide in fishing.

2.5.6Predicted major impacts of project establishment and operation on the MPA and its coral and fish communities.

Significant earthmoving works in the establishment phase of the Project will likely result to increments in silt and sediment intrusion in shallow coastal waters which may infiltrate into the MPA. If such sediment streams are uncontrolled, the remaining live corals may be at risk from intense suffocation and species of reef-associated fish may move out due to loss of corals and increased turbidity. In extreme cases, turbidity will lead to reduced photosynthetic function which can affect microscopic primary producers of phytoplankton and dependent zooplankton communities, suppress macrobenthic algae settlement, and affect fish larval development.

The construction of the Project causeway, may cause scraping or dislocation of seagrass resources in the area which, at the time of the survey, are already extremely suffocated with silt. Communities of macro-invertebrates in the pathway of the wharf will be at risk of dislocation or mortality arising from wharf construction.

Moreover, silt and sediment-laden water run-off from the Project can potentially modify and disrupt many biological processes in the shallow coastal environment, including further


alteration of critical fish habitats, suffocation of seagrass meadows, impairment of marine food chains and changes in fish community structure due to fish migration. A decrease in reef fish abundance and diversity may occur if sediments envelop the remaining corals, especially in reefs close to project waterways in either project site option. Spawning processes can be disrupted and larval development can be depressed.

2.5.7 Mitigating measures

Drawing from results of fish visual census, it is apparent that abundance, diversity and productivity of demersal fishery resources around the coastal impact area of the cement project site are already affected by turbid waters and population decrease due to overharvesting. The overall mitigation strategy to protect coral reefs and support a healthy fisheries resource is principally the prevention of sediment intrusion into the MPA through a series of control measures in all phases of project operations. The goal of the project's environmental management plan in this regard is to seek to improve ecological functions that will promote coral enhancement, fish growth, maturation and recruitment. Strategies to protect ecological niches from further degradation, including illegal fishing practices in areas around the impact area, habitat loss and stressors of anthropogenic origin will be considered in the overall regimen of mitigating measures. Support for the effective management of the Marine Protected Area will be at the forefront of this overall strategic approach.

The Project will support fisheries management and stock enhancement measures through collaboration with the local government and the Municipal Fisheries and Aquatic Resources Management Councils (FARMC). Support to organized fisher groups for the implementation of better fisheries law enforcement, advocacy against destructive fishing practices and the implementation of fish stock enhancement measures to protect growth, maturation and recruitment will be supplied by the project.

2.3 AIR

2.3.1 Climatology and Meteorology

The climate at the proposed Project area was described based on Climate Map of the Philippines while the meteorological considerations at the Project site were described using the meteorological data from PAGASA Ambulong Synoptic Station located in Ambulong, Tanauan City Batangas with coordinates 14°05′24.49" N; 121°03′18.88" E and at approximately 31 aerial kilometer northeast of the project site. Data recorded from Ambulong Station are from 1981-2010 with the following parameters: a) wind speed, b) wind direction, c) temperature (max, min, & mean), d) dry bulb, e) wet bulb, f) dew point, g) vapor pressure, h) relative humidity, i) barometric pressure, j) cloud cover, and k) number of days with thunderstorm and lighting.

Impacts to the local climate at the proposed site were done by analyzing trends of relevant parameters like temperature, rainfall, and relative humidity. Table below shows the recorded meteorological data in Ambulong Station.

	1. 10.000	ologiou	Data	1 (0 00)	aoa ai		eng ej	nopuo	etation (10	01 20 10)	
	Rainfal			Temp	eratur	Polotiv	Wind Direction/Spee d				
Month	Amou nt (mm)	No. of Rain y Day s	Ma x (°C)	Mi n (°C)	Mea n (°C)	Dry Bul b (°C)	We t Bul b (°C)	De w Poi nt (°C)	e Humidi ty (%)	Wind Directi on (16 pt)	Wind Spee d (m/s)
January	22.7	5	30. 4	22. 2	26.3	25. 9	23. 1	22	79	NE	2
Februar	16	3	31.	22.	26.9	26.	23.	22.1	77	NE	2

Table 2.2.1 Mataaralagia	al Data Bacarda	d at Ambulana S	Vinantia Station	1001 2010)
Table 2.3-1. Meteorologic	al Data Recorded	a al Ampulond S	synoptic Station (1981-2010)

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у			6	1		4	3				
March	21.5	3	33.	22.	28.1	27.	24.	22.8	74	NE	2
			2	9		7	1				
April	35	4	34.	23.	29.2	29	25.	23.8	73	NE	1
			5	9			1				
May	116.6	10	33.	24.	29.2	29.	25.	24.6	76	NE	1
			9	6		1	7				
June	228.7	16	32.	24.	28.6	28.	25.	24.7	80	SW	1
			5	6		4	6				
July	329.6	19	31.	24.	27.8	27.	25.	24.5	83	SW	1
			4	1		6	3				
August	286.9	18	31	24.	27.6	27.	25.	24.5	84	SW	2
				3		5	3				
Septem	255	17	31.	24.	27.8	27.	25.	24.5	84	SW	1
ber			4	1		5	3				
October	218.4	15	31.	23.	27.7	27.	25.	24.3	83	NE	1
			6	9		4	1				
Novemb	144.7	13	31.	23.	27.5	27.	24.	23.7	81	NE	2
er			4	6		1	6				
Decemb	92	9	30.	22.	26.5	26.	23.	22.6	80	NE	2
er			2	8		2	6				
Annual	1767	132	31.	23.	27.8	27.	24.	23.7	80	NE	2
			9	6		5	7				

Source: PAGASA Ambulong Station Climatological Normals 1981-2010

2.3.1.1 Local Climate

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Based on the Modified Coronas Climate Classification System, the proposed Project site fall under a Type I climate classification as indicated in the Climate Map of the Philippines (Figure 2.3-1). Type I Climate is characterized by two (2) pronounced seasons, dry season from November to April and wet season from May to October with a maximum period from June to September. Areas under this type of climate are generally exposed to the southwest monsoon during rainy season and get a fair share of rainfall as brought about by the tropical cyclones occurring during the maximum rainy period. ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project SteelAsia Manufacturing Corporation Brgy. Mataas na Bayan and Balanga, Lemery Batangas



Source: PAGASA

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Figure 2.3-1: Philippine Climate Map



(1) Wind Regime

The meteorological data recorded in Ambulong Station from January 1 to December 31, 2016 show that prevailing wind are from east-southeast comprises of about 18% over the site followed by east covering 12% over the site, respectively and can be reflected in the plotted windrose diagram below. The average wind speed is 3.12 meters per second, few winds exceed 11.1 meters per second and winds less than 2.10 meter per second occur from all directions. Calm conditions were observed 8.39% of the time. Strongest wind comes from west followed by west-southwest about 7.11% of the time.



Note:Plotted by AERMET View Version 9.6.0



Rainfall

The rainfall in Batangas has a very distinct monthly pattern (Figure 2.3-3) based from the 30year record in PAGASA Ambulong Station. Heavy rain has been known to occur, usually between May to November with maximum period from June to October causing flooding in low lying areas. The heaviest precipitation occurred in the month of July with an average of 329.6 mm. The total annual amount of rainfall is 1,767 mm with annual average number of rainy days of 132 days.





Figure 2.3-3. Monthly Rainfall PAGASA Ambulong Station

Relative Humidity

Relative humidity refers to the amount of water vapour in the air, expressed as a percentage of the maximum amount that the air could hot at a given time. The annual average dry and wet bulb temperature from Ambulong Station are 27.5°C and 24.7°C, respectively. This translate to annual average relative humidity of 80% with August and September are the most humid months having an average relative humidity of 84% while the month of April is the least humid at 73% (Figure 2.3-4).



Figure 2.3-4. Monthly Relative Humidity PAGASA Ambulong Station



Temperature

The average monthly temperature of Batangas tends to decrease during wet season based on the data from Ambulong Station. January being the coldest month having a mean temperature of 26.3°C while the month of April and May is the warmest with a mean temperature of 29.2°C. The mean annual average temperature in Batangas is 27.8°C.



Figure 2.3-5. Monthly Temperature Humidity PAGASA Ambulong Station

Cyclone Frequency

A tropical cyclone reaching maximum sustained winds of greater than 118 kph are called typhoons. The Philippines is located in the northwest Pacific Ocean cyclone basin and tropical cyclones. The most number of cyclones in the Philippines occur during the months of June to December. These tropical cyclones are associated with the occurrence of low pressures areas (LPA) normally originating over the North Western Pacific Ocean side of the Philippine Area of Responsibility (PAR) and generally moving northwestward. Tropical cyclones also originate in the South China Sea or at the western part of the country, having unusual motions, and quite rare with 52 occurrences in fifty (50) years (Perez, 2001). PAGASA categorized these cyclones as tropical depressions (TD), with wind speeds up to 63 kph; tropical storm (TS) with wind speeds from 64-117 kph, and tropical typhoon (TY), with wind speeds over 117 kph.

From 1948-2016 (period of 68 years) PAGASA determined an annual average of 20 tropical cyclones in the PAR with nine of these passing through the Philippine landmasses. Overall, PAGASA had tracked 29 tropical cyclones that crossed in the Province of Batangas from 1948-2016 is shown in Figure 2.3-5 while Figure 2.3-6 is the monthly distribution of tropical cyclone.

STEEL ASIA TRACKS OF TROPICAL CYCLONES WHICH CROSSED THE Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) **PROVINCE OF BATANGAS FROM 1948 TO 2016** LEGEND: Tropical Depression Tropical Storm + Severe Tropical Storm Typhoon Super Typhoon Batangas Month No of TC January 1 February 0 E. March 0 April 1 May 5 June 1 July 4 August 0 September 6 October 5 November 2 PACIFIC OCEAN December 4 29 TOTAL TC TYPE No of TC **Tropical Depression** 4 **Tropical Storm** 13 0 Severe Tropical Storm 12 Typhoon Super Typhoon 0 TOTAL 29 Philippine Area of Responsibility (PAR) Projection: UTM Zone 51N PREPARED BY: Climate and Agromet Data Section (CADS)

Figure 2.3-5. Track of Tropical Cyclone in Batangas





Figure 2.3-6. Monthly Distribution of Tropical Cyclone in Batangas



(2) Frequency of Extreme Event

Climatological extremes values are from the 30-year monthly and annual summaries of temperature, rainfall, and wind speed in Table 2.3-2. The recorded annual extreme high and low temperature is 38.8°C occurred in May 15, 1921 and 16.0°C occurred in January 9, 1985 and January 24, 2014, respectively. The amount of annual average extreme greatest rainfall is 499.2 mm occurred in May 21, 1976 while the annual average extreme highest wind is 75 meters per second westerly direction occurred in July 15, 1983.

Month		Tempe (°(erature C)		Greatest Dailly RF Strongest (mm) (m/s				Winds s)		
	High	Date	Low	Date	Amount	Date	Speed	Dir	Date		
	34.9	01-03-	16.0	01-09-	118.1	01-01-	20	ENE	01-29-		
lan		1958		1985		1960			1989		
Jan			16.0	01-24-							
				2014							
Feb	37.2	02-28-	16.1	02-03-	92.7	02-21-	24	NE	02-06-		
		1985		1976		2013			1982		
Mar	38.0	03-30-	16.2	03-03-	60.6	03-24-	22	ENE	03-10-		
		1984		1963		1980			1989		
Apr	38.3	04-05-	17.5	04-05-	57.0	04-23-	18	SE	04-25-		
		1987		1963		1996			1989		
May	38.8	05-15-	20.0	05-21-	499.2	05-21-	41	SW	05-17-		
		1921		1974		1976			1989		
Jun	38.0	06-14-	20.6	06-18-	301.5	06-27-	40	SW	06-23-		
	00.0	1983	40.0	1976	040 5	1961	75	14/	1984		
	36.8	07-15-	19.2	07-19-	218.5	07-13-	/5	VV	07-15-		
Jul	26.0	1999		2014		2010			1983		
	30.0	07-23-									
Aug	26.7	2010	10.0	09.21	202.6	09.24	40		09.12		
Aug	30.7	1969	19.0	2015	203.0	100-24-	40		1087		
	35.7	09-14-	10.5	09-04-	270.8	09-05-	54	SSW	09_09_		
	55.7	1984	13.5	1991	270.0	1962	54	0000	1982		
Sep	35.7	09-07-		1001		1002			1002		
		2016									
Oct	37.3	10-11-	18.9	10-31-	183.2	10-28-	70	S	10-11-		
		1975		1969		2000			1989		
	36.5	11-02-	18.3	11-29-	277.2	11-03-	45	NĒ	11-25-		
Nov		1956		1974		1995			1987		
INOV			18.3	11-22-							
				1975							
Dec	35.3	12-25-	16.8	12-16-	151.9	12-09-	54	NE	12-30-		
		1962		1960		1971			1950		
	38.8	05-15-	16.0	01-09-	499.2	05-21-	75	W	07-15-		
Annual		1921		1985		1976			1983		
			16.0	01-24-							
				2014							

Table 2.3-2: Climatological Extreme Recorded at Ambulong Station as of 2016

Source: PAGASA Climatological Extremes as of 2016

2.3.1.2 Contribution in Terms of Greenhouse Gas Emissions

Majority of greenhouse gas (GHG) emissions that the proposed Project may generate are expected to come from activities associated with the construction (fuel/ electricity uses for the operation of construction vehicles and equipment), furnace operation (burning of fossil fuel) and melting furnace operation (electricity uses for steel melting operations) of the Project. These fuel combustion and electricity consumption activities releases three (3) major GHGs, namely: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Of these gases, the

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major gas emitted is CO2 and the bulk of the GHG emissions calculations involve determining the amount of CO₂ emissions as CH₄ and N₂O emissions have a very low share in terms of emissions. As such, this report only focused on CO₂ emissions.

(1) Methodology

The CO_2 were calculated using emission factor-based estimation method. The methodology estimates the CO_2 emissions by multiplying a level of activity data (AD) by an emission factor (EF). Activity data is a quantified measure of activity resulting in emissions during a given period of time (e.g. data on fuel consumption (liters/km) and purchased electricity (kWh reading)) while emission factor is the average emission rate of a given GHG for a given source, relative to units of activity. The general equation is shown below. This is based on The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard, Revised Edition, World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI), 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories and 2014 IPCC Assessment Report.

Equation: GHG Emissions = AD x EF

Results and Analysis (2)

The emissions associated with the Project are categorized into direct and indirect emissions. Direct GHG emissions of Scope 1 are from sources that are owned and/or controlled by the proponent. This is usually applicable during the operational phase (e.g. use of generator set and equipment owned by the proponent). Indirect emissions, on the other hand, are further categorized into Scope 2 and Scope 3. Scope 2 emissions are a consequence of the project's operations at sources owned and/or controlled by another entity which include purchased electricity consumption. Scope 3 emissions are a consequence of the proponent's activities but to which the proponent has no direct control over which include tailpipe emissions from contracted equipment/ vehicles during construction.

	Table 2.3-3. Items to Consid	der for Each Scope
Scope	Construction	Operation
1	1. Stationary combustion Emissions from fuel use of entity- owned/ controlled stationary equipment (e.g. standby genset)	1. Stationary combustion Emissions from fuel use of entity- owned/ controlled stationary equipment (e.g. genset)
	2. Mobile combustion Tailpipe emissions from entity-owned/ controlled vehicles (e.g. service van)	2. Mobile combustion Tailpipe emissions from entity-owned/ controlled vehicles (e.g. service van)
2	1. Stationary combustion Emissions from the consumption of purchased electricity for construction works	1. Stationary combustion Emissions from the use of purchased electricity for rolling mill, electric arc furnace and other operations requiring electricity
3	1. Stationary combustion Emissions from fuel use of contracted construction equipment (e.g. standby genset)	1. Mobile combustion Emissions from fuel use of contracted vehicles (e.g. service vans)
	2. Mobile combustion Emissions from transportation of purchased construction materials/ construction wastes using contracted vehicles (e.g. trucks, pickup)	

CO₂ Emissions during construction (a)

In calculating Scope 3 emissions, fuel consumption for each construction equipment, including service vehicles in transporting of construction materials were estimated and



presented in Table 2.3-4. These construction equipment/ vehicles are diesel-powered, the emission factor for diesel will be based from the US EPA Emission Factors for Greenhouse Gas Inventories, which was last modified on November 19, 2015. Presented below are the activity data, emission factor as well as the results of the computation. The total CO_2 emissions during construction are estimated at 691.5 MT CO_2 /yr.

Emission Sources	No. of Units	Fuel Type	Fuel Consumption (L/100km) ^a	Assumed distance travelled (km/yr)	Fuel Consumption (L/yr)	Emission Factor (kg CO□/L) ^b	Calculated CO ₂ Emission (MT CO /yr)
Heavy	20	Diesel	31.6	5,000	31,600	2.7	85.3
Equipment							
30-tonner	50	Diesel	20.9	15,000	156,750	2.7	432.2
Truck							
Pick-up	20	Diesel	12.1	12,000	43,560	2.7	117.6
Service	20	Diesel	12.1	10,000	24,200	2.7	65.3
Van							
			Total CO ₂ E	mission			691.5

Table 2.3-4: Calculated CO₂ Emission from Heavy Equipment and Mobile Sources

Source: a – 2017 Fuel Consumption Guide, Natural Resources Canada

b – Emission Factors for Greenhouse Gas Inventories USEPA

(b) CO₂ Emissions for Steel Rolling Mill Furnace Operation

The CO₂ emission from the steel rolling mill furnace is calculated under Scope 1 emissions using the equation presented above. Low sulfur fuel oil is the proposed fuel to be used in rolling mill furnace. Table 2.3-6 shows the summary of the calculated GHG emissions from the rolling mill furnace. The default emission factor of residual oil no. 6 from Table 2.2 of the IPCC 2006 Guidelines is 77,400 kg of CO₂/TJ; 10 kg of CH₄/TJ for methane; and 0.6 kg of N₂O/TJ for nitrous oxides.

Emission Sources	Fuel Consumption (L/year)	Fuel Heating Value (kcal/kg)	CO ₂ Emission (MT/year)	ČH₄ Emission (MT/year)	N₂O Emission (MT/year)
Light Mill Furnace Stack	10,236,408	10,082	29,750	3.84	0.23
Heavy Mill Furnace Stack	14,623,440	10,082	42,499	5.49	0.33
-	Total Emissions	72,249	9.33	0.56	

Table 2.3-6: Summary of Calculated GHG Emissions for Rolling Mill Furnace

(c) CO₂ Emissions for Steel Melting Furnace Operation

The indirect CO_2 emission from the steel melting furnace is calculated under Scope 2 emissions which is electricity consumed through purchased. The electricity consumption during project operation was estimated at 190,322.60 MWh/yr. The assumption is based on the daily power requirements for the operation of the smelting furnace at 355 kWh per ton of steel in nominal tapping capacity of 70 tons with tap-to-tap time of 45 minutes. GHG Protocol's Purchased Electricity Calculation Tool with emission factor from the GWP values of the 2014 IPCC Fifth Assessment Report was utilized to automatically calculate the total CO_2 emissions. Presented below are the activity data as well as the results of the computation. The total CO_2 emissions during operation are estimated at 19,122.62 MT $CO\Box/yr$.

Emission Sources	Annual Electricity Consumption (MWh)	Calculated CO ₂ Emission (MT/yr)									
Light Meltshop	190,322.60	9,561.31									
Heavy Meltshop	190,322.60	9,561.31									
Total CO ₂	Emission	19,122.62									

Table 2.3-5: Calculated CO₂ Emission for Smelting Furnace



The Philippines Second National Communication (SNC) on Climate Change has projected 100,402,000 MT of CO_2 for 2020. Using the projection of SNC, the Project is expected to contribute approximately 0.00069% during the construction phase and approximately 0.091% during the operation phase. When such a comparison is made, this total emerges as a small contribution to the total anthropogenic CO_2 load. If this total load is a measure of responsibility for global warming on an absolute magnitude, the Project can still be considered to be on the low-end greenhouse gas emitters.

2.3.1.3 Climate Risk/Climate Change

(1) Change in Local Climate

According to PAGASA, future climate changes in the Philippines are likely in terms of trends in seasonal values of temperature, rainfall and extreme events.

(a) Temperature Change

The climate change scenario for the Philippines published by PAGASA in February 2011 indicated that the Province of Batangas will have an increase in temperature in 2020 and 2050. The projected temperature increase is 0.9 to 1.2°C in the average temperature baseline data in 2020 and an increase of 1.0 to 2.2°C in 2050.

Table 2.3-7 and Table 2.3-8 show the seasonal temperature increase and projected seasonal mean temperature in 2020 and 2050 under medium range emission scenario in the Province of Batangas. Figure 2.3-7 and Figure 2.3-8 show the graphical presentation of the monthly average temperature change from 2006 to 2035 and from 2036-2050, respectively.

Provinc	Observed Baseline (1971-2000)				Cha	nge in 2 203	2020 (2 35)	2006-	Change in 2050 (2036- 2065)				
е	DJF	MA M	JJA	SO N	DJ F	MA M	JJ A	SO N	DJ F	MA M	JJA	SO N	
Batanga	24.	26.5	25.	25.6	1.0	1.2	0.9	1.0	1.9	2.2	1.8	1.9	
S	2		9										

 Table 2.3-7: Seasonal Temperature Increase (in °C) in 2020 and 2050 under Medium Range

 Emission Scenario in the Province of Batangas

Table 2.3-8: Projected Seasonal Mean Temperature in 2020 and 2050 under Medium Range
Emission Scenario in the Province of Batangas

	Jan	⊢eb	Mar	Apr	мау	Jun	Jui	Aug	Sep	Oct	NOV	Dec
Baseline without Climate Change Scenario (1981-20100												
Max	30.4	31.6	33.2	34.5	33.9	32.5	31.4	31	31.4	31.6	31.4	30.2
Min	22.2	22.1	22.9	23.9	24.6	24.6	24.1	24.3	24.1	23.9	23.6	22.8
Ave	26.3	26.9	28.1	29.2	29.2	28.6	27.8	27.6	27.8	27.7	27.5	26.5
With C	Climate	Chance	Scena	rio (200	6-2035)						
Max	31.4	32.6	34.4	35.7	35.1	33.4	32.3	31.9	32.4	32.6	32.4	31.2
Min	23.2	23.1	24.1	25.1	25.8	25.5	25	25.2	25.1	24.9	24.6	23.8
Ave	27.3	27.9	29.3	30.4	30.4	29.5	28.7	28.8	28.8	28.7	28.5	27.5
With C	Climate	Chance	Scena	rio (203	6-2065))						
Max	32.3	33.5	35.4	36.7	36.1	34.3	33.2	32.8	33.3	33.5	33.3	32.1
Min	24.1	24	25.1	26.1	28.8	26.4	25.9	26.1	26	25.8	25.5	24.7
Ave	28.2	28.8	30.3	31.4	31.4	30.4	29.6	29.4	29.7	29.6	29.4	28.4





Figure 2.3-7. Change in Monthly Average Temperature for the Period 2006-2035



Figure 2.3-8. Change in Monthly Average Temperature for the Period 2036-2065



(b) Rainfall Change

The climate change scenario projected a rainfall decrease and increase in 2020 and 2050 in the Province of Batangas. In 2020, an increase of 9.1% and 0.5% for the months of July to August and September to October, respectively while a decrease of 29.9% and 24.1% for the months of December to February and March to May, respectively. Similarly, the 2050 projection has an increase of 17.2% and 6.3% for the months of July to August and September to November, respectively while a decrease of 11.1% and 23.1% for the months of December to February and March to May, respectively.

Table 2.3-9 and Table 2.3-10 present the projected the monthly average rainfall with climate change scenario for 2006-2035 and the monthly average rainfall with climate change scenario for 2036-2065. Figure 2.3-9 shows the projected seasonal mean rainfall in 2020 and 2050.

Table 2.3-9. Seasonal Rainfall Change (in %) in 2020 and 2050 under Medium Range Emission Scenario in the Province of Batangas

Provinc	Observed Baseline (1971-2000)					nge in 2 203	2020 (2 35)	2006-	Change in 2050 (2036- 2065)			
е	DJ F	MA M	JJA	SON	DJ F	MA M	JJ A	SO N	DJ F	MA M	JJ A	SO N
Batanga	231	280.	856.	746.	-	-	9.1	0.5	-	-	17.	6.3
s		4	5	4	29. 9	24.1			11. 1	23.1	2	

Table 2.3-10. Projected Seasonal Mean Rainfall in 2020 and 2050 under Medium Range Emission Scenario in the Province of Batangas

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Base	Baseline without Climate Change Scenario (1981-20100											
Av	22.	16	21.	35	116.	228.	329.	286.	255	218.	144.	92
е	7		5		6	7	6	9		4	7	
With	Climate	e Chan	ice Sce	enario (2006-20)35)						
Av	15.	11.	16.	26.	88.5	249.	359.	313	256.	219.	145.	64.
е	9	2	3	6		5	6		3	5	4	5
With	With Climate Chance Scenario (2036-2065)											
Av	20.	14.	21.	26.	89.7	268	386.	336.	271.	232.	153.	81.
е	2	2	5	9			3	2	1	2	8	8

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Figure 2.3-9. Projected Seasonal Mean Rainfall in 2020-2050 (2) Frequency of Extreme Weather Events

Table below shows the projected occurrences of extreme weather events in Batangas under the medium-range scenario. Batangas will have 8,010 days with extreme or maximum temperature greater than 35°C while the number of dry days or days with rainfall less than 2.5 mm/day showed decreasing trend in both 2020 and 2050. The number of days with daily rainfall greater than 200 mm will increased by 133% in 2020 and 50% in 2050.

Table 2.3-11. Frequency of Extreme Events in 2020 and 2050 under Medium Range Emission Scenario in the Province of Batangas

Province	No. of days w/ Tmax >35°C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
	OBS (1971- 2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
Batangas	928	8010	8016	8226	6081	6049	6	14	9

2.3.1.4 Impact Identification, Prediction and Assessment, and Mitigation

(1) Pre-Construction and Construction Phase

(a) Change in Local Climate

During construction, variations in climate will affect the schedule of construction works, potentially delaying the progress of construction. Consideration of effects of climate variabilities will mitigate the delays in the work schedule.

The changes in the rainfall pattern and significant local temperature changes shall be included in the design criteria of the Project. Material selection and technologies to be used in the Project will take into consideration the effects of climate variations and the effects of extreme temperature changes to operating conditions of project components. The selection of



the design temperature reflects an optimization of plant productivity, operational and capital costs based on historical conditions.

Workers' exposure to extreme local climate conditions may have negative effects to their health and compromise their safety and productivity. Climate variations shall have to be integrated to designing work policies, proper work clothing, equipment safety features, etc. to minimize health effects and work hazards for the workers.

(b) Contribution in Terms of Greenhouse Gas Emissions

The construction of the Project is expected to contribute an approximately 0.00069% of the total CO_2 emission, which is a small contribution to the total anthropogenic CO_2 load.

However, in order to minimize unnecessary CO_2 generation from construction activities, the following measures will be implemented:

- Minimize vegetation removal and alteration of topography if possible;
- Implement regular inspection and preventive maintenance of heavy equipment, machineries and service vehicles to meet the DENR Emission Standard; and
- Use electric or fuel-efficient equipment, machineries and vehicles and maximize its operation if possible.

(2) Operation Phase

(a) Change in Local Climate

The Project will consider the temperature increase for 2020 and 2050 in their plant design. The selection of the design temperature reflects an optimization of plant productivity, operational and capital costs based on historical conditions.

The changes in the rainfall pattern will be included in the design criteria of the Project. Design improvement of the internal drainage system will be considered to accommodate storm water run-off that will be collected in water harvesting facility of the plant based on the PAGASA projection.

(b) Contribution in Terms of Greenhouse Gas Emissions

Project can be considered to be on the low-end greenhouse gas emitters based on its estimated CO□ contribution. However, necessary measures shall be enforced to further minimize its possible impact. In addition, essential enhancement shall be implemented to lessen impact of climate change to the Project.

To maintain and/or further reduce its minimal contribution, necessary measures during operation shall be enforced including tree planting, energy/water conservation program implementation as well as:

- Planting of vegetation as much as possible to open areas at the facility and in the buffer zone.
- Energy/water conservation program such as use energy efficient products (i.e. LED lights) and carbon footprint monitoring.
- Regular inspection and proper maintenance of structural facilities, equipment, and machinery.

2.3.2 Air Quality and Noise

2.3.2.1 Ambient Air Quality

(1) Field Survey

An ambient air quality monitoring was conducted to in six (6) sampling locations within the project site and its vicinity. Two (2) monitoring stations were identified for 24-hour averaging period while four (4) stations for 1-hour averaging period. These stations are located in the downwind and upwind of the prevailing wind direction of the project site. The locations of the monitoring stations are described in Table 2.3-12 and shown in Figure 2.3-10.



The ambient air quality monitoring was conducted on April 1-3, 2018. The monitoring was conducted in accordance to the standard methods of the DENR as prescribed in its DAO No. 2000-81, the Implementing Rules and Regulations (IRR) of the Philippine Clean Act of 1999. The collected ambient air and noise data from the established stations will be used to represent the baseline data of the project. Parameters measured are TSP, PM_{10} , SO_2 , and NO_2 .

Ambient air samples are drawn through a glass fiber filter for TSP at a flow rate of 40 cubic feet per minute over a period of 1-hour and 24-hour averaging period. Calibrated high volume pumps were used to draw air sample into the sampling media to ensure collection of sufficient sample mass for analysis. The sampler flow rate and geometry of the shelter favor the collection of particles at aerodynamic diameter. Following sampling, filters were sent to Greentech Laboratory to analysed TSP gravimetrically. The concentrations of TSP in ambient air are computed as the mass of collected particles, measured gravimetrically and after moisture equilibrium divided by the total volume of air sampled, corrected to standard condition.

An EFRM Particulate Monitor sampler was used to collect PM_{10} from ambient Air. The sampler is equipped with a specially shaped inlet cyclone where suspended particulate matter is inertially separated into one or more size fractions within the PM_{10} size range. The sampler draws ambient air at constant flow rate of 16.7 L/min through a pre-weighed quartz fiber filter. Following sampling, filters were sent to Greentech Laboratory to analysed PM_{10} gravimetrically. The concentrations of PM_{10} in ambient air are computed as the mass of collected particles, measured gravimetrically and after moisture equilibrium divided by the total volume of air sampled, corrected to standard condition.

Air samples for sulfur dioxide and nitrogen dioxide were collected using midget impinger trains consisting of two primary impinger tubes and one back up tube. The two primary impinger tubes, with an approximately 30 milliliter capacities were loaded by a suitable reagent reactive to the specific pollutant. Calibrated low-volume pumps (set at 0.5 liter/minute for 1-hour sampling) were used to draw air through the impinger tubes and sample inlet nozzle is positioned at 1.5 meters above ground level. Impinger solutions were submitted to AERONICS, INC. for analysis using Colorimetry; Pararosaniline Method for SO₂ and Griess-Saltzman Method for NO₂.

		Coord	dinates	Averaging Period		
Sampling Station	Description	Easting (m)	Northing (m)	1-hour /Date/Time of Sampling	24-hour /Date/Time of Sampling	
AAQ-1	Beside San Rafael Church, Brgy. Bagong Pook Lemery Batangas	269044.60	1540161.39	-	April 1-2, 2018 1550H- 1550H	
AAQ-2	Behind the house of Nolasco Razon, Brgy. Balanga, Lemery Batangas	270738.00	1538117.28	-	April 2-3, 2018 1700H- 1700H	
AAQ-3	Beside the house of Napoleon Diezmos, Brgy. Mataas Na Bayan, Lemery Batangas	269849.25	1539477.85	April 3, 2018 1730H- 1830H	-	
AAQ-4	Beside the house of Conrado Mayuga, Brgy.	271438.48	1539217.75	April 3, 2018 1850H-	-	

Table 2.3-12. Ambient Air Quality Monitoring Stations, Description, Coordinates, Date and Time of Sampling



	Matingain Uno, Lemery Batangas			1950H	
AAQ-5	50 meters away from the house of Bining Tamayo, Brgy. Bukal, Lemery Batangas	271851.22	1538353.32	April 3, 2018 2030H- 2130H	-
AAQ-6	Beside the house of Lito Diezmos, Brgy. Sinisian, Lemery Batangas	268911.24	1538686.96	April 3, 2018 2150H- 2250H	-





Figure 2.3-10. Map of Ambient Air Quality Monitoring Station

(2) Criteria Assessment of Ambient Air Quality

The monitoring results of ambient air quality monitoring were compared with the National Ambient Air Quality Standard for Source Specific Air Pollutants (NAAQSSSAP) provided in the PCAA of 1999 for 1-hour averaging period. On the other hand, the 24-hour sampling results was compared with the National Ambient Air Quality Guideline Value (NAAQGV).

Pollutant	Averaging Period	NAAQGV (µg/m³)	NAAQSSSAP (µg/m³)
SO ₂	1-hour	-	340
	24-hour	180	
NO ₂	1-hour	-	260
	24-hour	150	-
TSP	1-hour	-	300
	24-hour	230	-
PM ₁₀	1-hour	-	200
	24-hour	150	-

(3) Results and Analysis

Table 2.3-14 and Table 2.3-15 present the results of air quality monitoring for 24-hour and hourly averaging period conducted on April 1-3, 2018 at the Project site and its vicinity. The results show the concentrations of particulates (TSP & PM_{10}), SO₂, and NO₂ for 24-hour averaging period are all below the CAA limit of 230 µg/Ncm for TSP; 150 µg/Ncm for PM₁₀; 150 µg/Ncm for NO₂; and 180 µg/Ncm for SO₂. All samples collected for hourly averaging time in all stations were also below the CAA limit of 300 µg/Ncm for TSP, 200 µg/Ncm for PM₁₀, 260 µg/Ncm for NO₂, and 340µg/Ncm for SO₂.

All sampling results for heavy metals are below the method detection limit in all air sampling stations.

Table 2.3-14 Results of 24-hour Ambient Air Quality Monitoring				
	Items	Description/Values		



Sampling Station Date of Sampling Time of Sampling	AAQ-1 April 1-2, 2018 1550H-1550H	AAQ-2 April 2-3, 2018 1700-1700H	CAA Limit (µg/Ncm)
TSP, (µg/Ncm)	210	184	230
PM ₁₀ , (µg/Ncm)	1.28	2.73	150
SO ₂ , (µg/Ncm)	98.1	93.4	180
NO ₂ , (µg/Ncm)	31.7	20	150
As, (µg/Ncm)	ND	ND	-
Cd, (µg/Ncm)	ND	ND	-
Cr ⁺⁶ , (µg/Ncm)	ND	ND	-
Pb, (µg/Ncm)	ND	ND	-
Hg, (µg/Ncm)	ND	ND	-

Table 2.3-15 Results of hourly	Ambient Air Quality Monitoring
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Items	Description/Values						
Sampling Station Date of Sampling Time of Sampling	AAQ-3 April 3, 2018 1730-1830H	AAQ-4 April 3, 2018 1850-1950H	AAQ-5 April 3, 2018 2030-2130H	AAQ-6 April 3, 2018 2250- 2250H	CAA Limit (µg/Ncm)		
TSP, (µg/Ncm)	279.26	250.49	236.20	263.29	300		
PM ₁₀ , (μg/Ncm)	36.14	93.54	30.66	37.97	200		
SO ₂ , (µg/Ncm)	64.5	83.9	68.8	74.2	340		
NO ₂ , (µg/Ncm)	8	7	5.2	7.6	260		

(4) Results per Parameters

Results of analysis for each parameter were graphed showing its relative concentration levels at the six (6) sampling stations. Brief discussions were made comparing the results across the sampling stations and against relevant CAA limit.

• Total Suspended Particulates (TSP)

Figure 2.3-11 shows the graphical presentation of the concentration levels of TSP in six (6) sampling stations. As shown, the highest concentration of TSP is 279.26 μ g/Ncm recorded at Station 3, while the lowest concentration is 184 μ g/Ncm recorded at Station 2. None in the monitoring stations exceeded the CAA limit for TSP.

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Figure 2.3-11. Concentration Level of TSP in Six (6) Sampling Stations

• Particulate Matter less than 10-microns (PM₁₀)

Figure 2.3-12 shows the graphical presentation of the concentration levels of PM_{10} in six (6) sampling stations. As shown, the highest concentration of PM_{10} is 93.54 µg/Ncm recorded at Station 4 while the lowest concentration is 1.28 µg/Ncm recorded at Station 1. None in the monitoring stations exceeded the CAA limit for PM_{10} .





Figure 2.3-12. Concentration Level of PM₁₀ in Six (6) Sampling Stations

• Sulfur Dioxide (SO₂)

Figure 2.3-13 shows the graphical presentation of the concentration levels of SO₂ in six (6) sampling stations. As shown, the highest concentration of SO₂ is 98.1 μ g/Ncm recorded at Station 1 while the lowest concentration is 64.5 μ g/Ncm recorded at Station 3. None in the monitoring stations exceeded the CAA limit for SO₂.





Figure 2.3-13. Concentration Level of SO₂ in Six (6) Sampling Stations

• Nitrogen Dioxide (NO₂)

Figure 2.3-14 shows the graphical presentation of the concentration levels of NO2 in six (6) sampling stations. As shown, the highest concentration of NO₂, the highest concentration is 31.7 μ g/Ncm recorded at Station 1 while the lowest is 5.2 μ g/Ncm recorded at Station 5. None in the monitoring stations exceeded the CAA limit for NO₂.





Figure 2.3-14. Concentration Level of NO₂ in Six (6) Sampling Stations

Impact Identification, Prediction and Assessment, and Mitigation

Pre-construction and Construction Phase

Due to the nature of construction process, emissions will not be constant and will fluctuate based on operating periods and the combination equipment to be used at any one time. Intensive construction activities will not be generally carried out at night time. Potential receptors such as residents will not be continually exposed during construction for extended period and limited daily exposure.

The major sources of impacts on air quality by the Project in the construction phases are as follows:

- Exhaust emission from movement of equipment by vehicles, excavated soil carrying by vehicle and other heavy loaders;
- Earthworks including excavation activities;
- Site clearance including removal of topsoil at the construction site;
- Construction site's generation of dust from construction materials, waste, loose earth, and moving excavated material and transporting wastes on vehicles;
- Use of diesel-based construction machineries which may cause huge air quality impacts; and
- Loading and unloading of construction materials.

Dust Generation

Maximum construction activities have the potential to generate dust. The expansion of impacts from dust will depend on the location of construction activities and types of vehicles. Weather also plays an important factor for dust generation. Stronger winds and dry condition will increase the transfer of dust, whereas damp or wet conditions will reduce the impact.

Transportation of earth and establishment of the material will involve use of heavy machinery like compactors, rollers, water tankers, and dumpers. This activity is machinery intensive



resulting in dust generation. However, this activity will only be short⊡term and the air pollution during construction is localized and only around the project site only.

The following are the proposed mitigating measures:

- Minimize alteration of topography and removal of vegetation to lessens earthworks;
- Conduct regular cleaning and clearing of construction access /sites and the surfaces of spoils and debris from construction equipment and vehicles and wetting of ground soil in the construction site when necessary;
- Store excavated materials at designated disposal area. Stock pile construction and trucks loaded with spoils shall be covered;
- Undertake daily cleaning of paved routes around the construction sites;
- Control vehicle movement maintaining the speed limit within the construction site to <10kp;
- Store excavated materials outside road reserve, but where there is no area, spoils shall be loaded and transported immediately; and
- Plant vegetation on bare ground as early as possible and create vegetated buffer zone where possible.

Exhaust Generation

Transportation of construction materials and excavated soil by trucks that use diesel for fuel will cause impacts on ambient air quality. Operation of construction machine will cause exhaust gas emissions. However, the air quality impacts associated with the vehicular and operational equipment emissions during construction activities will be less significant as the construction period will be short term.

The proposed mitigating measures are as follows:

- Undertake regular preventive maintenance of heavy equipment, machineries and service vehicles to meet the DENR Emission Standards. Wherever possible, use electricallypowered equipment;
- Minimize vehicle transport by maximizing the use of site-generated materials.
- Air quality will be monitored at identified baseline sampling point including nearby sensitive receptors (residential, school and hospital areas) including ecologically significant area/s (if any) likely to be affected by the operation and evaluate effectiveness of the air pollution reduction measures. Monitor actions on complaints, if any, based on Grievance Redress Mechanism.

Operation Phase

Light and Heavy Section Mill

The proposed rolling mill furnace will utilize oil as its primary fuel. The fuel oil will be burned in the re-heating furnace unit in turn releases air pollutants which will cause significant impact on the environment. The criteria pollutants emitted from the furnace operation are total suspended particulates (TSP), particulate matter less than 10-microns (PM₁₀), sulfur oxides (SOx), nitrogen oxides (NOx), and carbon monoxide (CO).

The arrangement of burners in the reheating furnace is "top and bottom fired" type. They are arranged to provide the most efficient heat transfer to the billets; with lowest possible fuel consumption and the best temperature uniformity for the stock. By using sophisticated computer and programmable logic controllers, all billets are subject to predetermined heating profile to achieve the most optimized temperature at the discharging end of the reheat furnace. The eventual billet temperature is 1150-1250°C before being discharged for rolling. Due to sophisticated fuel/air ratio control within the system, emissions from the combustion are kept to below the national regulation limits. Low sulfur fuel oil is used to achieve lower than national limits of SOx. The burners are designed for low NOx emission. There is no ozone resulted from the combustion process.



Waste gases are ducted to the chimney via a heat-exchanger called recuperator. The recuperator provides additional heat salvaged from the waste gas to heat up ambient air for combustion. Typical combustion air temperature can be raised to around 300 to 350°C; enabling major energy savings as compared to traditional billet reheat furnaces presently exist in the country. The chimney will be of steel construction, lined with heat insulating refractory. The chimney height will be more than 50m high, so that emissions concentration can be kept negligible surrounding the plant.

Light and Heavy Melt Shop

The proposed light and heavy-duty melt shop will use Electric Arc Furnace (EAF) in melting scrap which is the most appropriate steelmaking route to produce quality steel. The EAF makes use of electric arcs that emit extremely high heat at 6000°C in the furnace. The intense heat is sufficient to melt any steel scrap brought into contact. The continuous striking of the arcs melts all the scrap, and the bath temperature is steadily brought to around 1600°C, ready for tapping. Structure of the EAF is shown below. High electrical power is connected to a set of 3-graphite electrodes suspended from above the furnace. The furnace is a refractory-lined vessel that holds measured quantity of scrap or molten steel. The graphite electrode mast is controlled up and down the furnace so that predetermined arc currents will flow when in contact with the scrap.



Figure 2.3-15. EAF Structure

A waste heat recovery system makes use of the waste heat to preheat the in-feeding scrap so that it attains around 500 to 600°C before being charged into the furnace. The feeding system is specially constructed to divert the hot waste gases from the EAF to heat the scrap before being ducted to the fume treatment plant (FES). Benefiting from the scrap preheating system, electrical energy consumption can be reduced to 350kW-hours per ton of liquid steel.

The FES is adequately sized to provided sufficient suction and to handle the dust being collected from the process. Hot gas is drafted from the EAF through the scrap preheater at flow rate more than 300,000 Nm³/hr. Thereafter, the flue gas flows into a combustion chamber for complete oxidation of the remaining combustibles. Larger particulates are settled at this station. The gas is further drafted to a heat exchanger to cool the temperature down to below 140°C, before going into the baghouse for dust removal. In the baghouse, the gas is distributed into a series of long filter bags. Dust particles gather at one side of the filter and clean gas passes through the filter medium. Gas velocity is controlled at around 1 meter per



second to allow for maximum capture. Figure below is the typical dedusting using a series of filter bag house. The filter baghouse is equipped with louvers where particulates (TSP, PM_{10} , & $PM_{2.5}$) are emitted.



Figure 2.3-16. Typical EAF Dedusting Using a Series of Filter Baghouse

Emission Assessment of Criteria Pollutants through Air Dispersion Modeling

The Environmental Management Bureau, Memorandum Circular 2008-03 "Guidelines for Air Dispersion Modeling" uses a tiered approach in assessing air contaminants concentrations against the Clean Air Act (CAA of 1999) air quality guidelines and standard. The tiered approach follows the United States Environmental Protection Agency (USEPA) that includes:

Screening-level dispersion modeling techniques conducted using worst-case input data rather than site-specific data; and

Refined level dispersion modeling techniques conducted using site specific meteorological data or derived regional meteorological data.

A fundamental assumption of the tiered approach to model selection is that the simpler modeling techniques always yielded more conservative results. It is assumed that screening level models would always predict higher ground-level concentrations than refined modelling techniques, and that the refined models would predict higher impacts than the 'best-estimate' models.

Modeling Approach for this Study

AERMOD Version 9.6.0 software was used to assess and determine air quality impact due to the emissions of criteria pollutants from the project operation. AERMOD in as approved software under TIER 4 of MC-2003-003. AERMOD requires two types of hourly meteorological data files, a file containing surface parameters and vertical profiles. These two files are produced by AERMET meteorological preprocessor program. The meteorological data used in the modeling and processed by AERMET is from Ambulong Station covering the period of January 1 to December 31, 2016.

Modeling analysis with AERMOD is performed using the regulatory default option. Dispersion modeling domain is maximized to 8km x 8km with a cartesian grid interval of 500 meters. A nested grid is included with interval of 50 meter up to the extent of 2km x 2km; 100 meters up to the extent of 4km x 4km; and 200 meters up to the extent of 6km x 6km from the point



sources. Figure 2.3-17 show the modeling domain; Figure 2.3-18 is the cartesian grid and nested grid in the modeling domain.



AERMOD View - Lakes Environmental Software

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Figure 2.3-17. Modeling Domain (8km x 8km)





Figure 2.3-18. Cartesian Grid and Nested Grid within the Modeling Domain



Plot Plan

The sources subject for this modeling are the proposed light and heavy-duty reheating furnace flue stacks and light and heavy melt shop filter bag houses that release particulates (TSP, PM_{10} , & $PM_{2.5}$) from the EAF operations. Figure 2.3-19 is the general plant lay-out of the facility showing the location of the emission sources.



Figure 2.3-19. General Plant Layout

Air Sensitive Receptors (ASRs)

An air sensitive receptor was identified within the modeling domain. The description, distance from the source, and geographical coordinates of these receptors are listed in the table below. Figure 2.3-20 shows the relative location of the area sensitive receptors.

		Distance	Direction	Coordinates		
Station	Description	from the source (m)		Easting (m)	Northing (m)	
ASR-1	Residential Area, Barangay Talisay, Lemery Batangas	3420	w	266454.98	1539177.08	
ASR-2	Pedro A. Paterno National High School Brgy Talisay, Lemery Batangas	3356	WNW	266686.99	1539820.51	
ASR-3	Residential Area, Barangay Puting Bato West, Lemery Batangas	4630	NW	266069.77	1541226.64	
ASR-4	Residential Area,	1815	NNW	268390.51	1541001.04	

Table 2.3-16.	Description,	Distance,	Direction, a	and Coordinate	s of the ASRs
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		Distance	Direction	Coordinates		
Station	Description	from the source (m)	from the source	Easting (m)	Northing (m)	
	Barangay Sinisian, Lemery Batangas					
ASR-5	Residential Area, Barangay Sinisian West, Lemery Batangas	2059	w	267829.05	1538809.36	
ASR-6	Residential Area, Barangay Sinisian East, Lemery Batangas	1312	w	268588.10	1538763.65	
ASR-7	Bagong Pook Chapel, Barangay Sinisian East, Lemery Batangas	1773	NNW	269053.69	1540166.14	
ASR-8	Residential Area, Barangay Bagong Pook, Lemery Batangas	1094	N	269807.86	1539705.10	
ASR-9	Residential Area, Barangay Mahayahay, Lemery Batangas	901	NNE	270436.04	1539321.80	
ASR-10	Residential Area, Barangay Balanga, Lemery Batangas	819	SE	270476.97	1538063.95	
ASR-11	Rico Beach Resort, Barangay Balanga, Lemery Batangas	1335	SE	271021.02	1537902.18	
ASR-12	Virgilio Mariella Subd., Barangay Matingain I, Lemery Batangas	1354	NE	271086.37	1539217.74	
ASR-13	Midwest Park, Barangay Matingain I	1748	ENE	271597.47	1538998.55	
ASR-14	Residential Area, Barangay Matingain II, Lemery Batangas	2596	NE	272287.58	1539555.95	
ASR-15	Residential Area, Barangay Cahilan II, Lemery Batangas	3458	NE	273086.18	1539915.94	
ASR-16	Residential Area, Baraangay Tubigan, Lemery Batangas	3447	E	273325.87	1538751.63	
ASR-17	Santa Monica Beach Resort, Brgy. Nonong Castro, Lemery Batangas	2503	SE	272000.31	1537301.50	
ASR-18	Residential Area, Barangay Malinis	3570	ESE	273359.94	1537824.51	
AAQ-1	Beside San Rafael Church, Brgy. Bagong Pook Lemery Batangas	1781	NNW	269044.60	1540161.39	
AAQ-2	Behind the house of Nolasco Razon, Brgy. Balanga, Lemery Batangas	979	SE	270738.00	1538117.28	
AAQ-3	Beside the house of Napoleon Diezmos, Brgy. Mataas Na Bayan, Lemery Batangas	885	N	269849.25	1539477.85	
AAQ-4	Beside the house of	1679	NE	271438.48	1539217.75	



Station		Distance	Direction	Coordinates		
	Description	from the source (m)	from the source	Easting (m)	Northing (m)	
	Matingain Uno, Lemery Batangas					
AAQ-5	50 meters away from the house of Bining Tamayo, Brgy. Bukal, Lemery Batangas	1975	E	271851.22	1538353.32	
AAQ-6	Beside the house of Lito Diezmos, Brgy. Sinisian, Lemery Batangas	967	w	268911.24	1538686.96	



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Figure 2.3-11. Plant Site and the Location of Air Sensitive Receptors



Emission Sources and Rates

The source subject for this modeling is the particulates and gaseous emissions from the proposed reheating furnace flue stack and the particulates emission from the filter baghouse. The scenario considered in this air dispersion modeling is under normal operating condition.

The emission rates used in the modeling for each parameter are provided in the table below. Emission rate of the reheating furnace are calculated based on the concentration emission limits listed in Table 2, Section 1, Rule XXV, Part VII Implementing Rules and Regulations (IRR) of the Philippine Clean Air Act (PCAA) of 1999.

Assumption used in calculating emission rate such as stack temperature, stack gas velocity, and dry volumetric flow rate are extracted from the source emission testing report conducted by Ostrea Mineral Laboratory dated October 16, 2016.

Parameter	Unit	Proposed (Light Mill) Furnace Flue Stack 1	Proposed (Medium Mill) Furnace Flue Stack 2	Proposed (Light Meltshop) Filter Baghouse Flue Stack 1	Proposed (Heavy Meltshop) Filter Baghouse Flue Stack 2
Coordinates					
Easting (x)	m	269801.12	269593.46	270119.57	270196.63
Northing (y) m		1538693.38	1538473.44	1538800.68	1538529.05
Elevation (z)	m	9.48	6.7	7.17	7.13
Operating hours	h/yr	8220	8220	8220	8220
Flue gas velocity	m/s	7.8	7.8	1	1
Flue gas exit temperature	°C	348.8	348.8	120	120
Stack height above the ground	m	75	75	30	30
Stack exit diameter	m	2	2	3	3
Pollutant Emission Rate					
SO ₂	g/s	4.954	4.954	-	-
NO ₂	g/s	3.538	3.538	-	-
CO	g/s	3.538	3.538	-	-
PM	g/s	1.062	1.062	0.707	0.707
PM ₁₀ ^a	g/s	0.913	0.913	0.608	0.608

Table 2.3-9. Summary of Source Parameters

Source: Steel Asia Corporation: EIA Study for Steel Asia High Street, 2017 Note: a - PM₁₀ assumed to be 86% of PM: Source: Atmospheric Environment; Relationship between size segregated mass concentration, January 1999

Modeling Results

The maximum predicted ground level concentrations from the normal operation of the Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project is shown in the table below (Table 2.3-10) using PAGASA Ambulong Station meteorological data from the period January 1 – December 31, 2016. The contour plots showing the spatial distributions of the maximum predicted concentrations are also provided in the succeeding figures. The results of the modeling per averaging period are discussed in succeeding section.





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	Maximum Predicted Ground Level Concentration (µg/m ³)										
Receptor ID	CO ^a NO		NO ₂	10 ₂ SO ₂		3O ₂		TSP		PM ₁₀	
	1hr	8hr	1hr	24hr	1hr	24hr	1hr	24hr	1hr	24hr	
Domain	0.127	0.0431	126.80	16 77	177 54	23 / 8	100.87	33.0	171.80	28.38	
Maximum	0.127	0.0431	120.00	10.77	177.54	23.40	199.07	55.0	171.09	20.30	
ASR-1	0.00394	0.00104	3.94	0.63	5.52	0.88	5.30	1.06	4.56	0.95	
ASR-2	0.00499	0.00195	4.99	1.06	6.98	1.48	5.64	1.98	4.85	1.70	
ASR-3	0.00333	0.000709	3.33	0.27	4.66	0.38	2.17	0.28	1.86	0.24	
ASR-4	0.00467	0.000799	4.67	0.45	6.54	0.63	4.99	0.47	4.30	0.40	
ASR-5	0.00658	0.00246	6.58	1.49	9.22	2.09	7.32	2.26	6.30	1.95	
ASR-6	0.00677	0.00423	6.77	2.58	9.48	3.61	7.64	2.99	6.57	2.57	
ASR-7	0.00676	0.00146	6.76	0.60	9.47	0.84	92.93	5.07	79.91	4.36	
ASR-8	0.01027	0.00172	10.27	0.75	14.39	1.06	26.88	1.54	23.11	1.33	
ASR-9	0.00982	0.00646	9.82	3.11	13.76	4.36	6.77	1.62	5.83	1.39	
ASR-10	0.0053	0.00315	5.30	1.23	7.42	1.73	10.30	1.20	8.86	1.03	
ASR-11	0.00648	0.00202	6.48	0.85	9.07	1.19	7.77	0.94	6.68	0.81	
ASR-12	0.00698	0.00325	6.98	2.28	9.78	3.19	6.42	2.28	5.52	1.96	
ASR-13	0.00617	0.00192	6.17	1.41	8.64	1.98	6.38	1.91	5.49	1.64	
ASR-14	0.0055	0.00177	5.50	1.23	7.70	1.73	6.31	1.32	5.43	1.13	
ASR-15	0.00451	0.00163	4.51	0.90	6.31	1.26	6.34	1.08	5.45	0.93	
ASR-16	0.00379	0.00137	3.79	0.87	5.31	1.22	5.84	1.15	5.02	0.99	
ASR-17	0.00485	0.000834	4.85	0.33	6.79	0.46	2.43	0.27	2.09	0.24	
ASR-18	0.00325	0.000679	3.25	0.36	4.55	0.50	5.85	0.56	5.03	0.48	
AAQ-1	0.00672	0.00145	6.72	0.60	9.41	0.85	93.75	5.15	80.62	4.42	
AAQ-2	0.00687	0.00304	6.87	1.27	9.62	1.77	8.83	1.33	7.60	1.14	
AAQ-3	0.00858	0.00210	8.58	0.95	12.01	1.33	10.77	0.72	9.26	0.62	
AAQ-4	0.00683	0.00256	6.83	2.0	9.57	2.80	6.24	2.05	5.37	1.77	
AAQ-5	0.00394	0.00196	3.94	0.96	5.51	1.34	5.81	1.48	5.0	1.27	
AAQ-6	0.00707	0.00585	7.07	3.31	9.90	4.63	7.18	3.22	6.18	2.77	
NAAQGV:	35	10	-	150	-	180	-	230	-	150	
NAAQSSSAP	-	-	260	-	340	-	300	-	200	-	

Table 2.3-10. Summary of Modeling Results

Note: ^a – mg/m³



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Modeling Results for 1-hour and 8-hour Averaging Period

The spatial distribution of predicted CO concentration for 1-hour and 8-hour averaging period shows that the most common concentrations is less than 6 μ g/m³ and 2 μ g/m³, respectively while the 1-hour averaging period for NO₂, SO₂, TSP and PM₁₀ are less than 9 μ g/m³; 7 μ g/m³; 8 μ g/m³; and 5 μ g/m³; respectively.

The results of the modeling may be summarized as follows:

- No exceedances of the relevant National Ambient Air Quality for Source Specific Air Pollutants (NAAQSSAP) and National Ambient Air Quality Guideline Values (NAQGV) are predicted by the modeling for the five (5) modeled pollutants (SO₂, NO₂, CO, TSP, & PM₁₀) in the whole modeling domain and in any of the 24 air sensitive receptors for 1hour and 8-hour averaging period (Table 2.3-10).
- The highest predicted concentration of CO for 1-hour and 8-hour averaging period is 126.80 µg/m³ and 43.10 µg/m³, respectively. The highest predicted concentration of NO₂, SO₂, TSP, & PM₁₀ for 1-hour averaging period is 126.80 µg/m³; 177.54 µg/m³; 199.87 µg/m³; and 171.81 µg/m³, respectively and is located at coordinates 269816.59 m E. 1539958.60 m N. at approximately 1.34km north of the project site.
- The most affected sensitive receptors for all pollutants based on the modeling isopleth are some communities and residential area of Barangay Bagong Pook approximately 1.3km extending to 2km north of the project site.
- The contour figures (Figures 2.3-12 to 17) generally show that impacts on all pollutants from the operation of the Project is greatest in the elevated terrain region north of the Project site.





Figure 2.3-12. Highest 1-hour Average CO Concentration for the Modeled Year January 1 – December 31, 2017





Figure 2.3-13. Highest 8-hour Average CO Concentration for the Modeled Year January 1 – December 31, 2017





Figure 2.3-14. Highest 1-hour Average SO₂ Concentration for the Modeled Year January 1 – December 31, 2017





Figure 2.3-15. Highest 1-hour Average NO₂ Concentration for the Modeled Year January 1 – December 31, 2017





Figure 2.3-16. Highest 1-hour Average TSP Concentration for the Modeled Year January 1 – December 31, 2017



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AERMOD View - Lakes Environmental Software Figure 2.3-17. Highest 1-hour Average PM₁₀ Concentration for the Modeled Year January 1 – December 31, 2017



(b) Modeling Results for 24-hour Averaging Period

The spatial distribution of predicted NO₂, SO₂, TSP and PM₁₀ concentrations for 24-hour averaging period shows that the most common concentrations are less than 1.0 μ g/m³; 2.0 μ g/m³; 3.0 μ g/m³; and 2.0 μ g/m³; respectively.

The results of the modeling may be summarized as follows:

No exceedances of the relevant NAAQGV values are predicted by the modeling for the four (4) modeled parameters (NO₂, SO₂, TSP & PM_{10}) in the whole modeling domain and in any of the 24 air sensitive receptors for 24-hour averaging period (Table 2.3-10).

The highest predicted concentrations of NO₂, SO₂, TSP and PM₁₀ for 24-hour averaging period is 16.77 μ g/m³; 23.48 μ g/m³; 33.0 μ g/m³; and 28.38 μ g/m³, respectively and is located at coordinates 269816.59 m E. 1539958.60 m N. at approximately 1.3km north of the project site.

The most affected sensitive receptors for all pollutants based on the modeling isopleth are some communities and residential area of Barangay Bagong Pook approximately 1.3km extending to 2km north of the project site.

The contour figures (Figures 2.3-18 to 21) generally show that impacts on all pollutants from the operation of the Project is greatest in the elevated terrain region north of the Project site.

In this modeling analysis, the results exclude natural background levels and the contribution of other sources, the model shows that the project impacts on the short-term and long-term ambient air quality concentrations would be well within the guideline values for the protection of environment and community living within the project vicinity.

The selected input and output files of the model runs are attached in Annex G.





AERMOD View - Lakes Environmental Software Figure 2.3-18. Highest 24-hour Average NO₂ Concentration for the Modeled Year January 1 – December 31, 2017



Figure 2.3-19. Highest 24-hour Average SO₂ Concentration for the Modeled Year January 1 – December 31, 2017





AERMOD View - Lakes Environmental Software Figure 2.3-20. Highest 24-hour Average TSP Concentration for the Modeled Year January 1 – December 31, 2017





Figure 2.3-21. Highest 24-hour Average PM₁₀ Concentration for the Modeled Year January 1 – December 31, 2017



Management and Mitigation Measures

The following mitigation and control measures are presented in detail to establish the capabilities of each equipment to lessen, control and prevent emission of criteria pollutants into the receiving environment.

Low NOx Burner

The Project will use Low NOx Burners (LNB) in the furnace to reduce the amount of NOx emission. LNB limit NO_x formation by controlling the stoichiometric and temperature profiles of the combustion process in each burner zone. The unique design of features of an LNB may create: (i) reduced oxygen level in the combustion zone to limit fuel NO_x formation; (ii) a reduced flame temperature that limits thermal NO_x formation; and/or (iii) a reduced residence time at peak temperature which also limits thermal NO_x formation.

Recuperator System

The Project will utilize recuperator system in the proposed furnace. A recuperator is a special purpose counter flow energy recovery heat exchanger positioned within the supply and exhaust air streams of an air handling system in order to recover the waste heat. The system needs to install because it provides benefits on energy saving, fuel and time during operation. It will also reduce emissions of gases pollutants such as CO_2 , SO_2 and other gases emissions formed during the combustion of fossil fuel.

Filter Bag House

Emission Monitoring System

The furnace flue stack will be provided with a complete set of emission monitoring system. The basis for the installation of monitoring system will be the DAO 2007-22 "Guidelines on the requirements for continuous emission monitoring systems and other acceptable protocols, thereby modifying and clarifying certain provisions of Section 5, Rule X of DAO 2000-81 and other related provisions".

Section 3 of DAO 2007-22 states that a) new and modified sources with potential to emit at least 750 tons per year for each applicable pollutant listed in Section 4, Rule IX of DAO 2000-81 must install CEMS for that parameter; b) all sources with potential to emit more than 100 tons per year but less than 750 tons after the air pollution control installation may utilize a PEMS.

In this regard, the plant's utilization of emission monitoring system either CEMS or PEMS will depend on the results of actual source emission testing to be conducted once the plant is in operation. The result of the actual source testing will determine if the plant's emission rate will have exceeded the 750 tons/year of any regulated pollutants for the installation of CEMS or below the 750 tons/year but more than 100 tons/year of any regulated pollutants for the installation of PEMS.

2.3.2.2 Noise Quality

2.3.2.2.1 Ambient Noise Level

The main sources of noise will be the equipment during construction and vehicle operations. There will be a short-term noise that will be created by the operations of the construction equipment. This equipment may consist of earth moving machines such as, graders, trucks, scrapers, generators and compressors.

Field Survey

Noise level measurement was conducted in six (6) sampling locations within the project site and its vicinity. The measured noise level from the established stations is used to represent the baseline data of the project. The noise monitoring station is the same as the ambient air station. Refer to Table 2.3-12 and Figure 2.3-10 which shows the station identification and the geographical position.



Criteria Assessment for Noise Quality

The measured noise levels were compared to the 1978 National Pollution Control Commission Rules and Regulations under Section 78, Table 1, Environmental Quality Standards for Noise in General Areas as amended by the NPCC Memorandum Circular No. 1980-002. The noise standards are set according to land use and time of day as can be seen in the table below.

Class	Maximum Allowable Noise Level, (dB)					
	Daytime	Morning/Evening	Night time			
AA	50	45	40			
A	55	50	45			
В	65	60	55			
С	70	65	60			
D	75	70	65			

Table 2.3-11. Noise Standard in General Areas

Notes:

Morning	0500H - 0900H
Daytime	0900H - 1800H
Evening	1800H – 2200H
Nighttime	2200H - 0500H

AA - a section or contiguous area which requires quietness, such areas With 100m from sites, nursery schools, hospitals and special homes for the aged.

А	-	a section or contiguous areas which is primarily used for residential
		purposes
В	-	a section or contiguous areas which is primarily a commercial area
С	-	a section primarily reserved as a light, industrial area
-		

D - a section which is primarily reserved as a heavy industrial area

Results and Analysis

Based on the results, the ambient noise levels observed in all stations are below the NPCC standard values for their respective classifications.

The lowest median noise obtained was 26.1 dBA at station NST-1 during nighttime, while the highest obtained was 35.8 dBA during evening. The morning period noise levels ranges from 33.5 dBA to 35.3 dBA, while for daytime noise levels range from 31.0 dBA to 34.5 dBA was observed. During evening, noise levels range from 30.0 dBA to 35.8 dBA, while during nighttime, noise levels range from 26.1 dBA to 31.1 dBA was observed. The most frequently observed sources of noise were vehicles passing near the monitoring station, followed by voices of people talking nearby. Most of the ambient noise monitoring stations were located at residential areas.

Station	Period	Date	Time	Median SPL dB(A)	DENR Noise Standard dB(A)		
NST-1	Morning	April 2, 2018	0720H-0735H	33.5	50		
	Daytime	April 2, 2018	1400H-1415H	34.5	55		
	Evening	April 1, 2018	2030H-2045H	35.8	50		
	Night time	April 2, 2018	0010H-0025H	26.1	45		
NST-2	Morning	April 3, 2018	0720H-0735H	35.3	50		
	Daytime	April 3, 2018	1435H-1450H	31.0	55		
	Evening	April 2, 2018	2010H-2025H	34.6	50		
	Night time	April 3, 2018	0020H-0035H	28.9	45		
NST-3	Daytime	April 3, 2018	1715H-1730H	31.9	55		
NST-4	Evening	April 3, 2018	1950H-2005H	30.0	50		

Table 2-3.12 Results of Noise Levels Measurement

NST-5	Evening	April 3, 2018	2015H-2030H	30.3	50
NST-6	Night time	April 3, 2018	2250H-2305H	31.1	45

The noise monitoring results have found to be within the limit of 55 dBA for daytime; 50 dBA for morning/evening; and 45 dBA for nighttime. The results are within the standard although significant noise was contributed by vehicles plying along the road near the stations, especially those stations which were situated in populated communities, with houses close to each other. Motorcycles and tricycles were main modes of transportation particularly for communities situated in sitios, aside from few cars passing along the main roads.

Impact Assessment and Mitigation

Construction Phase

Noise level will definitely increase because of the project construction activities. Sources of noise will include heavy equipment and machineries, generator sets, construction activities, and vehicles coming in and out of the Project site.

Based on noise survey conducted in the area, measured noise levels at various stations are within the NPCC standards. It is important, therefore, that the Project construction activities do not worsen the acoustic situation of existing condition.

Sensitive receptors near the Project site that may be affected by the construction activities will be identified for provision of appropriate mitigating measures during the Detailed Design Phase of the Project. However, normal work schedules usually restrict noise producing activities to daytime hours.

Prediction Method

The prediction model developed in the Technical Memorandum on Noise of Hongkong Environmental Protection Department, Noise Control Authority is applied. Noise levels is summed in a pairwise fashion and the final total rounded to the nearest whole dB(A), with values of 0.5 or more being rounded up as shown in the table below.¹ Table below shows the summation of noise levels.

Difference in dB(A) Between Two Noise	Amount in dB(A) to Add to the Higher Noise
Levels Being Summed	Level
0 to 0.5	3.0
1.0 to 1.5	2.5
2.0 to 3.0	2.0
3.5 to 4.5	1.5
5.0 to 7.0	1.0
7.5 to 12.0	0.5
More than 12.0	0

Table 2.3-12. Summation of Noise Levels

Source: Technical Memorandum on Noise, Hongkong Environmental Protection Department

Power Level of Construction Machinery

The power mechanical equipment and its equivalent sound power levels of main construction machineries are presented in Table 2.3-13. The equipment listed in the table are the typical equipment used during construction. As a worst-case scenario for this modeling, it is assumed that all equipment listed are running at the same time during construction.

Table 2.3-13. Equivalent PWL of Power Mechanical Equipment during Construction Phase

Power Mechanical Equipment	PWL, dB(A)
Jackhammer	104

¹ Technical Memorandum on Noise, Hongkong Environmental Protection Department, Noise Control Authority, January 1996



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Power Mechanical Equipment	PWL, dB(A)
Chipping gun	93
Air compressor	96
Bulldozer	89
Lejeune gun	89
Backhoe	86
Forklift	85
Hand hammer	85
Welding torch	84
Chopsaw	80
Truck	78
Heavy-duty bulldozer	99
Vibrating road roller	97
Crawler crane <35 ton Non-insulated cab	94
Laborers	90
Power shovel	88
Shop work	95
Rubber tired crane, <35 ton Insulated	81
cab	
Truck-mounted crane	79
Tower crane	74
Dozer	102
Paver	90
Front-end loader	90
Roller	98
Heavy equipment	90
Gravel plant	102
Crane	99

Source: Neitzel, R., N. Seixas, M. Yost, and J. Camp., 1998

The total estimated sound power level for all construction equipment is 109.8 dB(A) from the data listed in the table above.

The total power level considers assumed maximum numbers of equipment and an assumed 'on-time' for the equipment, that is, period in percentage terms during which the equipment will be operating. Construction activities are predicted to be its worst-case scenario where 24-hour operation is expected.

Location of Noise Sources and Receiving Point

Noise sensitive receivers (NSRs) can be defining as those locations or areas where dwelling units or other fixed, developed sites frequent human use occur (FHWA). The description and coordinates of the selected noise sensitive receivers are the same as those ASRs identified in air dispersion modeling (Table 2.3-16 and Figure 2.3-11).

Noise Modeling Input Data

CUSTIC 2.0 noise modeling software was used to predict noise propagation during construction. CUSTIC 2.0 is capable of executing predicted noise contours showing sound pressure as it moves away from the source.

The following input data were used to execute the noise prediction for the construction of the project:

- External source: External means a noise source placed out of a building (for example, a vehicle engine).
- Noise power (dB): This is the noise power at source position in decibels.
- Ambient Data: Ambient conditions are defined by the land and atmospheric conditions in the vicinity of the pollutant emission.

- Terrain the data will use to draw topographical lines.
- Scale command Use to set the scale in the X-axis width (in meters)

The Scale use for the model is $14,777.34 \text{ m} \times 7,207.03 \text{ m}$ which is a scale view of CUSTIC 2.0. The modeling grid is $1,500 \text{ m} \times 1,500 \text{ m}$. The following assumptions were made to execute the model:

- Ambient Temperature 25°C
- Relative Humidity 80%
- Frequency 500 Hz

STEEL

Results of the Noise Prediction and Evaluation

The predicted noise levels in all noise sensitive receivers during plant construction is exhibited (Table 2.3-14) are all below the allowable noise levels during daytime, morning/evening and night time. The highest noise emission during construction is 54.80 dB(A) at approximately 170 meters north from the center of the Plant. The noise contribution from the construction of the Project is not expected to cause any significant noise impacts to the surrounding environment. The predicted noise contours for the operation is presented in Figure 2.3-22.

		Distance	Predicted	Allowable Noise Level, dB(A)		
Station	Description	from the source (m)	Noise Level, dB(A)	Daytime	Morning/ Evening	Night time
NSR-1	Residential Area, Barangay Talisay, Lemery Batangas	3420	26.32	55	50	45
NSR-2	Pedro A. Paterno National High School Brgy Talisay, Lemery Batangas	3356	26.40	50	45	40
NSR-3	Residential Area, Barangay Puting Bato West, Lemery Batangas	4630	22.01	55	50	45
NSR-4	Residential Area, Barangay Sinisian, Lemery Batangas	1815	28.29	55	50	45
NSR-5	Residential Area, Barangay Sinisian West, Lemery Batangas	2059	32.65	55	50	45
NSR-6	Residential Area, Barangay Sinisian East, Lemery Batangas	1312	37.86	55	50	45
NSR-7	Bagong Pook Chapel, Barangay Sinisian East, Lemery Batangas	1773	34.35	50	45	40
NSR-8	Residential Area, Barangay Bagong Pook, Lemery Batangas	1094	38.36	55	50	45
NSR-9	Residential Area, Barangay Mahayahay, Lemery Batangas	901	40.72	55	50	45
NSR-10	Residential Area, Barangay Balanga, Lemery Batangas	819	43.34	55	50	45
NSR-11	Rico Beach Resort, Barangay Balanga, Lemery Batangas	1335	37.72	65	60	55

Table 2.3-14. Predicted Noise Level at Nearest Sensitive Receiver for Construction



		Distance	Predicted	Allowable	Noise Leve	l, dB(A)
Station	Description	from the source (m)	Noise Level, dB(A)	Daytime	Morning/ Evening	Night time
NSR-12	Virgilio Mariella Subd., Barangay Matingain I, Lemery Batangas	1354	36.78	55	50	45
NSR-13	Midwest Park, Barangay Matingain I	1748	34.74	55	50	45
NSR-14	Residential Area, Barangay Matingain II, Lemery Batangas	2596	29.79	55	50	45
NSR-15	Residential Area, Barangay Cahilan II, Lemery Batangas	3458	26.18	55	50	45
NSR-16	Residential Area, Baraangay Tubigan, Lemery Batangas	3447	25.82	55	50	45
NSR-17	Santa Monica Beach Resort, Brgy. Nonong Castro, Lemery Batangas	2503	30.09	65	60	55
NSR-18	Residential Area, Barangay Malinis	3570	25.61	55	50	45
NST-1	Beside San Rafael Church, Brgy. Bagong Pook Lemery Batangas	1781	34.35	50	45	40
NST-2	Behind the house of Nolasco Razon, Brgy. Balanga, Lemery Batangas	979	40.03	55	50	45
NST-3	Beside the house of Napoleon Diezmos, Brgy. Mataas Na Bayan, Lemery Batangas	885	42.04	55	50	45
NST-4	Beside the house of Conrado Mayuga, Brgy. Matingain Uno, Lemery Batangas	1679	34.37	55	50	45
NST-5	50 meters away from the house of Bining Tamayo, Brgy. Bukal, Lemery Batangas	1975	32.65	55	50	45
NST-6	Beside the house of Lito Diezmos, Brgy. Sinisian, Lemery Batangas	967	41.48	55	50	45

Note: The allowable noise standard used is from the Rules and Regulations of the National Pollution Control Commission (1978), Section 78, Table 1, Environmental Quality Standards for Noise in general areas as amended by NPCC Memorandum Circular No. 1980-002 dated May 12, 1980.





Figure 2.3-22. Plot of Noise Isolines during Construction



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Management and Mitigation Measures

The need for the following measures should be considered prior to commencement of construction activities:

- Scheduling certain high noise emitting works to more acceptable times of day;
- Use of the most environmentally acceptable equipment which is properly maintained and silenced;
- Use of the least intrusive method of work;
- Proper instruction and supervision of staff; and
- Acoustic screening.

The following are the noise control measures that will be applied for the protection of employees working on site as well as the nearest sensitive receptor:

- It is advisable that electrically powered plant should be preferred, where practicable, to mechanically powered alternatives. If mechanical powered plant will be used, it should be fitted with suitable silencers and mufflers;
- Defective equipment/parts with abnormal noise and/or vibration will be either repaired replaced;
- Schedule use of equipment/machines emitting high noise like pile driver during day time operation while, minimize use during night time operation;
- All employees working on site will be provided with proper ear protectors;
- During truck transport, along or beside the residential area, traffic transportation will be limited during night operation; and
- The Contractor shall at all times comply with all current statutory environmental legislation.

Operation Phase

Quantitative Analysis

The sound power level during operation was assumed to be at steady state base load and bypass operations and will not consider following activities:

- Commissioning phase;
- Failure conditions;
- Emergency conditions; and
- Other abnormal operating conditions.

Power Level of Operational Equipment

The sound power levels derived/anticipated for each equipment identified during the operation of the rolling mill were based on the given equipment noise data/sizes/dimensions extracted from a previous project. The list of power mechanical equipment during operation is presented in Table 2.3-15. It is advised that the detailed design should be updated to reflect equipment data whenever the design changes.

Power Mechanical Equipment	PWL, dB(A)
Reheating Furnace	90
Rolling Mill	90
Cooling Bed	93
Twin Finishing Blocks	95
Casting	97
Electric Arc Furnace	109
Furnace Enclosure	109

Table 2.3-15. Equivalent PWL of Power Mechanical Equipment for Operation Phase

Source: Steel Asia, 2018

The total estimated sound power level for the operational equipment is 108.5 dB(A) from the data listed in the table above.



The total power level considers assumed maximum numbers of equipment and an assumed 'on-time' for the equipment, that is, period in percentage terms during which the equipment will be operating. The operational activities are predicted to be its worst-case scenario where 24-hour operation and without barrier.

Location of Noise Sources and Receiving Point

Noise sensitive receivers (NSRs) can be defining as those locations or areas where dwelling units or other fixed, developed sites frequent human use occur (FHWA). The description and coordinates of the selected noise sensitive receivers are the same as those ASRs identified in air dispersion modeling (Table 2.3-16 and Figure 2.3-11).

Noise Modeling Input Data

The following input data were used to execute the noise simulation for the operation of rolling mill project:

- Internal source such as rolling mill, roller mill, compressors or any other noise source placed inside of a building.
- Noise power (dB): This is the noise power at source position in decibels.
- Ambient Data: Ambient conditions are defined by the land and atmospheric conditions in the vicinity of the pollutant emission.
- Terrain the data will use to draw topographical lines.
- Scale command Use to set the scale in the X-axis width (in meters)

The Scale use for the model is $14,777.34 \text{ m} \times 7,207.03 \text{ m}$ which is a scale view of CUSTIC 2.0. The modeling grid is $1,500 \text{ m} \times 1,500 \text{ m}$. The following assumptions were made to execute the model:

- Ambient Temperature 25°C
- Relative Humidity 80%
- Frequency 500 Hz

Results of the Prediction and Evaluation

The predicted noise levels in all sensitive receivers for the operation of the Project exhibited in Table 2.3-16 are all below the noise condition during daytime, morning/evening and night time. The highest noise emission during operation is 53.50 dBA at approximately 170 meters north from the center of the Plant. The noise contribution from the operation of the Project is not expected to cause any significant noise impacts to the surrounding environment. The predicted noise contours for the operation is presented in Figure 2.3-23.

Table 2.3-16. Predicted Noise Level at Nearest Sensitive Receiver for Operation

Station	Description	Distance from the	Predicted Noise	Allowable Noise Level, dB(A)		
Station	Description	source (m)	Level, dB(A)	Daytime	Morning/ Evening	Night time
NSR-1	Residential Area, Barangay Talisay, Lemery Batangas	3420	25.02	55	50	45
NSR-2	Pedro A. Paterno National High School Brgy Talisay, Lemery Batangas	3356	25.10	50	45	40
NSR-3	Residential Area, Barangay Puting Bato West, Lemery Batangas	4630	20.71	55	50	45
NSR-4	Residential Area, Barangay Sinisian, Lemery Batangas	1815	26.99	55	50	45
NSR-5	Residential Area, Barangay Sinisian	2059	31.35	55	50	45



Ctation	Description	Distance from the	Predicted Noise	Allowable dB(A)	e Noise Lev	el,
Station	Description	source (m)	Level, dB(A)	Daytime	Morning/ Evening	Night time
	West, Lemery Batangas					
	Residential Area					
NSR-6	Barangay Sinisian East, Lemery Batangas	1312	36.56	55	50	45
NSR-7	Bagong Pook Chapel, Barangay Sinisian East, Lemery Batangas	1773	33.05	50	45	40
NSR-8	Residential Area, Barangay Bagong Pook, Lemery Batangas	1094	37.06	55	50	45
NSR-9	Residential Area, Barangay Mahayahay, Lemery Batangas	901	39.42	55	50	45
NSR-10	Residential Area, Barangay Balanga, Lemery Batangas	819	42.04	55	50	45
NSR-11	Rico Beach Resort, Barangay Balanga, Lemery Batangas	1335	36.42	65	60	55
NSR-12	Virgilio Mariella Subd., Barangay Matingain I, Lemery Batangas	1354	35.48	55	50	45
NSR-13	Midwest Park, Barangay Matingain I	1748	33.44	55	50	45
NSR-14	Residential Area, Barangay Matingain II, Lemery Batangas	2596	28.49	55	50	45
NSR-15	Residential Area, Barangay Cahilan II, Lemery Batangas	3458	24.88	55	50	45
NSR-16	Residential Area, Baraangay Tubigan, Lemery Batangas	3447	24.52	55	50	45
NSR-17	Santa Monica Beach Resort, Brgy. Nonong Castro, Lemery Batangas	2503	28.79	65	60	55
NSR-18	Residential Area, Barangay Malinis	3570	24.31	55	50	45
NST-1	Beside San Rafael Church, Brgy. Bagong Pook Lemery Batangas	1781	33.05	50	45	40
NST-2	Behind the house of Nolasco Razon, Brgy. Balanga, Lemery Batangas	979	38.73	55	50	45
NST-3	Beside the house of Napoleon Diezmos, Brgy. Mataas Na	885	38.76	55	50	45



Station	Description	Distance from the	Predicted Noise	Allowable dB(A)	e Noise Lev	el,
Station	Description	source (m)	Level, dB(A)	Daytime	Morning/ Evening	Night time
	Bayan, Lemery					
	Batangas					
NST-4	Beside the house of Conrado Mayuga, Brgy. Matingain Uno, Lemery Batangas	1679	33.07	55	50	45
NST-5	50 meters away from the house of Bining Tamayo, Brgy. Bukal, Lemery Batangas	1975	31.56	55	50	45
NST-6	Beside the house of Lito Diezmos, Brgy. Sinisian, Lemery Batangas	967	40.18	55	50	45

Note: The allowable noise standard used is from the Rules and Regulations of the National Pollution Control Commission (1978), Section 78, Table 1, Environmental Quality Standards for Noise in general areas as amended by Memorandum Circular No. 1980-002 dated May 12, 1980.





Figure 2.3-23. Plot of Operation Noise Isolines



Management and Mitigation Measures

It is clearly important to limit the noise emission of all major noise sources in the production area for both environmental and occupational reasons. The specific noise limit to be placed on an individual item of equipment may be dictated by either the on-plant requirements or by the boundary noise limit, depending on the source size, location and elevation.

Providing the majority of the equipment complies with the relevant equipment noise specifications, noise levels on-plant should meet the 85 dBA limit and noise levels at all boundaries would then be expected to meet the DENR and DOLE requirements.

It is important therefore to ensure that appropriate noise limits are specified within the equipment tender documents and that guarantees are obtained for all major equipment. A detailed noise control study should be carried out as part of the detailed design of the rolling mill to ensure that appropriate limits and noise control measures are incorporated.

Moreover, predicted noise levels are high within the radius of the plant premises which may bring negative impact to workers because of excessive noise. Therefore; it is recommended that personnel protection of workers should be provided and it is necessary to carry out the planned protective measures systematically. The stated measures include (i) controlling the noise level inside the rolling mill and the surrounding inhabited areas; (ii) reducing the noise in individual plants and machines; (iii) applying acoustic protection by setting physical barriers or enclosures and applying personal protection instruments of the employees in the mine.

Protective panels, as physical barriers should be used as an additional measure for protecting the settlement from noise along with the envisaged green belt.

The effect of the panel is momentary reduction of noise emitted towards the settlement until the designed green belt has reached functional age. In terms of protection from emitted noise, the panels as movable structures follow the progression of the activities.

Protective measures for reducing the negative impacts of noise on the working and living environment include the following:

The engines of the equipment should be equipped with silencers, maintained in proper condition and used in accordance with the manufacturer's recommendations in order to prevent the creation of excessive noise;

If the noise level in the surrounding settlements exceeds legally allowed values, barriers should be set – sound protection panels for the reduction of noise;

If it is practically possible and feasible, noise sources should be enclosed, which directly depends on the source nature;

It is necessary to provide the equipment for protecting the hearing of the machines operators from the harmful consequences of excessive noise; and

Planting a green belt around the plant, especially in the part where the level of noise in the vicinity of an inhabited place is the highest.

Defective equipment/parts with abnormal noise and/or vibration will be either repaired or replaced.

2.4 PEOPLE

This section provides the key baseline conditions of the site in terms of relevant socioeconomic parameters and the corresponding impacts assessed. Common adverse impacts during the operations phase are as follows:

- In-migration
- Generation of solid waste
- Increase in traffic
- Long-term beneficial impacts are a) generation of employment and livelihood opportunities, b) increase in business opportunities and associated economic activities, and c) increase LGU revenue.



2.4.1 Demographic data of impact area

2.4.1.1 Population, Number of households and household size Provided below is the population, number of households and household size of Lemery sourced from the website of the Philippine Statistics Authority.

 Table 2.4.1.1.1: Household Population, Number of Households and Average Household Size by Region,

 Province, City, and Municipality: Philippines, 2015

Region, Province, City, and Municipality	Household Population	Number of Households	Average Number of Households
REGION IV-A (CALABARZON)	14,365,137	3,395,383	4.2
BATANGAS	2,686,444	613,825	4.4
AGONCILLO	38,009	7,826	4.9
ALITAGTAG	25,264	5,556	4.5
BALAYAN	90,503	22,001	4.1
BALETE	22,618	4,732	4.8
BATANGAS CITY (Capital)	327,643	77,990	4.2
BAUAN	90,609	20,694	4.4
CALACA	81,640	18,459	4.4
CALATAGAN	56,424	13,717	4.1
CUENCA	32,750	7,213	4.5
IBAAN	52,960	12,307	4.3
LAUREL	39,405	8,563	4.6
LEMERY	92,932	20,141	4.6
LIAN	52,610	12,956	4.1
LIPA CITY	330,325	73,607	4.5
LOBO	41,499	9,052	4.6
MABINI	46,126	9,954	4.6
MALVAR	56,270	13,761	4.1
MATAASNAKAHOY	29,162	6,901	4.2
NASUGBU	133,817	30,751	4.4
PADRE GARCIA	48,297	11,109	4.3
ROSARIO	116,647	26,906	4.3
SAN JOSE	76,971	18,458	4.2
SAN JUAN	108,379	23,911	4.5
SAN LUIS	33,126	7,368	4.5
SAN NICOLAS	22,611	4,485	5.0
SAN PASCUAL	65,339	15,212	4.3
SANTA TERESITA	21,108	4,309	4.9
SANTO TOMAS	179,551	42,629	4.2
TAAL	56,168	12,293	4.6
TALISAY	45,194	9,825	4.6
CITY OF TANAUAN	172,990	38,239	4.5
TAYSAN	37,955	8,512	4.5
TINGLOY	17,863	4,315	4.1
TUY	43,679	10,073	4.3

2.4.1.2 Land area

According to the Philippine Statistics Authority, the municipality has a land area of 109.80 square kilometres (42.39 sq mi) constituting 3.52% of the 3,119.75 square kilometres (1,204.54 sq mi) total area of Batangas.

2.4.1.3 Population density/growth

In the 2015 census, Lemery had a population of 93,157. The population density was 850 inhabitants per square kilometre (2,200/sq mi).

2.4.1.4 Gender and Age Profile

Residents of Lemery comprise of almost half men and half women in terms of population profile. Provided below are information on gender and age as per PSA 2015.

	Table 2	.4.1.4.1: Gender (C 2015)	
	Males	47,140	
	Females	46,017	
	Table 2	2.4.1.4.2: Age Groups (C 2015)	
0-14	years	2	8,150
15-64	years	6	0,060
65+ y	ears		4,947

Table 2.4.1.4.	3: Age Distribution (C 2015)
0-9 years	19,086
10-19 years	18,130
20-29 years	16,958
30-39 years	13,831
40-49 years	10,550
50-59 years	7,096
60-69 years	4,565
70-79 years	2,133
80+ years	808

The programs being implemented by the LGU such as 4Ps include gender sensitivity training to male spouses of Pantawid grantees, family and youth development sessions, yearly municipal screening of Huwarang Pantawid Pamilya and Exemplary Child, and the Pantawid Pamilya Day Celebration.

2.4.1.6 Literacy Rate, profile of educational attainment

Since 2008, the municipal government has initiated to implement the LMA Scholarship Program for poor yet deserving college students. Under this program, beneficiaries were given allowance for transportation and other school expenses. From the year 2012, the municipal government has continued to tie up with the Lemery Colleges for the Local Monetary Assistance thru Need-Based Scholarship Program (LMA-NBS) which sent 105 high school graduates from public schools to college. Currently, there are 248 scholars in the municipality. These students are currently enrolled in Bachelor in Elementary Education (BEED), Bachelor in Secondary Education(BSED), BSBusiness Administration (BSBA), BSCustoms Administration (BSCA), BSTourism Management (BSTM), BS Computer Science (BSCS), BS Information Technology (BSIT), and BS Criminology. For SY 2016-2017, there are 97 LMA scholars (26 are male and 71 are female) whograduated from college.

The LGU also accommodates students under the Special Program for the Employment of Students (SPES) wherein students who are enrolled during the preceding year are givenopportunities to work during summer with the LGU paying 60% of their daily wage and DOLE paying the remaining 40%. This year 2017, there are a total of 103 SPES insured beneficiaries, between 15 to 22 years old, who are distributed to eleven (11) assured establishments including the LGU Lemery.

Basic literacy was also given its due share. Distribution of free bags and notebooks began in 2008 targeting more or less 13,000 public elementary students and has been the local government's contribution to increase participation rate at the elementary level. For the year 2017, a total of 12,515public elementarypupils received 6,620 small bags, 41,295 writing notebooks, and 6,620 raincoats for Kinder and Grade 1-3; and 5,895 big bags and 58,950 composition notebooks for Grade 4-6 and SPED.

The Alternative Learning System was implemented although it focused more on functional literacy. ALS continues to conduct classes for Accreditation and Equivalency (A&E) programs for elementary and high school undergraduatesfacilitated by only two teachers namely the District ALS Coordinator and the ALS Mobile Teacher, handling 23 barangays each. They sometimes implement livelihood programs (such as Food and Beverage Services, Shielded Metal Arc Welding (SMAW) Training, Hilot Wellness, Electrical Installation and Maintenance (EIM), and Hair Science) which require at least 25 participants for each program. The conduct of these programs depends on the current available fund and budget of the ALS. Additionally, they participated in the Inter-Division Sports competition and one of the ALS students won

in the track and field, qualifying him to compete in the STCAA (Southern Tagalog Calabarzon Athletic Association) Meet.

For the year 2017, there are a total of 208 ALS students. Out of this number, 24 are BJMP inmates (8 elementary and 16 junior high school ALS students). These students age between 15 to 52 years old. Last November 19, 2017, 104 ALS students(11 elementary and 93 junior high school) took the A&E Exam and 102 students (11 elementary and 91 junior high school) passed.

Currently, there is 1 private college and one 1 state university for the tertiary level and serve students not only from Lemery but from other municipalities as well. For the elementary and secondary education, the facilities and services of 25 public and 11 private elementary schools, 4 public and 3 private junior high schools, and 1 public and 3 private senior high schools can be availed.

2.4.2 Methodology for Data gathering

Primary data was obtained through socio-economic and perception survey, key informant interviews (KIIs), focus group discussions (FGDs) with stakeholders in Barangays Mataas na Bayan and Balanga, its barangay officials, residents and municipal LGU of Lemery and Public Scoping.

Secondary data was collected data from the different offices of the LGU of Lemery. Other available secondary information was taken from relevant government agency websites.

2.4.2.1 Household Survey

Perception survey was conducted in 02 May 2016. A total of 595 households were randomly interviewed and surveyed, which corresponds to 31% of the estimated household population of Brgys. Mataas na Bayan and Balanga, Lemery, Batangas.

Survey Questions

Questions in the survey covered the following:

- Gender
- Age
- Civil status
- Religious affiliation
- Educational attainment
- Occupation
- Place of work
- Number of years earning income
- Monthly income
- Length of stay in the area

• Material component of

Intention to out-migrate

- the dwelling unitHouse ownership
- Home utilities

•

- Causes of morbidity and mortality
- Health services
- Health facilities
- Type of Toilet
- Source of Drinking Water
- Garbage Disposal

- Perception about the Current Environmental Conditions
- Awareness on the Proposed Project
- Impacts of Proposed Power Project: Positive and Negative
- Perception and attitude towards the Project

Perception Survey Result

SOCIO PROFILE

Demographic Characteristics

Among the respondents, few (29.41%) are males and the majority (70.59%) is females. A total of 170 respondents (28.57%) were self-employed, 60 respondents (10.08%) were drivers, another 60 respondents (10.08%) were laborer/skilled, 15 respondents (2.52%) were Barangay Officials/Government Employees and the remaining 50 respondents (8.40%) have other occupation.

For the respondents' monthly income, 325 respondents (54.62%) answered to be earning between Php 1,000-5,000. 130 respondents (21.85%)earn a monthly income of Php 5,001-10,000 while 140 respondents (23.53%) obtains a monthly salary of Php 10,001-above.

Among the respondents, majority are Catholic (94.12%), 30 respondents (5.04%) are Protestants while 5 respondents (0.84%) have other Religion.

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In terms of civil status, 445 respondents (74.79%) are married, 125 respondents (21.01%) are single, 20 respondents (3.36%) are widowed while the remaining 5 respondents (0.84%) are living together (live-in).

66 households (55.46%) have a family size between 2-5 persons. 46 households (38.66%) answered the range between 6-10 persons while 7 households (5.88%) have11-15 persons in their family. According to the survey, all respondents and households are residents of Lemery.

In terms of the types of houses, 46 households (38.66%) are concrete, 44 households (36.97%) are made of nipa, bamboo, 27 (22.69%) mixed concrete, and 2 (1.68%) are salvage material. Roofs of these houses are made of steel roof (yero) (45.95%), concrete (35.14%), nipa, and bamboo (17.57%) and salvage material (1.35%).

For the households' method of cooking and fuel, majority (49.25%) uses wood, other households use LPG/Butane (34.33%), 9 households (6.72%) use charcoal, another 9 households (6.72%) use kerosene while the remaining 4 households (2.99%) use electric stove.

In terms of their sources of water, 112 households (40.73%) acquires water from artesian well, 112 households (40.73%) use purified water. 45 households (16.36%) obtains water from the water district while the remaining 6 households (2.18%) get water from deep wells. Most households use water for drinking/cooking (49.58%) as well as washing (49.58%) while 2 households (0.83%) use water for farming.

88 households (25.36%) have television sets in their homes, 82 households (23.63%) have electric fans, 68 households (19.60%) possesses radio, 58 households (16.71%) owns a CD/DVD player, 28 households (8.07%) have computers while 23 households (6.63%) owns airconditioners.

Majority of the respondents (57.03%) do not own any vehicle but 175 respondents (27.34%) own motorcycle, 60 respondents (9.38%) have bicycles, 30 respondents (4.69%) holds a car (sedan), 5 respondents (0.78%) owns a van/jeepney and the remaining 5 respondents (0.78%) answered the others option. Note: Multiple responses.





Figure 2.4.1: Map showing the barangay boundaries with the project site

It can be seen from Figure 2.4.1 that both barangays Mataas ana Bayan and Balanga are covered by the Project.



Health situation, Environmental awareness and Utilities

Each 119 households had a sick family member for the past years and all consulted a doctor although there are multiple responses for this question. The top three causes of illness in the area are Fever/Headache (44.55%), Cough/Flu (39.55%), and Diabetes/Highblood (15.45%), one household (0.45%) answered the others option.

In terms of toilet facilities, 115 households (93.50%) have water closet toilets while 8 households (6.50%) have an open pit toilet.

All 595 respondents (100%) experienced Calamity for the last 10 (ten) years.

PERCEPTION:

580 respondents (97.48%) are aware of the proposed project while 15 respondents (2.52%) are not. Majority of the respondents (28.57%) got informed thorugh Barangay/Municipal Officials, 195 respondents (24.22%) acquired information from the neighbors, 160 respondents (19.88%) attended the public scoping and barangay consultation, 60 respondents (7.45%) heard the proposed project from the Project employees, 30 respondents (3.73%) got informed through the media and 130 respondents (16.15%) answered the others option.

Perceived Positive Effects from the Proposed Project

270 respondents (39.42%) believed that the proposed project will generate employment for the local residents, 240 respondents (35.04%) believed there will be increase in the revenue of Lemery LGU, 70 respondents (10.22%) thought of assistance thru community projects, 60 respondents (8.76%) said the proposed project can prompt industrialization in the community, 30 respondents (4.38%) believed that community solidarity will be shaped while 15 respondents (2.19%) posted no answer.

Perceived Negative Effects of the Proposed Project

280 respondents (28%) said that the proposed project can be a health hazard, 215 respondents (21.50%) believed that it will cause noise pollution, 170 respondents (17%) assume that it will cause water pollution, 165 respondents (16.50%) stated that it will cause air pollution, 105 respondents (10.50%) presumed that the proposed project can be a reason for peace and order hazard, 60 respondents (6%) stated that it will cause traffic congestion while 5 respondents (0.50%) said that it can decrease the ground water resources in the area.

Opinions of the Project

480 respondents (75%) stated that the project can greatly help in improving the community and local residents while 115 respondents (17.95%) uttered that the proposed project will be detrimental to the community and 30 respondents (4.69%) said that the proposed project will be able to help but not that much, the remaining 15 respondents (2.34%) provided no answer.

Approval/Disapproval of the Project

550 respondents (92.44%) approved the proposed project while 15 respondents (2.52%) disapproved because they believe that the proposed project can damage nature and it will make them move to other area, the remaining 30 respondents (4.04%) are not sure.

2.4.3 Displacement of settlers

There is absence of settlers in the project area thus there will be no displacement of settlers that will take place. However, there will be some community members who may have to immediately harvest their crops as these are planted in the area covered by the project site.

2.4.4 In-Migration / Proliferation of informal settlers

Inmigration is likely to occur brought about by workers from the head office of SteelAsia coming in and out of Lemery because of the Project. Although the company hiring policy will give preference to qualified locals, inmigration may further be increased if there are no qualified applicants from the host barangay or municipality. The company will encourage that migrant workers will participate in social activities and social development programs to interact with the community.



2.4.5 Cultural/Lifestyle Change

Lemery, together with other towns and cities in the province of Batangas, is rich with several cultural traditional heritage such as celebration of Fiesta during their Patron Saint's Feast Day, celebration of the Holy Week, Simbang Gabi during Christmas time, among others.

With the implementation of the project, these cultural practices will not be affected as these will continue to be celebrated and the Project will support these celebrations. However, there will be change in lifestyle of the community which will be for the better because the Project will contribute to improvement of the people's standard of living. This will be brought about by stable 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 company, by example, shall encourage modest lifestyle and simple living standards in accordance with its philosophy. On the contrary, the company will encourage families to participate in livelihood projects that will be sponsored by the company.

2.4.6 Impacts on physical/cultural resources

The project will not affect any physical nor cultural resource in Lemery. It will even support and assist the customs and traditions of the community and assist in the improvement of the physical resources through its social development programs.

2.4.7 Threat To Delivery Of Basic Services /Resource Competition

Lemery has the following Basic Services that it offers to its constituents:

Power and Water Source

Lemery's electrification is provided by Batangas Electric Cooperativewhile water resources are from Lemery Water District, Barangay Waterworks, Deepwell, Dugwell, Rain Collector and Shallow tube well.

Transportation

In terms of transportation System, there are Bus Terminals in Lemery which will cater to transfers from Lemery to Buendia Station, Lemery Cubao Station, Lemery Alabang Station and GT Express in District III. The bus lines are JAM in Palanas, ALPS in Malinis, RRCG in Palanas. There are also Tricycle Terminals at selected/designated areas in Lemery. Jeepney Terminal also in TownProper, Rural Barangays and other municipalities and designated areas.

Communication

Lemery has substantial communication system facilities such as Digitel, Globe and Western Batangas Telephone System as well as the strategically-located cell sites for cellular phones for Globe, Smart and Sun.

Educational System

Since 2008, the municipal government has initiated to implement the LMA Scholarship Program for poor yet deserving college students. Under this program, beneficiaries were given allowance for transportation and other school expenses. From the year 2012, the municipal government has continued to tie up with the Lemery Colleges for the Local Monetary Assistance thru Need-Based Scholarship Program (LMA-NBS) which sent 105 high school graduates from public schools to college. Currently, there are 248 scholars in the municipality. These students are currently enrolled in Bachelor in Elementary Education (BEED), Bachelor in Secondary Education(BSED), BSBusiness Administration (BSBA), BSCustoms Administration (BSCA), BSTourism Management (BSTM), BS Computer Science (BSCS), BS Information Technology (BSIT), and BS Criminology. For SY 2016-2017, there are 97 LMA scholars (26 are male and 71 are female) whograduated from college.

The LGU also accommodates students under the Special Program for the Employment of Students (SPES) wherein students who are enrolled during the preceding year are givenopportunities to work during summer with the LGU paying 60% of their daily wage and DOLE paying the remaining 40%. This year 2017, there are a total of 103 SPES insured beneficiaries, between 15 to 22 years old, who are distributed to eleven (11) assured establishments including the LGU Lemery.

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contribution to increase participation rate at the elementary level. For the year 2017, a total of 12,515public elementarypupils received 6,620 small bags, 41,295 writing notebooks, and 6,620 raincoats for Kinder and Grade 1-3; and 5,895 big bags and 58,950 composition notebooks for Grade 4-6 and SPED.

The Alternative Learning System was implemented although it focused more on functional literacy. ALS continues to conduct classes for Accreditation and Equivalency (A&E) programs for elementary and high school undergraduatesfacilitated by only two teachers namely the District ALS Coordinator and the ALS Mobile Teacher, handling 23 barangays each. They sometimes implement livelihood programs (such as Food and Beverage Services, Shielded Metal Arc Welding (SMAW) Training, Hilot Wellness, Electrical Installation and Maintenance (EIM), and Hair Science) which require at least 25 participants for each program. The conduct of these programs depends on the current available fund and budget of the ALS. Additionally, they participated in the Inter-Division Sports competition and one of the ALS students won in the track and field, qualifying him to compete in the STCAA (Southern Tagalog Calabarzon Athletic Association) Meet.

For the year 2017, there are a total of 208 ALS students. Out of this number, 24 are BJMP inmates (8 elementary and 16 junior high school ALS students). These students age between 15 to 52 years old. Last November 19, 2017, 104 ALS students(11 elementary and 93 junior high school) took the A&E Exam and 102 students (11 elementary and 91 junior high school) passed.

Currently, there is 1 private college and one 1 state university for the tertiary level and serve students not only from Lemery but from other municipalities as well. For the elementary and secondary education, the facilities and services of 25 public and 11 private elementary schools, 4 public and 3 private junior high schools, and 1 public and 3 private senior high schools can be availed.

For SY 2017-2018, data of enrolment for the month of June, both public and private, and the number of graduates at the end of the SY 2016-2017 were secured, to wit:



Enrolment Data 2017

											A. P			EIN I A	RT 30		-9										_
NAME OF PUBLIC ELEM.		KINDER			GRADE 1	l		GRADE 2	2		GRADE 3	3		GRADE 4	<u></u>		GRADE 5	j		GRADE 6	;	GR KINDE	AND TOT	AL ADE 6		SPED	
SCHOOL	М	F	T	М	F	Т	М	F	Т	М	F	Т	М	F	Т	М	F	Т	М	F	Т	М	F	Т	М	F	
Arumahan ES	19	15	34	23	17	40	31	22	53	17	23	40	22	19	41	21	31	52	16	26	42	149	153	302	0	0	(
Ayao-Iyao ES	40	38	78	38	39	77	35	38	73	33	32	65	37	52	89	39	49	88	48	48	96	270	296	566	0	0	(
Bagong Paraiso ES	11	8	19	7	8	15	7	8	15	17	12	29	10	8	18	9	7	16	12	12	24	73	63	136	0	0	(
Bukal ES	65	37	102	44	36	80	43	38	81	59	38	97	67	52	119	63	52	115	41	55	96	382	308	690	0	0	(
Dayapan ES	10	16	26	16	15	31	13	4	17	16	21	37	19	10	29	24	9	33	14	8	22	112	83	195	0	0	(
Dita ES	9	9	18	7	9	16	15	11	26	15	12	27	7	19	26	12	8	20	14	13	27	79	81	160	0	0	(
Doña Matilde	50	48	98	62	51	113	52	53	105	70	52	122	61	51	112	67	51	118	69	46	115	431	352	783	0	0	(
E.Vito	26	23	49	22	32	54	32	28	60	42	32	74	39	38	77	36	33	69	46	39	85	243	225	468	0	0	(
Gulod ES	16	15	31	14	22	36	12	15	27	16	19	35	16	18	34	19	18	37	21	15	36	114	122	236	0	0	(
Lemery Pilot ES	217	166	383	192	152	344	196	180	376	189	196	385	218	214	432	220	227	447	228	206	434	1483	1356	2839	23	15	3
Mahayahay ES	52	58	110	43	40	83	51	41	92	55	52	107	58	58	116	39	41	80	39	43	82	337	333	670	0	0	(
Marcos C.	12	21	33	18	5	23	22	11	33	11	4	15	22	20	42	16	11	27	24	23	47	125	95	220	0	0	(
Masalisi ES	8	6	14	20	10	30	14	7	21	14	7	21	7	7	14	6	11	17	14	9	23	83	57	140	0	0	(
Mayasang ES	36	37	73	42	25	67	32	30	62	29	31	60	35	28	63	41	34	75	43	31	74	258	126	474	0	0	(
Niogan ES	14	13	27	13	18	31	10	13	23	15	19	34	18	11	29	21	11	32	19	11	30	110	96	206	0	0	(
Payapa ES	42	39	81	34	31	65	33	53	86	63	35	98	56	44	100	60	52	112	52	39	91	340	293	633	0	0	(
Payapa Ibaba ES	11	15	26	12	9	21	14	14	28	15	17	32	10	20	30	22	10	32	20	19	39	104	104	208	0	0	(
R. Venturanza	55	45	100	48	45	93	56	41	97	50	55	105	52	64	116	60	63	123	50	55	105	371	368	739	0	0	(
Sambal ES	79	74	153	73	70	143	64	71	135	81	79	160	86	60	146	79	80	159	65	76	141	527	510	1037	0	0	(
San Isidro Itaas ES	30	35	65	36	15	51	25	28	53	18	15	33	31	35	66	27	21	48	29	30	59	196	179	375	0	0	(
San Isidro Labac ES	12	21	33	13	10	23	19	10	29	13	17	30	21	21	42	28	11	39	26	19	45	132	109	241	0	0	(
Sinisian ES	33	31	64	35	22	57	27	35	62	32	34	66	38	41	79	36	41	77	38	33	71	239	237	476	0	0	(
Talaga ES	43	42	85	31	29	60	35	27	62	45	48	93	36	43	79	41	44	85	38	24	62	269	257	526	0	0	
Tubuan ES	12	13	25	6	14	20	11	10	21	11	7	18	10	12	22	13	8	21	9	11	20	72	75	147	0	0	

A. PUBLIC ELEMENTARY SCHOOLS



ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project SteelAsia Manufacturing Corporation

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V. Ornales	16	8	24	14	11	25	11	19	30	12	18	30	17	10	27	13	9	22	21	10	31	104	85	189	0	0	0
TOTAL	918	833	175 1	863	735	1598	860	807	1667	938	875	1813	993	955	1948	1012	932	1944	996	901	1897	6603	6053	12, 656	23	15	3

NAME OF											NO.	OF E	NROI	LEE	S SY	<mark>2017</mark> -	-2018								
PRIVATE ELEMENTARY	NUR	SERY	KIN	DER	GR	ADE 1	GR/	ADE 2	GR/	ADE 3	GR/	ADE 4	GR/	ADE 5	GR	ADE 6	EAI INTERV	rly Ention	PL GR(AY DUP	SP	ED	THE TUT	RAPY/ Orial	TOTAL
SCHOOL	М	F	М	F	М	F	М	F	М	F	М	F	М	F	М	F	М	F	Μ	F	М	F	М	F	
Blaidenmurge Christian Academy			4	3	3	0	0	1	0	0	1	0	1	1	6	1									21
Christian Knight Academy	11	6	7	5	8	13	7	8	7	9	11	12	17	11	5	9									146
Diezmos Learning Center	3	6	1	7																					17
El Shalom	2	0	2	2	3	0	2	2	3	0	2	2	0	0	4	3									27
Glorious Faith	4	5	2	9	5	7	4	4	1	4	6	3	4	4	5	0									67
Kaleidoscope Therapy & Learning Center	12	2	13	5	3	1	1	0	0	0	5	1	0	0	0	0	38	5	7	6	9	4	71	18	201
Lemery Christian Academy Inc.	6	9	6	11	7	7	4	13	6	7	3	6	10	5	10	4									114
Maranatha Shekinah			6	6	4	9	7	6	2	2	7	3	7	4	1	5									69

B. PRIVATE ELEMENTARY SCHOOLS



ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project SteelAsia Manufacturing Corporation

Brgys. Mataas na Bayan and Balanga, Lemery Batangas

Christian School																									
St. Mary's Educational Institute			19	22	13	21	20	17	17	24	28	18	30	26	30	25									310
Swiss Montessori School Inc.	7	3	8	6	8	14	14	8	7	14	18	7	11	8	13	10									156
Universal Scholastic Academy			9	6	1	0	3	5	5	5	9	4	5	2	3	4									61
TOTAL	45	31	77	82	55	72	62	64	48	65	90	56	85	61	77	61	38	5	7	6	9	4	71	18	1,189

C. PUBLICJUNIOR HIGH SCHOOLS

		NC	D. OF EI	NROLLE	ES SY	2017-20	18		τοτα
	GRA	DE 7	GRA	DE 8	GRA	DE 9	GRA	DE 10	
SCHOOL	М	F	М	F	М	F	М	F	L
Ananias C. Hernandez NHS	67	43	44	62	51	46	55	42	410
Dionisio P. Vito	44	35	59	32	36	42	47	33	328
GFLMNHS	778	789	719	703	690	727	672	656	5,734
Payapa National High School	270	203	278	233	225	194	225	177	1,805
TOTAL	1159	1070	1100	1030	1002	1009	999	908	8,277

D. PRIVATE JUNIOR HIGH SCHOOLS

		NC	D. OF EN	ROLLE	ES SY	<mark>2017-20</mark>	18		
	GRA	DE 7	GRA	DE 8	GRA	DE 9	GRAI	DE 10	
	М	F	М	F	М	F	М	F	TOTA L
NAME OF PRIVATE JUNIOR HIGH SCHOOL									
Christian Knight Academy	7	2	10	6	5	3	5	2	40
St. Mary's Educational Institute	43	61	52	61	59	54	65	61	456
Swiss Montessori School Inc.	19	25	20	18	16	17	11	8	134


TOTAL	69	88	82	85	80	74	81	71	630

E. PUBLIC SENIOR HIGH SCHOOL

NAME OF PUBLIC SENIOR HIGH	NO.	TOTAL			
SCHOOL	GRADE 11		GRADE 12		TOTAL
SCHOOL	М	F	М	F	
Lemery Senior High School	549	505	378	312	1,744
TOTAL	549	505	378	312	1,744

F. PRIVATE SENIOR HIGH SCHOOLS

	NO				
	GRADE 11		GRADE 12		TOTAL
SCHOOL	М	F	M	F	
Lemery Colleges					1,949
St. Mary's Educational Institute	54	49	44	63	210
Universal Scholastic Academy	110	183	9	19	321
TOTAL					2,480

G. PUBLIC TERTIARY SCHOOL

		NO. OF ENROLLEES SY 2017-2018							
	1ST \	/EAR	2ND Y	YEAR	3RD \	YEAR	4TH \	YEAR	
	М	F	М	F	М	F	М	F	τοτα
									L
NAME OF PRIVATE TERTIARY SCHOOL									
Batangas State University - Lemery	22	15	65	51	183	254	113	241	944
TOTAL	22	15	65	51	183	254	113	241	944

H. PRIVATE TERTIARY SCHOOL



NO. OF ENROLLEES SY 2017-2018 **1ST YEAR 3RD YEAR 4TH YEAR 2ND YEAR** Μ F М F Μ F Μ F ΤΟΤΑ L NAME OF PRIVATE TERTIARY SCHOOL Lemery Colleges 1,457 TOTAL 1,457



Graduates 2017 A. PUBLIC ELEMENTARY SCHOOLS

NAME OF PUBLIC	NO. OF GRADE 6 GRADUATES SY 2016-2017				
ELEMENTARY SCHOOL	MALE	FEMALE	TOTAL		
Arumahan ES	29	25	54		
Ayao-Iyao ES	40	34	74		
Bagong Paraiso ES	11	9	20		
Bukal ES	58	45	103		
Dayapan ES	20	12	32		
Dita ES	11	6	17		
Doña Matilde	51	53	104		
E.Vito	34	32	66		
Gulod ES	18	23	41		
Lemery Pilot ES	229	211	440		
Mahayahay ES	55	58	113		
Marcos Catibog	15	22	37		
Masalisi ES	10	7	17		
Mayasang ES	44	33	77		
Niogan ES	15	8	23		
Payapa ES	52	55	107		
Payapa Ibaba ES	22	18	40		
R. Venturanza	58	47	105		
Sambal ES	85	69	154		
San Isidro Itaas ES	32	38	70		
San Isidro Labac ES	14	17	31		
Sinisian ES	37	43	80		
Talaga ES	45	27	72		
Tubuan ES	13	7	20		
V. Ornales	13	13	26		
TOTAL	1,011	912	1,923		

B. PRIVATE ELEMENTARY SCHOOLS

NAME OF PRIVATE ELEMENTARY	NO. OF GF	NO. OF GRADE 6 GRADUATES SY 2016-2017				
SCHOOL	MALE	FEMALE	TOTAL			
Blaidenmurge Christian Academy	0	3	3			
Christian Knight Academy	7	7	14			
Diezmos Learning Center	-	-	-			
El Shalom	0	0	0			
Glorious Faith	4	2	6			
Kaleidoscope Therapy & Learning Center	-	-	-			
Lemery Christian Academy Inc.	10	3	13			
Maranatha Shekinah Christian School	7	6	13			
St. Mary's Educational Institute	26	27	53			
Swiss Montessori School Inc.	17	10	27			
Universal Scholastic Academy	4	5	9			
TOTAL	75	63	138			

C. PUBLIC JUNIOR HIGH SCHOOLS

NAME OF PRIVATE JUNIOR HIGH	PRIVATE JUNIOR HIGH NO. OF GRADE 10 GRADUATES SY 2016-2017				
SCHOOL	MALE	FEMALE	TOTAL		
Ananias C. Hernandez NHS	53	45	98		
Dionisio P. Vito	46	41	87		
GFLMNHS	651	637	1,288		
Payapa National High School	185	193	378		
TOTAL	935	916	1,851		

D. PRIVATE JUNIOR HIGH SCHOOLS



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NAME OF PRIVATE JUNIOR	NO. OF G	NO. OF GRADE 10 GRADUATES SY 2016-2017				
HIGHSCHOOL	MALE	FEMALE	TOTAL			
Christian Knight Academy	6	0	6			
St. Mary's Educational Institute	63	46	109			
Swiss Montessori School Inc.	8	10	18			
TOTAL	77	56	133			

Ε.	PUBLIC TERTIA	RY SCHOOL			
NAME OF PUBLIC TERTIARY	NO. OFGRADUATES SY 2016-2017				
SCHOOL	MALE	FEMALE	TOTAL		
Batangas State University – Lemery	171	184	355		
TOTAL	171	184	355		

F. PRIVATE TERTIART SCHOOL						
NAME OF PRIVATE TERTIARY	NO. OF GRADUATESSY 2016-2017					
SCHOOL	MALE	FEMALE	TOTAL			
Lemery Colleges	112	220	332			
TOTAL	112	220	332			

Assessment

The Project will not pose threat to delivery of basic services because it will not compete with the services being provided by the local and national government. The Project will even be a partner to deliver and improve the delivery of these basic services for the people because the Project has social development component which include assistance to infrastructure, livelihood and education, among others.

2.4.8 Threat to Public Health and Safety

Some of the health institutions in Lemery include:

- **Batangas Provincial Hospital**
- Metro Lemery Medical Center
- Our Lady of Caysasay Medical Center
- Lemery Doctors Medical Center
- Little Angels Medical Hospital

The Municipal Health Office of Lemery, as the lead agency in the promotion of health among its constituents, provides medical, dental, laboratory, and other health services within the community. At present, the office is accredited under the PHILHEALTH indecency program which serves the indigent PHILHEALTH members through free laboratory examinations, medicines, and consultation. It is also accredited and awarded with the Certificate of Quality Service on DOTS as one of the TB DOTS facility in the province of Batangas for having completed the standard requirements of quality TB DOTS services with about 253 TB case patients.

The newly renovated Lemery Municipal Health Center was sponsored by the SM Foundation, Inc. and was inaugurated and turned over to the local officials of Lemery on August 15, 2017. The improvement of the Center includes a Felicidad Sy Wellness Center for Children & the Elderly, Reception & Waiting Area, Pre-Natal & Breastfeeding Room, Conference Room, Doctors Rooms, Consultation Area, Laboratory, TB-Dots Room & a newly constructed PWD-Comfort Room.

A systematized method of providing health services is being observed in the delivery of such





services to the target sectors. Basic service is offered at the municipal health center and satellite health centers in the barangays. Focus on primary health care as well as health education is also provided by the health personnel.

	BARANGAY	UNDERWEIGHT AGE 0-5		TOTAL	TAL SEVERELY UNDERWEIGHT AGE 0-5		TOTAL
		M	F		М	F	
1	Anak-Dagat	0	0	0	0	0	0
2	Arumahan	0	0	0	0	2	2
3	Ayao-Iyao	1	1	2	1	1	2
4	Bagong Pook	3	0	3	0	0	0
5	Bagong Sikat	0	0	0	0	0	0
6	Balanga	2	1	3	0	1	1
7	Bucal	0	1	1	0	0	0
8	Cahilan I	0	0	0	0	0	0
9	Cahilan II	0	1	1	0	1	1
10	Dayapan	7	4	11	2	4	6
11	District I	0	0	0	0	0	0
12	District II	0	0	0	0	0	0
13	District III	0	0	0	0	0	0
14	District IV	0	0	0	1	2	3
15	Dita	1	1	2	0	0	0
16	Gulod	0	2	2	4	2	6
17	Lucky	0	0	0	0	0	0
18	Maguihan	1	1	2	2	0	2
19	Mahabang Dahilig	2	4	6	0	2	2
20	Mahayahay	2	2	4	0	0	0
21	Maigsing Dahilig	1	1	2	0	0	0
22	Maligaya	0	0	0	0	0	0
23	Malinis	1	1	2	0	1	1
24	Masalisi	0	0	0	0	0	0
25	Mataas na Bayan	3	0	3	0	0	0
26	Matingain I	1	0	1	1	0	1
27	Matingain II	2	1	3	1	2	3
28	Mayasang	0	2	2	1	0	1
29	Niogan	0	2	2	2	2	4
30	Nonong Casto	0	0	0	0	0	0
31	Palanas	3	3	6	4	3	7
32	Payapa Ibaba	3	2	5	1	2	3
33	Payapa Ilaya	0	1	1	1	0	1
34	Rizal	0	0	0	0	0	0
35	Sambal Ibaba	1	0	1	1	0	1
36	Sambal Ilaya	0	0	0	0	0	0
37	San Isidro Ibaba	2	1	3	2	1	3
38	San Isidro Itaas	5	3	8	3	0	3
39	Sangalang	3	0	3	1	1	2
40	Sinisian East	5	2	7	0	0	0
41	Sinisian West	1	1	2	0	0	0
42	Talaga	2	2	4	0	0	0
43	Tubigan	0	1	1	1	0	1
44	Tubuan	2	1	3	0	0	0
45	Wawa Ibaba	2	2	4	0	1	1
46	Wawa Ilaya	0	0	0	0	1	1
	TOTAL	56	44	100	29	29	58

DATA ON MALNOURISHED 2017

Source: Municipal Health Office



The OPTreport from the office of the MHO showed that out of 12,542 0 to 5 years old (0-70 months), 100 children are malnourished/underweight in the different barangays of the municipality. Barangay Dayapan is noted to have the biggest number of malnourished/underweight children totalling to 11. The severely underweight, on the other hand, has a total of58 children with 7 children at Barangay Palanas.





For the year 2016, out of 321 malnourished/underweighted children, 172 are maleand 149 are female. Meanwhile, 56 male and 44 female out of 100 children are malnourished/underweight for the year 2017.



COMPARATIVE DATA ON SEVERELY MALNOURISHED CHILDREN OF 2016 AND 2017

Out of 107 severely malnourished children, for the year 2016,62 are maleand 45 are female.On the other hand, for the year 2017, 29 male and 29 female out of 58 children are severely malnourished.

Based on the given data above, it is clearly shown that the number of male, female, and the total number of malnourished/underweighted and severely malnourished children are significantly greater in 2016 than 2017. This is an implication that the current services provided by the MHO have seriously contributed in lessening the number of malnourished children compared to the past year.

The Rural Health Unit offers free regular check-up scheduled daily for the residents of Lemery. The reports of which together with its total number of local patients that have been provided with other services are as follows:

DAY		NATURE
Monday	-	Medical Check-up / TB Dots/Dental / EPI
Tuesday	-	Dental / TB Dots (RHU Payapallaya) / MedicalCheck-up/ EPI
Wednesday	-	Dental / EPI / Medical Check-up / TB Dots
Thursday	-	Dental / Prenatal(scheduled in barangays)/ TB Dots/ EPI / Medical Check-up



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Friday - MedicalCheck-up/Premarital Counselling/ TB Dots/ EPI / Dental (scheduled in barangays)

NATURE	TOTAL NO. OF PATIENTS EXAMINED
Medical Check-up	7,041
Dental	4,151
EPI	1,518
Prenatal	1,233
Premarital counselling	250 Pairs
TB Dots	253
Medical Check-up	7,041



Non-Government Organization is d development activities, dental I



vision of vaccines, mu

To pay attention to the importance of readiness of blood in times of need, voluntary blood donation program was conducted and participated by 31 blood donors.

The services provided by the MHO are further augmented by the Batangas Provincial Hospital and six (6) private hospitals within the community. There are twelve (12) registered medical clinics and ten (10) dental clinics.



The following are the five (5) hospitals in Lemery, to wit:

- Batangas Provincial Hospital
- Metro Lemery Medical Center

120 beds 72 beds



- Our Lady of Caysasay Medical Center
- Lemery Doctors Medical Center
- Little Angels Hospital

100 beds 27 beds 20 beds

Morbidity, Mortality, Infant Death And Neonatal Death Report

A. MORBIDITY



	DISEASES		NO. OF CASES			
		MALE	FEMALE	TOTAL		
1.	Acute Upper Respiratory Infections of Multiple and Unspecified Sites	1,227	1,437	2,664		
2.	Acute Nasopharyngitis (Common Cold) Acute Rhinitis (Coryza)	899	989	1,888		
3.	Essential (Primary) Hypertension	347	437	784		
4.	Other Disorders of Urinary System	172	225	397		
5.	Urticaria	200	192	392		
6.	Cystitis	157	232	389		
7.	Open Wound of Ankle and Foot	118	123	241		
8.	Fever of Unknown Origin	133	104	237		
9.	Asthma	110	93	203		
10.	Scabies	97	91	188		

B. MORTALITY



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		NO. OF CAS	SES
DISEASES	MALE	FEMALE	TOTAL
1. Other Symptoms and Signs Involving the Circulatory and Respiratory System	33	29	62
2. Other General Symptoms and Signs	27	26	53
3. Cardiac Arrest	24	14	38
4. Respiratory Failure	9	17	26
5. Shock	10	16	26
6. Acute Myocardial Infarction	11	6	17
7. Other Pulmonary Heart Diseases	8	3	11
8. Pneumonia	8	2	10
9. Complications and Ill-defined Descriptions of Heart Disease	2	7	9
10. Chronic Ischemic Heart Disease	3	5	8
11. Pneumonia in Diseases Classified Elsewhere	4	4	8

C. INFANT DEATH AND NEONATAL DEATH

STEEL



	DISEASES	N	<mark>D. OF CASE</mark>	S
		MALE	FEMALE	TOTAL
1.	Birth Asphyxia	3	1	4
2.	Other Symptoms and Signs Involving the Circulatory and Respiratory System	1	2	3
3.	Shock	2	0	2
4.	Cardiac Arrest	0	1	1
5.	Complications and III-defined Descriptions of Heart Disease	0	1	1
6.	Maternal Care for Other Known or Suspected Fetal Problems	1	0	1
7.	Disorders Related to Short Gestation and Low Birth Weight	1	0	1
8.	Convulsions/Seizure of Newborn	1	0	1
9.	Fetal Death of Unspecified Cause	1	0	1
10.	. Respiratory Distress of Newborn (Acute Respiratory Distress Syndrome)	1	0	1
11.	. Congenital Pneumonia	0	1	1

Assessment

The Project will not pose threat to public health because all management and mitigating measures will be implemented. Also, the company shall be responsible for the regular check-ups of workers and immediate treatment of any work-related sickness incurred by any worker. The company, as it does in all of its plants, will cover employees and its dependents with an HMO plan. Moreover, the company will have medical and dental missions and other health assistance projects for the community.



Diseases Due To Climate Change

According to Dr. Fely Marilyn Lorenzo of the Commission on Higher Education (CHED), climate change exacerbates the conditions that make it more favourable for diseases to set in. For example, in dengue, the vectors can multiply faster and become fiercer. However, even if there is a lot of mosquitoes, if there is no source of infection, there will be very few cases.

The Philippines has been a dengue hotspot in recent years. Dengue cases in 2015 saw a 64.8 percent increase from the previous year, with a Department of Health (DOH) official attributing it to climate change. While the nationwide tally for the first half of 2017 has decreased by 36.8 percent from the year prior, Metro Manila experienced a 24.9 percent increase in dengue victims. This spike is linked to the high population density of areas which is ideal for transmitting diseases. This is especially evident in poor communities, which suffer from poor hygiene and stagnant water occasionally brought by flooding episodes.

Climate-related health issues become more critical in rural areas, which lack infrastructures and services common in urban areas such as water distribution systems. For instance, the spread of cholera and typhoid fever can be worsened by poor water quality, lack of electricity access, and improper sanitation. In shoreline areas, the storm surge due to typhoons may lead to saltwater infiltration of groundwater resource, exposing its inhabitants to water-borne diseases afterwards.

Occupational Health Plan and Occupational Hazards

Occupational Health is among SAMC's priority as it is committed to implementing a structured approach to workplace health and safety in order to achieve a consistently high standard of safety performance. Occupational Health Plan is included in its Environment, Health and Safety Policies of the Company which is a component of its ISO Certification.

RESPONSIBILITIES

Management

Following are the responsibilities that SAMC is committed to:

- > ensure the health and safety of its workers and others in its workplace
- > ensure the health and safety of other persons is not put at risk from work carried out as part of its operations
- > provide and maintain a work environment that is without risks to health and safety
- > provide and maintain safe plant and structures
- > provide and maintain safe systems of work
- > ensure the safe use, handling and storage of plant, structures and substances
- > provide adequate facilities for the welfare of workers
- > provide information, training, instruction and supervision
- > monitor the health of workers and the conditions of our workplaces.

Workers

Workers must take reasonable care for their own health and safety while they are at work, and take reasonable care that their acts or omissions do not adversely affect the health and safety of other persons. They must comply, so far as they are reasonably able, with any reasonable instruction given by the Station Manager, as well as co-operating with any reasonable policy or procedure which relates to workplace health and safety. On a day to day basis, this includes:

> to the extent of the worker's control or influence over working conditions and methods, take reasonable care to work safely

> making sure that the work area safe when leaving it

> make proper use of all appropriate safeguards, safety devices and personal protective equipment

>follow agreed safe working practices and rules

> report all known hazards, accidents and incidents as soon as possible.

It is acknowledged that, in accordance with Labor laws, a worker may cease, or refuse to carry out work if they have a reasonable concern the work would expose the worker to a serious risk to their health or safety. The workers who cease work shall notify the relevant manager that they have ceased unsafe work as soon as practicable after doing so. Workers are also required to remain available to carry out 'suitable alternative work'. This would not however require workers to remain at any place that poses a serious risk to their health or safety.



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Contractors

Contractors, sub-contractors and self-employed persons are required to:

- > comply with the contractual requirements with SAMC, laws, rules and regulations
- > have in place any work health and safety policies and programs required under safety legislation
- > consult with about safety matters and comply with policies
- > work safely and to include the safety of staff and visitors in their safety plans.

If any staff member believes that a contractor may be engaging in an unsafe work practice, they are required to report this issue to their manager.

Visitors

Visitors and other persons' responsibilities include:

- > take reasonable care for their own health and safety and for the health and safety of other persons
- > comply with, so far as they are reasonably able, all reasonable safety directions provided by SAMC
- > report all safety related incidents to SAMC
- > ensure the adequate supervision of any accompanying children
- > Do not enter any restricted area without authorisation or escort
- > Do not bring or consume alcohol or illegal drugs at workplaces
- > Do not wilfully or recklessly interfere with property.

Emergency Procedures is also part of the Occupational Health Plan which is fully discussed in Chapter IV.

Provided below is the Health and Safety Program being implemented in existing and operating SAMC Plants which will also be adopted for this Project.

Health Programs	Target Date	Activities
Liver Cancer and Viral Hepatitis Awareness and Prevention Program	January	Lecture on Liver Cancer and Hepatitis.
Locker Room/Restrooms Inspection		Regular inspection of restrooms and lockers together with B&G, San Maritanzion and HR.
Potability Test of Drinking Water		Potability Test of drinking water every two months and Physica/Chemical Test of water source once a year.
STD/AIDS Awareness Program	February	STD/AIDS Awareness Seminar.
Oral Health Program		Lecture on Oral Hygiene and Care (Invite a dentist to talk about the topic).
Cardiovascular Diseases/	March	Lecture on Cardiovascular Diseases/ Hypertension Prevention.
		of high risk employees.
Lecture on Conjunctivitis and		Lecture on conjunctivits (Sore eyes) and Foreign Body
Foreign Body in the Eyes		in the eyes.
Lecture on Wound Care	April	Lecture on proper wound care and dressing.
Sports Fest - Table Tennis		Table Tennis tournament.
Smoking Cessation Program	May	Seminar on the III-effects of smoking.
Motorcycle Safety Program		Seminar on Motorcycle Safety.
Elu Awaronoss and Provention		Flu Awareness Lecture.
Program	June	Flu vaccination in partnership with accredited clinics (Sanofi) for interested employees.
National Headache/Migraine	luna	Headache/Migraine Awareness Lecture
Awareness month	June	Case finding / monitoring from previous SL records
Sports Fest - Billiards	June	Billiards Tournament
Dengue Awareness	July	Lecture on Dengue Disease and Prevention.
Gout Arthritis Awareness Lecture	August	Lecture on Gout/Arthritis Disease and Prevention.
Family Planning Program	July	Lecture on Family Planning and Responsible Parenthood.
		One on one counselling to those who are interested

Table 2.4.2.6.1: Health and Safety Programs



	with family planning.	
Tuberculosis Awareness and	August	Lecture on TB Awareness and Prevention.
Prevention Program		Case finding (APE Result).
Programs on Ergonomics	September	Lecture on Ergonomics.
Food Safety and Nutrition Program	October	Lecture on Safe Food Handling.
Drug Free Workplace Brogram	November	Re-orientation on Drug Free Workplace Policy.
Diug Fiee Workplace Fiografii		Random Drug Testing.
Diabetes Awareness Lecture December		Lecture on Diabetes

Specifically, provided below are potential health hazards during construction and project operations and the appropriate mitigating measures that will be implemented.

CATEGORY	TYPES	POSSIBLE SOURCES	HEALTH EFFECTS	MITIGATION
Chemical	Vapors	When liquids are heated	Dissolve skin fats and	Proper ventilations and
hazards		up to its Flash Point	oils	exhausts
			Skin dryness, cracking,	Inducing fresh air to
			redness, and blisters	work rooms/stations
			Local health effect	
			Central nervous	
			system damage	
			Systemic health effect	
	Fumes	Welding and flame	Respiratory illnesses;	Proper ventilations
		cutting	asphixation	and exhausts;
		Using internal	Skin irritations	Inducing fresh air to
		combustion engines and		work rooms/stations;
		LPG burners		Use of air purifying
		Burning of waste		mask, Eye and face
		materials		protections
		Painting - particularly		
		paint spraying using		
		adhesive and thinners		
	Gases	Oxygen – used for	Cause severe skin and	Proper ventilations
		welding and cutting	eye irritation and burns	and exhausts;
		Acetylene – used for	as well as frostbite.	Inducing fresh air to
		welding and cutting	Breathing pure Oxygen	work rooms/stations;
		Propane – used for	at high pressures can	Use of air purifying
		heating & fuel	cause nausea,	mask, Eye and face
		Carbon Dioxide – used	dizziness, muscle	protections
		as an inert gas and can	twitching, vision loss,	
		be found naturally in	convulsions (fits), and	
		sewers	loss of consciousness,	
		Methane – the principle	Death	
		component of natural		
		gas and found in earth		
		deposits		
		Hydrogen Sulfide –break		
		down of organic matter		
		and can be found		
		naturally in sewers		
		Carbon Monoxide –		
		highly toxic and		
		produced by the		
		incomplete combustion		
		of fuels		
	1	Welding Gases – The		
		welding arc can produce		
		Ozone, phosgene and		
		carbon monoxide gases		

Table 2.4.2.6.2: Health Hazarda During Construction Project Operation



		Diesel Exhaust – Nitrogen Dioxide		
	Dust	Silica dust - Any process involving breaking, crushing or grinding silica containing materials will generate silica dust. Lead dust - arise from handling materials containing lead or its compounds, such as removal of leaded paint and handling of metallic lead	Disease of the lungs due to the breathing of dust containing crystalline silica particles. Silicosis, a disease with lung fibrosis causing difficulty in breathing; Excessive exposure may cause acute or chronic health effects	Engineering Control - Dust collector; Use of air purifying breathig apparatus/Mask
Physical hazards	Noise	With noise damage to the ear, it may take many years for the symptoms to appear	can distract concentration, cause difficulties in speech communication;Long term exposure to excessive noise can cause permanent hearing damage	Engineering controls thru replacement of equipment or regular conduct of Preventive Maintenance; Introduce work schedule rotation; Use of ear protections
	Heat	May be aggravated if impermeable protective clothing is worn when undertaking heavy work or working in an enclosed area with a strong heat source, poor ventilation and high humidity.	Heat rashes, Heat cramps, Heat exhaustion, Heat stroke; Injuries	Avoid heavy manual work in hot environment, Providing shelter, blowing fans, adequate cool drinks to replace the water lost as sweat and sufficient rest breaks
	Vibration	Hand-Arm Vibration Syndrome (HAVS) can cause permanent damage	May cause carpal tunnel syndrome - affects the fingers and hands; In the long run, permanent damages to the nerves will result in a loss of the sense of touch and dexterity	Where possible, low vibration tools should be used; Wearing anti-vibration gloves
Ergonomics		Poor design of equipment, workstation design, (postural) or workflow, manual handling, repetitive movement.	Body fatigue; Risk for heart diseases; Induce risk of diatebetes; moscuskeletal dis- orders	Adopt ergonomiccaly design apparatus and equipment;
Psychologica I		Shiftwork, workload, dealing subordinates, harassment, discrimination, threat of danger, constant low- level noise, stress	Affects a person's thinking, feeling or mood; may affect someone's ability to relate to others and function each day	
Biological		Infection by bacteria, virus, fungi or parasites through a cut, insect bite, or contact with infected persons or contaminated object.	Sickness; Infections	Information campaign; Good housekeeping practices; Personal hygene



2.4.9 Generation of Local Benefits

Lemery is a first class municipality by income classification pursuant to reclassification under Memorandum Circular 01-M (11)-08 dated November 12, 2008. The primary source of income is agricultural activities, including crop production, livestock and poultry, with 30 out of 46 barangays are involved in it. As a coastal municipality with 13 barangays located along the shore, fishing activities are also significant contributor to the local economy.

In the Rankings of Cities and Municipalities that are based on the sum of their scores on 3 Pillars: Economic Dynamism, Government Efficiency, and Infrastructure. In 2016, Lemery ranked 75th out of 479 municipalities, with total score of 28.252921. The municipality also serves as an provincial urban center for its surrounding rural municipalities including Taal, San Nicolas, Agoncillo and San Luis. It hosts the largest public high school in the first legislative district of Batangas, a private college (Lemery Colleges), a campus of a public university (Batangas State University) and the Batangas Provincial Hospital. Furthermore, bus lines from Manila serving the Southern Tagalog Region reach Central Batangas by way of Lemery. Vans also connect the town to and from other urban centers in the region such as Dasmariñas, Calamba and Lucena.

In February 2014, Xentro Mall Lemery, a community mall, opened in the Diversion Road, further cementing Lemery's position as a growing commercial center. In December 2017, SM Center Lemery opened.

SOCIAL WELFARE

The mandate of the social welfare and development office is to address the immediate concerns of the disadvantaged sectors of the community, the persons with disabilities, senior citizens, children and youth, women to include the victims of disasters and calamities and the returning OFWs and their families. Conscious of the immediate needs of the disadvantaged sectors in terms of food, medicine, water, electricity and education, it implements programs like PailawsaMahihirap, PantawidPamilyang Pilipino Program, and Assistance in Crisis Situation (AICS). It also provides livelihood opportunities for women, persons with disabilities, and the elderly to make them realize their worth as productive citizens of the community.

A. Day Care

Social aspect of Day Care children and their basic literacy were addressed through the day care program. These children were provided with food through the supplemental feeding program funded by the DSWD. The LGU, on the other hand, has provided kitchen utensils (kitchen turner, ladle, caldron, casserole, and pot) for the 45 Day Care Centers. In addition, construction of handwashing facilities and provision of height board & weighing mechanical scale, hygiene kit, and learning materials were made.With the support of the parents, officers, MSWDO, SB Members, Office of the Mayor, and Child Development Workers (CDW), Day Care Recognition Day washeld at the Lemery Municipal Covered Courton January 26, 2017. For 2017, there are a total of 1,769 Day Care students.



For the year 2016, the Day Care Center of Barangay Tubuan was constructed using the BUB fund in the amount of P750, 000. Likewise, the Day Care Center of Barangay Tubigan was rehabilitated using the same fund in the amount of P400, 000.



B. Pantawid Pamilyang Pilipino Program (4Ps)

The LGU has 3,519 Pantawid Pamilyang Pilipino Program (4Ps) members and they are being prioritized for assistance. These beneficiaries are regularly receiving their monthly assistance provided that they have complied with the documentary requirements.

BARANGAY	SENIOR CITIZEN	PWD	MALE	FEMALE	TOTAL
Anak-Dagat	2	0	53	9	62
Arumahan	7	1	71	9	80
Ayao-Iyao	6	2	99	11	110
Bagong Pook	3	0	35	3	38
Bagong Sikat	2	0	43	2	45
Balanga	0	1	49	16	65
Bucal	2	0	32	2	34
Cahilan I	4	0	81	16	97
Cahilan II	4	0	52	8	60
Dayapan	4	0	46	6	52
District I (Pob.)	4	0	45	7	52
District II (Pob.)	2	0	19	2	21
District III (Pob.)	0	0	1	0	1
District IV (Pob.)	1	2	65	7	72
Dita	5	0	71	8	79
Gulod	5	1	60	4	64
Lucky	0	0	3	0	3
Maguihan	3	0	53	10	63
Mahabang Dahilig	5	1	65	8	73
Mahayahay	4	0	30	3	33
Maigsing Dahilig	3	1	53	11	64
Maligaya	2	1	22	5	27
Malinis	5	0	57	12	69
Masalisi	5	1	40	4	44
Mataas Na Bayan	7	0	78	6	84
Matingain I	9	1	95	10	105
Matingain II	1	0	39	6	45
Mayasang	11	0	95	6	101
Niogan	8	1	68	13	81
Nonong Casto	5	0	89	17	106
Palanas	9	1	135	17	152
Payapa Ibaba	4	0	63	8	71
Payapa Ilaya	11	3	140	21	161
Rizal	0	0	5	0	5
Sambal Ibaba	7	0	92	18	110
Sambal Ilaya	11	0	153	21	174
San Isidro Ibaba	9	0	66	9	75
San Isidro Itaas	13	5	210	24	234
Sangalang	3	1	44	10	54

NUMBER OF 4PS BENEFICIARIES

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Sinisian East	3	0	52	7	59
Sinisian West	15	0	79	9	88
Talaga	13	3	216	29	245
Tubigan	3	0	36	11	47
Tubuan	1	0	32	2	34
Wawa Ibaba	13	0	116	11	127
Wawa Ilaya	2	0	50	3	53
GRAND TOTAL	234	26	3,098	421	3,519



STEEL

The programs for 4Ps members include gender sensitivity training to male spouses of Pantawid grantees, family and youth development sessions, yearly municipal screening of Huwarang Pantawid Pamilya and Exemplary Child, and the Pantawid Pamilya Day Celebration.



C. Senior Citizens and Persons with Disabilities (PWDs)

The Federation of the Senior Citizen Affairs has its office being shared with persons with disabilities (PWDs) located within the municipal compound. This office served as a meeting place of its members. As of 2017, there are about 1,861 members of senior citizens (763 are male and 1,098 are female) and 480 persons with disabilities (268 are male and 212 are female) as per record of the MSWDO. Senior Citizen's Week and General Assembly are two among the major activities of the senior citizens. Meanwhile, provision of assistive device, educational and financial assistance, medical and burial assistance, and the conduct of General Assembly are for the PWDs. Further, all members of these federations are provided with ID card which is one of the requirements in availing the privileges of being an elderly or disabled.

D. Overseas Filipino Workers (OFWs)

Training on financial literacy was attended by 145 financially literate OFWs and their families. On December 12, 2017, 800 OFW leaders, officers, and registered members from 46 barangays gathered together for the OFW Month Celebration.Meanwhile, for their protection services, 5 OFW cases have been attended and 2 repatriated OFWs have been referred to Welfare Agencies (PSWDO and OWWA IV-A) for psychosocial assistance.

E. Women



13 cases

6 cases

2016

2017

There are a total number of 19 VAW (Violence Against Women) cases for the years 2016 and 2017. Majority of these cases are classified under the "battered wife" category whereinphysical and psychological abuse isrepeatedly exhibited to a woman mostly by her husband or partner. 13 VAW cases during the year 2016 are higher compared to 6 VAW cases during the year 2017, which means that incidents of abuse and violence inflicted to women or wives lessened in the latter year.

F. Livelihood Programs

To augment income in support to poverty alleviation program, the following livelihood projects have been launched:



LIVELIHOOD PROJECTS	NO. OF BENEFICIARIES			
Candle Making	35 Women/Mothers			
Poverty Reduction Program for Food Processing Training	50 Women			
Sustainable Livelihood Program for Indigent Surrenderees of Substance Abuse	55 Indigent Drug Surrenderees			
TESDA Shielded Metal Arc Welding (SMAW) Training	30 Drug Surrenderees			
Hilot Massage Therapy Training	30 Drug Surrenderees			
Livelihood Training for Electrical Installation and Maintenance (EIM)	25 Participants			
Livelihood Training for Shielded Metal Arc Welding (SMAW)	25 Participants			

With the Project, additional income will be brought in to Lemery including the following local benefits that may be generated from the project:

- Enhancement of Employment and Livelihood Opportunities
- Increased Business Opportunities and Associated Economic Activities



Increased Revenue of LGUs

2.4.9 Traffic Congestion

Lemery is accessible by bus from Manila via the South Luzon Expressway (SLEX). The Lipa-Lemery Road connects the STAR Tollway in Lipa to Lemery, passing a number of municipalities along the southern shores of Taal Lake. Lemery can also be reached from Tagaytay via the Diokno Highway. Furthermore, there are vans connecting Manila to Lemery.

ROADS

The inventory of roads and bridges from the Municipal Engineer's Office showed that the municipality has a total of 18.07 kilometers of municipal roads which are classified as concrete pavement, 11.17 kilometers of provincial road which are mostly classified as concrete road, 38.43 kilometers of national road made of bituminous macadam and concrete pavement. Barangay roads are classified as concrete while others were classified as earth road.

Based on data gathered from the Engineering office, there are about 96.86 kilometer roads, both rural and urban, remained unpaved up to the present.

BRIDGES

The municipality has six (6) bridges classified as national. They are as follows:

- 1. Ayao-Iyao Bridge with a length of 6.35 meters
- 2. Calawang Bridge with a length of 18 meters
- 3. Calbang Bridge with a length of 36 meters and 9 meters respectively
- 4. Matingain Bridge with a length of 16 meters
- 5. Palanas Bridge with a length of 20.1 meters

There are three (3) bridges which are classified as provincial to wit:

- 1. BagongPook Bridge with a length of 15 meters
- 2. Arumahan Bridge with a length of 22 meters
- 3. TubuanBrdge with a length of 12.3 meters

Foot bridge:

There are four (4) constructed footbridges in various barangays such as:

- 1. Mataas na Bayan (2)
- 2. Maigsing Dahilig
- 3. Tubigan
- 4. Malinis

The expected additional transport vehicles in the area will be tricycles, jeepneys, cars and most significantly, cargo and delivery trucks. Since the road is an existing route, traffic density within the site is high and the size of cargo and delivery trucks may be a potential cause of traffic problem. With this, SAMC has formulated its Traffic Management Plan as follows.

Traffic Management Plan

Provided below is the Traffic Management Plan that SAMC will implement:

A. Traffic Scheme

- Designate marshalling/holding area (no idling zone) is offsite;
- The provincial road, Diokno Highway is the main ingress/egress;
- No trucks will be allowed to park outside the mill compound
- Comply with government laws on load limit requirements (13.5 metric tons/axle);
- Comply with existing road traffic and smoke belching laws;
- Assist with company's security personnel the traffic entry to and exit from project site;
- Post proper directional and safety traffic signs in coordination with Lemery Traffic Management Office
- Alert concerned government agencies regarding the upkeep and maintenance of the roads.
- Comply with load limit requirements set by DPWH and the speed limit on roads.

B. The Road Networks of the Project Impact Zone

The main access road to the Project site is the provincial road, Diokno Highway.



C. Impacts of the Project on the Existing Traffic

The expected additional transport vehicles in the area will be tricycles, jeepneys, cars and most significantly, cargo and delivery trucks.

During construction, if the estimated filling materials needed is around 60,000 cubic meters, it is projected that the truck hauling per day will be 60,000 cm / 20 cm / 120 days or 25 trucks per day or 50 trucks per day (multiplied by 2 to consider both in and out traffic). The estimated truck hauling time is 24 hours depending on availability of filling materials and traffic permitting. Thus, the hauling trucks will add an approximate 50 trucks per day or an average of 2 trucks per hour (in and out).

During operations, the Plant will produce finished goods of 1,200,000 tons per year. Likewise, it will consume scraps of 1,383,120 tons per year for a total of 2,583,120 tons of steel materials per year. A truck can load up to 30 tons per trip. With this, the truck hauling per year of 2,583,120 / 30 = 86,104 trucks; which 86,104 / 360 days = 239.18 trucks per day which is equivalent to 239.18 / 24 hours = 9.97 trucks per hour. While, trucks hauling consumables such as fuel, oil and lubricants are estimated to be at 4 trucks per day or 0.2 trucks per hour. Thus, there will be an average of 10.17 trucks per hour or approximately 1 truck coming in or out per 5.9 minutes interval.

In consideration of all above factors, the Project will have an impact in the traffic situation of the locality. Since the road is an existing route, traffic density within the site may become high and the volume of cargo and delivery trucks that will traverse the route from and to the steel rolling mill project site may contribute to traffic problem.

D. MANAGEMENT PLAN

The concept of the Management Plan is basically premised on the measures that will be implemented by the Proponent in coordination with and authorization of the LGU of Lemery and future (proposed widening and re-concreting of portion of provincial and municipal roads leading to the project siteand ongoing government infrastructure projects that will contribute to significant reduction of inland traffic and relief in traffic density. Nevertheless, during the construction and operation stages of the Project, the following mitigating measures will be instituted:

CONSTRUCTION STAGE

During construction, the following mitigating and management measures will be implemented:

- 1. The provincial road, Diokno Highway, is the main ingress/egress;
- 2. Proper scheduling of hauling of construction materials in relation to existing truck ban ordinances;
- 3. No trucks and/or any kind of vehicles, i.e.: cars, motorcycles will be allowed to park outside the mill compound;
- 4. Assign traffic marshals or officers to control the vehicular movements at the entrance / exit of the Project Site;
- 5. Coordinate with LGU Lemery in crafting new and better routing scheme within the affected impact zone area;
- 6. Posting of the project's own traffic officer to assist and coordinate with Lemery LGU's Traffic Bureau for orderly flow of vehicle and pedestrian traffic within the identified route of trucks;
- Institution of mitigating and enhancement measures to avoid the risk of vehicular accidents (e.g. traffic accidents as a result of hauling of construction materials or construction spoils) and to promote safety like putting of safety and directional signages on the identified route of trucks;
- 8. Assign sufficient number of owned traffic enforcers during rush hours;
- 9. Comply with government laws on load limit requirements (13.5 metric tons/axle);
- 10. Comply with existing road traffic and smoke belching laws, and;
- 11. Conduct free trainings/seminars on Discipline and Traffic Rules and Regulations for all LGU traffic enforcer, Barangay Mataas na Bayan and Balanga officers and tanods as well as other interested motorists and pedestrians.

OPERATION STAGE

During project operation, the company will implement traffic management scheme as follows:

- 1. The provincial road is the main ingress/egress;
- 2. Proper scheduling of hauling of raw materials and finished products in relation to existing truck ban ordinances;
- 3. No trucks and/or any kind of vehicles, i.e.: cars, motorcycles will be allowed to park outside the mill compound;
- 4. Designate a substantial area inside the plant site for truck marshalling/holding;

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- 5. Address the parking demands/requirements of employees and visitors through proper allocation of parking slots;
- 6. Assign a traffic marshals or officers to control the vehicular movements at the entrance / exit of the Project Site;
- 7. Coordinate with LGU Lemery in crafting new and better routing scheme within the affected impact zone area;
- 8. Posting of the project's own traffic enforcers to assist and coordinate with Lemery LGU's Traffic Bureau for orderly flow of vehicle and pedestrian traffic within the identified route of trucks;
- 9. Post proper and permanent directional and safety traffic signs in coordination with Lemery Traffic Management Office;
- 10. Assign sufficient number of traffic enforcers during rush hours;
- 11. Alert concerned government agencies regarding the upkeep and maintenance of the roads.
- 12. Comply with government laws (DPWH load requirement) on load limit requirements (13.5 metric tons/axle);
- 13. Comply with existing road traffic and smoke belching laws, and;
- 14. Conduct free trainings/seminars on Discipline and Traffic Rules Education for all LGU traffic enforcer, Barangay Mataas na Bayan and Balanga officers and tanods as well as other interested motorist and pedestrian.



CHAPTER III: ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) is formulated to minimize the potential adverse impacts while enhancing the beneficial effects of implementation of the project. This EMP shall serve as the environmental monitoring and implementing guidelines for the project.

With the identification of the key project activities at each phase and key impact thereof (Chapter 2) and the delineation of the important baseline conditions (Chapter 3), this Section summarizes the significant impacts and corresponding management plan/mitigating measures.

Table 3.4.1 summarizes all the potential impacts and options for prevention.

Project Phase / Environmental Aspect (Project Activity Which will likely Impact the Environmental Component)	Environment al Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsi ble Entry	Estimat ed Cost in PhP	Guarantee / Financial Arrangeme nts
		NU	Coursing of aquipment	Drananart	Dort of	
			and contractors; Securing of ECC	Proponent	Part of Project Cost	
Environmental Aspect # 1: Land clearing and demolition of some existing structures	A. The Land	Scraps Construction debris Soil erosion	 Metal scraps if any will be segregated for inclusion in the scraps that will be used as raw material in scrap recycling operations Good housekeeping Provision of Material Recovery Facility Water spraying for dust management Proper construction methods and procedures and implementation of slope protection 	Proponent	10,000 Part of contract	Agreement with contractor
Environmental Aspect # 2	B. The Water	Domestic waste discharges	Use of Portable toilets	Proponent	5,000 dependin g on septage disposal cost - Part of contract	Agreement with contractor
		River water quality: Further increase in siltation/ sedimentation loading in river increase in turbidity and	 Provision of drainage canals with silt/sediment traps Immediate soil compacting in area of earth moving activities Periodic 			

Table 3.4-1: Summary Matrix of the Impact Management Plan

		suspended solids Suffocation of fish and crustacean nesting grounds Further impairment of plankton community Disruption of	environmental monitoring, i.e., to comparatively determine fish and crustacean population compared to baseline data.			
		Isn and benthos larval growth Used oil, used batteries, contaminated rags, busted bulbs and lamps	Provision of a Hazardous Waste Area with proper labeling, segregation and storage of wastes Transport, treatment and disposal by DENR accredited third party contractors	Proponent	No cost because this is being bought by DENR accredite d third party contracto rs	ECC Conditions TSD Permit conditions
Environmental Aspect # 3: Land clearing	The Air	Dust	 Road water sprinkling Tree nursery and tree planting 	Proponent	Part of Contract	ECC Conditions
		Noise	 Proper maintenance of construction equipment and vehicles The Contractor shall at all times comply with all current statutory environmental legislation. 	Proponent	Part of contract	ECC Conditions and DENR Standards on noise
Environmental Aspect # 4: transport of construction materials	D. People	Safety	 Strict implementation of DOLE DO 13-98 Health and safety policies Employee safety inspections and toolbox meetings Regular APE and use of PPEs First aid training Provision of ambulance and Clinic Provision of Fire Fighting System 	Proponent	Part of Contract	Contract provisions
		Employment	Employment generation	Proponent	Part of contract	Agreement with Contractor
		Traffic	Implementation of	Proponent	Part of	Agreement



		1				
			 Traffic management plan Coordination with local traffic bureau 		contract	with Contractor
			(barangay and			
II- OPERATION PHASE	=					
Environmental Aspect # 1: Solid waste accumulation	A. The Land	Solid waste pollution due to garbage	 Good housekeeping Provision of a Material Recovery Facility Recycle Sell recyclables Reuse Septic Vaults Disposal thru DENR- accredited 3rd party 	Proponent	10,000.00	RA 9003, ECC conditions and EIS commitment s
		Generation of sludge from septage	Septic tank management by desludging	Proponent	10,000.00	RA 9275
		Contamination and improper management of hazardous waste materials	 Provision of Hazardous Waste area with proper labeling, segregation and storage of wastes Management of transformer oil to prevent spills. Transport, treatment and disposal of DENR accredited third party contractors 	Proponent	15,000.0 0	RA 6969
		Generation of slags	 Proper stockpiling/storage Will be used as raw material for other uses 	Proponent	No cost	RA 9003
Environmental Aspect # 2: Operation of rolling mill facility	B. Water	Water pollution from run-off and domestic wastes	 Construction of rain water cisterns and collection ponds Regular ambient and effluent water quality monitoring using DENR standards Domestic wastewater management by connecting it to the water treatment facility Zero discharge/effluent 	Proponent	Part of Project Cost	ECC conditions and EIS Commitment s
		Use of river water for make up water	Address resource use competition; secure water permit	Proponent	Part of Project cost	Water Permit from NWRB
						ECC conditions and EIS Commitment s



	Inadvertent spill of domestic wastewaters that can cause pollution	 Establishment of WTP Use of 3-chamber septic tanks in all project facilities; Construction of wastewater canal to divert fugitive liquid waste streams into a containment and treatment area; Adoption of clean practices by all project operating units and personnel; Efficient waste retrieval system; Greening of project's compound. 			ECC conditions
	Pollution and blockage of portions of river due to solid wastes	 Implement a rigid solid waste collection and disposal system; Collaboration with LGU on waste management and recovery. 			ECC conditions
	Leachate of steel mill debris and spoils	 Steel litter recovery and recycling Install weirs to efficiently collect steel mill debris. 			ECC conditions
C. Air	Air pollution from fugitive dusts, equipment and vehicles	 65 meters stack height Training on power equipment and vehicle use and speed Proper maintenance, designation of no idling zone Routine plant maintenance and good house keeping Use of low sulfur fuel (LSFO or mixing with Diesel) use of enclosures, barriers and buffer zones Implementation of reforestation and Carbon-sink Program Insulate structures Installation of dust collectors 	Proponent	Part of Project cost	N.A.
	Greenhouse gas emission	Implementationofareforestationandcarbon-sink/greenhousegasreduction program	Proponent	Part of Project cost	ECC conditions



	Noise from	c	Duffor zone and the	Propopont	Dort of	FCC
D. The People	Noise from equipment and vehicles	•	Butter zone and tree planting Enclosed facility Provision of AC motors Scheduling certain high noise emitting works to more acceptable times of day; Enclosures for sources of noise Provide high fence within the plant's perimeter Provide a buffer zone on the adjoining boundaries Planting of trees on the buffer zone and plant's perimeter that will serve as noise barrier It is advisable that electrically-powered equipment should be preferred, where practicable, to mechanical powered plant will be used, it should be fitted with suitable silencers and mufflers; Defective equipment/parts with abnormal noise and/or vibration will be either repaired replaced; All employees working on site will be provided with PPE	Proponent	Part of Project cost	conditions
	Health and safety hazards	• • •	Health and safety policies Employee safety inspections and toolbox meetings Regular APE and use of PPEs First aid training Provision of ambulance and Clinic Provision of Fire Fighting System	Proponent		



II- ABANDONMENT PH	HASE				
Environmental aspect #1: Demolition of structures	A. The Land	Solid waste pollution/ contamination brought about by scraps and debris from demolished structures	 Good housekeeping Planting of endemic species or reforestation 	Proponent	
		Oil spill	Conduct of Environmental Site Assessment (ESA) prior to abandonment	Proponent	
	B. Water	Water pollution/ contamination	Conduct of Environmental Site Assessment (ESA) prior to abandonment	Proponent	
	C. Air	Air pollution because of dusts from demolished structures	Sprinkling of water	Proponent	
		Noise pollution from structures being demolished	No population center at construction sites	Proponent	
Environment aspect #2: plant closure or operation stoppage	D. The People	Loss of Jobs	 Payment of legal social benefits Retrenchment package Labor support programs 	Proponent	
		Health data of	Recording based on	Proponent	
		employees and communities	annual physical checkup of employees and data from Rural Health Units for the community	Proponent	



CHAPTER IV: ENVIRONMENTAL RISK ASSESSMENT AND EMERGENCY RESPONSE POLICY AND GUIDELINES

Introduction

Human safety is the major concern of the Environmental Risk Assessment (ERA) in the context of the PEISS. DAO 2003-30's RPM defined ERA as "a process of analyzing and describing the risks associated with a project activity to ecosystems, human health and welfare".

SteelAsia Manufacturing Corporation has high regard to the environment and is committed to serving its consumers' and stakeholders' social and economic needs by providing livelihood projects, technical trainings and career opportunities to deserving local residents of Brgy. Telabanca.

Annex 2-7e of the RPM provides for the guidelines on the degree of ERA requirements and preparation as provided below:

- Level 1: Preparation of an Emergency/Contingency Plan
- Level 2: Preparation of an Emergency/Contingency Plan and ERA Report

Based on the levels of coverage, it was preliminarily determined that Risk screening level is applicable after using the Guideline of DAO 2003-30 as follows:

Scope and Coverage

As required in the technical scoping agreement, the ERA details for this section will only be limited to the information provided in the succeeding section. These information will also provide the basis for further quantitative risk assessment in case will be required in the post EIA stage/process.

 Presentation of the different type of safety associated risk relative to the project's operation; Includes discussion on the conditions, events and circumstances which could be significant in bringing about identified safety risks

Description & assessment of the possible accident scenarios

Description of the hazards, both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the release of toxic substance (include unloading of raw materials/fuel), as applicable

 b) Presentation of the different type of physical risk associated to the project's operation; Identification of conditions, events and "trigger" which could be significant in bringing about identified physical risks

Description & assessment of the possible accident scenarios

Description of the hazards both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the failure of structure, as applicable.

c) Risk or Hazards Management measures or the general emergency procedures during the worst case scenario

Type of Risks

Safety Risks

Fire

Description and assessment of the possible accident scenarios

Probable major fires may not occur at the Plant. As an emergency measure, firefighting facilities, principally fire water lines, fire extinguishers and water hose stations and hoses will be installed at the Plant premises. Alarms will also be installed.

Explosion

Identification of conditions, events and circumstances which could be significant in bringing about identified safety risks

The elements for explosion which are the extraordinary/release of energy accompanied by rapid increase in volume of explosive materials are not present in this Project.

Description and assessment of the possible accident scenarios

The possible accident scenarios and the affected population are related to the operation of the major plant equipment and auxiliaries which are not present in this Project.

The instrumentation system of the plant is provided with control, measurements, recording and response mechanism to prevent equipment failures that may result in accidents. Pressure relief valves are installed in sensitive points to cause release of gases away from personnel. Unit or equipment shutdowns are automatically built in the instrumentation system.

Movement of personnel to high structures.

Plant operators and maintenance personnel may necessarily climb to high structures as routine part of their functions. Thus the potential for falling off from these structures exist.

Movement of vehicles

Delivery trucks for materials will necessarily enter the plant premises. Only accredited vehicles and drivers may be allowed to enter the plant, Road signages will be posted conspicuously at strategic places.

Release of Toxic Substances

There are no toxic substances associated with the Project. Even if such is the case, the proponent will implement health hazard control programs on different levels as follows:

- A. Engineering controls
- B. Administrative controls:
 - 1. workplace and community level monitoring for noise, dust and smoke emissions;
 - 2. information, education and training strategies for workers
 - 3. dialogue, information and education of community members on health hazards of concern;
 - 4. provision of adequate housing and sanitary facilities for workers;
 - 5. personal hygiene facilities for workers; and
 - 6. immunization and/or medical prophylaxis for areas where endemic diseases are present.
- C. Personal protective equipment (PPE):
 - 1. dust mask and other respiratory protection or workers;
 - 2. ear protectors (either muffs or plugs) for workers; and
 - 3. hard hats and other safety PPE for workers.
- D. Proper storage of hazardous waste

Storage is the holding of waste for a temporary period of time prior to the waste being treated, disposed, or stored elsewhere. Hazardous waste is commonly stored prior to treatment or disposal, and must be stored in containers, tanks, containment buildings, drip pads, waste piles, or surface impoundments that comply with DENR regulations.

Busted lamps and bulbs and used automotive batteries are among the hazardous wastes that may be generated. These may be stored in containers or any portable device in which a hazardous waste is stored, transported, treated, disposed, or otherwise handled.

- E. Disaster management prevention and minimization:
 - 1. there must be a provision for a medical clinic at the plant site:
 - first aid and emergency plan for plant accidents which needs trained people and detailed steps 2. to include transport facilities and communication with the referral hospitals;
 - 3. disaster plan in case of excessive emissions of pollution, and

Toxic Metals in Air

Under the Philippine Clean Air Act, the emission limits for stationary sources (new facilities) for mercury and lead are: 5 mg/NcM and 10 mg/NcM respectively.

Under the Toxic and Hazardous Wastes Law (R.A. 6969) following are the limits for metallic elements:

Elements

Maximum Concentration Includes all wastes with a total Hg concentration > 0.2 mg/ 1. Mercury & mercury compounds Also include organ mercury compounds



2. Lead compounds mg/l

Includes all wastes with a total Pb concentration > 5

Complete inventory of hazardous wastes, incorporating the inventory in the emergency response plan for hazardous wastes with high risks Or

List of the Identified Hazardous Substances within the Plant and its Physical and Chemical Properties

Nature of hazardous wastes	Source/Generator	Inventory (Initial estimate only)
Accidental Oil spills	From vehicles and plant	Variable but small in quantities
Spent lighting bulbs	Equipment Lighting for Offices and Plant premises	To be determined but small in quantity
Spent computer parts for office use only	Office computers	Small in quantity
Oil Sludges	From Storage Tanks	Generated only during tank cleaning which is undertaken after several years of operation, thus minimal volumes

Physical Risks

On-site or off-site contamination of oil or any hazardous waste during plant's operation

In case of on-site or off-site contamination of oil/lubricants or any hazardous waste during plant operation management procedure or plan for the rehabilitation or corrective measures such as the following will be undertaken:

- For hazardous wastes that will be generated such as busted bulbs and lamps, LED lamps, used oil and used batteries, disposal will be done thru 3rd party DENR-accredited Treaters. Used oil will be collected and put inside sealed drums, stored in a company designated Material Recovery Facility (MRF) inside the plant. It will be transported and treated by a DENR accredited TSD facility.
- 2. Busted Fluorescent Bulbs will be put in a container, stored inside the plant MRF in accumulation until there are sufficient inventory for proper disposal through a DENR accredited TSD facility.
- 3. Contaminated rags and gloves will also be put in bags, stored inside the plant MRF in accumulation until there is sufficient inventory for proper disposal through a DENR accredited TSD facility.
- 4. Used automotive batteries will be traded-in to designated suppliers.
- 5. Remedial measures will be undertaken for soil contamination.

Breakdown or Failure of Equipment and Facilities

Temperature Extremes as Precursor to Accidents

At worst case scenario extreme temperature rise is predicted at 2.4^oC for a short term period of June/July/August in 2050. At the peak ambient temperature at this time of 29.3^oC the effect on operations and maintenance personnel is unlikely.

Indirect adverse effects even if unlikely have to be factored in the design of equipment and safety system, noting that process design take into consideration ambient conditions, e.g., temperature. Failure of systems (e.g. instrumentation) may in theory trigger accidents.

Rainfall Extremes as Precursor to Accidents

Aberrations in predicted rainfalls are seen from the above table. Certain months exhibit decrease in rainfalls while in other periods increase is predicted. These predicted increases are however, not



expected to trigger accidents in the operation of the plant. Potential effects of heavy rainfalls are flooding. The plant however will be designed for appropriate drainage system.

Hazard Analysis

Natural Hazards

"Hazard is a potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. It can include latent conditions that may represent future threats and can have origins, natural (geological, hydrometeorological and

"Natural Hazards" are the natural processes or phenomena occurring in the biosphere that may constitute a damaging event. It can be classified by origin: geological, hydrometeorological or biological.

Floods

Floods usually occur during or after heavy rainfall wherein the river channels are saturated with water resulting to river swelling and overflowing of floodplains. The project area falls in moderate susceptibility to flooding as delineated by Mines and Geosciences Bureau. The project site could experience "localized flooding" if the drainage systems are inadequate and not fully maintained.

Earthquake

Earthquake is the perceptible trembling to violent shaking of ground caused by either tectonic movements or volcanic activity. The Philippines is located near or along the so called "earthquake belt" and is prone to seismic hazards. Areas that are susceptible to this seismic hazard are those underlain by unconsolidated soils and sediments deposited on the low-lying areas.

Social

In terms of Social aspect, following are the concerns during abandonment phase:

- Loss of jobs thru loss of income
- Loss of taxes paid to the government
- Loss of independent economy dependent on the project
- Loss of projects by contractors

On top of all of these measures, SteelAsia Manufacturing Corporation has formulated its Emergency Response and Disaster Preparedness Plan (DPP) provided below:

1. Introduction

The Emergency Response Procedure (ERP) is a consolidated compendium of guidance for management of emergencies in all phases of the project cycle starting from the construction stage to the abandonment phase.

An Emergency Situation is defined as any situation or occurrence of serious nature which may develop suddenly and unexpectedly, posing threat to life, property or even the environment that demand immediate action, including, but not limited to accidents, fire, explosions, acts of terrorism and sabotage.

The success of this plan depends upon the cooperation of everybody at the site of an emergency and adherence to safety precautions and directives of this plan. The prime concern is everybody's safety which requires unwavering discipline and preparedness.

This plan reflects the Management System that is applied to ensure compliance with SteelAsia Manufacturing Corporation's standards and other applicable Philippine legal requirements pertaining to rolling mill operations.

The scope of this "Plan" is to set the minimum standards required and identifies the persons responsible for applying safe working conditions, procedures and practices including emergency situations potentially arising from plant operations. Whether natural or man-made the accidents or consequences of hazards will not be societal in scope but most confined to the plant personnel.

Notwithstanding that there are preventive measures to be undertaken, e.g. in the design and construction of major equipment, in the storage of diesel oil, it is prudent for operating companies to develop their internal response plans.



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The response and procedure will depend on the nature of the emergency and will include the following generic guidelines:

- Establishment of official detailed responses per type of emergency; Thus each plan would be relevant to emergency situations such as fire, earthquake, and even from attacks of criminal elements.
- Contact of necessary and important agencies and offices outside of the plant and facility for assistance depending on the type of emergency;
- Sought after or obtaining the assistance of the Disaster Reduction and Management Coordinating Council;
- Conduct of emergency drills with emergency evacuation as an integral part of the drill;
- Installation or securing of necessary emergency response facilities/equipment, e.g. firefighting system, oil spill containment boom (in an event of accidental oil spill at the jetty), vehicles for use in emergency cases, situations and disasters; and
- Setting up of communication lines, e.g. with barangay, fire department, police department, clinics or hospitals.

During actual emergencies

- Designation of on-site emergency marshal;
 - The on-site team leader should be pre-determined. Night shift supervisors are the logical leaders during night time emergencies.
 - In case of more serious situations, the on-site team leader may have to call assistance from his supervisor who may be outside the plant premises.
- Communicating with outside parties for help when necessary: Contact numbers and means of communications should be well-established and be posted in conspicuous places in the plant premises and buildings.
- Execution of emergency procedure; and As a basic first step, emergency alarm signals should be set on. The alarms may be coded depending on the type and seriousness of an emergency.
- Evacuation of personnel: Evacuation routes should be well defined and known to the plant personnel.

After emergency

- Audit or investigation of cause of emergency, if man-made such as fire;
- Assistance to injured people

2. Purpose

The ERP will serve the following general and important purposes:

- Guide and assist the proponent including all its employees, construction contractors' management, and other service provider/suppliers to handle emergency situation;
- Pre-identify responsible parties including their roles and responsibilities in handling emergency situations and cases;
- Achieve Zero Loss Time Injury, Occupational Illness and minimize the rate of incidents
- Comply with the Philippine legal requirement and international standards for handling emergency, health and safety practices and measures; and
- In case of emergency situations/cases and abnormal conditions, prevent contamination to ground water, surface ground stability, destruction of flora and fauna and if they occur take measures to manage them in timely, safely and environmental friendly manner.

3. Emergency Action Team (EAT)

The Emergency Action Team (EAT) shall be responsible for execution of the ERP. The Team is composed of:

During the Construction Work:

- Chief Marshall Construction/Project Manager,
- Members LGUs including the Police Department, Fire Department, National Risk Reduction Committee members and the Health Department..

Under the general supervision of the Plant Manager, the EAT will be responsible for providing direction, guidance, and taking appropriate measures in safeguarding life and property. The EAT will also maintain close liaison with the Project Proponent and affected communities/people.



During the Operations Phase:

For serious accidents or emergencies the EAT shall be headed by the most senior personnel of the Proponent who would be at the site of the emergency.

Emergency Action Officer

Emergency Response Procedures shall be under constant close supervision of the Emergency Action Officer (EAO). The EAO shall maintain central control of the execution of the plans. All incidents under emergency situations shall be reported to him. The EAO shall command, coordinate, communicate and direct necessary actions and measures. The mandate of EAO is to establish command and control. However, this does not preclude abstinence of others, especially supervisory employees, from emergency tasks requirements.

In addition to the emergency duties, the EAT shall provide training and/or arrange drills around the year so as to train employees on handling emergency situations.

Threat/Emergency Analysis

When there is an emergency incident e.g. fire or any type of threat or emergency as mentioned below, the first person who sees, hears or recognizes danger should immediately inform the EAO.

Designation of Safe Haven

Safe Haven is a place of safety, shelter, refuge or rest where there is no danger to life. Based on the type of incident, the safe haven shall be determined and designated where the people affected by an emergency situation shall proceed. In case of fire or explosion, the Safe Haven shall be the open space distant from the fire site.

By nature of the project the site is an open area; the safe haven should be pre identified and well informed to all the personnel.

Evacuation Policy

In the event of any emergency, an alarm or siren or alternately a sound generating devise shall be blown / activated. The alarm may be coded to signify the intensity and nature of the emergency situation. The EAO shall direct and provide guidance to all persons affected. All affected persons shall be enjoined to strictly follow as instructed.

The evacuation route/roads will be clearly delineated.

4. Standard Operating Procedures

Fire

All persons near the fire site should be evacuated. Firefighting shall be handled by the EAO in the beginning until assistance from the LGU shall have been obtained.

Acts of Sabotage

Act of sabotage may cause fire, explosion, or damage to life and property. If a threat of sabotage is identified, the Emergency Action Team shall analyze and assess the impact of such sabotage and will determine course(s) of action. The EAO shall maintain liaison with the concerned government agency (ies) e.g. Bureau of Fire Protection, Police Department, etc. Should a fire or explosion happen due to sabotage, the corresponding procedure specific to the situation shall be followed.

Terrorist Attacks or Kidnappings

The EAT shall analyze, assess and maintain constant but safe contact with the attackers, review all incoming and outgoing communications, designate or task others for action. The EAO shall ensure compliance of the planned strategy and psychological tactics to counter terrorism and provide guidance for dealing with these incidents. An officer shall be designated to maintain direct or indirect contact with the kidnappers, maintain liaison with the Client and other pertinent Government Agencies, principally the police or the military.

Natural Disasters

Natural disasters such as landslides and earthquakes are beyond human control with respect to occurrences. The EAT shall analyze the situation and take appropriate measures. In the event of



earthquake, construction workers shall come out of their workplaces, wear hard hats, and assemble at Safe Haven. Search and Rescue Team shall start search and rescue operations when needed.

As a matter of complete guidelines natural disasters are included although the occurrence of such are deemed remote.

Severe Weather Disturbances

Extreme rainfall and strong typhoon events should be prepared for.

The most effective measure is precautionary action. Constant communications with the PAG ASA and the NDRMC should be made. Warnings which are posted at the websites should be constantly referred to. Work stoppage may be mandated by management when severe weather disturbances may be forthcoming. The movements of vehicles should be regulated on account of dangers slippery roads.

Search and Rescue Team

This team shall work in close cooperation with the LGUs. The primary function of this team is to handle the smooth evacuation of personnel, supplies and personal belongings during the emergency. It is also the duty of this team to rescue personnel trapped or injured in any of the rooms of the building.

Coordination and Communication

One of the most important aspects in any Emergency Response Procedure is efficiency of immediate communications with the parties which will manage an emergency situation.

In an event of fire, explosion or an act of terrorism and sabotage, the EAO shall maintain constant coordination and communication with other senior officers at site or the department heads to locate employees trapped in a work area and take appropriate measures to evacuate them.

Transportation

The EAO shall plan ground transportation of personnel or evacuees for transport to the city, hospital, medical professionals, etc.

Funds and Expenditures

Under the direct supervision of the Project Manager, the EAO shall manage funds for meeting emergency expenditures. This includes, but is not limited to, transportation, medication, expenditures arising out of emergency treatment, hospital and medical expenses, etc.

During the operations phase, the Proponent shall ensure that the emergency response plans are properly supported by funds and resources, the latter involving people and equipment.

Emergency Numbers/Contact Persons

A list of the emergency contact information is provided below: Table 4.1: Proforma List of Emergency Contact Numbers

OFFICE	Contact	Email
LGU	(043)7400157; 7402618	Ima_lemery@yahoo.com
DRRM	0915-676-1424/726-3223	mdrrmo.lemery@gmail.com/mdrrmo.lemery@yahoo.com
RESCUE	09156761424 / 740-0157 / 0905-485-4388	
PLANT		

The emergency numbers/contact persons shall be posted in conspicuous places especially in the construction work temporary offices and in the toll booths, the latter during the operations phase.

Emergency Drills

A protocol will be developed for the conduct of emergency drills at regular schedules.

Administration of first aid especially involving vehicular accidents is among the important drills/training that will be imparted to the EAO for the operations phase.

Trainings and Seminars

The Proponent shall organize and conduct regular trainings and seminars to be conducted by professionals in safety and emergency management. Attendance to these on the part of the personnel



shall be compulsory. Members of the LGUs as well as heads of community sectors/sitios/tribes shall be invited as well for their own education.

Among the topics to be discussed during these training programmes are: proper use of Personnel Protective Equipment (PPE), First Aid, Basic Life Support such as Cardiopulmonary Resuscitation; training in the handling of injured persons; training in search and rescue operation and fire-fighting. The assistance of NDRRMC at least from the City level in conducting drills or training for earthquake situations should be explored.

5. Institutional Set Up

The Plant Team will constitute themselves as the Emergency Response Team. Inasmuch as by its nature the occurrences of emergency situation cannot be reasonably anticipated the most senior personnel at the scene of an emergency situation will be designated as On Site Emergency Marshall. The supporting personnel will be dependent on the nature/extent of the emergency and the number of persons who may be exposed.

Provided in Annex D is the detailed ERA and ERP of SAMC which are components of its ISO Certification.



CHAPTER V:SOCIAL DEVELOPMENT PLAN (SDP) AND IEC FRAMEWORK

5.1 The Social Development Plan (SDP)

The Proponent will be undertaking SDPs in consonance with it Corporate Social Responsibility (CSR) mission, which includes but not limited to the following:

- Skills training to prepare the community for employment opportunities during the construction phase of the project
- Sustainable livelihood training programs
- Environmental/Climate Mitigation Actions: Reforestation and Carbon Sink Programme

The SDP Framework provided in the Table 5.1 below shows programs needed by the community based on the perception survey conducted and issues and concerns raised during the Public Scoping and Public Consultation.

Attached in Annex D is the complete documentation of the Public Scoping.

5.2 The Information, Education and Communications (IEC) Implementation Plan

The IEC started as early as 2015 when the Proponent started series of dialogues with the LGU and land owners. This IEC will be a continuing process through the life of the project.

IEC necessarily involves several media and forms such as perception surveys, public consultations or Focus Group Discussions (FGDs) or print media.

The generic IEC Plan/Framework is shown in Table 5.2-1.

The SDP and IEC provided are generic in nature. These will be updated before project implementation thru consultations with stakeholders concerned.

CONCERN	Responsible Community Member / Beneficiary	Government Agency/ Non- government Agency and Services	PROPONENT	Indicative Timeline	Source of fund
Livelihood / Employment (Men, Women, Youth & elderly) Skills training to prepare the community for employment opportunities during the construction phase of the project Sustainable livelihood training programs	Qualified Project Affected Men, Women, Youth & Elderly	 Barangay Council City Council TESDA 	Community Relations Officer	Construction Operation	LGU – IRA/ Propone nt
Education and Recreation	Barangay Kagawad for Education • Project-affected Families	• DepEd	Community Relations Officer	Construction Operation	Same
 Environment and Sanitation Reforestation and Carbon-Sink Program Tree nursery Climate Change and Disaster preparedness Adoption of Rivers for clean-up Coastal Clean-up Adoption of Mangrove 	Barangay Kagawad for Environment • Project Affected Community	• CENRO • CHO	Community Relations Officer	Construction Operation	Same

Table 5.2-1: Preliminary Social Development (SDP) Plan/Framework¹



ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project SteelAsia Manufacturing Corporation

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CONCERN	Responsible Community Member / Beneficiary	Government Agency/ Non- government Agency and Services	PROPONENT	Indicative Timeline	Source of fund
area beside the project					
site					
Peace and order	Barangay Kagawad	• LGU	Chief Security	Construction	Same
	for Peace and order	• PNP	Officer	Operation	
	 Project Affected 				
	Community				
Climate Change Adaptation	Barangay and	LGU	Safety Officer	Construction	Same
and Disaster Risk	municipal Disaster	NDRRMC	-	Operation	
Reduction and	Risk Reduction and				
Management	Management Council				

¹ The SDP of the project shall be derived from and aligned with, the LGU's existing SDP. The project's SDP normally aims to prevent/mitigate and/or enhance a project's adverse and positive impacts, respectively, on people's livelihood, health and environment. The process of formulating the project's SDP shall be actively participated in by Barangay Council, the Municipal Planning and Development Office (MPDO) and/or other Government Agencies whose mandates cover the management of impacts posed by project operations, e.g. DOH who may coordinate with the Proponent on the conduct of health impact studies or conduct of medical mission(s).

Target Sector Identified as Needing Project IEC	Major Topic/s of concern in Relation to Project	IEC Scheme / Strategy Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
1.Residents of Brgy. Telabanca	Awareness for the people on the actual impacts & mitigating measures of the Project and concerns related to Climate Change Adaptation and Disaster Risk Reduction (CCA-DRR) specifically capacity- building for Barangay and Municipal Disaster Risk Reduction and Management Council	Group methods Multi-media	 Stakeholders' Consultative Planning Session / Community Projects Planning Sessions Informal discussion/ / meeting with stakeholders Climate Change Adaptation and Disaster Risk Reduction and Management Seminar and workshop 	Annually Monthly	35,000.00
2. Students of elementary schools of impact barangay, i.e. Brgy. Telabanca		Group methods	 Educational Tour with the four elementary schools of the impact barangays 	Once a year	50,000.00
3. Stakeholders meeting		Group methods	Stakeholder's meeting	Once a year	25,000.00
4. SteelAsia Manufacturing Corporation	Awareness and safety	Group methods	 Annual Safety program Safety Inspectors 	Once a year	Part of company budget for

Table 5.2-2:Generic IEC Plan/Framework
ENVIRONMENTAL IMPACT STATEMENT (EIS) Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Project



SteelAsia Manufacturing Corporation

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employees	Training First Aid Training Hazard Identification and Risk Assessment Training Climate Change Adaptation and Disaster Risk Reduction and Management	employees
	Seminar	

Grievance Redress Mechanism (GRM)

In order to avoid conflict and misunderstanding among employees and the community, SAMC implements the following mechanism:

- 1. Grievance hotline in different Departments to report any suspected violation in the Code of Ethics or any concerns
- 2. Regular coordination with barangays thru meetings
- 3. Provision of Bulletin Boards at the Plant site and in the Barangays
- 4. Reporting to LGU on any issue or concern to the barangay and/or to the LGU of the Municipal Government of Lemery
- 5. Dedicated Resident Manager who also acts as Community Relations Officer



CHAPTER VI: ENVIRONMENTAL COMPLIANCE MONITORING

6.1 Self-Monitoring Plan

Provided in Table 6.3 is the Self-Monitoring Plan as per Annex 2-20 of RPM for DAO 2003-30. Below is the definition of EQPL-Environmental Quality Performance Level:

	Table 6.1-1: EQPL Definition
EQPL Level	Description
Alert or Red Flag	early warning
Action Level	point where management measures must be employed so as not to reach the regulated threshold or limit level, or to reduce deterioration of affected environmental component to pre-impact or optimum environmental quality
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.

Provided in Table 6.5-1 is the Environmental Monitoring Plan (EMoP) with ENVIRONMENTAL QUALITY PERFORMANCE LEVELS (EQPLs). The EQPL Criteria/Guidelines above are interim and could be best firmed up with the MMT prior to construction phase.

6.2 Multi-Sectoral Monitoring Framework

As per DAO 2017-15, the vigilance of the public especially stakeholders living or working near the project site shall be used as tool in effectively monitoring and managing environmental impacts of projects.

The Public especially the stakeholders shall be encouraged participate in the monitoring of environment impacts by visiting the EMB Website for relevant information about projects that are being implemented in their respective areas including monitoring reports and providing relevant feedback. Among the information that shall be made available through the EMB Website are the following:

- Updated status of proponents' compliance with the requirement to submit CMR
- The latest MMT reports as described in Section 16
- Updated EMP, as needed
- Amendments, if any
- Cancellation, if any

Online feedback mechanisms shall be instituted.

Provided below is the list of stakeholder-members of the MMT for the project:

Table 6.2-1: MMT Composition

	Stakeholder-Members
LGU F	Representatives
•	Municipality of Lemery / MENRO
•	Rural Health Office Chief
•	Brgy. Mataas na Bayan Captain
•	Brgy. Balanga Captain
LGU-A	Accredited Local NGO
2 reps	from locally-recognized community leaders
3 reps and in	from government agencies with related mandate on the type of project project during operations

6.2.1 Functions of the Multi-Partile Monitoring Team (MMT)

As an independent entity whose membership represents the stakeholders / public, the MMT is expected to add credibility by being open and transparent in monitoring environmental impacts and compliance with the Philippine EIS System requirements.



The MMT shall have the following specific functions:

- a.) Conduct quarterly ocular site visit to validate the proponent's compliance with the ECC conditions and the Environmental Management and Monitoring Plan including the requirement to conduct self-monitoring and submit corresponding reports regularly. The MMT may observe sampling activities conducted by the project proponent.
- b.) Prepare and submit its reported to EMB-CO and EMB-RO concerned using EMB-prescribed format at least semi-annually not later than July 30 for the first semester report and January 30 for the 2nd semester report
- c.) Institute and environmental emergency and complaints receiving and management mechanism which shall include systems for transmitting recommendations for necessary regulatory action to EMB in a timely manner to prevent adverse environmental impacts.

6.2.2 MMT Formation and Operationalization

- a. After the issuance of ECC for ECPs, the project proponent shall initiate the formation of the MMT based on the above policy updates in compliance to the relevant ECC condition. A Memorandum Agreement (MOA) between EMB-CO and PROPONENT based on a pro-forma to be provided by EMB shall be executed with conformity of members of the MMT as identified based on Section 15.3 of this Order. The MOA signed by the proponent and the new members the project proponent shall submitted to EMB CO for final approval within the deadline specified in the ECC.
- b. A MMT Manual of Operations (MOO) shall be formulated / updated based on these policy updates. The MOO shall guide the MMT in planning its activities.
- C. In the conduct of its quarterly site visit, the MMTs shall implement the usual procedures including a closing meeting where the MMT findings shall be discussed with the representative of the project proponent.
- d. MMTs who do not submit the required reports, those who fail to submit its report before the deadlines or submits incomplete reports for one (1) year shall be suspended until such time that such requirements are complied with.
- e. Individual MMT Members who violate the code of ethics shall be subject to suspension/ removal/replacement/ by the chairman of MMT or any other disciplinary action as indicated in the MOO.
- f. All other existing guidelines consistent with the provisions of this DAO shall still be in effect.

6.3 Environmental Guarantee and Monitoring Fund Commitments

DAO 2017-15 also laid down the guidelines for the fund commitments as follows.

- a. The Proponent shall provide funds for the EMF, the amount of which shall be based on the annual work and financial plan (A WFP) to be approved by the EMB-CO. All EMF's established without and MMT shall be returned to the project proponent. No new EMF's shall be established without and MMT.
- b. The EMF administration and management shall be prescribed in the MOO and should contain at the minimum, the following provisions:
 - Eligible Expenses and Standards
 - Preparation and Approval of Work and Financial Plan for the establishment of the amount of EMF
 - Management of Fund
 - Disbursement and auditing procedures
- C. The mode of fund administration shall be decided upon by the project proponent in consultation with the MMT and should consider the MMT's independence. The Fund Administrator shall accept the



fund administration and management responsibilities as reflected in the MOO and shall be liable for any misapplication or inappropriate disbursements allowed to be charged against the EMF.

- d. The Fund Administrator shall open an account with a government accredited bank, with the elected Chairperson or Treasurer of the MMT as signatory and the representative of the Fund Administrator as counter signatory.
- e. The Proponent shall release the amount of funds based on the EMB-approved a WFP initially, equivalent to the projected expenses for the first three quarters and succeeding releases shall be done semi-annually upon liquidating expenses and validating submission of the MMT Report to EMB for the previous reporting period. The proponent shall conduct regular audit of the EMF and apprise EMB on irregularities, if any.
- f. MMT members especially those who will lose their opportunity to earn while participating in MMT activities shall receive honoraria of not more than PhP 2000.00 per quarter for their participation charged to the EMF. A contingency of not more than 50% of the total amount allotted for the honoraria and for logistical expense for regular activities may be allotted emergency meetings, capability building and other related activities.



ENVIRONMENTAL IMPACT STATEMENT (Proposed Scrap Recycling Steel Mill for Structural Shapes and Sections Prc SteelAsia Manufacturing Corpora

Brgy. Mataas na Bayan and Balanga, Lemery Batar

	Potential Param	Param			Lead	d	EQPL MANAGEMENT SCHEME						
Key Environmental Aspects per Project	Impacts Per	eter to	Method	Frequen	Locati	Perso n	Annual Estimated	EC	PL RANG	E	MAN M	AGEME	NT
Phase	Environm ental Sector	Monito red		су	on		Cost in PhP	ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI
PRE- CONSTRUCTION PHASE						NOT A	PPLICABLE						
I. CONSTRUCTION PHA	SE				1		1	1					
Environmental Aspect # 1: The Land: Land clearing	Increased sediment deposition	Silts in drainag e system	Desilting of canals	Quarter ly	Existin g station s	Propon ent	10,000	Visual observati on of silt depositio n	Immedi ate clean- up	Total clean- up	Presence of Complai nts	IEC	Regu coordi tion w stakel ders tl regul IEC
Environmental Aspect # 1: The Land – solid wastes/garbage accumulation	Soil contaminatio n / pollution	Scraps and debris	Observation	Quarter ly	Workin g areas	Propon ent	10,000	Uncollect ed garbage	Coordin ate with the garbage hauler immedi ate collectio n of garbage	Ensure regular garbag e collecti on	Presence of Complaint s	IEC	IEC
II. OPERATIONS PHASE								, 					
Environmental Aspect # I: The Land - Generation of solid wate	Soil contaminatio n	Heavy metals	TCLP/AAS	Annuall y	Area near hazwast e storage	PCO	50,000				Presence of Complaint s	IEC	Regu r coor natio with stake older

Table 6.2-1:SUMMARY OF ENVIRONMENTAL MONITORING PLAN (EMoP) with ENVIRONMENTAL QUALITY PERFORMANCE LEVELS (EQPLs)



	Potential	ial Param	Method	Frequen cy		Lead	Annual Estimated Cost in PhP	EQPL MANAGEMENT SCHEME						
Key Environmental	Impacts Per	eter to			Locati	Perso n		E	QPL RANG	E	MANAGEMENT MEASURE			
Phase	Environm ental Sector	Monito red	Method		on			ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI	
													thru regul IEC	
Environmental Aspect #	Generation of EAF dust	Heavy metals	TCLP/AAS	Annuall v										
1: The Land	Generation of slags	Heavy metals	TCLP/AAS	Annuall v										
Environmental Aspect # 2: The Water - Use, Operation and Maintenance of Equipment	Water pollution from used oil	BOD ₅	Azide Modification- Dilution Technique (USEPA method 3010)	Quarter ly / Per DAO 2003 - 07	Hand pump tube well in Barang ay Mataas na Bayan and Balang a	Project Propone nt	7,000	6,000	5,000	7	Review performan ce	Check WWTF	Regu r main nanc of WWT	
Environmental Aspect # 3:	Ambient air pollution: Increase in dust generation	TSP	(S)24 hr High Volume (A)Gravimetri c USEPA 40 CFR, Part 50	Quarter ly		Propone nt through PCO; MMT	100,000.00	400 ug/Ncm	500 ug/Ncm	600 ug/Nc m		Chec k APC D	Stop operat n	
The Air – plant operation	, Increase in exhaust or SOx and NOx emission	SO2	(S)24 hr Gas Bubbler (A) Pararosanilin e Method (West and	Quarter ly			Part of Operating Cost	126	144	180		-do-		



	Potential Impacts Per	Param eter to be Monito red	Method	Frequen cy	Locati on	Lead Perso n	d O Annual Estimated Cost in PhP	EQPL MANAGEMENT SCHEME						
Key Environmental Aspects per Project								EQPL RANGE			MANAGEMENT MEASURE			
Phase	Environm ental Sector							ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI	
			Gaeke Method)											
		NO2	S)24 hr Gas Bubbler (A) Griess- Saltzman or Chemi Iuminescence Method	Quarter ly			Part of Operating Cost	105	120	150		-do-		
		PM10	Quarterly	Quarter ly			Part of Operating Cost	70% of the CAA limit	80% of the CAA limit	90% of the CAA limit	Conduct adjustm ent of the unit's operatio n as per operatin g manual.	Check APCD	Stop opera on until the proble m has been resolv ed.	
Environmental Aspect # 3: The Air – Operation of Rolling Mill	Greenhous e gas emission	CO ₂ , CH ₄ , and N ₂ O Emissi ons based on IPCC 2006 Guideli nes	Implementati on of Reforestation and Carbon- Sink / greenhouse gas reduction program			Propon ent	Part of Operating Cost	Unattende d reforestati on commitme nt	80% reforestati on	60% reforesta tion a	Immediate planting of trees and revegetatio n	Revie w refore statio n and carbo n sink progr am	Furth study revision of the progra	



	Potential	Daram				Lead	d	EQPL MANAGEMENT SCHEME						
Key Environmental Aspects per Project	Impacts Per	eter to	Method	Frequen	Locati	Perso n	Annual Estimated Cost in PhP	EQPL RANGE			MANAGEMENT MEASURE			
Phase	Environm ental Sector	Monito red		су	on			ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI	
		and USEP A Proced ure												
Environmental Aspect # 3: The Air – Operation of Melt shop	Generation of EAF dust	Heavy metals	TCLP/AAS	Annuall y		Propon ent					Immediat e repair, conduct regular maintena nce	Repla ceme nt of parts and condu ct regul ar maint enanc e	Stop opera on	
Environmental Aspect # 3: The Air –Operation of equipment and vehicles	Increase in sound levels from operation activities	Sound levels	Sound measurement s using handheld sound meter	Quarter ly		Propon ent	To be determined	does not exceed 71.6dB	does not exceed 76.6 dB	does not excee d 81dB	Investigat e and identify source of noise	Identific ation of the source of noise and check buffer zones and noise attenuati	Asse: perfori nce (the attenu on measu s, emple correc e measu	



	Potential Baram					Lead		EQPL MANAGEMENT SCHEME						
Key Environmental Aspects per Project	Impacts Per	eter to	Method	Frequen	Locati	Perso n	Annual Estimated	EQPL RANGE			MANAGEMENT MEASURE			
Phase	Environm ental Sector	Monito red	mothod	су	on		Cost in PhP	ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI	
												on measur es	s and insta additic I measu s if necess y	
Environmental Aspect # 4: The People	Traffic congestio n	Traffic condition / Road Accessib ility	Visual: Number of vehicles per report of Receiving Clerl Representatior with the LGU regarding road network and its infrastructure plans Traffic Impact Assessment	r Daily	Access Road	Project Proponen t	Part of the Proponent's responsibilities	20 minutes traffic	Half hour traffic	1 hour traffic	Deploym ent of traffic enforcers	Increas ed deploy ment of traffic enforce rs	Revie traffi mana progra anc impa asses ent a revis	
	Accidents	Numbe r and Nature	Records from Clinics Safety Records	Monthl y	NA	Health and Safety	No cost	5	10	10	Evalu pi	ation of s rocedure:	afety s	
IV. ABANDONMENT P	HASE			1	1	1								
Environmental Aspect # 1: The Land: oil spill	Soil contaminatio n	Heavy metals	TCLP/AAS		Area near hazwas te storage	Propone nt	50,000		Арр	ly remed	ial measure	S		



	Potential Lead							EQPL MANAGEMENT SCHEME							
Key Environmental	Impacts Per	eter to	Method	Frequen	Locati	Perso n	Annual Estimated	EQPL RANGE			MANAGEMENT MEASURE				
Phase	Environm ental Sector	Monito red	method	су	on		Cost in PhP	ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI		
Environmental Aspect # 2: The Water	Water pollution/ contaminati on	 BOD₅ Total Colif orm Fecal Colif orm Total Susp ende d Solid s (TSS) pH 	Environmental Site Assessment (ESA) that will be conducted prior to abandonment			Propon ent thru PCO; MMT	To be determined	Based on	ESA recor	mmendati	ons				
Environmental Aspect # 4: The People	Employme nt	No. of employe es	Quarterly	Brgy. Mataas na Bayan and Balang a	Comrel	150,000 00	70% implementati on of employment program	60% implement ation of employme nt program	100% implement ation of employme nt program	Review progra ms	Revise program s	Enhan ce progra m imple menta tion	Emplc ment		
	Environme ntal Aspect # 1: The Land: oil spill	Soil contamin ation	Contaminated soil TPH (C6- C36) USEPA priority	USEPA 8260C USEPA 8015C USEPA	Once before decommis sioning	Hazardo us Waste Storage Area	PCO	50,000	80 0.8	90 0.9	100	Investig ate source of contami nation and	Invest te and streng en impler ntatior meası		



	Potential Pa	Param				Lead		EQPL MANAGEMENT SCHEME						
Key Environmental Aspects per Project	Impacts Per	eter to be	Method	Frequen	Locati	Perso n	Annual Estimated Cost in PhP	EQPL RANGE			MANAGEMENT MEASURE			
Phase	Environm ental Sector	Monito red		су	on			ALERT	ACTION	LIMIT	ALERT	ACTIO N	LIMI	
			pollutant metals (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, TI,Zn VOCs	7470A USEPA 6020A USEPA 8260 USEPA 8270					1.6 40	1.8 45	2.0 50	implem ent correcti ve measur es	S	
	Livelihood opportuniti es for local people and entreprene urs	No. of Program s impleme nted	Survey / FGD	Quarter ly	Lemery	Comrel	150,000.00	60% implem entation of program s	100% implem entation of program s	Revie w progra ms	Revise program s	Enhan ce progra m imple menta tion	Livelik ood oppor unities for local people and entrep eneur	
	 Total taxes paid to the national governme nt Developm ent of 	Total taxes paid	Real Property Tax payments	Quarter ly	Lemery	Comrel		90% availme nt	70% availme nt	60% availm ent servic es	Review availmen t and identify issues	Coordi nate with LGU to deter mine if there are	Revis polic and implei nt amen ents a enhar men	



Potential EQPL MANAGEMENT SCHEME Lead Param Impacts MANAGEMENT Perso **Key Environmental** eter to Annual EQPL RANGE Per Frequen MEASURE Locati n Aspects per Project be Method Estimated Environm су on Phase Monito Cost in PhP ACTIO ental ALERT LIMI ALERT ACTION LIMIT Ν red Sector small and revisio medium ns/ enterprise impro s like veme transport, nt constructi neede on and d utility services, food services and laundry supplies



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CHAPTER VII:DECOMMISSIONING/ ABANDONMENT/ REHABILITATION POLICY

The Decommissioning Phase

Decommissioning refers to the permanent stoppage of the plant operations. The relevant aspects, waste generation, issues and built-in measures during this phase will be dependent on the decommissioning plan. The decommissioning / abandonment plan necessarily starts with an Environmental Site Assessment (ESA) taking note in particular of any residual toxic substances especially in the soil.

As a matter of procedure, the Decommissioning shall be subject to submittal of a plan and approval thereof by the Environmental Management Bureau. Third party monitoring of the decommissioning activities for the check and balance may be made by the MMT and the EMB. Unless given clearance after the decommissioning works shall have been completed, the Proponent shall remain legally responsible for any residual impacts on the environmental resources.

On the basis that the economic life of the project is at a minimum of forty (40) years, decommissioning may take place after this period. The protocol for the decommissioning is premature to develop at this early stage but will include among others the following aspects:

In drafting the Decommissioning/Abandonment Plan, following shall be considered:

- 1. Baseline environmental conditions especially air and water quality. Any plan shall be accompanied by definite action plans on how to rehabilitate the environmental resources in order to approximate its pre-project state
- 2. Result of the monitoring activities
- 3. Existing rehabilitation program and the cumulative accomplishments of the mitigating measures. The accomplishments will be useful in the determination of the performance gaps which must be
- given more attention and funding if needed. Also, consideration of these efforts shall be given attention to have continuity and not just disregard them
- 4. Issues and concerns, demands, opinions, wishes and suggestions of the local community, workers and local government which may be extracted thru several means of public consultation It is best to consider them they will the ones who will be left behind after the life of the Project
- Inputs from MMT as an independent third party institution and interaction and relationship between EU and MMT
- 6. Procedures for decommissioning of the equipment which will consider the following:
 - Potential use of the equipment to be decommissioned; i.e. equipment that can be usable by third parties needs to be decommissioned intact.
 - Transportation of equipment and other materials used
 - Alternatives for the future use of the abandoned area
 - Alternate use of the area which may involve development into business centers including area for housing.
 - Consistency with the long-term zoning and land use development plan
 - Restoration/rehabilitation plan; and
 - Results of the ESA mentioned above.



CHAPTER VIII: INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

Introduction/Rationale

This section provides the instrument required to establish a proactive institutional requirement to guarantee compliance with environmental regulations and policies and implementation of environmental safeguards and commitments. It is important to set up capable and competent unit/group with properly defined roles in the process of the monitoring and evaluation of post EIA requirements and commitments as well as with other environmental regulations. It is important to identify and provide the group that will implement said requirements for a sustainable project operation.

Function

The Environment Unit/Team is responsible for the environmental performance of the project. It ensures implementation of the environmental safeguards and controls for the project implementation (for all phases of the project) and is responsible for overseeing environmental compliance activities, environmental requirements and regulatory obligations.

Core Function of the team/unit includes the following:

- Systems and Procedures
- Environmental Safeguards and Implementation
- Government Regulatory Compliance
- Environment Health Safety Program and Awareness
- EHS Program Compliance

Set Up

In many cases, the environmental unit leads the post EIA compliance and implementation process in collaboration with the other technical team/groups to provide technical support. Figure 9.1 illustrate the institutional framework. There are no generally applicable, rigid rules, so many variations are possible depending on the personnel capacities and structures.

The Multipartite Monitring Team (MMT) is also included as part of the EMP implementation mechanism because it has the primary role of monitoring the project's implementation of the committed EMP.

Presented below is the partial listing of key manpower requirements and the Table of Organization

ASIA

STEEL



STEELASIA ORGANIZATIONAL STRUCTURE AS OFFEBRUARY 2018



Figure 9.1: The Initial Organizational Chart/Institutional Plan for EMP Implementation



Roles and Responsibilities

In order to have a better understanding of the roles and responsibilities of the main actors in the institutional framework, below provides a brief explanation of the role of the key personnel, the technical team, and collaborating units/groups.

Key Personnel	Roles and Responsibilities
Pollution Control Officer/ Engineer	Compliance to environmental regulations & standards; maintenance of reports that are submitted to internal and external agencies
Safety Engineer	Responsible for implementation of emergency response procedures, handling of hazardous materials and environmental management systems and requirements of DOLE on occupational safety and health
CSR and SDP personnel	Community relations, design, training and implementation of CSR and SDP programmes
ММТ	 Monitor project compliance with the conditions stipulated in the ECC and commitments made in the Environmental Monitoring Plan (EMP) using checklist form and mainly secondary technical information and primary observations; Prepare, integrate, and disseminate simplified monitoring reports and submit recommendations to the DENR; Monitor implementation of community information, education, and communication (IEC) plan/program and social development programs (SDP); Interface with the technical third party audit group to understand and be updated on Monitoring and Evaluation results; Initiate popularization of Monitoring and Evaluation results for community consumption; and Officially receive complaints/requests from the public-at large for transmittal to the proponent and EMB-DENR and be able to recommend immediate measures against the complaint.

Following are the functions, roles and responsibilities of each departments:

- A. Operations The operations department is responsible for acquiring the inputs and devising the best plant operations methods so that value adding occurs in the most efficient and effective way. Thus, the role of operations management (and the operations manager) is to ensure a smooth production process that contributes to the output of goods and services of an organization. In additions, following are inherent responsibilities of the Operations Department:
 - Full Plant operations
 - Safety and Morale of the Department
 - Production / Schedule attainment
 - Continuous Improvement
 - Leadership and Direction, plant wide
 - Customer interface
 - Company policy enforcement
 - Production start-up / launch

B. Maintenance

This department is in charge for the schedule and regular inspection, maintenance and repair of equipment.

C. Engineering Support

This Department is in charge of the automation control, optimization, safety and testing of necessary support needed by the plant.

D. Admin. And Finance

Administrative and Financial Department is a unit to be assigned with various responsibilities concerning personnel, finance, publications, public relations, conferences, sale of documents and similar administrative functions; in particular:



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- 2. Organization of training of officials and supervision of programs established to that effect;
- 3. General services including the general register of the staff and services;
- 4. Rendering consultations to other Departments on organizational matters;
- 5. Preparation of studies on the administrative organization;
- 6. Maintaining and auditing the accounts of the Company;
- 7. Supervision of storage and purchasing;
- 8. Preparation of the budget;
- 9. Organization of administrative services for conferences and meetings;
- 10. Maintaining and organization of the library and the archives as well as their use.

E. MMT

Details of MMT Structure are provided in Chapter VI, Section 6.2.

Skills and Competency

Selection of competent and effective personnel comprising the environmental unit will be crucial in the institutional or organization building. Qualifications for the members may include the following:

- Understanding of environment management, legal regulatory framework, environmental impact assessment and reporting, and environmental compliance and audit management. Well-versed and familiar with the application of local laws and regulations on Environmental regulatory compliance.
- Experience in integrated environmental assessment
- Good relationship with the environmental regulatory authority
- capacity to dialogue with different stakeholders from both the public and private sector, and ability to build consensus on key environmental issues
- Oral and written communication skills; people skills; project coordination; monitoring and audit; scientific research and development; project planning; policy formulation; and training and facilitation



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CHAPTER X: ANNEXES

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