

Executive Summary

Rio Tuba Nickel Mining Corporation



1.0 PROJECT FACT SHEET

1.1 Background of the Project

Project Name:	Rio Tuba Nickel Mining Project (AMA-IVB-144A)
Nature of Project:	Resource Extractive Industry
Total Area:	AMA-IVB-114A: 3,553.4 ha
Site Location:	Barangay Rio Tuba, Barangay Taratak and Barangay Ocayan, Municipality of Bataraza, Province of Palawan

1.2 Profile of the Proponent

Name of Proponent:	Rio Tuba Nickel Mining Corporation (RTNMC)
Office Address:	29th Floor NAC Tower, 32nd Street, Bonifacio Global City, Taguig, Metro Manila
Contact Person:	Engr. Cynthia E. Rosero <i>Resident Mine Manager</i>
Tel No.:	(02) 798-7622 loc. 8308

1.3 Profile of the Preparer

EIS Preparer:	Gaia South, Inc.
Office Address:	7th Floor Montepino Bldg., Adelantado cor. Gamboa St., Legaspi Village, Makati City
Contact Person:	Liezyl S. Liton-Rellea <i>Project Director</i>
Tel No.:	(02) 893-5661

1.4 Project Background

RTNMC is applying for the Mineral Product Sharing Agreement (MPSA) of its current Mining Lease Contracts (MLCs). The application denoted as AMA-IVB-144A is only for the mining claims within the Municipality of Bataraza. One of the requirements for the MPSA application is an Environmental Compliance Certificate (ECC), hence the submission of this Environmental Impact Statement (EIS) Report.

The MPSA application has already been endorsed by the local government thru the passing of resolutions presented as **Annex 1.4.1** and was granted with a Strategic Environmental Plan (SEP) Clearance by the Palawan Council for Sustainable Development (PCSD) (**Annex 1.1.2**) in December 11, 2014. The said SEP Clearance specifically requires that the areas subject to RTNMC's AMA-IVB-144A where RTNMC shall conduct the activities are situated below 1,000 masl.

1.5 Major Project Components

For the proposed operation within AMA-IVB-144A, RTNMC shall use its existing facilities within the Municipality of Bataraza. Aside from the mining areas, additional structures such as office, motor pool and access roads shall be constructed within the project site. **Table ES1** shows the existing and the proposed project facilities within AMA-IVB-144A. A summary of the project components is provided as **Table ES2**. With the proposed mining project, RTNMC intends to apply the entire 5,553.40 ha within AMA-IVB-144A for the ECC. In consideration, one of the major conditions under the SEP Clearance requires RTNMC to exclude the 4.1 ha (above 1,000 masl) from the operation (**Annex 1.1.1**). Therefore, the actual mining operation shall only be concentrated within a total of 3,549.3 ha as allowed by the PCSD.

Table ES1. Existing and proposed project components within AMA-IVB-144A

Project Component	Area (ha)
AMA-IVB-144A (for ECC application)	3,553.4
PSCD Allowed Area for Operation	3,549.3*
Existing Facilities within AMA-IVB-144A	
Crushing plant facilities	2.53
Administration Building	1.50
Mine Office & Mine Look-out	7.30
Mechanical Building	2.80
Access Road	33.00
Siltation Ponds	55.61
Solar Drying Area	13.50
Ore Stockpile Area	16.90
CBNC Used Area	98.29
Tailings Dam No. 2 (CBNC)	76.24
Sub-total	307.67
Proposed Facilities to be located within AMA-IVB-144A	
Mining area	678
Bulanjao Field Office	0.015
Bulanjao Motor pool	0.019
Siltation ponds	16.32
Drainage canal	2.47
Access road	4.00
Sub-total	700.82
Total Area of Existing and Proposed Facilities within AMA-IVB-144A	1,008.49

Project Component	Area (ha)
Remaining area within the PSCD Allowed area of Operation	2,540.81

*Note: *The 4.1 ha above 1,000 masl is excluded from the proposed project operation area*

Table ES2. Components of the proposed mining operations

Component	Details of the Proposed Mining Operations
Application for MPSA	AMA-IVB-144A (3,553.4 hectares)
Total Project Area for ECC Application	AMA-IVB-144A (3,553.4 hectares)
Average Annual Production Capacity	Saprolite: 2.20 M WMT Limonite: 3.78 M WMT (HPAL/High Fe) 1.80 M WMT (No Assay)
Average Shipping Capacity	Saprolite: 2.11 M WMT Limonite: 0.06 M WMT (High Fe) 3.54 M WMT (HPAL)
Ore reserves (as of Dec 31, 2015)	AMA-IVB-144A Saprolite: 9,947,636 WMT Limonite: 19,191,710 WMT Cut-Off Grades used: Saprolite: ≥ 0.80% Ni Limonite High Fe: < 0.80% Ni, > 44.00% Fe Limonite HPAL: ≥ 0.80% Ni, ≥ 20.00% Fe
Method of ore extraction	Contour Mining
No. of stockyards	One (1) 61-hectare Pier Stockyard
Average # of ore shipments/year	42 shipments per year (assuming 52,000 WMT/shipment)
Port loading capacity	Maximum of three ships at any given time.
Stockpile limit	18,000 WMT
Power Source	One (1) 700 kW Nigata Power Plant Two (2) 350 kW
Domestic and Industrial Water Source	Domestic source from Rio Tuba Water Supply System (Umawi Creek) established by RTNMC; Water Wells 3, 4 & 5; and For road watering, water impounded in the siltation ponds as well as from mine pits due for rehab.
Water requirements	Total: 2,031,700 m ³ /yr Townsite: 1,500,000 m ³ /yr Equipment Cleaning: 274,700 m ³ /yr Road watering/dust control: 256,000 m ³ /yr
Fuel tank capacity	Pier Site (2 units) Diesel (1st Unit): 1,077,147 L Diesel (2nd Unit): 1,711,018 L
Manpower requirements	690 (engineering, maintenance, production)
Project Cost	PhP 4,583 B

Source: RTNMC, 2015

2.0 PROCESS DOCUMENTATION

2.1 The Environmental Impact Assessment (EIA) Report

The proposed Rio Tuba Nickel Mining Project as per Environmental Management Bureau (EMB) Memorandum Circular 005-2014, is classified as Category A or Environmentally Critical Projects (ECP). The ECC application of a new and single project under *Category A* such as this proposed project, shall be applied at the EMB Central Office (CO). An EIS shall be submitted as its documentary requirement.

The EIS shall contain the following:

- Project Description;
- Analysis of Environmental Impacts;
- Environmental Management Plan;
Environmental Risk Assessment (ERA) & Emergency Response Policy and Guidelines;
- Social Development Plan/Framework;
- Environmental Compliance Monitoring;
- Decommissioning/Abandonment/Rehabilitation Policy; and
- Institutional Plan for EMP Implementation.

To prepare the EIS Report, RTNMC contracted the services of Gaia South Inc., a third party Environmental Consultancy firm. To guide both the proponent and its preparer in the conduct of the Environmental Impact Assessment (EIA) and preparation of the EIS Report, a Technical Scoping Meeting was conducted on July 24, 2015 at the EMB Central Office. List of attendees of the meeting is provided in the Technical Scoping Report attached as **Annex ES1**.

During the meeting, the EMB Casehandlers, Review Committee Members, RTNMC and Gaia South Inc. representatives agreed on the coverage of the Technical Scoping Checklist (**Annex ES2**), which will serve as guide in preparing the EIS report.

2.2 Limitation of the Study

As mentioned earlier, the Technical Scoping Checklist serves as the guide for all the imperative information needed in this EIA. Experts from different field of interest prepared this comprehensive EIS based from primary data gathered through actual fieldwork and secondary data sourced from the barangay and municipal offices and other related agencies such as the National Mapping and Resource Information Authority (NAMRIA), Palawan Council for Sustainable Development (PCSD), Philippine Institute of Volcanology and Seismology (PHIVOLCS), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Bureau of Soils and Water Management (BSWM), and Mines and Geosciences Bureau (MGB), among others.

2.3 The Project Team

Table ES3 shows the roster of Gaia South team of experts who participated in the conduct and preparation of this EIA report. **Annexes ES3** and **ES4** are the Accountability Statements of RTNMC and Gaia South, Inc., respectively.

Table ES3. List of EIA team members and their respective field of expertise

Consultant/Researchers	Module/Position
Liezyl S. Liton-Rellea	Project Director
Emmanuel G. Ramos, PhD	Team Leader / Geology / Technical Reviewer
Perfecto Evangelista, PhD	Soils and Land use
Edwino Fernando, PhD	Terrestrial Flora
Judeline Dimalibot, MSc	Terrestrial Fauna
Davee Drake Medina, MSc	Hydrogeology
Emiterio Hernandez, MSc	Flood Modelling and Sediment Transport Modelling
Ernesto Dela Cruz, PhD	Air Quality/Water Quality
Melanie Manaog, MSc	Freshwater Ecology/Technical Writer
Renmar Martinez, MSc	Marine Ecology
Thelma D. Dela Cruz, MSc	Environmental Risk Assessment
Merlyn Carmelita Rivera, PhD	Socio-economics
Monette Bato, PhD	Public Health
Neil James E. Duran	Senior Technical Associate
Danica Dela Rosa	Technical Associate/Team Coordinator

2.4 The EIA Study Schedule and Area

For this application, RTNMC is applying to operate within the 5,553.4-hectare claim denominated as Application for Mineral Agreement (AMA-IVB-144A). **Table 1.2.1** shows the boundary coordinates of the project area. The actual operation shall exclude the 4.1-ha area above 1,000 masl as approved by the PCSD under PCSD Resolution No. 14-517 “A Resolution Granting a Strategic Environmental Plan Clearance To Rio Tuba Nickel Mining Corporation on its Nickel Mining Project Denominated as Application for Mineral Agreement (AMA) No. AMA-IVB-144A”, which was released in 2014. Therefore, RTNMC shall concentrate its mining operation only within a total of 5,549.3 hectares.

Table ES4 shows the study schedule for this particular EIA starting from fieldwork activities to the finalization of the EIS Report.

Table ES4. EIA study schedule

Activity	Period
Environmental and Social fieldwork	August to September 2015
Date gap analysis	September 2015 to March 2016
Draft EIS Report writing	September 2015 to May 2016
Submission of EIS to EMB for substantive evaluation	March 2019
Finalization of EIS Report	<i>To be finalized</i>

2.5 The EIA Methodology

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

Table ES5. The EIA methodology

Component	Description
Land Use	<ul style="list-style-type: none"> Use of Comprehensive Land Use Plan (CLUP) of the Municipality of Bataraza for 2009 to 2018; Environmental Critical Areas Network (ECAN) Map; National Mapping and Resource Information Authority (NAMRIA) Map and Google Earth Imagery as references.
Geology and Geomorphology	<ul style="list-style-type: none"> Conduct of field survey and use of available reports, geology literature and information to describe site’s existing condition; Use of geological and seismological data lifted from publicly available international and local sources.

Component	Description
Pedology	<ul style="list-style-type: none"> Use of NAMRIA topographic map with a 1:50,000 scale to locate site selection for sampling; Collection of soil samples using soil auger borings in 24 observation sites for physico-chemical analyses (texture, pH, N, OM, P, K) and heavy metal analysis (As, Cd, Co, Cr⁶⁺, Fe, Hg, Ni, Pb, Cr, Zn); 15 representative sites were used to represent the soil profiles of the project area; Use of Abney Hand Level for the determination of slope gradient.
Terrestrial Flora	<ul style="list-style-type: none"> Establishment of 26 vegetation sampling plots for the inventory and assessment of the project area: 20 m x 10 m, 5m x 5m and 1m x 1m; Measurement of stem diameter at breast height (dbh) and total height (TH) for trees with more than 10 cm dbh. Collection of specimen of species for proper identification in the laboratory. Computation of the density, dominance frequency, relative density, importance value and Shannon-Weiner Index for data analysis. Use of the DAO 2007-1 and IUCN Redlist for the conservation status.
Terrestrial Fauna	<ul style="list-style-type: none"> Use of field equipment and materials during survey such as binoculars, handheld GPS, digital camera, 3 m x 12 m nylon mist nets, live traps, flashlights, bird bags, and field notebooks. Establishment of three (3) transects for the assessment of terrestrial vertebrates: Bohoy, Lower Bulanjao, and Upper Bulanjao. Standard procedures employed during the assessment and surveys of terrestrial vertebrates are provided in Annex 2.1.1. Use of the DAO 2004-15, Palawan PCSDS No. 15-521 and IUCN Redlist for the conservation status.
Hydrology/Flood Modelling	<ul style="list-style-type: none"> Use of meteorological data sourced from the PAGASA and from the mine site rainfall monitoring station established by RTNMC from 1980 to 1999 and the automatic weather station established by Coal Bay Nickel Corporation (CBNC) that monitored maximum, minimum and mean temperature, among other parameters. Computation of the monthly and annual Potential Evapotranspiration in the vicinity of AMA-IVB-144A using Thornthwaite Method (Knödel, et al, 2007); Use of the Turc-Pike Equation (Xu and Singh, 2004) to estimate the monthly and annual Actual Evapotranspiration (AET). Computation of the long-term water balance using the equation $P = AET - Q - GR$, where P, AET, Q and GR represent rainfall, actual evapotranspiration, stream discharge and groundwater recharge respectively (Sokolov and Chapman, 1974). Flood modeling was conducted using Direct Rainfall Model (DRM) an integrated hydrological and hydraulic modeling computation that directly applies rainfall on the catchment to generate runoff which is simultaneously routed downstream across the topographic 2D grid. The Deltares' Delft3D models were employed for the assessment of the model set-up for hydrodynamics and particle tracking simulations/sediment transport modeling.
Water Quality	<ul style="list-style-type: none"> Use of the quarterly Self-Monitoring Report (SMR) of RTNMC from 2011-2018. Collection of 15 water samples from Rio Tuba, Ocayan River, Sumbiling River, and groundwater sources. The sampling was carried out in Sept 2-3, 2015. Methodology for conducting the water quality assessment study in the project area was based on the Water Quality Monitoring Manual issued by the Environment Management Bureau and the Philippine National Standards for Drinking Water (PNSDW) specified by Department of Health Administrative Order No. 2007-12. The procedure for field assessment, site selection, sampling and analysis are specified in the above references. Use of DAO 2016-08 (Water Quality Guidelines and General Effluent Standards of 2016) as reference.
Freshwater Ecology	<ul style="list-style-type: none"> Eleven sampling sites were established for the six (6) surface water bodies identified as impact areas: Sumbiling River, Gamayon Creek, Togpon Creek, Ibelnan Creek, Ocayan River and Malatgao River. Field sampling study was conducted on 22 and 24 August 2015. About 60 liters of water were filtered through the 25 um net and collected for the plankton identification and determination of its density per liter. Use of 0.5 m x 0.5 m Surber sampler for benthos enumeration. Field observation and interviews were conducted to identify fish and other riverine organisms. Use of the 2001 and 2005 EIA studies for comparison of results.
Physical Oceanography	<ul style="list-style-type: none"> Use of RTNMC Baseline Study of 2010 and 2013 EPRMP for the Rio Tuba Beneficiated Nickel Silicate Ore Expansion (Production/Extraction Output) Project; use of 2015 hydrodynamic modeling scenarios and current circulation in coastal environments.
Marine Ecology	<ul style="list-style-type: none"> For the fish and coral surveys, 50-m transects were laid in six (6) different reefs near Rio Tuba while five (5) transects were done for the seagrass survey, on three (3) different

Component	Description
	<p>sites. Water quality and plankton surveys were done in seven (7) different sites across the waters adjacent to Rio Tuba.</p> <ul style="list-style-type: none"> • Benthic surveys were done using the line intercept transect method (LIT) from English et al., (1997). • Fish Visual Census (FVC) technique (English, et al., 1997) was used to determine the species diversity, abundance and biomass in different survey sites. • For the seagrass monitoring, a modified Seagrass Net method (Short, et al., 2006) was adopted. 1 x 50 m transect was laid perpendicular to the shore and a 0.5 x 0.5 m quadrat was placed every 5m in every station. • Surface water quality data (temperature, pH, and dissolved oxygen) were measured <i>in situ</i> using Lutron WA-2017SD. Turbidity was also measured using a Secchi disc. • Plankton samples were collected by filtering 50 liters of seawater through a 20 µm net. Filtered water was stored in 500 ml polyethylene bottles and the samples fixed with a 5% formalin solution.
Meteorology	<ul style="list-style-type: none"> • Use of meteorological data sourced from PAGASA and from the mine site rainfall monitoring station established by RTNMC from 1980 to 1999 and the automatic weather station established by CBNC that monitored maximum, minimum and mean temperature, among other parameters. • Other relevant information gathered from PAGASA is the climate and typhoon frequency maps and the 2020 and 2050 climate projection (Climate Change in the Philippines, 2011).
Air Quality	<ul style="list-style-type: none"> • The 24-hour ambient air quality sampling for analysis of particulate matter (PM10) and gaseous pollutants (NO₂, and SO₂) was conducted from August 13 to 21, 2015 covering seven (7) sampling stations. The sampling stations are as follows: RTN Townsite, Pier Stockyard A, Sitio Bohoy, Sitio Tagpisa, Upper Kinurong (Magazine), Barangay Taratak and Barangay Sumbiling. • The ambient air quality at the project site was assessed following the DENR Administrative Order (DAO) 2000-81 (Implementing Rules and Regulations of the Philippine Clean Air Act of 1999). • The sampling procedures were based on USEPA, 40 CFR Part 50, (Appendix A, B, and J) and EMB Air Pollution Monitoring Manual (1994). • Analysis of RTNMC Monitoring Data for 2011-2018 for the following stations: <ul style="list-style-type: none"> ○ Station 1 – Pier Stockyard ○ Station 2 – Macadam Road (2011-2014); RTN Townsite Oval (2014-2015) ○ Station 3 – Minesite Gate (2011-2014) ○ Station 4 – Admin Building (2011-2014) Magazine Area (2014-2015) ○ Station 5 – RTN Townsite Oval (2011-2014) Tagpisa (2014-2015)
Noise	<ul style="list-style-type: none"> • A Digital EXTECH 407764 sound meter that meets the American National Standard Institute (ANSI) standard was used in measuring noise level in the air quality sampling points. • The same stations for air quality were used for the noise assessment. • The arithmetic median of the readings was taken and compared with the National Pollution Control Commission (NPCC-1981) noise standards. • Analysis of RTNMC Monitoring Data for 2013-2018 for the following stations: <ul style="list-style-type: none"> ○ Station 1 – Front of Omar Residence ○ Station 2 – Front of Valdeztamon Residence ○ Station 3 – Front of Sto. Nino Chapel (Near Hulguin Residence) ○ Station 4 – Oval (Near Townsite Gate 2) ○ Station 5 – Pier Jetty Area
People	<ul style="list-style-type: none"> • The baseline data were sourced from the barangay profiles provided by each barangay and the profile of Bataraza sourced from the Municipal planning and Development Office (MPDO). It is important to note that most of the barangays do not have an updated profile. The data presented in this report are based on the most recent available information gathered from either the barangay and/or municipal profile. • A perception survey (Annex 2.4.1), Focus Group Discussions (FGDs) and key informant interviews (KIIs) were conducted for the direct impact barangays - Rio Tuba, Ocayan, Taratak and the indirect impact barangays - Sumbiling, Igang-igang, Sarong, Culandanum, Tarusan, Sandoval, and Iwahig. • A total of 370 respondents for the perception survey were randomly selected from the DIA while 171 respondents were derived from the IIA. Computation of the sample size is presented in Annex 2.1.1.

2.6 Public Participation

This ECC application started in 2004 and continued in 2010, with a public scoping conducted on October 16, 2004. Due to technical issues related to the SEP Clearance, the ECC application was suspended and re-applied in 2015. The continuous IEC programs of RTNMC have always emphasized the continuation of the MPSA application for AMA-IVB-144A. Due to this, a public scoping was not required by the EMB. However, public participation in this recent re-application was considered during the actual fieldwork of the socio-economics team. FGDs, KIIs and perception surveys were conducted for the direct impact barangays - Rio Tuba, Ocayan, Taratak and the indirect impact barangays - Sumbiling, Igang-igang, Sarong, Culandanum, Tarusan, Sandoval, and Iwahig. Included in **Annex 2.1.5** is the photo-documentation of the abovementioned activities.

2.7 Delineation of Impact Areas

The pre-identified direct impact areas (DIA) covered by the proposed project are Brgys. Rio Tuba, Taratak, and Ocayan (**Figure 1.2.2**) with Barangays Sandoval, Sumbiling, Culandanum, Igang-igang, Iwahig, Sarong, and Tarusan as the identified indirect impact areas when additional mine facilities were considered. All these barangays are the recipients of the Social Development and Management Plan (SDMP) of RTNMC and CBNC.

Based on the environmental assessment presented in *Chapter 2*, the following were identified as direct impact areas:

- Barangay Rio Tuba, Barangay Taratak and Barangay Ocayan which are host barangays of the mining areas and mining ancillary facilities;
- Rio Tuba and Ocayan Rivers which are downstream rivers of the proposed mining areas; and
- Areas along Coral Bay determined thru sediment transport modeling as the affected areas in case of failure of structures containing silt/sediment including 500 m buffer zone.

As for the indirect impact areas, the following are considered:

- Barangays Sandoval, Sumbiling, Culandanum, Igang-igang, Iwahig, Sarong, and Tarusan which are located within the vicinity of the proposed mining areas and recipient of the benefits from SDMP; and
- Areas along the Coral Bay within 500 m from the primary impact area.

Figure 1.2.3 shows the impact map of the proposed project based on the environmental assessment.

3.0 SUMMARY OF BASELINE CHARACTERIZATION

The summary of the baseline characterization is presented as **Table ES6**.

Table ES6. Summary of the environmental and socio-economic profile

Component	Description
Land Use	<ul style="list-style-type: none"> • The project site and its vicinity are covered by five (5) Landuse/Vegetation units: Forest, Shrubland, Grassland, Bare area (Mining area/Kaingin) and Built-up area; • The land use of the mining area is classified as Mineral Development Area based on the 2009 MCLUP; • Three potential Environmental Critical Areas (ECA) within the AMA-IVB-144A including habitat for wildlife species, areas with critical slopes and recharge areas for

Component	Description
	aquifers were identified.
Geology	<ul style="list-style-type: none"> • Site geological map shows that ultramafic rocks underlie most of the AMA-IVB-144A area; • The nickeliferous laterite deposit at Rio Tuba was formed by the in-situ weathering of the ultramafic rocks. High moisture content and the occurrence of boulders and hard saprolite that hold 2% and above nickel are its outstanding characteristics (Hirai, et al., 1987); • Practically, there is no active fault in Palawan, and there is no threat from faulting or fault ruptures, and local earthquakes; • The steep slopes in the project site are occasionally affected by landslides while the rivers are flooded during the seasonal monsoon and typhoons, although debris flows have not been documented; and • No active tectonic features are present on this region. No active faults and volcanoes are found in the region. Very rare occurrence of earthquakes is observed in Palawan, and these have magnitudes of only 5 or lower.
Pedology	<ul style="list-style-type: none"> • One soil type, Tagburos clay loam, which was subdivided into four (4) soil mapping units based on differences in slope ranges (3-8 % slopes, 8-18% slopes, 18-30% slopes, and >30% slopes) were identified, characterized, and mapped within the project area; • All soil mapping units have nickel and chromium above the contamination levels as prescribed by the Taiwanese standard; and • The bare area (Kaingin) on Tagburos clay loam with 18-30% and >30% slopes is with "high susceptibility to erosion".
Terrestrial Flora	<ul style="list-style-type: none"> • A total of 147 species of vascular plants belonging to 67 families were recorded during the study. The species richness of the project site constitutes about 4.20% of the estimated flowering plants (roughly 3,000–3,500) found in Palawan (Madulid 2002); • Two forest formations were observed in the project site. These are forest over ultramafic rocks or serpentine soils found on Mt. Bulanjao, Bataraza and mangrove forest along the Rio Tuba River; • At least 15 species in the proposed project site are endemic to Palawan, viz., <i>Alpinia foxworthyi</i>, <i>Angelesia palawanensis</i>, <i>Antirrhoea caudata</i>, <i>Ardisia romanii</i>, <i>Decaspermum philippinum</i>, <i>Ficus glareosa</i>, <i>Gomphandra bracteata</i>, <i>Nepenthes philippinensis</i>, <i>Pinanga curranii</i>, <i>Podocarpus palawanensis</i>, <i>Premna depauperata</i>, <i>Protium connarifolium</i>, <i>Mussaenda grandifolia</i>, <i>Wrightia palawanensis</i>, and <i>Xanthostemon speciosus</i>; • Several of these Palawan endemic species are currently also included in the Philippine threatened plants list (DAO 2007-01, Fernando et al. 2008), viz. <i>Nepenthes philippinensis</i> (EN category), <i>Podocarpus palawanensis</i> (EN category), <i>Xanthostemon speciosus</i> (EN category), <i>Ardisia romanii</i> (OTS category), and <i>Protium connarifolium</i> (OTS category). <i>Adiantum cupreum</i> (VU Category) is a Philippine endemic known from Palawan and Sibuyan. <i>Dillenia luzoniensis</i> (OTS category) and <i>Aglaia angustifolia</i> (VU category), although not Philippine endemics, are also listed as threatened; and • <i>Podocarpus palawanensis</i> is the rarest and most threatened species present in the area; only two (2) individuals of this species have been recorded in the project site, one in <i>Gymnostoma-Xanthostemon</i> dominated community and the other in the mixed-species community. <i>Protium connarifolium</i> and <i>Dillenia luzoniensis</i> are two (2) of the dominant species in the intermediate vegetation on Mt. Bulanjao.
Terrestrial Fauna	<p>Birds</p> <ul style="list-style-type: none"> • Twenty-three species of birds belonging to 17 families were observed and recorded from the three (3) survey sites; five (5) from Bohoy, 11 from Lower Bulanjao and eight (8) from Upper Bulanjao. No species were common to the three (3) sites. It was observed that only one (1) or two (2) species comprise each family indicating very low species diversity of birds during the assessment and survey; • According to the IUCN 2016.3 list, all of the species of birds are under the Least Concern category which means that there is no indication that the species are threatened and their population is not decreasing. • DAO 2004-15 placed <i>Gracula religiosa</i> or Common Hill Mynah under the Vulnerable category. • PCSD Resolution No. 15-521 series of 2015 listed <i>Gracula religiosa</i> under the Critically Endangered category and <i>Haliaeetus leucogaster</i> as Endangered. Four species are placed under the Vulnerable category, these are <i>Alophoixus frater</i>,

Component	Description
	<p><i>Chloropsis palawanensis</i>, <i>Dryocopus javensis</i> and <i>Prionochilus plateni</i>.</p> <p><u>Mammals</u></p> <ul style="list-style-type: none"> Only two (2) species of volant mammals were caught in the mist nets, <i>Cynopterus brachyotis</i> and <i>Megaderma spasma</i>, and there were no non-volant mammals caught through live trapping. Both species are residents and are of LC according to the IUCN, DAO 2004-15 and PCSDS No.15-521; <p><u>Herpetofauna</u></p> <ul style="list-style-type: none"> Observation of herps (amphibians and reptiles) during the transect walk and the evening frogging activity yielded eight (8) species; four (4) amphibians and four (4) reptiles. One species, <i>Hylarana moellendorfi</i> is classified as Near Threatened (NT) by the IUCN because its population is threatened by habitat destruction, pollution from dust and other environmental factors. Most of the species however, are of LC; As for DENR, all of the species are of Least Concern. PCSDS Resolution 15-521 ser. 2015 placed <i>Hylarana moellendorffi</i> and <i>Sanguirana sanguinea</i> under the Vulnerable category while all the other species are of Least Concern
Hydrology/Flood Modelling	<ul style="list-style-type: none"> The area occupied by AMA-IVB-144A lies within the catchments of five (5) drainage systems, which are the Canipan, Sumbiling, Tuba, Ocayan, and Iwahig river systems; The annual rainfall in the Canipan, Sumbiling, Tuba, Ocayan, and Iwahig watersheds amounts to 263.6, 130.4, 146.7, 228.8 and 484.5 MCM, respectively. Stream discharge, actual evapotranspiration and groundwater recharge take up 52%, 40%, and 8% of the rainfall, respectively; The barangays of Bataraza surrounding AMA-IVB-144A used to rely on wells and some springs for their domestic water requirements. The wells are public and private shallow dug wells and drilled wells cased with 38 to 102 mm diameter G.I. pipes; The springs on the other hand, are depression springs whose water comes from the intersection of the water table with an abrupt break in the land slope. These were mainly used for bathing and washing clothes; Since 2010 however, Barangay Rio Tuba was supplied by a Level 3 water system installed by RTNMC and CBNC while Barangays Sandoval and Iwahig and many portions of Ocayan, Culandanum, Igang-Igang and Sarong were also connected to a Level 2 water system likewise developed by RTNMC and CBNC in 2013. Barangays Taratak and Sumbiling still depend on shallow dug wells and deep wells and also on creeks that drain the western and southwestern slopes of Mount Bulanjao for their water requirements; The geology of the area and the findings of the water source inventory, particularly the presence of wells that range from 3 to 49 m depth, indicate that shallow unconfined aquifers as well as deeper, presumably confined aquifers exist in the lowlands surrounding Mt. Bulanjao; Based on the comparative results of the flood modeling, no major changes in the flood characteristics of the areas downstream of the project area. Within the project area, however, depression storage at the downstream-most portion of the mining area which is visible under the pre-development scenario would become moderately larger in scope once the project becomes operational. This can be attributed to the potential changes in topography in that particular area during project implementation; and The climate change projections of PAGASA indicate that rainfall will become more during the rainy season and become less during the dry season. Increasing rainfall intensities will increase the frequency of flooding.
Water Quality	<ul style="list-style-type: none"> All groundwater stations were found unfit for drinking with respect to microbial quality with the exception of the water pump at Tagpisa (RTN-GW1). The heavy metals, on the other hand, were below detection limits and thus way below the standard criteria for drinking water; Of the three (3) rivers draining the RTNMC site: both Rio Tuba and Ocayan have been classified as Class C by DENR. No classification was reported for Sumbiling River but for this study, Class C comparison will be made. All stations showed values well within their prescribed Class C water quality classification (pH, DO, BOD, oil and grease, total coliform and TSS), except for total coliform in RTN-OR4 and RTN SR-3. Both are downstream stations situated in relatively high population areas. As for the parameters for toxic and other deleterious substances, results were below the respective detection limits for the analytical methods used, indicating the correctness of the prescribed classification with respect to these parameters; and

Component	Description
	<ul style="list-style-type: none"> For the two (2) marine stations, both results show good values (within standards) for pH, dissolved oxygen, BOD, oil and grease, and total coliforms. In terms of parameters for toxic and other deleterious substances, all the parameters measured, except for total chromium and nickel, were below the detection limits of the analytical methods used, indicating good quality for the Class SC standard.
Physical Oceanography/ Thermal Plume Modelling	<ul style="list-style-type: none"> The maximum depth of the Tuba River estuary is 20 m from about 3 km from the coastal side. The seabed is generally muddy including shallow coral outcrops; Based on the nearest tidal station, Balabac Pier, there are two (2) types of tide: the diurnal and semidiurnal; <u>Based on the 2000 measurements</u> <ul style="list-style-type: none"> Based on the 2000 measurements of the ocean currents, the current speeds range from 1.1 to 5.1 cm/s during flood tide and from 1.2 to 11.3 cm/s during ebb tide. The currents during ebb tide are generally directed towards the west. The observed current was generally directed to the northeast during the flood tide; <u>Based on the 2015 measurements</u> <ul style="list-style-type: none"> Using a wind speed of 4 ms⁻¹ blowing from the southwest (so called <i>habagat</i> wind), the model runs revealed that from the open waters of Sulu Sea, the flow velocity field is directed towards the northeast with magnitudes in range of 2-8 cms⁻¹ near the coast and moderately exceeding 10 cms⁻¹ far offshore. Swift currents acted at the vicinity of Arrecife Island and the adjoining shallow coral reef areas with magnitudes in the range of 15 cms⁻¹. During tidal ebbing, the flow velocity field far offshore is directed to flow outwards of the Bay with weak clockwise movement (or 'gyre') formed near the Arrecife Island and adjoining waters with flow magnitudes of about 8-15 cms⁻¹ which is a bit weaker than during high tides. Under <i>amihan</i> wind conditions scenario, with a wind velocity input of 4 ms⁻¹ and blowing from the northern direction, the model results revealed similar eastward flow direction in the Bay during tidal flooding, with flow velocity fields in the range of 4-8 cms⁻¹ near the coastline, regardless of tidal conditions. During tidal flooding conditions, the currents near the coast exhibit a bias towards the north and northeast, regardless of prevailing wind directions. The high tidal event induces current speeds reaching a maximum of about 10-15 cms⁻¹ while the currents during tidal ebbing were generally weaker, reaching a maximum of ~8 cms⁻¹ near the coast.
Freshwater Ecology	<ul style="list-style-type: none"> There were five (5) major groups of phytoplankton identified in the samples taken from the 11 sampling stations. These are Division Chlorophyta, Division Euglenophyta, Division Pyrhophyta, Division Bacillariophyta, and Division Cyanophyta with 35 species; For zooplankton species, there were at least five (5) groups of species in the samples, however, similar with phytoplankton, there were limited number of individuals; The absence of large numbers of zooplankton in the sample indicates energy relations. Phytoplanktons are the primary producers in an aquatic environment driving the energy flow and productivity of other organisms. Low population of phytoplankton limits available energy source for the secondary producers like the zooplankters which also limits their probability of being included in the sample; The sampling identified two (2) freshwater crab species (crustaceans), two (2) gastropods and five (5) orders of insects. Station 2 (Ibelnan W) has the most species observed (7) with Sumbiling River upstream with the highest number of individuals (43) followed by Malatgao River (28) and next is Ocayan River in Bohoy (24). Majority of Individual are mayflies from Family Heptageniidae (Order Ephemeroptera); and Limited fish species were observed to be present in the surface water. The most common is <i>paet</i> (<i>Barbodes</i> sp.) but all species are found in all sampling areas. The resident have also reported the presence of eel however, were not caught.
Marine Ecology	<ul style="list-style-type: none"> The coral reefs in Rio Tuba are in Good to Excellent Condition, with coral covers ranging from more than 50% to more than 75%. The highest coral cover was observed in the Sandbar Parola site (76.2% - within the <i>excellent</i> category), while the lowest coral cover was observed in the reefs near the mouth of the Sumbiling River (53.9% - still within the <i>good</i> category); A total of 155 reef fish species belonging 34 families were recorded in the six (6) selected sites in Coral Bay. Over 90% fishes in the bay are composed of non-target species or fishes that are not commercially valuable. Abundance was highest at Ameril Station 2 with 546 individuals/500m² followed by Sandbar Parola with 523

Component	Description
	<p>individuals/500m²;</p> <ul style="list-style-type: none"> • A total of seven (7) species were recorded in five (5) stations indicating a high diverse mixed seagrass bed in the area. <i>C. rotundata</i>, <i>H. ovalis</i> and <i>T. hemprichii</i> were present in all stations, while <i>E. acoroides</i> was only recorded in one (1) station; • All stations are home to several species of invertebrates such as sea urchin <i>Diadema setosum</i>, and some species of seastars such as <i>Linkia laevigata</i> and <i>Protoreaster nodosus</i>. Presence of mollusks was also observed; and • A total of 39 phytoplankton species belonging to three (3) major groups (Cyanobacteria: 1 species, Diatoms: 17 species, and Dinoflagellates: 21 species) were identified in the selected stations. The highest phytoplankton abundance was recorded in Station 2 (Ocayan Point) with 952 cells/L.
Meteorology	<ul style="list-style-type: none"> • Rainfall characteristics indicate that the climate in the project area is of Type III under the Modified Corona Classification of Philippine Climate. This type of climate is relatively dry from January to April and wet throughout the year; • The proposed site (AMA-IVB-144A) receives an average rainfall of 2,611 mm per year. The rainy season apparently begins at April and lasts up to January where the monthly rainfall exceeds 160 mm and peaks at 362 mm in October; • In the Palawan area, the typhoon passage frequency is one (1) cyclone per year mostly in Northern Palawan which occurs during the last quarter of the year; and • Using the emissions calculation tool Transport Tool (version 2.6 formulated by the Greenhouse Gas Protocol Initiative (World Resource Institute, World Business Council For Sustainable Development), it is estimated that the potential CO₂ emission (CO₂-e) of the proposed operation within the AMA-IVB-144A per year is 36,272 metric tonnes.
Air Quality	<p><u>Particulate Matter (Micron 10) and Total Suspended Particulates</u></p> <ul style="list-style-type: none"> • The result of the 24-hour ambient air quality sampling conducted in 2015 showed that the PM10 values of the seven (7) sampling stations were below the standard and ranged between 0.02-0.06 ug/Ncm. TSP values were also below the limit and ranged from 2.3-10.8 ug/Ncm; • The monitoring results based on the Self-Monitoring Reports (SMR) of RTNMC for the period 2011-2017 for TSP show no exceedance from the 300 ug/Ncm guide value. Starting 2018, PM10 was required for the monitoring activities and the average of all stations was only 0.00055 ug/NCM; and <p><u>Sulfur Dioxide and Nitrogen Dioxide</u></p> <ul style="list-style-type: none"> • Baseline SO₂ results for all sites were below the DENR standard of 180 ug/Ncm. The values ranged from 0.49 to 4.74 ug/Ncm. Similarly, NO₂ values were all below the ambient air quality guide value of 150 ug/Ncm, ranging from 3.14 to 5.53 ug/Ncm.
Noise	<ul style="list-style-type: none"> • Noise level monitoring data collected in 2015 show that average morning values for all sites (AQ1 to AQ7) would be 60.8, daytime would be 60, evening at 62.6, and nighttime at 60.6. This would indicate that the area generally falls under Class C noise category which is designated for light industrial area. Even for this category, though, sites such as AQ2 (pier), AQ3 and AQ4 which are roadside areas, exceed the nighttime noise standards; and • Based on the noise level monitoring of RTNMC from 2013 to 2018 for its five sampling stations, the background noise readings ranged from a minimum of 54 dB to a maximum of 87 dB. Average noise level in the areas sampled is 75.4. These readings were above the daytime DENR standard of 70 dB for Class C areas. Of the 276 measurements reported, 210 exceeded 70 dB (76%).
Socio-economics	<ul style="list-style-type: none"> • In the 2010 Census of Population and Housing released by NSO, the total population of Bataraza was 63,644. At the barangay level, Barangay Rio Tuba showed the highest population of 8,461 followed by Barangay Poblacion with a populace of 5,299; • Barangay Rio Tuba is around 39.7 km way from the Central Poblacion of Bataraza. Rio Tuba has a total land area of 16,635.887 ha. In 2014, its population increased to 20,071; • Barangay Ocayan is considered a rural barangay with a total land area of 1,803.5 ha and population of 1,780 in 2007. Its land use is generally agricultural with negligible portions of residential, forest and idle land; and • The total population of Barangay Taratak in 2015 was 1,627. About 50.09% are male residents while 49.72% are female. <p><u>Perception towards the project</u></p> <ul style="list-style-type: none"> • Based on the survey, 91.13% agreed that the RTNMC project on its option for mineral conversion will bring positive benefits to the community. The perceived

Component	Description
	<p>positive benefits include: provision of employment to local residents, implementation of more community projects, infrastructure, and livelihood development, increase in livelihood and business and increase in tax collection and revenue in the barangay and municipality;</p> <ul style="list-style-type: none"> • On the other hand, perceived negative effects are danger and risk the project might bring to the community in terms of pollution, sickness or environmental degradation (17.94%), possible traffic accidents (14.76%), possible flooding and landslides (13.44%), peace and order hazards (12.24%), decrease in livelihood (11.76%), in-migration (11.34%), displacement of families (10.38%) and potential changes in lifestyle and culture (8.16%); • About 70% of the total DIA and IIA respondents agreed that the proposed project will help the community and local residents while 1.66% thought that there will be a large damage brought about by the proposed project; and • On an overall perception about the project and once perceived negative effects are abated, 70.06% of the total respondents will approve/endorse it while 12.94% will not. 32.86% who disapproved the proposed project said that they saw the project bringing negative impacts on the health, welfare and livelihood of the residents of the community.
Public Health	<ul style="list-style-type: none"> • Based on the vital health statistics of the Municipality of Bataraza, the leading cause of diseases in the municipality is upper respiratory tract infection (URTI) which consistently ranked first from 2010 to 2014. Based on the information released by the Department of Health in 2010, Acute Respiratory Infection appeared to be the highest number of cases in the country with a total of 1,289,168¹. URTI represents the most common acute illness evaluated in the outpatient setting which ranges from common cold to life threatening illnesses such as epiglottitis². Thus, such illness is present not only in the Bataraza but in the global range; • The leading cause of deaths in Bataraza, Palawan from the years 2010 to 2014 is hypertension (HPN). Most of the leading causes of death for the covered period are not related to communicable diseases with the exception of pulmonary tuberculosis (PTB) and pneumonia; • In 2011, a doctor, a dentist, a medical technologist, and a sanitary inspector take care of the 63,644 population of Bataraza, Palawan. There is one (1) nurse for every 21,215 resident in the municipality; one (1) midwife for every 4,546 resident; and one (1) active barangay health worker for every 350 resident in the municipality. • Barangay Rio Tuba listed 19 health related facilities, which included three (3) private medical clinics, one (1) hospital, two (2) maternal and child clinics, a Barangay Health Center, a Family Planning Center, six (6) Day Care Centers, and five (5) drug stores. • Complementing the role of the Municipal RHU in health service delivery is the RTNFI Hospital, which is located within the RTN Townsite about 35 km from the town proper. It has 30 beds and five (5) bassinets.

4.0 SUMMARY OF ALTERNATIVES

In the selection of the mining area for its proposed mining project, RTNMC considered its on-going application for MPSA (AMA-IVB-144A). By working towards the approval of the MPSA and expanding the mining operations, RTNMC is likely to continue providing employment opportunities to the communities, tax contributions to the government, and its SDMP. This will also ensure the continuous operations of the HPP of CBNC, which is a high valued private investment, along with the delivery of its associated socio-economic benefits. If RTNMC will not continue the MPSA application (AMA-IVB-144A), it loses the chance to develop and extract the nickel and cobalt within the 3,553.4 ha. However, this may and probably will also result to other entities filing an MPSA application over the same area. Depending on the capabilities of these entities and their successful compliance with the government's requirements, the mineral property may thus be developed and the nickel and cobalt similarly extracted. This way, the host and surrounding communities may benefit from the new mining ventures. If the government rejects the new entities' MPSA application,

¹ <https://www.doh.gov.ph/Statistics/Leading-Causes-of-Morbidity>

² <https://emedicine.medscape.com/article/302460-overview>

mining in the area will cease. The HPP will eventually run out of ore feed and be forced to shut down as well. There will be an adverse economic impact to the host and surrounding communities as jobs, tax revenues, and company-sponsored social services and community programs will cease. The resulting backlash would be an acutely reduced economic activity in the municipality as money in circulation (particularly originating from salaries and wages from both RTNMC and its sister company CBNC, which sources its raw materials directly from RTNMC) will be significantly reduced. Once these employees leave, the demand for resources will be lowered and the suppliers of these will lose their sources of income. It can be assumed that many families and individuals will most probably have no option but to leave the area and seek employment elsewhere.

Other alternatives considered for the mining method and technology selection are presented in **Table 1.4.1**.

5.0 SUMMARY OF IMPACTS AND MITIGATION

In *Chapter 2* of this report, the potential impacts and its corresponding mitigating measures were identified based on the analysis of the environmental and socio-economic profile of the project area. These proposed mitigating measures were integrated into an Impact Management Plan presented as **Table 4.1.1** in *Chapter 4*. To ensure the effectiveness of these measures and maintain compliance to environmental standards, an Environmental Monitoring Plan with EQPL was formulated and presented as **Table 6.1.2** in *Chapter 6*.

Table ES7. Summary of identified impacts and corresponding management measures

Impacts	Proposed Management Plan
The Land	
Encroachment in Environmentally Critical Areas (ECAs)	RTNMC will confine operations at areas below 1,000 m and limited to the approved mining areas of the MGB. A 50m buffer zone will be maintained and enhanced at the peripheries of the mining pits and access roads.
Change in surface landform	RTNMC will submit the Environmental Protection and Enhancement Program (EPEP) which will define management measures for the progressive rehabilitation of mined out areas including the stabilization of the slopes of the mines out area.
Soil erosion	The EPEP which will be submitted by RTNMC will define the soil conservation measures including selective clearing of vegetation cover, slope stabilization measures, recovery of topsoil and proper storage and installation or erosion control measures.
Removal of vegetation and loss of habitat and native and endemic species and change in community structure of flora and fauna	Prior to the start of mining operations, RTNMC will implement a comprehensive Biodiversity Conservation Action Plan to conserve and propagate important plant species. The implementation of the EPEP will help manage the impact of habitat loss and provide green corridors for movement of fauna.
The Water	
Depletion of water resources	Keeping bare or exposed areas to a minimum through selective clearing and progressive rehabilitation will allow more water to infiltrate into the ground. It is recommended that approximately 50 ha at a time will be opened for the mining operations and rehabilitation will be immediately implemented after all ores are recovered and prior to opening of another site.
Degradation of groundwater and surface water quality	During construction, temporary sediment control structures will be installed to limit sedimentation of streams draining the site until such time that all surface run off are diverted towards the siltation ponds. A stormwater management plan for the operation phase will be prepared and implemented.
The Air	
Degradation of air quality	Reforestation programs and progressive rehabilitation of mined out areas will be undertaken in order to offset GHG emissions and alleviate projected increase in ambient temperature.

Impacts	Proposed Management Plan
	Dust generation is limited by regular spraying of water along haul roads, maintenance of the concreted Macadam Road, imposition of speed limits, tire washing prior to passage along Macadam Road, and other measures.
The People	
	<p>Impact barangays will benefit from various Social Development Programs (SDP) which include educational, health and livelihood assistance as well as paying taxes promptly.</p> <p>RTNMC provides PPE to all employees and safety trainings for mine personnel.</p> <p>Traffic issue along macadam road are addressed by providing barriers, signages, and traffic personnel to maintain the proper flow of vehicles.</p>