JLR CONSTRUCTION and AGGREGATES INC.

JLR Compound, B. Suico Street, Tingub, Mandaue City, Cebu, 6014 Philippines











JLR BASALT MATERIAL QUARRY PRODUCTION EXPANSION 2021

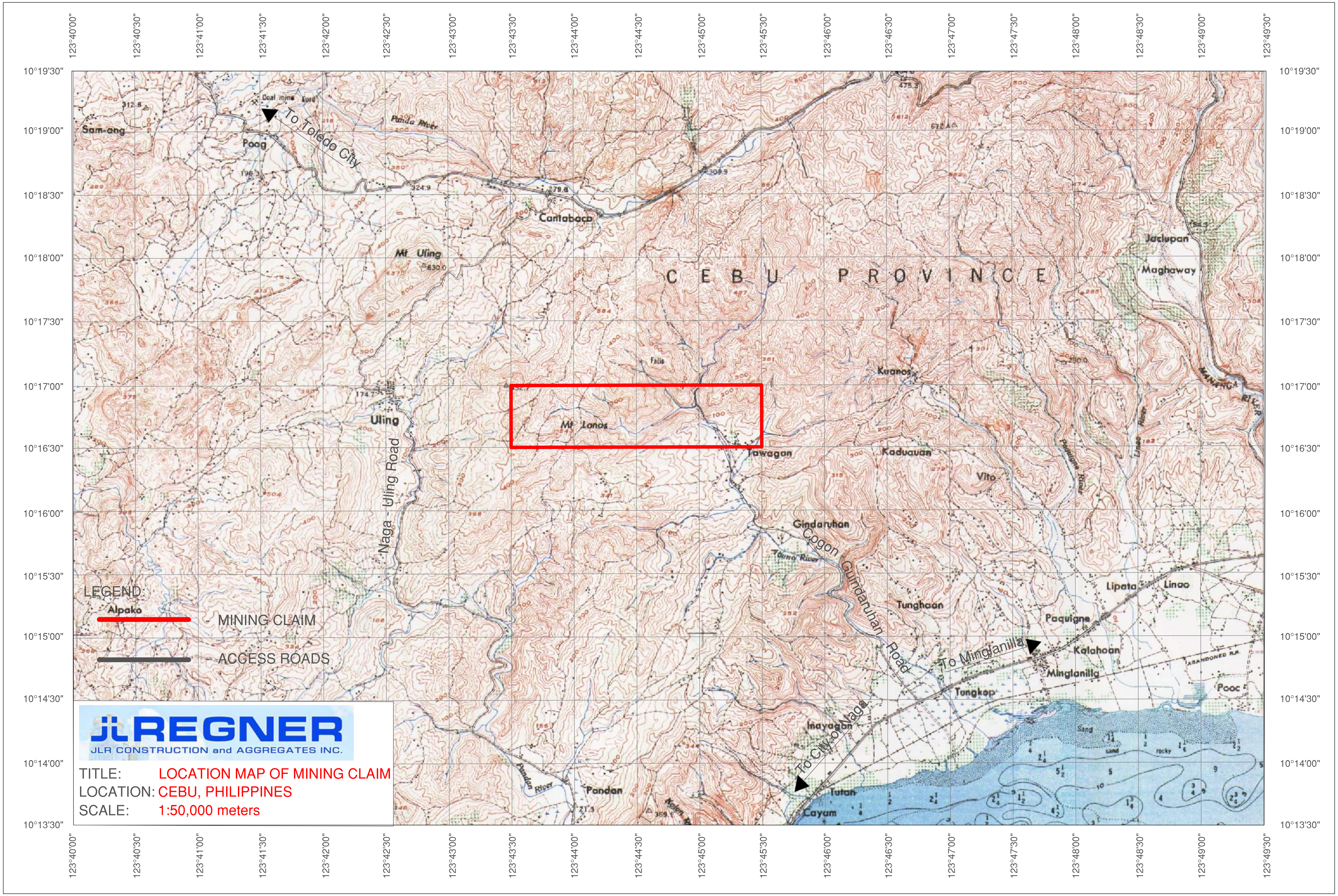
• PROJECT DESCRIPTION REPORT FOR SCOPING •

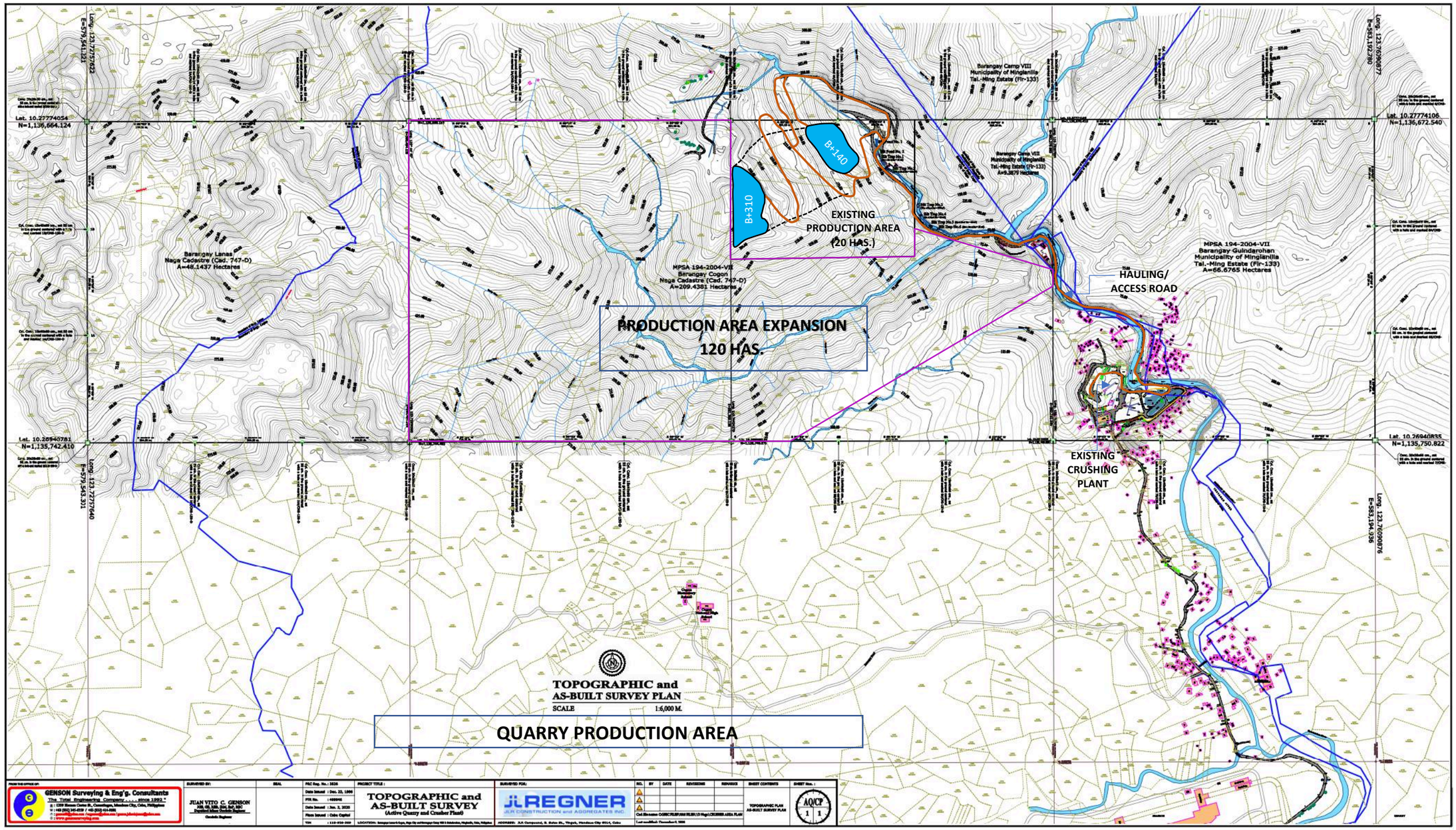
Table of Contents

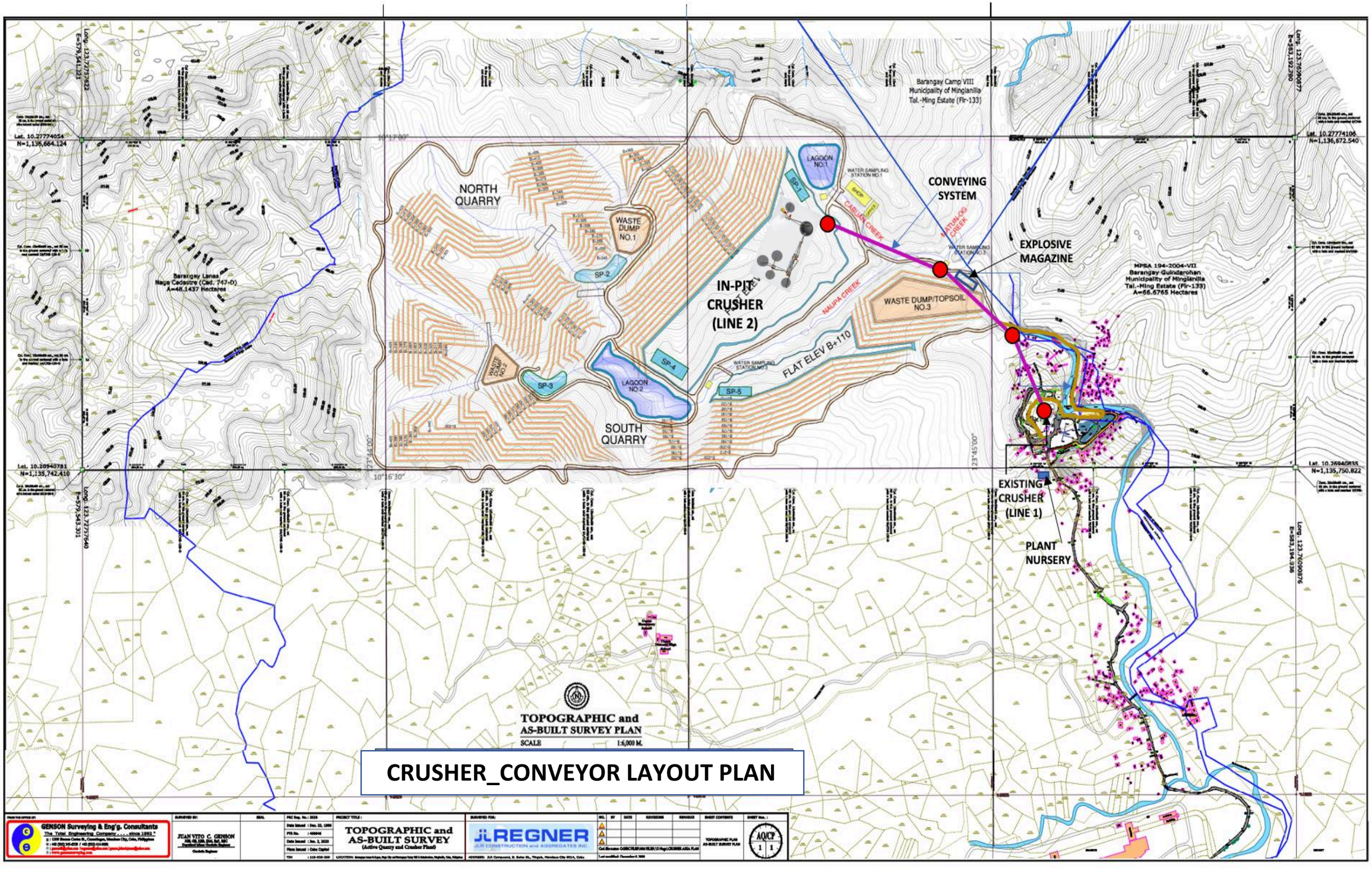
List of Tables

List of Figures

ANNEXES


CEBU PROVINCE
To Toledo City
To Minglanilla
To City of Naga
Naga - Uling Road
Cogon - Guindaruhan Road
Mt Uling
Mt Lanas
Uling
Cantabaco
Tawagan
Kuanos
Kaduauan
Vito
Gindaruhan
Tunghaan
Lipata
Linao
Paquigne
Kalahoan
Minglanilla
Tungkop
Inayagan
Tutan
Cayam
Pandan
Pooc
Jaclupan
Maghaway
Sam-ang
Poog
Alpaka
LEGEND:
MINING CLAIM
ACCESS ROADS
JLREGNER
JLR CONSTRUCTION and AGGREGATES INC.
TITLE: LOCATION MAP OF MINING CLAIM
LOCATION: CEBU, PHILIPPINES
SCALE: 1:50,000 meters


Barangay Camp VIII
Municipality of Minglanilla
Tal.-Ming Estate (Flr-133)
B+140
B+310
EXISTING
PRODUCTION AREA
(20 HAS.)
Barangay Lanas
Naga Cadastre (Cad. 747-D)
A=48.1437 Hectares
MPSA 194-2004-VII
Barangay Cogon
Naga Cadastre (Cad. 747-D)
A=209.4381 Hectares
PRODUCTION AREA EXPANSION
120 HAS.
MPSA 194-2004-VII
Barangay Guindarohan
Municipality of Minglanilla
Tal.-Ming Estate (Flr-133)
A=66.6765 Hectares
HAULING/
ACCESS ROAD
EXISTING
CRUSHING
PLANT
QUARRY PRODUCTION AREA
TOPOGRAPHIC and
AS-BUILT SURVEY PLAN
SCALE 1:6,000 M.
GENSON Surveying & Eng'g. Consultants
TOPOGRAPHIC and
AS-BUILT SURVEY
(Active Quarry and Crusher Plant)
JLREGNER
JLR CONSTRUCTION and AGGREGATES INC.
AQ/CP
1 1


NORTH QUARRY
SOUTH QUARRY
WASTE DUMP NO.1
WASTE DUMP NO.2
WASTE DUMP/TOPSOIL NO.3
LAGOON NO.1
LAGOON NO.2
SP-1
SP-2
SP-3
SP-4
SP-5
IN-PIT CRUSHER (LINE 2)
CONVEYING SYSTEM
EXPLOSIVE MAGAZINE
EXISTING CRUSHER (LINE 1)
PLANT NURSERY
CABUAN CREEK
NAUPA CREEK
FLAT ELEV B+110
Barangay Camp VIII
Municipality of Minglanilla
Tal.-Ming Estate (Flr-133)
Barangay Lanas
Naga Cadastre (Cad. 747-D)
A=46.1437 Hectares
MPSA 194-2004-VII
Barangay Guindarohan
Municipality of Minglanilla
Tal.-Ming Estate (Flr-133)
A=56.6765 Hectares
TOPOGRAPHIC and
AS-BUILT SURVEY PLAN
SCALE 1:6,000 M.
CRUSHER_CONVEYOR LAYOUT PLAN
GENSON Surveying & Eng'g. Consultants
JUAN VITO C. GENSON
TOPOGRAPHIC and AS-BUILT SURVEY
(Active Quarry and Crusher Plant)
JLREGNER
JLR CONSTRUCTION and AGGREGATES INC.

1. Basic Information and Project Proponent

<table>
<tr><td>Name of Project & Location</td><td>Basalt Material Quarry Production Expansion Project
Production Area : 140 ha. in Barangay Cogon, Naga
MPSA host areas: Barangay Cogon and Lanas City of Naga
Barangay Guindarohan and Camp 8, Municipality of Minglanilla
Province of Cebu, Region VII</td></tr>
<tr><td>Name and Office Address of Proponent</td><td>JLR Construction and Aggregates Inc.
JLR Compound, B. Suico St., Tingub, Mandaue City</td></tr>
<tr><td>Project ECC</td><td>ECC No. 0403-008-302 for MPSA 194-2004-VII. Issued August 27, 2004</td></tr>
<tr><td>Changes Project Components</td><td>
<table>
<tr><th></th><th>Existing</th><th>Expansion</th><th>Total</th></tr>
<tr><td>Quarry Production Area (ha.)</td><td>20</td><td>120</td><td>140</td></tr>
<tr><td>Production Volume (m3)</td><td>500,000</td><td>1,500,000</td><td>2,000,000</td></tr>
<tr><td>Crusher Capacity m3/hr)</td><td></td><td></td><td></td></tr>
<tr><td>Line 1 (wet process)</td><td>250</td><td></td><td rowspan="2">750</td></tr>
<tr><td>Line 2 In-Pit Crusher (dry process)</td><td></td><td>500</td></tr>
</table>
</td></tr>
<tr><td>Contact Person/Designation</td><td>Ms. Candice Regner-Neri
CEO and General Manager
Telephone: 09173204011
E-mail: candiceneri@yahoo.com
Mr. Herbert B. Camasura
Community Relations and Human Resource Manager
Telephone: 09176254665
E-mail: hbcamasura27@gmail.com</td></tr>
</table>

2. Project Description

1.1 Introduction

The JLR Construction and Aggregates, Inc. (JLRCAI) is a family-owned home-grown Filipino company, operating in Naga, Cebu for over 25 years. JLRCAI is on the leading edge of its industrial technology and is an innovator in the Ready-mix Concrete and Aggregates industry in Cebu, Philippines.

JLRCAI was issued Environmental Compliance Certificate (ECC) Ref. No. 0403-008-302 in August 27, 2004 for the increase in extraction of basalt materials from 45,000 to 500,000 cubic meters from MPSA No. 194-20004-VII with approved area of 336 hectares, which then recently superseded its initial mining area of 20 hectares.

1.2 Project Location and Area

The proposed Basalt Material Quarry Production Expansion Project, herein after referred to as "the Project", is within the political jurisdiction of Barangay Cogon in the City of Naga, Cebu, also within the boundaries of MPSA No. 194-2004-VII which has portions also in Barangay Lanas in the City of Naga; and Barangay Guindaruhan and Camp 8 in the municipality of Minglanilla, all within the Province of Cebu.

The technical descriptions of the expanded Basalt material production area is shown in Table1.1 with the location map presented in Figure 1.1.

Point	Latitude	Longitude
1.	10° 17.177'N	123° 44.016'E
2.	10° 17.180'N	123° 44.802'E
3.	10° 17.011'N	123° 44.801'E
4.	10° 16.946'N	123° 45.017'E
5.	10° 16.920'N	123° 45.017'E
6.	10° 16.679'N	123° 44.608'E
7.	10° 16.677'N	123° 44.016'E

Total Production Area : 1,363,937.45 square meters

Table 1. 1 Coordinates Bounding the Quarry Production Expansion Area

1.3 Project Accessibility

The expanded Basalt quarry production area is located in Barangay Cogon, City of Naga, Province of Cebu. The City of Naga is 22 km Southwest of Cebu City, and lies along the Cebu South National Road which is accessible by all types of land transport vehicles.

The existing access to the quarry area from the Cebu South national road is through the 6.0-kilometer Cogon-Guindaruhan barangay road (See Figure 1.5). A portion of this road is cemented and the rest is made of dirt and gravel.

The project will neither have any airport or port/shipping facilities but it is approximately 35 kilometers away from the Mactan Cebu International Airport in Lapu-Lapu City, Cebu and 25 kilometers away from the Cebu International Port. The province is accessible via regular flights from Manila and other cities; and it can be reached by passenger boat with a 20-hour maritime travel from Manila .

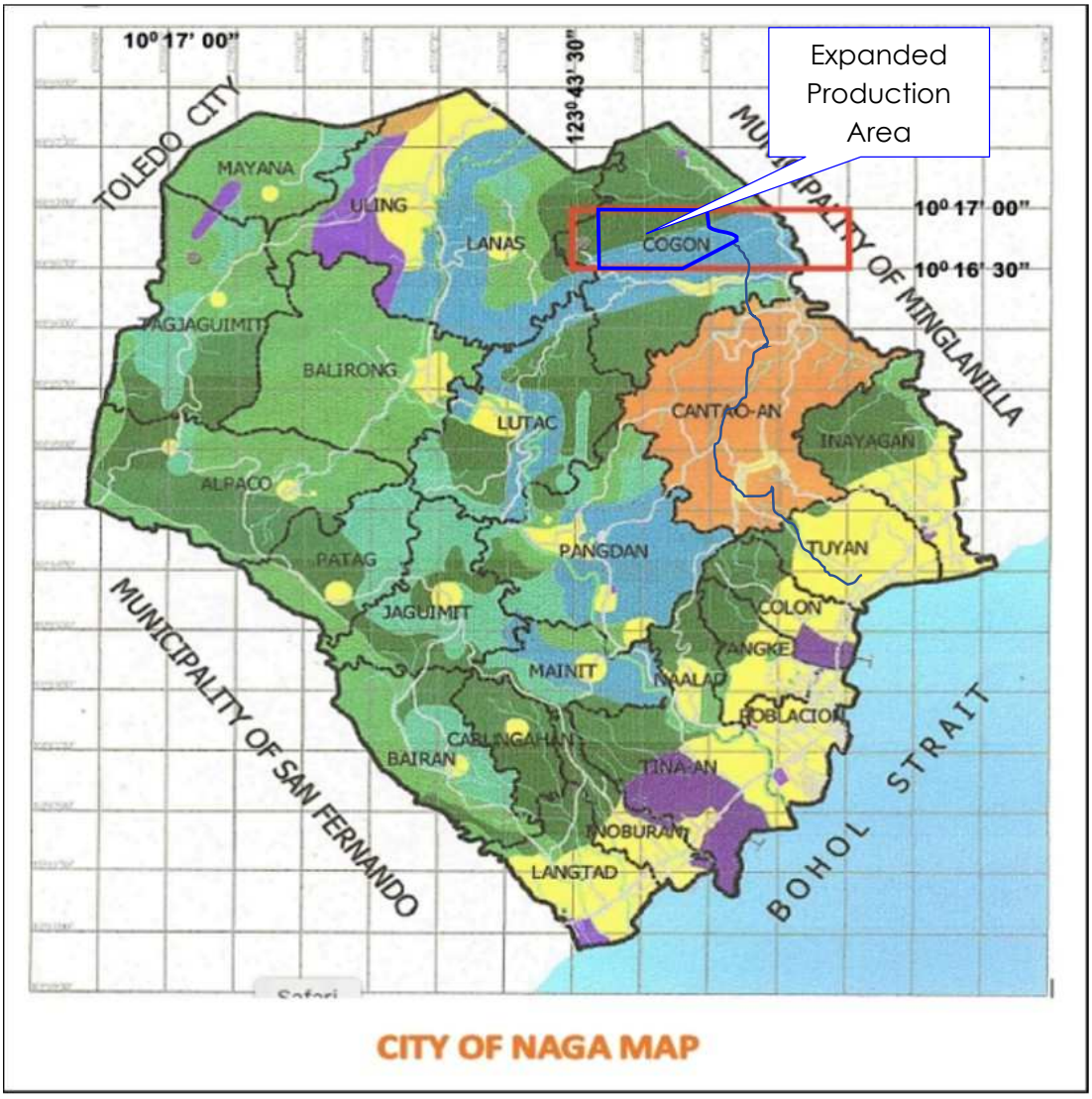
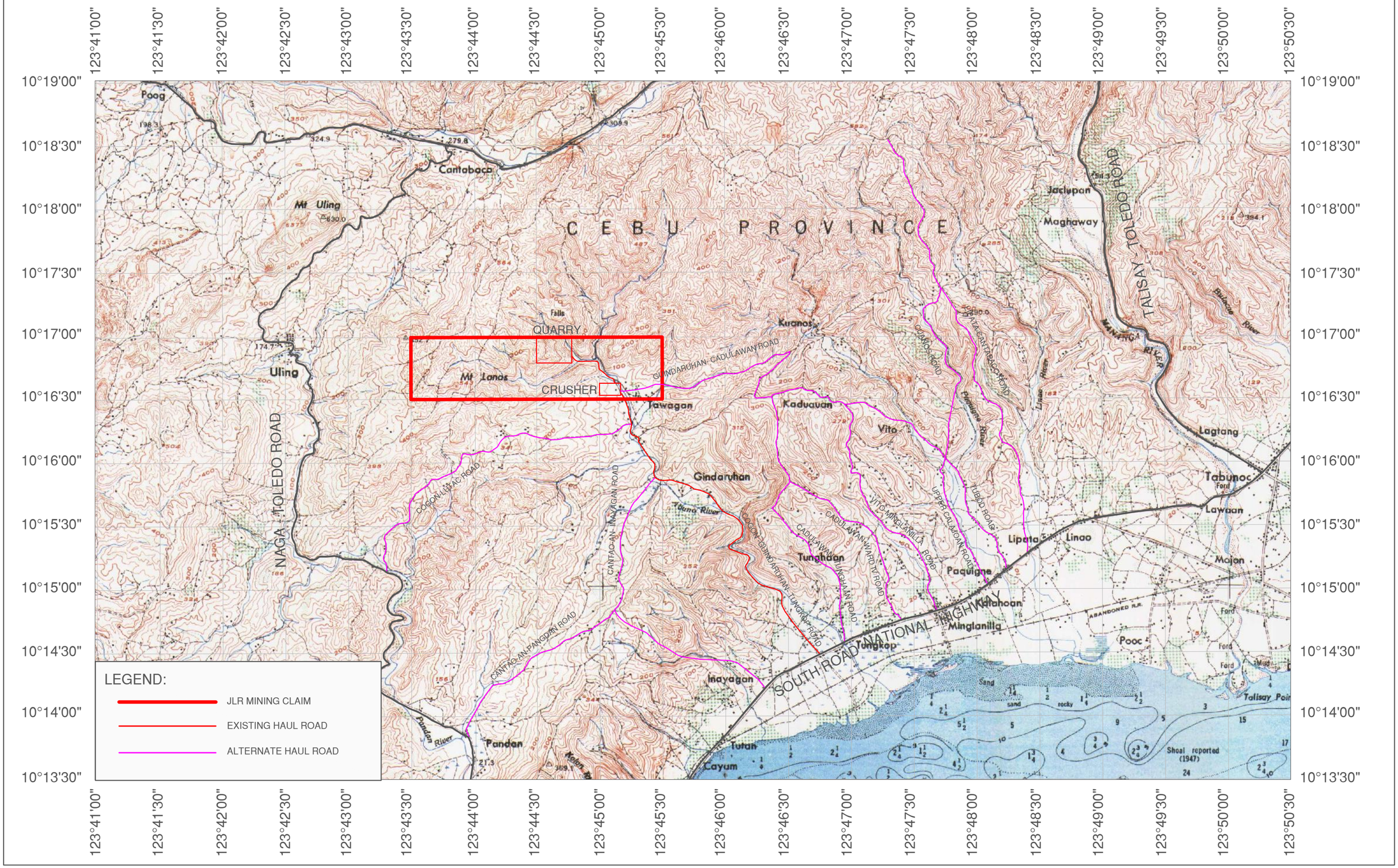


Figure 1. 4 Location of Applied Expanded Production Area



JLREGNER
JLR CONSTRUCTION and AGGREGATES INC.

TITLE: HAULING ROAD PLAN

LOCATION: CITY OF NAGA, CEBU

0 500 1000 1500 2000 2500 5000
SCALE 1:50,000

N
W E
S

1.4 Rationale

Cebu is seen as one of the most favorable places for the location of new industrial and commercial activities outside Metro Manila that will be opened by the integration of the country to global trade and investment which is made possible by the liberalization of the country's trade and investment policies. With its strategic location, it is expected that its current growth will continue to rise and there would be a lot of development and construction activities particularly in Metro Cebu.

An indication of this growth is the increasing demand for construction materials like aggregates. There are a number of small-scale river aggregate quarries operational in the province. However, their combined output is still insufficient to meet the demand of Cebu's construction industry.

Aggregates is one of the important materials in the construction of physical infrastructures such as commercial, institutional and residential buildings, roads and bridges; thus, is vital in infrastructure development particularly in the rural areas. The demand for aggregates in the Philippines continued to surge upward and is projected to escalate more in the coming years to keep up with the rising infrastructure development in the Philippines under President Duterte's "Build! Build! Build!" program.

In response to this situation, the JLR Construction and Aggregates Inc. aimed to increase their production capacity of aggregate materials; hereby, applying for the Amendment of Basalt Material Quarry Project. The expansion project promotes countryside development by boosting local employment and providing livelihood opportunities to the local communities while at the same time generating revenues for the local and national government. The project will help in minimizing the importation which will strengthen the economic stand of the country in the infrastructure industry. JLRCAI also aimed to pursue climate change mitigation, and sustainable and responsible mining.

1.5 Project Alternatives

To meet the exponential growth of demand for aggregates, JLRCAI is undergoing preparations to amend ECC Ref. No. 0403-008-302 to be authorized to increase annual raw basalt materials extraction to 2,000, 000 cubic meters from 140 hectares production area. The major quarry production area limited to Basalt and Pozzolanic materials, and processing shall be mechanical crushing to produce aggregate materials.

JLRCAI conducted geological explorations in the project MPSAs to identify specific potential sources of raw materials suitable for Aggregates and Pozzolanic materials production. The exploration activities were undertaken covering various promising locations within the MPSAs, and only the areas proposed herein are deemed feasible

for long-term quarry operations due to the material quality, quarriable volume, and contiguity of the proposed extraction area which contributes to operational efficiency and better profitability profile. The resources within the locations proposed in this application meet the material quality criteria which are found to be economically feasible for long-term quarry operations.

Considering the demand for aggregates production, there are no foreseen project alternatives for the MPSA other than to expand the existing quarrying operations.

The following section discuss the considerations related to technology, resources and siting and the reasons for project selection.

1.5.1 Technology

Quarry production will continue to utilize open bench mining method as this is a better option than the traditional "cut-and-push over-hill" method which produce higher volume of eroded soil and higher quarry drain water siltation which render JLRCAI vulnerable to Government sanction for environmental violation.

An in-pit crushing facility to be located at the quarry site is opted instead of increasing equipment at the existing crushing plant to meet the target processing volume of 2,000, 000 cubic meters annually, to avoid negative environmental impacts related to noise, ambient dust and traffic congestion in the densely populated area hosting the existing crushing facilities.

An elevated 1-kilometer processed material conveyor system from the quarry to the existing crushing plant was favorably considered to increase market distribution point and increase dispatching efficiency with the increased market distribution resulting from expanded production. The two-lane Barangay road connecting the existing crushing plant to the national highway. The scenario where trucks waiting to be loaded lining along the narrow Barangay road and causing potential traffic congestion will be avoided.

1.5.2 Resources

JLRCAI availing of its rights to exploit mineral resources within MPSA194-2004-VII issued by the Mines and GeoSciences Bureau is most logical. Exploiting mineral resources legally from a Government-permitted source is the safest, most reliable foundation for a multi-million investment.

1.5.3 Siting

Siting of the in-pit crusher within the quarry provides physical barrier offered by the surrounding mountains to contain increased ambient dust and noise within the uninhabited quarry area. This alternative is chosen over siting Line 2 crusher annexed to Line 1 which is densely populated.

The mineral extraction industry is site-sensitive. The existing project location offers the best available option for JLR to invest resources to meet an ever-growing provincial economic development requirement sustaining the construction industry and government infrastructure development.

1.6 Project Development Plan, Process and Components

Basically, the Project has two (2) main components, namely, the Quarry and the Crushing Plant (see Figure 1.3)

1.7 Project Size

Table 1. 2 Size of Production under Expanded Quarry Operations:

AMENDED PRODUCTION			
	EXISTING ECC	AMENDED ECC	
	(Cubic Meters)	(Cubic Meters)	
A. QUARRY			
Pozzolanic Materials	40,000	100,000	
Fill Materials	-	100,000	
Sub-Total	**40,000**	**200,000**	
B. CRUSHER			
B.1 IN-PIT CRUSHER (LINE 2)		DRY PROCESS	CM/HR
Natural Sand		300,000	125
Coarse Sand		200,000	80
3/8"		150,000	65
3/4"		350,000	150
G-1		200,000	80
Sub-Total		**1,200,000**	**500**
B.2 EXISTING CRUSHER (LINE 1)	WET PROCESS	WET PROCESS	CM/HR
Natural Sand	40,000	-	
Washed Sand	120,000	180,000	75
3/8"	100,000	120,000	50
3/4"	140,000	200,000	83
G-1	60,000	100,000	42
Sub-Total	**460,000**	**600,000**	**250**
C. COMBINED (Cubic Meters)	**500,000**	**2,000,000**	**750**

1.8 Quarry Resources, Reserves and Annual Production

Based on the result of the exploration conducted by JLRCAI, the identified production area has a mineable reserve of 66,000,000 cubic meters. The proposed increase in annual production from 500,000 cubic meters to 2,000,000 cubic meters shall be sourced from the said identified production area.

Table 1. 3 Existing and Amended Annual Production and Mineral Reserves

ECC No.	0403-008-302	
Tenement No.	MPSA No. 195-2004-VII	
Commodity	Basalt/ Lapilli Tuff	
Location	Barangay Cogon, City of Naga, Cebu	
Annual Production	Existing: 500,000 cubic meters For Amendment = 2,000,000 cubic meters	
Mineral	TOTAL = 66,000,000 cubic meters	
Mineral		
	MPSA 194-2004-VII	
ECC Area (has.)	Existing:	336
ECC Area (has.)	For amendment:	336
Production Area (has)	Existing:	20
Production Area (has)	For amendment	120
TOTAL AMENDED PRODUCTION AREA		140

1.8.1 Quarry Operations

The Basalt Material Quarry Production Expansion Project is located within the 336 hectares of MPSA 194-2004-VII. The actual exploitation activities will only be within the 160 hectares Production Area identified to hold the desired basalt material quality. Other portions of the MPSA will not be touched with the exception of the 20-meter riparian buffer zone which will be planted with bamboo, as well as the road network that will undergo maintenance work to ensure their serviceability for the hauling of quarry materials. **Figure 1.2** contains the location map of the existing quarry area and proposed expanded quarry area.

The JLRCAI will exploit the mineral resources using surface bench mining method with progressive rehabilitation. The current quarry production area is at 20 hectares with an estimated ore reserves of 20 million cubic meters on the 10mx10m bench dimension, a working batter slope of 70° and final maximum base to apex slope is 40°, 1m top soil overburden, 9m weathered pyroclastic rocks. Final pit bottom will not be lower than the existing road elevation.

With the applied Amendment of the existing ECC, the quarry operations will expand with an additional 120 hectares production area with an estimated ore reserves of

66 million cubic meters. Once the resource had been exhausted, the final mined-out area will be a terraced and flat land, that can be developed for various beneficial purposes such as real estate development, eco-park, institutional facility construction and others. Slope modification by removal of steep slopes through quarry will render the area more conducive and stable to host other socio-economically beneficial uses. Details of final land-use is discussed in the Final Mine Rehabilitation and Decommissioning Plan (FMRDP).

Photo 1.8.1 Aerial Photo of Existing JLR Basalt Quarry

1.8.2 Crushing Plant

The existing Crushing Plant has an annual production capacity of 500,000 cubic meters with complete set of Crushing and Sizing Equipment. This is now called Line 1 Crushing Plant.

With the applied amendment of existing ECC, the Crushing Plant Operations will expand with the construction of a new Line 2 Crushing Plant to be located in the Quarry area or simply known as In-Pit Crushing Plant. Line 1 and Line 2 Crushing Plant will produce a combined production of 2,000,000 cubic meters of aggregates and related products annually.

Line 2 Crushing Plant will be connected with the Line 1 Crushing Plant with the installation of 1-km. Conveying System. This Conveying system will transport the primary crushed raw materials from In-Pit Primary Crusher (-5 inches material size) to

the Surge Pile at the Line 1 Crushing Plant for Secondary Crushing, Sizing and Classification to different aggregate products (see Figure 1.3).

1.8.3 Topsoil and Waste Material Stockpile

Stockpiles of organically-rich top-soil will be allocated for compensation tree planting and nursery operations while the waste material stockpile, are set aside for the road maintenance and public use as backfill materials for the land development.

Topsoil and waste material stockpiles will be properly situated in locations with minimal additional disturbed area, areas with minimal tree and vegetation cover, areas without tree cutting requirement, and in relatively higher elevation that is easy to provide earth bounds or surrounding compacted embankment soil barriers. Three stockpile sites are designated within the quarry area for efficient operations for sectional rehabilitation, and within the buffer zone. Each stockpile area may hold both top soil overburden and waste materials but these are not allowed to mix. The stockpile slope will be kept at low angle and safe height to minimize slumping. The proposed height of the stockpile will be finally determined by the angle-of-repose of the materials, observed to average approximately three meters. Angle of repose is the maximum angle of descent or dip of the stockpile slope relative to the horizontal plane. This is to ensure that the maximum volume of materials will be stockpiled without sacrificing safety.

1.8.4 Stockpile Drainage

Stockpile drainage will be constructed to serve as a water catchment basin to address possible problems related to damage of nearby farms and exceedance of the water quality standard; stockpile areas will be carefully selected to have proper natural drainage features (**Figure 1-6**).

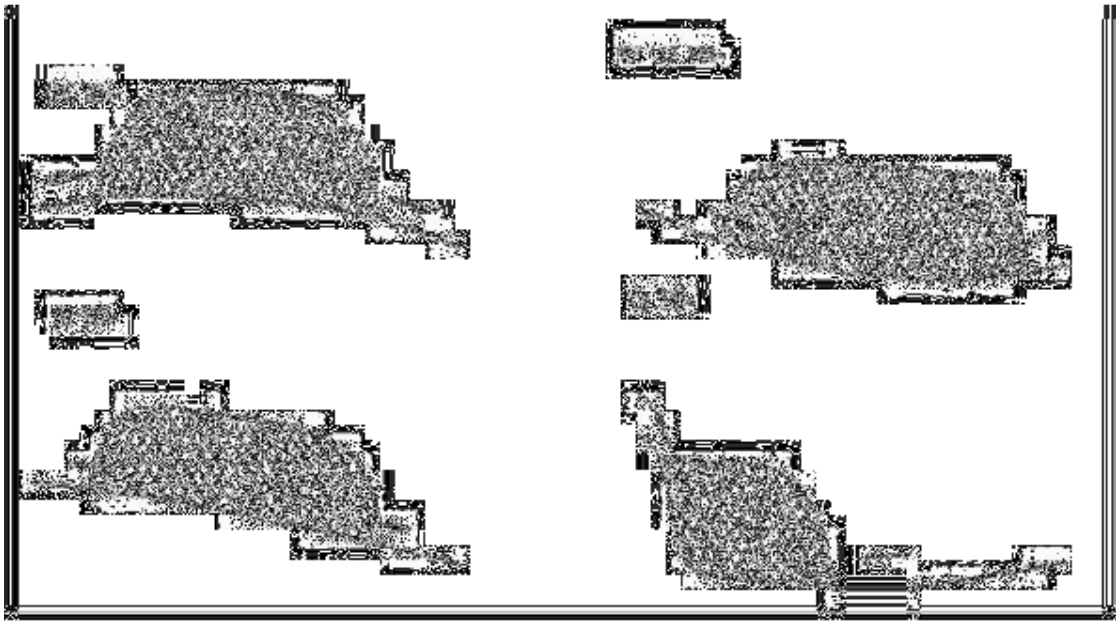


Figure 1. 6 Ideal Natural Drainage Features of Stockpile Area

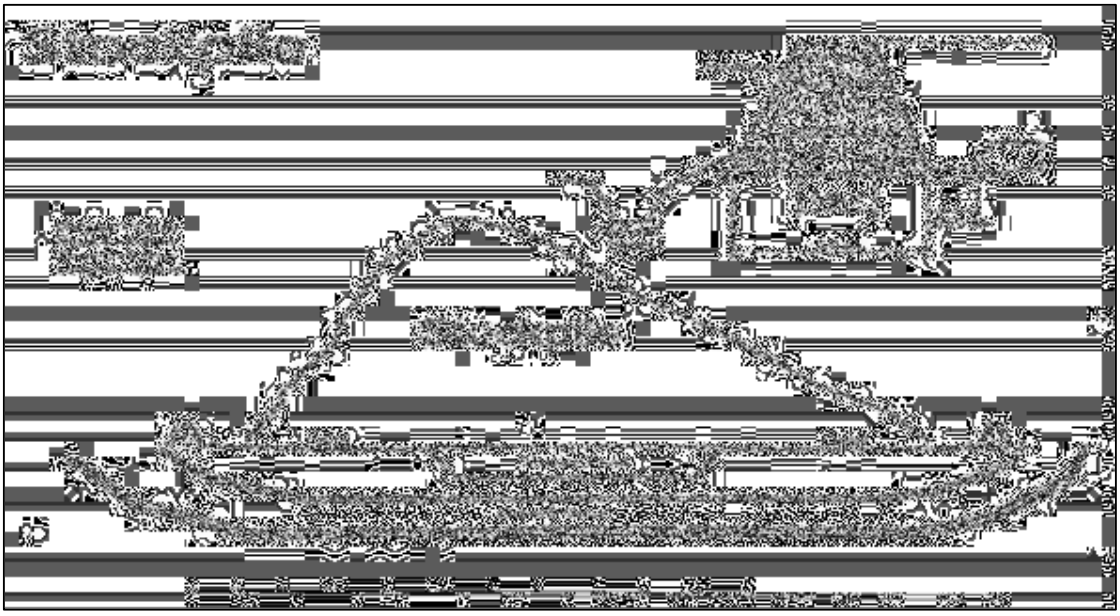


Figure 1. 7 **Drainage Provisional Plan for Stockpile**

The company will maintain a regulated stockpile area. Stockpile slope will be kept at low angle and height to minimize slumping. The proposed height of the stockpile will depend on the angle-of-repose of the material. This is to ensure that the maximum volume materials will be stockpiled without sacrificing safety. Angle of repose is the maximum angle of descent or dip of the stockpile slope relative to the horizontal plane.

1.8.5 Contour Canals

Drainage canals will be installed for every bench that is connected to a graded canal at the end of each bench. These canals are directed to a silt detention pond where sediments carried by run-off are to be collected. The overflows from the ponds are again collected by another canal with sufficient holding capacity to hold 24-hour normal rainfall and allow ground infiltration. The final settling pond in the series of settling ponds collecting quarry drain water spills overflow over through a ridge of concrete blocks to the existing streams, to further detain silt before final drain out.

1.8.6 Access Roads

JLRCAI will coordinate with the concerned LGUs and provide whatever assistance it can extend in maintaining the access road outside the project area. Internally, the company will monitor hauling trucks to ensure that there will be no overloading. Overloading will enhance the wear of access roads.

Access roads to the project site shall be improved by ballasting it with base coarse gravels (mixed with the silt from the silt dumps) and it shall be brought to the ideal compaction. The silt from the catchment will be dried and mixed with the gravels to become well bonded base coarse for road fill. Ballasting activities will be introduced to increase accessibility to the processing plant, thereby preventing soil erosion during wet season while controlling pollution from dust particles during dry season. This aspect of maintaining access roads does not only provide environmental control mechanism but also contributes to increased efficiency of quarry output.

1.8.7 Haul roads

The area is served by an existing barangay road that goes directly to the quarry site. The proposed quarry expansion area is presently accessible though the Cogon-Guindaruhan barangay road. Currently the barangay roads are enough for two dump trucks going both ways. However, road development/widening in the future will be necessary when the production expansion begins. The Barangay Road will need it to be widened later to about 10 meters for dump trucks to go two abreast. The Department of Public Works and Highways has the program "Roads Leveraging Linkages of Industry and Trade or the "ROLL IT" program, where Industry stakeholders, their LGU, identify potential industry road projects, which will greatly benefit both the industry and community. The JLR Basalt Production expansion project fills the criteria to be prioritized by the DTI as it will benefit the Government's Build!-Build!-Build! Program and likewise the community it serves.

1.8.8 Support Facilities

Surface Mine Buildings and Facilities

The JLRCAI will construct one Field office and Maintenance shed made of permanent materials. These offices will be equipped with sanitary facilities for use by the project staff and occasional visitors.

Nursery

As mandated by Executive Order no. 193, which expanded the coverage of the Executive Order no. 26 known as the National Greening Program (NGP), the proponent must undertake tree planting. To supply the reforestation requirements, a nursery will be established in the buffer zones proximate to the forest development areas. Recommended native forest tree species will be propagated, planted, and stocked in the nursery; then geo-tagged and registered in the NGP. Another objective of establishing the nursery is to offset and compensate the Green House Gas emissions from heavy equipment operations in the Project.

Siltation Ponds

JLRCAI will construct additional settling ponds to contain and treat the wastewater generated from the operation. The silt retained in each pond when accumulated diminish the containment capacity of the pond, thus, the possibility of overflowing to the natural drainage system the primary settling pond retains about 80% of the silt, which is the reason why it is the most desilted among the settling ponds. Silt is removed from the settling ponds by means of long-reach excavators. The silt recovered from the pond will be dried, transferred and mixed with the base coarse gravel that will be used in road fill and resurfacing to generate better compaction when used.

Riparian Buffer Zones

Riparian buffer zones are the interphase or transition zone between land and a river. Nature when undisturbed grow trees, thick bushes and shrubs along the creek and river banks to protect the aquatic ecosystems. Riparian zones moderate the surface water temperature and biodiversity. Riparian zones are likewise good sediment filters, trapping silt in surface run-off and reducing water siltation. Maintaining environmental balance includes protection of the riparian zone. Buffer zone of twenty meters inland from river banks will be planted with bamboo to restore the riparian buffer zone in the

quarry site. For the quarry expansion area, vegetation clearing and mineral extraction will stop 20 meters from the creek or river banks to preserve the riparian buffer zone.

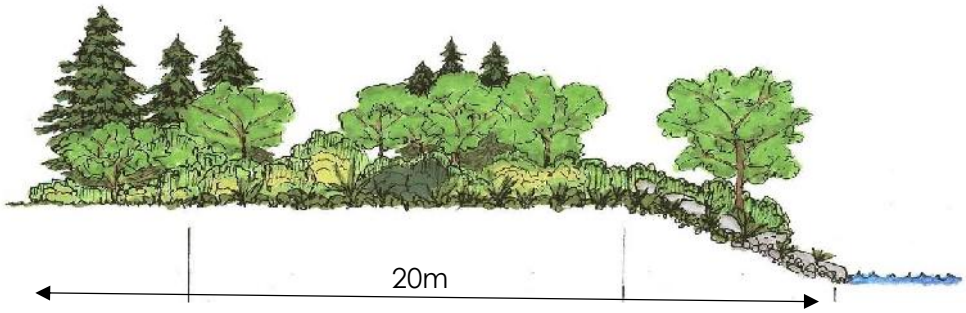


Figure 1. 8 **Riparian Buffer Zone**

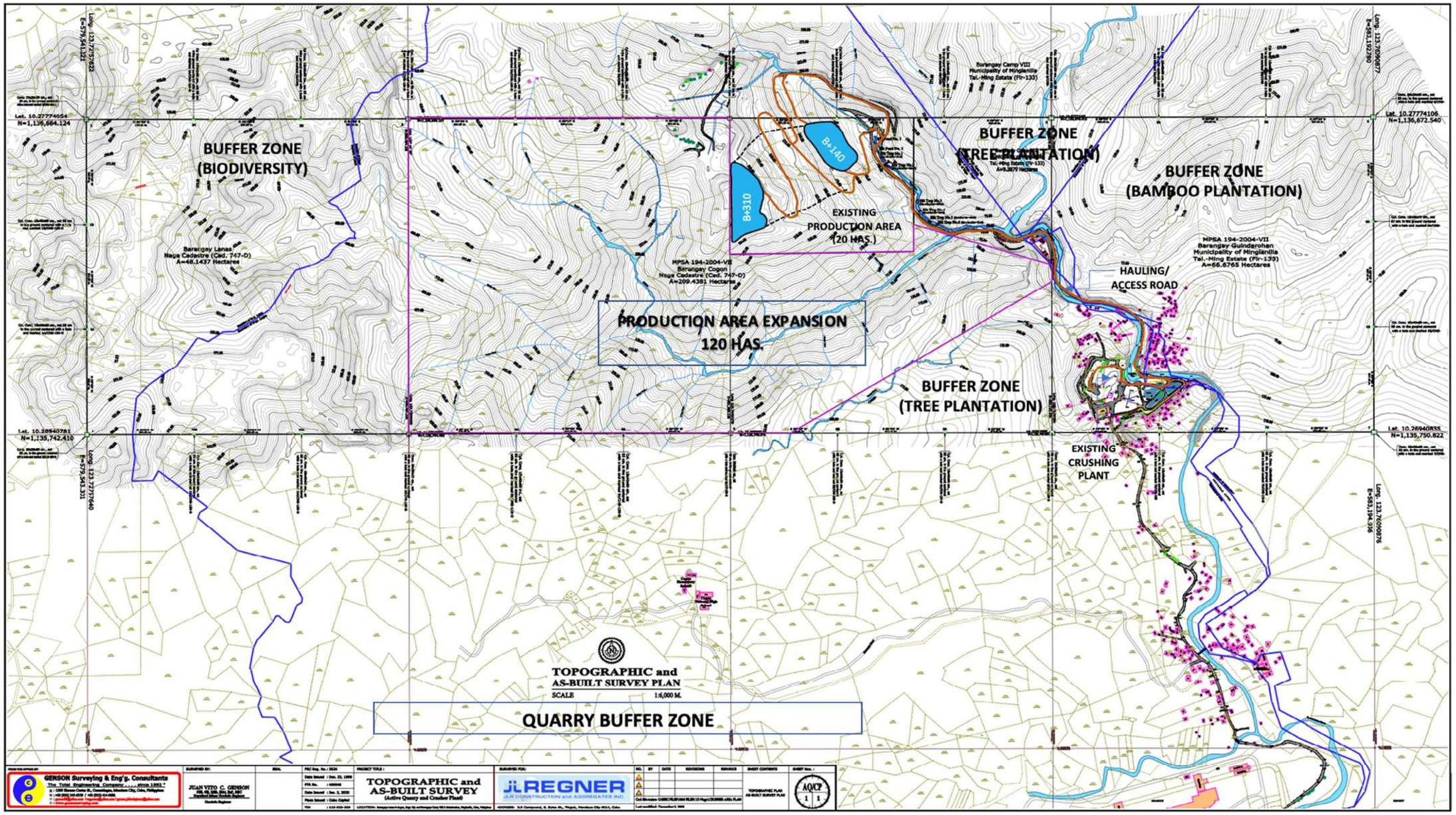


Figure 1. 9 **Production Map with Buffer Zone**

1.9 Process Technology

The aggregates raw materials will be extracted from the reserve using conventional surface bench mining method with progressive rehabilitation. Its mining operation includes stripping, extraction, hauling, and progressive rehabilitation. The general quarry process is shown in the following Figure 1.10:

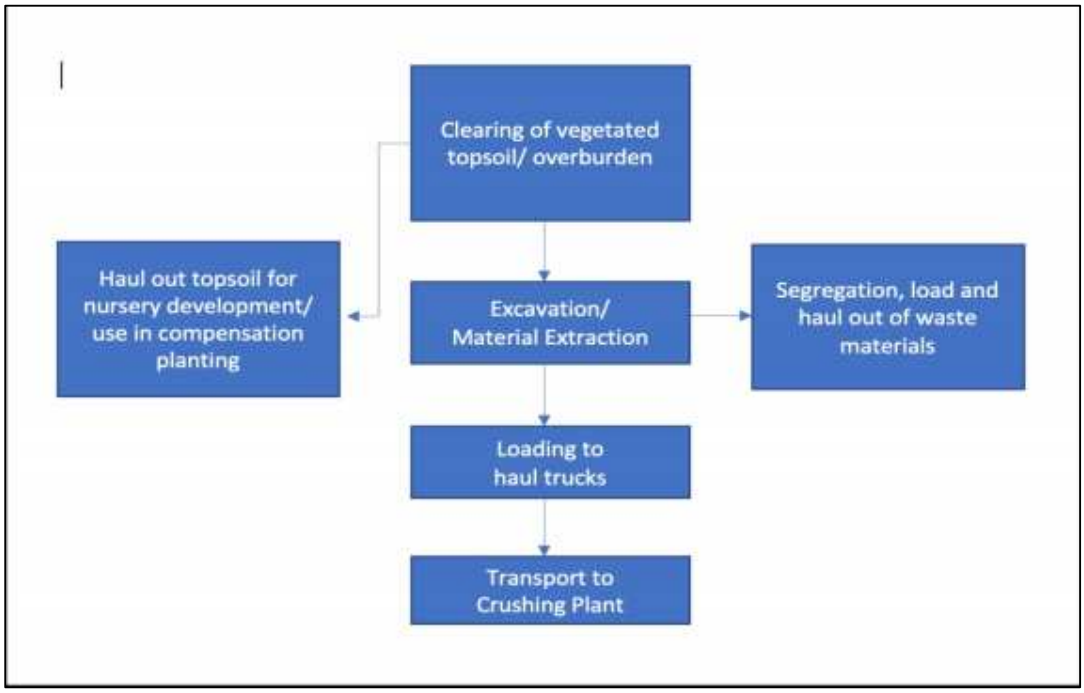


Figure 1. 10 **Quarry Operations Flowchart**

The overburden will be removed, dumped and stockpiled in the waste dumping area for future backfilling of mined out blocks. Care is taken to ensure that the fertile top soil is properly stockpile in order that it is not lost due to erosion or surface water run-off especially during the rainy season. Immediately following the extraction of the minerals, progressive rehabilitation follows. The fertile topsoil and subsoil are returned to the exploited area forming terraces which have better soil holding capacity. These new areas are planted with appropriate vegetation such as indigenous plant species (i.e. trees, shrubs and cover crop). **Figure 1.10** illustrates the general quarry process used by JLR, as well as progressive rehabilitation; while Figure **1.12** shows a transect of a mined-out area which had been subject to progressive rehabilitation, as well as the activities being done in each stage. **Figure 1.13** provides a photograph of vegetative slope stabilization measure which can adopted in the project.

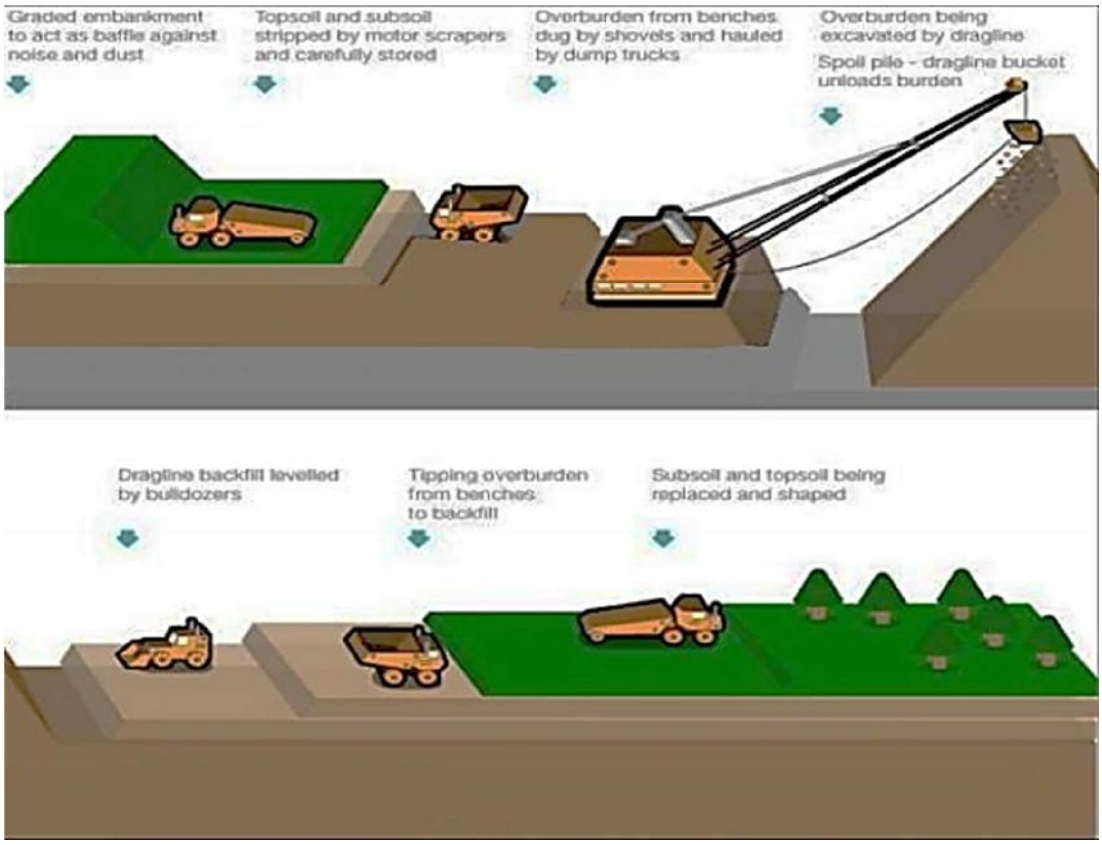


Figure 1. 11 General Quarry Process

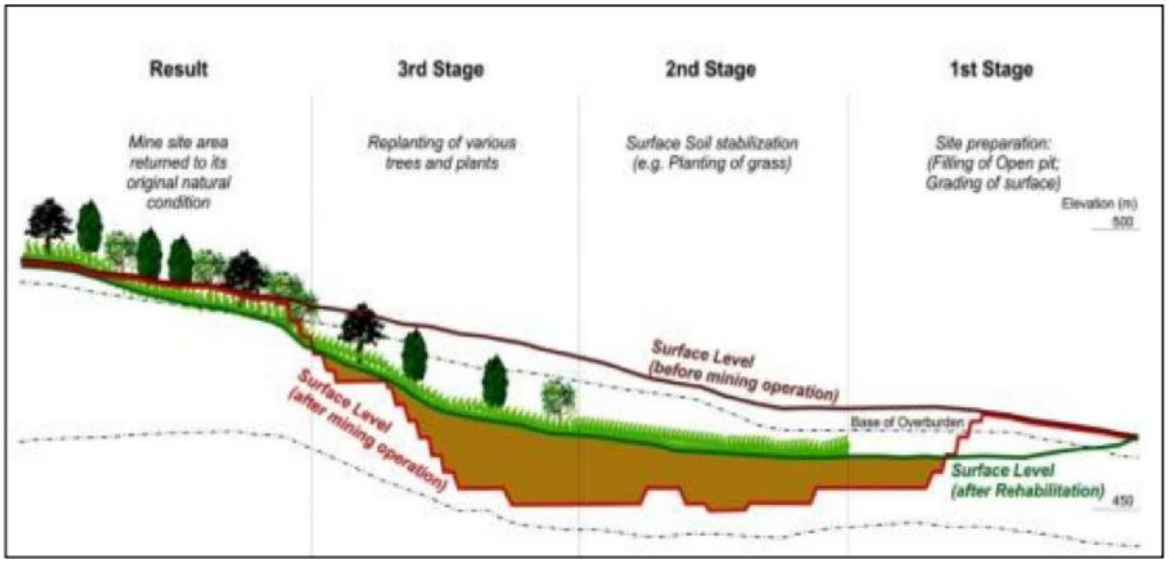


Figure 1. 12 Progressive Rehabilitation

Figure 1. 13 **Slope Stabilization Measures for mined-out areas**

1.10 Silt ponds

Silt ponds are one of the soil erosion control measures to be installed in the Project. This facility will be constructed at the pit bottom where it can collect run-off water coming from the top-most elevation of the quarry, and in the process, trap all silt and sediments carried by the surface water. By removing the silt and other sediments in the run-off prior to its discharge into the waterways, the siltation of the receiving streams/rivers is avoided.

Figure 1. 14 **Aerial View Showing Series of Settling Ponds**

1.11 Drainage Systems

Drainage from the quarry sections will be through the contour canals along the base of the slope face. Benches would be cut to allow the bench floor for positive drainage (5-degree fall away from the cut surface) approximately 0.5m x 0.5m (contour canal cross-section) to reduce surface water flow over the cut face and bench, and limit soil erosion potential. Surface run-off from benches would be directed to rock-lined water channels; forming a drainage system on quarry floor as necessary and directed toward the settling ponds designed sufficiently to contain expected surface run-off from the opened quarry area. Background area surface run-off will be directed toward the natural waterways. Due to the nature of the deposits which occur consistently from elevation ±230 masl to +320masl, the quarry activities will be a continuous extraction process until a pre-deter quarry elevation and quarry boundary limit is attained, after which quarry rehabilitation activities commence at each elevation level.

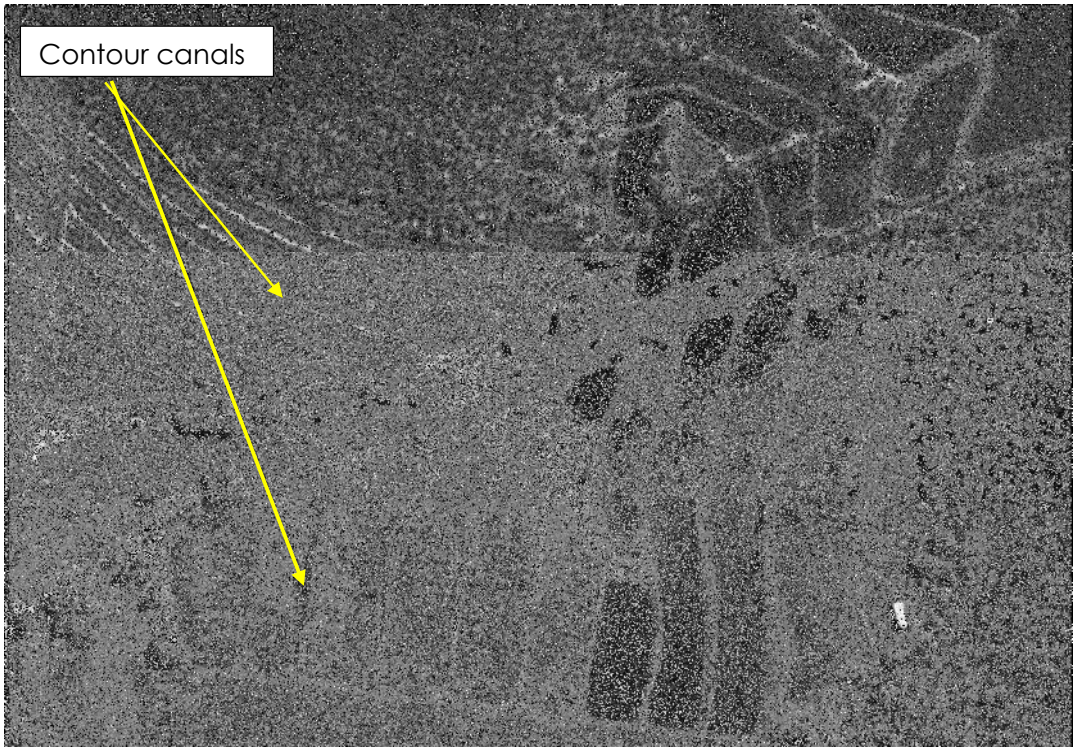


Figure 1. 15 Contour Canals

1.12 CRUSHING PLANT

With the increase in quarry production area from 20 hectares to 140 hectares, the crushing plant production will also increase from 500,000 cubic meters to 2,000,000 cubic meters annually. In order to attain the target production volume, a second line (in-pit crushing) will be installed. The in-pit crushing (Line 2) will be the source of crushed raw materials for feeding to existing Crusher (Line 1) and be transported via truck hauling and/or conveying system. Figure 1.6 shows the operational process flow crusher Line 1 and Line 2.

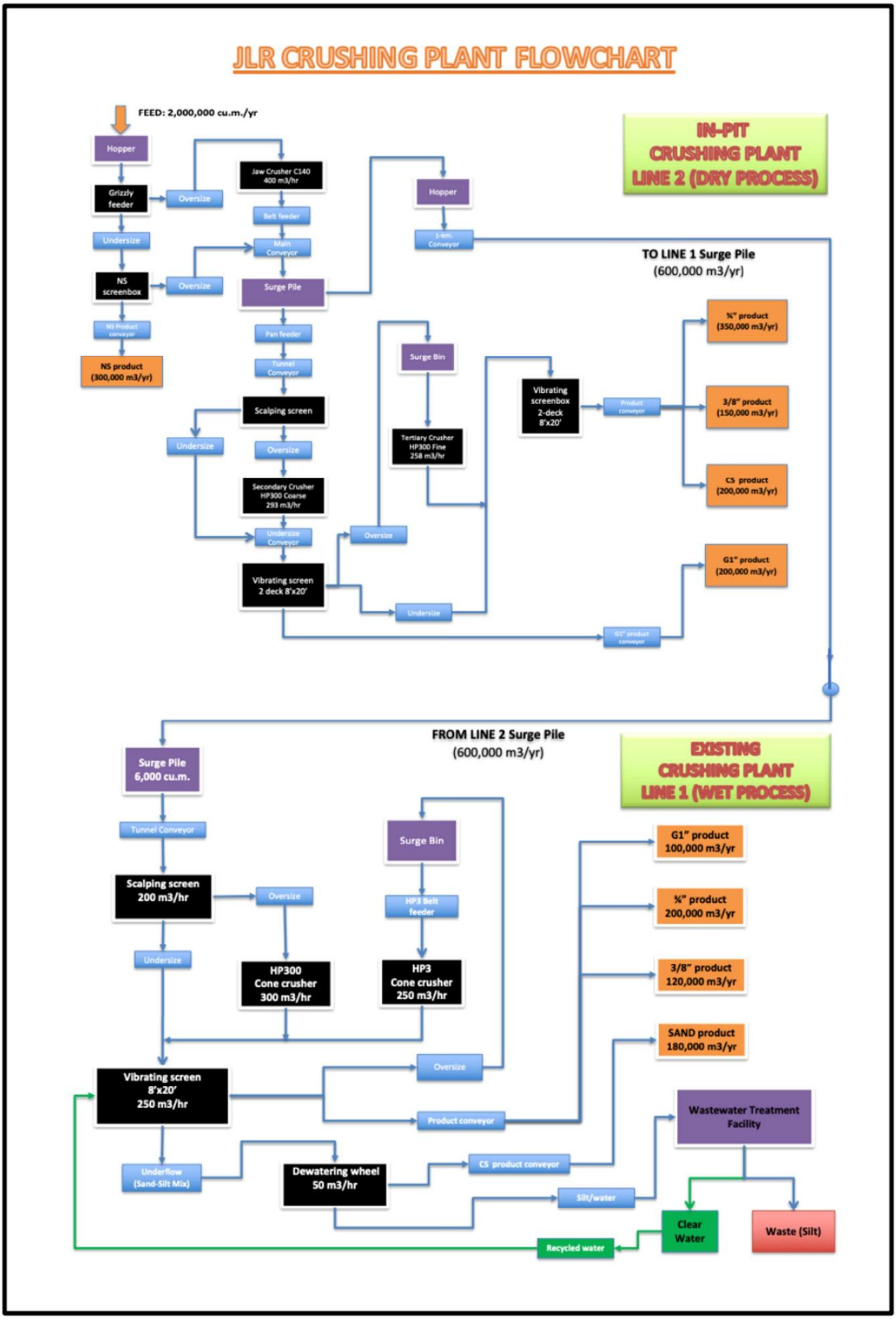


Figure 1. 16 Crushing Plant Flowchart

The equipment to be used in the expanded quarry and crushing operations are listed below.

Table 1. 4 Equipment Requirements

	EXISTING		EXPANSION		COMBINED
DESCRIPTION	No.of Units	Rated Capacity	No.of Units	Rated Capacity	Total No.of Units
Drill, Pneumatic	4	300 m3/hr)	4	300 m3/hr	8
Bulldozer, D155	3	5 cu.m.	3	5 cu.m.	6
Backhoe, PC450	3	3 cu.m.	5	3 cu.m.	8
Dump Trucks, HOWO	20	15 cu.m.	30	15 cu.m.	50
Grader	1	12ft blade	1	12ft blade	2
Compactor	1				1
Water Truck	1	15 cu.m.	2	15 cu.m.	2
B. CRUSHER MOBILE EQUIPMENT					
Payloader, WA380	3	3 cu.m.	4	3 cu.m.	7
Backhoe, PC 350	1	1 cu.m.	2	1 cu.m.	3
Backhoe, LR	2	0.5 cu.m.	-	-	2
Dump Trucks	3	10 cu.m.	2	10 cu.m.	5
Crane	1	50 tons	-	-	1
C. CRUSHER FIXED EQUIPMENT	Line 1		Line 2		Combined
Grizzly Feeder	1	200 m3/hr	1	800 m3/hr	2
Jaw Crusher	1	400 m3/hr	1	400 m3/hr	2
2D Scalper	2	200 m3/hr	2	400 m3/hr	4
Cone Crusher, HP 300	2	300 m3/hr	4	300 m3/hr	6
Vibrating Screen	1	250 m3/hr	3	400 m3/hr	3
Sand Dewaterer	1	50 m3/hr			1

1.13 Water Supply/Requirement

The project will utilize the water from Guindaruhan River as source of water requirements in its processing plant. However, treated wastewater from Treatment Facility within the crushing plant will be recycled back in the system.

The three (3) tributaries, namely, Cabuan Creek, Naupa Creek and Matun-og Creek, located upstream with ample supply of water, is more than enough to supply water requirements in its processing plant.

Water requirement for the quarry activities averages about 121 m per day to cover dust control sprinkling by water trucks of unpaved roads and quarry benches used as access roads. Since the Project will pursue progressive rehabilitation of mined-out portions of the quarry, additional water will be needed for the restoration work which may include vegetative planting which is estimated to have a maximum requirement of 50 m3 /hectare/day or total of 321,054 m3 /year when all of the quarry site is mined- out and undergoes full restoration. The water requirements for the restoration work will be added to the regular quarry water requirements for a total of 854,357.45 m3 /year maximum. The Project personnel will also be utilizing water for their domestic needs (i.e. drinking, washing, bathing, etc.), however, this volume is very minimal estimated at 13.2 m /day. Water requirement for quarry operations-related activities will be sourced from a water impounding area (Lagoon) at a creek that cuts across the project site.

1.14 Power Supply/Requirement

The project power requirements come from the Visayan Electric Company (VECO) which has the sole franchise from the National Power Corporation (NPC) in the area. Daily power consumption for the expanded operations is estimated at 15,000 kw-hr./day.

1.15 Description of Project Phases

The Project will be implemented in several phases which includes: a) project development/ construction phase, b) operations phase, and c) abandonment phase. The schedule of the different project phases is summarized in the sections below.

1.16 Project Development / Construction Phase

The project is currently under the operation phase. However, with the implementation of the Amended production area, several access roads and bridges will be developed and constructed to reach to different quarry production areas.

The Development/ Construction Phase shall involve the following activities:

- Construction of access and haul roads;
- Construction of bridges/ spillways
- Site preparation and construction of mine and plant facilities; and
- Construction and establishment of pollution control facilities

These activities prepare the site for the actual exploitation works, providing the access for the transport facilities to the quarry site and back to the stockpiling areas; as well as anti-pollution facilities in conformity with the conditions of the ECC.

1.17 Access road/ Haul Roads

Additional access roads will be developed for the expanded quarry area, to be constructed starting from the existing haul roads towards the topmost bench of different production areas. These access roads will be used also as haul roads when actual waste stripping, bench preparation and raw material production will start.

1.18 Bridges/ Spillways

Bridges/ Spillways will be constructed in crossing the creeks to reach the different production areas and waste dumps location.

1.19 Clearing of Vegetation, Topsoil and Overburden Stripping

Land clearing would entail clearing, balling, and transfer of trees less than 15cm diameter at breast height (DBH), timber recovery of trees above 15cm DBH, chipping/mulching of removed vegetation to be added to top soil heap, separation and haul out of humus (top soil). Bulldozers, backhoes, and dump trucks would be deployed to undertake these works. Stockpiling of the removed topsoil at designated areas for future re-use would preserve the mulched vegetation and the topsoil. The topsoil and other organic remnants are necessary requirement for the rehabilitation activities such as re-soiling and re-vegetation.

The stripping of the topsoil and overburden to expose the desired materials is necessary in preparation for actual production/exploitation. The topsoil will be stockpiled in the designated location to be used in final mine rehabilitation while the overburden will be stockpiled separately and will be sold commercially as pozzolanic materials for cement manufacturing, base coarse materials for road surfacing and backfilling materials for reclamation projects.

1.20 Operation/ Production Phase

Table 1. 5 Project Implementation and Production Expansion Schedule

AMENDED PRODUCTION SCHEDULE											
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	TOTAL
A. ECC AMENDNMENT											
A.1 EPRMP PREPARATION/ ECC APPROVAL											
B. CRUSHING PLANT CONSTRUCTION											
B.1 IN-PIT CRUSHING											
B.2 CONVEYING SYSTEM											
C. MPSA/ DMPF AMENDMENT											
D. QUARRY DEVELOPMENT											
D.1 NORTH QUARRY											
D.2 SOUTH QUARRY											
E. PRODUCTION											
E.1 NORTH QUARRY											
	500	500	500	500	600	700	800	900	1,000	1,000	7,000
E.2 SOUTH QUARRY											
			200	500	600	700	800	900	1,000	1,000	5,000
E.3 TOTAL PRODUCTION (000 OMITTED)	500	500	700	1,000	1,200	1,400	1,600	1,800	2,000	2,000	12,000

1.21 Quarrying/Material Extraction

The project will apply the method used in its existing quarry operations, the conventional method of Open Cut Mining with the utilization of Bulldozers, Backhoes, and Dump Trucks for earthworks. Pneumatic and hydraulic drills are used to bore 76 mm diameter holes for the blasting operations. Holes are drilled in a pre-designed pattern and depth depending on the applicability of the blasting purpose. The mining operation is classified into two major stages, the Development Stage and the Production stage.

In the development stage, the work involves the construction of access roads leading towards the targeted elevation of the mineable area and stripping of topsoil and overburden to expose the needed good quality basalt rocks. Working benches are then prepared by leveling at the targeted elevation.

In the production stage, the prepared working benches are then scheduled for cutting by drilling and blasting activities. The blasted materials are then pushed by Bulldozers

towards the loading area at pit bottom. Each production benches being prepared are cut in a retreating manner starting at the topmost bench and progresses down in accordance with the benching design which extends ten (10) meters high per bench. Final bench slope will be seventy (70) degrees with berm width of ten (10) meters. Quarrying will be undertaken by drilling-blasting-dozing-loading combination system of operation.

Photo 1.21.1 Engr. Delfin Campo's Supervised Surface Bench Limestone Quarry in the MPSA of Solid Earth Development Corporation, San Fernando, Cebu

Drilling and Blasting:

Employing a hillside cut approach, the quarry operation involves the stripping of the overburden, drilling, blasting, loading, and hauling. To make the mineable basalt rock available for extraction, the topsoil and other weathered overburden materials are stripped and transported to the rehabilitation area of the company.

Due to hardness of the basalt rock to be extracted, drilling and blasting are done. Blastholes, measuring 76 mm in diameter and 10 meters (including a subdrill of 1 meter) in depth, are drilled using pneumatic or hydraulic percussion drills. Blasting is done to break the materials from the mineable area using twenty to twenty-five (20 – 25) kg of dry ANFO per hole. Controlled blasting is resorted to through the use of nonelectric delay detonators to minimize ground vibration, fly-rocks, and excessive sound waves generation.

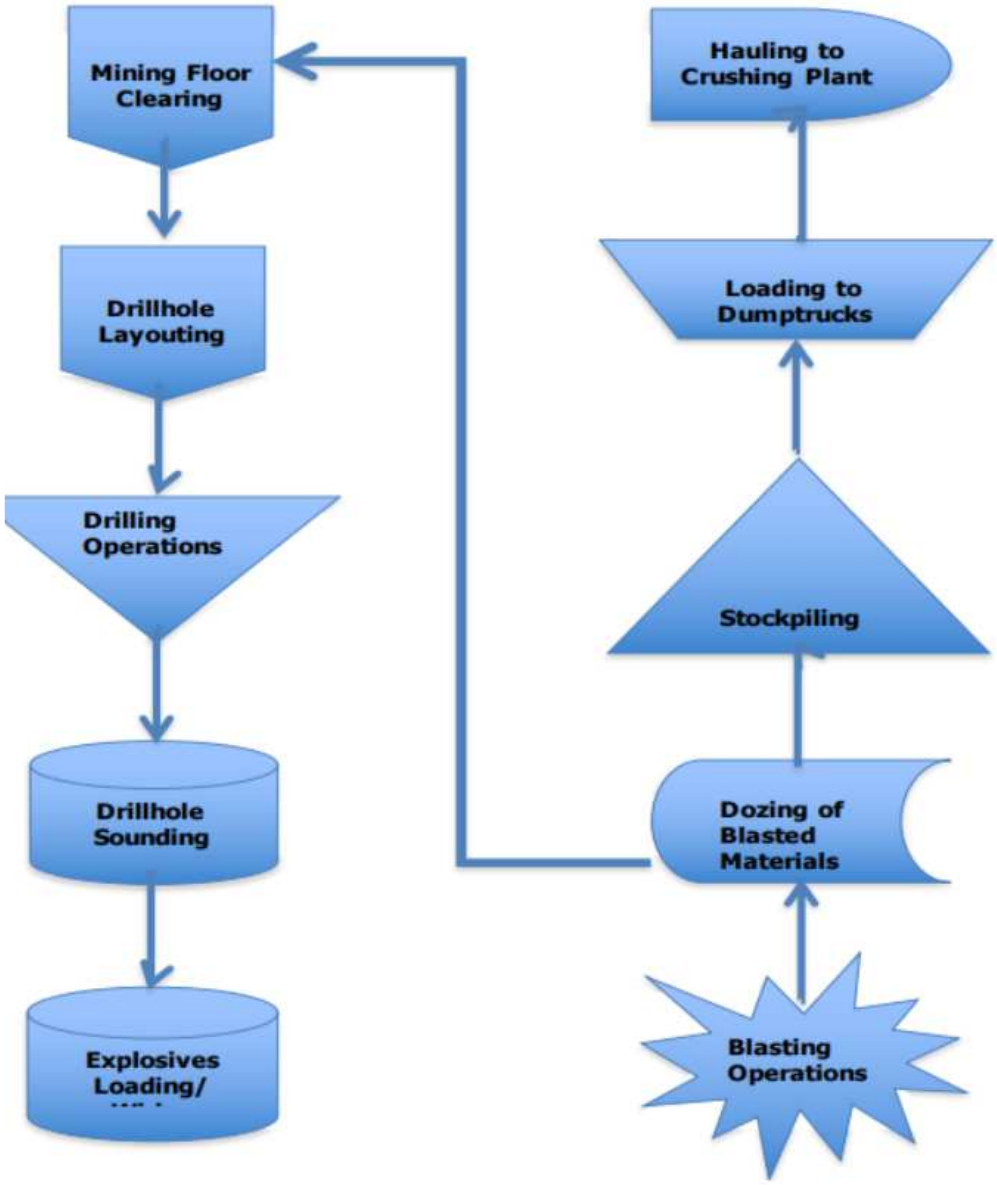


Figure 1. 17 Blasting Activity Process Flow

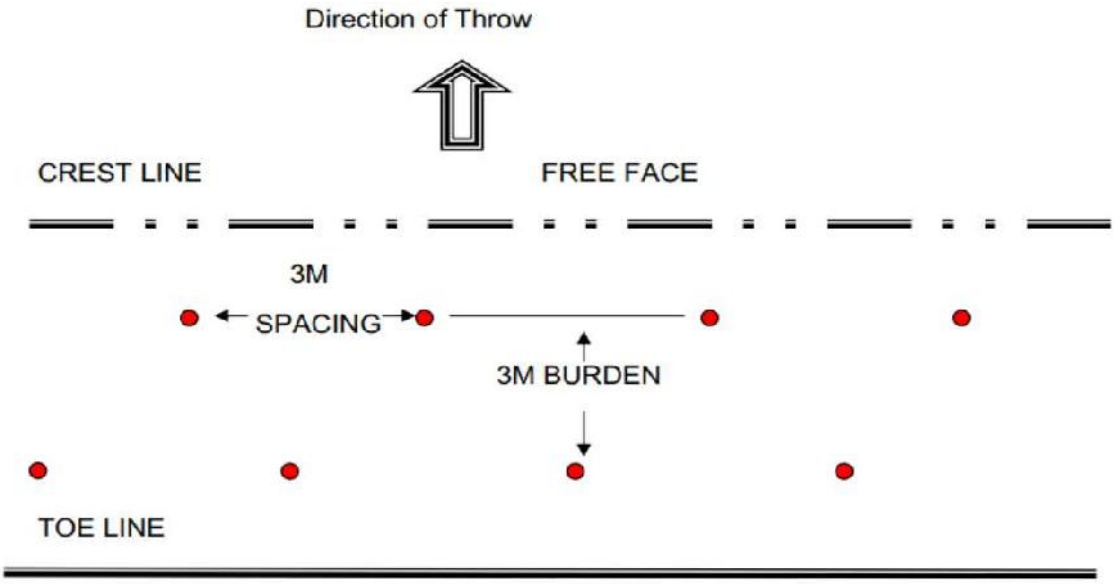
Photo 1.21.2 Drilling Equipment

Photo 1.21.3 Blasting Operations

Drilling/ Blasting Design Parameters

The following are the parameters to be used in the blasting design:

Burden = 3.0 meters
Spacing = 3.0 meters
Depth of Blastholes = 10 meters
Subdrill = 1 meter
Hole Diameter = 76 mm
Loading Density = 3.85 kg/linear meter
Powder Factor = 0.15 kg/MT



Sectional View of Drilling Pattern

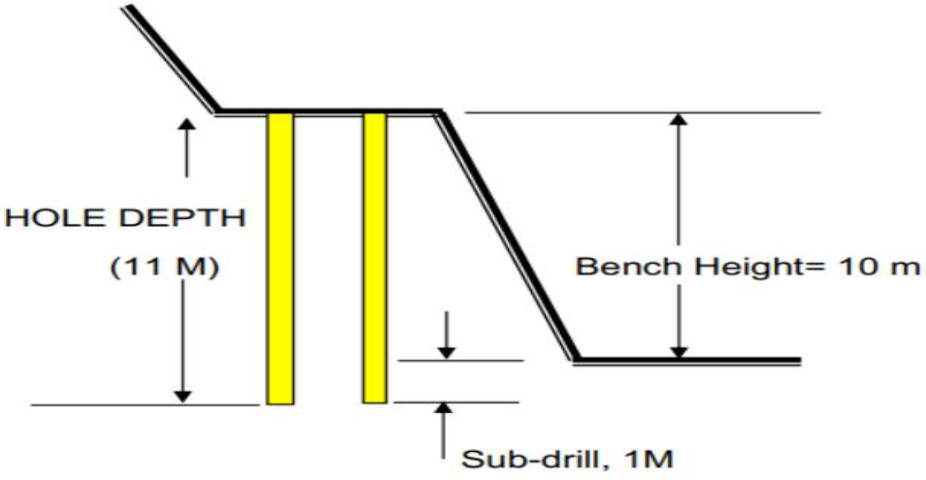


Figure 1. 18 PLAN AND PROFILE of A STAGGERED DRILLING PATTERN

The blasting procedure and material safety data sheet are in Annex 2.

Secondary Breaking

The fragmentation of rocks is fundamental to quarrying. It is the first preparatory stage in the extraction process making rocks small enough and loose enough to be efficiently excavated. By optimizing rock fragmentation by blasting, we can achieve significant improvements in mill throughput. Rock fragmentation distribution influences a range of mining and milling processes including load and haul rates, crushing and grinding performance and ore recovery in beneficiation processes. The objective of a blasting engineer in a mine is to generate a suitable muck pile having suitable size distribution of the rock that can be efficiently loaded, transported and milled.

Rock fragmentation depends upon two groups of variables: rock mass properties which cannot be controlled and drill and blast design parameters that can be controlled and optimized. Because of rock mass properties, oversize boulders will always surface every blasting operations. The oversized boulders will undergo secondary breaking to reduce the size suitable for milling operations. This will be achieved using a hydraulic breaker.

Photo 1.21.4 Hydraulic Breaker for Secondary Breaking

1.22 Material Handling & Transport

The broken materials are loaded onto off-road dump trucks by hydraulic

excavators (Photo No, 3) and then hauled (Photo no. 5) and unloaded into the crushers for primary crushing.

Photo 1.22.1 Loading of basalt is by the use of backhoe.

Photo 1.22.2 Haul trucks to transport basalt from the quarry.

MINERAL PROCESSING

RAW MATERIALS INPUT, SOURCE AND PRODUCT DESCRIPTION

The raw materials from Basalt Quarry operations is being hauled and fed to the hopper of the processing plant. It will undergo primary and secondary crushing, series of screening and classification. The products sold commercially are the following:

1. Base coarse – composed of topsoil, overburden and weathered rocks used for backfilling and base preparations in the Construction Industry and as additives in the production of Pozzolan Cement.

2. **Boulders** – blasted basalt rock materials used for riprapping.

3. Aggregates – crushed basalt rock in the following specifications:

- 1" gravel
- ¾" gravel
- 3/8" gravel
- Sand

Basalt materials are fed into the hopper and undergo **primary screening** using ***Grizzly Feeder*** with bar spacing of 3 inches.

The oversize (+3") will go directly to Jaw Crusher for further crushing while the undersize (-3") will pass to **NS Screen** to undergo another screening to remove the fines and topsoil (Base coarse) and the cleaned rocks will go to the Surge Pile for stockpiling.

Jaw Crusher with opening of 30" x 42" and rated capacity of 400 cu.m. per hour, is used as **primary crushing equipment** with discharge opening of 5 inches. The crushed materials are conveyed to the Surge Pile for stockpiling as **Primary Stockpile**.

Surge Pile with a capacity of 50,000 cubic meters, received the oversize and clean rocks from the NS Screen and crushed materials from Jaw Crusher. The stockpiled materials will be used for Line 1 (Existing Crusher) and Line 2 (In-Pit Crusher).

LINE 1 CRUSHER (WET PROCESS)

From the Primary Stockpile in the In-Pit Crushing Plant, the crushed materials is transported through a 1-km Conveying System and discharged to Surge Pile of the Existing Crusher (Line 1).

From the Surge Pile, the transported crushed materials passed the tunnel conveyor through the Pan Feeder and conveyed to the Scalping Screen for further sizing.

Scalping Screen received the materials from the Surge Pile for **secondary screening**. The undersize is conveyed to a four (4) deck Product Vibrating Screen and the oversized will undergo Secondary Crushing using HP 300 Cone Crusher.

Cone Crusher with rated capacity of 300 cu.m. per hour is used as **Secondary Crushing**

further size reduction. The resulting product has a maximum size of1-1/2 inch for grade classification at the Vibrating Screen.

Vibrating Screen, (8' x 20', 4-deck), with rated capacity of 250 cu.m. per hour receives the undersize from Scalping Screen and the crushed materials from Cone Crusher for **grade classification**. A pressurized **water sprinkler** is introduced to suppress the dust generated during screening action and to clean the products from silts and sediments.

The oversize (+1-1/2"), is being recycled back to the system and pass to **HP3 Cone Crusher**, a tertiary crushing equipment, for further crushing. The crushed materials is being conveyed back to Product Vibrating Screen for grade classification.

The **Gravel products** (1", ¾", 3/8") are conveyed separately towards its respective stockpile while the Sand-Silt products are introduced first to a Sand Dewaterer for final sand-silt classification.

Sand Dewaterer, with rated capacity of 50 cu.m. per hour receives the sand- silt-water mixture from the Vibrating Screen for **final classification**. The underflow, **Sand product**, is conveyed toward its own stockpile and the overflow, **Wastewater**, will go towards the Settling Pond for treatment.

Settling Pond, receives wastewater from Sand Dewaterer overflow. The wastewater will pass first at Silt pond No. 1 with series of baffles to trap silts and sediments. The silts settled down will be removed periodically and placed in a drying bed for future use as base coarse binder. The overflow (slurry) will be stored at Pond No. 2 and Pond No. 3 for natural settling of very fine silts overnight. The clear water produced will be recycled back to the Product Vibrating Screen the following day.

Treated Water Recycling. The main water requirement for the process is sourced from Cogon/Guindaruhan River at a rate of 1,000 cubic meters per day average using Pump No. 1 with rated capacity of 600 gpm. When Pond No. 2 is filled with water (Water Capacity=5,500 cubic meters), this treated water will be the new source of water in the process and will be recycled back to the system.

Vibrating Screen using Pump No. 2 with a rated capacity of 600 gpm. At this point, Pond No. 3 (Water Capacity=3,000 cubic meters) will be used as the storage of the slurry overflow from Pond No. 1. In this process, Pump No. 1 will not operate. When the

treated water in Pond No. 2 will be used-up, the fine silts at the bottom will be desilted immediately overnight and stored at the Drying Bed then later transferred to designated waste dump for future use. The following day, treated water in Pond No. 3 will be the new water source and the slurry from Pond No. 1 will be directed to the emptied Pond No. 2. If the water level in both Pond No. 2 and Pond No.3 becomes low, Pump No. 1 will operate to replenish water to both water pond until full capacity. This methodology is repeatedly done for Zero Discharge of Wastewater.

LINE 2 CRUSHER (DRY PROCESS)

From the Primary Stockpile, the crushed materials will be discharged to tunnel conveyor through the Pan Feeder and conveyed to the 2-deck Scalping Screen for further sizing.

Scalping Screen received the materials from the Primary Stockpile for **secondary screening**. The undersize is conveyed to a two (2) deck Product Vibrating Screen and the oversize will undergo Secondary Crushing using two (2)- HP 300 Standard Coarse Cone Crusher.

HP 300 Std Coarse Cone Crusher with rated capacity of 300 cu.m. per hour each is used as **Secondary Crushing Equipment** and received the oversize from the Scalping Screen for further size reduction. The resulting product has a maximum size of1-1/2 inch for grade classification at the Vibrating Screen.

ES402 Vibrating Screen, (8' x 20', 2-deck), with rated capacity of 250 cu.m. per hour each receives the undersize from Scalping Screen and the crushed materials from HP 300 Standard Coarse Cone Crusher for **grade classification**. The ES402 Vibrating Screen will produce **G-1 Gravel products**.

The oversize (+1-1/2"), is being recycled back to the system and pass to **HP 300 Standard Fine Cone Crusher**, a tertiary crushing equipment, for further crushing. The crushed materials is being conveyed back to Product ES302 Vibrating Screen for grade classification.

The undersized (-1-1/2"), is introduced directly to Product ES302 Vibrating Screen for final grade classification.

ES302 Product Vibrating Screen, (8' x 20', 2-deck), with rated capacity of 300 cu.m. per hour receives the undersize from ES402 Vibrating Screen and the crushed materials from HP 300 Standard Fine Cone Crusher for final grade classification and produces three products, namely, 3/4" Gravel, 3/8" Gravel and Sand.

The **Products** (¾", 3/8", sand) are conveyed separately towards its respective stockpile.

1.8.3 Progressive Rehabilitation

After each quarry block has been completely depleted of its mineral resources or "mined out", the abandonment procedure will be initiated, as follows:

- Carefully returning the enriched top soil from the stock piled overburden material;
- Undertake soil analysis (chemical and physical properties) to determine the final surface soil suitability for agro-forestry use and determine fertilizer requirements to ensure the growth of the planted trees into stable condition (up to three years old);

- Assess site condition for run-off management and increase water infiltration to the groundwater system through invert bench elevation to collect rain water at base of bench. This will also promote soil cohesion as collected water will gradually be drawn toward dry soil surfaces. Over time, soil moisture will help in the restoration and maintenance of replanted plant health. JLRCAI is committed to establish nursery areas within the project site and undertake vegetative restoration with the participation of local communities;

- At the final abandonment phase, all structures and facilities shall be properly dismantled for proper disposal or transfer to other probable quarry sites; and

- Infrastructures such as roads and buildings shall be turned over to the barangay local government units for the community's use, if these will be more beneficial to leave them in place. Otherwise, unwanted structures will be dismantled and hauled out.

1.23 Abandonment Phase

A final mine rehabilitation and decommissioning plan will be prepared to address concerns on planned and/or unplanned closure, and care and maintenance scenarios. The plan must be consistent with the company's closure policy, and with the provisions and relevant rules and regulations of the Republic Act no. 7942, known as the Philippine Mining Act of 1995.

Decommissioning activity will commence after the operating life of the project. This involves dismantling of company infrastructures and machineries. Simultaneously, rehabilitation will be carried out. Aside from the rehabilitation activities progressively done during the operation, a final rehabilitation shall be conducted succeeding the project's operation period. Stabilization of steep slopes, backfilling, grading and reforestation of mined-out areas, among others, will be performed as part of the Rehabilitation.

The Abandonment phase will follow as the mined-out sections are environmentally restored, ensuring its stability and sustainability, with respect to the mine

relinquishment guidelines from Mines and Geoscience Bureau (DENR-MGB). The following are activities involved in abandonment phase:

1. Top soil enrichment and preparation — This is done before restoring/re-soiling the mined-out areas. This is also done to support the nourishing and growing vegetative and tree cover in the future.
2. Final benching and contouring — This is conducted to achieve the slope stability all through the benches and terraces; following the slope gradient Contouring from toe to edge of benches to top-most point of about ±83.3% (40 degrees) or as approved by the Mines and Geosciences Bureau.
3. Restoring, and spreading of enriched top soil — The enriched top soil to be spread on the bench panels with 0.25m thickness with 50cm bench edge barrier for storm drainage control, with the 2% inward slope.
4. Re-vegetation of benches — This is implemented if the Local Government opts to reclassify the area as agricultural land
5. Bench and slope assessment — The slope condition and benches are assessed to ensure that the bench edges possess the sufficient run-off control barrier features.

   As necessary, contour canals will be re-trenched to provide supplemental storm drain retention function to allow silt to drop or rainfall infiltration which promotes soil cohesion and to some degree, contributes to slope stability.
6. Tree planting — This is undertaken especially on mined-out areas with highest elevation to increase the rainfall infiltration and ensure sufficient water catchment function. This shall be undertaken with the participation of local communities.
7. Turn-over of infrastructures — Depending on the agreement between the proponent and local communities. There shall be a turn-over of infrastructures like roads and buildings to the Local Government Unit/s. Structures that are not beneficial for the LGUs may be dismantled and hauled out.

To ensure the plan's proper implementation, the budget for decommissioning, abandonment, and rehabilitation shall be deposited in a government depository bank. The said funding is established in accordance with the provisions of the Philippine Mining Act of 1995.

Table 1. 6 **Final Mine Rehabilitation and Decommissioning Plan**

FINAL MINE REHABILITATION AND DECOMMISSIONING PLAN

ACTIVITIES	End of Operations	Decommissioning	*Rehabilitation*				Maintenance and monitoring				Relinquishment	COST (Php)
		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	
1. IEC Program	100,000											100,000
2. Decommissioning												
2.1 Crusher Equipment/ Structures		1,000,000										1,000,000
2.2 Quarry Bench Clearing loose boulders		800,000										800,000
3.Rehabilitation												
3.1 Creek/ Lagoon Clearing			1,000,000									1,000,000
3.2 Quarry Floor Topsoil Backfilling			1,000,000	1,000,000								2,000,000
3.3 Crusher Floor Topsoil Backfilling				1,000,000								1,000,000
3.4 Tree Plantation				500,000	500,000							1,000,000
3.5 Botanical Garden					500,000	500,000						1,000,000
4. MAINTENANCE												
4.1 Tree Plantation/ Botanical Garden							600,000	600,000	600,000	600,000		2,400,000
5. MONITORING												
5.1 Company Monitoring		600,000	600,000	600,000	600,000	600,000	300,000	300,000	300,000	300,000		4,200,000
5.2 MMT/ MRFC		600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000		5,400,000

ACTIVITIES	End of Operations	Decommissioning	*Rehabilitation*				Maintenance and monitoring				Relinquishment	COST (Php)
		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	
6. SOCIO-ECONOMIC (Cost incorporated in item 3 & 4)												
6.1 Creek/ Lagoon Clearing (2 local residents)												
6.2 Tree Plantation (10 local residents)												
6.3 Botanical Garden Development (10 local residents)												
6.4 Tree Plantation/ Botanical Garden Maint. (4 local residents												
7. RELINQUISHMENT												
7.1 Final Rehab. Report (FRR)												100,000
TOTAL	100,000	3,000,000	3,200,000	3,700,000	2,200,000	1,700,000	1,500,000	1,500,000	1,500,000	1,500,000	100,000	20,000,000

1.9 Personnel Requirement

JLR Construction and Aggregates Inc. (JLRCAI) is currently employing 48 regular workers, and 75 personnel under contractors for its Mine operation. Additional personnel complement is expected to be deployed for the expansion project. The general and specific breakdowns of the personnel complement is found in Table 1.17 and Table 1.8 below.

Table 1. 7 General Breakdown of Manpower Requirement

	Manager	Supervisor	R/F	Total
A. JLR-QAD				
Existing	6	6	36	48
Expansion	7	10	65	82
B. CONTRACTOR				
B.1 Drilling and Blasting				
Existing	1	3	18	22
Expansion	2	6	36	48
B.2 Hauling				
Existing	3	3	47	53
Expansion	4	3	99	106
TOTAL				
Existing	10	12	101	123
Expansion	13	19	200	232
Total	23	31	301	355

Details of Personnel Requirement

Table 1.8 provides the details of personnel requirement for the expanded project.

Table 1. 8 Personnel Requirement for JLR Basalt Material Quarry Production

JLR	Existing	Expansion	Combined
Manager	6	1	7
Supervisor	3	1	4
Safety Officer	1		1
MEPEO/PCO	1	1	2
Plant Operator	2	2	4
Plant Crew	6	3	9
Plant Mechanic	1	1	2
Sales	2	2	4
Checker	1	1	2
Warehouseman	1	1	2
Mechanic	3	3	6
Welder	1	1	2
Tireman	1	1	2
BD Operator	3	3	6
BH Operator	4	4	8
PL Operator	3	4	7
Driver	5		5
Nursery/ Plant Maintenance	3	3	6
Mechanical Engr.	1	1	2
Electrical Engr.	0	1	1
Sub-Total	**48**	**34**	**82**
Drilling Contractor	**Existing**	**Expansion**	**Combined**
Manager	1	1	2
Supervisor	2	2	4
Safety Officer	1	1	2
HR/Admin	1	1	2
Purchaser	1	1	2
Clerk	1	1	2
Warehouseman	1	1	2
Driver	2	2	4
Driller	4	4	8
Drill Helper	3	3	6
Mechanic	4	4	8
Welder	1	1	2
Sub-TOTAL	**22**	**22**	**44**

Hauling Contractor	Existing	Expansion	Combined
Manager	3	1	4
Supervisor/Safety Officer	3		3
Office Clerk	3		3
Mechanic	5	1	6
Electrician	3	0	3
Welder	3		3
BH Operator	3	5	8
Grader Operator	1	1	2
Driver	20	40	60
Tireman	3	4	7
Warehouseman	3		3
Checker	3	1	4
Sub-Total	**53**	**53**	**106**
TOTAL	**123**	**109**	**232**

1.24 Indicative Investment Cost

The estimated investment cost for the operations in MPSA 194-2004-VII is about PHP 911,245,000 inclusive of the mining and crusher equipment, crushing plant, conveying system and land acquisition.

Details are as follows:

Table 1. 9 Project Cost

A. QUARRY EQUIPMENT	Quantity	Unit Cost	Amount, Php
1. Pneumatic Drill	4	15,000,000	60,000,000
2. Bulldozer, D155	3	20,000,000	60,000,000
3. Backhoe, PC 450	5	17,000,000	85,000,000
4. Dump Truck, HOWO	30	3,500,000	105,000,000
5. Grader	1	5,000,000	5,000,000
6. Water Truck	1	3,000,000	3,000,000
7. Fuel Truck	1	3,000,000	3,000,000
8. Service Vehicle, 4 x 4	2	2,000,000	4,000,000
SUB-TOTAL			325,000,000
B. CRUSHER EQUIPMENT			
1. Payloader, WA 380	4	8,000,000	32,000,000
2. Backhoe, PC 350	2	12,000,000	24,000,000
3. Dump Trucks, HOWO	2	3,500,000	7,000,000
4. Service Vehicle	1	2,000,000	2,000,000
SUB-TOTAL			65,000,000
C. DEVELOPMENT COST			
1. Access Road Opening,	6000	2,000	12,000,000
2. Spillway Construction	5	600,000	3,000,000
3. Waste Stripping, m3	200,000	50	10,000,000
SUB-TOTAL			25,000,000
D. ENVIRONMENTAL COST			
1. EPEP COST			107,080,000
2. FMRDP COST			20,000,000
3. SDMP COST			36,400,000
SUB-TOTAL			163,480,000
E. IN-PIT CRUSHING PLANT	1 assy.		157,765,000

F. CONVEYING SYSTEM	1 km	50,000/meter	50,000,000
G. LAND ACQUISITION	150 has.	100/sq.m.	150,000,000
TOTAL			911,245,000

1.25 Waste Generation Potential, and Management

Table 1. 10 Summary of Project Wastes and Management System

Project Waste	Nature	Waste Management System	Disposal Method	Maintenance
Quarry				
Site Preparation				
Organic debris / top soil	Solid, non-hazardous	Waste segregation	Stockpiling for future restoration on mined-out areas	Provision of protective barrier (stacked waste rock, waste concrete test cylinders and blocks) at stockpile toes to prevent erosion.
Used engine oil	Liquid, hazardous	Collection and storage at motor pool only	Transport and disposal by EMB-accredited hazardous waste treater	Proper containment; secure storage in well ventilated fire-proof shed with concrete-lined flooring with spill collection sump. Shed will be provided with proper safety and hazard warning pictogram
Sanitation requirement of workers	hazardous	Provision of sanitary facilities at site	Septic tank treatment	Desludging every three years
Quarry operations				
Waste rock	Solid, non-hazardous	Collect and use as storm drain velocity breakers in contour canals	Matting into quarry access roads as part of road maintenance work	None necessary
Run-off siltation	Solid, non-hazardous	Series of settling ponds sufficient to hold normal 24-hour rainfall	Compaction into access roads as part of road maintenance	Settling pond desilting

Project Waste	Nature	Waste Management System	Disposal Method	Maintenance
		Provision of contour canals, access road ditch to manage surface run-off toward settling ponds		
Used engine oil	Liquid, hazardous	Collection and storage at motor pool only	Transport and disposal by EMB-accredited hazardous waste treater	Proper containment; secure storage in well ventilated fire-proof shed with concrete-lined flooring with spill collection sump. Shed will be provided with proper safety and hazard warning pictogram
Crusher Line 2 Construction Phase				
Waste Equipment packaging	Solid, non-hazardous	Dispose through LGU-accredited Material Recycling Agents for Re-purposing / recycling / re-use (wooden crates and pallet)	Haul out residual plastic waste to City sanitary landfill	Weekly (every Saturday) haul out of residual waste to City sanitary landfill
Crusher Line 2 Operation Phase				
Oil spills from heavy equipment	Liquid, hazardous	Provision of Oil and Water Separator in Line 2 grounds	Re-use of used oil for lubrications of conveyor belt, reclaimers and mechanical equipment	Regular removal of oil from oil and water separator, proper handling and storage. Periodic haul out of
Used engine oil		Proper collection, handling and storage of oil, Store in a well-ventilated fire-proof shed with concrete-lined flooring with spill collection sump. Shed will be provided	Transport and disposal of surplus waste oil by EMB-accredited hazardous waste treater	

Project Waste	Nature	Waste Management System	Disposal Method	Maintenance
		with proper safety and hazard warning pictogram		
Solid waste from office operations	Solid, non-hazardous	Waste minimization, Waste segregation, biodegradable waste fraction	Material recovery, waste recycling and re-use Haul out of residual waste to City sanitary landfill Contribution of biodegradable materials to top soil stockpile for decomposition	Weekly haul out of residual waste to City landfill
Sanitation requirement of workers	hazardous	Provision of sanitary facilities at site	Septic tank treatment	Desludging every three years

1.26 Summary of Baseline Condition

Module	Baseline Condition
Geology	The area is predominantly overlain by the Cretaceous to Paleocene Mananga Group. Locally, the group is composed of the Cansi Volcanics and the Pandan Formation (Santos Yñigo, 1951; Hashimoto and Balce, 1977 in BMG 1981). Published geological maps (sheet no 3750-IV BMG, 1981) show a pyroclastic rock formation with intercalated clastic sedimentary rocks occupying a large part of block 2 which corresponds to the Pandan Formation of earlier workers. The Cansi Volcanics which is made-up mainly of basaltic to andesitic lava flows occupies large portions of MPSA blocks 1, 3 and 4. Exposures show a moderate to high degree of fracturing and weathering. The rocks appear to have several facies exhibiting fine-gained through finely porphyritic to coarsely porphyritic textures. Amygdaloidal features were also noted. Specimen samples subjected to micro-chemical and physical test shows no reaction to cold HCl but exhibits slight magnetic property. The Pandan Formation occupies large areas in all the blocks. Traverses reveal that the Pandan Formation consists of a sequence of andesitic to basaltic pyroclastics and lava flow, sandstone, conglomeratic sandstone, calcareous mudstone, siltstone and limestone. The andesitc and basaltic pyroclastic and lava flows are moderately to highly fractured but generally hard. A distinct feature in the area is an elongate body which appear to be structurally (fault) controlled.
Topography	Approximately 80% of the area is characterized by a rugged terrain. The river and creek banks have steep to nearly vertical inclinations. Highest point within the blocks is Mt. Lanas (locally called Mt. Naupa) with its apex at elevation 543 meters above sea level. The rest of the area (about 20%) has moderate terrain with elevations ranging from 40 meters to 180 meters above sea level.
Pedology	Soil within the area and its immediate vicinities has been classified as part of Baguio Clay Loam based on the soil classification made by the Bureau of Soils and Water Management. The Baguio Clay Loam is widespread and has developed over the

Module	Baseline Condition
	Pangdan Formation. Soil that formed is generally brown to black. The texture is generally fine to coarse grained and moderately plastic. Its thickness usually varies but typically ranges from few centimeters to about 20 centimeters. The lower layer or the horizon is of lighter color and comparatively contains less organic matter. The texture is slightly coarse to fine grained and slightly plastic. The thickness hovers from 20 - 40 centimeters.
Terrestrial Biology	Flora The proposed site is highly denuded due to the prevalence of kaingin farming (slash-and-burn). In general, the vegetation cover is predominantly characterized by grasses, weeds, bushes and agricultural crops with occasional trees distributed in the area.
	Fauna IThe avian species identified in the area in 2004 were associated with agricultural lands, shrubland, and grasslands. There are 14 species of birds identified in the area. Most of the avian species are insectivorous and frugivorous due to the presence of corn crops and other fruit sources (i.e., mango and bananas), and insects in the areas. Two species abundant were Chestnut Munia (*Lonchura malacca*) and European Tree Sparrow (*Passer montanus*). These are graminivorous and considered major agricultural pests.
Hydrology and Hydrogeology	A dendritic drainage pattern has developed over the MPSA area. One of the tributaries is structurally and lithologically controlled. This creek has formed along the trace of the fault which is also the contact between two rock formations. The major creeks and river traversing the proposed quarry expansion area are the Naupa River and the Cabuan / Kabuwanan Creek. Hagukaya Creek and Matun-og Creek. Majority of the creeks are tributaries of the Guindaruhan river which flows towards the southeast and emptying its load onto the Bohol Straight. About half of the westernmost block is

Module	Baseline Condition
	drained by tributaries of the Pandan River which also empties its load in the Bohol Straight.
Water Quality	The upper sections of Cabuan River and Naupa River manifest pristine condition. The middle and lower segments of these river are heavily silted. Many small-scale stone quarry activities observed along the mid-and-lower river sections are major contributors to river siltation.
Climatology, Air Quality and Noise	Climatology Cebu falls within a Climate Type III (Modified Coronas Climate Classification) characterized as having no pronounced seasons, relatively dry from March to August and wet during the rest of the year. On the average, the area is visited by one typhoon annually. Air Quality Results of air quality sampling and analysis are not yet available. Due to the rainy weather as of reconnaissance activities, the observed air quality within the quarry and within the crushing plant bore no visible or perceptible levels of ambient dust.
Socio-economic and Cultural Environment	Available population data show the total population of Naga City to be 115,750 as of 2015. Of this, the population of Barangay Cogon was 4,267 persons, or 4%. The City of Naga had an average annual population growth rate of 2.6% from 2960 to 2015, higher than the Cebu provincial rate of 2.2% for the same period. Naga City has gender ratio of 1.04, a young dependency rate of 44.5%, a labor force of 62% and old dependency rate of 10.8%. Naga has high percentage of elementary and high school-level individuals who are actually attending school (96%). Naga has 98% literacy rate among persons ten years and older. 39% of Naga's population attained elementary level education as their highest, while 38% reached High School and 11% are academic degree holders. There are no inhabitants within the JLR MPSA.

1.27 Preliminary Environmental Management Plan

Table 1. 11 Summary of Preliminary Environmental Management Plan

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
Site clearing Construction of quarry access roads Quarry development Ground levelling for the in-pit crusher	Terrestrial ecology	• Trampling of Understorey vegetation, • Loss of vegetation due to site clearing • Disturbance of downstream riparian habitat due to sediment loading during heavy precipitation • Physiological stress to natural life cycle of wildlife floral and faunal species • Change in floral community structure • Wildlife species displacement	Protect and maintain the existing cluster of trees Avoiding trees in laying out the road network Localized movement of equipment and personnel, only clear areas absolutely necessary for quarry and equipment movement Leave and protect a twenty-meter-wide riparian buffer zone flanking the river and creeks within quarry area Just as standard orientation component, workers and contractors should be oriented with the importance of wildlife species that they would possibly encounter during the course of work Transfer/replant viable shrubs and busses to develop the riparian buffer zone Vegetation to be cleared should be properly delineated to avoid unnecessary clearing. Lure out wildlife from the target quarry sections/ block and Allow wildlife to escape, avoid preying on wildlife Operators of heavy vehicles should be made aware of the presence of wildlife (particularly large species) in the surrounding areas. They should be instructed to avoid as much as possible running into wildlife that crosses the access road.	MEPEO	Instruction for complying with applicable EMP and ECC conditions and co-charging the penalty clause will be part of Contract between Operations Contractor and JLRCAI
Site clearing Quarry development Construction of quarry access roads	Terrestrial ecology		Hunting should be banned at all cost. Strict penalties should be imposed. Direct transfer of trees ≤ 10cm diameter at breast height, to identified buffer zone.		Instruction for complying with applicable EMP and ECC conditions and co-charging the penalty clause will be

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
			Care and maintenance should be provided for at least 3 months or until stable, whichever is longer. Establish plant nurseries with seeds and planting materials from the natural vegetation in quarry site . Establish and enforce speed limits for drivers operating project vehicles and equipment to minimize undue noise and speed that unnecessarily disturb remaining wildlife		part of Contract between Operations Contractor and JLRCAI
		Loss of top soil	Top soil with organic materials stripped from quarry surface should be carefully stockpiled in level, well drained area and grassed. Vermiculture to produce vermicast for conditioning of nursery soil and reforestation areas Quarry bench design to consider inverse super elevation for sediment run-off to settle in land-side contour canal. Regular desilting of contour canals. Fuel refilling and maintenance of heavy equipment in quarry shall exclude transport vehicles. Construct at site a concrete platform with lip, surfaces lightly dipping to an oil collection sump	MEPEO	Instruction for complying with applicable EMP and ECC conditions and co-charging the penalty clause will be part of Contract between Operations Contractor and JLRCAI

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
	Water quality	soil erosion, siltation in surface water bodies by eroded soils and/or dumping or accidental large volume of spilled materials during handling deterioration of surface water quality resulting from increased siltation of surface runoff or discharge of spilled oil and/or other hazardous materials from vehicles and equipment;	follow the approved final pit design which includes erosion control structures, drainage system, and silt/ flood detention ponds; minimize ground clearing and other earth works to what is necessary for the present and next mining block; establish and maintain vegetated strips along waterways such as rows of planted bushes or sand bags in the meantime that the vegetative silt traps and silt detention ponds are not yet fully developed, when heavy water sediment load is observed in rainy season; regularly desilt settling ponds and clogged waterways; provide a small cemented and lipped equipment repair platform with oil sump and oil and grease separator in quarry site for in-site change oil and emergency equipment repairs; Minimize vehicle & equipment maintenance within quarry area and limit stored fuel to needs at site by equipment with limited mobility. store petroleum products in tightly sealed containers, located in secured areas far from fire hazards and floods;	JLRCAI	Instruction for complying with applicable EMP and ECC conditions and co-charging the penalty clause will be part of Contract between Operations Contractor and JLRCAI Instruction for complying with applicable EMP and ECC conditions and co-charging the penalty clause will be part of Contract between Operations Contractor and JLRCAI
	Water quality	Increased oxygen demand in waterways due to accumulated wastes	On-site collection and segregation of wastes Haul out of non-biodegradable and recyclable waste materials	MEPEO	ECC condition
	Air quality	Increased dust resuspension Increased noise generation Increased CO2 emissions from transport vehicles and heavy equipment	Regular water sprinkling of access and haul roads. strictly enforce covering of hauling trucks cargo; Tree planting to offset carbon foot print	MEPEO	Instruction for complying with applicable EMP and ECC conditions and penalty clause will be part of Contract between Operations Contractor and JLRCAI

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
Surface quarry operation Material Extraction Transport of produced quarry materials; Progressive compensation forestation; Rehabilitation of quarried-out areas	Land	Alteration of topography Soil erosion and subsequent siltation of water bodies; Disturbance of soil profile, change in soil suitability	Carefully design slope cut to always end the work day with stable working slopes and quarry faces Design slope cuts always with adequate drainage and silt control provisions Follow approved /agreed rehabilitation schedule Vegetative slope protection should be regularly maintained Consider visual aesthetics in land rehabilitation design. Preserved top soils are to be re-arranged in target landscaping sections, as per FMRDP.	MEPEO	ECC Conditions. Part of project implementation cost
	Terrestrial flora and fauna	Minor clearing of vegetation for security control, in perimeter area of the pit to better control influx of migrants and illegal establishments outside project area; Reduction of wildlife population due to hunting and/or gathering of forest products serving as food. Loss of habitat to aquatic life in streams draining project area which includes threatened frog species (IUCN Redbook).	Regular monitoring to control the entry of migrants and illegal establishments into the area;	MEPEO DENR LGU	ECC Conditions
		solid waste generation	The project will not establish a field office or workers' quarters in the production area. Should there be solid waste generated in addition to excavated soil and clay, these will be collected, transported and placed in suitable containers at the JLRCAI yard in the Poblacion area for disposal to the municipal waste facility.	JLRCAI	ECC Condition
	Geology	Subsidence, mass movement, collapse of slopes especially in areas with sink holes or limestone caverns. Risk due to earth movement along active fault line that traverse production area	Implement final pit design that has slope protection benches and silt detention ponds; Progressive rehabilitation of quarried-out sections & progressing forward preparation of new mining block in small increments	MEPEO	ECC Conditions

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
			Request PhilVolcs to confirm presence of fault line in production site prior to operations; Implement the recommendations of the geotechnical studies; Develop and implement a suitable and appropriate slope / ground failure monitoring plan guided by the results of the geotechnical studies, to detect instability at an early and non-critical stage so that safety measures could be initiated to prevent or minimize impacts Coordinate with PhilVolcs and PNRC to conduct a Community-based Risk Reduction Planning in the area.		
	Air	Increase in ambient TSP Increase in noise levels Increase in greenhouse gas emissions from operations of project vehicles and heavy equipment	Proper and regular maintenance of vehicles and equipment following manufacturer's manual; implement dust control thru water spraying on unpaved roads and benches used as access roads especially during dry days; Conduct or support compensation tree planting and maintenance of 7 hectares per year, and protection of all planted trees for thirty (30) years to offset Project carbon emissions. Establish and implement speed limits for company drivers and heavy equipment operators; Cover the cargo of trucks hauling materials thru public roads; Conduct IEC to inform local people on quarry operations, dust and noise control measures.	JLRCAI	
	Water	Deterioration of surface water quality due to increase in TSS and turbidity levels from streams draining project area;	Implement the approved final mine Regular desilting of catchment basins / settling ponds Recycling of surface water-run-off collected in the silt basin for dust control and watering of vegetative rehabilitation measures.	MEPEO	ECC Conditions.

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
			Minimum capacity of settling ponds should be = 24 hr. normal rainfall		
	People –Local Economy	Local government generation of revenues from taxes, permits and LGU share in the mining of cement raw materials Royalties and taxes paid locally and shared by municipal and barangay	Benefit from development programs through SDMP equivalent to 1.5% of operating cost Total taxes paid to the national government will exceed Excise Tax: 60% goes to national government; 40%, to the local government -- 20% for Cebu 45% for Naga 35% for Barangay Cogon Development of small and medium downstream enterprises like transport, construction utility services, food services and sundry supplies Future development of mountain resort to add to tourism asset of Naga & improve economic land use New downstream businesses will create more jobs	MEPEO	
	People	Maintenance of employment	Local hiring priority Continuing community assistance to produce goods and services to supply expanded JLR requirements Further skills training and livelihood assistance to upgrade local quality of life	Barangay LGU JLRCAI CRO TESDA	
		Uncontrolled influx of migrants and illegal structures for speculation will create social problems (i.e. congestion, competition for food and water, peace & order issues, theft/crime, prostitution, illegal-drug use/sale, etc., illegal quarry.)	JLR will require local residence certificate as employment requirement	MEPEO	Part of SDMP- IEC
	People-Health and safety	Continued assistance to MPSA host barangays in the delivery of health services	Continued and expanded support to Doctor to the Barrio	MEPEO	Part of SDMP
Rehabilitation of quarried-out areas Dismantling of structures	A. Physical	Erosion and/or collapse of rehabilitated areas;	Continue progressive rehabilitation of the quarried-out areas;	JLRCAI	Approved Final Mine Rehabilitation and Decommissioning Plan;

Project Phase / Environmental Aspect / Project Activity	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement	Responsible Entity	Guarantee / Financial Arrangements
		Solid waste generated from dismantling of structures in the site,	Proper and regular maintenance of quarry vegetative slope protection and contour canals and drainage systems Ensure that drainage facilities are functional during the decommissioning phase Ensure at least 85% survival of tree plantations		Approved Social Development and Management Program ECC Condition Part of EPEP / FMRDP ECC condition Part of EPEP / FMRDP
	B. Biological	Re-establishing vegetative cover in the project area Return of the avifauna and increase in population of small animals due to habitat restoration	Use indigenous species for reforestation. Shrubs, trees and other plants removed due to land clearing will nursed in the nursery and utilized for revegetation. No exotic species will be introduced.		ECC condition
	C.Socio-Economic	Abandonment of project site in an ecologically poor and environmentally deteriorated condition. reduction and eventual termination of employment	Implement progressive compensation planting by continuous reforestation of unutilized areas, and maintenance of riparian buffer zones. Ensure that contour canals of 0.5mx0.5m are provided at toes of all benches to collect run off and eroded soil. Prepare the communities that participate in the project through capability building for a self-sustaining enterprise.	JLRCAI CRO	