EXECUTIVE SUMMARY OF EIA DRAFT

FOR

K. INDIRANI ROUGH STONE QUARRY LEASE

At

Kavundampalayam Village, Gobichettipalayam Taluk,

Erode District, Tamil Nadu State.

S.F. Nos. 55/1A, 55/3 & 58

Extent: 2.91.5 hectares

"B1" CATEGORY- MINOR MINERAL-CLUSTER- NON-FOREST LAND

CLUSTER EXTENT= 8.84.5 hectares

Complied as per ToR Obtained vide

Lr. No. SEIAA-TN/F. No.8478/SEAC/ToR-1273/2021 dated 08.10.2022

NAME OF PROPOSED PROJECT PROPONENT

Tmt.K. Indirani

W/o. K.Kuppuraj,

No.16, Kongu Nagar,

T.N.Palayam, Gobichettipalayam,

Erode-638506.

ENVIRONMENTAL CONSULTANT

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Valid till : 29th Dec.2023

CHAPTER I

INTRODUCTION

Environmental Impact Assessment (EIA) is the management tool to ensure the sustainable development and it is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for any project. EIA systematically examines both beneficial and adverse consequences of the project and ensures that these impacts are taken into account during the project designing. It also reduces conflicts by promoting community participation, information, decision makers, and helps in developing the base for environmentally sound projects.

As the proposed rough stone mining project, known as P1 falls within the 500m radius cluster of quarries with the total extent of >5 hectares, it is classified under category "B1" and requires submission of EIA report for grant of Environmental Clearance (EC) after conducting public hearing. The cluster with the extent of 8.84.5 ha contains two proposed projects, known as P1 and P2 and two expired projects, known as EX1 and EX2. The cluster area was calculated as per MoEF & CC Notification S.O. 2269(E) dated 1st July 2016. This EIA report has been prepared by considering the cumulative load of two proposed quarries in a cluster in Kavundampalayam Village, Gobichettipalayam Taluk, Erode District, and Tamil Nadu State.

This EIA draft discusses the cumulative impacts of two proposed projects in a cluster on the environment and provides a detailed Environmental Management Plan (EMP) to minimize the adverse impacts of those projects situated in a cluster with the total extent of 8.84.5 ha in Kavundampalayam Village, Gobichettipalayam Taluk, Erode District and Tamil Nadu State. It has been prepared in compliance with ToR issued vide letter no. SEIAA-TN/F.No.8478/ToR-1273/2021 dated 08.10.2022, for the proposed project by conducting the baseline monitoring study during the period of October-December 2021.

Details of the project proponent and the list of quarries within the cluster of 500 m radius have been provided in Tables 1.1 and 1.2, respectively.

Table 1.1 Details of Project Proponent

Name of the Project Proponent	**Tmt.K.Indirani**
Address	W/o. K.Kuppuraj, No.16, Kongu Nagar, T.N.Palayam, Gobichettipalayam, Erode-638506.
Status	Proprietor

Table 1.2 List of Quarries within 500 Meter Radius

Proposed Quarries				
ID	**Name of the Owner**	**Village & S.F. No.**	**Extent (ha)**	**Status**
P1	**Tmt. K.Indirani,** W/o. K.Kuppuraj, No.16, Kongu Nagar, T.N.Palayam, Gobichettipalayam Taluk, Erode-638506.	Kavundampalayam & 55/1A (Part), 55/3 (Part) and 58.	2.91.5	ToR obtained vide letter No. SEIAA-TN/F.No.8478/ToR-1273/2021 dated 08.10.2022
P2	**Thiru S.Kandhasamy,** S/O. K.R.Subramaniam, 12/1, Kamaraj Street, Chinna Kodiveri, Gobichettipalayam Taluk, Erode -638503	Kavundampalayam & 63/1,64/1A,64/3A & 64/5A.	2.66.0	ToR obtained vide Lr.No. SEIAA-TN/F.No. 8616/SEAC/ToR-1025/20201 Dated:26.08.2021
Expired/Abandoned Quarries				
EX1	Thiru. K.Kuppuraj	57/2C	1.27.0	02.12.2014 to 01.12.2019
EX2	Thiru. M.Seenivasan	70/9 (South part)	2.00.0	26.04.2010 to 25.04.2020
		Total Cluster Extent	**8.84.5**	

Source: i). AD Letter – Rc.No.23891/2013/X-1 dated 25.06.2021

ii). AD Letter – Rc.No.18122/2018/X-1 dated 02.06.2021

Note: Cluster area is calculated as per MoEF & CC Notification – S.O. 2269 (E) dated 01.07.2016.

CHAPTER II
PROJECT DESCRIPTION

2.0 INTRODUCTION

The proposed project is an existing rough stone quarrying project. The quarrying operation will be carried out by the opencast mining method involving drilling and blasting for splitting the massive rock, and excavators for loading the fragmented rocks. Details about the proposed projects have been given in Table 2.1.

Table 2.1 Brief Description of the Project

Name of the Quarry	K.Indirani Roughstone Quarry	
Type of Land	Patta land	
Extent	2.91.5 ha	
S.F. No.	55/1A(part), 55/3(part), and 58	
Toposheet No.	58E/06	
Latitude	11°30'59.07"N to 11°31'08.46"N	
Longitude	77°22'22.79"E to 77°22'31.18"E	
Ultimate Depth of Mining	56 m (16 m AGL and 40 m BGL)	
Existing Pit Dimension	Pit 1: 230 m(L) X 112 m(W) X 30 m(D) Pit 2: 105 m(L) X 37 m(W) X 36 m(D)	
Ultimate Pit Dimension	Pit 1: 284 m(L) X 112 m(W) X 56 m(D) Pit 2: 105 m(L) X 37 m(W) X 36 m(D)	
Geological Resources	Roughstone (m^3)	Topsoil(m^3)
	1162270	5560
Mineable Reserves	404470	2006
Proposed production for 5 years	404470	2006
Total No. of Lorry Loads	45 loads of roughstone/day	
Method of Mining	Open cast mining method	
Topography	Undulated	
Machinery proposed	Jack hammer	1
	Compressor	3
	Excavator	2

	Tipper	4
Blasting Method	Controlled blasting involving shot-holes and slurry explosives of 25 mm diameter.	
Depth of Shot-holes	1.5 m	
Number of Shot-holes Proposed	234 holes/day	
Quantity of Explosives	117 kg/day	
Proposed Manpower Deployment	40 persons	
Project Cost	Rs. 69,97,000/-	
CER Cost @ 2% of Project Cost	Rs. 1,40,000/-	
Proposed Water Requirement	3.5 KLD	

2.1 LOCATION OF THE PROJECT

The proposed project falls in Kavundampalayam Village, Gobichettipalayam Taluk and Erode District. The project area is located about 42 km Southeast of Erode, 10 km Southeast of Gobichettipalayam and 1 km Northeast of Village. Boundary coordinates of corner pillars of the project site and accessibility details of accessibility to the project site have been given in Tables 2.2 and 2.3, respectively. The lease area of the project site has been overlaid on Google earth image (Figure 2.1) and the overall view of the cluster quarries has been shown in Figure 2.2.

Table 2.2 Geographic Coordinates of Corner Pillars

Pillar ID	Latitude	Longitude	Pillar ID	Latitude	Longitude
1	11°30’59.31’’N	77°22’22.78’’E	9	11°31’06.75’’N	77°22’30.04’’E
2	11°31’01.97’’N	77°22’23.09’’E	10	11°31’06.73’’N	77°22’31.07’’E
3	11°31’02.10’’N	77°22’22.79’’E	11	11°31’05.47’’N	77°22’30.31’’E
4	11°31’07.04’’N	77°22’24.89’’E	12	11°31’03.49’’N	77°22’27.99’’E
5	11°31’07.97’’N	77°22’27.78’’E	13	11°31’02.34’’N	77°22’27.78’’E
6	11°31’05.48’’N	77°22’28.96’’E	14	11°31’01.14’’N	77°22’25.42’’E
7	11°31’08.46’’N	77°22’30.97’’E	15	11°30’59.07’’N	77°22’23.19’’E
8	11°31’08.44’’N	77°22’31.18’’E			

Table 2.3 Accessibility Details to the Project Site

Nearest Roadways	Coimbatore-Sathyamangalam Road (NH-209)	15 km SW
	Sathyamangalam – Bhavani Road (SH-62)	1 km South
Nearest Town	Gobichettypalayam	10 km SE
Nearest Railway Station	Erode	44 km SE
Nearest Airport	Coimbatore	66 km SW
Nearest Seaport	Kochi	214 km SW

2.2 OPERATIONAL DETAILS FOR PROPOSED PROJECT

Operational details of the project including yearly and daily production, and mine closure have been extracted from mining plans shown in Figures 2.1 and 2.2 and given in Table 2.4. Mine closure budget required for the closure of this project have been provided in Table 2.7.

Table 2.4 Estimated Resources and Reserves of the Project

Resource Type	Rough Stone in m^3	Topsoil in m^3
Geological Resource in m^3	11,62,270	5,560
Mineable Reserves in m^3	4,04,470	2,006

Based on the year wise development and production plan and sections, the year wise production results have been given in Table 2.5.

Table 2.5 Year-Wise Production Details

Year	Rough Stone (m^3)	Weathered Rock m^3	Topsoil in m^3
I	80400	-	2006
II	77220	-	-
III	76690	-	-
IV	80975	-	-
V	89185	-	-
Total	**404470**	**-**	**2006**

Source: Approved Mining Plan & ToR

2.3 LAND USE PATTERN

Land use and land cover information for the proposed project site has been given in Table 2.6.

Table 2.6 Land use data at present, during scheme of mining, and at the end of mine life

Description	Present Area (ha)	Area at the end of life of quarry (ha)
Area under quarry	2.07.0	2.42.0
Infrastructure	Nil	0.01.0
Roads	0.02.0	0.02.0
Green Belt	Nil	0.30.0
Unutilized area	0.82.5	0.16.5
Total	**2.91.5**	**2.91.5**

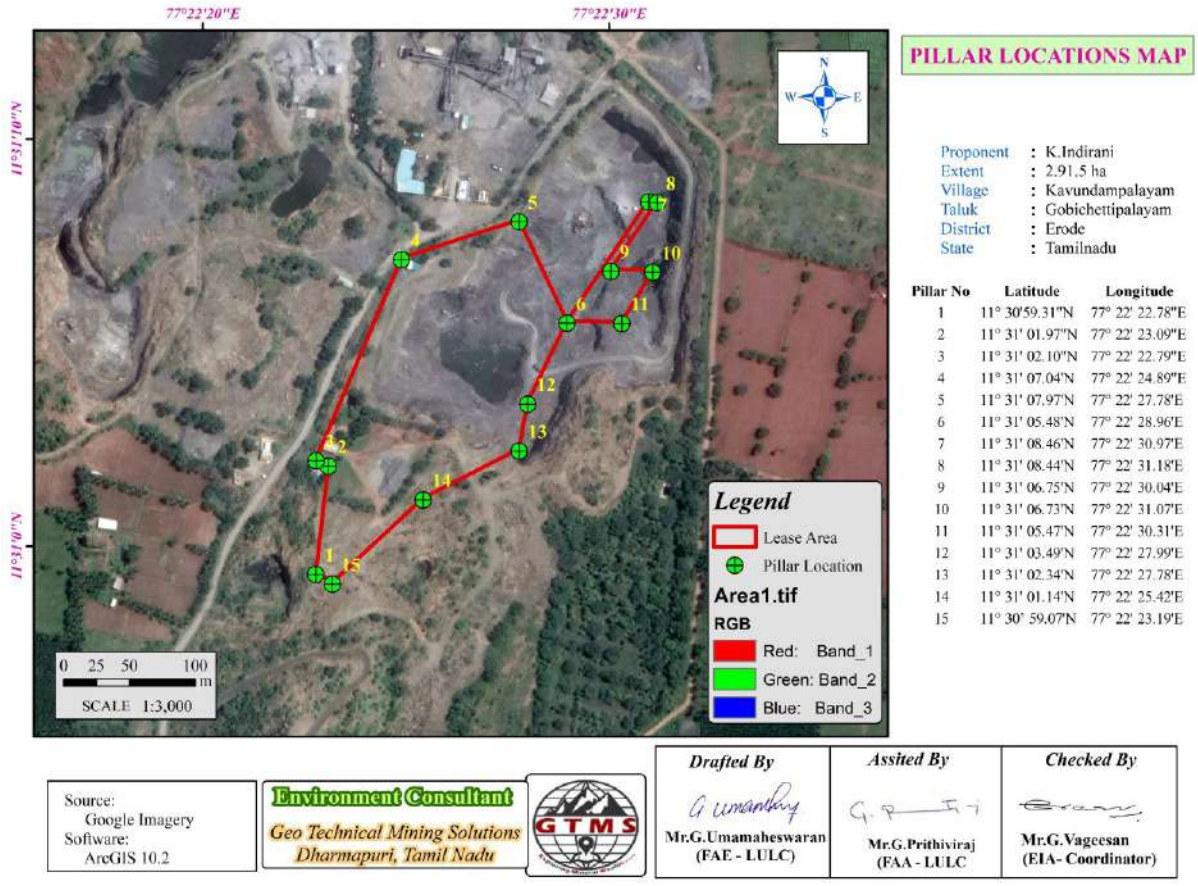

Figure 2.1 Google Earth Image Showing Lease Area with Pillars

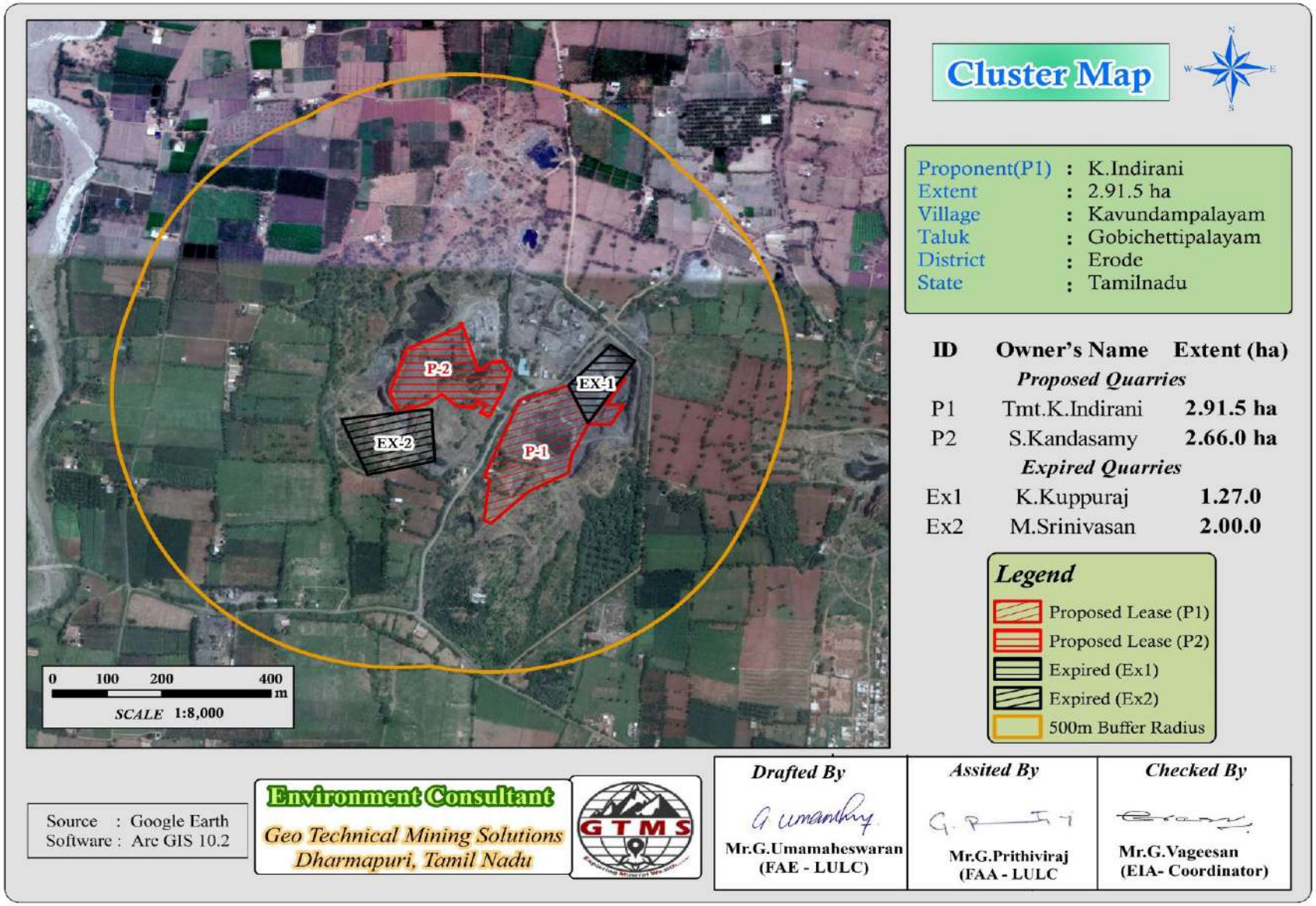

Figure 2.2 Google earth image showing 500m radius limits and the proposed projectand expired quarries

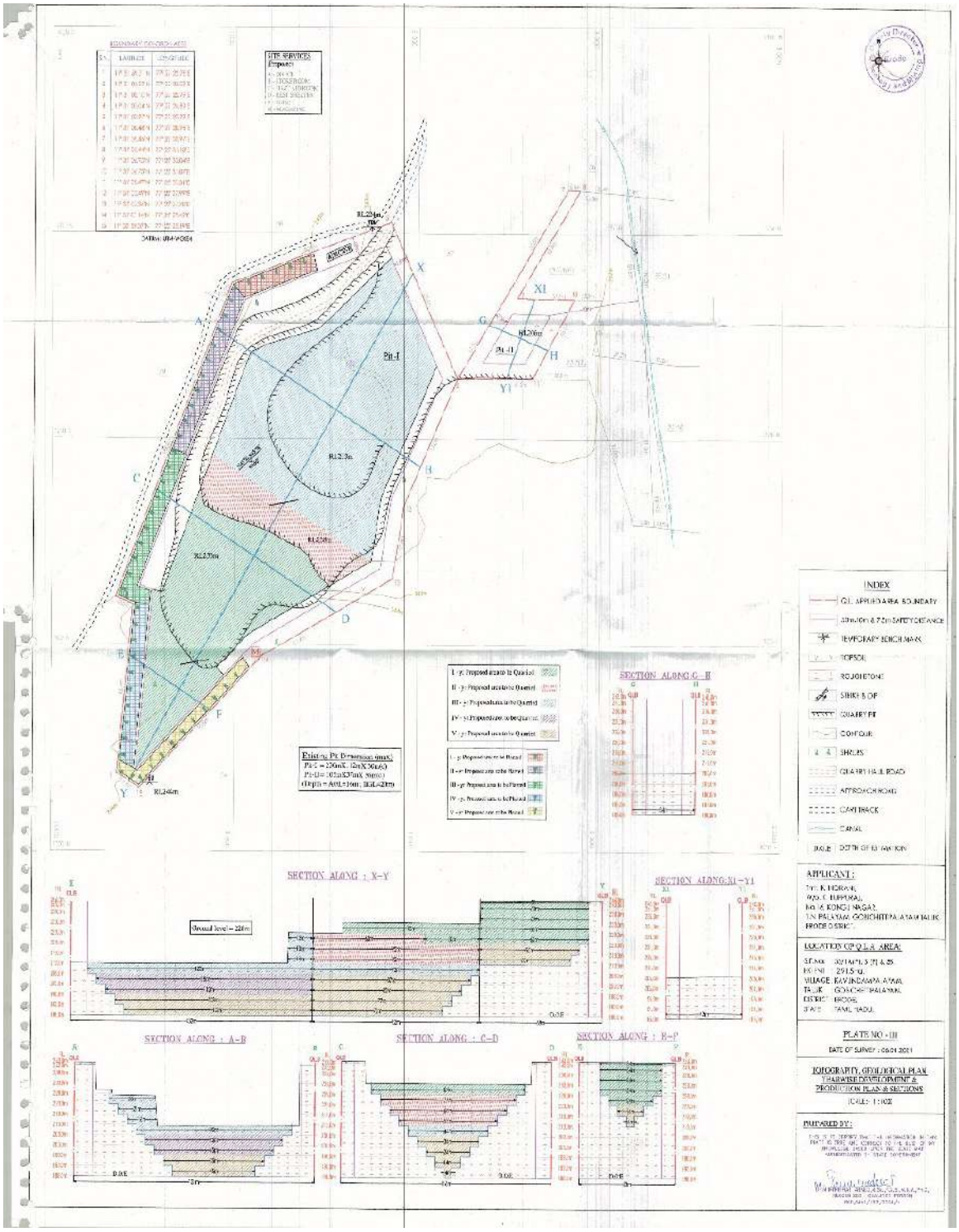

Figure 2.3 Geological plan, yearwise development and production plan and sections

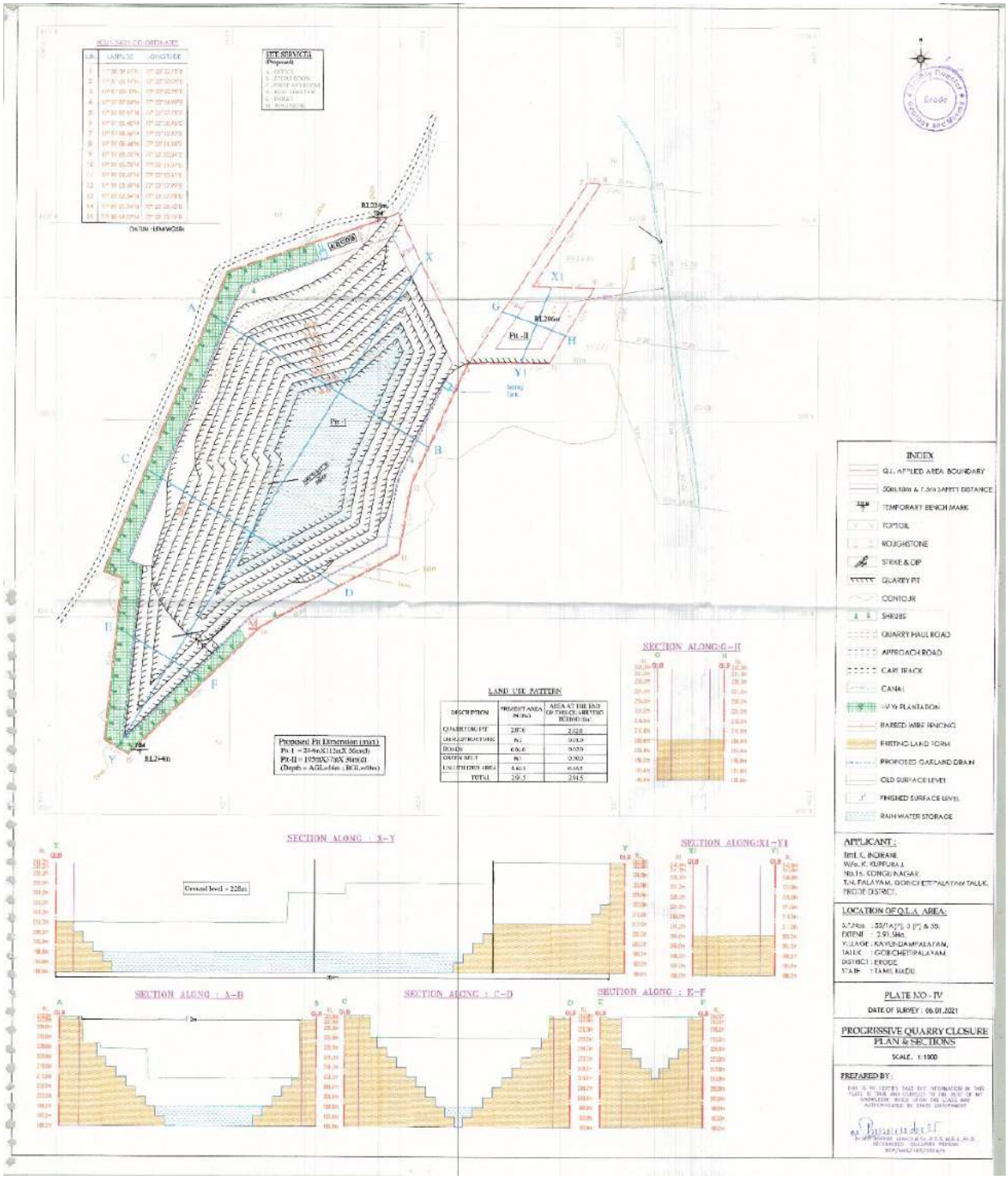

Figure 2.4 Progressive Quarry Closure Plan and Sections

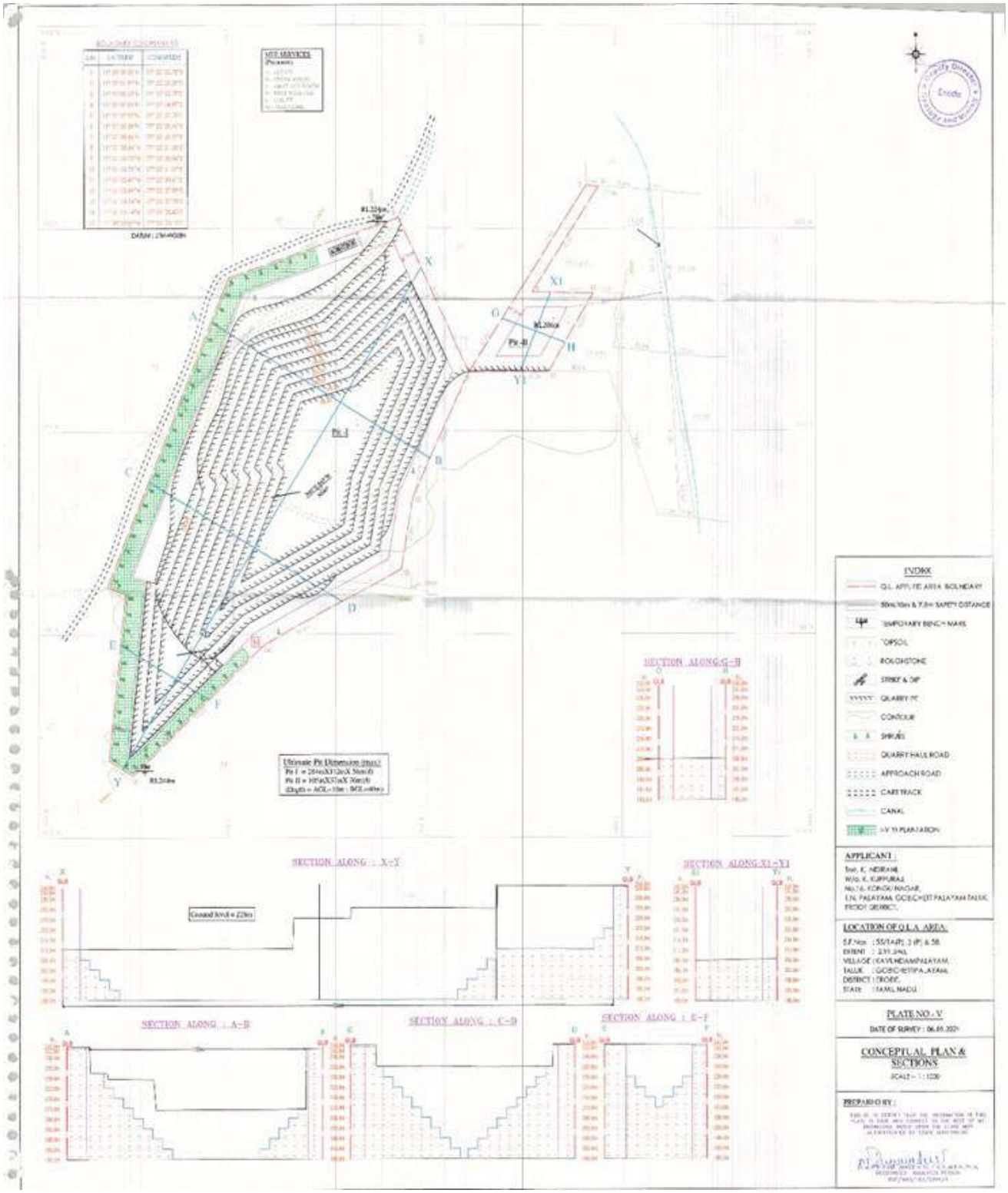

Figure 2.5 Conceptual Plan and Sections

Table 2.7 Mine Closure Budget

Activity	Capital Cost	Recurring Cost/Annum
600 plants inside the lease area	120000	18000
900 plants outside the lease area	270000	27000
Wire Fencing (2.91.5 ha)	583000	29150
Renovation of Garland Drain (2.91.5 ha)	29150	29150
Total	**1002150**	**103300**

Source: Environment Management Plan

2.4 METHOD OF MINING

Opencast mining method has been proposed for the proposed project. It involves formation of benches with 5 m height and 5 m width. The rough stone will be mined using drilling, blasting, and excavators. The excavators attached with rock breaker will be used for breaking large boulders to blocks of required size and the excavators attached with bucket unit will be used for loading the rough stone into the tippers and then, the stone will be transported from the quarry to the nearby crushers. Machineries proposed for this project have been given in Table 2.8.

2.5 PROPOSED MACHINERY DEPLOYMENT

Table 2.8 Proposed Machinery Deployments

S. No.	Type	No.	Size / Capacity	Motive Power
1	Jack hammers	8	1.2m to 2m	Compressed air
2	Compressor	2	400 PSI	Diesel Drive
3	Excavator with Bucket / Rock Breaker	1	300 HP	Diesel Drive
4	Tipper	4	20 Tonnes	Diesel Drive

Source: Approved Mining Plan

2.6 CONCEPTUAL MINING PLAN/ FINAL MINE CLOSURE PLAN

- Mine closure is a process of returning a disturbed site to its natural state for other productive uses to minimize adverse effects on the environment or threats to humans' health and safety.
- The objective of the mine closure plan is to transform quarries to be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting, and non-contaminating.
- At the end of mining life, the mine pit will act as an artificial reservoir for collecting rain wapter and will help to meet the water demand during drought season.
- After mine closure, the greenbelt will be developed along the safety barrier and over top benches. Water from the pit will be used to the greenbelt development and maintenance.

CHAPTER III

DESCRIPTION OF THE ENVIRONMENT

3.0 INTRODUCTION

Field monitoring studies were carried out to evaluate the existing environmental condition of the project site during October 2021 – December 2021 as per CPCB guidelines. Data on the existing environmental condition were collected by **Ekdant Enviro Services (P) Ltd** for the main environmental components including land, water, air, ecology, and socio-economy.

3.1 LAND ENVIRONMENT

Land use pattern of the area of 10km radius was studied using LISS III imagery of ISRO. LULC types have been identified and given in Table 3.1.

Table 3.1 LULC Statistics of the Study Area

S. No.	Classification	Area(ha)	Area in %
1	Barren rocky	207	0.68
2	Crop land	12244	37.86
3	Dense forest	6430	24.4
4	Dense grass land	177	0.58
5	Fallow land	244	0.74
6	Land affected by salinity	44	0.14
7	Scrub land	3227	10.74
8	Manmade features	50	0.16
9	Mining Area	25	0.08
10	Plantations	6830	22.7
11	Settlement	320	1.06
12	Water bodies	261	0.86
	Total	**30059**	**100**

Source: LISS III Satellite Imagery

3.2 SOIL ENVIRONMENT

Six locations were selected for soil sampling on the basis of soil types, vegetative cover, and industrial and residential activities to assess the existing soil conditions such as physical and chemical properties in and around the project site.

Physical Characteristics

❖ The soil texture found in the study area is clayey loam.

- ❖ PH of the soil varies from 7.97 to 8.85 indicating slightly alkaline to strongly alkaline nature.
- ❖ Electrical conductivity of the soil varies from 240 to 460 µs/cm.
- ❖ The bulk density of soils in the study area varies between 0.73 and 1.23 g/cc.
- ❖ The water holding capacity varies from 41.2 to 51.9 and
- ❖ Porosity varies from 27.7 to 42 %.

Chemical Characteristics

- ❖ Nitrogen ranges between 120 and 180 kg/ha.
- ❖ Phosphorus ranges between 0.55 and 1.05 kg/ha.
- ❖ Potassium ranges between 21.5 and 44.5 mg/kg.
- ❖ Calcium ranges between 127 and 180 mg/kg.
- ❖ Magnesium ranges between 22.1 and 40.5 mg/kg.
- ❖ Sulphate ranges between 88.2 and 140 mg/kg.
- ❖ Organic matter ranges between 1.32 and 2.62 mg/kg.
- ❖ Organic carbon ranges between 0.77 and 1.52 mg/kg.
- ❖ CEC ranges between 35.5 and 42 meq. /100g.

3.3 WATER ENVIRONMENT

The water resources, both surface and ground water play a significant role in the development of the area. The water samples were collected and transported as per the norms in pre-treated sampling cans to laboratory for chemical analysis. The purpose of this study is to assess the present water quality of the water resources in and around the project site.

Surface Water

- ❖ The pH of surface water sample is 7.55.
- ❖ Turbidity is 7.8 NTU.
- ❖ TDS is 621 mg/l, whereas TH is 196.7 mg/l.
- ❖ Calcium is 40.1 mg/l and magnesium 23.5 mg/l.
- ❖ Chloride is 112.4 mg/l; nitrate 18 mg/l; and sulphate 56 mg/l.

Ground Water

- ❖ The pH of the water samples ranges from 6.56 to 7.68.
- ❖ TDS are found in the range of 435 - 562 mg/l.
- ❖ The total hardness varies between 129.39 and 208.3 mg/l.
- ❖ Calcium varies from 25 to 41.8 mg/l and magnesium from 16.3 mg/l to 25.3.
- ❖ Chloride varies from 71.3 mg/l to 100; nitrate from 6.2 to 10.2 mg/l; sulphate from 30.1 to 45.6 mg/l; and fluoride from 0.11 to 0.25 mg/l.

- ❖ When speaking about microbiological parameters, the water samples from all the locations meet the requirement.

When compared to IS 10500:2012 all the parameters thus analysed fall within the prescribed limits.

3.4 AIR ENVIRONMENT

The existing ambient air quality of the area is important for evaluating the impact of mining activities on the ambient air quality. The baseline studies on air environment include identification of specific air pollutants and their existing levels in ambient air. The ambient air quality in the study area of 10 km radius around the proposed quarry sites provides the baseline ambient air quality information.

3.4.1 Wind Pattern

Local wind pattern will largely influence the dispersion pattern of air pollutants and noise from the proposed project site. Analysis of wind pattern requires hourly site-specific data of wind speed and direction over a period of 3 months. The wind rose thus produced, as shown in Figure 3.9 reveals that:

- ❖ The measured average wind velocity during the study period is 1.99m/s
- ❖ Predominant wind direction during the study period was Northeast to Southwest and WSW to ESE.

3.4.2 Ambient Air Quality

Ambient air quality was monitored for the period of October 2021 – December 2021 at eight locations within 10 km radius from the project site. For the entire study area, PM_{10} ranges from 35.8 µg/m^3 to 48.9 µg/m^3; $PM_{2.5}$ from 16.8 µg/m^3 to 25.1 µg/m^3; SO_2 from 4.3µg/m^3 to 9.9 µg/m^3; NO_2 from 15.8 µg/m^3 to 23.7 µg/m^3; and the fugitive emission from 50.51 to 54.06. The concentration levels of the pollutants fall within the acceptable limits of NAAQS prescribed by CPCB.

3.5 NOISE ENVIRONMENT

Ambient noise levels were measured at 8 locations around the proposed project area. Noise levels recorded in core zone during day time was 38.5 dB (A) Leq and noise levels in core zone during night time was 36.2 dB (A) Leq. During day time, noise levels in buffer zone varied from 37.8 to 41dB (A) Leq and during night time, noise levels varied from 35.4 to 38.2 dB (A) Leq. Thus, the noise levels from the industrial and residential area meet with the requirements of CPCB.

3.6 ECOLOGICAL ENVIRONMENT

The main objective of biological study is to collect the baseline data regarding flora and fauna in the study area and identify ecologically sensitive areas and whether there are any rare, endangered, endemic or threatened (REET) species of flora and fauna in the core zone as well as buffer zone. The study has also been designed to suggest suitable mitigation measures, if necessary, to protect wildlife habitats and conservation of REET species if any.

From the study of biological environment, it is concluded that there was no schedule I species of animals observed within study area as per Wildlife Protection Act, 1972 and no species were found in vulnerable, endangered or threatened category as per IUCN and that there is no endangered red list species found in the study area. Hence, this small mining operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.7 SOCIO ECONOMIC ENVIRONMENT

Socio-economic study is an essential part of environmental study. It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as features like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis. The proposed project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

CHAPTER IV

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 INTRODUCTION

In order to maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components. This would help in formulating suitable management plans for sustainable resource extraction.

4.1 LAND ENVIRONMENT

4.1.1 Anticipated Impact

The main anticipated impact on the land environment due to quarrying operation is changes in landscape and land use pattern. The mining activities in the cluster occupies about 8.84.5 ha. The size of lands used for mining is insignificant when compared to the size of other LULCs. This small size of mining activities shall not have any significant impact on the land environment. While speaking the impact of the mining project on groundwater resources, the mining activity will not reach the groundwater aquifers. Therefore, it will not affect groundwater quality and quantity.

4.1.2 Mitigation Measures

The mining activity will be progressively implemented along with other mitigative measures as discussed below:

- Garland drains will be constructed all around the quarry pit and a check dam will be constructed at the suitable location in lower elevations to prevent erosion due to surface runoff during heavy rainfall and to collect the storm water for various uses.
- Green belt will be developed in safety zone. The water stored in the quarry will be used for greenbelt.
- Thick plantation will be done on unutilized area, top benches, safety barrier, etc.
- At conceptual stage, the land use pattern of the quarry will be changed into greenbelt area and temporary reservoir.
- Natural vegetation surrounding the quarry will be retained to minimize dust emissions.
- Proper fencing will be established at the conceptual stage and security will be posted round the clock to prevent inherent entry of the public and cattle.

4.2 SOIL ENVIRONMENT

4.2.1 Impact on Soil Environment

The proposed project area is covered by a soil layer of 2m thickness. The soil layer will be removed during mining operations and preserved all along the boundary barrier to facilitate the greenbelt development to reduce the removal of the soil by erosion.

4.2.2 Mitigation Measures for Soil Conservation

- *Run-off diversion* – Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry area. The water from garland drainage system will be discharged into vegetated natural drainage lines, or as distributed flow across an area stabilised against erosion.
- *Sedimentation ponds* - Run-off from working areas will be routed towards sedimentation ponds. These ponds trap sediments and reduce suspended sediment loads before runoff is discharged from the quarry sites. Sedimentation ponds will be designed based on runoff, retention times, and soil characteristics. There may be a need to provide a series of sedimentation ponds to achieve the desired outcome.
- *Retention of vegetation* – Existing vegetation will be retained or the vegetation will be planted at the site wherever possible.
- *Monitoring and maintenance* –Erosion control systems will be maintained to make sure seamless performance of the systems during rainy season.

4.3 WATER ENVIRONMENT

4.3.1 Anticipated Impact

The impact of mining on the water quality is insignificant because of no use of chemicals or hazardous substances during quarrying process. The quarrying activity will not intersect ground water table as the proposed depth is 40m below ground level and water table is found at the depth of 60 m below ground level.

There is no intersection of surface water bodies in the project area. As there is no proposal for rough stone processing or workshop within the project area there will be no effluent anticipated from the mines.

4.3.2 Mitigation Measures

- Water softening will be adopted to make it fit for drinking purposes. But it can be used for other domestic purposes.
- Rainwater will be collected in the mining pit and the water will be pumped out to surface settling tank of the dimension of 15m x 10m x 3m to remove suspended

solids if any. The water stored in the settling tank will be used for dust suppression, greenbelt development and rainwater harvesting.

- ❖ A drainage network, known as garland drains will be constructed to divert surface run-off into the quarrying area.
- ❖ The quality of water in the quarry will be analysed periodically.
- ❖ Domestic sewage from site office and latrines in the mining site will be discharged to septic tanks followed by soak pits.
- ❖ Wastewater from the mining site will be treated in settling tanks before using it for dust suppression and tree plantation purposes.
- ❖ Desilting will be carried out before and immediately after the monsoon season.
- ❖ The quality of water in open and bore wells, and surface water bodies will be monitored regularly.

4.4 AIR ENVIRONMENT

The air borne particulate matter is the main air pollutant in the opencast mining involving drilling, blasting, and loading.

4.4.1 Anticipated Impact

The emission of sulphur dioxide (SO_2), oxides of nitrogen (NO_2) due to excavation and loading equipment and vehicles plying on haul roads are marginal. But, loading/unloading and transportation of rough stone, wind erosion of the exposed area and movement of vehicles will be the main polluting sources releasing Particulate Matter (PM_{10}) affecting ambient air quality of the area.

Anticipated increase of the air pollutants due to the proponents' quarrying activities and the existing quarrying activities within the area of 500m radius around the project sites have been predicted by modelling using AERMOD software and the modelling results shown in Tables 4.1 to 4.4 will be used in providing mitigation measures.

Table 4.1 Incremental & Resultant GLC of PM_{10}

Station Code	Location	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	11°31'10.30"N 77°22'19.45"E	38.9	10	48.9
AAQ2	11°31'12.40"N 77°22'30.03"E	41.5	22.8	64.3
AAQ3	11°31'20.95"N 77°24'4.19"E	39.8	0.5	40.3
AAQ4	11°31'5.79"N 77°19'41.88"E	40.6	5	45.6
AAQ5	11°29'56.14"N 77°20'48.53"E	37.4	5	42.4
AAQ6	11°30'16.48"N 77°23'12.27"E	37.7	0.5	38.2
AAQ7	11°33'3.42"N 77°21'54.67"E	38.2	5	43.2
AAQ8	11°28'23.62"N 77°21'9.11"E	41.0	5	46

TABLE 4.2 Incremental and Resultant GLC of $PM_{2.5}$

Station Code	Location	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$)
AAQ1	11°31'10.30"N 77°22'19.45"E	19.4	10	29.4
AAQ2	11°31'12.40"N 77°22'30.03"E	19.8	15.8	35.6
AAQ3	11°30'43.21"N 77°24'32.48"E	18.5	0.1	18.6
AAQ4	11°30'25.03"N 77°19'25.18"E	20.7	1	21.7
AAQ5	11°29'56.14"N 77°20'48.53"E	19.3	1	20.3
AAQ6	11°29'47.48"N 77°24'34.59"E	18.0	0.1	18.1
AAQ7	11°33'10.26"N 77°21'56.37"E	18.0	1	19
AAQ8	11°28'23.62"N 77°21'9.11"E	18.3	1	19.3

Table 4.3 Incremental & Resultant GLC of SO_2

Station Code	Location	Average Baseline So_2 ($\mu g/m^3$)	Incremental value of So_2 due to mining ($\mu g/m^3$)	Total So_2 ($\mu g/m^3$)
AAQ1	11°31'10.30"N 77°22'19.45"E	6.4	5	11.4
AAQ2	11°31'12.40"N 77°22'30.03"E	6.9	8.08	14.98
AAQ3	11°30'43.21"N 77°24'32.48"E	6.3	0.5	6.8
AAQ4	11°30'25.03"N 77°19'25.18"E	7.0	1	8
AAQ5	11°29'56.14"N 77°20'48.53"E	6.4	5	11.4
AAQ6	11°29'47.48"N 77°24'34.59"E	5.7	0.1	5.8
AAQ7	11°33'10.26"N 77°21'56.37"E	5.9	0.5	6.4
AAQ8	11°28'23.62"N 77°21'9.11"E	6.4	1	7.4

Table 4.4 Incremental & Resultant GLC of NO_X

Station Code	Location	Average Baseline Nox ($\mu g/m^3$)	Incremental value of Nox due to mining ($\mu g/m^3$)	Total Nox ($\mu g/m^3$)
AAQ1	11°31'10.30"N 77°22'19.45"E	21.2	5	26.2
AAQ2	11°31'12.40"N 77°22'30.03"E	22.9	7.88	30.78
AAQ3	11°30'43.21"N 77°24'32.48"E	23.5	0.5	24
AAQ4	11°30'25.03"N 77°19'25.18"E	24.6	1	25.6
AAQ5	11°29'56.14"N 77°20'48.53"E	21.2	5	26.2
AAQ6	11°29'47.48"N 77°24'34.59"E	21.7	0.5	22.2
AAQ7	11°33'10.26"N 77°21'56.37"E	19.1	1	20.1
AAQ8	11°28'23.62"N 77°21'9.11"E	25.2	1	26.2

The values of cumulative concentration i.e., background + incremental concentration of pollutant in all the receptor locations are still within the prescribed NAAQ limits without effective mitigation measures. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be controlled further.

4.4.2 Mitigation Measures

4.4.2.1 Drilling

- ❖ Wet drilling will be practiced to control dust at source. Where water is unavailable, suitably designed dust extractor will be provided for dry drilling.

4.4.2.2 Blasting

- ❖ Blasting time will be determined according to the local conditions.
- ❖ Blasting will be avoided when temperature changes suddenly and strong wind blows towards residential areas.
- ❖ Controlled blasting will be done and the blasting will be restricted to a particular time of the day (i.e., at the time lunch hours).
- ❖ Before loading of rough stone, water will be sprayed on the blasted rough stone.
- ❖ Dust mask will be provided to the workers and their use will be strictly monitored.

4.4.2.3 Haul Road and Transportation

- ❖ Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation.
- ❖ Rough stone will be properly covered with tarpaulin and transported during the day time.
- ❖ The speed of tippers plying on the haul road will be limited to below 20 km/hr to avoid generation of dust.
- ❖ Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of vehicles and other machines will be done to improve combustion process and reduce the emission of pollutants.
- ❖ The haul roads will be compacted weekly before being put into use.
- ❖ Over loading of tippers will be avoided to prevent spillage.
- ❖ It will be ensured that all transportation vehicles carry a valid PUC (Pollution Under Control) certificate.

4.4.2.4 Green Belt

- ❖ Trees will be planted all along the main haul roads and haul roads will often be levelled to prevent the generation of dust due to movement of tippers.
- ❖ Green belt of adequate width will be developed around the project areas.

4.4.2.5 Occupational Health

- ❖ Dust masks will be provided to the workers and their use will be strictly monitored.

- ❖ Annual medical check-ups, trainings and campaigns will be arranged to create awareness about the importance of wearing dust masks among all mine workers and tipper drivers.
- ❖ Ambient air quality monitoring will be conducted six months once to assess the effectiveness of mitigation measures proposed for the projects.

4.5 NOISE ENVIRONMENT

The incremental noise level is found to be 70.6 dB (A) in core zone and ranges between 27 and 44.5 dB (A) in buffer zone.

4.5.1 Anticipated Impact

Noise pollution poses a major health risk to the mine workers. Drilling, blasting, loading and movement of vehicles are the sources of noise in the existing open cast mining projects.

Table 4.5 Predicted Noise Incremental Values

Location ID	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**
Monitored Value (Day) dB(A)	47.8	42.6	43.4	44.5	47.6	43.2	46.7	46.2
Incremental Value dB(A)	51.40	55.29	25.52	22.37	26.43	23.70	25.23	22.79
Total Predicted Noise level dB(A)	52.98	55.52	43.47	44.53	47.63	43.25	46.73	46.22

4.5.2 Mitigation Measures

- ❖ Sharp drill bits will be used while drilling to reduce noise.
- ❖ Secondary blasting will be avoided and rock breaker will be used for breaking boulders.
- ❖ The blasting will be carried out during favourable atmospheric condition and less human activity timings by using nonelectrical initiation system (NONEL).
- ❖ Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise.
- ❖ Sound insulated chambers will be provided for the workers working on machines producing higher levels of noise.
- ❖ Silencers / mufflers will be installed in all machineries.
- ❖ Green belt will be developed around the project area and along the haul roads to minimize propagation of noise.

- ❖ Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of heavy machines and persons working near the heavy machines and their use will be ensured though training and awareness.
- ❖ Regular medical check–up and proper training will be provided to personnel to create awareness about adverse noise level effects.

Ground Vibrations

Table 4.6 Predicted PPV Values due to Blasting

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in mm/s
P1	117	660	1.59

4.5.3.1 Common Mitigation Measures

- ❖ The blasting operations in the cluster quarries are carried out without deep hole drilling and blasting using delay detonators which reduce the ground vibrations.
- ❖ Proper quantity of explosives, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting.
- ❖ Adequate safe distance from blasting will be maintained as per DGMS guidelines.
- ❖ Blasting shelter will be provided as per DGMS guidelines.
- ❖ Blasting operations will be carried out only during day time.
- ❖ The charge per delay will be minimized and preferably a greater number of delays will be used per blasts.
- ❖ During blasting, other activities in the immediate vicinity will be temporarily stopped
- ❖ Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast.
- ❖ A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- ❖ A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- ❖ Sufficient angular stemming material will be used to confine the explosive force and minimise environmental disturbance caused by venting / misfire.
- ❖ The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.

- ❖ The detonation delay sequence shall be designed to ensure that firing of the holes is in the direction of free faces to minimise vibration effects.
- ❖ Appropriate blasting techniques shall be adopted in such a way that the peak particle velocity shall not exceed 1.59 mm/s.
- ❖ Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices.

4.6 BIOLOGICAL ENVIRONMENT

4.6.1 Anticipated Impact

- ❖ None of the plants will be cut during operational phase of the projects.
- ❖ There shall be negligible air emissions or effluents from the project sites. Dust generation during loading will be a temporary effect and is not anticipated to affect the surrounding vegetation significantly.
- ❖ Most of the land in the buffer area consists of crop lands, grass patches and small shrubs. Hence, there will be no effect on the flora.
- ❖ Wildlife except few domestic animals, reptiles, hares and some common birds is not found in the cluster and its immediate surrounds because of lack of vegetal cover and surface water.

4.6.2 Mitigation Measures

The proposed projects will develop the green belt within the lease area, along roads and other vacant areas to provide a barrier between the source of pollution and the surrounding areas. Although the project will not lead to any tree cutting, it is proposed to improve the greenery of the locality by plantation. During green belt development,

- ❖ Plants that grow fast will be preferred.
- ❖ High canopy plants with local varieties will be preferred.
- ❖ Perennial and evergreen plants will be preferred.

Green belt development plan and the cost for the greenbelt development for the proposed project have been given in Table 4.7 and 4.8, respectively.

Table 4.7 Greenbelt Development Plan

S. No.	No. of trees proposed for plantation	Survival %	Area to be covered(m^2)	Name of the species	No. of trees expected to be grown
Plantation in the construction phase (3Months)	Number of plants inside the mine lease area				
	600	80%	5400	*Azadirachta indica, Albizia lebbeck,Delonix regia,Techtona grandis,* etc.,	480
	Number of plants inside the mine lease area				
	900	80%	8100		720

Table 4.8 Budget for Greenbelt Development Plan

Activity	Plantation in the construction phase (3Months)	Cost	Capital Cost (Rs.)	Recuring Cost-per annum
Plantation inside the mine lease area (in safety margins)	600	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring))"	120000	18000

Plantation outside the area	900	Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	270000	27000
Total			**390000**	**45000**

Source: EMP budget

4.7 SOCIO ECONOMIC ENVIRONMENT

4.7.1 Anticipated Impact

The project will generate employment for about 36 persons and indirectly will generate employment for around 45 persons.

4.7.2 Mitigation Measures

- Good maintenance practices will be adopted for plant machinery and equipment to avert potential noise problems.
- Green belt will be developed in and around the project sites as per Central Pollution Control Board (CPCB) guidelines.
- Appropriate air pollution control measure will be provided to minimize the environmental impact within the core zone.
- For the safety of workers, personal protective appliances like hand gloves, helmets, safety shoes, goggles, aprons, nose masks and ear protecting devices will be provided as per the mines act and rules.
- Both the State and the Central governments will be benefited through financial revenues by way of Royalty, Tax, DMF, NMET etc. from the projects directly and indirectly.

CHAPTER V

ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

The mineral deposits are site specific in nature; hence, question of seeking alternate sites do not arise for the projects.

CHAPTER VI

ENVIRONMENT MONITORING PROGRAM

6.0 PURPOSE

Regular monitoring program of environmental components is essential to take into account the changes in the environmental components as shown in Table 6.1. The Objectives of monitoring is:

- To check or assess the efficiency of the controlling measures
- To establish a data base for future impact assessment studies

Table 6.1 Post Environmental Clearance Monitoring Schedule

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 locations (1 core & 1buffer)	24 hours	Once in 6 months	Fugitive dust, $PM_{2.5}$, PM_{10}, SO_2 and NO_x.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone	-	Once in 6 months	Depth in bgl

		around 1 km at specific wells			
5	Noise	2 locations (1Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	During blasting Operation	Peak Particle Velocity
7	Soil	2 locations (1 core & 1 Buffer)	–	Once in 6 months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

Source: Guidance of manual for mining of minerals, February 2010

6.2 BUDGETARY PROVISION FOR EMP

The cost in respect of monitoring of environmental components has been shown in Table 6.2.

Table 6.2 Environment Monitoring Budget

S. No.	Parameter	Capital Cost	Recurring Cost Per Annum
1	Air Quality	Rs. 3,80,000/-	Rs. 76,000/-
2	Meteorology		
3	Water Quality		
4	Hydrology		
5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
Total		**Rs. 3,80,000/-**	**Rs. 76,000/-**

Source: Approved Mining Plan

CHAPTER VII

ADDITIONAL STUDIES

7.1 RISK ASSESSMENT

Risk assessment is all about prevention of accidents and to take necessary steps to prevent it from happening. The methodology for the risk assessment is based on the specific risk assessment guidance issued by the Directorate General of Mine Safety (DGMS), Dhanbad vide circular no.13 of 2002 dated 31st December 2002. The DGMS risk assessment process is intended to identify existing and probable hazards in the work environment and assess the risk levels of those hazards in order to prioritize those that need an immediate attention. Further, mechanisms responsible for these hazards are identified and control measures are recorded along with pinpointed responsibilities. The whole quarry operation will be carried out under the direction of a qualified competent mine manager certified by the DGMS, Dhanbad.

7.2 DISASTER MANAGEMENT PLAN

The objective of the disaster management plan is to make use of the combined resources of the mine and the outside services to:

- Rescue and treat casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

7.3 CUMULATIVE IMPACT STUDY

This section deals with the cumulative impacts of the mining projects in the cluster area on the environment. For this study, the data provided in the tables 7.1-7.8 were used.

Table 7.1 Cumulative Production Load of Rough Stone

Proposed Production Details				
Quarry	**5 Years in m^3**	**Per Year in m^3**	**Per Day in m^3**	**Number of Lorry Load Per Day**
P1	404470	80894	270	45
P2	283295	56659	189	32
Grand Total	**6,87,765**	**1,37,553**	**459**	**77**

Table 7.2 Cumulative Production Load of Gravel

Quarry	Production for 3 Years (m^3)	Yearly Production (m^3)	Daily Production (m^3)	Number of Lorry Loads Per Day
P1	---	---	---	---
P2	25380	8460	28	5
Grand Total	**25380**	**8460**	**28**	**5**

Table 7.3 Cumulative Impact Results from the 2 proposed projects

Pollutants	Baseline Data(µg/m^3)	Incremental Values(µg/m^3)		Cumulative Value (µg/m^3)
		P1	P2	
$PM_{2.5}$	19.4	11.87		
PM_{10}	38.9	24.90		
SO_2	6.4	6.82		
NO_2	21.2	13.67		

Table 7.4 Predicted Noise Incremental Values from Cluster

Location ID	Distance (m)	Direction	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	660 m	SE	41.5	40.77	44.16	55
Habitation Near P2	1000 m	SE	41.5	37.16	42.86	
Cumulative Noise (dB(A))					**46.57**	

Source: Lab Monitoring Data

Table 7.5 Ground Vibrations at 2 Mines

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in mm/s
P1	117	660	1.59
P2	88	1000	0.65
Total Vibration			**2.24**

Source: Blasting Calculations

Table 7.6 Socio Economic Benefits from 2 Mines

Location ID	Project Cost	CER @ 2%
P1	Rs.69,70,000/-	Rs.1,40,000/-
P2	Rs.50,16,000/-	Rs 1,00,320 /-
Grand Total	**Rs. 1,19,86,000/-**	**Rs.2,40,320/-**

Table 7.7 Employment Benefits from 2 Mines

Location ID	Employment
P1	40
P2	36
Grand Total	**76**

A total of 76 people will get employment due to 2 proposed mine in cluster

Table 7.8 Greenbelt Development Benefits From 2 Mines

CODE	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species	No. of Trees expected to be grown
P1	1500	80%	13500	Neem, Teak	1200
P2	330	80%	3000	Neem, Pongamia, Teak	265
Total	**1850**	**80%**	**16500**	Neem, Pongamia, Teak	**1465**

CHAPTER VIII

PROJECT BENEFITS

The proposed project at Kavundampalayam Village aims to produce **404470 m^3** of rough stone over a period of 5 years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits:

- Increase in Employment Potential
- Improvement in Socio-Economic Welfare
- Improvement in Physical Infrastructure
- Improvement in Social infrastructure

CHAPTER IX

ENVIRONMENT MANAGEMENT PLAN

The environment monitoring cell formed by the mine management will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through mine management level. The said team will:

- Monitor the water/ waste water quality, air quality and solid waste generated
- Analyse the water and air samples collected through external laboratory
- Implement and monitor the pollution control and protective measures/devices including financial estimation, installation of air pollution control equipment, waste water treatment plant, etc.
- Co-ordinate the environment related activities
- Collect health statistics of the workers and population of the surrounding villages
- Develop Green belt and monitor the progress of the environmental monitoring programme;
- Comply with statutory provisions, norms of State Pollution Control Board, Ministry of Environment and Forests and the conditions of the environmental clearance.

CHAPTER X

CONCLUSION

Various aspects of mining activities were considered and related impacts were evaluated. Considering all the possible ways to mitigate the environmental issues, environmental management plan (EMP) was prepared and fund has been allocated for the same. The EMP is dynamic, flexible and subjected to periodic review. For project where the major environmental impacts are associated, EMP will be under regular review. Senior management responsible for the project will conduct a review of EMP and its implementation to ensure that the EMP remains effective and appropriate. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP and the project will bring the positive impact in the study area.