1. INTRODUCTION

1.1 INTRODUCTION

Sri V. Nikhileswar Reddy proposed Barytes mine over an extent of 1.858 Hect. in Survey No. 770 of Chapalamadugu Village,Pullalacheruvu Mandal, Prakasam District, Andhra Pradesh. In principle of application of quarry lease notice issued by Director of Mines and Geology, Ibrahimpatnam, Govt. of A.P for 20 years vide notice no. 18357/R3-2/2017 dated 30.08.2017. Mining Plan was approved by the Deputy Director of Mines and Geology, Guntur, Government of Andhra Pradesh vide Letter No. 818/MP/Barytes/MRKP/2018 Dt:07.09.2018.

The Lessee proposes to produce about 9656.64 TPA (2299.2 Cum/Year) of Barytes mineral. The total cost of the project is Rs.35 lakhs only.

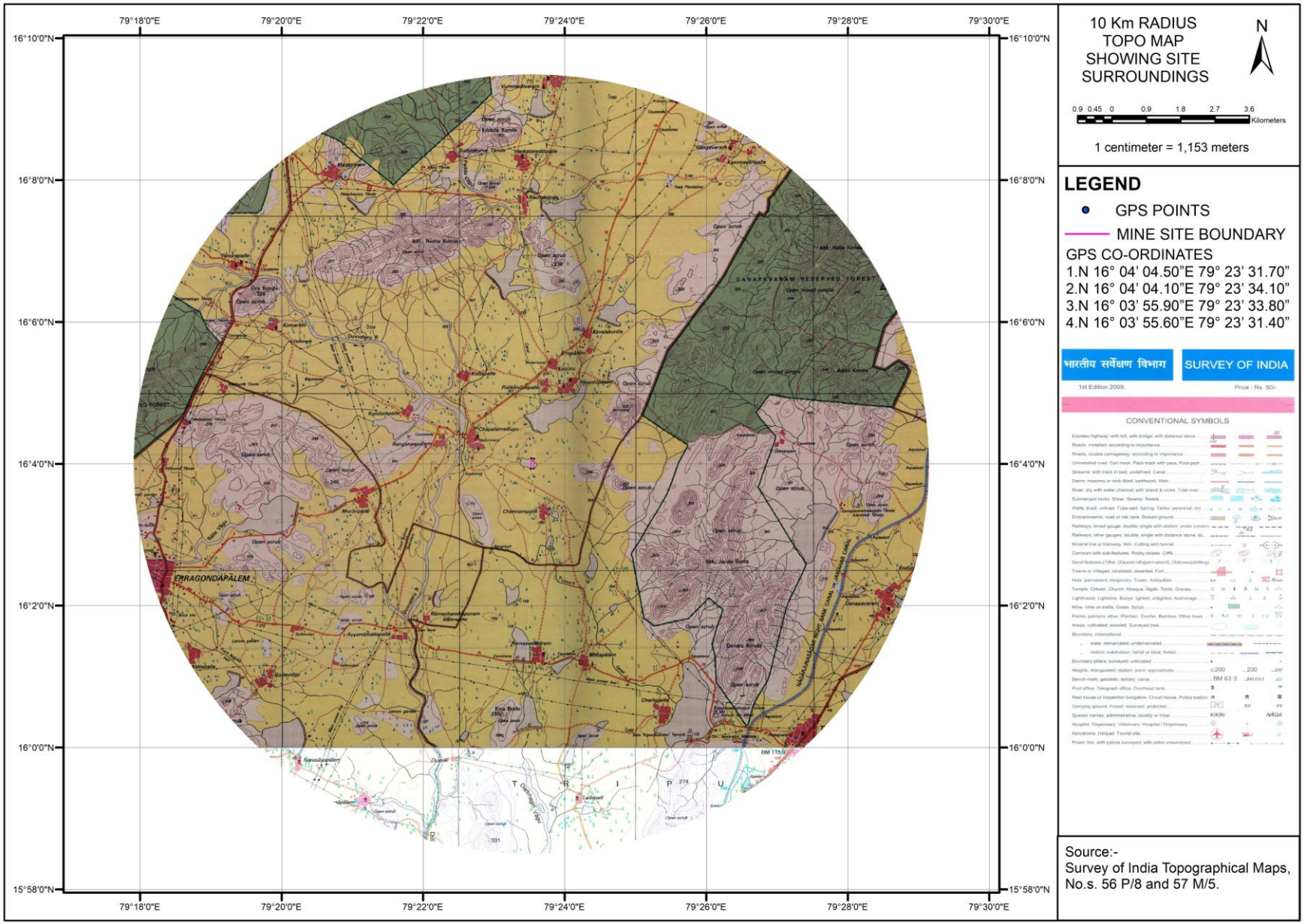
Sri V. Nikhileswar Reddy is conscious of its responsibility towards the society in minimizing the pollution load due to this proposed activity and according to Office Memorandam No. -11011/47/2011-IA.II(M), dated.18-05-2012 from MoEF, GoI, New Delhi for obtaining Environmental Clearance from SEIAA, Andhra Pradesh; the project proponents intends to prepare an Environmental Management Plan for submission for grant of Environmental Clearance for their proposed 1.858 Ha. of Barytes Mine Lease area.

Cluster Clarification: Assistant Director of Mines & Geology, Markapur has issued a letter vide Lr.No. 2840/Q/2016 Dated:29.12.2018 and as per the ADMG, Markapur within the 500 mtrs from the mine lease boundary there are NO Existing mine leases.

Table – 1: SALIENT FEATURES OF THE STUDY AREA

Details of the Study Area		
District & State	Prakasham District, Andhra Pradesh	
Mandal	Pullalacheruvu	
Village	Chapalamadugu	
Extent of the Area	1.858 Ha.	
Nature of the Area	Government Land	
Latitude	$N16^{o}$ 04' 04.50"	$E79^{o}$ 23' 31.70"
Longitude	$N16^{o}$ 04' 04.10"	$E79^{o}$ 23' 34.10"
	$N16^{o}$ 03' 55.90"	$E79^{o}$ 23' 33.80"
	$N16^{o}$ 03' 55.60"	$E79^{o}$ 23' 31.40"
General Climatic Conditions		
Maximum Temperature	$42^{o}C$	
Minimum Temperature	$20^{o}C$	
Annual Rainfall	940 mm	
Wind Pattern	SW to NE	
Accessibility		
Road Connectivity	The quarry lease applied area is located at a distance of 4.22 Km due N of Chapalamadugu village	
Rail Connectivity	Donakonda Railway Station is about 25 km South from the applied lease area.	
Airport & Seaport	Donakonda Air port- 25 Kms Krishnapatnam port is about 180 km from the site.	
Nearest Habitation (Arial Distance)	Chapalamadugu village 01 Km from applied area	
Historical / Important Places		
Archaeologically Important Site	Nil within the study area	
Historically Important Site	Nil within the study area	
Sensitive Places	Nil within the study area	
Sanctuaries / National Parks	Nil within the study area	
Nearest Forest boundary	Ganapuram RF-3.1 Km	
Nearest Water bodies/Rivers/Streams	Duvvaleru River- 1.5 Km Nayudupalem Water pond-1.0 Km Nagarjuna sagar right bank canal- 8.1 Km	

Figure 1 shows the 10 km radius of the study area around the proposed Mine Lease area.


79°18'0"E
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79°24'0"E
79°26'0"E
79°28'0"E
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16°10'0"N
16°8'0"N
16°6'0"N
16°4'0"N
16°2'0"N
16°0'0"N
15°58'0"N
ERRAGONDAPALEM
SANAPAVARAM RESERVED FOREST
10 Km RADIUS TOPO MAP SHOWING SITE SURROUNDINGS
N
0.9 0.45 0 0.9 1.8 2.7 3.6
Kilometers
1 centimeter = 1,153 meters
LEGEND
GPS POINTS
MINE SITE BOUNDARY
GPS CO-ORDINATES
1.N 16° 04' 04.50"E 79° 23' 31.70"
2.N 16° 04' 04.10"E 79° 23' 34.10"
3.N 16° 03' 55.90"E 79° 23' 33.80"
4.N 16° 03' 55.60"E 79° 23' 31.40"
भारतीय सर्वेक्षण विभाग
SURVEY OF INDIA
1st Edition 2009.
Price : Rs. 50/-
CONVENTIONAL SYMBOLS
Source:-
Survey of India Topographical Maps, No.s. 56 P/8 and 57 M/5.

2. PROJECT DESCRIPTION

2.1 THE PROJECT

The mine lease area of **Sri V. Nikhileswar Reddy** deals with the production of 9656.64 TPA Barytes in Survey No: 770 of Chapalamadugu Village, Pullalacheruvu Mandal, Prakasham District, Andhra Pradesh. Hence, it is proposed to mine the Barytes by open cast, using semi-mechanized method by developing the benches of 6 M. height 3m bench width with shallow drilling and blasting.

The lease area is at the intersection of N16^{o} 03' 55.60"- 16^{o} 04' 04.50" latitudes and E79^{o} 23' 31.40" - E79^{o} 23' 34.10" longitudes. The area is located at a distance of 4.2 Km from Chapalamadugu.

2.2 NEED FOR THE PROJECT

In order to meet the statutory requirements the lessee intends to obtain Environmental Clearance from Statutory Authorities.

2.3 TOPOGRAPHY

The Quarry lease applied area is undulating land. The NW side of the lease area has a maximum RL 166 observed in North side corner boundary pillar no 3 and minimum 165M of observed at SE side corner point 3 corners of QL area. Surface relief in QL area is 3m. from West side

Quarry Lease applied area is a fresh mine and a trial is opened at NW and NE of the quarry lease area to know the depth of Barytes.

General ground level observed as 165m RL and ABM is fixed as 165 m RL at Boundary Pillar No.3. The quarry lease area is part of undulating land with some shrubs and bushes exist in the QL area.

2.4 GEOLOGY

2.4.1 Regional Geology

The rock units, exposed in this region of the subjet area belong to Vempalli formation of Papaghni Series in Cuddapah Super Group. The Vempalli formation comprises of Purple shale with interbeded layers of Dolomitic Limestone, Igneous intrusives at lower part and vein Barytes also ours occasionally. The following table shows the stratigraphy of the region.

---------- Unconformity ----------

Papaghni Series – Vempalli formation -- Cherty Dolomitic, Vein Barytes,
Shales and Igneous intrusives (Traps)

Gulcheru Quartzite

---------- Unconformity ----------

2.4.2 Local Geology

The quarry lease applied area is almost plain terrain with a relief of 3 M where barites occurring along fracture zones of intrusive rock. Thin vein Barytes is occurring along fracture zones of the intrusive rock (Tuff). A trial pit was made on the strike direction of the Barytes and found the continuation of the Barytes vein in the Q.L applied area. It is observed from adjacent working mines and trial pit of subject area that the Barytes veins are formed to an average width of 1.0 m in the strike direction of N-S and dipping towards East with 60^{o} and average depth is 3.75 m. One vein observed in the applied area in parallel directions. The host rock i.e. Intrusive Tuff is formed as hanging wall and footwall in this area the Barytes might have been derived from magmatic exhalation & emanating from a Shallow seated differentiating barium rich magma along fracture from zone within country rock. The applied area is covered by the soil on the surface and intrusive tuff is exposed below the soil in existing pits.

2.5 DETAILS OF EXPLORATION

Details of prospecting carried out: To prove the strike continuity and parallel veins in the area, prospecting one trial pit to a depth of 4 m. is opened at the Western side of QL area. The size of the pit is 8 m. length and 10 m. width.

2.6 GEOLOGICAL RESERVES

Method of Estimation of Reserves:

The deposit is found to be irregular in shape. Hence cross-sectional method adopted for Estimation of Geological Reserves. 1 Section A-A^1 1 were drawn at equal distance perpendicular to strike direction of the formation to estimate the reserves.

The cross sections were drawn perpendicular to the trend direction, the cross-sectional area of the individual sections is calculated to arrive at sectional area, the area thus arrived is multiplied by the sectional influence of 8M (average) to arrive the volume of Barites.

Broadly indicate the future program of exploration with due justification taking into consideration the future tentative excavation programme planned in next five years

One Cross Section (A-A') are drawn perpendicular to the slope direction for profile purpose: Section Area (Sqm) x Section Influence (m) = Volume of Geological Reserve (Cum). Reserves are taken only or proved reserves only. 30% recovery of the Barytes is considered from the quarry.

a) Total Geological Reserves

Geological Reserves							
S. No.	Category	Section	Sectional Area (m^2)	Influence (m)	Volume (m^3)	Recover 30%(m^3)	Waste 70%(m^3)
1	Proved	A-A'	4944	8	39552	11865.6	27686.4
	Total Reserves				39552	11865.6	27686.4

a) Mineable Reserves

Mineable reserves are calculated by deducting the reserves blocked under benches and reserves blocked in 7.5 m buffer zone from the total geological reserves. Only proved reserves were considered for calculating the mineable reserves. The details of reserves blocked under benches & safety zone are given in table below:

Reserves Blocked under Benches							
S. No.	Category	Section	Sectional Area (m^2)	Influence (m)	Volume (m^3)	Recover 30%(m^3)	Waste 70%(m^3)
1	Proved	A-A'	77	8	616	184.8	431.2
	Total Reserves				616	184.8	431.2

Reserves Blocked 7.5 Buffer Zone							
S. No.	Category	Section	Sectional Area (m^2)	Influence (m)	Volume (m^3)	Recover 30%(m^3)	Waste 70%(m^3)
1	Proved	A-A'	315	8	2520	756	1764
	Total Reserves				2520	756	1764

Details of Mineable:

Reserves: Marketable Grade Baryte is 30% Recovery

		Reserves in M^3
A. Total Proved Geological Reserves	:	11865.6
B. Reserves Blocked under benches	:	184.8
C. Reserves Blocked under 7.5m Buffer Zone	:	756
Mineable Reserves (A-(B+C))	:	10925
Average Annual Production	:	2221.44 M^3

Life of the Mine	:	= 10925/2221.44 = 4.917 years say 5 years

2.7 MINING

Open Cast Mining: The Barytes is exposed on the surface. Hence, it is proposed to mine the Barytes by open cast, using semi-mechanized method by developing the benches of 6 M. height 3m bench width with shallow drilling and blasting. The development of benches will be maintained @ 40 – 60^{o} safety slopes.

Drilling & Blasting:

Drill holes of 6m depth will be drilled in a staggered pattern at 3 m x 2.50 m interval:

i)	Drill hole diameter	:	115 mm up to 3 – 3.25 m long
ii)	Depth and inclination of drill hole	:	Generally drilled vertically in an alignment
iii)	Explosive type	:	Detonator Fuse/Anfo with detonators

Magazine Type and Capacity: Lessee will apply for the Explosive license for storing the explosives with 60 kg Portable Magazine. Alternatively engages a licensed blasting contractor for carrying out the drilling and blasting.

Machinery: Heavy Earth Moving Machinery like excavator, dumpers dozer and other transport vehicles will be used for mining operations.

2.8 USE OF MINERAL

This Barytes is useful for Metallurgical industry, Ceramic Industry, Abrasive industry and Glass and Moulding Industry. The Barytes is mainly used for ceramic and isolators manufacturing units.

2.9 MINERAL PROCESSING

No beneficiation is planned at this mine, except breaking the oversize lumps and separation Barytes from country rock such as Sericite Schist/phyllite and dolerite sills.

2.10 SITE SERVICES

Site services such as Office Room –cum- First Aid, separate shelter and toilet for Gents and ladies will be provided in the lease area as demarked in the year wise Working Plan.

2.11 EMPLOYMENT POTENTIAL

The mining activity is providing the job facilities to the local people. It will have 1 Mines manager, supervisor, skilled & unskilled labour about 24 persons.

3. EVALUATION OF IMPACTS

3.1 INTRODUCTION

Opencast mining activity causes some adverse impacts on the surround environment unless proper environmental management plan is adopted. Selecting suitable sites for mining and adopting the guidelines prescribed by the Ministry of Environment & Forests (MoEF) and Indian Bureau of Mines (IBM), one can minimize the major possible impacts.

In this chapter, an attempt has been made to quantify the possible environmental impacts on various features such as air, water, noise, land, ecology and socio-economies. The following aspects have been studied to identify the possible impacts while achieving the total production of 9656.64 TPA of barite mineral.

The magnitude and significance of the environmental pollution caused by mining depends on method of mining, scale and concentration of mining activity.

3.2 AIR ENVIRONMENT

The impacts on air environment from a mining activity depend on various factors like production capacity, machinery involved, operations and maintenance of various equipments and vehicle. Apart from these, there will be other activities associated viz transportation of mineral and waste, stocking facilities and dump management within the mine lease area that may contribute to pollution.

3.2.1 SOURCES OF DUST EMISSION

Mining is carried out by open cast manual method by using drilling & blasting. Based on the various operations involved in the production of minerals, the various emission sources have been identified as given below.

a. Point source

b. Area sources.

c. Line sources.

Drilling operations of the mine are considered as point sources. Extraction of mineral from mine, are considered as area sources. Transportation of material from mining benches to various end points are considered as line sources. The impact of above sources on air environment is discussed below:

a) Drilling

It is proposed to drill 2 m deep shot hole with 1m spacing and 0.75 m burden

Wedge cut method of drilling is in practice in both horizontal & vertical development of Levels/ shafts/winges. The length of the drill rod will be 1.2m. To achieve an advancement of 0.8-1.0m in levels and 0.6m in winge development, the pattern of holes is as follows.

Drilling Capacity= 3holes/hour, Depth of the hole=1.2m

Therefore for drilling 24 holes will be 8 hours (one shift)

b) Blasting:

In this area for fragmentation of quartzite the blasting will be conducted. Multiple blast holes of 1.0 to 2.0 m depth will be drilled with the help of 34 mm drill rod, Jack Hammer and Air Compressor of 250 cfm capacity. It is proposed to drill 2 m deep shot hole with 1m spacing and 0.75 m burden.

c) Extraction & Loading

Extraction & Loading will be done manually Loading activity of mine operation is contributing to the area source emission and the extent of influence of this operation is about 100 m^2.

c) Haulage &Transportation

In the operating mine, the excavated material form mine face to the consumers is transported by tractor and trucks. The trucks will be well maintained so that exhaust smoke does not contribute abnormal values of noxious gases and unburnt hydrocarbons. The other sources of air pollution is due to the dust generated during the movement of trucks on the haul road.

The above sources, which include blasting, excavation, haulage for transport of mineral will contribute to dust pollution in the air.

The dust generated in the operating mine is that of topsoil and feldspar.

3.2.2 ANTICIPATED IMPACTS

The impacts envisaged due to mining activity are evaluated based on various factors. The emission inventory of the pollutants is as follows, the main air pollutant would be dust or particulate matter generated by handling and transportation of ore. The persons employed

at the above areas are likely to get lung related diseases like silicosis, after prolonged exposure to the Barytes particles without protective measures. But the impact of mining operations on air quality is minimum as mining involved manual opencast method by using small scale drilling & blasting and as the production quantity is very less i.e 32.18 TPD only.

3.2.2.1 Dust Generation and Control

The air pollutant would be dust or particulate matter generated by handling and transportation of ore. The dust generated due to mining operations will be controlled by water sprinkling through water tankers.

3.3 NOISE ENVIRONMENT

Noise will be produced at the mine is due to drilling, blasting, movement of vehicles and other machinery. The noise generated by the mining activity is dissipated within a small zone around the mine. There is no major impact of the mining activity on the vicinity however; pronounced effect of above noise levels will felt only near the active working area and on the personnel working in the vicinity. The impact of noise on the villages is negligible as the villages are located far from the mine site.

3.4 WATER ENVIRONMENT

The Mining activity will be carried out on hill slope will not have any effect on the ground water and the general water table in this area is below 25-30 m.

3.4.1 Impact on Surface Water

There are no major streams and rivers, which can get effected by the mining. Hence, there will be no effect on the surface water

The rainwater drains the slopes of the area and joins to seasonal nallahs, which is running in out side the area.

3.4.2 Impact on Ground Water

Mining activity will be above the GWL (25-30m). Hence, there will be no effect on the ground water regime.

3.4.3 Impact on Water Quality

Water samples collected form bore wells located in the buffer zone have indicted that the ground water is free form heavy metal concentration and after implementation proposed mining activity will not interference on the water quality.

3.4.4 Water Consumption & Wastewater Generation

The water requirement for this proposed mining activity will be 10 KLD. Breakup details are:

Sl. No:	Purpose	Quantity (KLD)
1	Dust suppression purpose	08
2	Domestic purpose	01
3	Greenbelt purpose	01
	Total	**10**

There is no generation & discharge of wastewater from this mine.

3.5 LAND ENVIRONMENTS

Various components of land environment have been identified for study of impact of the mine operations. Details of the same are given below:

3.5.1 Solid Waste Generation

The side burden such as quartzite and shale are collected as waste.

The waste generated during the five years may be dumped in the zone separately reserved for dumping within the Q.L. area. The dump will be designed in such that it will have slopes equal to the angle of repose of such material. Garland drains have to be sunk along around the leading edge of the dump. A retaining wall will be constructed around the dump to preventing the slanting of boulders Care will be taken to minimize the waste generation at the source.

About 5364.8 Cum/Year of Waste will be generated and The waste such as soil mixed with stony material will be generated by development work and production. The waste along with soil will be used in their lands adjacent to the ML area (for spreading), until then it will be the waste will be dumped on the eastern side of the quarry lease area. Generated waste will be stocked over an area of 0.172 Ha of dump area with an avg height of 30mtrs over in lease period.

3.5.2 Impact on Land use

The 1.858 Hects of the lease area is used for mining. There will not be any damage or land degradation due to mining as the entire Mine working.

The soil cover disturbed in the opencast workings is comparatively very low and the same soil will be used for afforestation. Considering this swell factor and the recoveries of the Barytes from the broken pegmatite, the dumps are fair enough to completely fill the mined out portion.

There is no agricultural land that got affected by the mining and there is no devastation of habitants for mining the small deposit.

There is no forest cover also that got affected mine workings. But to keep the greener and promote aesthetic beauty in the area, the year wise afforestation programme has been chalked out. There may not be much effect on the aesthetic environment of the lease area due to mining. The aesthetic beauty can be maintained by proper reclamation programme. Since this is a opencast mining proposal the land use on surface will not affect in any way.

3.6 BIOLOGICAL ENVIRONMENT

There is no adverse impacts are anticipated due to the proposed mining activity on biological environment. However, with the implementation of the environmental management measures, there will be improvement in the parameters of biological environment.

The tree species found with the core zone represent the common type of flora species along with small shrubs and bushes. Due to mining activities community structure of the vegetation will not change. Where as diversity of plant species and food web index of the area reduced to certain extent.

However, if the proposed reclamation of the mining area and dumped out area using proper re-vegetation techniques and development of green belt around the ultimate limit and roadside there shall be an improvement in the species diversity and food web index compared to the existing level.

3.7 SOCIO- ECONOMIC ENVIRONMENT

3.7.1 No Rehabilitation

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. No public buildings, places, monuments etc. exist within the lease area or in the vicinity. The mining operations will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated.

3.7.2 Improvement in Socio Economic Status

It will be obvious to assume that the activities of the mining operations have to be produced some improvements in the socio-economic levels in the study area.

The lessee provides employment to local population and it will give preference to the local people whenever there is requirement of manpower.

The proposed mining activities provide employment to persons of different skills and trades. The local population is the largest plausibility among these employees. The employment potential ameliorated economic conditions of these families directly and provided employment to many other families indirectly who are involved in business and service oriented activities. This in-turn will improve the socio-economic conditions of the area.

3.7.3 Occupational Health and Safety

The mine is going to be developed mainly manual opencast method. No major crushing or pulverization will be done here. The small-scale mining will not have any ill effects on the health of labour.

Excessive dust and noise are the chief health hazards for the miners. As already mentioned these causative factors are well within the safety limits and the proponents will strictly implement the prescribed safety measures. The health of the workers will be regularly checked and suitable medical facilities should be created on or close to the site. Highest safety will be ensured in the working conditions of the miners.

4. ENVIRONMENTAL MANAGEMENT PLAN

4.1 INTRODUCTION

The mining development in the study area needs to intertwined with judicious utilization natural resources within the limits of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged in the environment without affecting the designated use and is governed by dilution, dispersion and removal due to natural physio-chemical and biological processes. The Environmental Management Plan (EMP) is required to ensure sustainable development in the study area.

This chapter covers the genesis of pollution, the principal sources of pollution, the nature of pollution, the proposed measures required for meeting the prevailing statutory requirements of gaseous emissions, wastewater discharge characteristics, noise levels etc. for environmental management purpose in connection with the mining and mining related activities in the study area.

This section discusses the management plan for mitigation/abatement impacts and enhancement of beneficial impacts due to mining. The Environmental Management Plan (EMP) has been designed within the framework of various Indian legislative and regulatory requirements on environmental and socio-economic aspects.

Environmental Management Plan giving the environmental protection measures at mine to meet the stipulated norms of IBM/MoEF are as detailed.

4.2 AIR POLLUTION CONTROL MEASURES

The present ambient air quality measurements in the mine area are well within the limits. Due to the proposed production of 9656.64 TPA of Barytes minerals, there will be marginal increase in dust concentrations.

Mitigative measures suggested for air pollution control are based on the baseline ambient air quality monitoring data. From the point of view of maintenance of an acceptable ambient air quality in the region, it is desirable that air quality should be monitored on a regular basis to check it vis-à-vis the standards prescribed by CPCB and in cases of non-compliance appropriate mitigative measures shall be adopted.

The following dust prone areas are identified for adopting proper control measures in the mine area.

i) Drilling & Blasting

ii) Excavation

iii) Transportation

The environmental control measures which will be implemented to control the fugitive dust released from the proposed production are given below:

- Wet drilling
- Use of sharp drill bits for drilling holes. Charging the holes by using optimum charge and using millisecond delay detonators
- Water sprinkling arrangements such as specially fabricated tankers mounted on tipper are deployed at mine site to control the fugitive dust generation from the haulage roads.
- Regular grading of haul roads and service roads to clear accumulation of loose material
- The blasted piles (temporary) are wetted by spraying water
- Avoiding blasting during high windy periods, night times and temperature inversion periods.
- Excavation operations are suspended during periods of very strong winds.
- Avoiding over filling of tippers and consequent spillage on the roads
- Massive afforestation for control of dust
- Spraying of water on sub grade stacks
- The vehicles and machinery are kept in well-maintained condition so that emission of fugitive constituents is minimized.
- Plantation of wide leaf trees, creepers, tall grass around working pit, along roads will help suppress dust.
- Tall trees with an average height of 5 m will be developed all along the boundary of the lease area to minimize the dispersion of the dust from the mining.
- Periodical monitoring of air quality to take steps to control the pollutants.

4.2.1 OCCUPATIONAL HEALTH & SAFETY MEASURES

All the precautions would be adopted to prevent dust generation at site and to be dispersed into the outer environment. However, for the safety of workers at site, engaged at strategic locations/dust generation points like drilling, loading and unloading points, etc., dust masks would be provided. Dust masks would prevent inhalation of RSPM thereby reducing the risk of lung diseases and other respiratory disorders. Regular health monitoring of workers will be carried out.

4.3 NOISE POLLUTION CONTROL MEASURES

The ambient noise level monitoring is carried out in and around the proposed mine shows that ambient noise levels are well within the stipulated limits of CPCB.

Noise generation may be for an instant, intermittent or for continuous periods, with low to high decibels. Periodic inspection and checks of the risk prone areas and equipments have to be conducted.

To control noise pollution during the proposed mining operations following steps will be practiced.

- The noise generated by the machinery will be reduced by proper lubrication of the machinery and equipment.
- The workers employed should be provided with personal hearing protection equipment, with earmuffs and earplugs combined, as a protection from the high noise level generated at the plant site.
- The provision of green barrier along the boundary will further reduce the propagation of noise level generated.
- Limiting time exposure of workers to excessive noise.
- Carrying out blasting only during daytime and avoiding the same on cloudy days and when strong wind blows across.
- Speed of trucks entering or leaving the mine is limited to moderate speed of 25 kmph to prevent undue noise from empty tippers.

4.4 CONTROL OF GROUND VIBRATIONS

- During blasting, proper blast pattern should be adopted. The latest technology delay blasting should be adopted to reduce the impact on the ground vibration and noise generation during blasting operations.
- Shock tube initiation system with sequential blasting should be adopted
- Blasting should be done in only one bench at a time.
- Charge weights per delay should be properly adopted so that the peak particle velocity will be maintained as per the DGMS requirement.

All the above-mentioned points will be taken care, while planning and conducting blasts.

4.4.1 Safety in Blasting

Care should be taken to evacuate the mining area completely at the time of blasting operations. The blasting team should be equipped with all personal safety and precautionary measure. The following safety measures will be given attention while conducting the blasting operations.

- A blasting SIREN should be used at the time of blasting for audio signal.
- Before blasting and after blasting, red & green flags should be displayed as visual signals.
- Warning notice boards indicating the time of blasting and NOT TO TRESPASS are displayed prominently.

4.5 WATER POLLUTION CONTROL MEASURES

The action program for minimizing adverse affects on water regime is to prevent wash-off of mine water and uncontrolled run-off water during monsoon. Proposed measures for this are as follows:

a) Building/extending of retention/toe walls at the foot of the dumps

b) Construction of Garland drains along the slopes to divert the rainwater course away from the dumping areas.

c) Covering of dump slopes with grass plantation to stabilize and prevent erosion.

d) Plantation of trees along the ridges and slopes.

e) Stabilization of worked out slopes by planting appropriate shrub/grass species on the slopes to prevent material wash off.

4.6 LAND ENVIRONMENT

The Environmental Management Plan of land environment is divided into the following three components.

a) Solid waste management

b) Reclamation of degraded areas

c) Afforestation/plantation/Greenbelt Development

4.6.1 Solid Waste Management

The side burden such as quartzite and shale are collected as waste.

The waste generated during the five years may be dumped in the zone separately reserved for dumping within the Q.L. area. The dump will be designed in such that it will have slopes equal to the angle of repose of such material. Garland drains have to be sunk along around the leading edge of the dump. A retaining wall will be constructed around the dump to preventing the slanting of boulders Care will be taken to minimize the waste generation at the source.

About 5364.8 Cum/Year of Waste will be generated and The waste such as soil mixed with stony material will be generated by development work and production. The waste along with soil will be used in their lands adjacent to the ML area (for spreading), until then it will be the waste will be dumped on the eastern side of the quarry lease area. Generated waste will be stocked over an area of 0.1727 Ha of dump area with an avg height of 30mtrs over in lease period.

4.6.2 Reclamation of Mined out Areas

The lessee could not do the reclamation due to continuity of mining activity and pending exploration on mine-out land. The mine is expected to be operated for long time after renewal of mining lease. Therefore, the matter regarding reclamation will be given in final closure plan. This part of the lands and area are short of water on account of drought in nature. Therefore, after complete exhaustion of mineral, the excavated area will be used for rainwater storage and the water will be used for cattle and for agriculture purpose.

4.6.3 Afforestation Plan

It was proposed to undertake plantation of 1250 seedlings in first 5 year plan period in the area. The lessee could not undertake the plantation in lease area. Now also the plantation is continuing in phase-wise manner. At Western side border of ML area scarcely spread plantation is observed.year wise afforestation programme is given below table.

Year	No. of Plants (Seedlings)	Area m^2	Location	Type of Plants
1st	250	150	ML Boundary	Eucalyptus
2nd	250	150	ML Boundary	Eucalyptus
3rd	250	150	ML Boundary	Eucalyptus
4th	250	150	ML Boundary	Eucalyptus
5th	250	150	ML Boundary	Eucalyptus
Total	1250	750	ML Boundary	Eucalyptus

Apart from the green belts and aesthetic plantation for eliminating fugitive emissions and noise control, all other massive plantation efforts shall be decided and executed with the assistance and co-operation of the local community. Based on the community needs the afforestation would mainly aim at:

a) Protection & Development of Natural Vegetation
b) Protection of soil erosion
c) Plantations of fuel wood blocks to meet the energy requirements.

4.7 LAND USE PATTERN IN LEASE AREA

The details of land use pattern in mine lease area for scheme period is given below

Land Use Pattern for the mine

S. No.	Head	Area put on use at start of Plan (Ha.)	Additional requirement during plan period (Ha.)	Total (Ha.)
1	Area under Mining	0.0293	0.1777	0.207
2	Over burden / Waste Dump	0	0	0.172
3	Roads (Included in pits)	0	0.015	0.015
4	Others / Retaining Wall	0	0.075	0.075
5	Fencing Around the Pit (Included in Quarry Area)	0	1.561	1.561
	Total	0.0293	1.8287	1.858

4.8 SOCIO ECONOMIC BENEFITS

There is positive impact on socio-economics of people living in the villages. The villages in buffer zone depend upon agriculture. Mining operations in the subject area has positive impact by providing direct and indirect job opportunities. There will be indirect employment opportunities in transportation of ore to destination.

4.9 POST PROJECT MONITORING

The Lessee will monitor the environmental parameters as per APPCB/IBM/CPCB guidelines.

4.10 IMPLEMENTATION OF EMP & MONITORING PROGRAMME

The environment management plan is detailed on the basis of impact assessment. Control and mitigation measures for the adverse impacts envisaged. As the major environmental attributes have been confined to the project area alone, implementations of the proposed control measures and monitoring thereof will be undertaken on the regional basis. The Lessee will ensure the implementation of the measures within the mine area and carryout efficient monitoring. In order to implement the measures suggested for mitigating the adverse impacts on the environment, it is suggested to monitor the environmental parameters regularly.

A detail of investments to carryout the regular monitoring and pollution control measures is given below in table – 2.

Table – 2: Cost of Environmental Protection Measures (in Rs. Lakhs)

Sl.No	Description	Item	Capital Cost	Recurring Cost	Remarks
1	Air Pollution	Nose Masks	-	5,000.00	Replaceable, and cost can increase with time
		Cloth for drillers	-	10,000.00	Issued thrice in a year
		Gunny bags for covering the surface of jackhammer holes	-	6,000.00	As and when needed
		Road wetting and plant water feeding	50,000.00	210,000.00	Water tanker cost @ Two tankers per day for 8 months

		Plantation on road side plus maintenance	250,000.00	100,000.00	Re-plant the non-surviving plants
2	Water Pollution	Construction of garland drains	250,000.00	100,000.00	Once only (For manual de-silting)
		De-silting operations	-	15,000.00	Yearly and manual operations
		Construction of Silting ponds	100,000.00	50,000.00	Once in year, cost incurred is to buy sand bags and filling sand
		Construction of retaining wall for waste dump	120,000.00	50,000.00	Cost of construction of wall around the dip side of the dump.
3	Noise Pollution	Maintenance of machinery suitably	40,000.00	20,000.00	Included in main cost
		PPE's like Ear muffs	8,000.00	5,000.00	Once in six months
4	Occupational Health & Safety	Providing First aid kits – and fire extinguishers	8,000.00	4,000.00	Once in year, replace by conducting periodical checkup
		Providing Personal protective equipments to all employees (hand gloves, safety shoe and helmets)	35,000.00	20,000.00	Included in air pollution and noise pollution
		Training and awareness programs on risk factors during emergencies by the experts	15,000.00	10,000.00	Once in six months and create sign boards about the risk and safety precautions regularly
		Periodical medical checkup and supply of medicines – Rs. 200 per head	10,000.00	10,000.00	Once in a year and supply of medicines for every three months
5	Environmental monitoring	Ambient air quality studies – Once in six months – 3 locations	-	25,000.00	MoEF /NABL recognized laboratories

		Water quality studies – Once a year – 3 Locations	-	8,000.00	
		Noise studies – once in six months – 3 Locations	-	7,000.00	
		Vibration studies – Once in year – 1 location	-	10,000.00	
TOTAL			**886,000.00**	**665,000.00**	

Conclusion

Based on the EMP study it is observed that there will be a marginal increase in the dust pollution, which will be controlled by sprinkling of water and transportation of mineral in closed trucks.

There will be negligible impact on ambient environment & ecology due to mining activities, moreover the mining operations will lead to direct and indirect employment generation in the area.

Hence, it can be summarized that the development of these mines will have a positive impact on the socio-economics of the area and lead to overall sustainable development of the region.