

EIA
of
Uttambar Bauxite
M/s Ashapura Minechem Ltd.

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1. Ambient Air Quality test results
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3. Socio-economic study area

1 CHAPTER: INTRODUCTION

1.1 IDENTIFICATION OF PROJECT PROPONENT AND PROJECT

Uttambar Bauxite Deposit is situated in village Uttambar, Tehsil - Dapoli, District Ratnagiri of Maharashtra State. Sri. Chetan Shah is a private entrepreneur and Managing Director of M/s Ashapura Minechem Ltd., has obtained approval for initial Mining Plan for 107.44.40 ha vide letter No MP/MAN/567/(MAH)/GOA/2004-05 in Dec 2004. Accordingly in 2006 an approval for modification in the mining plan was obtained from IBM due to the then envisaged enhanced production levels of bauxite mineral from Uttambar deposit vide letter No MP/MAN-567(MAH)/GOA/2004-05 for an area of 107.44.40 ha. Later it was observed that, the mining proposals falls within CRZ restricted zone. Hence to comply with this condition it was decided to delete 61.90 ha of area. As a result of CRZ stipulations, the earlier granted ML has reduced to 45.544 ha. for present mining purposes.

1.2 PURPOSE OF THE REPORT

M/s Ashapura Minechem Ltd. has delegated the work to M/s Bhagavathi Ana Labs Ltd., Hyderabad to prepare an Environmental Impact Assessment and Environment Management Plan after evaluating all the environmental impacts and delineate the management plan to prevent, control, mitigate or minimize the adverse environmental impacts.

M/s Bhagavathi Ana Labs Ltd. undertook the above-said work during the Winter season (Dec -2008 to Feb -2009) as per EIA guidelines laid by Ministry of Environment & Forests (MoEF) and various statutory agencies. The findings of the study carried during Winter season are presented in this report.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature of the project

It is an opencast manual Bauxite mine.

1.3.2 Size of the Project

Area of the mining lease : 45.544.ha (Private Revenue Non Forest Land)

Production : 24,000 TPA

1.3.3 Location of the Project

The mine lease area is located within the jurisdiction of Uttambar village, Dapoli Tehsil, Ratnagiri District (M.P). Geographically the ML area falls under following co-ordinates:

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Latitude	:	N 17 ⁰ 54' 03" to 17 ⁰ 54' 39"
Longitude	:	E 73 ⁰ 03' 51" to 73 ⁰ 04' 06"

Accessibility

Road

The lease area is approachable from Ratnagiri district headquarter which is 220 km via Dapoli which is Tehsil township and proposed site is accessible via Harne, ade and kelsi are connected by tar and fair weather road. Dapoli is well connected by road to Mumbai, Ratnagiri, Kolhapur and Pune etc.

Rail

The nearest rail head is located at Mangaon on the Konkan railway which is 80 km from the proposed site.

A location map of mining lease area is shown in Figure 1.

1.4 IMPORTANCE OF THE PROJECT

The proposed production of 24,000 tpa of bauxite from this mine is proposed to be used in cement, chemicals, face makeup, soda cans, dishwashers, siding for houses, and other aluminium products. It is recycled so that it can be used over again. This would bring revenues to the Government of Maharashtra through royalty, sales tax, cess etc and also Central Government through income tax and significantly contribute to the industrial growth of the state. The local population around the mine site will be most benefited due to employment opportunity that is expected to come with this proposed project.

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Figure 1 : Location Map

1.5 SCOPE OF THE STUDY

The scope of study involves identification of all the environmental aspects that have a potential impact on the environment due to the mining activities, delineating proper environmental measures to minimise the impacts and to check the compliance of operations as per the statutory consent / legal requirement

The Scope of the study includes a Baseline data generation / collection in the study area of 10 km from the mining lease. Based on the scale of operation after expansion and the existing polluting sources in the region, assess the environmental impact on the surrounding and to propose Environmental Management Plan to prevent, control, mitigate or minimize the impacts on the identified recipients of pollution.

1.6 METHODOLOGY / APPROACH

1.6.1 Methodology of EIA

Environmental Impact Assessment study has been conducted within an area of 10 km radius around the ML area. The various steps involved in the study for this project are divided into three following phases.

- Identification of significant environmental parameters and assessing the baseline status within the study area and assessment of pollutants envisaged due to proposed activities and the polluting activities in the study area on various environmental parameters
- Evaluation of impacts after superimposing the predicted pollution load over the baseline condition.
- Prepare Environmental Management Plan for mitigation of impacts on environment arising out of the proposed activity.

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1.6.2 Approach

Environmental monitoring in order to establish the baseline environmental status of the study area for Ambient air, Water, Soil, Land use, ecology, etc.

- Collection of site specific meteorological data at the mine site
- Carrying out a detailed biological study for the Core and Buffer Zone.
- Conducting ground vibration study to measure the peak particle velocity generated due to blasting.
- Literature review that includes identification of relevant data and articles from various publications, various government agencies and other sources for socio-economy, demography, meteorology, land use, ecology, etc.
- Identify various existing pollution loads due to mining and domestic activities in the buffer zone
- Evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted Environmental Impact Assessment (EIA) Methodologies
- Preparation an Environmental Management Plan (EMP) outlining the measures for improving the environmental quality

Accordingly, field studies were carried out during the study period (December 2008 – February 2009) to establish the existing baseline conditions.

2 CHAPTER: PROJECT DESCRIPTION

2.1 TOPOGRAPHY AND DRAINAGE

The plateau is located on the north-west of Dapoli township at about 15 km, this plateau is considered as a North-Westerly extension of the Anjarle plateau but dissected by the Savitri Nadi. The Uttambar plateau extends from WNW-ESE direction. Arabian Sea is located at about 0.5 km west of the mining lease area. The elevation of the study area ranges between 0m to 1142 m AMSL where as the elevation of mine lease area is 250m AMSL. The slopes of the hill are covered with shrubs. The plateau is having a radial drainage system with the streams and small nallahs. There are two perennial rivers flowing within the study area from East to West.

Surface map and Topographical map are shown in Figure 2 and Figure 3 respectively.

2.2 GEOLOGY

2.2.1 Local Geology

Bauxite also occurs in the form of float ore at the base of the scrap-sections and one the slopes of the plateau. The bauxite deposits in the area occur in the form of blanket type in the ferruginous or aluminous laterite. Thickness of bauxite ore is varying and ranging from 1.2m to 5m. The deposit is extending from eastern end to western end in the form of blanket type and in places it is having large voids. It is observed that very often an impressive thickness of bauxite dwindles to almost nothing within short distances, converse by outcrops which to be of minor thickness may develop into thick and massive lenticles of bauxite. It has been observed that thick exposures of bauxite in scrap sections may die out within very short distance from the edge of the scrap. The controlling factors for selective enrichment and development of bauxite are not yet fully known and the model of origin of laterite and bauxite is not yet completely understood. The physical nature of the bauxite of the area is also different from that of bauxite in kolhapur district. The bauxite occurring in the Ratnagiri district is found that softy and earthy in appearance. Geological Plan is shown in Figure 4.

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Figure 2 : Surface Plan of ML area

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Figure 3 : Topographical Map of the Study Area

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Figure 4 : Geological Map of ML Area

RESERVE

- Total Mineable reserves
Bauxite: 14, 58,800 tons

2.3 ANTICIPATED LIFE OF MINE

The expected rate of production will be 24,000 tonnes per annum; hence the anticipated life of mine will be 61 years.

2.4 MINING

Method of Mining

The proposed method of mining is opencast manual mining, due to the nature of deposit and also due to envisaged low quantities of production

Drilling & Blasting

It will be carried out by Jack Hammer drill supported by compressor. 32 mm dia holes will be drilled with the Jack Hammer with compressed air. One Jack Hammer Drill and a compressor 250 cfm will be deployed for drilling purpose.

Broad Blasting Parameters

The mining operations will be of very low scale and the envisaged production is 100 tons per day totaling to 24000 tons per annum. The bench heights are 2m in the overburden and 5 m in the bauxite bench. On this basis the parameters followed are:

Depth of the Hole: It will be as per the height of the bench for eg in case of OB it will be 2.0m and 5.0 m in case of bauxite bench.

Blasting Pattern: Single row blasting will be carried out with a length of free face of 100m at the working pits.

Spacing: A spacing of 1.0m will be maintained between the two holes.

Burden: A burden of 0.90m will be maintained.

Charge per Hole: It will be very less because the production expected is of low level. It will be around 30 to 50 grams per hole of special gelatin with detonators

Powder Factor: It is expected to yield 10 to 12 tons per Kg of explosive

Explosive Consumption: It is expected about 5 Kg / per day of explosive will be the Consumption.

Type of Explosives

As the bauxite is soft to medium hard, light charges of special gelatin with detonators would suffice to break the rock formation.

Storage of Explosives

A portable magazine of suitable capacity with detonator box will be maintained.

The year wise production and development program as per mining is given in Table-1.

Table 1: Year-wise Production/Development

Year	Bauxite Production (tonnes)	Overburden waste (tonnes)	Ore to Overburden ratio
1 st	24250	18390	1:0.75
2 nd	24200	18150	1:0.75
3 rd	24200	18150	1:0.75
4 th	24200	18150	1:0.75
5 th	24400	18300	1:0.75
Total	121250	91140	1:0.75

2.5 DISPOSAL OF WASTE

Nature of Waste

The nature of waste is an account of the top lateritic overburden and the internal mineral waste which is not useful to any industry. The fragmented bauxite will be screened and - 10mm size fraction bauxite will be considered as the reject which has no useful value to any industry and stacked separately.

Selection of Dump Site

Dump site for overburden has been selected in the non mineral bearing area N532-N627 & E-517-E600. It is situated to the SW of the present 5 years mine working at a distance 0.35km.

Maximum Height and spread of dumps

The dumps will be with in the mine lease boundary, with a maximum height of 10m. The angle of repose will be 23 to 28 0. The space required for the dumping the waste for the immediate 5 years planning is about 0.36 ha which will be gradually increased to 2.00 ha for the future years.

Selection Site for Mineral Stacking

Stacking of mineral is located at N 678-N713 & E676 –E722

Height and Spread of Stacks

The height of the stack is about 2m and the area is around selected is 0.20 ha for the current plan period which will gradually increased to 0.75 ha keeping in view of conceptual mining and the future likely increased quantities.

2.6 USE OF MINERAL

The mineral will be used for calcined Alumina production and the low grade ore can be utilized by the cement and allied industries. It is also useful for the industries that can produce alumina metal as the deposit has the metal grade. Since the quantities are meager it may not support any major alumina producing company. As envisaged by the company the end product from this mine will be used for export/ calcined Alumina production and other allied industries.

2.7 MINERAL BENEFICIATION

There is no processing or beneficiation required for Bauxite mine. Only simple sizing and sorting will be done manually.

2.8 SITE SERVICES

Mode of Transport

It is proposed to deploy out by tippers. Two tippers for Bauxite and one for OB will be deployed. As the quantities are very less per day only three tippers are proposed.

Manpower Requirement

About 31 people will be engaged as direct employment including managerial staff. On an average the labour employment will be uniform & the employees will remain same.

3 CHAPTER: BASELINE DATA: DESCRIPTION OF BASELINE STATUS OF ENVIRONMENT, ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATING MEASURES

The EIA report for the project has to describe the existing environmental conditions surrounding the ML area. The study has been conducted in accordance with the Ministry of Environment and Forest (MoEF) guidelines applicable pertaining to IS – 5182 (Part-14), 1985. The Environmental attributes and frequency of monitoring is given in Table 2.

Table 2 : Salient Features of Baseline Environmental Studies

Parameter	Study	Inference
Micrometeorological Studies	Wind Profile, Temperature, Relative humidity, Rainfall, cloud cover etc.	To assess the potential targets of pollution from the activity
Air Quality Data	Suspended Particulate Matter (SPM) Respirable Particulate Matter (RPM) Sulphur Dioxide (SO ₂) Oxides of Nitrogen (NO _x) Carbon Monoxide (CO)	To assess baseline air quality status of the area
Noise Quality Studies	Noise Levels	To identify present noise levels and noise generating sources
Water Quality, Soil Quality Studies and land use	Physical, Chemical, and Heavy Metals & Land Use Studies	To identify baseline water quality, Soil quality for future reference and land use pattern in the area
Biological Environment	Study of flora & fauna	To identify the existing flora & fauna for the possible impacts on them due to mining.
Socio-economic & Demographic studies	Socio-economic	To know the socio-economic status of the study area.

3.1 AIR ENVIRONMENT

3.1.1 Baseline Status

Climate and Meteorology

The study area enjoys a typical tropical climate with distinct summer, rainy and winter seasons. Micrometeorological data within the project area was monitored through an automatic weather monitoring station set up at mine site during Winter 2008 (Dec 2008 -Feb 2009). Wind speed, wind direction, temperature and relative humidity were recorded in the met-station and parameters like cloud cover and rainfall were recorded by visual observations and rain gauge respectively.

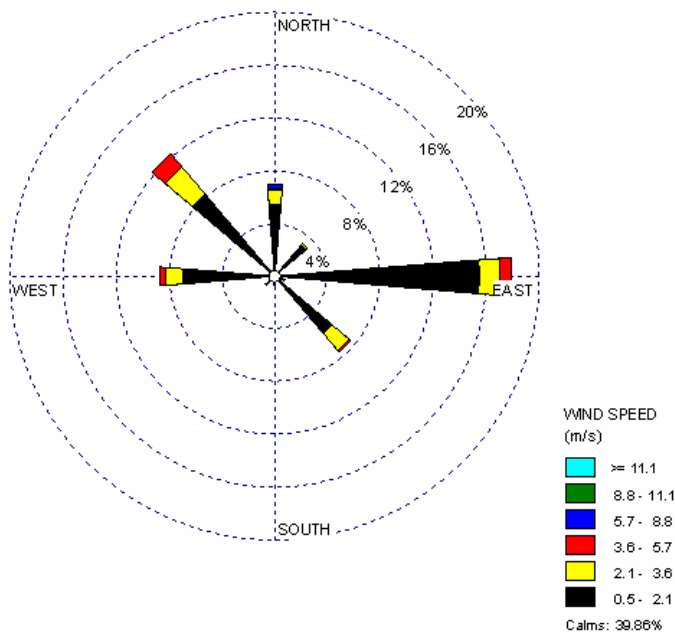
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Hourly average, maximum and minimum values were recorded continuously for 24 hours duration. The data generated is computed to obtain wind roses of the area. The plotted wind rose diagram representing 16 directions is depicted in Figure 5.

Summary of micro meteorological data monitored at site during study period

Sl. No.	Parameters	Data
1	Maximum temperature (⁰ C)	34.6
2	Minimum temperature (⁰ C)	17.6
3	Maximum Relative Humidity (%)	96
4	Minimum Relative Humidity (%)	18
5	Predominant wind direction	E

Figure 5: Wind Rose Diagram



Besides the site specific recording of primary meteorological data the secondary meteorological data available for the period of 1951 to 1980 of the nearest India Meteorological Department (IMD), Ratnagiri observatory station have been used. Crow fly distance of this IMD station from proposed site is around 30 km. Summary of this secondary data is given below.

Summary of Meteorological Data Observed at the nearest IMD, Ratnagiri (1951 to 1980)

Sl. No.	Parameters	Value
1	Max. Temperature (⁰ C)	35.4
2	Min. Temperature (⁰ C)	15.9
3	Max. Relative Humidity (%)	67
4	Min. Relative Humidity (%)	58

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Scenario of the existing Ambient Air Quality in the study area of 5 km radius around mine site has been assessed through a network of 6 Ambient Air Quality locations. The design of monitoring network in the air quality surveillance program was based on the following considerations.

- Topography / Terrain of the study area
- Human Settlements
- Wind pattern
- Representation of Regional Background levels
- Accessibility of monitoring site

Pre-calibrated R.D. Samplers have been used for monitoring the existing AAQ status. Maximum, Minimum, Average and Percentile values have been computed from the raw data collected at all individual sampling stations to represent the Ambient Air Quality Status. The significant parameters viz., Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x), Hydro Carbon (HC) and Carbon monoxide (CO) were monitored in the core and buffer zones.

Criteria for site selection of ambient air quality monitoring stations

The number of ambient air quality monitoring stations to be put up for generating the baseline data and for further monitoring is arrived at using the model suggested by USEPA (1975b). The model suggests that the minimum number of stations should be four. However, the exact number has to be arrived at by knowing the wind rose (wind blowing directions and their respective frequencies) at site and the distances of the residential and sensitive areas from the project site in the buffer zone. This model suggested by Houghland and Stephens, 1976 (Ref. The Design of Air Quality Monitoring Network," R.E. Munn, 1981) is simple and reliable. It suggests setting up of monitoring stations at those locations where the probability of occurrence of maximum GLCs (Ground Level Concentrations) is high. The probability factor was found by determining the 'Coverage Factor (A_{jk})' for residential locations around the proposed site, which are liable to be affected by pollutants. Coverage Factors 'A_{jk}' for all the potential locations were calculated by the following formula.

$$A_{jk} = \text{Freq. (k)} / (1 + D_j)$$

Where,

A_{jk} = Coverage factor of monitoring station in the 'k'th downwind Sector from source.

Freq. (k) = Frequency of wind direction in the 'k'th sector

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Dj = Distance from the station to the source in km.

Ten probable monitoring stations were selected all around the project site with due consideration to the wind direction and the distance from the site. For each of these stations coverage factor 'Ajk' was calculated and presented in Table 3. The stations which gave higher Ajk values were taken as monitoring stations.

Table 3: Coverage Factors for Ambient Air Quality Monitoring Stations

S. No.	Monitoring stations	Distance in (Dj) kms	Direction w.r.t. mine	Frequency k %	Ajk	AAQM Ranking
1	Uttambar	0.5	NW	7.57	5.05	II
2	Kelsi	1.7	NNW	0.28	0.10	V
3	Umbershet	2.2	NE	1.00	0.31	IV
4	Rowale	2.0	ENE	0.14	0.05	-
5	Adhe	0.7	SE	12.14	7.14	I
6	Ranavali	3.7	NNE	0	0.00	-
7	Malvi	2.3	ESE	0.14	0.04	-
8	Kavadoli	3.5	ENE	0.14	0.03	-
9	Rawtoli	3.1	ENE	0.14	0.03	-
10	Vanjoli	3.8	E	8.71	1.81	III

Apart from the mine lease area, five other stations Adhe, Uttambar, Vanjoli, Umbershet & Kelsi were chosen as the ambient air quality monitoring stations based on AAQM ranking. The ambient air quality sampling locations are given in Table 4 and shown in Figure 6.

Table 4: Ambient Air Quality Monitoring Locations

Sl. No.	Location	Direction w.r.t Mines	Distance w.r.t Mines (km)
Core Zone			
A-1	Mine Lease Area	--	--
Buffer Zone			
A-2	Adhe	SE	0.7
A-3	Uttambar	NW	0.5
A-4	Vanjoli	E	3.8
A-5	Umbershet	NE	2.2
A-6	Kelsi	ENE	3.5

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Analysis of baseline concentrations

24 hourly Ambient Air Quality monitoring results including maximum, minimum and 98 percentile values in the study area are given in Annexure 1 and range of AAQ test results are summarized in Table 5 with relevant ambient air quality standards.

Table 5: Summary of ambient air quality (98th percentile values, Units: µg/m³)

Name of sampling location	SPM	RPM	SO ₂	NO _X
Mine Lease Area	120.6	36.6	7.2	10.5
Adhe	108.6	32.7	6.4	9.9
Uttambar	109.6	33.0	6.4	9.9
Vanjoli	105.6	31.7	6.2	9.8
Umbershet	111.6	33.7	6.6	10.0
Kelsi	107.6	32.3	6.3	9.8
NAAQ Standard for industrial area Annual Average / 24 Hrs	360/500	120/150	80/120	80/120
NAAQ Standard for residential area Annual Average / 24 Hrs	140/200	60/100	60/80	60/80

The baseline ambient air quality test results monitored during the study period are well within the prescribed National Ambient Air Quality Standards for industrial area and Residential area at the present scale of operation.

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Figure 6 : Map showing Ambient Air Quality Sampling Location

3.1.2 Anticipated Impacts

The impacts on the air environment from this mining activity will depend on factors like production capacity, machinery involved for drilling & blasting for clearance of mine debris. Apart from these, there will be other associated activities viz., transportation of ore and waste within the mine lease area that may contribute to pollution. Loading of mineral into the trucks will also be done manually. Dumping of overburden will be done by loader and tipper combination which lead to air pollution.

Sources of Air Pollution

Air pollution sources in the operating mine are classified into three categories

- Point sources
- Area sources
- Line sources

Drilling & blasting operations of a mine are considered as point sources.

Extraction of mineral by various activities in mining area, are considered as area sources.

Transportation of mineral & waste from mining benches to relevant places are considered as line sources.

The anticipated air pollution due to this Bauxite mining is as follows:

- Drilling and blasting of overburden and the mineral contribute to release of SPM and explosive fumes into the atmosphere.
- Removal of vegetation from the area designated for mining and other purposes increases the chances of the spread of airborne dust in the surrounding environment.
- Removal, handling, transportation of ore and disposal of wastes also causes an increase in the concentration of SPM in the atmosphere.

Emission Details

Of the above sources excavation, loading and transportation through tippers are the major sources, which are of significance. Therefore, the emissions considered for modelling are from excavation and transportation of Bauxite.

The emissions will be mainly due to total production of 24,000 tonnes per annum of Bauxite and handling of around 18390 tonnes per annum of waste. Hence for the predictions of impacts, the emissions due to handling of the said ore and waste have been considered.

The emissions are computed based on AP-42 emission factors.

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For line source, apart from operational hours and activity rate, moisture and silt content of the haulage road have been considered.

Predictions are carried out for the worst-case scenario tippers for transportation from mine pit to loading point (line sources) over a distance of 1500 m. The manual operations are covered over a distance of 100 m in the mine.

Particle size concentration assumed in the modelling consisted of five separate particles size classes 1.25, 3.75, 7.5, 12.5, and 20 micrometers with a particle concentration of 0.0262, 0.0678, 0.1704, 0.1536 and 0.5820 respectively.

The number of working days has been taken at 240 days per year with 8 hours of operation / day, hence the concentrations predicted are considered to be the worst case. With control measures, the emissions have been taken at 30% of uncontrolled emissions for handling and 10% of uncontrolled emissions for transportation.

The emission details and calculations line source emissions are presented in Table 6 & Table 7.

Table 6: Haulage Emissions – Bauxite

	Present	Proposed	Incremental
Quantity, tpa	--	24000.00	24000.00
Operational Hours per year	--	2400.00	2400.00
Capacity of each Tipper	--	14	14
Total No of Tippers/year	--	1714.28	1714.28
Lead length /trip, Km	1.5		
Total VKT/Year	--		2571.42
Emission kg/VKT	--		0.9195
Total emission kg/year	--		2364.42
Uncontrolled emission rate g/s/m	--	--	0.000364881
Controlled emission rate, g/s/m	--	--	0.0000364881

Table 7: Haulage Emissions – Transportation of Waste

	Present	Proposed	Incremental
Quantity, tpa	--	18390.00	18390.00
Operational Hours per year	--	2400.00	2400.00
Capacity of each Tipper	--	14	14
Total No of Tippers/year	--	1313.57	1313.57
Lead length /trip, Km	1.5		
Total VKT/Year	--		1970.35
Emission kg/VKT	--		0.9195

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Total emission kg/year	--		1811.74
Uncontrolled emission rate g/s/m	--	--	0.00027959
Controlled emission rate, g/s/m	--	--	0.000027959

Note: * Emission factor computed based on wind speed of 1 m/s, moisture & silt content of 5%.

3.1.3 Proposed Mitigating Measures

In order to minimize the dust emanating from the above sources water will be sprinkled regularly at the mine pits and also on the haulage roads that shall aid in suppressing the dust. Transport vehicles (14-t tippers) will be maintained periodically (once in a week), in order to minimize the emissions from them.

- Controlled blasting practice will be carried out.
- Not more than 10 holes will be blasted at a time and no hole will be charged with more than 350 gms of explosives at a time.
- Wet drilling will be practiced.
- Dust masks will be provided to the workers.
- Dead dumps will be adequately afforested.
- The external OB dump will be maintained with leguminous plantation and water sprinkling. The wastes generated shall be backfilled and afforested.
- Trucks will not be overloaded and the trucks transporting the ore to different destinations will be covered with tarpaulin.
- Speed limits will be prescribed for transport vehicle
- Wide green belt will be developed surrounding the ML area, OB yard and along the main transport roads.

3.2 NOISE ENVIRONMENT

3.2.1 Base Line Status

3.2.1.1 Noise Level

A preliminary reconnaissance survey was undertaken to identify the major noise generating sources in the area. The noise at different noise generating sources based on the mining activities, commercial activities, traffic, etc have been identified. The noise monitoring has been conducted at all the identified location in the study area during the study period.

Measured noise levels, displayed, as a function of time, is useful for describing the acoustical climate of the community. Noise levels recorded at each station with a time interval of about 60 minutes are computed for equivalent noise levels.

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Equivalent noise level is a single number descriptor for describing time varying noise levels.

The equivalent noise level is defined mathematically as

$$Leq = 10 \log L / T \sum (10L_n/10)$$

Where, L = Sound pressure level at function of time dB (A)

T = Time interval of observation

Noise levels during the night time generally drop, therefore to compute equivalent noise levels for the night time, noise levels are increased by 10 dB (A) as the night time high noise levels are judged more annoying compared to the day time. Noise levels at a particular station are represented as Day-Night equivalents (Ldn). Day Night equivalent is the single number index designed to rate environmental noise on daily / 24 hourly basis.

Mathematically Ldn is given by

$$Ldn = 10 \log \{1/24 (16 \times 10(Ld/10) + 8 \times 10(Ln+10) /10)\}$$

Where, Ld = A weighed equivalent for day time period (6 am-9 pm)

Ln = A weighed equivalent for night time period (9 pm to 6 am)

The noise level monitoring locations are given in Table 8 and shown in Figure: 7. The details of noise levels monitored results are given in Annexure 2 and summarized in Table 9.

Table 8 : Ambient Noise level monitoring locations

Sl. No.	Location	Direction w.r.t Mines	Distance (km)
Core Zone			
N-1	Mine Lease Area	--	--
Buffer Zone			
N-2	Adhe	SE	0.7
N-3	Uttambar	NW	0.5
N-4	Vanjoli	E	3.8
N-5	Umbershet	NE	2.2
N-6	Kelsi	ENE	3.5

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Figure 7 : Noise level monitoring location

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Table 9 : Noise Levels during Study Period [Units: dB (A)]

	N-1	N-2	N-3	N-4	N-5	N-6
L _{min}	35.2	34.9	34.0	35.1	34.6	34.1
L _{Max}	57.5	58.0	53.8	54.3	54.0	54.0
L _d	51.6	51.9	49.7	50.4	50.0	49.8
Standard	75	75	55	55	55	55
L _n	36.7	36.9	35.5	36.7	36.9	36.9
Standard	70	70	45	45	45	45
L _{min}	Minimum Noise Level Recorded					
L _{Max}	Maximum Noise Level Recorded					
L _d	Day Equivalents					
L _n	Night Equivalents					
L _{dn}	Day-Night Equivalents					

It is observed that the noise values recorded were well within the prescribed Ambient Air Quality Standards with respect to Noise.

3.2.1.2 Traffic Density

The characteristics and volume of traffic in the buffer zone is studied during the monitoring period on Uttambar- Kelsi road. Summary of the traffic density is given below.

Type of Vehicle	Total traffic on Uttambar- Kelsi road (in 24 hrs)
HMV	55
LMV	45
2 & 3 Wheelers	150
Total	250

Perusal of the above monitored data shows that the traffic load on Uttambar- Kelsi road in a working day is 250.

3.2.2 Anticipated Impacts

The noise levels are dependent upon the deployment of mining machinery and heavy-duty vehicles in any mine. The main sources of noise in this mine are given below.

Anticipated Noise Levels From Mining Equipments

Type	Name / Capacity	Quantity	Anticipated Noise Level [in dB(A)] at 1m away from the source
Drilling Machine	Compressor and Jack Hammer Drill	01	95
Transportation Vehicles	Dumper/Tippers (14t)	06	85

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In order to protect the workers from higher noise levels, project proponent will adopt the following noise abatement measures.

- Maintenance of drilling machine as per the manufacturer instruction manual twice in a month.
- Provision of earmuffs/ear plugs to workers in noise prone zones in the mine.

Anticipated noise levels at mine boundary resulting from operation of the excavation have been computed using point source model. Computation of noise level at the mine boundary is based on the assumption that there are no attenuation paths between the source and the mine boundary.

Basic phenomenon of the model is the geometric attenuation of sound. Noise at a point generates spherical waves, which are propagated outwards from the source through the air at a speed of 1,100 ft/sec, with the first wave making an ever-increasing sphere with time. As the wave spreads the intensity of noise diminishes as the fixed amount of energy is spread over an increasing surface area of the sphere.

The assumption of the model is based on point source relationship i.e., for every doubling of the distance the noise levels are decreased by 6 dB (A). Point source propagation is defined by the following equation:

$$Lp2 = Lp1 - 20 \log r2/r1$$

Where $Lp1$ and $Lp2$ are sound pressure levels at points located at distances $r1$ and $r2$ respectively from the source.

Based upon the above mentioned formula the anticipated noise level at ML boundary from nearest pit boundary will be less than 50 dB (A), which is less than the prescribed limits for industrial area. The nearest habitat of Uttambar village is at about 0.5km distance from the ML area, where the existing noise level in day hours is 42dB(A). With the use of above mentioned formula, there will be no impact on the base line noise level at the Uttambar village.

3.2.3 Mitigation measures

In order to protect the workers from higher noise levels, the management will adopt the following noise abatement measures.

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- Controlled blasting techniques with sequential blasting to reduce noise level and blast induced ground vibrations.
- Use of low density explosives to have a heaving effect than an explosion
- Restricting the blasting operations to noon times to avoid the periods of temperature inversions.
- Use of sharp drilling bits and delivery of compressed air at optimal pressure during drilling.
- Provision of earmuffs/ear plugs to workers in noise prone zones in the mine.
- Timely maintenance of drilling machines and transporting vehicles as per manufacturers recommendations;
- Limiting of speed of haulage vehicles/tippers

3.3 WATER ENVIRONMENT

3.3.1 Baseline Status

3.3.1.1 Water Resources

Surface Water

There are no water courses passing through the lease area. There are two perennial rivers flowing within the study area from East to West. There is Bharja river within 2 km in the northern side of the area and Maharawadi river with in the study area. There may be accumulation of surface water during rainy season, but this will be drained out by proper drainage system from the mine site.

Ground Water

The ground water is available within 15m of the surface level which is evident by nearby well, bore well etc. Accumulation of water in the pit will help in recharging & improving the water table.

3.3.1.2 Water Quality

Assessment of baseline data on water quality includes

Identification of surface water sources

Identification of ground water sources

Collection of water samples

Analyzing water samples collected for physico-chemical and biological parameters

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Two surface water & three ground water samples were collected to assess the ground water quality in the study area. The sampling locations are given in Table 10 and shown in Figure 8. Detailed test results are given in Table 11.

Table 10: Surface & Ground water sampling locations

S. No	Code	Location	Source
1	SW1	Barja River	-
2	SW2	Sea Water at Kelsi	-
3	GW1	Near Mine Site	Bore Well
4	GW2	Uttambar Village	Bore Well
5	GW3	Kelsi Village	Bore Well
6	GW4	Malvi Village	Bore Well

Table 11: Surface Water & Ground Water Quality

S. No	Parameter	Unit	Water Quality					
			Barja River			Sea Water at Kelsi		
1	pH	--	7.9	7.7	7.8	8.1	7.6	7.9
2	Color	Hazen unit	Colorless	Colorless	Colorless	Colorless	Colorless	Colorless
3	Odor	----	Odorless	Odorless	Odorless	Odorless	Odorless	Odorless
4	Taste	-----	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Total Hardness as CaCO ₃	mg/l	254	156	140	6480	6452	6558
6	Conductivity	Micro mhos	----	----	----	----	----	----
7	Iron as Fe	mg/l	0.05	0.04	ND	ND	0.04	0.05
8	Chlorides as Cl	mg/l	41	42	51	19234	19876	18799
9	Residual Chlorine	mg/l	0.08	0.08	---	17500	17900	17800
10	Dissolved Solids	mg/l	300	252	216	76790	76784	76799
11	Calcium as Ca	mg/l	15.6	18.8	18	400	412	425
12	Magnesium as Mg	mg/l	18.4	20.2	16.5	1300	1290	1345
13	Sodium as Na	mg/l	35.4	42.6	55.8	10600	11010	10896
14	Sulphate as SO ₄	mg/l	52.4	18.6	65.2	900	984	956
15	Nitrate as NO ₃	mg/l	5.2	4.8	6.5	2.5	8.4	5.1
16	Arsenic as As	mg/l	BDL	BDL	BDL	BDL	BDL	BDL
17	Alkalinity	mg/l	156	189	186	174	148	174
18	Dissolved Oxygen	mg/l	4.5	4.6	4.7	8.5	8.6	9.7
19	Fluorides	mg/l	BDL	BDL	BDL	BDL	BDL	BDL

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S. No	Parameter	Unit	Water Quality Monitored in Village			
			Near Mining Site	Uttambar	Kelshi	Malvi
1	pH	--	7.9	7.3	7.6	7.7
2	Color	Hazen unit	>5	>5	>5	>5
3	Odour	----	Odourless	Odourless	Odourless	Odourless
4	Taste	-----	Agreeable	Agreeable	Agreeable	Agreeable
5	Total Hardness as CaCO ₃	mg/l	334	493	312	225
6	Iron as Fe	mg/l	0.20	0.010	0.02	0.04
7	Chlorides as Cl	mg/l	1.5	4	1.2	3.7
8	Residual Chlorine	mg/l	0.1	0.75	0.4	0.6
9	Total Dissolved Solids	mg/l	45.75	43.3	58.7	85.3
10	Alkalinity	mg/l	250	240	457	391
11	Ammonical Nitrogen as NH ₃ -N	mg/l	BDL	BDL	BDL	BDL
12	Calcium as Ca	mg/l	16.5	82.4	112	102
13	Magnesium as mg	mg/l	5.1	18.2	25.8	17.2
14	Sodium as Na	mg/l	26.2	31.5	28.2	38.2
15	Sulphate as SO ₄	mg/l	2.1	2.5	3.8	2.5
16	Nitrate as NO ₃	mg/l	0.08	1.8	4.1	3.8
17	Fluorides as F	mg/l	BDL	BDL	BDL	BDL
18	Phenolic Compounds	mg/l	BDL	BDL	BDL	BDL
19	Mercury as Hg	mg/l	BDL	BDL	BDL	BDL
20	Cadmium as Cd	mg/l	BDL	BDL	BDL	BDL
21	Selenium as Se	mg/l	BDL	BDL	BDL	BDL
22	Arsenic as As	mg/l	BDL	BDL	BDL	BDL
23	Barium as Ba	mg/l	BDL	BDL	BDL	BDL
24	Potassium as K	mg/l	3.7	2.8	1.4	6.5
25	Cyanide as CN	mg/l	BDL	BDL	BDL	BDL
26	Lead as Pb	mg/l	BDL	BDL	BDL	BDL
27	Zinc as Zn	mg/l	BDL	BDL	BDL	BDL
28	Aluminum	mg/l	BDL	BDL	BDL	BDL
29	Boron	mg/l	BDL	BDL	BDL	BDL
30	Dissolved Oxygen	mg/l	5.5	5.8	5.8	5.8

Figure 8 : Water Sampling Location

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Assessment of water quality

The ground water quality parameters were assessed as per the Indian Standard IS 10500 (Drinking Water Standard). The observations are given below:

- It is observed that the pH of the surface water and ground water samples are in the range of 7.6-8.1 and 7.3 – 7.9 respectively.
- Total dissolved solids (TDS) in the samples were in the range 216 - 76799 mg/l for surface water & 43.3 -85.3 mg/l for ground water.
- Total hardness of the surface water and ground water samples was found to vary between 140 -6558 mg/l and 225 – 493 mg/l respectively.
- Fluoride concentration was found to be within the permissible limits
- Heavy metal concentrations in all the samples were found to be well within the limits.

3.3.2 Anticipated Impacts

Mining activities have potential to cause adverse impacts due to mine drainage, siltation due to storm water and contaminated water from domestic sewage water. The impact on water environment has been considered under the following heads:

- Water consumption
- Waste water generation
- Impact on ground water table
- Impact on surface water bodies
- Impact on drainage

Water consumption

The water consumption at the mine is in the following areas

- Water sprinkling at mine pit areas and haulage roads.
- Green belt development and rehabilitation of backfilled mine pits with afforestation.
- For domestic purpose
- Around 12 m³/day water will be required under following heads:

<i>Activity</i>	<i>Water requirement, m³/d</i>	<i>Source</i>
Dust suppression	2.0	Ground water in the ML area
Green Belt / Plantation	1.5	
Domestic	1.5	
Total	5.0	

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Wastewater generation

There is no wastewater generation from mining activities. A facility for sanitation that will be provided, in the ML area will have filter bed and soak pits for domestic waste water generation.

Impact on ground water table

The study area essentially comprises of weathered Bauxite at shallow depth and hard Bauxite comparatively at lower depth. In the study area ground water is available both under confined and un-confined conditions. The water table is about 15m below the ground level. This indicates mine operation will have no adverse impact on the local ground water regime.

Impact on surface water bodies

There is a drain towards south which drains the pumped out water. The pumped water is mostly utilized for irrigation purpose. Since there is no water course in the lease area, diversion will not be required. There is no toxic element in and around the mine area. Hence contamination of any nature is not expected for surface or any ground water source. The scale of mining is low and hence the above factor has no role to play. There is no waste water generation is envisaged from this mine. The sanitary waste will be treated in the septic tanks.

3.3.3 Mitigation measures

The Bauxite deposit does not have toxic/heavy metals. Further, the mining operation does not contribute to any heavy/toxic metals to the environment. Hence, there will not be any occurrence of heavy/toxic metal contamination in surface or ground water.

The only pollution anticipated in the surface drainage water is the suspended solids, due to wash off from the waste dump and top soil dump. A garland drain will be constructed around the dumps area that shall prevent the runoff water of the mine lease area in to the surface drainage channel. The runoff water so collected in the garland drain shall be diverted towards natural gradient in the south of ML area through settling tanks.

Around the toe of the OB dump and Top soil storage heap parapet walls / retaining walls and garland drain shall be provided. Fast growing grass, small plants and bushes will be grown on the inactive/ mature OB dumps and Top soil heaps to reduce siltation. The design of the silt check pits/dams shall be adequate to ensure the discharged runoff water shall meet the discharge standards.

With the above provisions the impacts due to storm water flow, soil erosion and siltation, on the surface water will be minimal.

3.4 LAND ENVIRONMENT

3.4.1 Baseline Status

3.4.1.1 Land Use Pattern

The Mine Lease Area is barren with thorny bushes and shrubs with very thin and sparse vegetation. The area comprises non-forest revenue waste land with out any agriculture.

Study Area

Village wise land use details of the study area as per census 2001 is given in Annexure 3 and summarized in the Table 12.

Table 12: Land use in the Study area

<i>Land use</i>	<i>Area (in ha)</i>	<i>Percentage (%)</i>
Forest land	142	1
Irrigated land	135	1
Un irrigated land	3535	25
Culturable waste land	6265	44
Area N/A for cultivation	4085	29
<i>Total</i>	<i>31400</i>	<i>100</i>

Perusal of the above table shows that around 44 % of the total study area is covered under Culturable waste land followed by Area N/A for cultivation.

3.4.1.2 Soil Quality

The soil samples from the core and buffer zones were collected and analyzed for physico-chemical parameters. The location of soil sampling stations is given in Table 13 and same is shown in Figure 9 and Conceptual Plan is shown in Figure 10. The test results are given in Table 14.

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Table 13 : Location of Soil Sampling Stations

S. No	Code	Name of sampling station
1	S1	Mine Lease Area
2	S2	Uttambar Village
3	S3	Kelsi Village
4	S4	Malvi Village

Table 14 : Soil Quality Data

S. No	Parameters	Unit	Soil Sampling Stations			
			S1	S2	S3	S4
1	pH of 10% suspension	pH	7.5	7.4	7.9	7.7
2	Moisture content at 105°C	%	21.2	19	21.8	20.5
3	Water holding capacity	%	48	45	54	49
4	Organic matter	%	3.5	5.1	4.9	6.1
5	Free Ammonical Nitrogen	Kg/ha	150	355	380	435
6	Potassium as K	Kg/ha	25	115	48	76
7	Phosphorous as P	Kg/ha	0.2	2.5	2.9	2.7
8	Copper as Cu	ppm	2	1	1.5	2.5
9	Cadmium as Cd	ppm	BDL	BDL	BDL	BDL
10	Lead as Pb	ppm	35	43	115	67
11	Chromium as Cr	ppm	BDL	BDL	BDL	BDL
12	Texture		Sandy clay	Sandy clay	Sandy clay	Sandy clay

Soil quality of study area shows the following observation:

- All the samples having neutral pH.
- All the samples having average concentration of Electrical Conductivity and Organic Carbon.
- Concentration of Nitrogen, Phosphorus and Potassium are under better, medium and very less category as per standard soil classification

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Figure 9 : Location of soil sampling station

Figure 10: Conceptual Plan

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3.4.2 Anticipated Impact

Around 45% of the ML area will be used for mining and its related activities. The future land use pattern is given in Table 15.

Table 15 : Land Use Plan of ML area (In Ha.)

S.No.	Category	End of plan period (in ha)	End of mine life (In ha.)
1	Area to be excavated	1.52	18.24
2	Overburden dumps	0.36	2.00
3	Mineral storage	0.25	0.70
4	Infrastructure (office)	0.10	0.15
5	Roads	1.00	1.25
6	Green belt	1.70	22.97
7	Others (parapet walls, settling tank etc.)	0.15	0.25
8	Undisturbed land	40.464	-
Total		45.544	45.544

Land is one of the most important resources for the human beings as this is needed for all the activities. Mining activities especially the opencast methods affect the land in various ways.

- Topography and land scenario changes due to digging of open pits and dumping of overburden rock mass in the form of the heaps.
- The drainage pattern on the surface undergoes a change due to the alterations in the surface topography due to mining and associated activities.
- The land-use pattern undergoes a change due to the use of the land for mining, dumping, and other mining and associated activities.
- The land-use in the surrounding areas may get affected due to the impacts of mining on soil quality & water regime.

The waste generated will be lateritic overburden and murrum. During 5 years, a total of 91140 tons of overburden will be handled and dumped. Dumps will be stabilized and plantation will be carried out. Garland drain will be made around the dump to avoid surface runoff, if any, during the rainy season.

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The overburden waste that will be produced during course of mining will be dumped at N532-N627 & E517-E600 SW. The manner of disposal of waste will be manual. The sides of the dumps will be sloped at 28°

Construction of retaining walls with garland drains for the waste dumps, erection of check dams and gully plugs along the natural drainage system shall restrict the soil erosions and allow discharge of clean water into the surrounding environment.

Top soil will be stacked and grassed immediately to prevent erosion and maintain humus. The soil dump would have very mild slope.

It is evident from the above stated impacts of the mining and associated activities on the land and the mitigation measures proposed that in this mining complex the land use and surface drainage pattern do not undergoes any major changes. There is no generation of sub grade mineral.

3.4.3 Proposed Mitigating Measures

No blasting will be done in over burden. Sufficient warning by signal will be given over the entire area falling within the danger zone & ensure that all persons within such area have taken proper shelter.

3.5 BIOLOGICAL ENVIRONMENT

3.5.1 Baseline Status

To establish the baseline ecological status of the study area, a biological study has been carried within the study area, to assess the impacts of the existing mine production and that of the proposed one on the vegetation structure of the area.

3.5.1.1 Flora

The area is thinly forested and there is no thick vegetation on the plateau top

There is the tree growth on the top of the plateau area, but grass shrub and bushes grow sparsely. The valley portions have moderate to thick vegetative cover. Various plants species commonly noticed in the study area are as follows.

Grass: Kushali, Gondwal, Marvel, Livali, Phulsari

Shrubs: Chambli, Abai, Chilar, Bondwel, Bhovasi, Gunj, Kawli, Palasvet, Shemba, Wagati, Dinda, Karvi, Bharang, Amoni, Papdi, Esar

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Herbs: Bala, Duopari, Rankel, Takla, Korshirec, Chikta, Anantmur

Trees: Umber, Jambul, Amba, Chinch, Kaju, Kokam, Acacia, Shishan, Teak, Waras

Fauna

The fauna of the study area includes

Local Name	English Name	Schedule
Randukar	Wild Boar	Schedule-III
Sasa	Indian Hare	Schedule-IV
Nag	Cobra	Schedule-I
Salinder	Porcupine	Schedule-IV
Ghonas	Russels Viper	Schedule-IV
Ghorpad	Monitor Lizard	Schedule-IV
Kolha	Jackal	Schedule-II
Dhaman	Rat Snake	Schedule-II
Makad	Monkey	Schedule-IV
More	Peacock	Schedule-I
Sarda	Forest Lizard	Schedule-IV
Ranmanjar	Jungle Cat	Schedule-IV

3.5.2 Anticipated Impact

The lease area is mostly covered with laterite and there is no thick tree growth in the mineralized area. The tree species planted within 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. But the number of plant species of the area may be reduced to certain extent due to the clean up of the land for different mining activities. Summarized impacts on Biological Environment are furnished below:

- Removal of scanty vegetation (flora) existing in the area required for mining and other purposes.
- Dust in atmosphere, contributed by mining and associated activities, when deposited on the leaves of the plants in the surrounding areas may retard their growth.
- Noise and vibrations due to blasting and operation of the machines drive away the wild animals and birds from the nearby forests.
- Water scarcity caused due to the impacts of opencast mining on water regime affects the growth of vegetation and agriculture in and around the complexes. But under the present project there will be no affect on any water resources.

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3.5.3 Proposed Mitigating Measures

The mined out areas will be backfilled and reclaimed with dense poly-culture plantation of the local species. With this proposed plan, the scantily vegetated virgin land will be converted to a dense plantation that will improve the floral content and attract fauna. Thus the project shall ultimately enrich the bio-diversity and contribute to the improvement of the eco system of the area. The benefits envisaged from the mitigating measures on Biological Environment are summarized below:

Ultimate reclamation planned leaves a congenial environment for development of flora & immigration of fauna through afforestation and creation of water resources.

The ML area is not habited by any wildlife. Further limited blasting with small diameter jackhammer drill holes, use of low density explosives and with controlled blasting technique will help to maintain the existing noise levels and generation of ground vibrations within limits. The proposed parapet walls / retainer walls, check dams and gully plugs, settling tank and the water reservoir created by the abandoned workings will help to maintain the quality of surface water. The check dams and the water reservoir created shall also assist in enhancing the time period of water flow through nallahs and streams of the valley.

3.6 SOCIO-ECONOMIC ENVIRONMENT

3.6.1 Baseline Status

The information on socio-economic aspects of the study area (10 km radius) has been compiled from primary random sample survey and various secondary sources including census 2001, tehsil office, etc. Village wise socio-economic details of the study area are given in Annexure 3 and the same is summarised in Table 16.

Table 16 : Socio-Economic details within the study area (10 kms Radius)

Sl. No.	Description	Numbers
Demographic Details		
1	Total Tehsil	2
2	Total Villages	43
3	Total no. of House Hold	7552
4	Total Population	32264
5	Total SC Population	221
6	Total ST Population	3069
7	Total Literate Population	20760

Based on census data and field survey following observations have been drawn:

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- 17 villages are having medical facilities
- Primary Health Sub Centre is available in 7 villages
- Educational facilities are available in 43 villages
- Total 85 primary schools are present in the study area
- Drinking water from hand pump is available in 19 villages
- The study region is well facilitated with road and rail network

Mining and other industrial activity play a significant role in enhancing the socio-economic life of region. Besides rain fed agriculture as a major source of income, people are engaged in small scale industries like making of stone chips, bricks, wooden furniture, earthen pots, bamboo baskets, weaving of cloths and carpets etc

3.6.2 Anticipated Impact

The objective is to demonstrate the range of potential impacts on communities and families by the mining project. The actual impacts experienced at a given project site will depend on a variety of factors. Some of the most important are:

Details of the villages within 3 km radius of the ML area are given in the details below:

Village	Distance in km	Total population	Total working population	Primary School	Secondary school	Medical facilities	Drinking water facilities
Sakhri	2.5	339	247	2	0	Absent	Present
Kelsi	1.7	3148	1485	6	1	Present	Present
Uttambar	0.3	841	405	3	0	Present	Present
Umbershet	2.2	848	355	1	0	Absent	Present
Rowale	2.0	442	217	2	0	Absent	Present
Malvi	2.3	346	216	2	0	Present	Present
Adhe	0.7	2189	719	2	0	Present	Present
Padale	1.5	385	220	2	0	Present	Present
Lonawadi	1.7	271	122	2	0	Absent	Present

Name of the village	Distance in km	Total Area	Forest Area	Irrigated Area	Un-irrigated Area	Culturable Waste	Area not available for cultivation
Sakhri	2.5	777	0	0	542	1	235
Kelsi	1.7	265	0	70	14	86	95
Uttambar	0.3	421	0	0	0	368	112
Umbershet	2.2	515	0	0	0	385	131
Rowale	2.0	480	0	0	0	368	112
Malvi	2.3	417	0	0	0	295	122
Adhe	0.7	146	0	0	0	103	43
Padale	1.5	151	0	0	0	125	25
Lonawadi	1.7	154	0	0	0	102	52

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Community Engagement

The villages surrounding the mine lease area are dependent on rain fed agricultural and mining activities in the nearby areas for their livelihood. The present mining involves open cast manual operations. The Ore will be produced by drilling & blasting and then sized manually. The OB handling is manual. This proposed mining shall give direct employment to more than 31 unskilled labour and indirect employment to more than 50 Skilled and Unskilled people in transportation and allied activities. This project provides the local populace with employment and business entrepreneurial opportunity. All unskilled manual labour will be employed from the local community and they also will have a big opportunity to enter into transport business. The local skilled labour will have additional opportunity to enter into automobile maintenance profession to cater to the needs of the transport trucks. The proposed project will be a continual source of income to the local population, who otherwise depends primarily on rain fed agricultural income that is uncertain and irregular. Thus, there will be beneficial impact to the community due to development of the mining activity.

Resettlement

The entire ML area is in the possession of the project proponent. There are no human settlements in the MLA and hence no resettlement involved. The workmen and staff come from the villages/towns outside the leasehold. The impact of mining activities at Uttambar Bauxite mine of M/s Ashapura minechem Ltd. on the nearby villages is negligible.

3.6.3 Socio Economic Developments

Community Developmental Measures	Economic Developmental Measures
Financial Assistance for Community Developmental Activities, School Building Renovation, Community Hall Development,	Training local villagers to utilize the available 1833 ha of culturable waste land (1 ha in Sakhri Village + 86 ha in Kelsi Village + 368 ha in Uttambar Village + 385 ha in Umbershet Village + 368 ha in Rowale Village + 295 ha in Malvi Village + 103 ha in Adhe Village + 125 ha in Padale Village + 102 ha in Lonavadi Village) for developing fruit yielding & timber yielding varieties in a phased manner after obtaining necessary permission from local panchayat
Provision of Emergency Medical Van which is available 24 hrs	Assistance in providing seed capital for small business activities for women group
Provision of Bus for school Children	Training for women groups in tailoring & home made items and providing financial assistance for the same
Provision of Merit Scholarships	Technical training for school & college dropouts and assisting them in establishing their own

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	business
Provision of school books & uniforms to needy children	Construction of Artificial ponds which serve both as ground water recharge system & also for horticultural usage
Crop Damage Compensation	
Strengthening Public Health Infrastructure & transportation facilities	
Conducting awareness programmes on Malaria & Filaria Eradication, regarding HIV/Aids and other water borne diseases	

3.7 OCCUPATIONAL HEALTH ENVIRONMENT

3.7.1 Base line Data of Mine workers

Based on regular health check up report of all the employees working in Uttambar Bauxite mine, only Pathological and Dermatological cases were observed in the last 2 years of mining. Over all the employees are free from all Occupational Health Diseases. Anaemia, Hook worm were the pathological cases, where as Itching problem and fungal infection were the dermatological cases observed in the workers.

3.7.2 Anticipated impacts

An assessment of Occupational Health and Safety w.r.t this mine are tabulated below

Sl. No.	Requirement	Explanation	
1	What principal environmental and occupational risks are likely to be created	Instant Accident due to pit wall sliding Accident due to sliding of dump slope Accident due to transportation of mine material	Long term Continuous exposure to air pollutants generated from mining activity (lung related diseases viz. silicosis, asthma, etc. Hearing loss due to continuous exposure to noise generating equipment
2	Rank the risks to public health in order of severity	These potential hazards are limited to MLA and the general public are restricted from entering the MLA. The public health and safety will therefore not be affected due to these hazards identified.	
3	How will risks be assessed	As per the design of hazard risk assessment matrices for ranking occupational health risks in mining and mineral processing.	
4	Measures to communicate these risks to people and steps for prevention & control	All the risks and steps for prevention & control will be communicated during induction Vocational training, which is a statutory requirement. Periodic refresher training for all workers and on the job training. Display of appropriate sign boards at suitable locations.	
5	How would the health impact	Regular monitoring, Reconnaissance survey,	

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Sl. No.	Requirement	Explanation	
	assessment undertaken, if needed	Periodic health camp.	
6	Does project provide a hiring a person with established credentials to be able to undertake such activities	A safety officer and part time doctor for medical periodic health check up will be haired	
7	Name specialized agency to undertake an environmental health study, if needed	National Institute of Miners Health, Nagpur.	
8	Budget for occupational health activities	12 lakhs per year	
9	List of hazardous operations / activities that are likely	None	
10	How many workers will be employed in each hazardous job ; give numbers	None.	
11	How long are they expected to be employed	Employed on Permanent basis.	
12	Would a safety committee be constituted	Yes	
13	Who will be the members of safety committee	Mine Manager. Safety Officer Worker's representative	
14	What will be the function of safety committee and who will head it	Function	To implement the proposed OHAS management plan and take proper mitigative measure as plan
		Head	Mine Manager
15	Will there be a budget to allow it to hold meetings	Budget has been allocated under Recurring Annual Cost For Occupational Health and safety	
16	Is there a provision of induction training for workers health and safety	Yes Vocational training as per the MINES ACT and company's in-house recruitment and induction program.	
17	How workplace exposures will be assessed	Through regular monitoring	
18	How these will be communicated and explained to the workers	The findings will be communicated through Safety committee meetings and through individual interactions. Also, the findings will become a part of the induction program.	
19	Who will conduct training and education in occupational health and safety	Qualified Vocational Training Officer appointed Statutorily and Medical officer	
20	Where will health surveillance be undertaken including tests, i.e. X-Rays, Pulmonary function tests and tests for hearing and identifying Tuberculosis	All the mine workers will be examined in the occupational health centre at tehsil medical hospital annually. For additional tests that are not available will be done at specialised diagnostic centres tied up by the company at district head quarter.	
21	What occupational illness are anticipated in view of the hazardous exposure	Respiratory disorder Hearing impairments	
22	Who will pay for the tests and the treatment of non occupational illness.	All expenditure related to health check up and treatment of the mine workers shall be borne by organization.	
23	Who will compensate the workers for	All workers will be covered under ESI/Medical	

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Sl. No.	Requirement	Explanation	
	health impairment due to injury or illness	Reimbursement. Mine management will make their contribution towards subscriptions.	
24	The amount of compensation: List the minimum and maximum amount stipulated	As per ESI Act/ Workmen Compensation Act	
25	How will and how long the records of health checkups be maintained and what will happen to records when the project ends	Individual health record of every worker will be maintained till the end of service. The health check report will be handed over to the employee at the end of the project.	
26	Who will identify occupational disease early to prevent serious damage	Company Medical officer	
27	What measure are to be undertaken for following		
I	Preventing heat stress	Not Applicable	
ii	Preventing noise exposure	Individual	Provision of ear muff / ear plug, Reducing the exposure time
		Common	Transport vehicles will be equipped with silencers and regularly maintained
iii	Preventing injuries	Occupational Health and Safety Policy and Preventive actions shall be displayed at relevant places; Awareness program will be conducted during the annual safety weeks and Environmental protection weeks.	
iv	Providing ergonomic support	Operator cabins along with seating arrangements will be maintained properly.	
28	Who will undertake administration of Personal Protective Equipment	Mines Manager / Mines safety officer	
29	What if any action is proposed when the project ends, workers become exposed and have latent disease which may appear in future	At the end of service health certificate will be provided from district medical officer after thorough checkup from the OHS budget of organization. If worker are found to be exposed with latent diseases, due compensation shall be paid.	

3.7.3 Proposed Mitigation Measure

Occupational Health & Safety measures to control dust inhalation

For the safety of workers at site, engaged at strategic locations/dust generation points like loading and unloading points, etc., dust masks would be provided. Dust masks would prevent inhalation of RPM thereby reducing the risk of lung diseases and other respiratory disorders. Regular health monitoring of workers will be carried out. There would be periodic job rotation of employees from dust and noise generating areas to other areas as a precaution to avoid continuous exposure.

4 CHAPTER: ADDITIONAL STUDIES

4.1 RISK ASSESSMENT

The proposed project involves bauxite mining through opencast manual mining. The anticipated risks are mentioned below:

4.1.1 Inundation

This is a developed mine and drain has been prepared towards north and south and as such no further garland drain preparation will be needed. In order to control the in-rush of water into the quarry in rainy season from the surface, the existing drain would serve the purpose.

4.1.2 Pit slope & dump slope failures

The development will be done in five benches each of height (1.5m – 3m). Land slide, subsidence is not expected in view of opencast mining. However the quarry faces at top will be suitably fenced or parapet walls will be made.

4.1.3 Blasting

Blasting in this mine is not a regular affair, and is done occasionally for heaving purpose in ore body Bauxite. The hole depth is restricted to 1.5 m and the spacing and burden are kept at 1.0m and 0.8m respectively. Controlled blasting will be done and not more than 10 holes will be blasted at a time and no hole will be charged with more than 350gms of explosive at a time. Suitable air respirators will be provided to the drillers. Sufficient warning by signal is given over the entire area falling within the danger zone and ensure that all persons within such area have taken proper shelter.

4.1.4 Surface Fire

There are no ignitable materials in a Bauxite mine deposit. The applicant has a license from controller of explosive-Agra and a portable M and S type magazine installed at mine site. The capacity is as under:

- Weight = 215 kgs
- Capacity = 100kgs of explosive

Sufficient fire extinguishers will be made available at these locations

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4.1.5 Dust from the drilling operations

The hazard is the inhalation of dust which is created during the drilling operations. Wet drilling will be practiced to suppress dust generation during the drilling operations. All personnel working during drilling operations will compulsorily use dust masks.

4.1.6 Noise

Drilling operations give rise to harmful levels of noise. However, as the drill hole depth is about 1.5 m, the personnel working in drilling operation are not exposed continuously to high noise level. Nevertheless, all personnel working in the drilling impact zone will compulsorily use earmuffs to reduce the noise impacts.

4.1.7 Loading

All loading of ore will be done using loaders. There is no risk associated with the activity.

4.1.8 Heavy Vehicles

Occasional usage of JCB front end loader cum excavator is done to remove the overburden. The haulage of OB will be done with tractor trolley or 10 tonne tippers. Hence proper care will be given while transportation and occasional loading with JCB front end loader cum excavator.

Good maintenance and regular testing are necessary to reduce the possibility of brake failure. An area shall be set out as a testing area where regular tests are carried out on the effectiveness of a vehicles braking system.

4.1.9 House keeping

The provision and maintenance of a safe and healthy workplace is the most basic principle of health and safety. Dirty and untidy workplaces or walkways contribute to a very large proportion of trip and fall accidents. In the context of surface mining the provision of well defined roadways and walkways clear of obstruction and regular cleaning up of spillage will greatly reduce the potential risk for this type of accidents.

4.1.10 The Work

The application of risk assessment depends upon a full understanding of all aspects of the job being undertaken. In carrying out a risk assessment in relation to a particular task the

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evaluation must include a review of the knowledge, experience and training of those persons carrying out the work.

Personal Competence

It follows that the knowledge, experience and training of personnel involved in work is critical to evaluate any risk assessment. A knowledgeable, experienced well-trained and competently supervised workforce will be at a lower risk of accidents occurring than a poorly trained and badly supervised workforce.

Co-ordination

It is essential that the coordinator ensures that everyone engaged in the work is capable and understands the role of others and their responsibility for each other. This is particularly important when contract workers undertake part or all of the work to be carried out.

Health hazards

For the purposes of this document health hazards should be interpreted as being harmful dust and noise which is emitted during surface mining operations.

Personal Protective Equipment (PPE)

The PPE should be of good construction, where ever possible ISI certified, suitable for the hazard e.g. a dust respirator fitted with the correct filter to capture the particular hazardous dust and maintained to recommended standards. As personal protective equipment only affords limited protection it should only be used as a last resort and then as an interim arrangement until other steps are taken to reduce the risk of personal injury to an acceptable level.

Traffic Movement

As the vehicles used are very less in number there is no risk of accidents due to the traffic movement.

4.2 DISASTER MANAGEMENT PLAN

The complete mining operation is carried out under the management control and direction of a qualified mine manager holding a First Class Manager's certificate of competency. The DGMS have been issuing a number of standing orders, model standing orders and circulars to be followed by the mine management in case of disaster, if any. Moreover, mining staff is

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being sent to refresher courses from time to time to keep them alert. This being a Bauxite open cast manual mine with occasional usage of a JCB loader, no disasters are envisaged.

The following natural/industrial hazards may occur during normal operation.

- Inundation of mine pit due to flood/excessive rains;
- Accident due to explosives;
- Sabotage in case of magazine.

In order to take care of above hazard/disasters, the following control measures have been adopted.

Blasting operations are supervised and done by qualified personnel.

- In order to control the in-rush of water into the quarry in rainy season from the surface, the existing drain would serve the purpose.
- Entry of unauthorized persons is prohibited;
- Fire fighting and first-aid provisions in the mines office complex and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc. are made available to the employees and regular check for their use;
- Working of mine, as per approved plan and regularly updating the mine plan;
- Cleaning of mine faces is regularly done;
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines;
- Suppression of dust on the haulage roads;
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.

The management is able to deal with the situation efficiently to reduce confusion keeping in view of the likely sources of danger in the mine.

4.3 OUT LINE OF DISASTER MANAGEMENT PLAN

The purpose of disaster management plan is to restore the normalcy for early resumption of mining operation due to an unexpected, sudden occurrence resulting to abnormalities in the course of mining activity leading to a serious danger to workers or any machinery or the environment.

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System of communication

An internal communication system for the department head and to their line of command should be maintained. Having the telephone nos and addresses of adjoining mines, rescue station, police station, Fire service station, local hospital, electricity supply agency and standing consultative committee members is another essential aspect.

Consultative committee

A standing consultative committee will be formed under the head of Mines manager.

Facilities & Accommodation

Accommodation and facilities for medical aid, rescue room, etc will be provided.

First Aid & medical facilities

The mine management is having first aid facilities for use in emergency situation. All casualties would be registered and will be given first aid. The mine management will have proper telephone / wireless set for quick communication with nearest hospitals where the complicated cases are to be sent.

Functions of public relations group

A cordial relation with government officials and other social service organization and working groups shall be maintained. To liaise with representatives of the mine workers to ameliorate the situation of panic, tension, sentiments, grievances and misgivings created by any disaster. To ameliorate the injured, survivors and family members of affected persons by providing material, moral support, finance and establishing contact with relatives of victims.

Care and maintenance during temporary discontinuance

If the mine will be discontinued temporarily for more than 120 days, notice will be given 30 days before the date of such discontinuance to the concerned authorities. During discontinuance period safety arrangement and fencing will be provided to avoid the entry of unauthorized persons. The accessibility to the mine from the surface will be prevented by providing fencing arrangement.

4.3.1 Emergency Plan

- On realizing anything serious happened anywhere in the mine, the foreman or the mate will immediately inform the nearest mining official & the manager of mines.
- On receiving information of emergency, Shift in-charge will ensure that all the materials and transport system to deal with emergency situation is kept under readiness.
- First aid facilities to be kept ready to receive the cases.

5 CHAPTER: ENVIRONMENT MANAGEMENT PLAN AND ENVIRONMENTAL MONITORING PROGRAM

5.1 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) has been designed within the framework of various Indian legislative and regulatory requirements on environmental and socio-economic aspects so as to attain sustainable development.

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 air emissions, waste water discharge characteristics, noise levels, land use, socio economics etc for environmental management purpose in connection with the mining and mining related activities in the study area.

5.1.1 Air Quality Management

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.

As per the results of ambient air quality monitoring data, the background concentrations and projected concentrations after proposed expansion, SPM, SO₂ and NO_x are within the stipulated CPCB standards for most of the samples.

Controlling dust levels

Dust is the major pollutant generated from the mining operations. Dust would be generated during mining, handling and transportation of the material. The environmental control measures, which are being taken and proposed to control the fugitive dust released during the ore production are given below:

Mines

Drilling & blasting operations which generate maximum quantity of dust are intermittently operated and are restricted to only hard rock portions exposed. Further the drilling of blast holes is done with small diameter jackhammer drills of maximum depth 1.5 m. Wet drilling

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will be practiced. Therefore the dust generated due to drilling and blasting shall be minimum. At a time only 25 to 40 holes shall be blasted. Thus most of the dusts generating operations are avoided.

- Blasting will be carried out in favourable weather condition
- The working faces will be regularly wetted before carrying out the blasting and excavation.
- Dust masks will be provided to the workers especially for the drillers and for the workers working in the loading operations.
- Afforestation over the inactive waste dump surfaces and over the backfilled areas shall be done simultaneously.
- Periodic health check up for the workers shall be done
- Plantation of wide leaf trees and tall grass along approach roads and on safety barrier zones surrounding the ML area.
- Water tankers with spraying arrangement will be used for regular water sprinkling on the haul roads to ensure effective dust suppression.

Haulage

- Haul road will be maintained regularly.
- Speed limits will be prescribed for transport vehicle
- Water will be sprayed daily on the roads by using water tankers.
- Periodic maintenance of the trucks used for transport shall be done to reduce smoke emissions.
- Over filling of tippers is avoided and thus spillage on the roads is restricted.
- Ore carrying trucks will be effectively covered by tarpaulin to avoid escape of fines to the ambient air.

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A summary of air pollution control measures is given below.

S.No	Dust Source	Control measure
1	Haul Road	Regular water spraying.
2	Truck Movement	No overloading of trucks. Trucks to be covered with tarpaulin while transporting ore. Enforcing speed limit. Regular monitoring of the exhaust Proper maintenance of trucks
3	Waste dumps	No dumping has been proposed in future.
4	Mine workings	Regular water spraying in working areas. Green belt surrounding ML Wet drilling Simultaneous backfilling of worked out portions and plantation over the backfilled surface.

Controlling of SO₂ & NO_x Levels

The source of SO₂ & NO_x would be due to vehicular emissions. This can be controlled by proper maintenance and servicing of vehicles.

5.1.2 Noise Pollution Control

The predicted levels of noise level due to the mining activity at mining lease boundary is only 42 dB(A). In an operational mine major noise sources are operation of mine machineries, equipment & plying vehicles. Noise generation may be for an instant, intermittent or continuous periods, with low to high decibels. The management plan for controlling noise pollution is as given below.

- Reducing the drilling & blasting operations as far as possible
- Restriction of blast hole drilling to only day time hours and usage of sharp drilling bits and delivery of compressed air at optimal pressure during drilling.
- Controlled blasting techniques to reduce noise level and generation of ground vibrations.
- Use of low density explosives to have a heaving effect than an explosion
- Provision of earmuffs to workers as a measure to protect their ears.
- Proper gradient of haul roads to reduce cumulative noise levels.

Control Measures for Blasting & Generation of Ground Vibrations

Blasting in this mine is not a regular affair, and is done occasionally for heaving purpose in ore body Bauxite. The hole depth is restricted to 1.5 m and the spacing and burden are kept at 1.0m and 0.8m respectively. Controlled blasting will be done and not more than 10 holes will be blasted at a time and no hole will be charged with more than 350gms of explosive at a

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time. Normally two rows of blasting pattern will be adopted to control the ground vibration, back break and noise pollution. Stemming of around one third the depth of hole will be done to control the fly-rock generation.

Safety in Blasting

The following safety measures have to be given attention while conducting the blasting operations

- A blasting SIREN at the time of blasting for audio signal
- Before blasting and after blasting, red and green flags display as visual signals
- Warning notice boards indicating the time of blasting and NOT TO TRESSPASS will be displayed.

5.1.3 Water Environment

5.1.3.1 Water Pollution Control Measures

Mining activities may cause adverse impacts due to mine drainage, Siltation due to storm water and contaminated water from dump. However as in the present project, manual mine working without any workshop at the site and no perennial streams exists within the ML area, the impact on water resources are negligible. However, in order to mitigate the likely impacts the following management has been proposed.

Surface water

The major concern is that the silt and the fine suspended particulate matter carried by the surface run-off from the mining area during the monsoon may cause siltation of surface water sources in the buffer zone.

The only pollution anticipated in the surface drainage water is the suspended solids, due to wash off from the existing dump and mine workings. The existing dump is already established with green cover, moreover the dump is provided with peripheral parapet walls/retainer walls and garland drain all around.

Following measures are proposed as part of the management plan to check the pollution of surface water bodies due to mining and dumping.

- At the foot of the waste dumps, laterite rubble walls (parapet walls) arrestors and short trenches will be provided to check the wash off.

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- Run-off from the mining area will be passed through a check dams with filter beds to allow settling of solid particles. For this purpose 1 check dam and 4 gully plugs is erected within the ML area, in the existing natural drains. Gully plugs are provided to reduce the silt load on the check dams. These check dams also assist in the recharge of ground water system.
- The check dams and the settling tank are being periodically de-silted before the onset of monsoon.

5.1.4 Land Environment

Soil

Soil in this deposit is very meager and it is intermixed with top murram and lateritic OB, which are inseparable. The thickness of this layer is 1.2 to 2.0 m in thickness.

Type of Overburden and Mineral Rejects

The deposit is covered with lateritic overburden and murram. While exploiting the mineral - 10mm bauxite chips will generate which are considered as rejects and not readily useful for the industry.

Disposal of Waste

During 5 years a total of 91140 tons of overburden will be handled and dumped in the area identified for the purpose. The dumps will be stabilized and plantation will be carried out.

Land Reclamation & Rehabilitation

The exhausted mine pit will be reclaimed with OB and wastes generated during the operations. However, the topography of the land will change due to extraction of ore. In order to retain the topography nearest to the virgin land, few voids will be left un-reclaimed and used as water reservoirs. The reclaimed land will be densely afforested (approx 2500 sapling per Ha.) with variety of plant species that are chosen from the background environment. That would help faster merger of the disturbed area with the virgin background and also will support faster rehabilitation and resettlement of the native people and the fauna of the region. The proposed rehabilitation plan shall ensure the bio-diversity of the reclaimed land will have more diverse flora than the virgin land.

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After backfilling the area is compacted and levelled, over which the top soil will be spread and afforestation will be done as described in the above. The Post Mining Land use pattern of the ML area is given in Table 17.

Table 17 : Post Mining Land use pattern of the ML area in (ha)

Sr. No.	Land use category	Post mining Land use
1	Excavated area	18.24
2	Green belt	4.534

5.1.5 Biological Environment

The ML area is thinly vegetated and with no thick vegetation within ML area. As in any typical Bauxite deposit, there is no tree growth on the area, but grass shrub and bushes grow sparsely. No wildlife is found in ML area. In order to minimize the impacts and to improve up on the existing eco system following actions are under taken under the present project.

Afforestation Plan

During the Conceptual period an area of 4.534 ha land has been proposed for phased green belt plantation/afforestation. 18.24 ha excavated land will be afforested at the post mining stage of the mine. The main aim of the plantation of the mined out areas is to stabilize the area to protect it from rain, wind erosion, improve the aesthetics and support the re-creation of bio-diversity.

The stage wise plantation and its areas are given in Table-18. The species to be grown in the areas should be dust tolerant and fast growing species so that a permanent green belt is created.

Table 18 : Stage wise Tree Plantation

Year	Green belt		Excavated area		Total	
	Area (ha)	Trees	Area (ha)	Trees	Area (ha)	Trees
1 st	0.10	250	-	-	0.10	250
2 nd	0.10	250	-	-	0.10	250
3 rd	1.25	3125	-	-	1.25	3125
4 th	1.25	3125	2.00	5000	3.25	8125
5 th	1.834	4585	2.00	5000	3.834	9585
10 th	-	-	4.00	10000	4.00	10000
15 th	-	-	4.00	10000	4.00	10000
20 th	-	-	4.00	10000	4.00	10000
Post Mining	-	-	2.24	5600	2.24	5600
Total	4.534	11335	18.24	45600	22.774	56935

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To stabilize the slopes of the waste dumps, proper stonewall shall be built along the toe ends. For the afforestation over the consolidated waste dump slopes and over the back filled area, the area shall be prepared for plantation by spreading/utilizing the topsoil segregated and stacked separately.

The implementation of the development of green belts is of paramount importance as it acts as a pollution sink. The species to be grown in the areas should be dust tolerant and fast growing species so that a permanent green belt is created.

The choice of plant species is broadly determined by the climate, site conditions and object of planting. The mining area is highly semi-arid and soil does not retain water for longer time and they are rather shallow. Only some of the drought tolerant plant species should receive consideration under this situation. Also the fertility level of soils is poor; plants belonging to family leguminaceae should be preferred.

The following are the chosen plants to be grown in the green belt.

Plantation for Arresting Dust

Trees, particularly having compact branching, closely arranged leaves, broad leaves of simple elliptical and hairy structure, shiny or waxy leaves and hairy twigs are efficient filters for dust. The leaf surface is 10-20 times greater than the earth surface occupied by the plants. It is found that 8m wide green belt can reduce the dust fall by 2 – 3 times. The following species are suggested to arrest the dust pollution:

Cassia fistula, Bauhinia purpurea, Cassia siamea, Polyalthia longifolia, Tamarindus indica, Melia azedarach, Azadirachta indica, Terminalia arjuna.

A consolidated list of trees recommended for plantation program is given in Table-19.

Table 19 : List of trees proposed for afforestation and green belt development as prescribed by CPCB

Sl. No	Botanical name of the plant	Size of the grown up tree	Type and suitable site, where the plants are to be plotted
1	<i>Acacia auriculaeformis</i>	Medium	Semi-evergreen fragrant white flowers suitable in green belts and on road sides
2	<i>Adina corodifolia</i>	Large	Deciduous, a light demander, suitable on open areas and near flares
3	<i>Aegle marmelos</i>	Medium	Deciduous, good for green belts.
4	<i>Anogeissus latifolia</i>	Medium	Deciduous, Suitable for green belts
5	<i>Azadirachta indica</i>	Large	Evergreen, suitable in green belts along the

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			boundary
6	<i>Bauhinia variegata</i>	Medium	Deciduous, good in green belts in garden and as a second row avenue tree
7	<i>Boswellia serrata</i>	Medium	Deciduous suitable on green belt on shallow soils
8	<i>Butea monosperma</i>	Medium	Deciduous for green belt and as a second row avenue tree
9	<i>Caesalpinia pulcherrima</i>	Small	A large shrub, suitable for gardens outside offices.
10	<i>Callistemon lanceolatus</i>	Medium	Deciduous for some time, ornamental plant in garden
11	<i>Carrisa Carandas</i>	Small	Semi evergreen large bushy shrub good as a hedge to protect against noise.
12	<i>Cassia fistula</i>	Medium	Deciduous, good ornamental tree in green belts.
13	<i>Cassia siamea</i>	Large	Evergreen, good as an avenue tree.
14	<i>Casuarina equisetifolia</i>	Medium	Evergreen suitable for covering low lying area and in green belts and along ponds.
15	<i>Ficus bengalensis</i>	Large	Deciduous, widely spaced avenue tree (15 m apart)
16	<i>Ficus religiosa</i>	Large	Deciduous, widely spaced avenue tree also as a single tree in isolated sites.
17	<i>Maduca indica</i>	Medium	Deciduous, good in green belts.
18	<i>Saraca indica</i>	Medium	Evergreen tree good on road sides
19	<i>Tamarindus indica</i>	Large	Evergreen tree good along boundary and road sides.
20	<i>Terminalia arjuna</i>	Large	Evergreen tree for road sides and in green belts
21	<i>Mangifera indica</i>	Large/Medium	Evergreen tree and fruit bearing
22	<i>Artocarpus inegrifolia</i>	Large	Evergreen tree and fruit bearing
23	<i>Syzygium cumini</i>	Large	Evergreen tree and fruit bearing
24	<i>Psidium guajava</i>	Medium	Evergreen tree and fruit bearing
25	<i>Embelica officinalis</i>	Medium	Evergreen tree and fruit bearing
26	<i>chikku</i>	Medium	Evergreen tree and fruit bearing

It is suggested to develop around 2500 tree sapling / ha. 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 of local Forest Dept experts and co-operation of the local community. All efforts to improve the survival of the saplings and their healthy growth will be taken up like watering, fencing, keeping watch and ward and seeking guidance from the local Forest Dept.

Further in between these tree species, under growth such as shrub variety which gives abandonment litter to develop the humus in the soil and also which retains the moisture content of the soil shall be developed.

5.1.6 Occupational Health & Safety Control Measures

Bauxite does not contain any toxic elements. Further this being a manual mine, Ore production and waste material handling are by manual way, there shall be marginal impact on air and noise qualities. Therefore, the possibilities of any health hazards are minimal. The most significant occupation health treats are Noise Induced Hearing Loss (NIHL) and Occupational Lung Disease (OLD) due to inhalation of dust. However the management of the Uttambar Bauxite mine are taking enough care in minimizing the impacts due to these activities.

- Employee will be adequately trained and educated for involvement and commitment in to the implementation of health and safety guidelines
- Monitoring the effects of mining activities on safety and health and conducting regular performance reviews through periodical health checkups.
- Provision of all necessary resources for safety and health of employees and contractors engaged in mining.
- Setting of safety and health objectives based on comprehensive strategic plans and measure performance against these plans
- Implementing safety and health management system and assessing the effectiveness through periodic audits

Noise Induced Hearing Loss (NIHL)

Baseline audiogram forms the basis for future assessment of employees in terms of hearing loss. Using engineering initiatives to reduce noise at source is the priority management tool. The hearing conservation programme includes the provision of Hearing Protection Devices (HPDs) and annual audiometry examination of all employees. Apart from provision of HPDs emphasis shall also laid on training the employees responsibility to protect his/her hearing.

Occupation Lung Diseases (OLD)

There will be regular health camps for all the workers. Lung function tests, chest X-rays etc shall be carried out and any health disorders will be evaluated. A part time Doctor will be haired for occupational health safety; he will take care in providing the necessary medical advice (Occupational Therapy Specialists) to the mine workers.

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5.1.7 Socio-economic Benefits

New Job opportunities in the proposed project will increase the per capita income and improve the life style of the people. Therefore, there shall be a beneficial impact to the community due to development of this mining activity, which shall provide them more regular income.

Mining will be done with the vision of leaving a positive impact on socio-economics of people living in the nearby villages. A first-aid centre to meet the basic medical needs of employees will be provided.

Employment potential

Besides the direct employment, company will provide vocational skill training to the unemployment youth of the neighbouring villages through outside agencies. Local villagers residing in the near by villages shall be employed as semi-skilled workers.

Infrastructure Management

Uttambar bauxite mine under its community development initiatives will provide seeding money for infrastructural projects like construction of Road, School building, Community hall, primary health centres, public water ponds and others depending on the need of the villages. Uttambar Bauxite Mine has set aside a budgetary allocation of about Rs.2 Lakhs per year as initial seed money towards its community development initiatives

Care and Maintenance during Temporary Discontinuance

All the provisions as per the Mines Act 1952 and MMDR Act shall be strictly adhered during temporary discontinuation.

Safety and Security

At the end of mining operations the total area excavated will be fenced properly with single opening for workers engaged in closure plan work. A water reservoir will be created from the mine voids to support the afforestation, future resettlements and fauna. The mines management shall make provision for the management of the abandoned mine for atleast five years from the last year of operation, during which the areas afforested will be maintained and developed sufficiently for self sustenance.

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Improvement in the Social Infrastructure

The villages within 3km radius from the ML area.

Area in ha.

Name of the village	Distance in km	Total Area	Forest Area	Irrigated Area	Un-irrigated Area	Culturable Waste	Area not available for cultivation
Sakhri	2.5	777	0	0	542	1	235
Kelsi	1.7	265	0	70	14	86	95
Uttambar	0.3	421	0	0	0	368	112
Umbershet	2.2	515	0	0	0	385	131
Rowale	2.0	480	0	0	0	368	112
Malvi	2.3	417	0	0	0	295	122
Adhe	0.7	146	0	0	0	103	43
Padale	1.5	151	0	0	0	125	25
Lonawadi	1.7	154	0	0	0	102	52

These are the 9 villages, which needs more attention for pollution and developmental point of view.

The Culturable waste land in these villages is about 1833 ha it is envisaged that out of this total area about 20% i.e. 366.6 ha of land along the road side may be affected due to the mining activities.

In order to minimize the impacts on these lands the management will ensure proper and effective management plan options like covering the trucks carrying ores with tarpaulin covers.

Plantation will be carried out all along the mine lease boundary and along the sides of the haulage road to act as pollution sink and acoustic barrier.

Employment opportunities will be provided for the local people. Jobs in mines will increase the per capita income of the villagers.

Financial assistance will be provided for conducting local sports, religious and cultural activities.

Medical camps will be arranged regularly for the villagers.

Renovation of houses, schools and roads will be done.

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Proper arrangements will be made for safe and healthy conditions such as dust suppression during loading, unloading & transporting, etc. Development of mines in this area will help to improve social standards of the villager.

Infrastructural facilities and earning avenues will improve due to mining activities. General economic level within the buffer zone will improve, which in turn improves quality of life; level of education and training. Direct and indirect employment opportunities will go up.

Awareness of Safety and Environment, by conducting Mines Safety & Environment Week, is likely to go up. It is decided that 2% of turnover will be given to District Administration for the social developmental activities.

Mining will be done with the vision of leaving the positive impact on socio-economics of people living in the nearby villages.

The State Government will earn higher revenue after proposed ML by way of royalty, sales tax, cess etc. The Government of India will earn Income tax and valuable foreign exchange as the ore is also exported to foreign countries

5.1.8 Budget

It is necessary to include the environmental cost as a part of the budgetary cost component. The project authorities propose to undertake the following environmental works to achieve the environmental quality as desired. The budget for environmental protection has been formulated and given in Table 20.

Table 20 : Budget for Environmental Protection

<i>Particulars</i>	<i>Capital Cost (Rs.Lakh)</i>	<i>Recurring Cost (Rs.Lakh)</i>
<i>Pollution Control</i>		
Dust suppression	5.00	3.00
Gully plugs (4 Nos), 1 Check Dam, 6 Retaining Walls, etc	7.50	2.50
Pollution Monitoring	--	3.00
<i>Occupational Health</i>		
For routine check up	--	2.80
Medical aid as per ESI Scheme	--	8.20
Training	--	1.00
<i>Reclamation & Rehabilitation</i>		
Green belt & afforestation	2.50	4.50
Others (Environmental study, Social Development Plan, etc.)	8.00	7.00
Total	23.00	32.00

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5.1.9 Organizational Setup

In order to develop and implement the environmental monitoring and management plan, Uttambar Bauxite Mine shall have an organisation headed by the Mines Manager. There shall be a designated environmental officer coordinating implementing and supervising these activities. The said organization will be responsible for:

- Regular environmental monitoring as stipulated by the regulatory authorities
- Preparation and submission of environmental report to the regulatory authorities
- Compliance management with all environmental legislations
- Implementation of various environmental management programs and reporting the performance to the top management.
- Co-ordinating the environment related activities within the project as well as with outside agencies
- Green belt development, etc.

5.2 ENVIRONMENTAL MONITORING PROGRAM

Environmental parameters viz. air, water, noise, will be monitored regularly in order to evaluate any changes from the baseline status and take appropriate mid course correction. Monitoring program will be followed till the mining operations ceases; every year as per the schedule below:

Air Quality Monitoring: One location in core zone and two locations in the buffer zone will be monitored for once per season except monsoon.

Noise Levels Monitoring: Noise levels in the working area will be monitored once in every month till the continuation of operations. Ambient noise levels will also be monitored once in a season in the buffer zone to evaluate the noise levels in surrounding community.

Water Quality Monitoring: Water environment will be assessed periodically for both surface water and ground water. Surface water quality will be monitored at identified rivers during all four seasons. Ground water level and quality on seasonal basis will be assessed in the open / dug wells to evaluate the impacts of ongoing operations. Water levels will also be monitored on seasonal basis in surrounding wells.

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Ecological monitoring: Half yearly monitoring of afforestation program will be done for the survival rate and plant growth within the core zone. Plantation, before the onset of monsoon season, will be done progressively till the final closure of the mine.

The monitoring system will also include:

- Continued analysis of mine site drainage water at regular intervals to monitor suspended solid content in particular and other parameters in general.
- Efficacy of check dams, gully plugs, retaining walls and settling tank and to improve the silt arresting arrangement.
- Compliance management with all environmental legislations
- Implementation of various environmental management program and reporting the performance to the top management.
- Co-ordinating the environment related activities within the project as well as with outside agencies
- Green belt development, etc.