EXECUTIVE SUMMARY

ENVIRONMENT IMPACT ASSESSMENT REPORT

FOR

MUKAM BAUXITE MINE

Proposed Production Capacity: 384615.4 TPA (ROM),
Mineral: 288461.5 TPA, Mineral Reject: 96153.85 TPA

Mining lease Area 110.563 ha.
At
Near Village-Mukam, Tehsil - Bodla,
District- Kabirdham, Chhattisgarh

By

M/s. Chhattisgarh Mineral Development Corporation Limited

Project Cost: Rs. 9 CRORE

Category-A

PROJECT PROPONENT	EIA CONSULTANT
M/S CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LIMITED Sector 24, Block no. 7A, Third Floor, Nava Raipur, Atal Nagar, (Chhattisgarh) pin- 492015 EMAIL ID: cmdcraipur@gmail.com Phone Number: 0771-4283557	OVERSEAS MIN-TECH CONSULTANTS ISO 9001:2015 Certified & NABET Accredited 501, Apex Tower, Tonk Road, Jaipur – 302015 Telefax: +91-141-2744509, Mobile: +91-9460221084 E-mail–arun.omtc@gmail.com, Website: www.overseasmintech.com

Project File ID: OMTC/EIA/2022/38

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EXECUTIVE SUMMARY

1. Introduction

Environmental Impact Assessment (EIA) is a systematic and integrative process for considering possible impacts prior to a decision being taken on whether or not a proposal should be given approval to proceed.

The proposed project has mining lease area of 110.563 Ha. (43.162 Ha. Government land, 67.401 Ha. Private land) and as per EIA Notification of the MoEF&CC dated 14.09.2006, as amended on 1.12.2009, 4.04.2011, 20th April, 2022; the proposed project falls under Category "A" and obtaining prior environmental clearance is mandatory. Accordingly, ToR was applied in the Month of October 2022 and the project was granted Terms of Reference (TOR) by Expert Appraisal Committee (Mining), MoEF&CC on 09.11.2022 (Refer Annex 1.1) bearing file number IA-J-11015/37/2022-IA-II(NCM).

2. Project Description

The proposed project is bauxite mining project. The total mining lease area is 110.563 Ha. (43.162 Ha. Government land, 67.401 Ha. Private land.), consists of revenue private and government land with mineral deposit of Bauxite, occurring in the ML area. The proposed capacity of the mines is 384615.4 TPA bauxite with an Area 110.563 Ha. and 418362.12 TPA of OB, 22061.83m3 of topsoil and 96153.85 TPA of mineral reject will generate in the five-year plan period. The estimated cost of the project is about Rs. 9.0 Cr. The lease area falls under the Survey of India topo sheet no. 64 F/3. The state govt. has issued Letter of Intent (LOI) - vide order no. F 3- 03/2021/12, dated 11.04.2022.

3. Project Proponent

Chhattisgarh Mineral Development Corporation (CMDC), Raipur has been allotted Mining Lease (ML) at MUKAM for Bauxite Mining is a fresh grant located in Village- MUKAM, under Tehsil- Bodla, District- Kabirdham, Chhattisgarh. The lease area is of 110.563 Ha. and project Category is B1. Opencast Semi- Mechanised Mining method will be adopted for this project.

4. Location of the Project

The proposed mine is located near village- Mukam, Tehsil- Bodla, District- Kabirdham, State- Chhattisgarh over an area of 110.563 Ha.

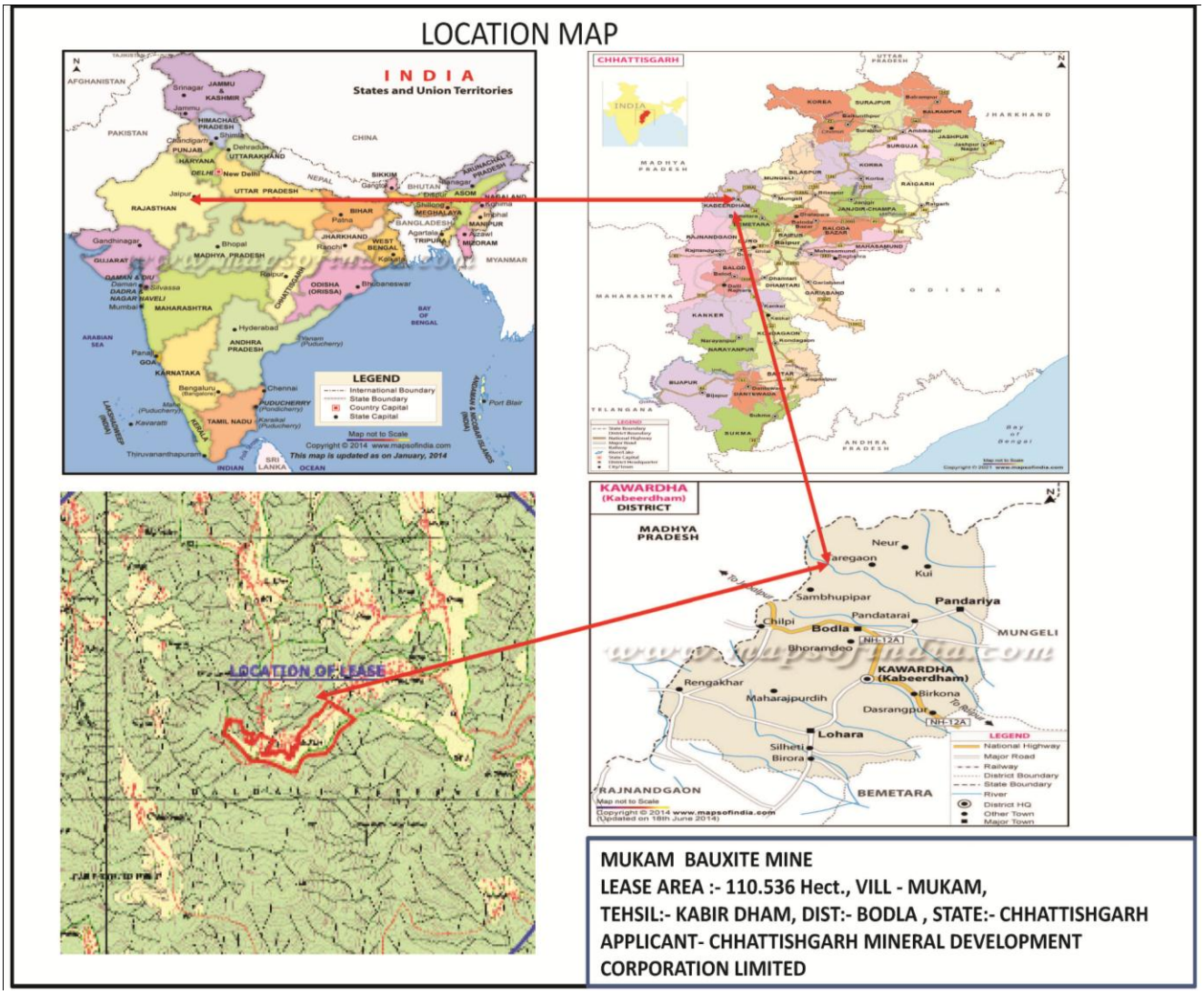

Figure ES-1: Location of Mine in Kabirdham District

5. Salient Features of the Project

Table ES-1: Salient Features of the Project

S. No.	Particulars	Details
1	Total Mine Lease Area	110.563 Ha.
2	Lease period validity	2022-2023 to 2072-2073
3	SOI Topo Sheet	64 F/3
4	Elevation above MSL	Highest MSL 877 m Lowest MSL 812m
5	Present Land Use	Agriculture
6	Nearest Highway	NH-12 Bodla to Daldali at about 42 km. and NH 30 which connects Bodla tehsil to mine area.
7	Nearest Railway Station	Raipur railway station at a distance of 135 km approx. and Bilaspur at a distance of About 110 km approx
8	Nearest Airport	Bilaspur airport at a distance of about 106.80 km approx. in

S. No.	Particulars	Details
		south east direction.
9	Nearest Port	Dhamra Port Approx. 626 Km.
10	Nearest Town/City	Kawardha , Bodla, Malajkhand , Mungeli , Bemetra are the nearby Cities to Mukam.
11	Nearest Villages	Mukam village approx. 0.5 km. from project boundary. Other certain villages are located within 15 kms of the project area. Ropakhar, Kudaridih approx. 9 to 6 Km.
12	Villages with ML area	Nil
13	Archaeologically important places	Nil
14	National parks/ wildlife sanctuaries	NIL
15	Reserved/protected forest	Daldali forest adjoining the area 7 National Park Kanha Kisli is about 40 Km.
16	State and national boundaries	Madhya Pradesh 4.14 km in west direction from mine site
17	Streams / Rivers/Drainage Pattern	Nil within ML. No perennial nala is flowing within the lease area. Regionally, the area is drained by Hapan Nadi on The east and Lilari Nadi on the west.
18	Défense Installations	Nil
19	Seismicity	Seismically, this area is categorized under zone-II as per IS-1893 (Part-I)-2002.
20	Nearby mines	Nil
21	Cost of the Project	9.0 Cr.
22	Water Requirement	6.5 KLD
23	Source of Water	Will be fulfilled from local supplier.

6. Topography

The area constitutes central part of an extensive laterite-capped plateau of the Maikal Range. In plains to the northern part of the area around Mawai and Kathaitola, gneissose and schistose rocks form the core of the range, whereas around Kukrapani and Taregaon in the southern, phyllite, slates and quartzites belonging to Chilphi Group are exposed. In the lower part of the plateau, narrow patches of Lametas, represented by calcareous gritty sandstones and pink & white clays are seen in the Kanai River section at Kukri. These are overlain by horizontally disposed basaltic lawa flows of Deccan Trap. Good exposures of Deccan Trap are noticed along the Kukrapani Daldali ghat section. The traps are capped by about 20-25 m thick laterite. Bauxite is normally found within upper part of the laterite capping.

7. Drainage in the study

The main rivers of the district originate generally from Maikal mountain range. Haf, Phok and Sakri rivers after emerging from north-west of the district flow towards southeast and in the end after going in District Durg fall in river Shivnath, whereas Phen, Halon, Banjar and Jamunia rivers flowing towards west fall in river Narmada. There is no all-weather rivulet except Saliha Nala in the district. The drainage pattern in the district is dendritic to sub-dendritic and the drainage density is high in central and southern parts. Direction of Flow has also been indicated on the same. Regionally, the area is drained by Hapan Nadi on The east and Lilari

Nadi on the west.

8. Quality of Reserves

The reserves and resources have been estimated as per the data given in the Prospecting Report. During prospecting the cut-off grade of bauxite is considered as Al2O3 minimum 40%, while for the preparation of this Mining Plan the reserve has been estimated as per the threshold value of Al2O3 30% with reactive silica 5%. Geological mapping and exploratory drilling were done in the year 2019-20 by CMDC, 449 bore holes were explored of 5446.5 meters depth in 110.563 Ha. area and showed the presence of bauxite ,4188 samples were collected and analysed. Bauxite deposit occurs as pocket and lenses form. The strike length of the ore body is 524 m approx. and width of the ore body is 428 m and thickness of the ore body is 2.31 m (average).

Table ES-2: Mineral reserve along with cut-off Grade

Classification	Code	Quantity			Grade	
		Forest	Non-Forest	Total	Forest	Non-Forest
Probable Mineral Reserve (A)	122	--	3213288.26	3213288.26	--	Al2O3 30% & above
Prefeasibility Mineral Resource (B)	222		1514313.30	1514313.30	--	Al2O3 30% & above
Inferred Mineral Resource (B)	333		299057.66	299057.66		Al2O3 30% & above
Total Mineral Resources (A+B)			**50,26,659.22**	**50,26,659.22**		

Source: Consultants Team

9. Proposed Method of Mining

The proposed mining will be open cast. The Semi- Mechanised method with drilling and blasting will be adopted. The infrastructure facilities like office, rest shelter, maintenance shed, urinal etc will be provided before commencement of the mining operation. A haulage road already exists for movement of vehicles.

Work related to overburden removal, production and dispatch of bauxite will be carried out in systematic manner, smaller size excavator of 2.0 cum bucket size, and dumper 18 tonne will be used for overburden removal, and 100 mm dia DTH drills of 100mm capacity will be used for drilling. The working will be carried out in single shift. The blast holes of 3 to 4 m depth shall be drilled by DTH drills, for blasting required for loosening of hard overburden and ore bench.

Thereafter where the soft overburden is available; it is excavated by excavator dumper combination and used for backfilling of mined out area. The top soil and soft overburden (SOB) shall be scrapped separately, but there is a single bench for both.

The hard overburden shall be drilled, blasted for loosening and shifted by excavator dumper combination to backfill the mined-out area. After removal of the overburden, the exposed ore zone having grade above 30% Al_2O_3 shall be excavated, after loosening by drilling blasting. Thereafter, sizing & sorting of blasted ore is being done at working face itself. The boulder above 600 mms size is reduced to (-) 600 mms size by hydraulic rock breaker before manual sizing/ sorting.

After removal of bauxite the mined-out areas are concurrently backfilled with generated OB (hard /soft laterite), reject material, and top soil. The backfilling of materials shall be done in

same sequence as it is found in the nature, i.e., hard laterite in bottom, then soft laterite and top soil. Levelling and compaction of backfilled area is being done from time to time by dozer so as to restore the topography in its original shape.

During the mining it is found that, the estimated recovery factor of saleable grade bauxite is 75% of total material. Out of total 100% ore zone, the 75% material will be saleable bauxite and rest 25% will be waste/rejects. The material of quality above 30% alumina will be stacked after it's sizing & sorting. During the mining of graded bauxite, the cut-off grade quality 30% alumina if encountered will be separated out and blended with high grade mineral, hence no separate stock is required. The left-out material will be as reject and will be transported to mined-out area for backfilling use.

10. Land Environment Mine Lease Area

The entire lease holds area of 110.563 Ha. (43.162 Ha. Government land, 67.401 Ha. Private land) is moistly rain-fed agriculture Land.

11. Description of Environment

This section contains the description of baseline studies of the 10-km radius of the area surrounding the site. The data collected has been used to understand the existing environment scenario around the proposed mining project against which the potential impacts of the project can be assessed. Baseline data was generated for various environmental parameters including air, water (surface and ground water), soil, noise, meteorological, ecology and socio-economic status to determine quality of the prevailing environmental settings. The baseline data for study was conducted during summer (March to May, 2022) season.

11.1 Meteorological Data

The study area is part of tropical monsoon climate with long humid summer and short winters. The rainfall is heavy during monsoon and light in pre monsoon season. The study area receives rainfall mainly from south-west monsoon. About 87% of the annual rainfall is received during May to October and July and August are the months of maximum precipitation. The area gets some rainfall during winter season also. The month with the most wet days in Kawardha is July, with an average of 20.5 days with at least 0.04 inches of precipitation. The maximum average wind speed was found to be 7.8 kmph in the month of June. The predominant wind direction recorded at the IMD station was from North followed by South-west and West.

11.2 Air Environment

Seven Ambient Air Quality Monitoring (AAQM) Stations were selected. Criteria used for designing the network were principally governed by the wind rose pattern for pre-monsoon seasons and the accessibility of the selected sites. The value of parameters at all the location is found within the limits prescribed by Central Pollution Control Board (CPCB).

- **PM_{10}:** The highest (98^{th} percentile) value i.e., 66.14 µg/m^3 was observed for PM_{10} at Mukam village and minimum value of 58.40 µg/m^3 for PM_{10} was observed at Chandradadar villlage. The 24 hours applicable limit for industrial, Residential Rural and other Areas is 100 µg/m^3.

- **$PM_{2.5}$:** The highest (98th percentile) value for $PM_{2.5}$ i.e., 30.59 µg/m^3 was observed at Mukam village and minimum value of 25.44 µg/m^3 for $PM_{2.5}$ was observed at Sukjhar. The 24 hours applicable limit for industrial, Residential Rural and other Areas is 60 µg/m^3.
- **SO_2:** The highest (98th percentile) value for SO_2 of 16.63 µg/m^3 was observed at Sajaotala village and minimum value for SO_2 is 13.22 µg/m^3 which was observed at Sukjhar village. The 24 hours applicable limit for Industrial, Residential, Rural and other Areas is 80 µg/m^3.
- **NO_2:** The highest (98th percentile) value for i.e., 12.81 µg/m^3 was observed at Larbakki village and minimum value for NOx is 10.43 µg/m^3 was observed at Bamhantara village. The 24 hours applicable limit for Industrial, Residential, Rural and other Areas is 80 µg/m^3.

11.3 Noise Environment

The noise level in area varies from 50.4 dB (A) to 64.8 dB (A) during day time and 36.8 dB (A) to 51.2 dB (A) during night time. Traffic movement was found due to the vehicular movement & mining activities in nearby areas. Noise levels varied from as per the standard of CPCB the noise level should be 75 dB (A) at day time and 70 dB (A) at night time in industrial area. All the results found within the permissible limit. However, noise level in rural & residential is the standard limit.

11.4 Water Environment

Drainage Pattern of Mine Lease Area

No perennial nala is flowing within the lease area. The main drainage of the area is through different seasonal water courses originating from the plateau. Streams of the plateau exhibit a combination radial and dendritic pattern. A main nala Gungata is about 3 km on the northern side of the area, flowing towards northern direction and meets to Gungata Nala.

There is a gentle slope from northern direction to southern direction, no stream crosses the mine area. Drainage within the mine lease area, as it can be seen that the flow is towards south contributing to nala in the south.

Water Quality

Two surface water and seven ground water samples were collected and tested to know the water quality of study area. The samples collected were examined for relevant physical and chemical parameters. Analysis of the parameters like pH and alkalinity were carried out at the sampling stations immediately after collection of samples with the help of Field Analysis Kits. The metallic constituents like Fluorides, chromium, iron and Magnesium were analyzed with Atomic Absorption Spectroscope. The samples were collected and analyzed as per the procedures specified in 'Standard Methods for the Examination of Water and Waste Water' published by American Public Health Association (APHA). The results were compared with the guidelines given by Bureau of Indian Standards (BIS). The water quality of the surface water samples collected were analysed and found well within the desirable limits as per IS: 2296 Class

C & IS: 10500:2012, and fit for drinking after conventional treatment and disinfection.

The colour and turbidity of the samples were normal. Total Dissolved Solid was 292.0 – 352.0 mg/l range which is within the maximum permissible limit of 1500 mg/l.

Chlorides, sulphates and fluoride concentration of the samples were well below the permissible limits. Biological contamination of surface water bodies were observed due to stagnant nature of water bodies. The heavy metals were found to be below detectable limits. In general, the water quality of the sampling location was found complying acceptable tolerance limits as per IS: 2296 Class C considering the concentrations of relevant parameters and can be used for drinking purpose after conventional treatment.

11.5 Soil Quality

To understand the soil quality in the proposed study area, 7 locations were selected for soil sampling. Composite sampling of soil up to root depth (30 cm) was carried out at each location. The important properties of soil are bulk density, porosity, infiltration rate, pH and organic matter, kjeldahl nitrogen, phosphorous and potassium.

It has been observed that the pH of the soil quality ranged from 7.56 to 7.92 i.e. slightly to moderately alkaline. Percentage of total organic carbon is observed in between 0.54 to 0.62 indicating that on an avg. sufficient in nature. The iron content of the soil samples varied from 1982 to 2164mg/kg. Other parameters like Cadmium and Chromium (mg/l) were below the detection limit.

11.6 Biological Environment

Flora

The project site is an open scrub land devoid of thick vegetation. The common trees observed in the study area and in the reserved forests in the study area are Tendu, Bael, Amla, Khair, Aam, Sal, Champa, Teak, Pakri, Kekad, Mahuwa etc.

Fauna

The mine lease area is Agricultural land and the area is devoid of significant faunal existence. A primary field survey was conducted through random observation in the study area and data was also collected from local persons of the area and forest officials. The common mammals observed in the study area and in the reserved forests in the study area are jackal, squirrel, fruit bat, field rat, Bengal monkey, barking deer, jungle cat etc. The common birds observed in the study area are common hyna, house crow, spotted dove, Jungle crow etc.

12. Anticipated Environmental Impacts and Mitigation Measures

12.1 Impact on Ambient Air Quality

The mining is proposed to be carried out by Opencast Semi- Mechanised method. The air borne particulate matter generated by ore and handling operations, transportation and screening of ore is the main air pollutant. The emissions of Sulphur dioxide (SO_2), Oxides of Nitrogen (NOx) contributed by vehicles plying on haul roads are marginal. Prediction of impacts on air environment has been carried out taking into consideration proposed production and net

increase in emissions. The maximum incremental ground level concentration of $PM_{2.5}$ will be 3.76 µg/m3 in the project site. This shows that the adverse impact of mining outside the ML area will be marginal and will not have any adverse effect on health of human and animals and also on the flora of the area. For PM_{10} the incremental value is 13.0 $\mu g/m^3$ at mining pit and it is confined to only mine area hence there will be no major impact on the environment.

Mitigation Measures for Air Pollution

Bauxite is a hydrated oxide of aluminium. It is a mixture of two or more hydroxides corresponding to Gibbsite (Al2O3.3H2O) and Boehmite (Al2O3.H2O). The moisture content in Bauxite is around 3% to 7%. Therefore, emissions due to mineral handling, during mining operations are not much and restricted to the lease area only. Air pollution is caused mainly due to dust generation added with gaseous emission from transportation activities along with mining operation like loading etc.

Control of Fugitive Emission

- Use of Personal Protection Equipment (PPE) like dust masks, ear plugs etc by the mine workers.
- Regular Water sprinkling on haul roads & loading points will be carried out.
- Development of green belt/plantation around the lease boundary, roads, dumps etc should be developed.
- Ambient Air Quality Monitoring conducted on regularly basis to assess the quality of ambient air.

Preservation and Control of Gaseous Pollution

In mining activities, the sources of gaseous emissions would be vehicle movements. Proper maintenance of machines improves combustion process & makes reduction in the pollution. Good maintenance and monitoring of fuel and oil will not allow significant addition in the gaseous emission.

12.2 Impact on Noise Level

Noise generated at the mine is due to truck transportation activities. The noises generated by the mining activity will dissipate within the mine. There may be noise pollution due to drilling, blasting and movement of trucks. This may go beyond the threshold value i.e. 90dB (A), but will be momentary. No major impact of the mining activity on the nearby villages is envisaged. The pronounced effect of noise will be felt only near the active working area. The impact of noise on the villages is negligible as the villages are located far from the proposed mine lease area or mine workings. Since there in no involvement of major machinery, the impact of noise levels will be minimal.

Mitigation Measures for Noise Pollution

The mitigation measures for Noise Pollution are suggested as follows:

List of all noise generating machinery onsite along with age to be prepared. Equipment to be maintained in good working order, Generation of vehicular noise to be minimised by proper maintenance of the vehicles and keeping records of the same Implement good working practices (equipment selection and sitting) to minimize noise and also reduce its impacts on

human health (ear muffs, safe distances and enclosures).
Adopt good blasting practices to reduce impact on flora and fauna. Muffling will be done at the time of blasting Noise to be monitored in ambient air near blasting shelter and at the lease boundaries

12.3 Mitigation Measures for Water Pollution

The following mitigation measures are suggested for water management and water pollution control. However, priority relevance depends on the location and type of mining and minerals.

- Garland drains will be constructed on all side of quarries and external dumps. All the outlets from garland drains will be routed through adequately sized settling pits to remove suspended solids from flowing into storm water drains. The design of settling pits would be calculated on the basis of silt loading, slope and detention time required.
- The vehicle washing and maintenance wastewater will be suitably treated for suspended solids and oil & grease.

Water Conservation Measure

Rain water will not be harvested in mine Pits as it is agricultural land which will be reclaimed after mining and will be handed over to farmers.

12.4 Impact on Flora & Fauna

The proposed mine lease area is away from any type of sensitive area. Mine site preparation will involve removal of vegetation cover which may impact the biodiversity of the area. The impact on terrestrial ecology will be due to emission of gaseous pollutant like NO2 from vehicles. For the mining operations, NO2 emissions are mainly due to burning of diesel in mining vehicles. As described in the baseline on air quality, the low concentrations of NO2 due to operation of the mining operations will have insignificant impact on ambient air quality and NO2 concentration will remain much below the NAAQ standards. Therefore, the impact of these emissions on the surrounding Agro-ecosystem will be insignificant.

12.5 Social Environment

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. No public buildings, places, monuments etc exist within the lease area or in the vicinity. The mining operation will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated. The impact of mining activity in the area is positive on the socio-economic environment of the region. The negative impact will be limited to some sporadic health problems, which may occur due to increase in fugitive emission in the vicinity of the mines. The proposed mine project is providing employment to local population and it will be give preference to the local people whenever there is requirement of man power. The local skilled labour will have additional opportunity to enter into automobile maintenance profession to cater to the needs of the transport trucks.

13. Analysis of Alternatives

In the proposed project, Opencast Semi- Mechanised mining method will be carried out. Hence, no new methodology is explored. So, all the parameters of EMP will be implemented as per the open cast Semi-Mechanized mining.

14. Budgetary Provision for Environment Protection

Sufficient fund allocation will be made towards environmental management and monitoring program. In order to implement the environmental monitoring, timely funds will be released as per requirement. Per annum capital cost is 6.5 lakh per and recurring cost is 8.5 lakh.

15. Conclusion

The proposed facilities are not likely to cause any significant impact to the environment and ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigation technique, as well as to serve as biological indicators for the pollutants released from the premises of Mukam Mining Project.