

Executive Summary

For

Mining of 60,000 TPA (ROM) of Bauxite

At

**Lamba Bauxite Mine, Survey No. 415/P (Old), 1883/P (New), Village
Lamba, Taluka Kalyanpur, District Devbhoomi Dwarka, Gujarat**

Land/Plot Area: 196780 m² (19.6780 Ha)

Production Capacity: 60,000 TPA (ROM) of Bauxite

Schedule 1 (a) Category–“B” as per EIA Notification 2006

ToR Letter No: SEIAA/GUJ/TOR/1(a)/610/2017 Dated: 30/04/2017

Study Period: October 2017 to December 2017

APPLICANT

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INTRODUCTION

M/s Industrial Minerals proposes Mining of 60,000 TPA (ROM) of Bauxite at Survey No. 415/P (Old), 1883/P (New), Village Lamba, Taluka Kalyanpur, District Devbhoomi Dwarka, Gujarat

PROJECT DESCRIPTION

Government of Gujarat has granted a Mining Lease of 19.6780 ha for Bauxite to Industrial Minerals. Industrial Minerals had applied for lease initially for 32.3748 ha and Government of Gujarat (GoG) issued a Grant order vide letter no. MCR-1580 (I-3)-7615-CHH dated 20.01.1983. However, due to some disputes with Industries and Mines Department, GoG, the lease was not executed. Subsequently, GoG has issued a revised Letter of Intent to grant Mining Lease vide letter No. RVZ 102011-RA-27-CHH-1 dated 30.06.2015. Mining lease was executed by GoG on 11.01.2017 as per the Oral order of Hon'ble Gujarat High Court dated 09.01.2017. Subsequently, GoG issued a corrigendum for Grant order vide their order no. RVZ-102011-RA-27-CHH-1 dated 21.01.2017. As per Rule 8(A)(2) of Amended MMDR Act, 1957, mining lease has been granted for 50 years. Lamba Bauxite Mine project is proposed for the production capacity of 60,000 TPA (ROM) of Bauxite. The mine lease is a piece of Government Waste Land and non-irrigated barren land. Total Geological Reserves are 11,53,324 tonnes estimated as per approved Mining Plan.

The project falls under Schedule, Mining of Minerals, Activity 1 (a), Category B under EIA Notification 2006 and amendments till date.

Proposed Project

The brief description of the project is given in **Table 1**.

Table 1: Project description

Sr. No.	Details	Description
General Description		
1	Nature	Mining of Bauxite by semi-mechanized open cast method
2	Product	Bauxite
4	Location	Survey No. 415/P (old), 1883/P (new), village Lamba, Taluka Kalyanpur, District Devbhoomi Dwarka, Gujarat
5	Latitude/Longitude	21°55'14.35"N/ 69°17'43.76"E (center of the site)
6	Total Plot Area	196780 m ²
7	Cost of the project	~INR 19.49 Lakh
Utilities		
1	Power	No power is required as the mining activities will be done by semi-mechanized method in daytime only
2	HSD	, ~3 lit/hr will be used as fuel for running pump for dewatering in rainy season that too for some time.
3	Water	22.36 KLD
Resource Estimation		
4	Total Geological Reserves	153324 MT
5	Rate of Mining and Life of Mine	Rate of Mining will be 60,000 TPA and life of mine will be around 9 years.

Manpower Requirement		
6	Direct Employment	Approx.. 32 (skilled and unskilled)
7	Indirect Employment	Approx. 20-30 for transportation, shorting of minerals, labours etc.

Mining Methodology

As per IBM approved mining plan, mining work will be carried out by Semi Mechanized Open Cast method. In this method Rock breaker are used to break bauxite into pieces. These pieces will be sorted out manually by labours in different grade.

Year wise Production plan

Detail of Bauxite production along with the waste generated in the approved five year mine plan will be as under:

Total Volume of soil removed in five year plan period will be 8858 m³ while ROM will be 62000 m³. Tonnage of ROM will be 155000 MT for five years out which recovery of Bauxite at 95% of ROM will be 147250 MT and 7750 MT (5 %) will be mineral waste.

Ultimate Pit Limit

At the end of life of mining, entire lease area leaving statutory barrier will be mined out with an average ultimate depth of 4.0 m. Ultimate Pit boundary is marked on approved Conceptual Plan. Mined out pit will be backfilled with generated waste and soil will be spread on backfilled area and will be covered by plantation of local spices. Remaining pit will be converted into Water reservoir that will be developed as Rain Water Harvesting Pit. Ground water in this area is ranges from 14 to 20 m below ground level (bgl). Hence, rain water collected in mined out pits will recharge the water table. These pits will be terraced and fenced.

Stacking of mineral reject and disposal of waste

In the proposed mining plan the waste likely to be generated in the form of associated clay with bauxite deposit, which is below threshold grade and has no sale value & can be treated as waste. The soil present in the proposed area will be excavated separately for the loosened soil, waste, the swelling factor considered is 1.3. The quantity of top soil and mineral waste likely to be generated during plan period will be 8858 m³ and 7750 m³ respectively.

It is proposed that the waste generated will be backfilled in south west part of mined out area simultaneously with mining and soil will be spread on backfilled area. As volume of voids is much more than material available for backfilling. Backfilling of the entire mined out land up to original ground level will not be possible. Therefore west part of mined out area will be backfilled and other part of the mined out are will be used as water reservoir. In the water reservoir the higher benches of excavated mining pit shall be terraced and plantation will be done for stabilized the slope.

As per approved mining Plan, total area under mining in five year mining plan will be around 17714 m² out which 3654 m² area will be backfilled and rest of the area will be developed as water reservoir.

Infrastructure

Pollutants

Air Emissions & Control

- Only exhaust gases due to vehicular movement are envisaged at negligible amount

- Dust generation during mining activities but in less amount as the mining will be done by semi mechanized technique.
- PUC certified vehicles will be used and regular water sprinkling will be done to reduce dust emission.

Noise & Vibration

Noise and Vibration will be generated due to mining machineries but it will be very less as no blasting is proposed.

Wastewater treatment & disposal

- Wastewater generated from domestic use will be disposed of into soak pit/septic tank.
- No other wastewater will be generated.

Hazardous & Other Solid Waste

- No Hazardous waste will be generated due to proposed mining.
- Solid waste in terms of over burden soil and mineral rejects will be generated.
- It will be used for back filling of mined out pits followed by soil cover on top.

DESCRIPTION OF THE ENVIRONMENT

Study Period, Area & Monitoring/Sampling Locations

The baseline environmental study has been conducted for the study area of 10 Km radial distance from site for the period 1st October to 31st December – 2017.

Total eight ambient air samples, eight groundwater samples, four soil samples, three surface water samples and two marine water samples were collected. Noise monitoring was carried out at eight different locations.

Summary of results is as under:

Land Use and Land Cover

The area surrounding the project site is largely a sea area covering around 30.15% of the total study area. Agriculture land like Crop land and Fallow land are covering around 28.80% and 6.98% respectively. Range land like Scrub land and Grass land occupies nearly 6.61 % and 9.25% respectively of the total study area. Pond/Lake is covering around 2.81% of the total study area. Wasteland like Sand, Stony waste and barren land is covering around 2.17 %, 4.98 % and 5.31 % respectively of the total study area. Settlement is covering around 0.95 % of the total study area. Forest land is covering around 1.19 % of the total study area.

Air Monitoring Meteorology

Micrometeorological data collected by using the weather station installed near project site as per CPCB guidelines. Following are the observations:

- Minimum and maximum temperature was recorded 12°C in December, 2017 and 42.8°C in October 2017 respectively.
- Hourly humidity data shows humidity ranges between 15% to 98%.

- Minimum and maximum wind speed data varies in the range of 0.1 to 15 km/h during study period. Maximum wind velocity was recorded in the month of November 2017.

Ambient Air Quality

The broad findings of the ambient air quality monitoring are:

- PM_{2.5} was observed in the range of 30.4 – 43.8 µg/m³. Maximum concentration of PM_{2.5} was found at Gangdi Village and minimum concentration at Maleta Village during the study period.
- PM₁₀ was observed in the range of 62.7 – 85.5 µg/m³. Maximum concentration of PM₁₀ was found at Gangdi Village and minimum concentration at Satapar Village during the study period.
- SO₂ concentration was observed in the range of 13.0 -22.2 µg/m³, which is well within the standard limit.
- NO_x concentration was observed in the range of 18.9- 30.4 µg/m³, which is well within the standard limit.

Noise Level

- Equivalent noise level was recorded 50.2 dB (A) at Project Site and it is 48.2 to 49.8 dB (A) in residential area during day time.
- Equivalent noise level was recorded 45.8 dB (A) at Project Site and it is 42.3 to 43.1 dB (A) in residential area during night time.

Soil Quality

Based on the soil analysis for its physical and chemical properties, variations observed for following parameters:

pH between 7.21 – 7.65, water holding capacity from 32.1 % to 36.2 %, texture clayey to silty clay, Total Nitrogen from 7.4 to 11.2 mg/100g, Total Phosphorous from 11.2 – 15.6 mg/100g, Available Calcium ranges from 22.1 – 25.1 meq/100g and Available Magnesium from 12.4 – 22.1 meq/100g.

Groundwater Quality

Total eight groundwater samples were collected from study area. The test results were compared with the Drinking Water Specification: IS: 10500, 1992 (2012) and summarized as under:

- pH was observed in the range of 7.04 – 7.78.
- Turbidity was found in the range of 1.4 – 3.4 NTU.
- Total Dissolved Solid (TDS) were recorded in the range of 608 - 4956 mg/L with minimum at Gangdi village and maximum at Navadra village.
- Conductivity varies from 930 to 7610 µmho/cm. The ratio of TDS to conductivity was observed from 0.6 to 0.65 which is within the desired range.
- Total Hardness was in the range of 250 to 1864 mg/L with minimum at Gangdi village and maximum at Navadra village.

- Total Alkalinity was found in the range of 230 - 1352 mg/L with minimum at Gangdi village and maximum at Navadra village.
- Chloride was found in the range of 160 to 2029 mg/L and Sulphate varies from 20.4 to 84.2 mg/L.
- Iron was found in the range of 0.18-0.45 mg/L with minimum at Gangdi village and maximum at Navadra village.
- Microbiological parameters MPN was found Nil.

Majority samples are having high TDS, Chloride and Total Hardness due to close proximity to sea and saline formations at top. It is advisable to drink such water after treatment from RO.

Surface water

Samples were collected from three locations. Following are the findings:

- During the analysis pH of the samples was found in the range of 7.17 - 8.08.
- TDS analysis was also carried out for surface water sample and it was found in the range of 221-1066 mg/L.
- TSS was found in the range of 8 – 16 mg/L.
- Total Hardness ranges from 124 – 304 mg/L with maximum in the water sample of Maleta and minimum in Project Site.
- DO is one of the important parameter to indicate towards the contamination of organic matter. DO level decreases as soon as organic contamination increases. During analysis DO was found in the range of 4.8-5.1 mg/L.
- COD and BOD analysis were also carried out during the study period and results were found more than the expected value. Various literatures show that BOD should be less than 4.0 mg/L for the better survival of aquatic life.
- Total Nitrogen was found in the range of 1.1 – 1.5 mg/L.
- Heavy metal analysis was also carried out and the Iron content was found in the range of 0.12- 0.34 mg/L.
- MPN test was also carried out for this surface water sample and it was found positive. It indicates towards the faecal contamination in surface water body.

As per classification of inland surface water standards, analysis results reveal that water cannot be used directly for drinking purpose as MPN as microbial test were found positive. This water can be used for washing and irrigation purpose. Bathing and drinking should not be allowed for this water body without disinfection.

Marine Water

Four Samples were collected from two locations during high tide and low tide. Findings are:

- Temperature is an important parameter, which affects the living organisms. The temperature of the water was less than ambient air temperature which define that marine water is not contaminated.
- The pH variation was observed in a narrow range of 7.54 to 7.60. pH range is maintained due to buffering action of CO_2 , CO_3^{-2} and HCO_3^{-2} .

- Salinity was observed in the range of 35470 to 38560 mg/L which is near to the expected value.
- DO is an essential parameter which affects the biotic component of the water. Fish and other aquatic life take oxygen through the gill. DO levels affect the aerobic bacterial population as well as chlorophyllous Phytoplankton. During study period maximum DO level was recorded up to 5.7 mg/L during high tide which is as per expected value.
- BOD an important parameter to define the environmental scenario of marine ecosystem which affects DO level, was found <4 mg/L in all the samples.
- Iron varies from 1.00 to 1.15 mg/L. Minimum value for Iron was recorded during High tide. Other Heavy metals were found well within the range.
- Microbiological and biological analysis was also carried out for marine water sample where MPN value was found in the range of 35 to 56 No./100ml . E-coli and streptococci results were found below detection range.

Based on the test result for the parameters DO and BOD it is interpreted that the Marine water quality is suitable for the survival of marine aquatic life as DO >4.0 mg/L and BOD value is below detection limit. Certain microbes survive at the DO level up to 0.8 mg/L and all biological marine organism can survive at the DO level >4 mg/L. Salinity has been found in the expected range. Iron content have been found more than the desired value and other heavy metal parameters have been found within the expected range. High concentration of Iron may be due to the sediment composition.

Ecology and Biodiversity

Study area has 30% sea shore and 70% terrestrial. No any major forest observed in the study area, the wild life distribution is meagre. There is absence of schedule I species or endangered species in core and buffer area. None of the sighted faunal species can be assigned endemic species category of the study area. Mining operation may affect the crop productivity of nearby area, as agriculture fields are very close to lease. An urgent need to protect agro-biodiversity of the area by using good practice in bauxite mining such as controlled wet blasting, 5m high boundry on periphery; regular water sprinkling and manual mining instead of Mechanized mining, plantation over benches, rainwater harvesting and its use in irrigation and restoration of mine pits. The effective plantation will be done in periphery i.e. 10 m wide in 3 tier green belt development.

Socio Economy

The summary of the social survey for the study area is provided as below:

- Population and its distribution: There are 9 villages, with a total population of 33,361. The Population density in the study area varies from 74 – 254 person/sq. km.
- Sex ratio: It is in the range of 921 – 1016 (number of females per 1000 males) with lowest in Lamba and highest in Navadra village

- Literacy Rate: Among other villages Lamba is having highest literacy rate *i.e.* 62.27 % and lowest is in Navadra *i.e.* 46.62 %.
- Jodhpar village has significant employment *i.e.* 43.86 % as main workers, while the lowest employment as main workers in Chachlana village *i.e.* 28.03 %. Almost all the villages have more than 50 % people as non-workers.

IMPACT AND MITIGATION MEASURES

Air Environment

Dispersion modeling (using “AERMOD” modeling software) was carried out for point source.

This indicates:

- Maximum PM concentration at project site was 83.20 $\mu\text{g}/\text{m}^3$.
- There will be incremental increase in GLC of PM in the range of 2.0 $\mu\text{g}/\text{m}^3$ at the distance of 173 m in south from the project site.
- At all other locations, incremental increase in GLC is in the range of 0.02 to 0.34 $\mu\text{g}/\text{m}^3$.
- All values are well within the prescribed NAAQ standards, 2009.
- Air impact are not expected to cause any effect on vegetation and human settlements in the vicinity of the project site

Mitigation measures for air quality impacts are:

- Regular water sprinkling will be done to reduce dust emission.
- PUC certified vehicles will be used to reduce exhaust emission.
- Greenbelt will be developed to reduce the dispersion of pollutants outside the premises.
- Effective water spraying will be done on the access roads to control re-entrained dust during dry season.
- Proper PPE like dust masks will be provided to workers and its use ensured;
- Tarpaulin sheet cover on trucks carrying bauxite to avoid the dispersion.

Noise and Vibration Environment

Due to the proposed activities the noise will be generated from Vehicular movement and mining machineries.

Control measures to reduce noise will be provided like silencers on vehicles. Blasting is not proposed and hence there will be very less vibration generated due to machineries. Control measures in the form of use of suitable PPE (ear muffs or ear plugs) will be provided.

Water Environment

Water requirement for the proposed mining activities will be 22.36 KLD out of which only 1.44 KLD will be used for domestic purpose and rest water will be utilized for dust suppression and plantation. For dust suppression, water stored into mined out pits will be utilized while water for domestic purpose will be sourced through tankers from nearby village.

Water Reservoir will be developed at end of the mine life. This water will be naturally recharge ground water and increase groundwater condition in the surrounding area.

Land Environment

Land clearance will be done leading to removal of top soil, which will stack separately and will be again spread on top after back filling of the area. Plantation will be done on it.

Mining activities will change topography. It will change for temporary during mining activities. Land reclamation will through back filling will be done concurrently. Water reservoir will be developed in remaining part of the mined out pits.

Biological Environment

Removal of common site specific floral species from project site will not have significant or permanent impact on the habitat structure of associated faunal or floral diversity.

Mining activities will generate noise, dusting and vibration but will be confined to mining lease only. It will considerably reduce due to mitigative measures like regular water sprinkling, use of certified equipment and use of PUC certified vehicles.

At end of the mine life, plantation will be done on reclaimed area and development of water reservoir will generate additional habitants for flora and fauna.

Traffic Study

LOS values have been calculated based on traffic data on SH-6 and it has been found 0.50. LOS value indicates that the performance of SH-6 is good. Due to upcoming project, traffic load will increase by 10 dumpers per day for transportation of materials and 3 to 5 vehicles for transportation of manpower, water etc. There will be negligible increase in traffic load due to proposed project and hence there will be no impact on existing road networks.

Green Belt Development

As per approved mining plan, 250 saplings will be planted covering 1250 m² area during plan period. Backfilling area will be 3654 m² as per mining plan. Thus, a total of 2404 m² area become available on which additional plantation can be carried out. Around 96 additional saplings can be planted on that area per year, considering 5m² area for each sapling.

Total area under the statutory barrier is 16652 m² on which about 3330 saplings can be planted up to the life of mine, considering 5 m² area for each sapling. Life of Mine is estimated as 9 years. Therefore, about 370 saplings can be planted per year. Therefore, Total 516 saplings can be planted per year, it includes 50 as per mining plan proposal, 96 additional saplings on backfilled area and 370 additional saplings in statutory barrier.

Socio-Economic Environment

The upcoming project will generate direct and indirect employment opportunities for local people.

ENVIRONMENTAL MONITORING PLAN

The following will be monitored on a regular basis during mining operation phase to ensure that a high level of environmental performance is maintained:

- Ambient air monitoring of PM₁₀, PM_{2.5}, SO₂ and NO_x will be carried out during the operational phase within site premises and nearby villages, location of downwind direction, once every season
- Groundwater sample from site or nearby location once in pre and post monsoon season.

ADDITIONAL STUDIES

Socio Economic Development Activities

Socio-economic development activities towards community welfare in the field of education, health care services, sanitation, & infrastructure development programs in the study area will be based on the need of the community.

Risk Assessment

Likely hazards identified and related risk involved (impact) during mining activities are mainly related to health issues, injuries, fall, accidents etc. of workers. Mitigation measures suggested are by providing proper PPEs and adequate safety measures.

Occupational health and safety

Only due to excess noise and dusting, health of workers may affect. So it will be ensured that all workers will wear ear plugs, muffs and nose mask etc. The project also envisages conditions that could lead to accidents, falls etc. Hence, it will be ensured that proper safety training and suitable PPEs to workers will be provided.

PROJECT BENEFITS

Due to the proposed project following benefits are envisaged for the locals and country:

- Availability of Bauxite for captive use as well as sale to various ceramic, refractory and metallurgical companies.
- Improvement in social infrastructure in terms of generation of new direct and indirect employment for nearby areas will be taken up for upliftment the conditions of the people living in nearby area.
- Generation of water reservoir and plantation in land reclaimed area will improve ground water condition, ecological condition in the study area.

ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan for suggested mitigation measures and monitoring plan will include:

- Review of Compliance of EMP, EC & statutory conditions in the management meeting
- Preparation and timely submission of required statutory reports & Cess
- Reviewing time bound action plan for imparting training to drivers and workers and availability of TREM cards
- Reviewing annual performance of EHS in board meeting

An Environmental Management Cell with adequate professional expertise and resources shall be established to discharge responsibilities related to environmental management including statutory compliance, pollution prevention, environmental monitoring, etc.

Industrial Minerals will have Environmental Management Cell headed by Mines-Head and Mines Manager and supported by EHS In-charge & staff members.

CONCLUSION

Based on the EIA study conducted in post monsoon season of 2017 and as per terms of reference given by SEAC dated 30th April, 2017, the following highlights emerge:

- There are no Protected Areas, Critically polluted areas, Eco-sensitive areas, Interstate boundaries and international boundaries located in 10 kms of study area from the proposed project site.
- There will be negligible pollution potential on air, water and noise environment, which, with the implementation of the mitigation measures and EMP, can be reduced considerably.
- The proposed project activities will have positive beneficial effect on the local population, economic output and other related facilities *viz.* employment, development of business, transportation *etc.*

Looking to the overall project justification, process, pollution potential and pollution prevention measures /technologies installed by proponent, environmental management activities of proponent; the proposed project would be environmentally acceptable, in compliance with environmental legislation and standards.