



BHILAI STEEL PLANT

(STEEL AUTHORITY OF INDIA)

Bhilai – 491 001

Executive Summary

***Environmental Impact Assessment and
Environmental Management Plan for Pandridalli and Rajhara Pahar
Lease (220.42 Ha) of Bhilai Steel Plant, M/s SAIL for Capacity
3.5 MTPA ROM at Iron Ore Complex (IOC) Dalli-Rajhara,
Tehsil: Dondi, Distt : Balod, Chhattisgarh-State***

Schedule 1 (a) – Mining of Minerals

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Prepared by

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CHAPTER - X

SUMMARY AND CONCLUSION

10.1 Preamble

Steel Authority of India Limited (SAIL) is the leading steel-making company in India. It is a fully integrated iron and steel maker, producing both basic and special steels for domestic construction, engineering, power, railway, automotive and defense industries and for sale in export markets. The company is ranked amongst the top ten public sector companies in India in terms of turnover, SAIL manufactures and sells a broad range of steel products, including hot and cold rolled sheets and coils, galvanized sheets, electrical sheets, structural's, railway products, plates, bars and rods, stainless steel and other alloy steels. Bhilai Steel Plant (BSP) is India's sole producer of rails and heavy steel plates and major producer of structural has won Prime Minister's Trophy for best Integrated Steel Plant in the country for Nine –times. The growth of mining / industry significantly contributes towards economic progress of the country. However, any project progress brings along with it a number of environmental problems. Many of these problems can be avoided, if adequate environmental control considerations are thought of during conceptual stage of the project. After Bhilai Steel Plant post expansion, the iron ore requirement for BSP will be about 12 MTPA from 9 MTPA at present In the view of more the demand of Iron Ore BSP has decided to enhance the excavation of Run of Mines (ROM) capacity to 3.50 MTPA from **Pandridalli Rajhara Pahar lease (220.42 Ha) which is one of the prime sources to supply Iron ore to Bhilai Steel Plant (BSP)**. The mines was in operation from the year 1958

Pandridalli Rajhara Pahar lease (220.42 Ha) situated at about 95 km towards south from Bhilai in Balod district in the state of Chhattisgarh. The Mining Lease renewed by MRD, Govt of Chhattisgarh VIDE F 3-42/2003/12, for a period from 28.04.2003 to 27.04.2023. The lease comprises of Reserve forest 100.76 Ha. & Revenue land 119.66 Ha. **Forestry Clearance granted by MOEF& CC, Gol vide F.N0.8-58/2003-FC dated-6/4/2004, over an area of**

100.76 Ha making it coterminous to mining lease up to 27.04.2023. Air & Water consent available for the mining lease.

As per EIA- Notification'2006, It is proposed to obtain Environment Clearance well before capacity expansion & renewal of lease.

10.2 Project Details

Location

Rajhara mechanized mine is situated at about 95 km towards south from Bhilai in Balod district in the state of Chhattisgarh and the mining lease called Pandridalli and Rajhara Pahar Lease

- Topo sheet No. 64H/2
- Pandridalli & Rajhara Pahar Lease lies in between the co-ordinates
Latitude 20° 33' 00" to 20° 35'00" N
Longitude 81° 04' 45" to 81° 07'03" E

Proposed Method of Mining

Presently no change is proposed in method of mining, however a possibility of enhancing equipment size particularly shovel and dumpers for enhancing capacity of mines in present setup is explored. In near future it is expected that higher capacity dumper up to 60/80 T, pay load capacity may be introduced with matching volumetric capacity of shovel for achieving the proposed rate of excavation at Rajhara Mechanised Mine. It also propose to provide one mobile crusher capacity of 1 MTPA within the lease hold area to accommodate excess ore after modernization & capacity enhancement of the mine. Design Parameter has been done by interactive open pit module of Datamine studio 3. It is desirable firstly to get economic an ultimate pit shell by Lerch-Grossman 2d/3d algorithm or floating cone method. But no ultimate pit shell has been prepared based on economic model considering the fact that the cost of iron ore in prevalent market The ultimate pit has been prepared by toe-ramp-crest method and worked between 283 -533 mRL for

Rajhara Mechanised Mine and whereas in Kokan (East) Mine worked 470 mRL-570 mRL. The ultimate pit shell has been designed so that statutory obligation of working 7.5 m inside the mining lease boundary is followed. The ultimate pit slope has been maintained at lift of every 30 m, for this purpose varying berm width has been used in batch of 3 benches for Rajhara Mechanised Mine and 6 benches Kokan (West) Mine respectively. Present lower most working in Rajhara is 383mRL. About 7 benches in waste and 8 benches in ore are now opened. In kokan (west) mine almost 5 benches are operating for waste removal and 8 benches are opened for ore.

Entire ore of Rajhara Mechanised Mine and Kokan (west) processed through crushing screening plant. Sub grade material is properly blended with high grade ore resultant there is no ROM reject. Ore of Kokan (west) mine is being processed at Rajhara Crushing Plant which is dry circuit process. There is no mineral reject.. As the mining activity in the lease hold area being done since last more than 50 years and almost mineralized zone is exposed and can be considered as broken area except in some part of hang wall slopes where encountering the top soil merely not available.

Manpower requirement

The requirement of manpower at the rated capacity of 3.5 MTPA of ore has been estimated as 662 numbers.

10.3 Description of Environment

Meteorology

Predominant wind was from South-west quadrant. Wind velocity was ranging from <1.0 to 24.6 Kmph. Temperature values were ranging from 16.5 °C to 43.0°C. The mean relative humidity value was found to be ranging from 35.4 – 69.9 %. Sky was clear during the study period. A total rainfall of 11.2 cm was recorded during the study period.

Air Environment

Pre Monsoon (March – May 2015)

Core-zone: PM10 and PM2.5 values were ranging between 48 and 83 $\mu\text{g}/\text{m}^3$ and 20 and 38 $\mu\text{g}/\text{m}^3$ respectively. The SO_2 and NO_x values were ranging between 14.8 and 22.6 $\mu\text{g}/\text{m}^3$ and 21.2 and 28.3 $\mu\text{g}/\text{m}^3$ respectively.

Bufferzone (March – May 2015) : PM10 and PM2.5 values were ranging between 37 and 86 $\mu\text{g}/\text{m}^3$ and 16 and 39 $\mu\text{g}/\text{m}^3$ respectively. The SO_2 and NO_x values were ranging between 8.2 and 22.7 $\mu\text{g}/\text{m}^3$ and 10.3 and 28.3 $\mu\text{g}/\text{m}^3$ respectively.

All CO values except in three locations in (corezone & crushing plant) were found to be below the detectable limit of $<114.5 \mu\text{g}/\text{m}^3$. The maximum CO value observed was found to be $<572.5 \mu\text{g}/\text{m}^3$. All heavy metal, Benzene and BAP values were found to be Below Detectable Limit. There is a traceable amount of NH_3 and O_3 , which is negligible while comparing with the prescribed AAQ standards. Based on the above discussions, it may be concluded that air quality data was found to be well within the prescribed limit.

Noise Levels

Core Zone: The Day and night time Leq Noise levels were ranging from 64.9 dB(A) to 65.8 dB(A) and 57.9 dB(A) to 58.2dB(A) respectively.

Buffer Zone: The Day and night time Leq Noise levels were ranging from 48.6dB(A) to 66.4dB(A) and 36.5dB(A) to 57.1dB(A) respectively.

The Noise level values were found to be well within the CPCB limit prescribed by CPCB.

Water Environment

Ground water

At all locations, pH values were in the range of 7.19 – 7.83 with agreeable colour, taste and odour. Chloride and Sulphate values were in the range of 112 – 392 mg/l and 68 – 246 mg/l respectively. Hardness values were found to be in the range of 271 – 1033 mg/l. The maximum Flouride value reported was 0.18 mg/l. At all locations, oil and grease, phenolic compounds, cyanides, sulphides and insecticides were found to be absent and all heavy metal except iron values were found to be below the detection limit. The maximum Iron value was found to be 0.16 mg/l. At all location the Total Coliforms found to be absent.

Surface water

pH values were found to be in the range of 7.35 - 7.67. At all locations Oil & Grease, Phenols, Cyanides, Sulphides and insecticides were found to be absent and most of the heavy metals values were found to be below the detectable limits. The low level of BOD and COD values shows that the surface water is not contaminated due to other pollution sources and human activities.

Hydrogeology

The Hydrogeology study reveals that the pre-monsoon water levels vary from 2.46 m to 9.95 m with an average of 7.35 m and the post-monsoon water levels vary from 0.85 m to 8.86 m with an average of 4.68 m. The average water fluctuation in the area was found to be 2.67 m. As per, CGWA norms, the trends reveal that the groundwater exploitation in the study area is well within the acceptable limits.

Land-use Pattern

Remote sensing satellite Imageries were collected and interpreted for the 10 Km radius study area with project site as center. Based on the satellite data

land -use / land cover maps have been prepared delineated in chapter III of EIA/EMP report.

Flora & Fauna

The environment has not supported foreign visitor birds since the entire zone (core and buffer) is devoid of large water bodies. There are no ecologically sensitive/fragile areas such as Wild life Sanctuaries, National Parks, and adjoining National Monuments, areas of cultural heritage, ecologically fragile areas, areas rich in biological diversity, gene pool, etc located on the proposed stretch. There are no known rare, endangered or ecologically significant animal and plant species. Except for a few wild species of plants and grasses and a few animals that are very commonly spotted in any rural environment, the study area does not have any endangered or endemic species of animals and plants. The conservation plan for Fauna is explained in Chapter – IX

Socio economic

As per 2011 census, the study area consisted of **32299** persons inhabited in 37 villages. The configuration of male and females indicates that the males constitute to about 49.34% and females to about 50.66% of the study area population. The study area at an average has 1027 females per 1000 males.

In the study area 9.52 % of the population belongs to Scheduled Castes (SC) while 45.29 % to Scheduled Tribes (ST), thus indicating that about 54.81% of the population is formed by SC and ST population. Scheduled Caste and Scheduled Tribe sections are predominant in this area. The study area experiences a moderate literacy rate of 78.05%. The male literacy i.e. the percentage of literate males to the total males of the study area is observed as 62.06% while female literacy rate, which is an important indicator for social change, is observed as 69.95 % in the study area. The total workers found be 46.87 % of total population which contributes 32.93% of main workers and 21.05% of marginal workers. The non workers were found be 46.01%. The cultivators are the major working group among main workers which found be 58.02%.

The Educational facilities, Healthcare facilities, Water supply, Communication facilities, Banking facilities, Road and Transportation facilities, availability of news papers & magazines etc., are available in the area. The power supply for agriculture and household purpose are available in most of the villages. The handpumps and borewells are available in most of the villages. Dalli Rajahara is the nearest town for almost all villages in the study area. Medical and Engineering colleges are available in Raipur and Durg which is 125 & 90Km distances from the study area respectively. A well equipped 50 beds Hospitals is being run and maintained at Rajhara by SAIL- BSP. The Hospital is having facilities like mini ICU, Operation Theatre, X- Ray, pathological lab, Ultra sound, specialties doctors etc. with 04 numbers of Ambulances. The Villagers in the study area still cultivate their land in a traditional pattern and they are dependent mostly upon seasonal rain. These BSP projects have directly or indirectly created various opportunities of employment in the region.

10.4 Anticipated Environmental Impacts and Mitigation Measures

Impact on Land use

The topography within the mining area will have marked changes in the quarry area, the dump area and the mining equipment area. No appreciable change in the topography is anticipated outside mining area. Total scenario of landscape and land use pattern will undergoes a stark change within the mining area. As being an existing mine no significant impact anticipated.

Impact on Air Quality

The major source of air pollution into the atmospheric environment are:

1. Removal and dumping of over burden
2. Drilling and blasting operations
3. Extraction of ore by machinery.
4. Loading of ore into trucks.
5. Dump yard waste material.
6. Crushing Plant

Predicted Ambient Air Quality

The maximum predicted concentration was found during winter season in Core zone

Post project Scenario ($\mu\text{g}/\text{m}^3$)

Air Environment in Core zone - Post project Scenario ($\mu\text{g}/\text{m}^3$)24 hourly concentrations	Suspended Particulate matter(PM10) (max)
Baseline Scenario(max)	83
Predicted Ground level Concentration(max)	8.6
Resultant concentrations	89.62
NAAQ standards	100

It is cleared from the predicted values that the concentrations of PM 10 are below the limits of NAAQS (for mines and residential & rural area).

Impact on Noise Level

Once the mine becomes operational, there would be various sources of noise in the area. These sources would be drilling, blasting operation of HEMM, Crusher and Workshop, Vehicular Movement and Belt Conveyor. Mining operations and the ore crusher would be the main sources of noise pollution. Noise due to vehicular movement will be intermittent, but will also add to the background noise level. It is being observed that at the mine site where heavy earth moving machinery is in operation, noise level is more than the stipulated 90 dB (A) per DGMS Circular, No 18 (Tech) of 1975. The noise level is within the tolerance limit at a distance of 15 to 20 m or so. The sound pressure level generated by a noise source decreases with increasing distance from the source due to wave divergence.

Socio economical impacts and infrastructural developments

In terms of the major socio-economic impacts, the project will provide more direct and indirect job opportunities and better economic standards to the people and others, through improved infrastructural, community facilities etc. Development of residential colony, creation of civic and welfare amenities like primary health care, communications, educational institutes, recreational facilities, etc, that will develop along with the project will ensure better quality of life for the local population. The increase in income opportunities and - employment potentialities in this sector is anticipated as the mining activities increase, the other economic sectors starts gaining in momentum. With added educational, medical and communication facilities developed in the areas, the standard of living has improved. With ongoing of mining activities additional facilities for local population by way of better communication, postal services, educational facilities, advanced medical services etc. are on in the area. There is a marked change in social status of the area with opening of the project. State Government is benefited through financial revenues in crores of rupees by way of royalty, District Mining Fund (DMF) and National Mineral Exploration Trust (NMET) etc. and Central Government will also be, benefited by way of GST.

Impact on flora and fauna

There will be positive impact on flora and fauna due to the proposed plantation activities and the conservation plan proposed for the forest and wild life. The negative impacts are mainly due to Mining activities such as excavation for quarry, erection & development of plants, service & allied structures, colony, roads, drains, culverts, etc. These activities will guide to forest degradation, lost of vegetation cover and ecological changes.

Mitigative measures

Secondary Employment opportunities

There will be spontaneous economic stimulus in the area with the commencement of opencast mine. Traders and private enterprises will grow in the area with this economic growth. Besides, the State exchequer will derive financial revenues through levy of royalty, District Mining Fund (DMF) and National Mineral Exploration Trust (NMET) etc. and Central Government will also be benefited by way of GST.

Medical Facilities

The project authorities have adopted following measures to prevent occupational diseases and health hazards.

- Pre-employment, pre-placement and periodic medical examination of employees.
- Regular monitoring of working environment and implementation of safety and control measures, to prevent hazards.
- Use of protective equipments, clothing, helmets, Gas mask, shoes, etc.
- Periodical medical examination-of every worker is done once in five years to detect preventable and curable diseases at an early stage.
- Cases suspected having Pneumoconiosis is examined by a Special Board constituted by the Chief Medical Officer. Established cases are suitably compensated and their job is changed if required.

Literacy Drive

An action plan for achieving 100% literacy among workers to be implemented by establishing Educational Institutions / adoption with modern facilities.

Planning of OB dumps

The Mining Lease is sufficient to accommodate total waste from Rajhara mechanized mine. The top profile of dumps will be merged with natural contours. The ideal slope should be less than 28°. To avoid rain washout & silting at valleys, the dumps need to be terraced and moon scaping will be effected for biological restoration of the dumps. The dump dimensions varies site to sites. It is recommended to maintain the VI: HE ratio (Vertical Interval & Horizontal Equivalents). As far as practicable terrace height will be kept not higher than 30 m with a spread of 100-150 m (max). Dump toes need not be made absolutely flat and may be left uneven as vegetation barrier should be provided at the bottom of the dumps. Bushes, grass, cactus etc. may initially be planted for stabilization of loose materials at the slope area.

Precautions and protective measures of dump

- Dump slopes are maintained at the natural angle of repose of 28°.
- Properly laid out surface drainage to prevent water logging at the surface, gulling, scouring and wash-off.
- Check embankments at the foothill scheduled periphery to arrest wash-off. Earthen backfill and boulder have been used to make the embankment at the main waste dump.
- Benching/ terracing wherever possible.
- Stabilization of all old/ inactive dumps by afforestation, allowing natural regeneration through seeding, enlacing check parapets at all probable gully point and allowing natural mulching.
- Sequential segment dumping in active dumps with subsequent stabilization

Control measures for air pollution

Following air pollution control measures are being done and will be practiced within the mining area and at ore handling plants.

- Saplings planted on OB dump, road side and colony to arrest dust.

- Mobile water sprinklers deployed in mine.
- Stationary sprinkler installed in the mine haul road from mine entry.
- Overloading of trucks is strictly prohibited.
- Ore transportation through covered trucks
- Optimum blast hole geometry will be followed to reduce the dust during blasting.
- Regular monitoring of ambient air quality of the project area & its surroundings villages

Management of surface water drainage

Garland drains will be made around the periphery of the quarry. These garland drains will be connected to the collection sump and pumped to the Industrial Rajhara Dam site through pipeline. In the workings, heavy duty pumps will be deployed in rainy season which will throw the accumulated water from the working face into these garland drains. As the extraction of the quarry advances, the position of garland drain will also advance. Thus these garland drains will drain of the rain water away from the workings.

Control measures for Noise

- Innovative approaches of using improvised plant and machinery designs, with in-built mechanism to reduce sound emissions like improved silencers, mufflers and closed noise generating parts
- procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin
- confining the equipment with heavy noise emissions in soundproof cabins, so that noise is not transmitted to other areas
- regular and proper maintenance of noise generating machinery including the transport vehicles and belt conveyors, to maintain the noise levels

- blasting operations to be carried out only during daytime so as to avoid high noise intensity in night time
- provision should be made for noise absorbing pads at foundations of vibrating equipment to reduce noise emissions
- thick green belt should be provided at the mine periphery, within the mine lease area along the roads and all around the working areas, to screen the noise.

Blasting Vibration Control Plan

- Peak particle velocity or ground vibrations for safety of nearby structures and residential buildings should be well within 12.5 mm/sec
- to contain fly rocks, stemming column should not be less than the burden of the hole, and the blasting area should be muffled
- short delay detonators should preferably be used in blasting rounds rather than detonating fuse as trunk line
- detonating fuse, if used, should be covered at least with 150 mm thick cover of sand or drill cuttings
- blasting should be carried out in the daytime, as during the night time the sound intensity becomes higher
- blasting should not be carried out when strong winds are blowing towards the inhabited areas
- Each blast should be carefully planned, checked, and executed under the supervision of a responsible officer. Blasting data / observations should be recorded
- Bruggs mesh shall be provided as and when required for arresting any fly rocks and boulders from mining operation

Green Belt Development

Green Belt around Mine

In the directions where natural forest does not exist, there is need for creating green belt of adequate width as an effective dust and sight curtain in the periphery of mining area. The trees planted in the green belt area shall act as buffers and shock

absorber against dusts, noise and stone flying. The trees in the green belt will be tall, wind firm, broad leaved and evergreen.

A green belt of adequate width on either side of the haul road will be raised and the existing vegetation will be protected. The plants will be raised at spacing of 2.0x2.0 meter. Along the roads other than the haul roads also, dust resistant plants as mentioned above will be planted.

Mine closure plan

The extent of impacts due to mine closure and mitigation measures to prevent or minimize them are classified under the following heads Viz Environmental Aspects, Technical Aspects, Social Aspects and Safety Aspects which is explained in Chapter IV.

10.5 Environmental Monitoring Program

The Environment Management Department (EMD) of BSP will be entrusted with this responsibility. The officers of EMD will assess the progress and analyze the data periodically. It will look after the following aspects of environmental management.

- Generation of environmental data bank.
- Evolving micro environmental management plan for the project in collaboration with other agencies and consultants. Monitoring project implementation along with environmental control measures.
- Co-ordinate with other project activities to ensure timely implementation of the project.
- Co-ordination with Ministry of Environment & Forest, Central/State Pollution Control Board for prevention and control of water and air pollution.

10.6 Risk Assessment

Risk assessment were carried out by considering the following aspects

- To identify the potential hazardous areas so that necessary design safety measures can be adopted to minimize the probability of accidental events.
- To identify the potential areas of environmental disaster which can be prevented by proper design of the installations and its controlled operation.
- To manage the emergency situation or a disastrous event, if any, from the plant operation.

10.7 Project benefits

The BSP authorities have adopted following measures to prevent occupational diseases and health hazards.

- Pre-employment, pre-placement and periodic, medical examination of employees.
- Regular monitoring of working environment and implementation of safety and control measures, to prevent hazards.
- Use of protective equipments, clothing, helmets, Gas mask, shoes, etc.
- Periodical medical examination of every worker is done once in five years to detect preventable and curable diseases at an early stage.
- Cases suspected having Pneumoconiosis are examined by a Special Board constituted by the Chief Medical Officer. Established cases are suitably compensated and their job is changed if required.

There will be infrastructure development in the near by village which are as follows.

- Construction of Pond/Deepening of existing pond.
- Construction of School Building
- Construction of Bore Wells for drinking water supply
- Construction of Dispensary Building/Panchayat Bhawan
- Construction of Children Park.
- Construction of Road, culverts and drains

10.8 Environmental Management plan

The objectives of the proposed EMP are aimed for meeting five basic requirements

- To integrate comprehensive monitoring and control of impacts.
- To comply with the environment protection regulations.
- To ensure that adverse environmental impacts on the baseline are minimized, and
- To plan for ecologically sustainable development (ESD) within the frame work of existing legislation and environmental management policies.

The detailed EMP is delineated in chapter IX.

10.9 Consultant Credentials

Richardson & Cruddas (1972) Ltd., Chennai

A Govt. of India undertaking under Ministry of Heavy Industries and Public Enterprises, one of the pioneers in the field of Environmental Engineering for the past three decades. R&C Laboratory is recognized as Environmental Laboratory by the Central Pollution Control Board (CPCB), Ministry of Environment & Forests (MoEF) under the Environmental Protection Act, 1986 and is, also, recognized by Tamil Nadu Pollution Control Board for carrying out air and waste water emissions monitoring as per Air (Prevention and Control of pollution) Act, 1981 and Water (Prevention and Control of Pollution) Act, 1974. We are also recognized by various other State Pollution Control Boards as Environmental Consultants for such studies.

R&C is regularly undertaking EIA / EMP, DMP, Risk Analysis, Pollution Atlas, Prediction Modeling studies besides ambient air, stack emission, water/ wastewater/sewage, sediment/ soil quality monitoring, analysis & operation and maintenance of Treatment plants.

ABC Techno Labs India Private Limited

ABC Techno Labs India Private Limited (Formerly ABC Environ Solutions Pvt. Ltd) has been involved in the development and execution of Environmental Impact Assessment, Environmental related studies and environmental testing services. We have worked on Environmental Health and Safety (EHS) studies for both private and public institutions, at the national level and are particularly strong with large infrastructure and industrial projects.

Accredited by **National Accreditation Board for Education and Training (NABET)**, a division of **Quality Council of India (QCI)** and it has recognized our organization as an Environment Consultant Organization to carryout Environmental Impact Assessment Study and environmental Management Plan based on the resources available with our organization including technical expertise of consultant, resource persons, their educational background, as well as experience and expertise.

ABC has extensive experience in the overall management of an EIA and environmental related studies and the various methods and research techniques required for it. ABC Techno Labs India Private Limited's multidisciplinary consulting services allow us to conduct soil investigations, ecological studies, noise assessments, air and water, wastewater analysis and assessment, evaluations of Best Available Technologies (BAT), socio-economic assessments, and other related studies, necessary for modern EIA and environmental related studies.