



JAIPRAKASH ASSOCIATES LIMITED

**EXECUTIVE SUMMARY
OF
ENVIRONMENTAL IMPACT ASSESSMENT
AND
ENVIRONMENTAL MANAGEMENT PLAN
OF
MANDLA NORTH UNDERGROUND COAL MINE
IN
VILLAGES SETHIYA, DEVRI, BICHHUWA AND
SANWALA DHANA,
PENCH- KANHAN COAL FIELDS,
DISTRICT CHHINDWARA OF MADHYA PRADESH
(EXTENT 10.41 SQ.KM, COAL PRODUCTION 1.5 MTPA)**

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**EXECUTIVE SUMMARY OF EIA/EMP OF
MANDLA NORTH UNDERGROUND COAL MINE
IN CHHINDWARA DISTRICT, MADHYA PRADESH**

1.0 INTRODUCTION

M/s Jaiprakash Associates Ltd. is one of the companies under Jaypee Group of Industries. The company operates cement plants and coal based thermal power stations. In order to fulfill the demand of coal for its proposed cement plants, Jaiprakash Associates Ltd. approached Ministry of Coal (MOC), Government of India and was allotted Mandla North Coal Block in Pench-Kanhan coal fields.

The total block area is proposed for developing as two separate mine units. The western part will be called mine unit no. 1 or Mandla West Mine and eastern part as mine no. 2 or Mandla East Mine. The Mandla West Mine would produce 1 MTPA and East Mine 0.5 MTPA. The rated capacity of the proposed underground project is envisaged as 1.5 MTPA of non-coking coal. The total mine lease area is 10.41 sq.km lying within the villages Sethiya, Devri, Bichhuwa & Sanwala Dhana. Nearly 80% of the block is covered by forests.

1.1 Location and communication

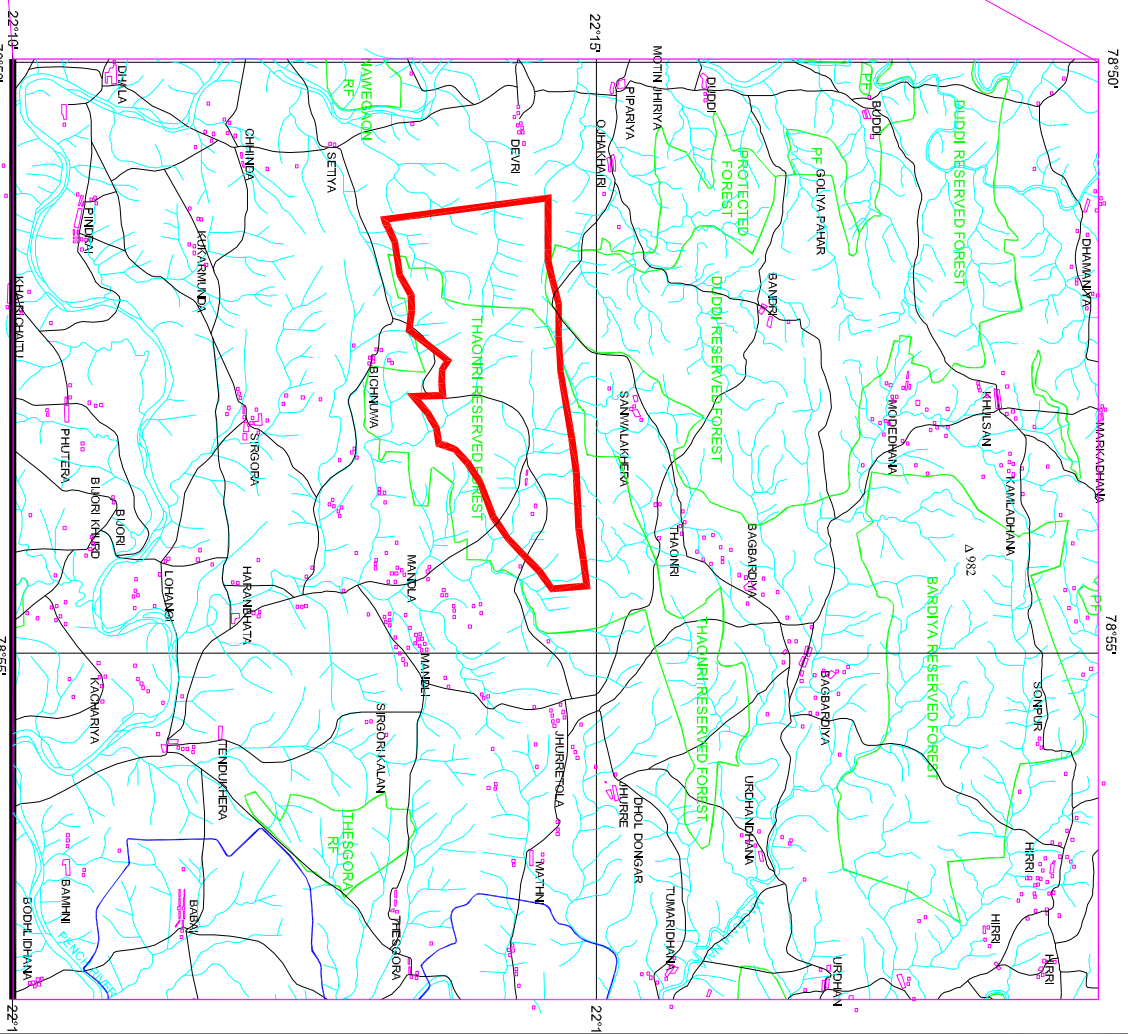
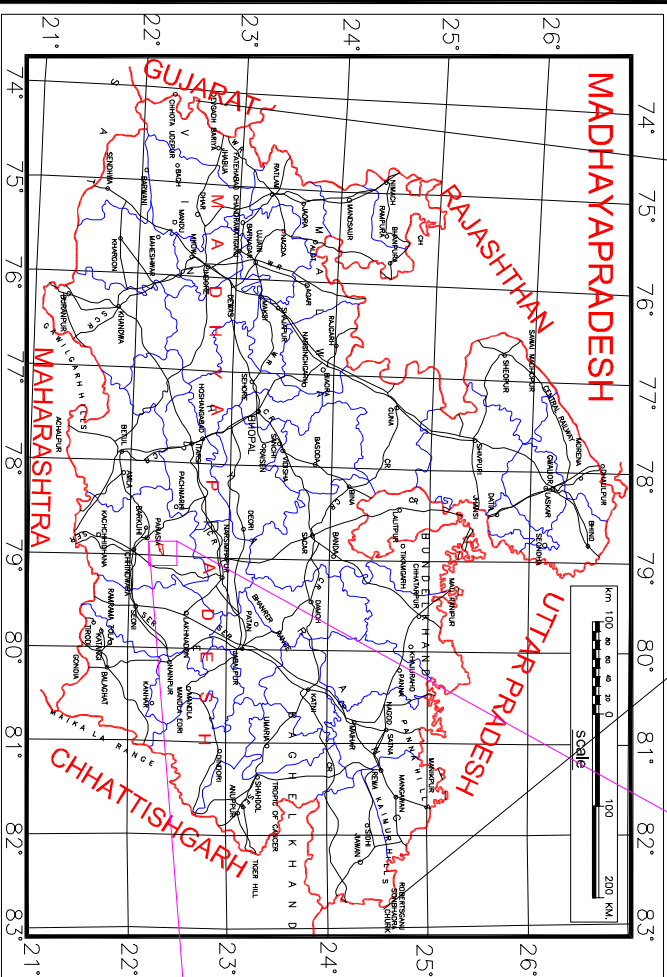
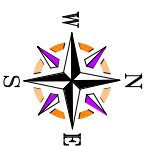
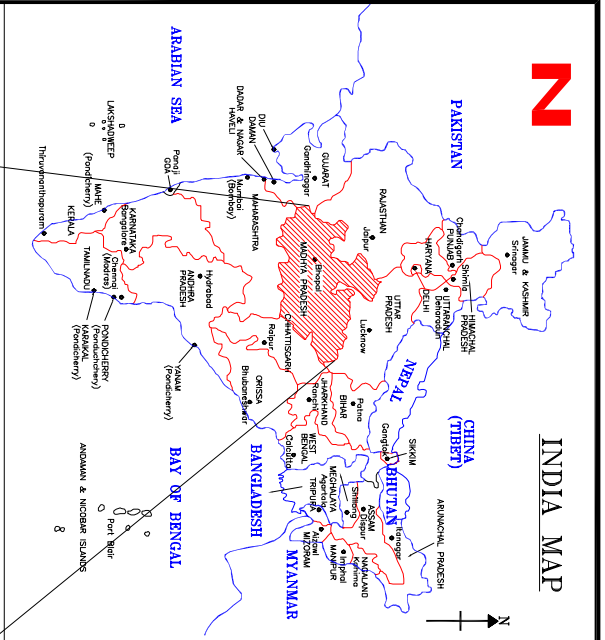
The Mandla North Underground Coal Mine is located in Pench-Kanhan coal fields, Chhindwara district of Madhya Pradesh. The area falls in Survey of India topo sheet No. 55 J/16 in Chhindwara district of Madhya Pradesh. The location of the proposed mine is shown in Fig 1. The area is connected to SH-19 starting from Chhindwara and passing through Parasia and Piparia at a distance of 12 kms by a metalled road. The nearest Railway station is Parasia 12 kms from the block on South Eastern Railway. The nearest air strip is at Chhindwara at about 50 km away.

2.0 PROJECT DESCRIPTION

2.1 Geology and exploration

The Coalfield stretches over a strike length of about 64 km where Talchirs are exposed, all along the southern limit of the basin. The drilling in Mandla North Block has proved the existence of 5 groups of seams, comprising of 19 coal sections / splits of workable / non workable nature. Only Barakar formation is coal bearing. The thickness range of the Barakar formation varies from 45 m to 114 m. However, only 45 m to 50 m column is coal bearing. The strike of the coal seams in the block is nearly east-west with minor fluctuations in ENE-WSW direction.

The dip of coal seams grade towards north and north-west. At the southern & south eastern peripheral parts of the block, the dip is around 7° while in major part of the Block, the dip is 9°. A total of 29 faults have been deciphered within the block. All of them are strike & strike oblique faults with a general E-W & NE-SW trend. Majority of faults are heading southerly against northerly dipping beds. Mineral Exploration Corporation Ltd. (MECL) drilled 50 boreholes of PMD series with a total meterage of 15758.15 m. In addition, 8 boreholes of PRN series and 4 boreholes of PE series with total meterage of 3946.6 m were also drilled. Thus, total meterage drilled in Mandla North comes to 19,704.75 m in 62 BH over 10 sq.km area.



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CLIENT: JAIPRAKASH ASSOCIATES LTD.

PROJECT: MANDLA NORTH UNDERGROUND COAL MINE

LOCATION MAP SUMMARY

DRAWN BY: B.R. MATLOTIA
CHECKED BY: B.D. SHARMA
SCALE: AS SHOWN
DATE: 12-08-2008
FIG. NO. 1

2.2 Reserve & quality

As per the Geological Report of CMPDIL, band by band analysis of coal samples has been done for 29 boreholes. As per geological report, the run-wise cores obtained from drilling have been logged systematically. The band by band analysis of 29 boreholes has been incorporated for making isochores thickness of the coal seams/ sections. The quality of the coal has been found to vary from grade D to E.

As seen from borehole logs only seams I B, I C & III B are distinct, persistent and available in entire block. Other seams like II, IVA, IVA₂, VA, VA₁, VB & VB₁ are not very distinct and persistent in thickness. Somew here it disappears and somew here it gets close to main section. How ever, the mine-able coal reserves and extractable coal reserves of all the 10 workable coal seams/sections (1.2m & above) are estimated for entire block.

The gross geological coal reserves are 199.315 million tonnes while the mineable coal reserves are 143.014 million tonnes. The extractable coal reserves are 84.125 million tonnes.

2.3 Mining

Barakar formation is lying at depth varying from 173 to 350 m from surface. The coal seams suitable for mining operation are lying at a depth of 200 m & more. The 19 coal seams/ sections/ splits have been divided into 2 distinct sets designated as Top & Bottom Set. The Top Set of coal seams comprises of seams I, II & III together with their sections/ splits, while the Bottom Set consists of seams IV & V with their sections/ splits. These two sets of seams have been separated by a distinct sand stone parting (main parting) varying in thickness from 7 – 25 meters. More over, 80% surface of the block is covered by Thaonri Reserve Forest and there is little non forest land in the area. Hence, in existing situation, the best option is underground method of working. In an underground mine, coal is extracted in a confined space with strata movement under the existing geo-mining conditions. Long-wall mining method gets ruled out since area is full of faults and the coal seam thickness is variable. B & P (bord and pillar) working with caving operations is an alternate option. 2 sets of 3 nos. of Incline drifts would be driven from surface to touch floor of seam IC in M-2 sector for mine unit-1 and M-18 sector for Mine Unit-2. Bord and Pillar Method with continuous miner, shuttle car/ LHD gate belt will be used for coal winning. In this case, drilling, blasting & consumption of explosive is not required nor jumbo drilling is required for roof bolting.

2.4 Site services

Complete site facilities like truck loading hopper, parking lot, lamp room/ time office, Site workshop, Electrical substation, Electronic weight bridge, Sedimentation pond, Pit head Bath, Manager's office, Canteen, Vocational training centre and for communication Automatic Telephone Exchange has been envisaged at surface. The site for township is within 1 km of the leasehold. About 500 units of residential houses will be constructed. There would be school, community building & shopping complex within the township.

Source of the water will be the ground water seeping into the mines and which is pumped out and stored in a sedimentation pond. Excess water, if any, will be released to local natural stream after treatment. Total requirement of fresh water for mining and allied activities are estimated as 589 cum/day. Out of total fresh 589

cum/day, 218 cum/day treated water is for green belt, 56 cum/day is for use in drinking and sanitation in mine, 270 cum/day is for colony water and 35 cum/day is for Industrial usage.

It is proposed to arrange power from M/s MPSEB, Palatbar sub station at 33 KV, located approximately at 15 km from project site. 33 KV power shall be taken through overhead transmission line. Project shall install 2 x 2.5 MVA; 33 KV/3.3 KV Sub-station at surface.

2.5 Employment potential

A total of 150 people would be recruited in unskilled, semi skilled office assistant categories etc.

3.0 PRESENT ENVIRONMENTAL SCENARIO

3.1 Topography and drainage

Mandla North Block is fully covered with Deccan Trap. The lease area and surrounding have hilly and undulating topography dissected by numerous small and moderately steep valleys. Large number of flat topped hill rising up to 1000 m elevation is present in the area. The lowest elevation of 680 m a.m.s.l. is aligned over south eastern portion in Gunor basin. The hill slopes are steep with flat top.

The study area is drained by PENCH River and its tributaries namely Gonur, Magrahi & Ghatamai. The drainage of the area represents dendritic fashion and follow circuital route. The river PENCH meanders heavily. Most of the streams are seasonal over flooding their banks during rainy season and are fed by groundwater in summer period.

3.2 Climate and micro-meteorology

The climate of the study area may be classified as tropical steppe, semi-arid and hot based on Koppen classification of climatic pattern. The year is divided into four seasons. Long term meteorological data available from nearest IMD (India Meteorological Department) station Chhindwara (1951-1980) shows that average annual rainfall is 1126.0 mm, average monthly maximum and minimum recorded temperature are 30.8 and 17.8°C, respectively and mean of monthly average relative humidity varies between 48% to 63%.

The micro-meteorological data of the core zone has been recorded with the aid of automatic weather station for the winter season between October 2007 to January 2008. The temperature recorded as a minimum of 13°C and maximum of 30°C, the relative humidity as a minimum of 47.7% and a maximum of 87.7%. The predominant wind speed was from NE with 10.46% reading excluding calm. The wind speed was found in the range between 'below calm' and 7.70 kmph, with average value of 1.68 kmph.

3.3 Ambient air quality

To establish the ambient air quality, ambient air quality study has been carried out continuously for three months at 6 stations, namely, Bichhuwa, Mandla, Sirgora, Chhinda, Thaonri and Devri, during October 2007 to January 2008 and for three months at 1 station in RF around lease (0.7 km, (N)) during 20th March to 20th June 2008. The concentration of RPM and SPM was found between 40-80 and 85-

135 $\mu\text{g}/\text{m}^3$. The concentration of SO_2 and NO_x was found between BDL-12.6 and 5.1-15.7 $\mu\text{g}/\text{m}^3$. The concentration of CO was found to be below 1000 $\mu\text{g}/\text{m}^3$.

3.4 Water resources

Surface water: The buffer zone falls under Pench river watershed of the Wainganga sub basin of Godavari basin as per Central Ground Water Board classification. The Pench flows through the Satpura range in the Chhindwara district and is joining by Koilar River at Kamptee. The drainage is mostly towards south and south west and has a dendritic pattern. Due to moderate rainfall and loamy clay soil, the drainage intensity is moderate.

Ground water: The groundwater in basaltic formations occurs within the secondary porosity present in the form of joints and fractures. The groundwater utilization is basically by the local population for drinking and by the mining industries. The utilization of groundwater for irrigation is practically nil as most of the agriculture is rainfed. The annual resource would be 29.10 MCM. The annual utilisation at present works out as 2.32 MCM.

Water quality: Water sampling was done during the summer season of 2008 at 10 locations. The analysis results of water quality of the study area shows that almost all the parameters of water samples are well within the prescribed limits as per IS 10500: 1991. The pH value is more or less neutral. The groundwater can be used for both domestic and industrial purposes.

3.5 Noise level and traffic density

Noise level monitoring was done at six locations. It has been observed that L_{eq} noise levels at day time and night time are found to be 43.5 and 35.3 dB (A) respectively in the core zone & L_{eq} noise levels for day time and night time are ranging between 43.2 to 43.4 dB(A) and 34.2 to 35.0 dB(A) respectively in the study area.

The traffic density monitoring has been done on Dighawani-Bichhuwa road at Sativa for 8 hours for 5 days. Average traffic density was found to be 1.88 vehicles per hour. The number of HMV movement ranges from 5 to 9 and that of LMV 6 to 10 during 8 hours.

3.6 Land use

Core zone: The total area of 1041.6 Ha covering part of Thaonri Reserved Forest, a Protected Forest and balance is private land from villages. Nearly 80% of the lease area is covered by Thaonri reserved forest. Non-forest area is on western side which includes fallow land, plantation area and scrubs.

Buffer zone: Land use pattern of study area on the basis of 2001 Census data shows that about 41.14% of the total area is occupied by unirrigated agricultural land while irrigated agricultural land is only 9.84%. The area not available for cultivation is 10.18% followed by culturable wasteland is 7.66 %

3.7 Soil quality

The soil is sandy clay loam in texture and pH is neutral in nature. The concentration of nitrogen ranges from 110-162 kg/ha. The concentration of Potash available is 38-70 kg/ha and that of organic carbon is 0.68% to 0.79%.

3.8 Ecology

Mostly (80%) core zone is forest land covered under the category of slightly dense mixed jungle of Thaonri Reserve Forest. The rabi crops grown are wheat and gram. The kharif crops comprising of soya bean, corn, urad, sorghum, kutki, kodo and paddy. Same types of crops are grown in the buffer zone.

The study area has a mixed feature of moist and dry deciduous type of forest. Trees including *Acacia Arabica*, *Bauhinia racemosa*, *Butea monosperma*, *Cassia fistula*, *Dalbergia latifolia*, *Diospyros melanoxylon*, *Ficus benghalensis*, are found. *Calotropis gigantea*, *Desmodium pulchellum*, *Ipomoea purpurea*, *Ocimum basilicum*, *Ocimum sanctum*, *Phoenix acaulis*, etc are the herbs and shrubs found.

Fauna found in the core and buffer zone includes several species of mammals, birds and reptiles. There are no Schedule-I species in core zone and only *Gyps benghalensis* and *Pavo cristatus* are the endangered species found in the buffer zone.

3.9 Socio-economics

As per Census 2001, there are 16145 households in the 110 villages of study area. Total population of the villages is 86443 persons. Mostly the population is rural and the majority are scheduled tribes (46.04%). The male population slightly exceeds female population. The family size is moderate. The literacy rate is 48.06% and it is lower among female. About 28.38% of total population are main workers, 11.93% are marginal workers and 59.69% are non-workers.

3.10 Places of tourism/religious/historical interest

There are no places of historical/tourist/religious or archaeological importance in either core zone or study area. However, there are local places of worship at some villages.

3.11 Industries around the mine lease

The industries within 10 km radius of the mine lease are Vishnupur Coal Mine, Kukurmunda Open Cast Mine, Rawanwara Khas Coal Mine, Thesgora Mine and Brahmapuri mine.

4.0 ENVIRONMENTAL IMPACT ASSESSMENT & MITIGATION MEASURES

4.1 Topography and drainage

Impact: The Block is drained by 1st / 2nd order streams & nallas which ultimately join East-West flowing PENCH River on the southern side. These nallas are rainfed. The underground mining activities will have very limited impact on topography of the mine lease area due to underground workings. The areas affected on the surface will be only the entry points, facilities and the dump area. The block is characterized by more or less flat terrain with gentle undulation. The mining activities will not disturb any major surface water body. The first and second order seasonal streams will also not be disturbed except those falling under the facilities and dump area for which diversion shall be made.

Management: Since the impact is very limited, limited management measures will be required. The facilities and entry points will be fenced and free access

prevented for both man and animal. The waste dump shall be to a height of 10 m and will be provided with garland drain and toe walls. The slopes of the dump shall be stabilised to prevent wash off during rainfall. Sedimentation tank will be provided for all runoff from the dump as well as the on-surface facilities to settle the suspended solids before releasing the rainwater into the natural drains. Check dams shall be constructed on the surface drainage channel to check silt flow and act as ground water recharge structures also.

4.2 Climate

The climatic conditions including temperature variations, wind direction and speed, rainfall and humidity are governed by regional factors and the monsoons. As such the mining and other allied activities will not tend to influence the climate

4.3 Air environment

Impact: This being an underground mine, dust producing activities are only a few. Coal from mine is to be loaded to trucks via a surge bunker & transported to railway siding. Therefore, impact on ambient air, in the mine lease area would be marginal. Use of continuous Miner has been envisaged for regular mine operation which will produce coal without resorting to blasting. So blasting vibration is reduced, and immediate roof is not affected to any great extent. Transport vehicles will generate dust and gaseous emission while plying on haul roads. Air pollution may result in irritation and inflammation of eyes and congestion of throat and oedema of lungs, if care is not taken. Carbon monoxide can cause loss of haemoglobin in blood and subsequently stresses on those suffering from cardiovascular and pulmonary diseases.

Management: The SPM, CO, SO₂ and NO_x concentrations are within limits in the monitored ambient air quality. The control measures to be adopted are comfortable working conditions by good ventilation for employees working below ground, dust control measures on belt transfer and truck loading points, water sprinkling by fixed and mobile sprinklers on transport road and at the railway siding, development green belt around coal loading point, Railway siding and along coal transport road. The ventilation system will be circulating air at the rate of 10,000 m³/min. Greenbelt will be planted around the mine and loading facilities. Dust masks will be provided as safety measure to the workers engaged at dust generation points like drills, loading/unloading points, material handling etc.

4.4 Water environment

Impact: The depth of working is in the range of 200 to 400 m below surface, which will have hardly any effect on the surface drainage of the area. The impact on surface water would be minimal. Near surface, water table would not be affected. Only deep seated aquifer below 100-120 meters depth would be affected. The maximum inflow of ground water in the mine will be 6840 m³/day at the conceptual stage which will be received from Barakar sandstones which are exposed at the surface in the buffer zone. It is therefore concluded that there will be hardly any impact of mining on ground water regime even by taking mining depth to 400 m bgl.

Management: The water accumulated in the mine in the sump will be pumped out and brought to surface into a water storage tank. After necessary desilting, the water will be used for dust suppression and for green development. Any water left after meeting the water requirement, will be released in the nearby Pench stream.

There will not any impact on the ground water resources of buffer zone due to mining activity which will be confined to surface area of 1041 hectares. All effluent from mine, workshop, domestic water shall be treated. For the workshop and oil water separator and desilting chamber shall be provided for removal of oil and grease and settling the suspended solids, which are the two main contaminants. The oil layer is skimmed off and subsequently re-processed or disposed of, and the bottom sediment layer is removed by a chain and flight scraper (or similar device) and a sludge pump.

4.5 Land environment

Impact: In case of an underground mine, the land area affected on the surface is limited only to the areas under facilities and the dump areas. The peak tensile strain is likely to be within permissible limit. Hence, no significant damage is likely to occur to the surface forest cover. It could be safely concluded that underground mining of seam IB and IC up to 25 years of mining will not have any significant impact of forest cover at the surface of Mandla North underground coal mine.

Management: Land degradation is low in case of an underground mine since the mine operations are below ground. On the surface, only the mine facilities and the dumps shall be visible. Most of the area shall remain undisturbed. Plantation shall be carried out on undisturbed areas and greenbelt shall be planted in the statutory barrier along the mine lease boundary. Garland drains will be provided around the dump to arrest any soil being carried away by the rain water. Special local stone paved chutes and channels will be provided, wherever required to allow controlled descent of water, especially from external dumps.

4.6 Solid waste

Impact: Raw coal (Run-of Mine Coal) will have some stones & shale which are mine waste; they will be picked up during conveyance through belt conveyor. This mine waste will be stacked within lease hold area. The height of stack would be approx 10 m with intermediate berms dump will be designed with overall face slope of 28°. Waste is expected to be 2.8 million cubic meter over 40 years of mine life.

Management: Limited quantity of top soil will be removed and used simultaneously in greenbelt and afforestation in undisturbed areas. Excess topsoil is not anticipated for storage; hence, no provision for top soil dump has been made. Reclamation of the waste dump areas shall be carried out by plantation.

4.7 Noise and vibration environment

Impact: The impact of noise will be more on the operating personnel and on the persons working nearby and not so much on the surroundings. The noises from mining and associated activities disturb animals/birds living in the surroundings forcing them to change their habitation.

Management: Provision and maintenance of peripheral green belts, avenue plantation, periodic maintenance of noise generating machinery and transportation vehicles will be ensured. Provision of the air silencer to modulate the noise generated by the machines will be made wherever required. To protect the workers from exposures to higher noise levels protective devices like ear muffs/ear plugs shall be provided, the exposure time of workers to the higher noise levels shall also be reduced.

4.8 Ecology

Impact: As the mine is underground, the surface flora and fauna shall not be uprooted from above the mining area. Only small areas under facilities, colonies and dumps shall be disturbed. Besides, not affecting existing floral coverage, block plantation and avenue plantation will be taken up in the project. Since, impact on surface water bodies is minimum, hence, it will continue to support any dependent flora and fauna.

Management: Green belt and block plantation shall be ensured to improve ecological set-up, besides controlling impact on air quality & noise level. The 7.5 m width of green belt development around the ML area will be completed within the 5 years.

4.9 Socio-economics

Impact: There are no resettlement issues involved. Rehabilitation of land owners is involved, needing suitable socio-economic studies. The land owners will be deprived of their land and the non-land owners who depend upon agriculture will be deprived of their earnings.

Management: Detailed socio-economic studies for affected land owners shall be done. Other dependent people shall also be included. Compensation for land shall be mutually settled with land owners, in association with state officials, if association is required. The proponent intends to provide better package for rehabilitation of land owners than presently in vogue in the state in the coal mining sector. Community development programme for neighborhood villages shall be taken up. Boost to employment, education and communication shall be given. Due to development activity in the rural and backward area, traders and private enterprises will grow in the region, which will provide indirect employment to the local people. The company will arrange medical camps, sports competitions and awareness programme for the benefit of the local people.

4.10 Occupational health and safety

The medical facilities will be provided for all the employees of the mine and colony. All the employees and contractual workers will be sent for regular health check up for the occupational diseases like Silicosis, Pneumoconiosis, etc., which are prevalent in the mining industry and tests like optometric, blood tests, chest X-rays, sputum test, audiometric test, lung test, cardio-vascular etc are done. The frequency for the periodic medical check up will be maintained as per the DGMS norms.

5.0 ANALYSIS OF ALTERNATIVES

Mining industry is very much site specific and a mineral has to be mined at the place where it exists in economically feasible quality and quantity. So, no site alternatives can be chosen. The selected site has many advantages like it is a captive mine allotted by Ministry of Coal M/S Jaiprakash Associates Ltd. with known reserves. The technology chosen in bord and pillar method with continuous miner and shuttle car system over augur cum drills, chain conveyors and gate belt.

6.0 ENVIRONMENTAL CONTROL & MONITORING ORGANIZATION INCLUDING BUDGETARY PROVISION

Keeping the utility of monitoring results in the implementation of the environmental management programme in view, an organizational set up has been proposed, headed by Environment Engineer. This team will look after the proposed monitoring and implementation activities. The total investment on environmental improvement is envisaged as Rs. 689.98 lakhs and recurring expenditure during the stage of production is Rs. 136.76 lakhs per year. The specific investment cost is Rs. 46.0 per tonne of annual target production and specific recurring cost is Rs. 9.120 per tonne of annual target production.

7.0 DISASTER MANAGEMENT PLAN

Underground fires are very much more dangerous than surface fires because, apart from the larger material damage, they often poison men by their fumes. The partial burning of timber releases an enormous quantity of carbon monoxide. Apart from the burning of timber, mineral also can burn, including coal, sulphur and pyrite. To prevent explosions avoid accumulation of inflammable gas, have adequate ventilation, avoid source of ignition by checking for contrabands and use of F.L.P. and intrinsically safe apparatus, avoid accidental fires due to friction or otherwise careful use of explosives. For fire prevention coal dust and old timber would be removed from roadways, waste oil and cleaning materials in machines rooms must be kept tidy and removed as required. To prevent the spread of the combustion products within the mine, the permanent roads would be provided which contain a fireproof wall and door which can be closed if a fire occurs. The prevention of spontaneous fires reduces to the choice of the right method of mining, ensuring extraction of the coal without leaving pillars, and the isolation of worked-out districts so as to prevent air reaching the gob. Ten extinguishers at the shaft station, and with timber supports, extra fire extinguishers amounting to one for every 40 m; Two or three extinguishers in all roads with electric cables in levels at every 400 m and in inclines at every 100 m; in small pits at the collar and the pit bottom, at the face loading points and development faces, two each; in all rooms, depending on their function, the number laid down must be provided, with firefighting equipment and sandboxes.

8.0 PROJECT BENEFITS

Most of the unskilled and semi-skilled work force required for operation of the mine will be drawn from the surrounding villages. With the establishment of the colony and the medical and educational facilities therein, the villagers will be given free/subsidized access to these. The project will give direct employment as well as indirect employment in the secondary sector in that area and offer the opportunity to the local people to improve their earnings, skills and exposure level. Therefore, better economic status of the community due to better earnings and higher inputs towards infrastructural facilities due to establishment of mine. Due to mine project, there will be development of communication facilities in the area. In the colony, accommodation has been planned for the skilled/ semi-skilled employees and the managerial/ supervisory personnel. The mine office and workers rest shelters will be equipped with sufficient infrastructural facilities including drinking water, toilets, sanitation facilities, health centre, etc. Education and medical facilities will be provided to the employees and to their family members and will also be extended to the villagers. Shopping complex and banks will come up, which can be beneficial for local villagers also. Vocational Training Centre (VTC) will be provided within the mining lease area.