EXECUTIVE SUMMARY
OF
ENVIRONMENTAL IMPACT ASSESSMENT
AND
ENVIRONMENTAL MANAGEMENT PLAN
OF
MANDLA SOUTH UNDERGROUND COAL MINE
IN
VILLAGES BICHHUWA, SIRGORA, MANDLA
AND MANDLI
PENCH- KANHAN COAL FIELDS,
DISTRICT CHHINDWARA OF MADHYA PRADESH
(EXTENT 5.6 SQ.KM, COAL PRODUCTION 0.3 MTPA)

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EXECUTIVE SUMMARY
of
Environmental Impact Assessment and Environmental Management Plan
of
Mandla South Underground Coal Mine

1.0 INTRODUCTION

The rated capacity of the proposed underground project is envisaged as 0.3 MTPA of non-coking coal. The total mine lease area is 5.6 sq.km lying within the villages, Bichhuwa, Sirgora, Mandla and Mandli. Nearly 37.5% of the block is covered by forests.

1.1 Location and communication

The Mandla South Underground Coal Mine is located in Pench-Kanhan coal fields, Chhindwara district of Madhya Pradesh. The area falls in Survey of India toposheet No. 55J/16. The block is situated around 20 km east of Parasia, major mining town in Pench valley coal field. Parasia is located 27km North West of Chhindwara, the district head quarter, and is connected by MP State Highway No.19 connecting Chhindwara with Piparia/Panchmari. Parasia is also connected to Amla (87 Km) by broad gauge line of central Railway. The nearest air port is Nagpur at 160 km away from Chhindwara.

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 South 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 7.45 m to 77.00 m. However, the strike of the coal seams in the block is nearly east-west with minor fluctuations in ENE-WSW direction.

The trend of the seam floors in general, is nearly east-west in the block. The fluctuations in ENE and WSW directions are common. The strike even takes a
swing towards NE and SW directions. The dip varies widely from place to place. The variation is between 4 to 12 degrees. A total of 38 faults have been deciphered within the block. All of them are strike & strike-oblique faults with magnitude of throw varies widely from 5 m to as high as 300 m Out of them 5 faults have throw well over 100 m while rest have throw mostly between 5 m to 50 m. Mineral Exploration Corporation Ltd. (MECL) drilled 57 boreholes of PMD series with a total meterage of 17432.1 m.

2.2 Reserve & quality

As seen from borehole logs only seams IC, II/IIB, IIIB and VA/VA2 are distinct, persistent and having workable thickness. Other seams are not very distinct and persistent in thickness of workable. Somewhere it disappears also. However, the mineable coal reserves and extractable coal reserves of all the 4 workable coal seams/sections (>1.5 m thickness) are estimated for entire block.

The gross geological coal reserves are 80.4 million tonnes. The extractable coal reserves are 13.35 million tonnes.

2.3 Mining

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 4.60 – 19.23 meters. More over, 37.5% surface of the block is covered by Thaonri Reserve Forest and revenue forest. 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. Bord and Pillar Method with continuous miner, shuttle car/ LHD and 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 and for communication Automatic Telephone Exchange has been envisaged at surface. The site for township is within 1 km of the leasehold. About 150 units of residential houses will be constructed. There would be school, community building & shopping complex within the township.

Source of the water will be 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 218 KLD. Out of total fresh 218 KLD, 115KLD treated water is for green belt, 53 KLD is for use in drinking and sanitation in mine, 50 KLD for dust suppression.

It is proposed to arrange power from M/s MPSEB, Tendukheda substation 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 and office assistant categories and another 180 persons will be deployed in skilled and officials category.

3.0 PRESENT ENVIRONMENTAL SCENARIO

3.1 Topography and drainage

Mandla South Block is fully covered with Deccan Trap. The area exhibits a rugged topography. The terrain comprises of many hills and valleys. The
maximum altitude towards north is 806 m while in the south the highest altitude is 706 m. There are no of small and moderately steep valleys having steep with flat top.

The study area is drained by Pench River and its tributaries namely Gonur, Magrahi & Ghatamai. Two seasonal nallas one flowing from north to south along the eastern boundary of the block and the other flowing easterly in the centre of the block are the only source of water. Both these nallas have their confluence near Mandla village.

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 post monsoon season between October, 2011 to December, 2011. The temperature recorded as a minimum of 11°C and maximum of 35°C, the mean relative humidity as a minimum of 59.5% and a maximum of 73.7%. The predominant wind speed was from NW with 15.95% reading excluding calm. The wind speed was found in the range between ‘below calm’ and 6.5 kmph, with average value of 2.3 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 Mandla, Balwara, Sanwalhara, Gogra, Mannawari and Thesgora during October, 2011 to December, 2011 and for three months at 1 station in RF around lease (2.2 km, (SE)) during post monsoon 2011. The concentration of PM\textsubscript{10} and PM\textsubscript{2.5} was found between 75-86 and 44-51 µg/m\textsuperscript{3}. The concentration of SO\textsubscript{2} and NO\textsubscript{x} was found between 13-19 and 16-22 µg/m\textsuperscript{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 joined 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.

**Water quality:** Water sampling was done during the post monsoon season of 2011 at 4 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 ground water 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 for day time and night time are ranging between 40.3 to 48.1 dB(A) and 35.2 to 42.3 dB(A) respectively in the study area.

The traffic density monitoring has been done on Shivpuri-Mandla road at Mandla 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 560.00 Ha comprises part of Thaonri Reserved Forest, Revenue Forest and balance is private land from four villages. Nearly 37.5% of
the lease area is covered by Thaonri reserved forest and revenue forest. Non-
forest area is on Southern, central and eastern side which includes agricultural
land and waste land.

**Buffer zone:** Land use pattern of study area as per satellite imagery shows that
about 41.07% of the total area is occupied by unirrigated agricultural land while
irrigated agricultural land is only 9.75%. The area not available for cultivation is
10.40% followed by culturable wasteland is 7.90 % 30.89% of buffer zone is covered by
forest land.

### 3.7 Soil quality

The soil is sandy clay loam in texture and pH is neutral in nature. The
concentration of nitrogen ranges from 95-130 kg/ha. The concentration of Potash
available is 180-280 kg/ha and that of organic carbon is 0.52% to 0.79%.

### 3.8 Ecology

37.5% of core zone is forest land covered under the category of slightly dense mixed
jungle of Thaonri Reserve Forest and revenue forest. The rabi crops grown are
wheat and gram. The kharif crops comprise 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 gigantia, 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 pavo cristatus and Gyps Bengalensis in core zone
which belongs to Schedule-1 category for which wildlife conservation plant has
been prepared.
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 is 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 is 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, Kukur munda Open Cast Mine, Raw anwara Khas Coal Mine, Thesgora Mine, Brahmapuri mine, Haranbhata mine and Mandla North Mine.

4.0 **ENVIRONMENTAL IMPACT ASSESSMENT & MITIGATION MEASURES**

4.1 **Topography and drainage**

**Impact:** The Block is drained by 2\textsuperscript{nd} / 3\textsuperscript{rd} 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. 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 second and third order seasonal streams will also not be disturbed except those falling under the facilities 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.

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 NOx 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 3100 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 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. It is therefore concluded that there will be hardly any impact of mining on ground water regime.

**Management:** The water accumulated in the mine in the sump will be pumped out and brought to surface in to 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. All effluent from mine, workshop, and domestic water shall be treated. For the workshop oil water separator and desilting chamber shall be provided for removal of oil and grease and settling the suspended solids, which are the 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 mine entry. 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 safety 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 South 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 mine entered shall be visible. Most of the area shall remain undisturbed. Plantation shall be carried out on undisturbed areas. Special local stone paved chutes and channels will be provided, wherever required to allow controlled descent of water.
4.6 Solid waste

**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.

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 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.

4.9 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 checkup will be maintained as per the DGMS norms.

5.0 ANALYSIS OF ALTERNATIVES

Mining industry is very much site specific and 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 technology chosen is 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. 130.00 lakhs and recurring expenditure during the stage of production is Rs. 40.00 lakhs per year.

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. 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.

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 will be achieved. 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.