

Chapter – 2

PROJECT DESCRIPTION

2.0 TYPE OF PROJECT

This is open cast coal mining project for the nominal rated capacity of 0.25 Mty and would excavate 5.19 Mt of coal in 26 years of mining life span with deployment of diesel hydraulic Shovel/backhoe- dumper combination at the initial capital cost of Rs. 5638.95 Lakhs.

2.1 NEED OF THE PROJECT

The following Table-2.1 shows the opencast coal production as well as total coal production of NEC of last six years. It is obvious from the given table that in the last five years the opencast coal production is almost static except in the year 1999-2000 where it decreased.

Table No. 2.1

| YEAR → | 96-97 | 97-98 | 98-99 | 99-2000 | 2000-01 | 2001-02 |
|-----------------------------|-------|-------|-------|---------|---------|---------|
| Total (Mt.) | 0.75 | 0.69 | 0.64 | 0.57 | 0.66 | 0.65 |
| Opencast Mines (Mt.) | 0.47 | 0.49 | 0.46 | 0.37 | 0.46 | 0.48 |

DEMAND AND AVAILABILITY OF COAL FROM NEC

The projections of coal production from NEC shown in the Table no. 2.2 are based on the available coal reserves in the ongoing mines and the demand of coal from NEC. There are currently 3 underground and 2 opencast mine in this coalfield in operation.

Table No. 2.2

| YEAR → | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|-----------------------|---------|---------|---------|---------|
| Opencast (Mt.) | 0.30 | 0.30 | 0.40 | 0.40 |
| UG (Mt.) | 0.20 | 0.20 | 0.20 | 0.20 |
| Total (Mt.) | 0.50 | 0.50 | 0.60 | 0.60 |

(Source: Annual Plans of CIL)

The following Table-2.3 shows the demand and availability of coal from NEC.

Table No. 2.3

| YEAR → | 08-09 | 11-12 |
|---------------------------|----------|----------|
| Demand (Mt.) | 2.37 | 4.02 |
| Availability (Mt.) | 1.30 | 1.70 |
| Gap (Mt.) | (-) 1.30 | (-) 2.32 |

JUSTIFICATION

The Tirap and Tikak (also called as Baragolai Hill Top) mines are the only two opencast mines in NEC. The balance reserves at Tirap OC mine would last for another 3-4 years at the current rate of production. Thus the Tirap OC mine is nearing its closure.

Tikak OC mine would be the only OC mine producing coal at the rate of 1.20-1.25 lakh tonne per annum for another 12-15 years.

By closing one OC mine producing coal at the rate of 3.40-3.50 lakh tonne per annum would bring down NEC further into red. The demand of coal as well as overall economics of the northeastern coalfields has therefore necessitated for looking at alternatives. Thus, the alternative lies in increasing opencast production in current economic situation.

The proposed project will be able to compensate partly for the loss of production due to closure of Tirap opencast mine.

2.2 LOCATION

Lekhapani block (area 1.00 sq.km) is located in south central part of Makum coalfield (area 210 sq.km) in Tinsukia district of Assam. It forms a part of southern limb of Namdang syncline and it is on the west of Tipong-west underground block. The block is about 25 Km east of Margherita township (Head Quarter of NEC) and about 85 Km south east of Tinsukia (District head quarter). The National Highway

No. 38 passes along the northern fringe of Makum coalfield and is 6 Km. north of the block. Dibrugarh-Tinsukia-Ledo broad gauge section of N.F. Railway also passes along the northern fringe of the coalfield. The nearest railway station is Ledo about 15 Km on the broad gauge and Lekhapani on the metre gauge about 6 Km away from the block. The block can be approached from Margherita by NH-38 up-to Lekhapani railway station and then through rugged terrain by unmetalled road after construction of a bridge over Lekhapani river. The block is bounded by latitude $27^{\circ}16'4''$ and $27^{\circ}17'6''$ N and longitude $95^{\circ}48'11''$ and $95^{\circ}49'32''$ E and covered in the Survey of India Topo-sheet No. 83 M/15.

The project is surrounded by the Tipong U/g mine on the east & reserved forest on the west and Lekhapani river on the north & Tipong river on the south. The location plan is shown as **Plate I**.

PHYSIOGRAPHY AND DRAINAGE

The area is characterised by rugged hilly terrain with elevations ranging from lower heights in the southern part of the western half of the block (with reference to colliery Bench-mark) to 675.24m in south eastern part. However, the elevation above mean sea level ranges from 280.00m. to 520.00m in the eastern part of the block. In general the ground slope is towards north but it is towards north & south both in central and western parts of the block. The surface contours, floor contours, and RL values of boreholes are with respect to local drainage level (named zero level by NEC). It is 155.24m above mean-sea-level. Therefore, to arrive at values of contours and borehole RL with respect to M.S.L, 155.24m should be deducted from their respective values.

The Lekhapani river in the north and the Tipong river in south control the drainage of the block. The water flowing from northerly slopes feeds the Lekhapani river. The Lekhapani river flows from SW to NE and joins the Tirap river, which flows from east to west. The water flowing from southerly slopes feed the Tipong river flowing from south to north.

Location Plan/Surface Plan is shown as **Plate No. I**, Pre-mining Drainage Pattern Plan is also shown in **Plate No. I** and Contour Map/Present land use plan of core zone is shown as **Plate No. II**.

CLIMATE

The area is characterised by humid climate (humidity 87 to 91%), short duration of summer, prolonged period of rains and fairly cold winter seasons. The maximum temperature during summer is as high as 36°C and in winter as low as 6°C. The annual rainfall ranges from 300 to 425 cm. Monsoon in real sense is felt during April to September. It rains for 8 to 9 months in the area. The dry periods are generally December to March.

HABITANTS & LAND USE

Scanty population of the Wanchoo and Nokte group of tribes are the main inhabitants of the area. They reside on hilltops and slopes, and mostly depend for their livelihood on forest produce and shifting cultivation "Jhum". In the foothills, around the mines, there are human activities connected with exploitation of coal by North Eastern Coalfields.

2.3 MINING

MINE BOUNDARIES AND COAL RESERVES:

BASIC CRITERIA

The detailed exploration and investigation carried out by CMPDI have established the presence of five (5) coal horizons over an area of 1.00 Sq. Km. Seam I (60') and seam III (20') are the two important coal seams. In other three seams, seam IV (5') has some mining potential and has been considered for estimating the mineable reserves. Seam II (7') and seam V (8') coal horizons are very inconsistent and occur over very small area and hence have not been considered for estimating mineable reserves in this block.

The Lekhapani block where the opencast mining is being proposed is a virgin block and lies further west of Tipong west underground mine. The geological report

of this block was prepared by CMPDI in November'2000 keeping in mind that an underground mine would be proposed in this block. The seam thickness has been calculated on the basis of I_{30} band thickness in this report. The necessary corrections have, therefore, been made in calculating coal thickness as well as band thickness in order to arrive at appropriate coal seam thickness for opencast mining. The isochores have been drawn after incorporating these corrections. The main coal horizon (60') has in general three obvious continuous bands dividing the coal seam into three coal horizons namely 60' top, middle and bottom sections. At places, the top and middle sections are combined in the block. The length and width of the coal deposit in this block is approximately 1.6 km and 0.6 km respectively.

DELINEATION OF MINE BOUNDARIES

The Iso-ratio lines plot show that in the block, a fairly large area is within 1:6 cut-off ratio line mainly in the eastern region and south eastern region where the topography is rather steep in comparison to the western region. The underground workings of Tipong west, developed in two sections i.e. in top and bottom sections in 60' seam, also lies in the block. The extent of workings is up-to about 300 m west of the colliery entrance adit-1 and adit-2. These features of the deposit have been used to delineate open pit mine boundaries.

MINE BOUNDARY OPTION

Mine boundary option is based on the commercial consideration of mining maximum possible reserves. Mine boundary along the pit floor in dip side is based on the boundary fault having a throw of 200m. The boundaries of the proposed opencast mine on all the sides are based on the followings:

South: Incrop of the seam I (60') and the limit of the geological block

North: Boundary fault having a down throw of 200m

East: A safe distance of 60 m from the extent of the u/g workings

West: Western limit of the geological block

This mine boundary option will permit exploitation of 5.19 million tonnes of coal at an average stripping ratio of 13.36 cum/t. It will be possible to mine coal at a rate of 0.25 MTY, which will sustain a mine life of about 23 years. It will thus be possible to meet a part of the demand of North Eastern Coalfields. The maximum depth in this mine boundary option will be 330 m, if considered from the highest point on the quarry surface, but the coal lift will be only 95 m. The minimum depth is 15 m at the mine entry. The ultimate pit configuration plan of the Lekhapani OCP has been shown in the Plate No.IV.

Seamwise thickness and mineable reserves have been summarised in Table 2.4.

Table No. 2.4

| Sl. No. | Particulars | Usual Thickness (m) | Mineable Reserves (Mt.) |
|--------------|----------------|---------------------|-------------------------|
| 1. | Seam I (60') | 19.00 | 3.49 |
| 2. | Seam III (20') | 5.50 | 1.30 |
| 3. | Seam IV (5') | 2.20 | 0.40 |
| Total | | | 5.19 |

Mine parameters of the selected boundary option is presented in Table No.2.5.

RELATIVE PARAMETERS OF THE MINE

Table No. 2.5

| Sl. No. | Particulars | Value |
|---------|---|-----------|
| 1. | Geological Reserves, Mt | 6.41 |
| 2. | Mineable Reserves, Mt | 5.19 |
| 3. | Waste quantity, M.cum | 69.32 |
| 4. | Av.Stripping Ratio, cum/t | 13.36 |
| 5. | Nominal Production capacity, Mt/yr | 0.25 |
| 6. | Nominal waste removal capacity. Mcum/yr | 3.40 |
| 7. | Mine life, (Years) | 23 |
| 8. | Depth -min (m) -max | 15 335 |
| 9. | Floor Gradient Deg -usual | 45°-52° |

| Sl. No. | Particulars | Value |
|---------|--|--------------|
| 10 | Pit area - Floor (Sq.Km) - Surface(Sq.Km.) | 0.14 0.77 |

SURFACE & MINING CONSTRAINTS

There are some surface and mining constraints while mining this block. Approach to this block is from NH-38 after Tirap siding. A katcha road of about 3.5 km is available up-to the Lekhapani river. A new bridge has to be constructed over the river to approach the Lekhapani block. Further, 2.0 km road has to be built to reach the block beyond the river. The entire mining and proposed external dump area falls under the reserved forest category.

2.3.2 RATE OF COAL PRODUCTION & MINE LIFE

Rate of coal production from Lekhapani OCP is 0.25 Mt per annum and the mine life will be 26 years including the construction period of three year.

2.4 MINING METHOD

Shallow occurrence of the 60' coal seam and 20' seam having considerable thickness as indicated in the table above, makes it ideally suited for exploitation by opencast method in the delineated areas. The deposit has therefore been proposed for mining by opencast method up-to the depths indicated in the above table. Opencast mining will also ensure near total extraction of the valuable natural resource. Limited nature of the deposit in dip side will permit the mining front to reach up-to the limits of the quarry at the mine opening side initially and thereafter the cut will be taken block by block towards strike direction after taking out the coal in that block. This way it will permit sequential mining of the coal reserves in a more effective manner allowing back filling of considerable quantity of overburden into the void simultaneously with the advance of the working pit. This feature will considerably mitigate the adverse environmental aspects generally associated with opencast mining. Specific deposit configuration is thus proposed to be used to considerable advantage for superior environmental control.

Analysing geo-mining characteristics of the deposit, the mine is proposed to be worked by horizontal slicing method with deployment of diesel hydraulic shovel/backhoe–dumper combination. Slope of the final quarry batter would vary from 45° to 37°. Height of the coal/overburden benches is proposed to be maximum 10 m, whereas, bench width of working and non-working benches is 30 m & 20 m respectively with a proposed cut width of 10 m. Slope of the bench will vary from 45° to 70° based on the nature of material. Overburden is to be stacked tier by tier and height of each such tier is proposed to be 30 m. Angle of repose of the overburden dump is assumed to be 37°. Lag between two tiers of overburden dump is proposed to be 40 m.

Table No. 2.6

Proposed mining system parameters

| Sl. No. | Particulars | Unit | OB | Coal | Dump |
|---------|----------------------------|--------|----------|--------------|------|
| 1 | Bench height | m | 10 | 10 | 30 |
| 2 | Working bench width | m | 30 | 30 | 40 |
| 3 | Nonworking bench width | m | 20 | 20 | - |
| 4 | Bench slope | Deg. | 45-70 | 70 | 37 |
| 5 | Blast Hole dia. | mm | 160 | Not required | - |
| 6 | Inclination of blast-holes | - | vertical | | |
| 7 | Powder factor | Kg/cum | 0.25 | - | - |

2.5 MINING STRATEGY (SEQUENCE OF MINING)

It is proposed to open up the Lekhapani open cast mine from the south-western end in the incrop of 60' seam by constructing an Initial Mining Cut (IMC). Minimum depth at the mine entrance is 15 m. The access trench will be driven along the incrop and the mine floor will be maintained at 420 m floor contour.

The mining operations will then proceed towards north as well as in the eastern direction. Later on the mining operations will be in strike direction only. The

proposed sequence of mining will permit start-up of mining operations at minimum depth; require least amount of rehandling of waste.

The above sequence will ensure better cash flows in the initial stages of mining as well as superior back filling of voids created during the course of mining operations. The selected sequence will facilitate the internal backfilling of overburden just behind the advancement of the OB and coal benches. The ground elevations are such that there will be options of coal lead as well as overburden lead to be maintained at 1.5-2.0 km.

Any alternative sequence of mining will necessitate considerably greater land requirement for external overburden dump due to limited back filling opportunities offered. Cost of mining will also be higher in such a case because of longer leads of OB transport.

MINING SCHEDULE

Life of mine schedule of mining, indicating year wise & cumulative coal production & waste removal along with running average stripping ratios for Lekhapani OCP is given in Table No. 2.7.

Mining Schedule

Table No. 2.7

| Year of mine operation | Year of production | Coal Production (Mt.) | | OB Removal (Mcum) | | Stripping Ratio (Cum/t) | |
|------------------------|--------------------|-----------------------|------------|-------------------|------------|-------------------------|-----------------|
| | | Annual | Cumulative | Annual | Cumulative | Running | Running Average |
| 1 | C1 | - | - | - | - | - | - |
| 2 | C2 | - | - | - | - | - | - |
| 3 | C3 | - | - | - | - | - | - |
| 4 | P1 | 0.07 | 0.07 | 1.00 | 1.00 | 14.29 | 14.29 |
| 5 | P2 | 0.14 | 0.21 | 1.60 | 2.60 | 11.43 | 12.38 |
| 6 | P3 | 0.25 | 0.46 | 3.10 | 5.70 | 12.80 | 12.39 |
| 7 | P4 | 0.25 | 0.71 | 3.10 | 8.80 | 12.40 | 12.39 |
| 8 | P5 | 0.25 | 0.96 | 3.10 | 11.90 | 12.40 | 12.40 |
| 9 | P6 | 0.25 | 1.21 | 3.10 | 15.00 | 12.40 | 12.40 |
| 10 | P7 | 0.25 | 1.46 | 3.10 | 18.10 | 12.40 | 12.40 |
| 11 | P8 | 0.25 | 1.71 | 3.55 | 21.65 | 14.20 | 12.66 |
| 12 | P9 | 0.25 | 1.96 | 3.55 | 25.20 | 14.20 | 12.86 |
| 13 | P10 | 0.25 | 2.21 | 3.55 | 28.75 | 14.20 | 13.01 |
| 14 | P11 | 0.25 | 2.46 | 3.55 | 32.30 | 14.20 | 13.13 |
| 15 | P12 | 0.25 | 2.71 | 3.55 | 35.85 | 14.20 | 13.23 |
| 16 | P13 | 0.25 | 2.96 | 3.55 | 39.40 | 14.20 | 13.31 |
| 17 | P14 | 0.25 | 3.21 | 3.55 | 42.95 | 14.20 | 13.38 |
| 18 | P15 | 0.25 | 3.46 | 3.55 | 46.50 | 14.20 | 13.44 |
| 19 | P16 | 0.25 | 3.71 | 3.55 | 50.05 | 14.20 | 13.49 |
| 20 | P17 | 0.25 | 3.96 | 3.55 | 53.60 | 14.20 | 13.54 |
| 21 | P18 | 0.25 | 4.21 | 3.55 | 57.15 | 14.20 | 13.57 |
| 22 | P19 | 0.25 | 4.46 | 3.55 | 60.70 | 14.20 | 13.61 |
| 23 | P20 | 0.25 | 4.71 | 3.55 | 64.25 | 14.20 | 13.64 |
| 24 | P21 | 0.25 | 4.96 | 3.10 | 67.35 | 12.40 | 13.58 |
| 25 | P22 | 0.15 | 5.11 | 1.50 | 68.85 | 10.00 | 13.47 |
| 26 | P23 | 0.08 | 5.19 | 0.47 | 69.32 | 5.88 | 13.36 |
| TOTAL | | 5.19 | | 69.32 | | 13.36 | |

Coal production will commence from the Lekhapani opencast mine in the 4th year of mine operation (P1) itself with 0.07Mt. of coal. Target production of 0.25 MTY

will be achieved in the 6th year of mine operation (P3) and will be sustained till the 24th year of mine operation (P21) thus ensuring 19 years of sustained coal production at rated capacity of 0.25 MTY. It will thus be possible to meet partially the coal demand from NEC.

OB removal will be 1.00 Mcum in the 4th year (P1) & 1.60 Mcum in the 5th year (P2), thereafter OB removal of 3.10 Mcum will be achieved in the 6th year of mine operation. The proposed sequence of mining permits stabilized OB removal operations from the mine at the envisaged level of 3.55 Mcum per year for a period of 13 years (from 11th year of mine operation (P8) to 23rd year of mine operation (P20)).

Schematic Layout of Initial Mining cut shown in **Plate No.VII**.

2.6 DUMPING STRATEGY

In view of the steep floor gradient, simultaneous backfilling of OB will not be possible with conventional strike faces and the entire waste will have to be placed in the external dumps. Requirement of external dumping space depends on annual rate of production and the dumping strategy adopted.

The proposed sequence of mining is ideally suited for achieving the objective of placing maximum possible OB in the internal dumps. The proposed location of IMC gives earliest back-filling opportunity, owing to the relatively shallow depth. Thus external dump quantities will be minimized. The following design criteria have been considered for waste dumps.

- i. OB to be dumped in 30 meter high decks.
- ii. 40 m berm width for allowing safe transport, where necessary.
- iii. Dump slope for each deck to be at natural angle of repose (37 degree)
- iv. Track dozers to be deployed for shaping the dumps
- v. Final reclamation will be achieved using the equipment provided for the purpose.

The adopted dumping strategy has enabled external dumps to be kept at bare minimum. A total of 120 hectares of land will be needed for this purpose. It is envisaged to accommodate about 50.32 Mm³ of OB in the external dump. Balance 19.00 Mm³ of OB will be accommodated in the internal dump constituting about 28% of the total OB.

Yearwise overburden removal and dumping schedule of Lekhapani opencast mine are presented in Table no. 2.8.

Table No. 2.8
Annual OB Removal and Dumping Schedule
(Qty. in Mm³)

| Year | Annual Overburden Removal | Dump Location | |
|--------------|---------------------------|---------------|---------------|
| | | External Dump | Internal Dump |
| 1 | 1.00 | 1.00 | - |
| 2 | 1.60 | 1.60 | - |
| 3 | 3.10 | 3.10 | - |
| 4 | 3.10 | 2.40 | 0.70 |
| 5 | 3.10 | 2.30 | 0.80 |
| 6 | 3.10 | 2.20 | 0.90 |
| 7 | 3.10 | 2.10 | 1.00 |
| 8 | 3.55 | 2.55 | 1.00 |
| 9 | 3.55 | 2.55 | 1.00 |
| 10 | 3.55 | 2.55 | 1.00 |
| 11 | 3.55 | 2.45 | 1.10 |
| 12 | 3.55 | 2.45 | 1.10 |
| 13 | 3.55 | 2.45 | 1.10 |
| 14 | 3.55 | 2.45 | 1.10 |
| 15 | 3.55 | 2.45 | 1.10 |
| 16 | 3.55 | 2.45 | 1.10 |
| 17 | 3.55 | 2.45 | 1.10 |
| 18 | 3.55 | 2.45 | 1.10 |
| 19 | 3.55 | 2.45 | 1.10 |
| 20 | 3.55 | 2.45 | 1.10 |
| 21 | 3.10 | 2.20 | 0.90 |
| 22 | 1.50 | 1.10 | 0.40 |
| 23 | 0.47 | 0.17 | 0.30 |
| Total | 69.32 | 50.32 | 19.00 |

The Schematic final stage dump plan showing External Dump on dipside is shown as **Plate No. X**.

2.7 OUTSOURCED OPERATIONS

GENERAL

In the hiring/outsourcing option, it is proposed to outsource the following major operations:

- Excavation & transportation of overburden
- Excavation & transportation of coal
- Loading & dispatch of coal at siding
- Drilling of blast hole
- Preparation of haul road, heavy duty roads, ramp etc
- Dozing & leveling works, grading
- Reclamation works
- Security

All statutory rules, regulations and applicable laws are to be followed including those related to the Govt. licenses, workmen compensation, insurance etc. Rest activities of mine operations, like blasting operation, power supply arrangements, surface illumination and dewatering etc will be carried out by the project.

It is essential that sequence of mining and dumping of overburden be executed as prescribed in calendar programme of excavation and schedule of dumping. Haul road will have to be maintained with requisite gradient as per regulations and in according to the conditions imposed by DGMS in its permission under regulation 98(1) & (3) and other relevant provisions of the Coal Mines Regulation 1957.

It is proposed to deploy diesel hydraulic shovel/backhoe in combination with dumper/tipping truck for mining in this hiring option. No provision has been made towards HEMM as well as maintenance and repair of HEMM. There will be no departmental workshop for the outsourced HEMM. Construction of a small capacity workshop, however, has been envisaged for the maintenance of the vehicles in case of the hiring option. Envisaged requirement of manpower is 70 to supervise and manage the project.

2.8 PROJECT COMPONENT

(A) REQUIREMENT OF LAND

The mining and dumping strategies have been formulated to keep the land requirement to the minimum to control land degradation in environmentally sensitive region. Head-wise requirement of land for Lekhapani OCP is presented in Table no. 2.9. Total land falls in the reserved forest land category. The mining area including the area required for mine infrastructures are under the existing leasehold of NEC (Lekhapani-Tipongpani leasehold). NEC will be required to acquire the fresh leasehold for the area of external dump, approach road & mine infrastructure etc.

Table No. 2.9

Head-wise Requirement of Land

| Sl. No. | Particulars | Land Requirement (in Ha) |
|----------------|--|---------------------------------|
| 1. | Mining | 80.00 |
| 2. | Mine Periphery including haul roads, power supply arrangements | 15.00 |
| 3. | External dumps | 120.00 |
| 4. | Office, workshop, Stores & Repair facilities, coal stock yard etc. | 10.00 |
| 5. | Approach road etc. | 10.00 |
| | Total | 235.00 |

(B) INFRASTRUCTURE

The mine site infrastructure includes the power distribution system, pumping arrangement in the mine, water supply, sewerage, communications, roads, workshops, stores, offices and other buildings.

(C) POWER SUPPLY

All the outsourced HEMM (shovel & drill) of the project are envisaged to be diesel engine driven and electricity is envisaged for workshop, CHP and pumping operation. Since the production of this mine is low (0.25 MTY), sizes of workshop and C.H.P. are also very small. Major load in this mine will be pumping due to heavy rainfall in the area.

Lekhapani O.C.P. will receive power at 11 KV from Lekhapani sub-station of ASEB which is about 5 KM from proposed site of O.C.P. At present Lekhapani substation which is receiving power at 33 KV from 132/33 KV Ledo Sub-station of ASEB, is feeding power to Tipong Colliery (U/G), MES (Military Engineering Service) and local private consumers at 11 KV, through a 33 KV/11 KV, 2.5 MVA transformer. As the present power demand of Tipong U/G, MES and Jagun Feeders (local consumers) is 1 MW, 0.5 MW and 1 MW respectively, there is no spare capacity in existing Lekhapani sub-station to supply power to Lekhapani O.C.P. It is therefore proposed to install one more 2.5 MVA, 33/11KV transformer in Lekhapani sub-station.

The Maximum Demand at the target production with all pumps working in the 8th year is estimated at 387 KVA. The transformer selected for contractual working is 2 x 250 KVA. The Contract Demand shall be decided as per selected option and stipulations of ASEB.

Power at 11 KV shall be received at the main sub-station (Near the mouth entry) of Lekhapani O.C.P. Two nos. 11/0.415 kV power transformers, 2 x 250 KVA (contractual option) are proposed to be installed in the main sub-station. One 415 V switch board with incoming air circuit breakers and outgoing moulded case circuit breakers will be installed in the main substation which will be supplied from power transformers to feed workshop, coal handling plant, pumping load, quarry lighting, substation lighting and outdoor lighting. One 415 V overhead line with DOG conductor will run from the substation to 415 V Distribution Board at Pumping station in the quarry.

(D) WATER SUPPLY AND SEWERAGE

The total water demand for the Project has been estimated as 0.076 MGD. This includes potable water requirement of 0.016 MGD and the industrial water requirement of 0.06 MGD. Separate sewerage system for domestic & industrial sewage has been envisaged for the Project.

COLONY WATER SUPPLY

The existing water supply system for the Ledo-Tirap colony has been considered for Lekhapani also. A provision of an overhead tank has been made to cater the needs of potable water for the proposed residential units. This overhead tank will be connected to the existing water supply network. From this tank water will be distributed to the residential units through gravity flow. The detail for the hiring option has been furnished.

INDUSTRIAL WATER SUPPLY

Lekhapani river has been identified as the source of water for the industrial water demand of project. Water from this river shall be drawn through an intake well to the ground reservoir located in the proposed industrial area. This water shall be treated through a pressure filter and pumped to an overhead tank. From this tank, water for industrial purposes has been considered to be delivered to the various industrial buildings, administrative complex & quarry sites and is proposed to be distributed by gravity to the point of consumption through a distribution network. For fire fighting purposes in the industrial areas like workshops, stores and quarry area, separate distribution networks have been proposed from the ground reservoir. Provision towards requirement of water for public utilities like garden, afforestation etc. has been made in this report. It has been envisaged that the distribution network for fire fighting purposes shall also be utilised for these purposes.

COLONY SEWERAGE

Colony sewage has been proposed to be dealt through septic tanks and soak pits.

INDUSTRIAL SEWERAGE

It has been considered that the industrial wastes from workshop and other industrial establishments would be led through oil & grease traps. The effluent coming out of the industrial premises is proposed to be treated and led to the settling tank and to be recycled for various industrial uses for this project. The domestic sewage generated in industrial premise has been considered to be dealt in septic tanks and soak pits.

(E) ROAD NETWORK AND CULVERTS

COLONY ROAD

The length of colony roads for the hiring option has been estimated as 0.3 Km.

HAUL ROAD

The requirement of haul road (0.50 Km) is envisaged to be constructed and maintained by the agency entrusted for mining.

HEAVY DUTY ROAD

The dumpers of the hiring agency deployed in the benches will also go to the workshop for maintenance. Hence a provision of 0.5 Km heavy duty road has been envisaged to be prepared and maintained by the outsourcing agency.

APPROACH ROAD TO PROJECT & TOWNSHIP

Approach road to project of 5.5 Km length has been envisaged with one bridge over Lekhapani river having a span of 35m.

APPROACH ROAD TO MAGAZINE

A 1.0 Km long approach road is proposed for magazine.

This is a new mine. No significant increase in vehicular density outside mine lease area is anticipated from the proposed production.

(F) BUILDINGS

Lekhapani block is about 25 Km east of Margherita township (Head Quarter of NEC). An unmetalled road through rugged terrain connects the block with the National Highway No. 38. Keeping in view the location of the block, it has been thought

prudent to locate the colony and community buildings for Lekhapani OCP in and around existing Ledo-Tirap Township. This township is around 15Km from the Project site. The existing colony for Ledo & Tirap comprises of Welfare & community buildings like school, college, cinema hall, post office, bank, workers' institute, club, parks and playground etc. Considering these existing facilities in the Ledo-Tirap Township, the present report has been prepared.

SERVICE BUILDINGS

These include community centre, shopping centre, offices, workshop & stores, sub-stations, magazine & other statutory buildings. Following are the broad details of these buildings.

COMMUNITY BUILDINGS

As has been indicated earlier that the existing Ledo-Tirap township has dispensary, primary school, officers' and staff rest houses, clubs etc., it has been envisaged in the report that only facilities like community centre, shopping complex etc. need to be provided.

OFFICES

Provision has been made for Project office and mine site office. These buildings have been envisaged as RCC-cum-brick masonry structures.

WORKSHOPS AND STORES

In this project report, provisions have been made for maintenance and repair of LMV, CHP, pumps etc. Accordingly, workshop and stores to cater for the needs of their repairs and maintenance have been considered. The area of various shops and facilities are envisaged on the basis of technological & operational requirements. The buildings are envisaged to be of structural steel construction with RCC foundation, 22G CGI sheeting on roof and 24G CGI sheeting as side cladding, cubicles for shop in-charge, small toilet facility, cage ladder for access to roof etc.

SUB-STATION

One Sub-station has been considered to cater for the requirements of the Project. This will be brick masonry, RCC beam and slab construction with RCC louvers for ventilation and ducts with proper size for electric cables.

MAGAZINE

Required provision for magazine has been made.

STATUTORY BUILDINGS

There are provisions for canteen, first aid centre, rest shelter, training centre, pit head bath etc. The areas for various statutory buildings have been considered on the basis of BPE guidelines.

RESIDENTIAL BUILDINGS

The manpower requirement for the hiring option Lekhapani Opencast Mine has been estimated as 70. This manpower is required to be housed near the project site for smooth and continuous operation of the mine. The project is located in the district of Tinsukia. Margherita town is about 10 kms away from the Ledo -Tirap township. With this background, 75% housing satisfaction has been considered for the project. Hostel accommodation has been proposed as 20% of type -A quarters, and reduction in proposed type - A quarters has been made accordingly.

(G) PUMPING AND DRAINAGE

The pumping system of Lekhapani Opencast mine has been designed to dewater the inflow of water due to precipitation falling within the active pit limit during the monsoon season to enable the mining activity to continue round the year. General topography of the project shows that surface drainage is not likely to pose any major problem. The surface within the mine intake area is highly undulating and is not traversed by major river/nallah.

The rainwater intake to the opencast mine is non-uniform during the year. The maximum rainwater intake will be during the period of about five months (June to October) in a year. During dry season, say November to April, seepage from strata is expected to be moderate and the same can be dealt by running a few number of pumps provided for monsoon pumping. During this period repair & overhauling of the pumps will be done by rotation. The quantity of water inflow during a day of peak rainfall in monsoon will be handled by the main pumps.

Pumping system has been designed for the volume of water accumulated in the mine at the final stage of production considering maximum daily rainfall as 190 mm.

Peak pumping capacity worked out as under: **26648 cum**

Above volume of water will be dewatered in 5 days at the rate of 18 hours pumping per day.

Hence pumping capacity/day: **$26648/5 \text{ cum/day} = 5330 \text{ cum/day}$**

Maximum capacity of pumping has determined based on operating time of 18 hours a day.

(H) COAL HANDLING ARRANGEMENT

From the production plan, annual target of 0.25Mt. capacity is reached in 3rd year. It is envisaged to construct receiving pit with grizzly facility, conveyor of suitable length and truck loading hopper from where coal will be dispatched by trucks to the Ledo Railway siding.

The handling capacity of the CHP has been decided to match with the production capacity of the mine. On the basis of 180 working days / year and 5 hours/shift, the rated capacity of the CHP works out to 278 tph. In order to meet the fluctuations of coal output from the mine due to irregularities of transport system and seasonal fluctuations, the design capacity of the CHP has been fixed at 300 tph.

The proposed coal handling plant will consist of receiving pit with grizzly, reciprocating feeder, belt conveyor and truck loading hopper & ground bunker. (-) 350 mm coal transported in 35 t rear dumpers will be fed into a receiving pit of 70 t capacity. Reciprocating feeder provided below receiving pit will discharge coal on belt conveyor which discharges coal into a 100 t. truck loading hopper.

PLANT DESCRIPTION

RECEIVING PIT

The Run-off mine coal from the open cast mine project shall be received into receiving pit, by means of rear discharge dumpers. Receiving pit is provided with grizzly, 70 t capacity hopper, one reciprocating feeder.

Grizzly is provided to rake and break over size lumps manually. The crushed coal from the hopper shall be collected on to a conveyor to transport the same to the truck loading hopper.

STORAGE HOPPER AND RECLAMATION SYSTEM

It has been envisaged to provide storage facility of 100 t. capacity. The hopper shall be of steel construction with sides sloping at 55⁰ to the horizontal. The bottom of hopper will have provision to fix rack and pinion chute gate to load into trucks.

LOAD OUT SYSTEM

The tipping trucks will transport coal from the mine upto nearest railway siding and spread along the siding. The loading on to the railway wagons will be done by one no. 2.2 cum front end loader.

(I) WORKSHOP

Since the mining operations in Lekhapani OCP are being proposed by outsourced equipment, there is no requirement of excavation workshop. E&M workshop is being envisaged for repair of pumps, CHP and lighting equipment etc. The proposed project store will facilitate the storage of spare-parts, sub- assemblies and consumables.

2.9 GEOLOGY

2.9.1 GENERAL

Lekhapani block is 1 sq.km in area. It is located in the extreme west of Lekhapani-Tipong coal belt on the southern limb of Namdang syncline. The geology and structure of the block have been deciphered based on the sub-surface data generated through ten coring boreholes and available mine data. These data have been processed to prepare geological map of the block, correlation of coal seams, floor contour and isochore plans of coal seam [Seams I(60'), III(20') & IV(5')]. The geological structure is based on sub-surface geological data interpretation of floor contour plan and geological cross-sections.

The Lekhapani block extends along strike for about 1.6 Km, approximately in NE-SW direction. The width of the block is 0.6 Km. It occupies an area of 1.0 Sq.Km.

STRATIGRAPHY:

All the ten boreholes drilled in the block have intersected Seam I (60'), which defines the base of Tikak Parbat Formation. No borehole has been deepened to intersect the underlying older formations. The stratigraphic sequence met in the block is given in Table - 2.10.

TABLE - 2.10

STRATIGRAPHIC SEQUENCE, LEKHAPANI BLOCK

| Age | Group | Formation Thickness range | Lithology |
|-----------|--------|--|---|
| Recent | - | 5.00m (MALM-007) to 23.00m (MALM-009) | Alluvium, clayey and sandy soil |
| Oligocene | Barail | Tikak Parbat, 204.10m (MALM-001) to 414.80m (MALM-005) | Fine to medium grained sandstones, sandy shales ferruginous clayey shale grey clay mudstone, carbonaceous shale and five correlatable regional and three local coal seams |

STRIKE AND DIP

The strike of the coal seams as per the floor contour plans varies from $N70^{\circ}E-S70^{\circ}W$ to $N50^{\circ}E-S50^{\circ}W$. However, on the surface, it is NE-SW. The dip direction of the strata varies from $N20^{\circ}W$ to $N40^{\circ}W$. The amount of dip in the block, as per floor contour plans of the seams ranges from 18° to 51° . The dip for surface strata ranges from 40° to 70° , as shown in the geological map of the coalfield (Plate No. 2). In the floor contour plan the amount of dip on up dip side of the block in the region of incrop to fault F_5F_5 is 45° to 51° . In the rest of areas it is 20° to 27° , except in the western part of the block, where it is about 18° . In the same areas (sectors) bounded by faults the amount of dip is generally uniform, but differs from sector to sector.

FAULTS

Ten normal faults have been deciphered on the basis of floor contour plans and geological cross sections of coal seams. Four faults, F_3F_3 , F_6F_6 , F_7F_7 & F_8F_8

are oblique and all the remaining six are strike fault. The throw of faults varies from 20m to 200m. Except faults F₁F₁, F₆F₆, F₇F₇ and F₈F₈ all the remaining faults have been intersected in one borehole each. For precise delineation of the faults a few structural boreholes are needed. The fault F₈F₈ is located in extreme southeast corner and has very small strike extent (about 60m) in the block, but it extends towards east. The faults F'₁F'₁ and F₁"F₁" are sympathetic to fault F₁F₁ and have limited strike extent of 0.1 Km each. The remaining faults extend for a length of 0.4 Km to 1.5 Km. The dip of the faults has been taken as 80°.

COAL SEAMS

Five regional coal seams occur in Makum coalfield. The drilling in Lekhapani block has proved the existence of three local coal seams, in addition to the five regional coal seams, in the strata above the youngest seam Seam-V (8'). The Seams I (60'), and III (20') occur in the entire block. Seam IV (5') is confined in the south-central part of the block. The remaining two regional Seams II (7') & V (8'), and the three local Seams, in ascending order, VA, VB and VC are mostly thin and impersistent. The detailed description of Seams I (60'), III (20') and IV (5') have been given, the other remaining five seams have been described in brief. Seam I (60') splits in three sections, and these three sections further split in two sub-sections in some of the boreholes. The determined coal quality and properties data are available only for entire Seam I (60') and not for individual section/sub-section of the seam.

SEQUENCE OF COAL SEAMS, MAKUM COALFIELD

The geo-mining characteristics of the Lekhapani block are shown in Table No. 2.11 below:

Table No. 2.11

| Sl. No. | Particulars | Unit | Min. | Max. | Usual |
|---------|---------------------------------|------|------|-------|------------|
| 1.0 | Strata Thickness | | | | |
| 1.1 | Overburden | | | | |
| (i) | Alluvium, clayey and sandy soil | m | 5.00 | 23.00 | 9.00-12.00 |

| | | | | | |
|-------------------------|-------------------------------|----------|--------------|---------------|--------------|
| (ii) | Sandy clay and weathered sst. | m | 2.72 | 6.43 | 3.00-6.00 |
| (iii) | Main Overburden | m | 20.00 | 60.00 | |
| (iv) | Parting between 5' & 20' | m | 40.00 | 70.00 | 50.00 |
| (v) | Parting between 20' & 60' | m | 70.00 | 90.00 | 75.00 |
| Total Overburden | | m | 15.00 | 260.00 | - |
| 1.2 | COAL (Exband) | | | | |
| (i) | 60' Seam | m | 12.00 | 18.00 | 16.00 |
| (ii) | 20' Seam | m | 6.00 | 6.00 | 6.00 |
| (iii) | 5' Seam | m | 1.00 | 5.00 | 3.00 |
| Total (Coal) | | m | 19.70 | 29.70 | 22-27 |

Topography and Geological Plan is shown as Plate No. III.

Ultimate Pit Configuration Plan is shown as Plate No. IV.

Mine Cross-Section along A-A', B-B' is shown as Plate No. V & Mine Cross-Section along C-C', D-D' is shown as Plate No. VI.

2.10 COAL QUALITY

Overall grade of product Coal comes to 'A'.

Caorific value (Kcal/kg)- >7000(approx.)

Ash(%)- 2.8-9.4

Moisture (%)- 2.1-3.9

Sulphur (%)- 1.5-3.5

2.11 COAL RESERVES :

The coal reserves of Seam I (60'), III (20') and IV (5') have been estimated. For the remaining seams, it has not been estimated due to their impersistent nature and their occurrence over small area. Seams I (60'), III (20') and IV (5') occur over an area of 0.892 sq.km, 0.809 sq.km and 0.224 sq.km respectively. The seam-wise net geological reserves for virgin, developed & barrier areas are given below as Table 2.12. The total net proved geological reserve of the block is 20.961 Mt. for the three seams. In the virgin area reserve is 20.02 Mt, in developed area it is 0.193 Mt and in barrier area the coal reserve is 0.741 Mt.

Table No.2.12

**SEAM-WISE PROVED NET GEOLOGICAL RESERVE FOR VIRGIN,
DEVELOPED & BARRIER AREAS, LEKHAPANI BLOCK, MAKUM COALFIELD
Seam I (60'), Above (155.24m) drainage Level**

| Virgin Area | | Developed Area | | Barrier Area | | Total | |
|--|--------------------|----------------|--------------------|---------------|--------------------|---------------|--------------------|
| Area in Sq.Km | Net reserve in Mt. | Area in Sq.Km | Net reserve in Mt. | Area in Sq.Km | Net reserve in Mt. | Area in Sq.Km | Net reserve in Mt. |
| 0.439 | 6.920 | 0.012 | 0.151 | 0.015 | 0.250 | 0.466 | 7.321 |
| Seam I (60'), Below (155.24m) Drainage Level & Less than 300m depth | | | | | | | |
| 0.410 | 7.216 | - | - | 0.016 | 0.263 | 0.426 | 7.479 |
| Sub-Total | 14.14 | 0.012 | 0.151 | 0.031 | 0.513 | 0.892 | 14.800 |
| Seam III (20'), Above (155.24m) Drainage Level | | | | | | | |
| 0.681 | 4.689 | 0.008 | 0.042 | 0.029 | 0.195 | 0.718 | 4.926 |
| Seam III (20'), Below (150.24m) Drainage Level & Less than 300m depth | | | | | | | |
| 0.086 | 0.590 | - | - | - | - | 0.086 | 0.590 |
| Sub-Total | 5.279 | 0.008 | 0.042 | 0.029 | 0.195 | 0.804 | 5.516 |
| Seam IV (5'), Above (155.24m) Drainage Level | | | | | | | |
| 0.213 | 0.612 | - | - | 0.001 | 0.033 | 0.224 | 0.645 |
| Total Reserve, Above (155.24m) Drainage Level of seams I (60'), III (20') & IV (5') | | | | | | | |
| Total | 12.221 | - | 0.193 | - | 0.478 | - | 12.892 |
| Total Reserve below (155.24m) Drainage Level & less than 300m depth of Seam I (60'), IV (20') & IV (5') | | | | | | | |
| Total | 7.806 | - | - | - | 0.263 | - | 8.069 |
| Grand Total | 20.027 | - | 0.193 | - | 0.741 | - | 20.961 |

2.12 OVERBURDEN AND STRIPPING RATIO:

Mining Schedule

| Year of mine operation | Year of production | Coal Production (Mt.) | | OB Removal (Mcum) | | Stripping Ratio (Cum/t) | |
|------------------------|--------------------|-----------------------|------------|-------------------|------------|-------------------------|-----------------|
| | | Annual | Cumulative | Annual | Cumulative | Running | Running Average |
| 1 | C1 | - | - | - | - | - | - |
| 2 | C2 | - | - | - | - | - | - |
| 3 | C3 | - | - | - | - | - | - |
| 4 | P1 | 0.07 | 0.07 | 1.00 | 1.00 | 14.29 | 14.29 |
| 5 | P2 | 0.14 | 0.21 | 1.60 | 2.60 | 11.43 | 12.38 |
| 6 | P3 | 0.25 | 0.46 | 3.10 | 5.70 | 12.80 | 12.39 |
| 7 | P4 | 0.25 | 0.71 | 3.10 | 8.80 | 12.40 | 12.39 |
| 8 | P5 | 0.25 | 0.96 | 3.10 | 11.90 | 12.40 | 12.40 |
| 9 | P6 | 0.25 | 1.21 | 3.10 | 15.00 | 12.40 | 12.40 |
| 10 | P7 | 0.25 | 1.46 | 3.10 | 18.10 | 12.40 | 12.40 |
| 11 | P8 | 0.25 | 1.71 | 3.55 | 21.65 | 14.20 | 12.66 |
| 12 | P9 | 0.25 | 1.96 | 3.55 | 25.20 | 14.20 | 12.86 |
| 13 | P10 | 0.25 | 2.21 | 3.55 | 28.75 | 14.20 | 13.01 |
| 14 | P11 | 0.25 | 2.46 | 3.55 | 32.30 | 14.20 | 13.13 |
| 15 | P12 | 0.25 | 2.71 | 3.55 | 35.85 | 14.20 | 13.23 |
| 16 | P13 | 0.25 | 2.96 | 3.55 | 39.40 | 14.20 | 13.31 |
| 17 | P14 | 0.25 | 3.21 | 3.55 | 42.95 | 14.20 | 13.38 |
| 18 | P15 | 0.25 | 3.46 | 3.55 | 46.50 | 14.20 | 13.44 |
| 19 | P16 | 0.25 | 3.71 | 3.55 | 50.05 | 14.20 | 13.49 |
| 20 | P17 | 0.25 | 3.96 | 3.55 | 53.60 | 14.20 | 13.54 |
| 21 | P18 | 0.25 | 4.21 | 3.55 | 57.15 | 14.20 | 13.57 |
| 22 | P19 | 0.25 | 4.46 | 3.55 | 60.70 | 14.20 | 13.61 |
| 23 | P20 | 0.25 | 4.71 | 3.55 | 64.25 | 14.20 | 13.64 |
| 24 | P21 | 0.25 | 4.96 | 3.10 | 67.35 | 12.40 | 13.58 |
| 25 | P22 | 0.15 | 5.11 | 1.50 | 68.85 | 10.00 | 13.47 |
| 26 | P23 | 0.08 | 5.19 | 0.47 | 69.32 | 5.88 | 13.36 |
| TOTAL | | 5.19 | | 69.32 | | 13.36 | |

OB removal will be 1.00 Mcum in the 4th year (P1) & 1.60 Mcum in the 5th year (P2), thereafter OB removal of 3.10 Mcum will be achieved in the 6th year of mine operation. The proposed sequence of mining permits stabilized OB removal operations from the mine at the envisaged level of 3.55 Mcum per year for a period of 13 years (from 11th year of mine operation (P8) to 23rd year of mine operation (P20)).

2.13 PROJECT ECONOMICS

CAPITAL INVESTMENT

The total capital investment for Lekhapani opencast project for the hiring/outsourcing option has been estimated as Rs. 56.39 Crore with specific investment of Rs. 2255.58/t. Initial capital investment has also been summarized below:

| Sl. No. | Particulars | Initial Capital Requirement (Rs. Lakh) |
|---------|--|--|
| 1 | Land | 2350.00 |
| 2 | Buildings | |
| | I) Service | 266.04 |
| | ii) Residential | 235.66 |
| 3 | Plant and Machinery | |
| | I) HEMM | 0.00 |
| | ii) Other than HEMM | 690.52 |
| | iii) Contingencies | - |
| 4 | Furniture & Fittings | 25.00 |
| 5 | Railway Siding | - |
| 6 | Vehicles | 76.50 |
| 7 | Prospecting & Boring | 93.08 |
| 8 | Development | |
| | i) Capital Outlay in Mines | 308.23 |
| | ii) Roads and Culverts | 490.53 |
| | iii) Water Supply & Sewerages | 354.63 |
| | iv) Pilot Scheme & Scientific Research | 40.00 |
| | v) PR Preparation cost | 150.00 |
| | Sub - Total (1 to 8) | 5080.19 |
| 9 | Revenue Expenditure Capitalised | 582.23 |
| 10 | Less Depreciation Capitalised | 23.47 |
| | Total Initial Capital | 5638.95 |

OPERATING COST ESTIMATES

Operating cost has been estimated and presented under the following heads:

Wages & Salaries

Stores

Power

Miscellaneous expenditure

Administrative charges

Interest on working capital

Interest on loan capital

Depreciation

Operating cost estimates have been prepared for the life of the mine at 100% and 85% levels of productivity. The estimated cost of production per tonne of coal at 100% and 85% levels of capacity utilization are given below.

| Sl. No. | Particulars | Cost of Production (Rs/t) |
|---------|------------------|---------------------------|
| 1. | At 100% capacity | 2039.86 |
| 2. | At 85% capacity | 2119.31 |

FINANCIAL ANALYSIS

Financial cash flow considers all the cash outflows by way of initial investment, replacement cost, operation cost as well as interest. The cash flow analysis at 100% level of production and as well as at 85% level of production.

Selling price of coal has been worked out for Lekhapani OCP as Rs. 2850/t considering the basic price of NEC coal, loading and shunting charges.

INTERNAL RATE OF RETURN (IRR)

Internal rate of return of the Lekhapani opencast project for the hiring/outsourcing option is 33.86% at 100% project capacity utilization & 28.40% at 85% project capacity utilization level respectively.

2.14 MAJOR AFFECTED PARAMETER OF ENVIRONMENT

Worst affecting parameter due to coal mining activities are Air and water and land.

Air- One of the worst affected environmental attributes in mining project is air which get polluted due to blasting, excavating, transporting, loading & unloading of coal and OB. This activities of mining create the pollution by increasing the SPM level in the environment. This is low fugitive in nature and settled quickly and more over this is not harmful gas.

Water- Water get polluted from the effluent of mine water, workshop and etc. In rainy days, effluent is allowed to discharge only after proper treatments. More over these pollutants are only physical in nature the form of TSS which are easily filterable and not much harmful to human or aquatic life.

There will be increase in the depth of water table due to deep excavation for mining but this effect would be occurred up-to maximum extent of one Km. from the cutting edge of mine.

Land- Land is the worst affected parameter in the mining projects. Mining activities completely changed the topographic and characteristics of the land. It create large void of more than 100 m depth at one side and form huge OB, like mountain on other side. This gives the bad appearance as well as air pollution due to wind erosion.

Over Burden dumps (external or Internal) needs the continuous parallel process (progressive) of reclamation with mining works till the closer of mines. After close of mines it needs reclamation of whole area to improve the over all aesthetics view in such away that area become the source of income for the local inhabitant.

2.15 MITIGATION MEASURES FOR ENVIRONMENTAL MANAGEMENT OF PROJECT

DUST CONTROL

Green Belt through afforestation, creation of parks and avenues in the township. Dust suppression with watering including spraying and sprinkling at pollution sources points.

PREVENTIVE STEPS

Proper and Periodic maintenance of vehicles and avoidance of vertical fall of coal.

WATER POLLUTANTS

The dust mixed with run-off as sediments in the drainage and water regime ultimately affect the quality of water, soil and vegetation.

WATER MANAGEMENT .**MANAGEMENT OF MINE WATER DISCHARGE & INDUSTRIAL EFFLUENT**

The seepage water of the mine will be collected in a mine sump. The water after sedimentation will be further treated in an ETP before discharging into Ledopani nallah. Workshop effluent will be treated before discharging.

MANAGEMENT OF OVERALL WATER QUALITY

Overall water quality will be assured through regular monitoring.

LAND DEGRADATION

Land will be degraded due to opencast working.

SOLID WASTE DISPOSAL AND ITS MANAGEMENT

The total volume of OBR within the proposed area have been estimated to be 69.32 Mm³. External dumps will accommodate about 50.32 Mm³ and balance 19.00 Mm³ of OB will be accommodated in the internal dumps. The internal dumps constituting about 28% of the total overburden

This backfilled area will be technically and biologically reclaimed with plantation of suitable species.

PREVENTIVE MEASURES

Regular monitoring of working environment and implementation of safety and control measures to prevent hazards.

Use of protective equipments, clothing, helmets, ear muff, shoes, etc. medical examination of workers once in five years to detect preventable and curable diseases at an early stage.

RESETTLEMENT AND REHABILITATION

There will be no displacement due to operation of this mine.

MITIGATION MEASURES FOR NOISE

- Planting rows of trees with thick foliage along roads and other noise generating points
- Isolating/enclosing the noisy machines/sources by using resilient paddings and proper enclosures
- Provision of ear muffs/ear plugs for workers.

MEDICAL FACILITIES

Apart from dispensaries and primary health centers there is a well equipped Hospital nearby.

PROGRESSIVE MINE CLOSURE PLAN

Mine closure planning needs to be done before the commencement of mine operation and requires periodic reviewing and modification, if needed, during its life cycle to ensure safety and to cope up with social & environmental challenges. Various objectives of the advance mine closure planning are as follows:

- a) To allow productive and sustainable after-use of the site which is acceptable to the mine owner and the regulatory authority.
- b) To protect public health and safety.
- c) To eliminate environmental damage and thereby encourage environmental sustainability.
- d) To minimize adverse socio-economic impacts.
- e) To protect the flora and fauna of the area.
- f) Effective use of the assets.

PROTECTIVE MEASURES TO BE TAKEN

Protective measures must include the following:

- (a) The protection of mine boundary, buildings and other structures of the project site against access by unauthorized persons.
- (b) The maintenance of all mechanical, hydraulic and waste management systems.
- (c) The continuation of all monitoring programs.
- (d) The control of all contaminated effluents.
- (e) The securing of all petroleum products, chemicals and waste.
- (f) The rendering of all tailings, dams and piles of earth, rock and waste resulting from work done on the project site in a stable and safe condition.

2.16 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR RISK OF TECHNOLOGICAL FAILURE

Considering the geo-mining conditions of the block, the shovel-dumper combination will be used for exploitation of coal. This technology is a proven and tested technology.

The proposed project does not envisage to employ any new or untested technology for exploitation of coal.