

## 1.0 INTRODUCTION

Bhilai Jaypee Cement Limited (BJCL) is a joint venture of Steel Authority of India Limited (SAIL) and Jaiprakash Associates Limited (JAL). BJCL is planning to develop a cement plant complex by installing new clinker plant of capacity 1.09 MTPA will produce clinker and cement plant of capacity 0.6 MTPA at Babupur village, Tehsil Raghuraj Nagar, District Satna, Madhya Pradesh.

### 1.1 Project Brief

The proposed green field cement plant project details are given in **Table-1**.

**TABLE-1**  
**DETAILS OF THE PROPOSED PROJECT**

Sr. No.	Unit	Capacity (MTPA)	Route of Proposed
1	Clinker Plant	1.09	6-stage pre-heater/Pre-calciner kiln and VRM's for Coal and raw material grinding
2	Cement Plant	0.6	By installing a new VRM for cement grinding and Packing Unit with truck and wagon loading
3	Captive Limestone Mines:	0.6	To open up ML - I and ML - II for feeding captive clinker plant
	A. Captive Limestone Mine ML-I (ML Area-590.522 ha)		
	B. Captive Limestone Mine ML-II (ML Area-1033.99 ha)	1.5	

Source: BJCL and Scheme of Mining of Limestone Mines Leases I and II

The supporting installation for the proposed project includes installation of limestone crushing and storage facility at adjacent to plant and captive mines leases I & II area and new railway siding at plant site to Sakaria railway station.

#### 1.1.1 Size of the Project

The project cost estimated for the proposed cement plant including utilities, offsite, auxiliary services, margin money etc is Rs 364.5 crores. The anticipated capital expenditure for the in-built pollution control measures is Rs. 36.0 crores. The total project cost for proposed mine leases I and II is Rs. 35 crores. The anticipated expenditure for the pollution control measures is Rs. 0.70 crores.

#### 1.1.2 Location of the Project

The environmental setting of the cement plant complex and both the captive limestone mines area is presented in **Table-2**. The vicinity map of plant and mines are shown in **Figure-1**.

<b>BJGL</b>	<b><i>Environmental Impact Assessment Study for the Proposed Cement Plant Complex at Babupur, Raghuraj Nagar Tehsil, Satna District, Madhya Pradesh</i></b> <b><i>Executive Summary</i></b>
-------------	--

**FIGURE-1**  
**VICINITY MAP OF PROPOSED CEMENT PLANT AND CAPTIVE MINES I & II**

**TABLE-2  
ENVIRONMENTAL SETTING OF PROJECT AREA**

Sr. No	Particulars	Details		
		ML I	ML II	Cement Plant
1	Location	Spread over parts of Barikhurd, Putondha, Putondhi Sarwahna and Nimi Villages of Raghuraj Nagar Tehsil, Satna District, Madhya Pradesh.	Spread over parts of Ramasthan, Khamariya (Tiwarian), Jamorhi, Atrahara, Mohana, Sakaria, Sarwahana, Barera, Lohora, Bharpurwa and Khamariya (Payasian) Villages of Raghuraj Nagar Tehsil, Satna District, Madhya Pradesh.	Babupur
2	Latitude	24° 36' 33" to 24° 38' 25" North	24° 35' 20" to 24° 37' 28" North	24° 36' 01" to 24° 36' 52" North
3	Longitude	80° 54' 21" to 80° 56' 58" East	80° 54' 23" to 80° 57' 48" East	80° 53' 55" to 80° 54' 37" East
4	Current status of land	Industrial use	Industrial use	Industrial use
5	Elevation above Mean Sea Level	Plain land of about 292-313 m above Mean Sea Level (MSL)	Plain land of about 292-313 m above Mean Sea Level (MSL)	Plain land of about 300-310 m above Mean Sea Level (MSL)
6	Nearest Highway	NH - 75, 5.6 -km (S)	NH - 75, 3.5 -km (S)	4.3-km, S
7	Nearest Railway station	Satna R.S, 9.8 - km, SW direction	Satna R.S, 9.1 -km, SW direction	8.3-km, SW
8	Nearest Airport	Khajuraho, 100 -km NW	Khajuraho, 100 -km NW	Khajuraho, 100 -km NW
9	Reserved/Protected Forest within 10-km radius	1) Jumori R.F, 1.2 - km, SE, 2) Naro P.F, 10.5 -km, S	Jumori R.F, 0.3 - km, SE, Naro P.F, 8.4 - km, S	Jumori R.F, 4.6 -km, E, Naro P.F, 9.5 -km, S
10	Nearest Township	Satna, 9.3 -km, SW	Satna, 8.3 -km, SW	Satna, 7.6 -km, SW
11	Rivers/Lakes	Tamas or Tonnes River, 2.9 -km, SE Simarawal Nadi, 5.1-km, NE	Tamas or Tonnes River, 1.3 -km, SE Simarawal Nadi, 4.8-km, NE	Tamas or Tonnes River, 3.5 -km, SSE Simarawal Nadi, 8.8 - km, NE
12	Seismic Zone	Zone-II as per IS-1893 (Part-1)-2002	Zone-II as per IS-1893 (Part-1)-2002	Zone-II as per IS-1893 (Part-1)-2002

Source: Vimta Labs Limited, Hyderabad

## 2.0 PROJECT DESCRIPTION

### 2.1 Details Proposed Plant Facilities

The cement & clinker manufacturing in the plant is proposed through dry process. The proposed project details are given in **Table-3**.

**TABLE-3  
DETAILS OF THE PROJECT**

Sr. No.	Parameter	Description
1	Clinker production	1.09-MTPA
2	Cement production	0.6- MTPA Cement
3	Lime stone production details	ML – I : 0.6- MTPA ML – II: 1.5 -MTPA
4	Mineral reserves	<b>ML – I</b>
		<b>ML –II</b>
		Lime stone : 37.73- MT Overburden: 12.18 – Million m <sup>3</sup> Top Soil : 0.18- Million m <sup>3</sup> Mineable reserve: 23.32- MT
		Lime stone : 154.84- MT Overburden: 54.07 –Million m <sup>3</sup> Top Soil : 19.82- Million m <sup>3</sup> Mineable reserve: 69.56- MT
5	Process	6 stage preheater/precalciner kiln for calcinations VRMs for coal and raw material grinding
6	Land requirement	Cement Plant : 87.45-ha ML – I : 590.522- ha ML – II : 1033.99- ha
7	Water requirement and source	Water requirement for entire cement plant complex: 1400 m <sup>3</sup> /day Water requirement for Plant Activity : 1200-m <sup>3</sup> /day Water requirement for Mine Activity (ML-I & ML-II) : 200- m <sup>3</sup> /day Water Source : Ground water resources initially and thereafter from Reservoir created in mined out area
8	Raw material requirement for cement plant	Limestone : 2.1-MTPA Laterite : 0.07-MTPA Coal : 0.18-MTPA Gypsum : 0.05-MTPA Slag : 0.20-MTPA
9	Power requirement and source	22-MW (Including Plant and township) 1-MW for Mine activity Source: Madhya Pradesh State Electricity Board (MPSEB) grid Standby DG set for emergency Purposes : 10-MW
10	Main equipment details	Raw mill: 1 x 300-tph (Vertical Roller Mill) Pyro process : 3300-tpd (dry process twin string 6 stage) Coal Mill: 30-ph (Vertical Roller Mill) Clinker silo : 1 x 25,000 -t Limestone crusher : 750-tph (impactor with pre & post screening)
11	Pollution control	Plant: Bag dust collectors (emission below 50-mg/Nm <sup>3</sup> ) Mines: Dust Suppression and Green belt development with in the Mine Lease Area
12	Storage capacities	Finished product (Clinker): 1 x 25,000-t RCC Silo Blending Silo : 12,000-t RCC silo Limestone : Stockpile : 2 x 36,000-t, linear Laterite: 1 x 3000-t, covered Coal: 1 x 10,000-t, linear
13	Total manpower requirement	581 persons for entire plant complex. Additional contract labor required for auxillary services like loading and unloading of materials, general cleaning work and security

### 2.1.1 Land Requirement

An area of 87.45-ha including railway siding has been earmarked for the cement plant project. The land use of the proposed plant is given in **Table-2.3**.

**TABLE-4**  
**LAND USE OF THE PROPOSED PLANT SITE**

Sr. No.	Land use	Area (hectares)
1	Plant area	45.10
2	Administrative buildings, etc.	0.63
3	Railway siding	5.76
4	Landscaping & Greenbelt area	27.00
5	Truck Parking	1.00
6	Raw material storage	7.96
<b>Total</b>		<b>87.45</b>

Source: BJCL

### 2.1.2 Raw Material Requirement and Transportation Details

The major raw materials used in the manufacturing of clinker are limestone, laterite and black coal. The raw materials like limestone and laterite will be transported to site through roadway by dumpers. The outflow of finished products from plant will be 1.09-MTPA clinker and 0.60 MTPA cement. The limestone will be transported through dumpers from crusher to plant. The details of raw material requirement and transportation are given in **Table-5**.

**TABLE-5**  
**RAW MATERIAL REQUIREMENT & TRANSPORTATION**

Sr. No.	Material	Quantity (MTPA)	Source	Mode of transport	Quantity stored at site (tonnes)
1	Limestone	2.1	Captive Limestone Quarry, adjoining to the plant site	Road - dumpers	Stockpile : 2 x 36,000 t, linear
2	Laterite	0.07	Katni, Madhya Pradesh	road	1 x 3000 t, covered
3	Coal	0.18	Central Coal Fields	Covered rail/trucks	1 x 10,000 t, linear

\* considering 300 working days/annum

### 2.1.3 Water Requirement

The break-up of water requirement for different units for the proposed project is given in **Table-6**.

**TABLE-6  
WATER REQUIREMENT**

Sr. No.	Water Consumption	Quantity (m <sup>3</sup> /day)
1	Cement Plant	1100
2	Township	100
3	Greenbelt development (Re-circulated from STP)	80
	<b>Total</b>	<b>1200</b>

*Note: The treated domestic wastewater from STP will be used for green belt development*

Water is required for equipment cooling and for domestic purpose. The total fresh water requirement of proposed plant to meet the requirement of cooling of equipment and domestic purpose is about 1200-m<sup>3</sup>/day. The water requirement will be met from ground water sources.

#### 2.1.4 Power Requirement

The power requirement of the proposed clinker plant and mining activities will be about 22-MW and 1 MW respectively. The power will be sourced from MPEB grid or any other private source. A D.G set of 10 MW shall be installed to meet the power demand during emergency/power tripping.

#### 2.1.5 Manpower

The total manpower requirement for the proposed project during construction phase is 2000 nos. including skilled and unskilled workers. About 393 people will be employed during operation of cement plant. Contract labour shall be employed for auxiliary services like loading of cement bags, unloading of stores & miscellaneous materials and general cleaning work.

#### 2.1.6 Township

A full-fledged township will be developed to accommodate plant, mines and security personnel and supporting staff. Other amenities such as community center, guest house, health center, shopping complex, post office, bank etc. will be established. The location of the township is in the NE direction to the plant and also adjacent to the ML – I boundary.

### 2.2 **Details of Captive Limestone Mines**

The salient features of the captive limestone mining areas are presented in **Table-7**.

**TABLE-7  
SALIENT FEATURES OF LIMESTONE MINE LEASES**

Sr. No	Description	Details	
		ML – I	ML - II
1	Name of the Mine lease		
2	Extent of Mine lease (ML) area	590.522 ha	1033.99-ha
3	Type of ML area	Non-forest land	Non-forest land
4	Method of mining	Fully mechanized opencast	Fully mechanized opencast
5	Rated capacity of mine	0.6 MTPA limestone production	1.5 MTPA limestone production
6	Expected life of mine	39 years	47
7	Date of expiry of ML	31.10.2021	3.01.2027
8	Average stripping ratio	1 : 0.94	1:1
9	Geological reserves	37.73 Million Tonnes (15094378 m <sup>3</sup> )	154.825 - Millions
10	Recoverable reserves		74.0. Millions
11	Mineable reserves	23.32 Million Tonnes	69.56 Millions
12	Mineable overburden	12.18 Million m <sup>3</sup>	67.07- Millions m <sup>3</sup>
13	Average no. of working days	330-days/annum	330-days/annum
14	Number of shifts per day	3-shifts/day	3-shifts/day
15	Working hours per day	8-hrs	8-hrs
16	Mining blocks	1	1
17	No. of benches	2	2
18	Average Bench height for top soil	1.0-m	0 - 1.5 -m
19	Average Bench height for over burden (OB)	1 - 6-m	1.5 - 8.0 -m
20	Bench height for limestone	6 - 8-m	6.0-8.0- m
21	Ultimate depth of mine	25-m below GL (approx. 313 m above MSL)	313- m above MSL (15-25 - m BGL)
22	Topsoil to be generated during entire life of mine	About 2.5 lakh tonnes in 5 years	6.0 lakh tonnes in 5 years
23	Overburden to be generated during entire life of mine	18.36 Million m <sup>3</sup>	54.07-million m <sup>3</sup>
24	No. of waste dumps planned	Nil ( temporary dump will be maintained)	No separate Over burden dump planned
25	Power requirement	1-MW (Including ML – II) from power grid	1- MW (Including ML – I)
26	Water requirement	75-m <sup>3</sup> /day from mine sump	125 m <sup>3</sup> /day
27	Transport of OB	Dumpers of capacity 22 to 32 T	22/35 -t capacity dumper
28	Transport of limestone from mine face to crushing plant	Dumpers of capacity 22 to 32 T	35 -t/ 50- t capacity dumper
29	Distance to mine face to user point	Crusher is located at a distance of 3 - km from the working face within ML area	Clinker plant is adjacent to the ML – II and from mine crushing plant

### 2.2.1 Method of Mining

The choice of mining method has been considered as opencast mining for quarrying the limestone from the mines. The mining operation will be fully mechanized. The sequence of operation in quarrying will be drilling, blasting, loading and transportation.

All the rock types occurring within the area are fully exposed. There is hardly any top soil that occurs on the surface and hence separate dozing of the top soil would not be required. Drilling and blasting will be carried out for excavation of OB and limestone. For OB, 115-mm size drills will be used for drilling and shovel combination with 32/22-tonne capacity dumper will be used to transport the OB blasted material from the face to dump area.

For limestone, 115-mm size drills will be used for drilling. Crawler mounted hydraulic excavator with bucket capacity of 3.8-m<sup>3</sup> and 4.1-m<sup>3</sup> capacity will be used for loading and in combination with 32/ 22-tonne capacity dumpers shall be used to transport the blasted material from the mine leases.

### 2.2.2 Mining Equipment

There are four types of equipment systems available for open cast mining

- Bucket - wheel excavator mining;
- Dragline mining;
- Shovel-dumper combination; and
- Surface miners.

The mining machinery will be placed in a phased manner till the operations continue at the same rate of production in this mine. The machinery will be shifted gradually to the other captive mine lease of ML - II. The details of the proposed major mining machineries are given in **Table-8**.

**TABLE-8**  
**DETAILS OF MINING MACHINERY**

<b>Sr. No</b>	<b>Description</b>	<b>No of Units</b>	<b>Size/Capacity</b>	<b>Make</b>	<b>Motive Power</b>	<b>H.P</b>
1	Bull Dozer	1	-	BEML	Diesel	400
2	4"/6" dia drill machine	1	4"/6" dia	IG/Atlas	Diesel	180 to 400
3	Hydraulic Excavator	1	3.8 to 4.2 m <sup>3</sup>	Komatsu/L & T	Diesel	295 to 335
4	Dumpers	6	22 to 32	Volvo/Tata	Diesel	-

### 2.2.3 Site Services

#### 2.2.3.1 *Lime crusher and ancillary facilities*

The limestone crushing plant and ancillary facilities are mainly consists of 750-TPH capacity jaw crusher, 800-TPH capacity hammer crusher, stacker and reclaimer.

### 2.2.3.2 Fuel Requirement

Drilling and mining operations, 1.0 KLD of diesel is being used to operate the dumpers and other transport vehicles in mine lease to transport the lime stone, over burden, sprinkling of water and other mining operation and no additional requirement of fuel is envisaged.

### 2.2.3.3 Water Requirement

Industrial water is required for mining operations/establishment mainly for sprinkling on haulage roads and at faces for suppression of dust. Water is also required for washing and servicing utilities for equipment. The average daily water requirement for the proposed mines leases I & II during operation is 200 m<sup>3</sup>, which will be met from the rainwater accumulated in the mine sump except for potable water. However, potable water will be sourced from the clinker plant. No additional water requirement is envisaged in mining operations and also in potable water.

## 3.0 **DESCRIPTION OF THE ENVIRONMENT**

The study area covers the area falling within 10-km radius of:

- Proposed cement plant complex at Babupur Village
- Captive limestone mine lease I and II

The baseline data has been generated through primary surveys for three (3) months during 1<sup>st</sup> March 2007 to 31<sup>st</sup> May 2007 representing pre-monsoon season.

### 3.1 **Land Use Studies**

The land use pattern of the study area has been studied by analyzing the available secondary data such as the district primary census handbooks.

#### 3.1.1 Cement Plant

The total area of the proposed plant is 87.45-ha. About 30.35-ha consisting of agriculture land and rest of 57.10-ha is barren land.

#### 3.1.2 ML I

There is no forest land available in the study area. About 309.956-ha consisting of agriculture land, which works out to about 52.49 % of the total study area is used for cultivation and rest of the area belongs to government land and private land.

#### 3.1.2 ML II

About 738.312-ha consisting of agriculture land, which works out to about 71.40 % of the total study area is used for cultivation and rest of the area belongs to government land and private land.

### 3.2 Soil Characteristics

Ten (10) soil samples were collected from various locations from study and analyzed for physico-chemical parameters to assess the existing soil characteristics.

It has been observed that the texture of soil is mostly clay in the study area. The pH of the soil quality ranged from 7.5 to 8.3 indicating that the soil is neutral to slightly alkaline.

The electrical conductivity was observed to be in the range from 315 to 1097  $\mu\text{S}/\text{cm}$ , during the study period. The phosphorus values ranged between 12.0 Kg/ha to 74.7 Kg/ha. The nitrogen values ranged between 28.6 Kg/ha to 113.3 Kg/ha. The potassium values ranged between 204.3 Kg/ha to 1485.5 Kg/ha. The potassium values have varied from medium to more than sufficient category. The analysis results reveals that these soils are moderately alkaline with less to good range of nitrogen, less to sufficient range of phosphorus and medium potassium content which requires supplementation of chemical or biological fertilizers to better crop yields from these soils.

### 3.3 Site specific meteorological data

The maximum and minimum ambient temperatures recorded at mine leases and project site are 42.3°C and 18.7°C respectively during study period. The predominant winds are recorded mostly from NW, and W directions.

### 3.4 Air Quality

Ten (10) ambient air quality locations were selected in and around the ML – I & II and plant sites in the study area. Ambient air quality result are compiled and presented in detail in EIA report and the results reveal that the observed values are within limits of prescribed norms.

### 3.5 Water Quality

Water samples were collected from 12 locations, mainly from groundwater and surface water sources. These samples were taken as grab samples and were analyzed for various parameters to be compared with the standards for drinking water as per IS: 10500.

#### 3.5.1 Ground Water Quality

The pH of the water samples collected ranges from 6.9 to 7.4. The conductivity varied from 638 to 2590  $\mu\text{S}/\text{cm}$ . Total Hardness varied from 290 to 1005 mg/l. Fluorides are observed to be in the range of 0.7 to 1.3 mg/l. The sodium and potassium concentrations varied in between 25.4 to 106.0 mg/l and 1.6 to 10.1 mg/l respectively.

### 3.5.2 Surface Water Quality

The analysis results indicate that the pH ranges in between 7.2 to 7.4, which is well within the specified standard of 6.8 to 8.5. The conductivity was found to be 477 and 461  $\mu\text{S}/\text{cm}$ . Total hardness was observed to be ranging from 205 to 175mg/l.

### 3.6 **Noise Level Survey**

Sound Pressure Level (SPL) measurements were carried out at ten (10) locations; one reading for every hour was taken for 24 hours. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at all the locations covered in 10-km radius of the study area and recorded results reveals that the measurement are well within the limits as per CPCB guidelines.

### 3.7 **Flora and Fauna Studies**

Detailed ecological studies were conducted during pre-monsoon 2007 to identify the floristic composition in and around proposed project site and surrounding villages.

During field survey, maximum 297 number of plant species (except algae, fungi and bryophytes) were recorded from the study area. Life form spectrum is a reflection of plant community. A plant community is governed by several factors like climatic, edaphic, topographic and biotic. Even local variations in environment affect components of plant community. The study area did not record the presence of any critically threatened species. The records of Botanical Survey of India and Forest department also did not indicate presence of any endangered or rare and vulnerable plant species in this area.

75 wild animals observed/recorded through primary survey or with interaction local elderly people and forest officials of the area. 42 birds species, 4 species of reptiles, 9 species of butterflies, 2 species of Amphibians and 18 species of mammals are recorded, out of which 1 species belongs to Schedule-I, 4 species belongs to Schedule-II animals and rest belongs to Schedule-III and IV and V of Wildlife (Protection) Act,1972.

### 3.8 **Demography and Socio-Economic Profile**

As per 2001 census, the study area around ML - I consists of a total population of 328472, residing in 61509 residential households. The males constitute about 52.8% and females 47.9% of the total population. About 14.8% of the population in the study area belongs to Scheduled Castes (SC) and 5.9% to Scheduled Tribes (ST). The study area experiences a literacy rate of 63.9%. The main workers, marginal workers and non-workers constitute 28.1%, 4.6% and 67.4% respectively of the total population.

As per 2001 census, the study area around ML - II consists of a total population of 331465, residing in 62213 residential households. The males constitute about 52.9 % and females 47.1 % of the total population. About 14.7 % of population in the study area belong SC and 6.6 % to ST. The study area experiences a literacy rate of 63.8%. The main workers, marginal workers and non-workers constitute 27.9 %, 4.7 % and 67.4 % respectively of the total population.

## 4.0 **ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

### 4.1 **Impacts due to the Proposed Cement Plant Complex**

#### 4.1.1 Impact on Land use

BJCL is in possession of land measuring 87.45-ha for the construction of the cement plant and accessories. The development in the study area will definitely bring changes in the land use pattern due to the proposed plant. Shift in occupation or sectoral changes would require more land for non-primary activities. However, the land identified for the cement plant construction is presently in non-agricultural use and is a vacant land. No forest land exists in this land. Hence, the impact on agricultural or forest land usages is insignificant.

The development of greenbelt in about 29-ha of land will help in attracting minor fauna and birds. This will have a positive impact on the land use pattern.

#### 4.1.2 Impact on Soil vis-à-vis Generation of Solid Waste

There will be minimum impact on the soil due to the generation of solid waste. No solid waste will be generated in the process. Solid waste in the form of sludge will be generated from the sewage water reclamation plant (SWRP), which will be about 14-TPA will be used as manure for greenbelt development.

Further, the proposed greenbelt program with diversified species not only increases the biomass, soil fertility, productivity but also works as pollution sink and control of soil erosion. Hence, the likely impact on the soil characteristics will be insignificant.

#### 4.1.3 Topography and Climate

No major topographical changes are expected due to the proposed cement plant. Similarly, micro or macro climatic changes including thermal imbalances are not envisaged.

#### 4.1.4 Impact on Air Quality

Being a cement plant, the main air pollutant would be particulate matter (dust). In order to control emissions of particulates adequate control equipment are proposed.

Prediction of impacts on air environment has been carried out by using **Industrial Source Complex (ISC3) 1993** complex terrain dispersion model based on a steady state gaussian plume dispersion, designed for multiple point sources for short-term and developed by United State Environmental Protection Agency [USEPA] has been used for simulations from point sources.

#### 4.1.5 Fugitive Emissions

Fugitive dust emissions from the proposed plant would be significant as there will be air pollution due to activities like transport of limestone, coal handling, clinker handling and crushing unit and movement of vehicles on the roads. The limestone

transport is carried out by the system of aerial ropeway from the limestone crusher unit to the plant hence fugitive dust is not envisaged. Number of smaller sized bag dust collectors for de-dusting at transfer points and other fugitive dust emission areas are proposed. Hence, the impact due to fugitive emissions would be insignificant. Most of the internal roads within the plant and mines are metalled, hence dust arising from the internal roads is insignificant. The proposed greenbelt and regular water sprinkling will help reduction in fugitive emissions.

#### 4.1.6 Impacts due to Traffic

The proposed plant activities will involve transport of raw materials and final products near to and from the site. The transportation of raw materials/finished products will involve generation of additional traffic of about 30 trucks per hour.

The traffic contribution to the highway from the proposed plant will be due to the transportation of coal, gypsum, laterite / iron ore clinker and the cement. As worst case 100% transportation by road has been considered for these materials. Compared to the existing traffic on highway, the incremental traffic density due to the proposed plant (30 trucks per hour) will be negligible. Hence, insignificant impact on the adequacy of the highway is envisaged.

#### 4.1.7 Impact on Water Resources

BJCL has estimated the water requirement for its cement plant and residential colony as 1200-m<sup>3</sup>/day. Primarily, water requirement is proposed to be met from bore wells, as adequate water is available in the underground sources through existing canal system. Tapping of ground water will be restricted only to drinking water purposes. Hence, no impact is envisaged on the water resources of the area.

However, BJCL is proposing to develop rain water harvesting structures, roof top harvesting structures as well as check dams in surrounding area to recharge ground water in the region.

#### 4.1.8 Impact on Water Quality

The quantity of wastewater generation depends upon the quantity of water used for various purposes. As the cement plant will be operated on the dry process and air is using as cooling media, water is mainly used for water spray in cement mills. As the system involved is a close circuit there is no scope for process wastewater generation. Wastewater generation will be mainly from sanitary wastes generated from domestic uses. The sanitary wastewater will be treated in the Sewage Water Reclamation Plant (SWRP) of a design capacity of 650 m<sup>3</sup>/day and utilized for green belt development.

#### 4.1.9 Impact on Noise Levels

Any industrial complex in general consists of several sources of noise in clusters or single. These clusters / single source may be housed in buildings of different dimensions made of different materials or installed in open or under sheds. The noise levels at the source will be in the range of 70-90 dB(A). For computing the

noise levels at various distances with respect to the plant site, noise levels are predicted using a user friendly model.

#### 4.1.10 Impact on Ecology

There are no ecologically sensitive areas like Wildlife Sanctuaries within 10-km radius from the plant and also no migration route to avi-fauna is observed or recorded in study area. Similarly, as per the forest department, no endangered or rare species of flora and fauna are reported or observed in the study area.

The impact on terrestrial ecology will be due to emission of pollutants like SPM, NO<sub>x</sub> and SO<sub>2</sub>. However, the incremental concentrations of these pollutants are very less and the impacts on the terrestrial ecology will be insignificant. Development of a thick green belt and transportation of material through closed conveyor system still further reduce of pollution loads in the surroundings areas and contain the negative impact on forests and terrestrial ecology.

#### 4.1.11 Prediction of Impacts on Socio-Economics

It is obvious to assume that the activities of the existing and the proposed increase in production will produce some improvements in the socio-economic levels in the study area. This project will not have any major impact on the population growth.

The positive impacts of plant activities on the civic amenities are substantial. The construction of new roads in the proposed project area after inception of the proposed plant facilities has enhanced the transportation facilities in the study area. With improved transportation facilities there is always a scope for development.

### **4.2 Impacts due to the Proposed Mines Activities**

The opencast mining operations in general cause environmental degradation and if adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause irreversible damage to the ecosystem.

Various environment impacts, which have been identified due to the proposed limestone mines and other related activity, are discussed in the following sections. As the limestone mines are under operation for more than 25 years, the mining operations and subsequent impacts due to operation of mine on environment were already covered in the baseline scenario.

#### 4.2.1 Impacts due to Limestone ML - I & ML - II

##### 4.2.1.1 Impact on Topography

The original topography of the ML areas shall be affected, mainly due to the actual mining operation. The mining activity will affect the present landscape of the ML areas. No major rivers or nallas flow in the study area. However, a seasonal nalla flows in the northern and southern flanks. The highest elevation in the mine lease areas is 292-312 -m above MSL. The mining will be carried below ground level and ultimate depth will be reached to 287-m above MSL. The mining

rejects generated will not be sufficient to refill the complete pit and the depression formed will be developed as water reservoir after backfilling.

However, general topography of the area will not be significantly affected because of backfilling up to 70% of the voids.

#### 4.2.1.2 Impact on Climate

The average, monthly minimum and maximum temperatures have been monitored at the site. The temperature pattern indicates a regional behavior and is not likely to be affected by limestone mining operations. The proposed mining operation is not expected to have any adverse effect on the rainfall pattern of the area. The controlling factors for wind speed lie much beyond the area considered for mining. Thus, proposed mining activities are not likely to contribute to any variation in wind speed in the area. The relative humidity in the area is not likely to change because of the proposed mining operations, as it will not cause any significant changes in the prevailing temperatures and rainfall of the region.

#### 4.2.1.3 Impact on Air Quality

The air pollution impact of limestone mines depends on the intensity of extraction operations and mode of transport and mode of screening of limestone. The intensity of operation is directly related to the rate of production from mining. All proposed mining operations are mechanized. Majority of the heavy machinery in the mines are operated on diesel. The proposed mining activity is likely to contribute towards SPM, NO<sub>x</sub> and SO<sub>2</sub> from mining machinery.

The incremental ground level concentrations of dust (SPM) due to the mining operations are estimated through computer aided software approved models (FDM techniques) and found to be about 12-µg/m<sup>3</sup> at the boundary of the lease with effective implementation of environment management plan.

##### Fugitive Emissions

The dust on haul roads will be suppressed through regular water sprinkling. With the proposed control measures, the fugitive emissions will be insignificant in terms of their impact on environment.

#### 4.2.1.4 Impact on Drainage

There are no major water bodies in the study region. Some seasonal nallas, which flow in rainy season are observed in the ML area and no diversion of these nallas around the working areas is foreseen as these do not carry quantities of water detrimental to mining operations due to meager rainfall experienced in the area. No impact on surface water drainage is envisaged.

Ground water occurs mostly in the regional fractures of hard rock at depths of more than 35-m below ground level (GL). The proposed mining operations shall be limited to a depth of only 25 m below GL and hence ground water shall not be encountered in the entire course of mining operations. Hence, no impact due to ground water quantity or quality is envisaged.

#### 4.2.1.5 Impact on Water Resources and Quality

Industrial water is required for mining operations/establishment mainly for sprinkling on haulage roads and at open faces during mining for suppression of dust. Water is also required for washing and servicing utilities for equipment. Water requirement for the mine leases (ML -I & ML-II) is estimated to be about 200-m<sup>3</sup>/day and will be made available by tapping rainwater stored in the mining pit. There will be insignificant impact on the groundwater resources due to withdrawal of water required for mining operations.

No wastewater generation is envisaged due to the mining operations. The sanitary wastewater will be sent to septic tanks. No impact of wastewater generation on the surface water is envisaged, as there is no discharge into surface water resources.

Ground water pollution can take place only if the mining rejects contain chemical substances. However, the deposit does not contain any harmful ingredients. Moreover, limestone constitutes of fairly inert and chemically non-reactive ingredients. Hence, no impact on groundwater quality is envisaged.

#### 4.2.1.6 Impact on Noise Levels and Ground Vibrations

With the proposed mining operations due to the deployment of drilling and blasting for mine development, excavation and transportation of ore and men, it is imperative that noise levels would increase. However, the expected noise levels are not likely to have any effect from the occupational health point of view.

With the adoption of controlled blasting techniques, the ground vibrations will be minimized and hence, no impacts due to ground vibrations are envisaged.

#### 4.2.1.7 Impact on Soil and Land use

Mining operations involve removal of soil, creation of depressions due to voids caused by removal of mineral / overburden rocks, change in relief of the area and of landscape etc. All these activities result in land degradation.

Original landuse pattern of captive limestone mine leases – I and II are mainly comprises of single crop agricultural lands, grazing and waste land. Land will be acquired from villagers and after extraction of limestone shall be backfilled properly with natural sequence of soil structure which is to be suitable for cultivation. In case of gauche land and wastelands, after extraction of limestone, area will be backfilled and converted into plantations.

#### 4.2.1.8 Impact of Solid Waste

The deposit has considerable quantity of waste rock to be removed to extract the required quality of limestone. The overburden mainly constitutes laterite pebbles/shale and boulders of sandstones. The excavated area will be backfilled with overburden and screen rejects and top soil will be spread over the backfilled area for rehabilitation purpose. There will be no dump yard of screen reject and overburden.

The removal and stacking of rejects will not cause any significant impact since the rejects do not contain any toxic elements. This may cause some adverse impact

on air quality by rise in SPM concentration. However, this will be mitigated by carrying out systematic plantation over the dump, which will arrest the windborne dust. The reclamation and afforestation plan has been prepared and will be implemented as the mining operation progress. The overburden dumps will be provided with proper slope.

Hence, the likely impact on the soil characteristics due the proposed mine activities will be insignificant.

#### 4.2.1.9 Impact on Flora and Fauna

Plant species observed are common in nature and there is no endangered threatened or protected or rare plant species recorded during field surveys and also from forest department records. Necessary compensatory afforestation is planned to be done. Major portion of the mined out pits will be backfilled and rehabilitated with afforestation.

The impact on the fauna of the buffer zone due to the mining activity will be marginal. Progressive plantation activity over a period of time will create favorable conditions for fauna. As necessary wildlife management practices will be taken, only minimum impact is envisaged on the fauna of the region.

#### 4.2.1.10 Impact on Socio-Economic Aspects

The project will contribute additional revenue to the State and Central exchequer in the form of royalty, cess and other taxes etc. As per the project plan the near by living inhabitants will not be disturbed and hence the project will not have significant impact on the nearby population.

##### *Progressive Mine Closure Plan*

##### ➤ Captive Limestone Mine Lease - I

Since the deposit is shallow, the lateral movement of the mine is fast and thus the mined out area will come under progressive closure of the mine due to exhaustion of the mineral. This progressive mines closure plan is being submitted along with scheme of mining before competent authorities for approval.

##### ➤ Captive Limestone Mine Lease - II

The limestone mines are mainly comprises of partly agricultural land and partly barren lands. Total mine leases – I and II are as on today is 1624.512-ha. There is no forest land involved. Due to mining activities, land degradation takes place at an average of 10 – 14-ha per annum. The excavated area is back filled with the reject material generated during the mining operation. The back filling is being done in a sequential manner.

## **5.0 MEASURES FOR MINIMIZING ADVERSE IMPACTS**

The Environment Management Plan has been prepared for the proposed project, which aims at minimizing the pollution at source.

## 5.1 Plant Operations

### 5.1.1 Air Pollution Management

- Installation of Bag house with pulse jet bag filters and ESPs of 99.9% efficiency to limit the SPM concentrations below 50 mg/Nm<sup>3</sup>;
- Provision of 140-m high stack for wider dispersion of gaseous emissions;
- Dust extraction system will be provided at transfer points of conveyor system;
- Enclosed conveyor belt to prevent dust generation;
- Provision of water sprinkling system at material handling and storage yard; and
- Development of greenbelt around the plant to arrest the fugitive emissions.

### 5.1.2 Water Pollution Management

- Provision of sewage treatment plant, separate storm water system and suitable rainwater harvesting structures.

### 5.1.3 Noise Pollution Management

- Equipment will conform to noise levels prescribed by regulatory authorities;
- Provision of acoustic enclosures to noise generating equipments;
- Provision of thick greenbelt to attenuate the noise levels; and
- Provision of earplugs to the workers working in high noise level area.

### 5.1.4 Solid Waste Management

- The used oil will be given to authorized recyclers;
- The organic portion of solid waste generated in the STP will be used as manure in greenbelt development; and

## 5.2 Mining operation

### 5.2.1 Air Pollution

- The production of blast fumes should be reduced by proportionate mixing of fuel oil with ammonium nitrate; Use of adequate booster/primer; and proper stemming of the blast hole.
- Dust due to drilling should be minimized by using wet drilling methods.
- If dry drilling is used, dust arrestor should be provided; and
- Regular maintenance of vehicles and machinery should be carried out in order to control emissions;
- Depending on the water availability, sprayer system should be incorporated with shovel loaders, which can also wet the limestone during loading and unloading.
- Dust generated due to traffic on haul roads will be reduced by water spraying at regular intervals;
- Greenbelt development should be taken up all along the haul roads and overburden dumps;
- The dust respirators will be provided to all workers working in dusty environment; and
- A good house keeping and proper maintenance.

<b>BJGL</b>	<b>Environmental Impact Assessment Study for the Proposed Cement Plant Complex at Babupur, Raghuraj Nagar Tehsil, Satna District, Madhya Pradesh</b>
	<b>Executive Summary</b>

## 5.2.2 Water Pollution

### 5.2.2.1 *Surface Water Pollution Control Measures*

- Retaining walls will be provided at the toe of dumps and the unstable OB benches within the mine to prevent wash off from dumps and sliding of material from benches. This would help in preventing silting of water drains/channels;
- The water channels/drains carrying the rain water from the mine will be provided with baffles and settling pits to arrest the suspended solids, if any, present in this water;
- The mine water will be regularly tested for presence of any undesirable elements; and
- Seepage water and rain water collected in the open pits will be pumped out and discharged with natural drainage system after de-silting in settling ponds.

### 5.2.2.2 *Ground Water Pollution Control Measures*

- The domestic sewage will be routed to septic tanks followed by soak pits.
- The workshop effluent will be treated and reused for mining operations.
- Regular monitoring of water levels and quality in the existing wells in the vicinity.

## 5.2.3 Noise Control Measures

- Secondary blasting will be totally avoided;
- Controlled blasting techniques;
- Minimum quantity of detonating fuse will be consumed;
- Blasting will be carried out during favorable atmospheric condition and less human activity timings;
- The prime movers/diesel engines will be of proper design and will be properly maintained;
- The operator's chamber will be safe guarded with proper enclosures to reduce the noise levels;
- A thick tree belt will be provided in phased manner around the periphery of the mine to attenuate noise;
- Personal protective equipment like ear muffs/ear plugs will be provided to persons working near HEMM;
- Provision of sound insulated chambers for the workers deployed on machines producing higher levels of noise; and
- Reducing the exposure time of workers to the higher noise levels.

## 5.2.4 Measures to Control Ground Vibration

- Blasting will be performed strictly as per the guidelines specified under blasting technology;
- Overcharging will be avoided;
- The charge per delay will be minimized and preferably more number of delays will be used per blasts;
- Blasting operations will be carried out only during day time as per mine safety guidelines;
- A safe distance of about 500 m from center of blasting will be maintained;

- During blasting, other activities in the immediate vicinity will be temporarily stopped; and
- Drilling parameters like over burden, depth, diameter and spacing will be properly designed to give proper blast.

#### 5.2.5 Measures to Control Pollution due to Solid Waste Disposal

During rain, there is a possibility of washing-off of loose materials along the plateau slopes. Therefore, following precautionary measures will be undertaken for controlling the wash off:

- Waste will be stacked and leveled systematically in layers;
- After reaching the benches to their ultimate height, plantation shall be done; and
- Construction of garland drains around the waste dump so that surface run off from the dump is collected in a sump.

#### 5.2.6 Land Reclamation Measures

- The area and time of ground disturbance will be minimized by progressively rehabilitating disturbed land;
- Efforts will be made to put the land to productive uses such as agriculture, forestry, water reservoir etc after reclamation.

Reclamation of land will be carried out by landscaping, soil amelioration and re-vegetation. As far as possible the reclamation activities will be taken up concurrently with the mining operations.

#### 5.2.7 Measures to Improve Ecological Aspects

- The degraded area will be reclaimed and rehabilitated with local species of plantation in a phased manner;
- Plantation will be carried out on waste dumps;
- The haulage roads will be flanked by trees on either side; and
- A belt of trees with thick canopy will be created along the mine boundary to intercept dust, gaseous pollutants and noise.

### **5.3 Greenbelt Development**

The entire clinker plant spread of 87.45-ha, out of which 29-ha will be developed in greenbelt around plant site and open areas in phased manner.

Due care will be taken to ensure that a greenbelt is developed around the plant, colony and mines. All areas devoid of vegetation and having low density will be systematically and scientifically afforested.

In addition to that systematic afforestation plan will be implemented in reclaimed areas, which belong to Government and wasteland category and also avenue plantations near villages.

## **6.0 ENVIRONMENTAL MONITORING PROGRAM**

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment during mining operations. The post-project monitoring as suggested is given below:

### **6.1 Air Pollution and Meteorological Aspects**

The ambient air will be monitored twice in a week in line with the guidelines of Central Pollution Control Board at about four locations around the plant and mine lease areas.

Meteorological parameters like wind speed, wind direction, temperature, relative humidity and rainfall will be recorded continuously at plant complex and mine lease areas.

### **6.2 Water Levels and Quality**

The storm water will be analyzed in the rainy season. The ground and surface water quality will be monitored in every season at selected locations. The water depths will be monitored in the wells of surrounding villages in every season.

### **6.3 Noise Levels**

Noise levels in the work zone environment will be monitored regularly. The ground vibration will be recorded at the time of blasting. The frequency of noise monitoring will be once in a month in the work zone. The ambient noise levels in the surrounding villages will be monitored once in six (6) months.

### **6.4 Soil Sampling and Analysis**

Soil samples will be tested before plantation/vegetation of the area. The environmental monitoring cell will co-ordinate all monitoring programs at site and data thus generated will be regularly furnished to the State regulatory agencies.

### **6.5 Budgetary Allocation for Environmental Protection**

BJCL is proposed to spend about Rs.36.7crores towards air pollution control equipments and shall also implement environmental pollution measures during operation of cement plant complex including mine leases.

As environmental protection will be monitored and implemented by a centralized environmental management cell, the fiscal estimates have been arrived for the plant and mining activity.

## **7.0 PROJECT BENEFITS**

The impact of proposed plant complex on the civic amenities will be substantial of plant and mine leases. The basic requirement of the community needs will be strengthened by extending health care, educational facilities, providing drinking water to the villages and strengthening of existing roads in the area. BJCL will

initiate the above amenities either by providing or by improving the facilities in the area, which will help in uplifting the living standards of local communities.

### **Employment Potential**

The impact of proposed plant on the economic aspects can be clearly observed. The activity of proposed project will provide employment to persons of different skills and trades.

The employment of local people in primary and secondary sectors of project shall upgrade the prosperity of the region. This in-turn will improve the socio-economic conditions of the area. The total manpower required for the proposed project during construction would be mainly sourced from local community in and around plant complex.

## **8.0 CONCLUSIONS**

- The mining operations will meet the compliance requirements of MPPCB/MoEF;
- Community impacts will be beneficial, as the project will generate significant economic benefits for the region;
- Adoption of Best Available Technology and Best Management Practices with more environmental friendly process; and

With the effective implementation of the Environment Management Plan (EMP) during the mining activities, the proposed project can proceed without any significant negative impact on environment.