## 1.0 Project Description

### 1.1 Background

Jaiprakash Associates Limited (JAL) formerly known as Jaypee Cement Limited is the well diversified conglomerate of Jaypee Group. Its cement division has 3 modern, computerized process control cement plants of 7.0 Million Tonnes of aggregate per annum capacity near Rewa in Madhya Pradesh, India – the single largest cement complex at a single location in India.

On the basis of market demand, JAL is planning to develop a Greenfield cement plant complex including captive power plant and captive limestone mines in Majhgawan village of Sidhi District in Madhya Pradesh. The cost of project is about Rs.550 crores.

### 1.2 Proposed Project Details

In the proposed project, JAL is planning to install 1.5 MTPA clinker plant and 2.0 MTPA cement plant. In order to meet the power requirement of the plant a 35-MW Coal based Captive Power Plant (CPP) is also proposed within the plant premises. Out of 1.5 MTPA clinker, 1.2 MTPA is planned to be used in production of 2.0 MTPA Cement and balance will be transported to the company's other grinding plants.

The total limestone requirement for the cement plant will be about 2.98 MTPA, which will be met from captive mines situated adjacent to project site.

### 1.3 Objective of the Study

This Environmental Impact Assessment (EIA) study is prepared for obtaining the Environmental Clearance (EC) from Ministry of Environment and Forests (MoEF), Government of India, New Delhi, for the proposed 1.5 MTPA Clinker plant, 2.0 MTPA Cement Plant and 35 MW Captive Power Plant.

Considering the above points, Environmental Impact Assessment report has been prepared along with Environment Management Plan (EMP) for various environmental components, which may be affected due to the proposed Cement Plant. The Risk Assessment and Disaster Management Plan has also been prepared to meet the eventualities during operation of the plant.

This EIA Report covers the primary data collected during the period 6$^{th}$ March 2006 through 5$^{th}$ June 2006 covering summer season.

### 1.4 Environmental Setting

The environmental setting of the proposed plant is given in Table-1.

## TABLE-1
## DETAILS OF ENVIRONMENTAL SETTING

| Sr. No. | Particulars | Details |
|---|---|---|
| 1 | Location | |
| a | Village | Majhgawan |
| b | Tehsil | Rampur Naikin |
| c | District | Sidhi |
| d | State | Madhya Pradesh |
| e | Latitude | 24° 19' 35" N |
| f | Longitude | 81° 19' 08" E |
| 2 | Elevation above MSL | 325 m |
| 3 | Climatic Conditions (IMD, Sidhi) | |
| a | Temperature | |
| | Mean Maximum | 42.0 °C |
| | Mean Minimum | 8.1 °C |
| | Highestest in the month | 45.1 °C |
| | Lowest in the month | 3.3 °C |
| b | Relative Humidity | Max: 85% and Min: 23% |
| c | Mean wind speed | 3.6 kmph |
| d | Predominant Wind Direction | W, SW |
| e | Mean Annual Rainfall | 1132.7-mm |
| 4 | Climatic conditions at Site (Majhgawan) | From 6th March to 5th June 2006 |
| a | Temperature | Max: 46.0°C and Min: 22.0°C |
| b | Relative Humidity | Max: 83% and Min: 20% |
| c | Mean wind speed | 3.9 kmph |
| d | Predominant Wind Direction | W, SW, N |
| 5 | National Highway | National Highway-7(24-km,NW)<br>National Highway-75(2.3-km,E ) |
| 6 | Nearest Railway station | Rewa (24-km NW, arial) |
| 7 | Nearest Airport | Khajuraho (150 km) |
| 8 | Tourist Places | Nil in 15 km radius |
| 9 | Archaeological important places | Nil in 15-km radius |
| 10 | Ecological Sensitive Areas (Wildlife Sanctuaries) | Nil in 15-km radius |
| 11 | Reserved/Protected Forest within 10-km radius | Govindgarh Reserved forest (0.2 km on North west direction) |
| 12 | Industries in 10-km radius | No Major Industries |
| 12 | Nearest major city with 2,00,000 population | Rewa (24-km on NW) |
| 13 | Nearest Town/City | Rewa (24-km in NW) |
| 14 | Villages within 1-km radius surrounding the project | Majhgawan (1.0 km on SW) |
| 15 | Nearest River | Son River (9.5-km, SE) |
| 16 | Nearest Lake/Ponds | Govindgarh Lake (6.0km, NW) |
| 17 | Nearest Hill Ranges | Govindgarh (325-680 MSL) |
| 18 | Soil Type | Silty sand |
| 19 | Irrigation Facilities in 10-km radius | Canal system from river Sone and also through borewells |
| 20 | Seismic Zone | Zone-II as per IS-1893 (Part-1)-2002 |

## 1.5 Project Cost

**The project cost estimated for the proposed cement plant including utilities, offsite, auxiliary services, margin money etc is Rs 550 crores. The anticipated capital expenditure for the in-built pollution control measures is Rs. 72.8 crores.**

# 2.0 PROCESS DESCRIPTION AND SOURCES OF POLLUTION

## 2.1 Process Description

- ***Cement Plant***

**The plant is operated on dry basis, which offers more advantages, particularly in fuel consumption. The proposed plant comprises of rotary kiln, preheater and precalciner.**

**Cement manufacturing principally involves grinding and blending of raw materials in a definite proportion - a material containing calcium oxide (such as limestone, chalk, marl) with a siliceous material (such as clay, shale, sand) along with certain additive or corrective materials (such as laterite) and then calcining the mixture at high temperatures in a kiln. The resulting 'clinker' is cooled and then ground with gypsum to produce the finished product, Ordinary Portland Cement (OPC). Gypsum is added to control the setting time of cement. Portland Pozzolona Cement (PPC) is manufactured by adding approximately 30% fly ash to clinker and gypsum during the grinding operation.**

- ***Coal based Captive Power Plant***

**The CPP will be having Steam Turbine Generating Sets with adequately seized Atmospheric Fluidized Bed Combustion (AFBC) boilers for generating 35 MW of power.**

## 2.2 Plant Layout Plan

**Well designed layout plan is prepared for the proposed cement plant including captive power plant and township. The features of the proposed layout are explained in Chapter-2 of the report.**

## 2.3 Infrastructural facilities and Raw material Requirement

- ***Land Requirement***

**The total land required for the project including CPP is 120.626 ha. The land is already under procession of proponent and land is in and around the proposed plant site is generally flat.**

- ***Raw Material Requirement***

**The details of required raw material are presented in the following table.**

| Material | Quantity | |
|---|---|---|
| | MTPA | TPD |
| Limestone | 2.98 | 9030 |
| Clay | 0.28 | 850 |
| Laterite | 0.11 | 345 |
| Coal for cement plant | 0.23 | 700 |
| Coal for captive power plant | 0.31 | 1000 |
| Gypsum | 0.05 | 146 |
| Fly ash | 0.36 | 1090 |

- ***Water Requirement***

**JAL has estimated the fresh water requirement for its cement plant, captive power plant, mines and residential colony as 2741$m^3$/day.**

- ***Manpower***

**The manpower required for the proposed project will be about 350 including skilled and unskilled workers. In addition, contract labour would be employed to carrying out the activities such as loading material from trucks, for loading of cement on to trucks and other miscellaneous works during operational phase.**

- ***Township***

**A full-fledged township will be developed to accommodate plant, mines and security personnel and supporting staff. Other amenities such as school, community center, guesthouse, health center, hospital, shopping complex, post office, bank etc will be established.**

## 2.4 Sources of Pollution and Control

**The major sources of pollution are particulate matter from cement plant and gaseous emissions from CPP. The emissions of particulate matters from all the stacks will be limited to 50 mg/$Nm^3$ and details of stacks and proposed control equipments are presented in the following Table.**

| Sr. No. | Area | Control Equipment | Efficiency (%) |
|---|---|---|---|
| 1 | Crushing plant | Bag Filter | >99.98 |
| 2 | Raw Mill Hopper | Bag Filter | >99.98 |
| 3 | Raw Mill/kiln system | Bag house | >99.98 |
| 4 | Blending silo/kiln feed | Bag Filter | >99.98 |
| 5 | Clinker Cooler | ESP | >99.98 |
| 6 | Clinker Storage | Bag Filter | >99.98 |
| 7 | Coal/Mill system | Bag house | >99.98 |
| 8 | Cement Mill Hopper | Bag Filter | >99.98 |
| 9 | Cement Mill | Bag house | >99.98 |
| 10 | Cement Silo, Bucket Elevator & Auxiliaries | Bag Filter | >99.98 |
| 11 | Cement Silo Top | Bag Filter | >99.98 |
| 12 | Packing Plant | Bag Filter | >99.98 |
| 13 | Transfer points | Bag Filter | >99.98 |
| 14 | Venting of auxiliaries | Bag Filter | >99.98 |
| 15 | Captive Power Plant | ESP | >99.98 |

### 2.4.1 Wastewater Generation and Treatment

**As the proposed cement plant will be operated on the dry process and air is used as cooling media, no wastewater will be generated.**

**Waste water generated from CPP will be treated in Effluent Treatment plant and will be used in dust suppression.**

**The domestic wastewater colony will be treated in the proposed Sewage Water Reclamation Plant (SWRP) and used in greenbelt development.**

### 2.4.2 Solid Waste Generation and Utilization

**No solid waste is generated in the cement manufacturing process. Dust collected from air pollution control equipment will be 100% recycled in process. Solid waste in the form of sludge will be generated from the sewage treatment plant and same will be used as manure for greenbelt development.**

**Bottom ash and Fly ash will be generated from the proposed Coal based captive power plant. The fly ash generated from the CPP will be (100%) utilized by the proposed cement plant for manufacturing the Portland Pozzolona Cement (PPC). The bottom ash generated will be utilized for the filling of used mines and low lying areas. Storage and handling facilities for bottom ash and fly ash will be established in the proposed project.**

### 2.4.3 Noise Levels

**The noise generation from various equipments of the proposed plant (Cement Plant + CPP) will not exceed 90 dB(A) at 1-m distance. All the equipment will be designed to comply with the Factories Rules and Stipulations.**

## 3.0 BASELINE ENVIRONMENTAL STATUS

**Primary baseline environmental monitoring studies were conducted durind summer season of 2006 and details are as follows:**

- ***Soil Environment***

**A total of 8 samples within the study area were collected and analyzed. It has been observed that the texture of soil is mostly clay in the study area. It has been observed that the pH of the soil quality ranged from 7.8 to 8.2 indicating that the soil is moderately alkaline in nature. The Electrical conductivity was observed to be in the range of 89 to 288 µS/cm. Available potassium was observed to be in the range of 564 Kg/ha to 1091 Kg/ha.**

- ***Meteorological Data Generated at Site***

**The meteorological parameters were recorded on hourly basis during the study period near proposed plant site and comprises of parameters like wind speed, wind direction (from 0 to 360 degrees), temperature, relative humidity, atmospheric pressure, rainfall and cloud cover. The summary of meteorological**

data generated at site is presented in following Table. The predominant wild directions during study period are west, north and northwest.

| Month | Temperature ($^0$C) | | Relative Humidity (%) | | Rainfall (mm) | Atmospheric Pressure (mb) | |
|---|---|---|---|---|---|---|---|
| | Max. | Min. | Max. | Min. | | Max. | Min. |
| March, 2006 | 36 | 17 | 52 | 36 | Nil | 976.5 | 976.2 |
| April, 2006 | 41 | 24 | 42 | 28 | Nil | 977.8 | 976.9 |
| May, 2006 | 45 | 27 | 62 | 44 | 12.0 | 977.6 | 977.2 |

- ***Air Quality***

The study area represents mostly rural/residential environment. Nine Ambient air quality monitoring stations were selected in and around project site and studies were carried out as per BIS standards. Ambient air quality analysis reveals that these results are well within limits in all locations as per National Ambient Air Quality standards.

- ***Water Quality***

Water samples were collected from twelve sampling locations. These samples were taken as grab samples and were analyzed for various parameters to compare with the standards.

The results for the groundwater samples analysed indicate that the pH of these samples ranges in between 7.4 to 8.0. The conductivity recorded in between 447 to 936 µs/cm. The sodium and potassium concentrations varied in between 3.9 to 78.9 mg/l and 1.3 to 9.8 mg/l respectively. The quality of groundwater bodies are observed to be in compliance with IS-10500 specifications.

The results for the surface water samples analysed indicate that, the pH of the water samples collected was observed to be 8.0 and 8.1. The conductivity was found to be 90 and 83 us/cm. The surface water bodies are observed to be in compliance with IS-2296 specifications.

- ***Noise Level Survey***

The noise monitoring has been conducted for determination of noise levels at ten locations in the study area. Noise monitoring results reveal ambient noise levels in all locations are well within the limits as per Ambient Noise standards.

- ***Flora and Fauna Studies***

A preliminary survey was made for determination of baseline details of flora. During field survey, maximum 336 plant species were recorded from the study area. In the study area, maximum number of species are phanerophytes (43.5%) followed by therophytes (38.7%). These classes are followed by hemicryptophytes (12.8%) and geophytes. Epiphytes were found in very few numbers.

**Presence of large number of phanerophytes (shrubs and trees) and therophytes (annuals or herbaceous vegetation) indicate semi-arid to tropical vegetation structure.**

**Hemicryptophytes (predominantly grasses and sedges) were found to be significant in the area. These indicate fertile and wet soil in upper layer of soil profile. Hydrophytes were present in both the seasonal and perennial water bodies.**

**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.**

**80 animal species were observed or recorded during study period. Out of these, two species were observed to be belonging to Sch-I and 9 species belong to sch-II of Wildlife Protection act, 1972. As per forest records of Rewa, Satna, Sidhi districts, and as per review of literature, there are no sanctuaries or national parks in 15-km radius from plant site.**

## 4.0 IMPACT ASSESSMENT

### 4.1 Impacts during Construction Phase

**Impact on Land use**

**JAL is in possession of land measuring 120.626 ha. The present land use of the area will change to industrial category. Greenbelt will be provided in 40-ha of land surrounding the plant and colony which gives good aesthetic value of the area.**

**Impact on Soil**

**The construction activities will result in minimum loss of vegetation and topsoil in the plant area. Maximum possible extent tree cutting would be avoided. No significant adverse impact on the soil in the surrounding area is anticipated.**

**Impact on Air Quality**

**During construction phase, dust will be the main pollutant, which would be generated from the site development activities and vehicular movement on the road. The impact of such activities would be confined within the project boundary and restricted to the construction phase. To mitigate these impacts, regular sprinkling of water will be done at the construction site. The approach roads will be black carpeted and vehicles will be kept in good order to minimize automobile exhaust.**

**Impact on Noise Levels**

**The major sources of noise during the construction phase are vehicular traffic, construction equipment like dozers, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, saws, vibrators etc. The operation of these equipment will generate noise ranging between 70-85 dB(A). The noise produced during the construction will have significant impact on**

**the existing ambient noise levels. The major work will be carried out during the daytime.**

**Impact on Terrestrial Ecology**

**Most of the land identified for the proposed project contains barren land, with limited number of trees. Trees will be cut only if required and as per functional requirement. Therefore, no major loss of biomass is envisaged during construction phase.**

**Demography and Socio-Economics**

**The non-workers constitute about 60% of the total population in 10-km radius study area. Some of them will be available for employment in the proposed plant during construction activities. As the labourers are generally un-skilled, the locals would get opportunities for employment during construction activities.**

## 4.2 Impacts During Operational Phase

**Impact on Soil vis-à-vis Solid Waste**

**All the solid wastes generated will be fully re-used either in the process, or in ancillary activities, hence, no impact of solid waste is envisaged on soil quliaty of the area.**

**Impact on Air Quality**

**Adequate stack height has been provided to disperse gaseous emissions over a wider area. 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 and the incremental concentration for SPM, $SO_2$ and $NO_x$ are observed as 1.8, 3.0 and 2.1 $\mu g/m^3$ at a distance of 1.4-km on southeast direction. After the implementation of the proposed project, these concentrations are found to be well below the permissible NAAQS norms for rural/residential zone and Industrial/Mixed zone. Therefore, the proposed activity is not likely to have any significant adverse impact on the air environment.**

**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, crushing unit and generally due to the movement of vehicles on the roads. The limestone transport is being carried out by covered conveyor system 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. All the internal roads within the plant premises will be metalled; hence dust arising from the internal roads will be in**

**significant. The proposed greenbelt and regular water sprinkling will further help reduction in fugitive emissions.**

**Impact on Water Resources**

**JAL has estimated the fresh water requirement for its operations as 2741m3/day. The groundwater dependency of the region is meager, because of existence of canal irrigation facilities and surface water bodies like Son river and Banosagar reservoir. Hence, tapping of ground water for use in cement plant will not have any impact on ground water resources. However, JAL is proposing to develop rain water harvesting structures, roof top harvesting technology to recharge ground water in project site area and also by constructing check dams in surrounding area of the project site will also enhance the ground recharge potential in the region.**

**Impact on Water Quality**

**As all of the wastewater generated will be suitably treated either in the proposed Sewage Water Reclamation Plant (SWRP) or in the Effluent Treatment Plant (ETP) and re-used either for process or greenbelt development and no discharge is proposed outside the premises, no impact is envisaged on water quality from the project.**

**Impact on Noise Levels**

**The prediction of incremental noise levels due to the operation phase of the power plant has been carried out using mathematical model. The predictions of model indicate that, at the plant boundary, noise levels will be varying between 48.0 to 52.5 dB(A).**

**Adequate protective measures in the form of ear muffs/ear plugs will be provided to the workers working in high noise areas. All the necessary noise protective equipment will be supplied to workmen operating near high noise generating sources. In addition, reduction in noise levels in the high noise machinery areas could be achieved by adoption of suitable preventive measures such as suitable building layout in which the equipment are to be located.**

**Impact on Ecology**

**Govindgarh reserve forest is 0.2-km north-northeast directions 10-km radius study area. But, 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.**

**Development of a thick greenbelt and also application of lime injection in AFBC boilers, 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. Hence, the impacts on the terrestrial ecology will be insignificant.**

## 5.0 ENVIRONMENT MANAGEMENT PLAN

**During construction, some of the vegetation in the plant premises is required to be cleared. The measures required to be undertaken to minimise the impact on the ecology are:**

- **The felling of trees will be kept at minimum;**
- **Transplantation of existing matured trees will be undertaken and transplanted in the area earmarked for greenbelt development;**
- **The greenbelt having vegetation density of 2500 trees/ha shall be developed; and**
- **Construction is restricted to day time only so that minimum disturbance to wildlife in Govingarh reserved forest.**

## 5.1 Environment Management during Operation Phase

**Air Pollution Management**

***Air Pollution Control Equipment - Proposed Cement Plant + CPP***

**Kiln and Raw mill exhaust gases shall be commonly dedusted while clinker cooler exhaust air is separately dedusted. For dedusting of kiln/raw mill, a glass fiber bag-house dust collector shall be provided; while for clinker cooler exhaust and CPP, an electrostatic precipitator (ESP) has been considered. The particulate matter in cooler stack and CPP will be limited to less than 50 mg/Nm$^3$.**

- ***Fugitive Emissions***

**To control the fugitive emissions, the following measures are proposed:**

- **Ø All the conveyors will be provided with conveyer covers and hoods to offset any trapping of material in wind stream. The height of the chutes at each of the transfer points and the slope of chutes to be considered to avoid dust generation;**
- **Ø High efficiency reverse air jet type bag filters are considered to arrest the air borne dust at all the locations where transfer of material from one conveyor to other takes place;**
- **Ø The automatic bagging machine with bag filters will be installed for packing plant;**
- **Ø Unloading of coal from trucks will be carried out with proper care avoiding dropping of the materials from height. It is advisable to moist the material by sprinkling water while unloading;**
- **Ø The sprinkling of water will be done along the internal roads in the plant in order to control the dust arising due to the movement of vehicular traffic;**
- **Ø All the workers and officers working inside the plant will be provided with disposable dust masks; and**
- **Ø Thick greenbelt will be developed around the plant to arrest the fugitive emissions.**

***Air Pollution Control Schemes***

**Adequate and efficient control equipment will be installed in the proposed plant to keep the dust emission at a minimum. The following measures shall be taken:**

- **Online particulate monitor will be installed for Kiln/Raw mill stack;**
- **Process interlocking system will be provided to trip off the complete system in case of raise in temperature of the gases and dust particulate across the glass fibre bag house and bag filters, which will trip the entire systems.**
- **Atmospheric Fluidized Bed Combustion (ACFBC) Boiler will be installed at the Captive Power Plant, which will control the emissions of $SO_2$. Low NOx burners will be installed to control the NOx emissions below 50 ppm. Further, chimney of 84-m height is proposed for adequate dispersion of gaseous emissions.**
- **As far as gaseous pollution is concerned, the impact of Carbon Monoxide (CO) emission is negligible in view of the firing technique of keeping a positive oxygen balance. However, regular monitoring and continuous auto regulation of fuel and air by automatic combustion control system is an indispensable part of all large cement plants.**
- **Since, the Coal to be used in the plant, lime injection system will be provided to reduce $SO_2$ pollution. Generation of NOx gases depends to a great extent on the combustion temperature. A well-designed burner system will be installed which limits the temperature to a reasonably low value of NOx generation.**

**<u>Noise Pollution Management</u>**

**The greenbelt proposed around the boundary of the plant will attenuate the noise emitted by the various sources in the plant.**

**Earplugs will be provided for the personnel working close to the noise generating units as a part of the safety policy. Apart from this, some of the design features provided to ensure low noise levels are as follows:**

- **All rotating machinery will be well lubricated and provided with enclosures as far as possible to reduce noise transmission;**
- **Provision of silencers will be made wherever possible;**
- **The insulation provided for prevention of loss of heat and personnel safety will also act as noise reducers;**
- **Necessary enclosures will also be provided on the working platforms/areas to provide local protection in high noise level areas;**
- **The workers will be provided with ear plugs; and**

- **Plantation in the zone between plant and township would attenuate noise in the residential area.**

**Water Pollution Management**

**Sanitary wastewater and wastewater from captive power plant are planning to treat in Sewage Water Reclamation Plant (SWRP) treatment and Effluent Treatment Plant (ETP) and treated effluents will be used in greenbelt or in plant operations and there will be no wastewater discharge from the proposed plant. Hence, there will not be any contamination of surface water bodies.**

**Solid Waste Management**

**All the solid waste wastes generated shall be reused either in process or in ancillary operations.**

**Entire fly ash generated shall be used in cement manufacture. Similarly, the excess sludge from SWRP can be used as manure for green belt development. Bottom ash shall be collected and used for backfilling in mined out areas.**

- ***Greenbelt Development***

**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. JAL has proposed to develop greenbelt in an area of 40-ha surrounding the proposed plant, CPP and township areas spending about Rs. 4.0 crores in 5 years period.**