10. SUMMARY AND CONCLUSION

10.1 INTRODUCTION

Environmental Impact Assessment (EIA) is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision making tool, which guides the decision makers in taking appropriate decisions for proposed projects. EIA systematically examines both beneficial and adverse consequences of the proposed project and ensure that these impacts are taken into account during the project designing.

10.2 PROJECT DESCRIPTION

10.2.1 The Project and its Location

The M/s Dalbir Singh & Sons limestone mining projects lies in Medesara village, Dhamdha Tehsil, Durg District in Chhattisgarh. The area lies in the latitude of 21°22'25.50"N to 21° 22'50.85"N and longitude of 81°22'32.39"E to 81°23'2.46"E. The project falls under Category "B" as per EIA Notification 2006 and as amended so far.
The silent features of the project site are given in **Table 10-1**.

Table 10-1: Salient Features of the Project Site

Project Site	Village-Medesara, Tehsil-Dhamdha, District-Durg and State Chhattisgarh
Site Coordinate (Refer **Figure 1.3** for map of coordinates superimposed on topographical sheet)	Latitude 21°22'25.50"N to 21°22'50.85"N Longitude 81°22'32.39"E to 81°23'2.46"E
Elevation above MSL	Maximum Elevation – 286 mRL Minimum Elevation – 282 mRL
Nearest Highway	SH, about 1.86 km towards West
Nearest Town/Village	Nandini Khundini-820 m towards North East Dhamdha-9.05 km North West direction
Nearest Railway Line	Bhilai Power House Railway station, about 18.0 km towards South
Nearest Airport	Raipur Airport, about 42.4 km towards South East direction
Nearest Reserve Forests	No RF lies within the study area (Forest lies towards East direction about 1.65 km)
Ecological Sensitive Zones	NIL
Seismicity	Seismic Zone I

10.2.2 Project Proponent

The Letter of Intent has been issued by the State Govt. to M/s Dalbir Singh & Sons for submission of the Mining Plan, vide Letter No. F 3-2/2017/12, अटल नगर ,दिनांक– 19.09.2018. Accordingly, the Mining Plan has been approved under Rule 16(1) of Minerals (other than atomic and hydrocarbon energy minerals) Concession Rules 2016 by Indian Bureau of Mines.

M/s Dalbir Singh & Sons has been submitted the application for environment clearance and presented to the State Expert Appraisal Committee (SEAC) Chhattisgarh. With reference to the technical presentation before SEAC Chhattisgarh; the committee recommended to prepare the EIA report for the area under Category B1 as per the latest amendments to the EIA Notification 2006.

Earlier, the baseline data of the project area has been generated during the month of October to December 2018 (Post Monsoon Season) for conducting the EIA Study of 17 mines lies in the cluster area and the above said proposed mine lease of M/s Dalbir Singh lies in the same cluster area. During the Terms of Reference (TOR) presentation before State Expert Appraisal Committee (SEAC) Chhattisgarh dated 14.06.2019; M/s Dalbir Singh & Sons has requested the SEAC Chhattisgarh to use the same baseline data (generated for 17 mines of cluster area) for conducting the EIA Study.

10.2.3 Proposed rate of production and life of the mine of the project area:

The Proposed rate of production and life of the mine of the project is depicted

S. No.	Name of the Mine	Area (Ha)	Life of mine	Production Capacity
1	M/s Dalbir Singh & Sons	29.20	134	100000 TPA

10.2.4 Topography and Drainage

The entire applied ML area is almost a flat land having gentle sloping towards southern direction and covers with agricultural land & barren rocky land. The highest contour level is 286 mRL on the northern side and gradually reduces towards southern direction having lowest contour level of 282 mRL.

There is an old pit within the lease area near the north eastern boundary having a depth of about 12 m and covering 13,100 sqm.

Drainage Pattern:

The **Shivnath River** is about 04 km away on western side of the lease area and flowing towards northern direction which is a tributary of River Mahanadi.

There is no perennial nala flowing through the applied ML area.

10.3 REGIONAL AND GEOLOGICAL SETTING

10.3.1 Regional Geology

The limestone and associated formations which are occurring near this village is a part of Chhattisgarh Synclinorium and belonging to Chandi Formation of the Raipur Group of Chhattisgarh Supergroup. The limestone deposit is almost horizontally bedded with local dip from 2^0 to 5^0 towards northwest. The general strike of the limestone bed is east-west.
The interacratonic Chhattisgarh Basin is crescent-shaped and covers about 33,000 sq km area in Raipur, Durg, Rajnandgaon, Bilaspur and Raigarh district of Chhattisgarh and adjoining parts of Orissa. The basin has a maximum length of about 300 km along ENE-WSW direction. The maximum thickness of sediments is estimated to more than 2 km and is epicontinental or stable shelf type.

The Chhattisgarh basin is well-known for industrial-grade limestone (Blast-furnace grade for steel plants and cement industries) and dolomite (industrial grade belonging to topmost formation of Hirri and Maniyari).

GEOLOGY IN BRIEF: Lito-stratigraphy of Chhattisgarh Basin (Source: GSI miscellaneous publication No. 30, part XXI, 2nd revised edition, 2006):

	Group	**Formation**	**Member**	
CHHATTISGARH SUPERGROUP	Raipur Group	Intrusives		Dolerite dyke
		Maniyari		Purple shale with dolomite, dolomitic limestone and gypsum
		Hirri(70 m+)		Grey dolomite, argillaceous dolomite
		Terenga (180 m ?)	Bilha	Purple dolomitic argillite
			Dagauri	Green clay, chert and shale intercalation (tuffaceous?)
			Kusmi	Pink to purple calcareous shale
		Chandi (67 m)	Nipania	Purple and bedded limestone Purple argillaceous stromatolitic dolomite
			Pendri / Deodongar	Purple and grey stromatolitic limestone and dolomite with flaggy limestone-shale intercalation / ferruginous glauconitic arenite and shale
		Gunderdehi	Newari	Pink and buff stromatolitic limestone and dolomite
			Andha / Dotopar	Predominantly pink, purple and grey shale with limestone intercalation / arenite / buff to green shale member in the middle

		Charmuriya (490 m)	Bagbura	Purple limestone (phosphatic)
			Kasdol	Dark grey bedded limestone / argillaceous limestone with minor shale intercalations
			Ranidhar	Cherty limestone and dolomite (phosphatic at places)
			Sirpur	Chert and clay intercalation
	Chadrapur Group	Kanspather (20-200m)		White to pinkish glauconite quartz arenite
		Chapordih (20-200 m)		Purple, green, grey and black shale with fine quartz arenite intercalation
		Lohardih (20 m)		Ferruginous purple arkose and gritty wacke arenite with shale partings and conglomerate at the base
		Unconformity		
	Singora Group	Chhuipali (300 m?)		Stromatolitic limestone and dolomite at the upper part Variegated shale with minor bedded limestone, chert, siltstone intercalations
		Bhalukona		Quartz arenite / siltstone and minor shale
		Saripali		Variegated shale with minor siltstone and limestone Porcellanite, tuff / tuffite
		Rahikhol		Feldspathic arenite, arkose and conglomerate at the base
		Unconformity		
		Basement		Archaean and Lower Proterozoic rocks

10.3.2 Local Geology

Geology of the area: The limestone bed belongs to Chandi Formation and is well-developed around the central part and southern part of the Hirri sub-basin. The limestone deposit is almost horizontally bedded.

Limestone is flaggy in nature, pinkish in color, fine to medium-grained, hard and compact and found to be associated with thin shale bands at places. Locally, following lithological sequence is occurring in the area:

Top soil/OB	Average 3 m
Bedded limestone	about 30 m thickness (as observed in the boreholes)
Intercalated shale/clay	Inter-layered within limestone beds of about 1 to 2 m thick

Type of Rocks:

Soil and Alluvium:
The lease area is mostly covered with soil except in the eastern part of the area, occupied by limestone out crops. The thickness of this top soil is varies from 0 to 1.4 m (BH-1).
The average thickness of top soil is 0.3 m (considering the borehole data).
The overburden consists of lateritic soil/ murrum, yellow soil and clayey material of variable thickness from 0 to 8.00 m (BH-7). The average thickness of overburden is 3.5m (considering the borehole data).
Limestone:
The limestone bed belongs to Chandi Formation and is well-developed around the central part and southern part of the Hirri sub-basin.
Limestone forms the dominant rock type in the area. It is purple grey to chocolate pink in colour, compact, massive & fine grained. Developments of stromatolitic rings are seen on the outcrops of limestone. The lime stone is usually massive, compact and thick bedded.
Thin shaly patches also occur within limestone but their thickness and lateral extent are so thin hardly affecting the quality of Limestone.
Limestone is flaggy in nature, pinkish in color, fine to medium-grained, hard and compact and found to be associated with thin shale bands at places.

Physical properties of limestone Colour– grey /pinkish, Form– massive, Lusture– vitreous, Streak– white, Hardness– about 3, Sp. gr. – 2.5.

Shaly Limestone / Siliceous Limestone:
Shaly limestone occurring in the area is pink to purple grey in colour and softer in nature. The shale do not outcrop in the lease area and lie below soil cover. Occurrences of shales or shaly limestone have been recorded in few boreholes.
Dolomitic Limestone / High Magnesium Limestone:
The patches of rich magnesium limestone as well siliceous limestone have been encountered in some of the bore holes.
Strike:
The general strike of limestone deposit found in the area is North-East to South West.

Dip: The limestone deposit is almost horizontally bedded with local dip/sloping varying from 2^0 to 5^0 towards northwest.
Joints: The joints are common in bedded limestone and are horizontal.

10.4 RESERVES

Estimation of Reserves
The exposed Limestone deposit is found to be entire applied area, the volume of the deposit is computed by cross sectional area method by multiplying the cross sectional area.

The cross sections were drawn perpendicular to the strike direction, the cross sectional area of the individual sections are calculated to arrive at sectional area, the area thus arrived is multiplied by the sectional influence (Average).
The details of minerals reserves are described below in **Table 10-2**

Table 10-2:- Total Reserve & Resource estimation table

S.No.	Name of the Mine	Total Geological Reserve (MT)	Total Blocked Reserve (MT)	Total Mineable Reserve (MT)	Average Production Capacity (in tonnes)	Life of the Mine (Yrs)
1	M/s Dalbir Singh & Sons	19107875	5767125	13340750	100000	134 Years

10.5 MINING

The proposed method of mining will be open-cast mechanized using wagon drill of 100 mm dia and jack hammer of 32 mm dia for drilling and subsequent blasting. Reduction of oversize boulders will be carried out by hydraulic rock breaker for loadable size of about 200 mm.
The sequence of working will be as under:

(i) The overburden is in the form of top soil and lateritic soil/murrum of variable thickness. As per the borehole data, there is no OB within the proposed working area during the first five years. However, the thickness of OB has been considered as 0.25 m (due to outcropping land observed in the field).

(ii) This overburden is consists of murrum and will be removed by dozer and utilized for the backfilling of already excavated 7.5 m barrier zone of old pit.

(iii) Thereafter, the production will be carried out by proper development of benches with a bench height of about 6 m, sub-benches of 2-3 m will also be developed if required.

(iv) For blasting, 100 mm dia and 6 m (+0.5 m perihole) will be drilled with compressed-air-operated wagon drills. The blasting will be done by ANFO/SME/Slurry as column charge and slurry /cast booster explosive as booster charge. Controlled blasting will be practiced by using Nonel detonators.

(v) After blasting, the over-sized boulders will be reduced to loadable size (about 200 mm) by hydraulic rock breaker, if required.

(vi) Hydraulic excavator of 1.9 cum capacity will be used in combination with 15 tonner dumpers for loading and transportation of limestone.

(vii) The entire ROM will be loaded by shovel/tipper combination and transported to consumers.

(viii) The rain-water and seepage water collected in the pit will be stored in the lower benches and will be used for spraying on the haul-roads and plantation.

(ix) The floor of the working faces will be kept slightly sloping to facilitate flow of water towards the sump during rainy season to keep the working faces dry.

(x) The working days in a year has been estimated as 300 days.

(xi) The mining loss during the mining of limestone is hardly 1-2% of the total ROM and hence the entire ROM has been considered as production and mining loss will be negligible.

(xii) However, a temporary stacking yard of about 0.20 Ha has been marked for stacking of limestone.

(xiii) All efforts will be made considering eco-friendly mining in the area. For this, dense plantation will be done all around the lease area in the non-mining zone.

Table 10-3 Mining Method of mine lease area:

The mining operation will be done in open cast mechanized method

S. No.	Name of the Mine	Existing	Proposed
1	M/s Dalbir Singh & Sons		Open cast mechanized

Source: Approved Mining plan/Scheme by Indian Bureau of Mines

10.6 LAND USE PATTERN

The proposed project site area is mainly land with or without scrub and agriculture land. Out of total project site area mostly contains agricultural land. Land-use Map and Pie-diagram showing land-use classification of the study area is given in **Figure 3.8 and Figure 3.10.** Site photographs are given in **Annex VIII.** The land-use classification of the project area is given in **Table 10-4**.

Table 10-4: Land-use Classification of the Study Area

S. No.	Land-use Classification	Area in Hectare	Area in %
1	Water body	1031	2.52
2	Open Scrub	3581	8.73
3	Sandy Area	58	0.14

S. No.	Land-use Classification	Area in Hectare	Area in %
4	Mining Area	692	1.68
5	Industry	224	0.55
6	Waste Land	1318	3.22
7	Fallow Land	1873	4.57
8	Marshy Land	87	0.21
9	Built-up	1465	3.57
10	Agriculture Land	30699	74.82
	Total	**41028**	**100.0**

Source: SOI Toposheet and Satellite Imagery of Project Area, Landsat LISS-III Satellite Imagery,Google earth Inc., USA

10.7 ANALYSIS OF ALTERNATIVES

In the proposed project, an opencast mining will be carried out. For that, no other methodology is going to be changed, depending upon the geological set up, strata of the rock, boulders and its structural behaviour. So, all the parameters of EIA/ EMP will be implemented as per the open cast mining.

10.8 DESCRIPTION OF ENVIRONMENT

Mining activities invariably affect the existing environmental status of the site. It has both adverse and beneficial effects. To maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components.

Baseline data collection/generation forms a part of the Environmental Impact Assessment (EIA) study and helps to evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted environmental impact assessment methodologies. Baseline data is also required in preparing an Environmental Management Plan (EMP) outlining the measures for improving the environment quality and scope of future expansions for environmentally sustainable development.

This section contains the description of baseline studies of the 10 km radius of the area surrounding “Medesara Mine”. The data collected has been used to understand the existing environment scenario around the proposed mining project against which the potential impacts of the project can be assessed.

Baseline data was generated for various environmental parameters including air, water (surface and ground water), land and soil, ecology and socio-economic status to determine

quality of the prevailing environmental settings. The study was conducted during Pre-monsoon (October-December, 2018) season.

The baseline data for environmental parameters were collected as per standard Terms of Reference for the relevant category of the project. The data was also authenticated or validated from the secondary data collected from regarding departments of agencies

10.8.1 Meteorological Data

The data on meteorological parameters in the study area were monitored for the period Pre-monsoon (October-December, 2018). The data was monitored with an automated weather-monitoring station placed near the proposed mining site. The data collected during Pre monsoon season are presented in **Table 10-5**

Table 10-5:- Summary of the Site Specific Meteorological Data

Months	Temperature (°C)			Relative Humidity (%)			Avg. Wind Speed		Total Rainfall (mm)
	Max	Min	Avg.	Max	Min	Avg.	m/s	km/hr	
October	35.3	16.0	25.7	79.2	51.3	60.9	1.0	3.7	0.0
November	33.1	13.1	22.4	72.1	43.6	54.9	0.9	3.2	0.0
December	30.2	10.7	20.4	73.7	42.6	52.9	0.9	3.3	0.0
Average	**32.9**	**13.3**	**22.8**	**75.0**	**45.8**	**56.2**	**0.9**	**3.4**	**0.0**

Source: Environment Pollution Analysis Lab, Bhiwadi Alwar

The maximum temperature recorded during the study period was 35.3°C in the month of October and the minimum temperature was 10.7°C in the month of December. The highest RH found in the study area was 79.2% in the month of October, while minimum monthly average RH found 42.6 % in the month of December. The average wind speed recorded was 0.9 m/sec.
Wind rose diagram (**Figure 3.22**) from the monitored data shows that the predominant wind direction during the study period was mainly N followed by NE and SW.

10.8.2 Air Environment

Nineteen Ambient Air Quality Monitoring (AAQM) Stations were selected. Criteria used for designing the network were principally governed by the wind rose pattern for Pre monsoon seasons and the accessibility of the selected sites. Attempts were made to locate most of the AAQ stations in predominant downwind direction with respect to the project site.
The tables show the highest P98 values of PM10, PM2.5 SO_2 and NOx during the study periods.

Table 10-6:- Consolidated Values of AAQ (98th Percentile Values in $\mu g/m^3$)

Location Code	Location Name	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x($\mu g/m^3$)	CO (mg/ m^3)	Silica as Quartz *
AAQ-1	Project Site-I	78.1	29.4	10.1	15.5	1.35	1.56
AAQ-2	Project Site-II	81.4	33.9	9.7	15.6	1.22	1.63
AAQ-3	Project Site-III	77.1	34.5	12.9	18.2	1.34	1.54
AAQ-4	Project Site-IV	86.2	30.5	11.8	16.3	1.23	1.72
AAQ-5	Project Site-V	112.7	46.1	13.9	19.6	1.22	2.25
AAQ-6	Project Site-VI	96.2	35.5	12.8	18.7	1.16	1.92
AAQ-7	Pathariya	72.9	29.9	9.0	15.4	1.28	1.46
AAQ-8	NandiniKhundini	92.2	38.7	12.6	19.6	1.20	1.84
AAQ-9	Meresara	84.0	29.6	11.1	16.7	1.32	1.68
AAQ-10	Pitora	72.7	34.6	9.8	16.8	1.19	1.45
AAQ-11	Potiya	68.0	28.1	9.9	14.8	1.11	1.36
AAQ-12	Deorjhal	89.5	35.4	9.6	15.9	1.27	1.79
AAQ-13	Basni	73.9	26.0	11.6	16.6	0.98	1.48
AAQ-14	Hardi	67.9	25.0	9.5	15.8	1.25	1.36
AAQ-15	Sonesarar	63.0	26.4	10.3	16.2	1.21	1.26
AAQ-16	Ghikuriya	73.7	24.8	9.7	14.2	1.21	1.47
AAQ-17	Parsada	72.3	29.7	10.0	16.9	1.13	1.45
AAQ-18	Korki	76.0	30.9	9.8	14.5	1.27	1.52
AAQ-19	Girhola	78.8	28.2	9.7	14.3	1.31	1.58
Standards for 24 Hours Monitoring except CO for 1 Hour Monitoring							
NAAQS 2009		100	60	80	80	4	-

Source: Environment Pollution Analysis Lab (Rajasthan Environmental Testing Lab), Bhiwadi Alwar

The value of parameters at all the location is found within the limits prescribed by Central Pollution Control Board (CPCB).

Baseline Interpretation

S. No.	Parameters	Baseline Status
1.	Particulate Matter (PM_{10} & $PM_{2.5}$)	The particulate matters size not greater than 10 µm in diameter is collectively referred to as PM_{10}. Due to their small sizes, PM_{10} can be inhaled readily and can penetrate deep into the human body.In study area particulate matter 10 varying from 63.0µg/$m^3$to 112.7µg/m^3. $PM_{2.5}$ was observed 24.8µg/$m^3$to 46.1 µg/m^3. Overall particulate

S. No.	Parameters	Baseline Status
		matter was observed below to the NAAQS standards of 100 µg/m^3 60 µg/m^3 respectively. Area has many mining activities so vehicular movement is phenomenal which may be the reason of particulate emission in the area.
2.	Gaseous Pollutants (SO_2, NO_x&CO)	The source of SO_2 in the study area is mainly from burning fuels containing sulphur or emissions from biomass depending on the sulphur content in the material. Other anthropogenic sources are high vehicular moment.The primary sources of NO_2 in the study area are motor vehicles, electric utilities and residential sources that burn fuels. SO_2 was varying from 9.0µg/$m^3$to 13.9µg/m^3&NO_x was observed 14.2µg/$m^3$to 19.6 µg/m^3) in study area. CO was observed from 0.98mg/$m^3$to 1.35 mg/m^3in study area.All the parameters are complying to the standards as defined by CPCB.
Overall, air quality was good in the area and only vehicular and mining emission activities are the major source of the particulate matter and gaseous emission.		

10.8.3 Noise Environment

Nineteen noise monitoring locations were selected.The Sound Pressure Level recorded during the daytime on all locations varies from 50.2 dB(A) to 56.1 dB(A) and during night-time varying from 32.9 dB(A) to 37.8 dB(A). The noise level was found well within prescribed standards due to absence of any major noise generating activities in the area

10.8.4 Water Environment

Ground water:

Eight surface and eleven ground water samples were collected for analysing the water quality of the study area.

The permanent hardness of water is typically given in one of three types of measurements: grains per gallon, milligrams per liter (mg/L), or parts per million (ppm) of "calcium carbonate" in the water. Since calcium carbonate has a mw of 100 g/mole the equivalents of calcium carbonate would be:

g $CaCO_3$=100 g/ mole × ($[Ca^{2+}]$ + $[Mg^{2+}]$)

where [Ca2+] [Ca2+] is the molarity of calcium and [Mg2+] is the molarity of magnesium. So, in the sense of molarity, calcium and magnesium are equal. However, you could also measure calcium and magnesium as mass of the cation per volume in which case

mass of $CaCO_3$=2.5 × (mass of Ca^{2+}) + 4.1 × (mass of Mg^{2+})

So, in the sense of the mass of cations, then 1 g/l of magnesium is harder than 1 g/l of calcium.

The physical parameters were meeting to the acceptable limits of drinking water as TDS was varying from 658 mg/l to 849 mg/l. Other physical parameters as pH, Na, K are also complying to acceptable limit of drinking water standard 10500:2012. Hardness in the water may be because of the presence of lime in the earth. The chemical parameters were analyzed as alkalinity, calcium, hardness, chloride, Sulphate, fluoride and nitrate etc. all the parameters were meeting to the acceptable limits of drinking water standards IS 10500:2012 at all locations. The heavy metals were also analyzed, only metals were detected as iron & zinc which was meeting to the acceptable limits of drinking water standard 10500:2012 and other metals were below to the detection limits of laboratory. Overall the ground water quality was good to drink.

Surface water:

The physical parameters were analyzed as turbidity, pH, TDS, Na and K. The chemical parameters were analyzed for Alkalinity, Total Hardness, Calcium, Magnesium, Chloride, Bicarbonate, Sulphate, Nitrate, Fluoride, DO and COD were analyzed. Dissolved oxygen was Drinking water source after conventional treatment and disinfection or suitable for outdoor bathing as per CPCB criteria. BOD was observed below Class E as per CPCB water quality criteria.The heavy metals were also analyzed in the surface water. Only iron & zinc were detected. Other parameters were below to the detection limits.Total coliform was meeting to the Class C of water quality criteria as defined by CPCB.

10.8.5 Soil Analysis Report

Soil samples has been collected from 9 locations. As per district brochure and area surveyed, Agriculture is practiced in the area during kharif and Rabi seasonevery year. During the Kharif, cultivation is done through rainfall while during the Rabi season,it is done through ground water as well as partly through surface water like ponds and othersources. The groundwater abstraction structures are generally Dug wells, Bore wells /tubewells. The principal crops in the block are Paddy, Wheat and Gram. The soil quality is very good as are was mostly loamy which is good for cropping and root development.

The pH was ranges 6.91 to 8.06 which was neutral to moderatelyalkaline as per ICAR guideline. The conductivity was varying from 269µmhos/cm to 512 µmhos/cm in the study area which is meeting to average soil quality. The organic carbon of the study area was an average sufficient to more than sufficient (0.18%) to (1.15%) which was very less and some locations, mostly mine areaand at some places it was more than sufficient in term of fertility according to their land-use. Nitrogen was observed varying from 108.2 kg/ha to 275.5kg/ha which is good to sufficient for crop growth. Phosphorous was variable in study area as the quality was very less to mediumin the soil. The potash content was very low in terms of

fertility. Overall the soil quality was good having the good bulk density, porosity and infiltration rate.

10.8.6 Water Requirement

The total water requirement in the project area of the limestone mine is about 5 KLD. The water is used in the following purpose and it will be met through Ground water.

- ❖ For dust suppression;
- ❖ For domestic consumption;
- ❖ For greenbelt development;

10.8.7 Air Modelling

In order to predict the particulate emissions, Gaussian's mathematical expression was used to predict changes in air quality i.e., maximum ground level concentration (GLC's) of particulate matter, due to the various mining activities of the proposed mine.

10.9 IMPACT ASSESSMENT

10.9.1 Air Environment

In opencast mining the different process of handling and transportation of minerals in the mining activities are prone to generation of high levels of fugitive dust that may increase the levels of particulate matters to high extent. Dusts are likely to generate due to the following mining processes:

- Blasting
- Generation of dust due to transportation of minerals
- Generation of dust due to movement of heavy vehicles

The effects of air pollutants upon receptors are influenced by concentrations of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards. It was found that after mines operation the resultant Ground Level Concentration for Particulate Matters will be below the stipulated standards. The efficient management of air quality requires the use of modelling techniques to analyse the patterns of pollutant concentrations from many individual sources of air pollutants operating simultaneously.

Mitigation measures:

- Controlled blasting techniques
- Drilling units to be equipped with water spraying system
- Drilling units to have in-built dust collector system

- Dense plantation
- Dust suppression systems

10.9.2 Noise Environment

The impact due to blasting noise in the nearest habitation from the mine site not going to be significant, as the time duration for which the noise level is going to rise is very limited, i.e. up to a few seconds in the whole day.

Mitigation Measures:

- Proper maintenance of equipment
- Dense plantation to act as acoustic barriers
- Blasting parameters to be suitably set to reduce ground vibrations
- Equipment to be sealed with acoustic enclosure

10.9.3 Water Environment

There is not toxic element in and around the applied area. Hence contamination of any nature is not expected for surface or any ground water source.

10.9.4 Ecology

There are no Wildlife Sanctuaries or National Parks or Tiger Reserve within 15 km radius of the project site. The impact on terrestrial ecology would be due to emission of gaseous pollutant like NO_2 due to transportation activities. Adequate dust control measures would be taken to control dust emissions. Moreover, as described in air quality section above, the contribution of PM, NO_2 and SO_2 due to mine operation will result in the AAQ to remain within the AAQ standards. The proposed mining lease area is private land. Lease area does not have any habitation of rare or vulnerable species. To control emissions, dense plantation will be carried out in the mine lease area as well as in the along the haul roads.

10.9.5 Impact on Socio-economic

The mining activity will generate socio-economic benefits to the people. In mining activity number of skilled and unskilled workers are employed which generate direct or indirect employment. Additional facilities such as medical, educational, and infrastructural development will also take place under CSR activities. While assessing the socio-economic and sociological impact it has been noticed that economic level and living standard of people will generally increase.

10.10 ENVIRONMENT MONITORING PLAN

Usually an impact assessment study is carried over short period of time and the data cannot bring out all variations induced by the natural or human activities. Therefore, regular monitoring program for environmental parameters is essential to take into account the changes in the environment. The objective of monitoring is:

- To verify the result of the impact assessment study in particular with regard to new developments;
- To follow the trend of parameters which have been identified as critical;
- To check or assess the efficiency of the controlling measures;
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new installations
- To check assumption made with regard to the development and to detect deviations in order to initiate necessary measures; and
- To establish a data base for future impact assessment studies for new projects.

10.11 RISK ASSESSMENT & HAZARD

The components associated with risk and hazard in a mining case include blasting, overburden, heavy machinery and explosive storage. Measures to reduce and avoid any incidents occurring from the above mentioned components are already planned and will be implemented as soon as the mine starts commissioning. This includes measures to avoid accidents during blasting, due to storage of overburden and due to trucks and dumpers. The project does not involve storage of any chemicals or explosives and therefore risk associated with storage is not considered.

10.12 PROJECT BENEFITS

- Improvement in physical infrastructure
- Improvement in Social Infrastructure
- Employment Potential
- Company will undertake awareness program and community activities like health, camps, medical aids, family welfare camps,

10.13 ENVIRONMENT MANAGEMENT PLAN

The mining activities involve, dozing, excavation, loading, haulage and transportation of OB and ore. These activities lead to generation of air borne dust, which can cause air pollution in and around the mining lease area, if appropriate control measures are not taken. Similarly mining causes Land Degradation, Noise and Water Pollution etc. in the area.

The Environmental Management Plan (EMP) is a site specific plan developed based on the base line environmental status, mining methodology and environmental impact assessment. In order to minimize impacts of mining on different environmental parameters and to keep air and water quality within prescribed limits of CPCB, aEnvironmental Management Plan (EMP) is prepared to strictly follow it. The environmental management plan includes all measures and safety precautions necessary for safe mining along with rehabilitation measures for mined out areas.
It is necessary to include the environmental cost as a part of the budgetary cost component. The project authorities propose to undertake the following environmental works to achieve the environmental quality as desired.

The mine will be supervised and controlled by an independent Mines Manager supported by adequate team of technically and statutorily qualified personnel apart from the operating staff of skilled, semi-skilled, unskilled and other categories.

This Environment Cell is responsible for the management and implementation of the environmental control measures. Basically, this department shall supervise the monitoring of environmental pollution levels viz. ambient air quality, water and effluent quality, noise level either departmentally or by appointing external agencies wherever necessary.

The working conditions in the mines are governed by the enactments of the Director General of Mines Safety (DGMS). As per the guidelines of the Mines Act, the management will take all necessary precautions. Normal sanitary facilities will be provided within the lease area. The management will carry out periodic health check-up of workers.
A well-defined environmental monitoring program would be emphasized with trained and qualified staff that would monitor the ambient air to ensure that the pollutants level is maintained always within the permissible levels. The locations will be finalized in consultation with SPCB.

10.13.1 Greenbelt Development Plan

Green belt is plantation of trees for reducing the pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. The greenbelt development plan aims to overall improvement in the environmental conditions of the region. The plan with a five-fold objective addresses issues such as providing sink for air pollutants likely to emitted from the project; enhancing the forest cover for increasing the biodiversity of the region; providing aesthetic value to the project area enhancing the ecological equilibrium of the area; and to a large proportion in combating soil erosion.

- ❖ Afforestation on degraded forest area, forest protection / conservation will be carried out every year by the mine owner
- ❖ This activity will promote the emergence of the primary succession species, hence it will be a silvicultural operation, extremely important for maintaining ecology and environmental health of the area
- ❖ This helps in regeneration & establishment of pioneer plant species saving expose land & land cutting

Plantation: During the plan period, about 1.25 Ha area will be covered by plantation, @ 1,000 saplings per hectares. Karanj, Khamar, Akesia, Gulmohar, Mango, Jamun, Amrud etc, are the common species which are planted and this will continue in future. The Year-wise afforestation within the Statutory Barriers will be as under:

Year	**Area for afforestation (Ha)**	**Nos. of saplings (Nos.)**	Achievement
I Year	0.250	250	Proposed
II Year	0.250	250	Proposed
III Year	0.250	250	Proposed
IV Year	0.250	250	Proposed
V Year	0.250	250	Proposed
Total	**1.25**	**1250**	--

Conceptual Period Plantation:
Upto conceptual period, entire 7.5 m of barrier zone will be covered by afforestation which will be about 4.00 Ha and about 4000 saplings will be planted.

10.13.2 Social Environment

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. No public buildings, places, monuments etc exist within the lease area or in the vicinity. The mining operation will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated.
The impact of mining activity in the area is positive on the socio-economic environment of the region. ***The negative impact will be limited to some sporadic health problems, which may occur due to increase in fugitive emission in the vicinity of the mines.*** The Project area of Limestone mine is providing employment to local population and it will be give preference to the local people whenever there is requirement of man power.

10.14. CONCLUSION

As discussed, it is safe to say that the proposed facilities are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the premises of “Medesara limestone Mine”.