ENVIRONMENTAL IMPACT ASSESSMENT
for
THE PROPOSED 7.0 MTPA BAILADILA IRON ORE MINE DEPOSIT NO.4 AT BHANSI, NEAR BACHELI, SOUTH BASTAR DANTEWADA DISTRICT, CHHATTISGARH

EXECUTIVE SUMMARY

Sponsor:

NMDC Limited
Hyderabad

Prepared by :

Vimta⁺

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**Vimta Labs Ltd. 142 IDA, Phase-II, Cherlapally Hyderabad–500 051
env@vimta.com, www.vimta.com**

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1.0 **INTRODUCTION**

NMDC Limited a Navaratna company and Government of India Enterprise under administrative control of Ministry of Steel is operating iron ore mining projects at Bailadila range of hills since 1968. The iron ore produced from Bailadila mines is catering the iron ore requirement of major steel plants of Government and Private sector and also many pellet / sponge iron ore plants in C.G state and also outside the state. NMDC Limited proposes for Iron ore mining at Bailadila Deposit No.4 at Bhansi near Bacheli, South Bastar Dantewada district, Chhattisgarh with a production capacity of 7.0 MTPA. The mine lease area is 646.596 ha falls in Bailadila Reserve Forest land, Bacheli forest range, Dantewada forest division, Chhattisgarh. The iron ore mining project is proposed to be developed for meeting the iron ore requirement of upcoming Integrated Steel Plant of 3.0 MTPA capacity of NMDC Limited at Nagarnar, Bastar District, C.G. The iron ore requirement for the above steel plant would be 5 MTPA. In order to maintain continuous and assured supply of raw material i.e iron ore, development of iron ore mining project at Bailadila Deposit no: 4 is very much essentially required. The remaining iron ore quantity after meeting the requirement of steel plant at Nagarnar will be sold to domestic customers in the state of Chhattisgarh.

1.1 Size of the Project

The project is iron ore mine Deposit-4 with a production capacity of 7.0 MTPA and spread in an (ML) area of 646.596 ha. Government Of India, Ministry of Mines, New Delhi vide letter dated 30/11/2011 and Government of C.G, Mineral Resource Department, Raipur vide letter dated 13/1/2012 has conveyed prior approval of central government under section 5(1) of the Mines and Mineral Act, 1957 to the grant of mining lease for iron ore over an area of 646.596 ha in Bailadila reserve forest, Deposit-4, South Bastar Dantewada, Chhattisgarh State in favour of NMDC for a period of 20 years. In addition to the ML area, 95.13 ha forest land is identified for development of infrastructure such as downhill conveyor, screening plant, loading plant and approach road etc. Forest clearance application for obtaining diversion of total 741.726 Ha of forest land has been registered by Nodal officer, Forest Department, Raipur and allotted registration number: 2013/35. Further, 50 ha of non-forest land is also required for installation of railway stock yard, administrative building, loading plant (part), tailing dam, STP and township etc. The proposed Deposit-4 iron ore mine will be developed as a standalone project with an estimated investment of Rs.1899.74 Crores under joint venture company i.e NMDC - CMDC Limited (NCL). CMDC Limited is a Government of C.G undertaking company and having equity ratio of 49% whereas NMDC is having 51% equity ratio in NCL company.

1.2 Location of the Project

The project site is located at Bacheli in Bailadila range of hills at Bhansi near Bacheli in South Bastar Dantewada District, Chhattisgarh. The proposed mine site is about 22.0 km from Danatewada. The site is easily accessible and well connected to Raipur, Visakhapatnam and Hyderabad cities by all-weather roads. The site is about 410 km from Raipur by road.

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The study area map of the proposed Deposit-4 mine site (10 km radius) are given in **Figure-1.**

1.3   Mining Plan approval

Mining plan along with progressive mine closure plan has been approved by Indian Bureau of Mines (IBM), for production capacity of 7.0 MTPA vide their letter no: No 314(3)/2012-MCCM(CZ)/MP-19 dated 26.07.2013.

1.4   Environmental Setting of the Proposed Project Site

The environmental setting of the proposed Deposit -4 mining project is presented in **Table-1**.

TABLE-1
ENVIRONMENTAL SETTING OF DEPOSIT-4 MINE (10 KM RADIUS)

Sr. No	Particulars	Description
1	M.L. Area	646.596 ha
2	Location	Bhansi, near Bacheli, South Bastar Dantewada District, Chhattisgarh.
3	Topo sheet nos	E44J1 (65F/1) - core zone E44J2, E44J6, (65 F/2, F/6) - buffer zone
4	Geographical Coordinates	
	Latitude Longitude	18° 41' 27.7" N to 18° 43' 45.7" N 81° 11' 57.7" E to 81° 13' 10.8" E
5	Current status of land	Iron Ore bearing area falling in forest land.
6	Elevation above MSL	Hilly and rough terrain, 1200 m above Mean Sea Level (MSL)
7	Distance of mines from ML area	Operating NMDC mine leases: • Deposit-5, 1- km, SW • Deposit-10, 0.5Km, E • Deposit-11C, 5.3 km, SSE • Deposit-14, 7.8 km, SSE
8	Nearest highway (in km)	NH-16 (29 km, N) at Geedam. SH-5 (4 Km, East)
9	Nearest town	Dantewada (22.0 km, NE) Bacheli (4Km, East)
10	Nearest railway station	Bhansi (7.5km, NNE) Bacheli (2.5 Km, East)
11	Nearest airport	• Non-commercial airstrip: Jagadalpur (110km, by road) • Raipur (410km by road)
12	Tourist places	Nil in 15 km radius
13	Places of archaeological important	There are no archeologically important places within 10 km radius
14	Protected areas as per Wildlife Protection Act, 1972 (Tiger reserve, Elephant reserve, Wildlife sanctuaries, National park, Conservation reserve and community reserve)	Nil within 10 km radius
15	Reserve Forests within 10 km	• Mine lease area falls in Bailadila

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Sr. No	Particulars	Description
	radius from mine lease boundary	Reserve Forest • Bijapur RF (1.1 km, W)
16	Rivers/Lakes	• Sankani River (4.2 km, E); Koyar Nadi (6.9 km, ESE)
17	Industries in 15 km	• Essar beneficiation plant, Kirandul, 8.6 km,SSE
18	Seismic Zone	Seismic Zone-II as per IS 1893 (Part I): 2002

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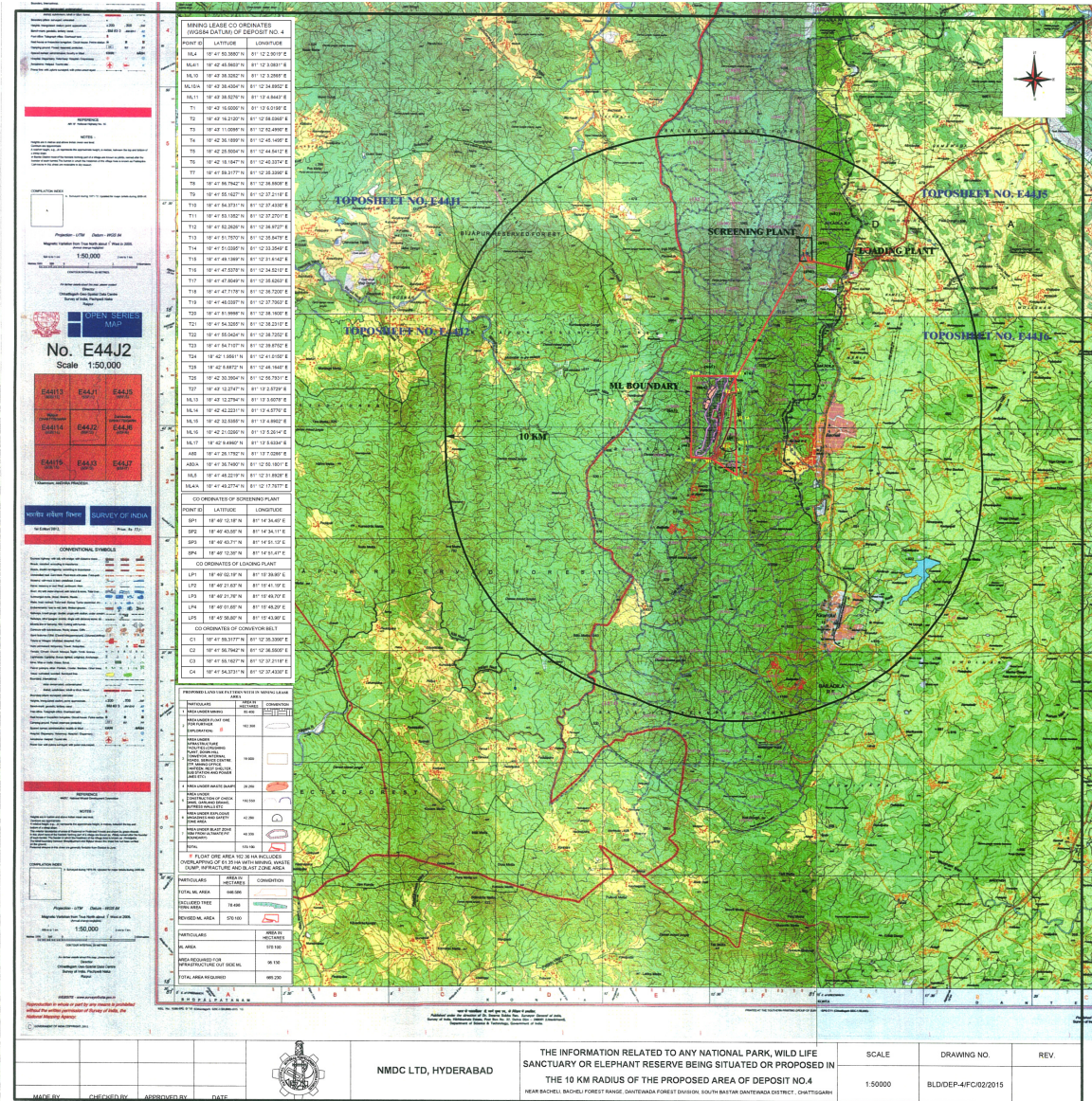
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FIGURE-1
STUDY AREA MAP 10 KM RADIUS

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2.0   PROJECT DESCRIPTION

2.1   Salient Features of the Project

The salient features of the proposed mining project Deposit-4 are presented in **Table-2.**

TABLE-2
SALIENT FEATURES OF IRON ORE MINE – DEPOSIT-4

Sr. No.	Description	Particulars
1	Mine lease area	646.596 ha
2	Method of mining	Fully mechanized open cast
3	Rated capacity	7.0 MTPA Iron Ore production
4	Expected life of mine	21 years
5	Production in first five years	2.0 MTPA
6	Average stripping ratio, iron ore: OB	1:0.468
7	Mineable reserves	107.59 MT
8	Average no. of working days	300
9	Number of shifts	3 shifts
10	Working hours	8 hrs / shift
11	Bench height	12 m
12	Overburden, inside waste & stripping waste	50.40 MT
13	Ultimate pit slope	45º
14	Power requirement	6 MVA
15	Water requirement	14500 m^3/day (approx.) and 4500 m^3/day (approx.) in wet and dry season respectively. Sankani nallah and Nerli nalla have been identified as the sources of water.
16	Man power	700 during production stage
17	Project cost	Rs. 1899.74 Crores

2.2   Mineral Reserves

A total of 107.59 million tonnes of Mineral Reserve has been estimated up-to 18th bench or 996 MRL. Mineable waste will be 50.40 million tonnes.

2.3   Method of Mining

The proposed captive mine project is a fully mechanized opencast mining project with 7.0 MTPA capacity. Conventional mining system with shovel dumper combination mining technology will be adopted. The sequence of the operations will be development of mine benches, drilling, blasting, excavation, loading, crushing, screening, stacking and transportation. The mine will be worked with the bench height of 12 m with drilling and blasting. For rock fragmentation deep hole

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drilling and blasting technique will be adopted. Shovel dumper combination will be deployed for excavation and transportation of iron ore from mine to the crushing plant.

2.4 Mine Development

An existing road from Bhansi to the deposit will be utilized for the development of the deposit. Further, road will be developed from 1128 MRL to 1200 MRL at the top level in North Block of the deposit.

2.5 Mining Machinery

- ### *Details of Mining Equipment*

The details of the proposed mining machineries during five years of mining plan period is given in **Table-3.**

TABLE-3
PROPOSED MINING MACHINERIES DURING FIVE YEARS
OF MINING PLAN PERIOD

Sr. No	Equipment Description	Capacity	Requirement
1	Blast hole drills (Multi pass)	150 mm dia	4
2	Crawler drills	100 mm dia	2
3	Diesel-hydraulic Shovel/Back-hoe	4.0 cum	5
4	Dumpers	50 T	12
5	Front end loaders	4 cum	2
6	Crawler dozer	410 HP	2
7	Motor grader	280 HP	1
8	Water sprinkler	28 Kl	2

Source: Mine Plan

2.6 Reclamation and Afforestation Programme

- ### *Biological Reclamation of Mined out Areas*

The back filling in the mineral out areas will start from 15th year onwards. The pit formed between CS-49 to CS-57 having bottom most bench of 1080 MRL would be backfilled upto 1152 MRL and another area of the pit formed near CS-46 to CS-48 having bottom most bench of 1032 MRL would be backfilled upto 1080 MRL by the waste rock generated during the normal mining operation. The total backfilled area will be around 17.81 Ha. Terrace plantation and slope plantation will be done at the bench floors and bench slopes respectively.

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The reclamation procedure is given below.

Soil binding species like Agave, Sisalam (Sisal), Dendrocalmus Strictus 9Kanta Bamboo) etc. will be planted to stabilize the slope. Species like Albizza Lebbek (Siris), Anilotoca (Babool), Acatechu (Khair), Emblica officianalis (Amla), Pongamia pinnata (Karonji), etc. will be planted on terraces. Mainly small trees, medicinal trees and aesthetic importance will be planted.

Waste Dumps and its Reclamation

The excavated material will be dumped at the Waste Dump No-1 located between CS-45 and CS-46 toward SE side of the deposit. A haul road will be prepared from 1188 MRL to 1140 MRL for dumping of the waste generated during mining operation. The waste Dump No-2 will be made between CS-55 and 56 towards N W side of the deposit. The ore generated during the development activities will be stacked in a temporary stack pile at 1128 MRL located between CS-56 and CS-48. The benches shall be terraced by keeping minimum width of 5 mt so as to maintain the overall slope angle not exceeding 28°. The dump will be scientifically vegetated with suitable native species to prevent erosion and surface run-off.

2.7   Land use Pattern – ML Area

The land use pattern in ML area is given in **Table-4.**

TABLE-4
DETAILS OF LAND USE PATTERN IN ML AREA

Sr. No.	Land Use	Area (in ha)
1	Rocky terrain/west land	215
2	Slopes with soil cover and natural forest	431
	Total	**646.596**

2.8   Method of Ore Processing

The ore will be crushed in primary crushing plant having capacity of 2000 TPH, Secondary crusher capacity of 1200 TPH. After crushing, (-) 100 mm ore size will be will be transported to screening plant by downhill conveyor system of 6.9 Km. The screening plant building houses primary screen of 670 TPH and secondary screen of 550 TPH and also Tertiary crushing plant of 800 TPH. The (-) 100m size ore will be crushed and screened to get (-) 40mm and (+) 10mm ore as Calibrated Lump Ore and (-) 10mm ore as Fine ore. Normally, dry screen operations will be carried out in screening plant where ore is separated into different size fractions. Only during Monsoon season period, wet screening operations will be carried out to improve the flow ability of ore and also for removing impurities associated with ore. The wet circuit system in screening plant shall comprises of classifiers, de-watering screens, hydro-cyclones, thickeners due to which fine ore along with process water is recovered. Tailing dam will be constructed for impoundment of slimes generated in wet screening operations.

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The loading system will be developed near Bhansi railway station. The stockpile of 3.5 lakh capacity will be developed for storing of Lumps and Fine ore.

About 700 persons would be employed for this project during its production stage.

3.0 Baseline Environmental Status

The baseline data generated during the period 1st December 2014 to 28th February 2015 representing winter season and secondary data collected from various government, semi-government and public sector organizations.

3.1 Land Use

The land use pattern of the 10 km radius area has been studied by analyzing the available secondary data published in Census records. The forest land occupies an area of about 34319 ha comprising to about 80.46% total geographical area under the study. There is no irrigated land in 10 km area as per 2001 census land use records, un-irrigated cultivable land was 5264 ha comprising about 12.34%, cultivable wasteland was 1572 ha comprising about 3.69% and land not available for cultivation was 1000 ha comprising about 2.34% of the total study area.

3.2 Soil Quality

Eight soil samples were analysed in and around the mine lease area to assess the present soil quality of the region. The pH of the soil indicates that the soil is neutral in nature. The nitrogen concentration of the soil indicates that the soil is less to more than sufficient category, phosphorous concentration of the soil indicates that the soil is very medium to sufficient category and potassium concentration of the soil indicates that the soil is less to better category.

Based on the results, it is evident that the soils are not contaminated by any pollution sources.

3.3 Meteorology

Meteorological data at the site was monitored by VIMTA during December-2014 to February 2015 representing winter season. It was observed that the during study period, temperature ranged from 7.0^0C to 27.4^0C. During the same period of observations, the relative humidity recorded was ranged from 20.0% to 98.1%. Total rainfall 4.3 mm was recorded during that period.

3.4 Ambient Air Quality

Ambient Air Quality Monitoring (AAQM) has been carried out at nine locations with a frequency of two days per week for three months during winter season of 2014-2015. The results thus obtained indicate that the concentrations of PM_{10}, $PM_{2.5}$, SO_2, NOx and CO in the ambient air are well within the National Ambient Air Quality (NAAQ) standards for Residential and Rural areas.

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3.5   Water Quality

To assess the physical and chemical properties of water in the region, water samples from four surface and eight ground water locations were collected by VIMTA from various water sources around the project site. The results indicate groundwater is generally in conformity with the drinking water standards (IS:10500) standards.

3.6   Noise Levels

Ambient noise levels were measured at eight locations around the proposed mine site. The daytime and night time noise levels in all the residential locations were observed to be within the permissible limits.

3.7   Ecological Environment

Entire ML area is part of Bailadila reserve forest area. Based on the field studies and review of published literature, it is observed that there are no endangered and protected flora and fauna in the core zone. The important mammal species of the buffer zone are Hare, Hyena, Jackal, Langur, Monkey, Squirrel, Wild pig, Wild dog, Field mouse, Common mongoose, Bandicoot, Panther, Bear, Wild fox, Blue Bull or Nilgai, Indian Gazella, Sambhar and Cheetal. Among the birds Bengal vulture, Bastar hill myna, Hawk-Eagle, Large Falcon. Some of the mammals recorded are parts of Schedule-I and schedule-II of Wildlife Protection Act. However, there are no wildlife sanctuaries and National Parks in 10-km radius area. NMDC has awarded separate study to M/s. Indian Institute of Bio Social Research Development, Kolkata for preparation of wildlife conservation plan, which is under progress.

3.8   Social Environment

The study area (10 km radius) area has a total population of 52053 according to 2011 census. Total male population is about 51.06% and total female population is around 48.94%. The average literacy rate (72.37%).

4.0   Anticipated Environmental Impacts And Mitigation Measures

The environmental impacts due to the proposed mining project, associated activities like ore crushing, screening have been assessed and adequate management plan has been devolved to mitigate the impacts.

4.1   Topography

Bailadila Iron Ore Deposit No-4 is situated on the north of Deposit No-5 and in the South of Deposit No-3 and is characterised by rugged and undulating topography. The highest elevation is 1200-m above MSL and the lowest elevation is about 996-m above MSL. The ore body as a general NNE-SSW trend with steep easterly slope. The galli Nalla situated in the valley is a good perennial source of water supply.

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4.2   Air Quality

The air pollution impact of iron ore mines depends on the intensity of ore extraction operations and mode of transport. All proposed mining operations are mechanized and operated on electricity/diesel. The maximum incremental ground level concentrations of dust (SPM) due to the mining operations are estimated through computer aided software approved models (AERMOD techniques) and found to be occurring within the mine lease with effective implementation of Environment Management Plan.

Adequate control measures like water sprinkling, dense plantation, regular maintenance of vehicles & machinery and good housekeeping would be continued to reduce the impacts.

4.3   Noise Levels and Ground Vibrations

With the mining operations, due to the proposed machinery, drilling and blasting for mine development, excavation, transportation and crushing of iron ore and men, it is imperative that noise levels would increase. However, as the mine lease boundary is located 3.0 km away from the nearest settlement, the expected noise levels will not have significant effect on the community.

The blasting operations are proposed to use deep hole drilling and blasting using delay detonators which are bound to reduce the ground vibrations. Further, the ground vibrations shall be controlled by using modern shock tubes with delay non-electric (nonel) detonators. In addition various mitigation measures as given EMP are being practiced at the mine site and will be continued. Hence, ground vibrations will be well within the specified maximum limits.

4.4   Water Resources

At hilltop, water is required for sprinkling on haul roads and feeder roads, mist spray at crushing plant, service center, auto shop, greenbelt development and domestic purposes in mine.

The average demand of water is estimated to be 14500 m3/day (approx) and 4500 m3/day (approx) in wet and dry season respectively. Sankani nallah and Nerli nallah has been identified as the sources of water.

Since the mining activities are confined to the hill top much above the levels of springs, ground water and perennial streams, the adverse impact is not anticipated.

There are no major water bodies in the mine lease area. Several nallas are originating from Bailadila complex. The aquatic fauna in these water bodies is not of major importance. Check dams and garland drains will be constructed to arrest the flow of turbid water. Retaining walls / buttress walls all around the waste dumps will be constructed to arrest the wash off due to soil erosion from waste dumps. Further, due to the plantation on the overburden dumps, soil erosion will be reduced.

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The slime generated during wet screening operations will be routed through slurry pipeline into proposed Tailing Dam of 22 LT capacity for settlement of slimes and clear water will be discharged into down stream nallas.

Hence, no impact is envisaged from the existing / proposed mining operations on aquatic bodies.

4.5   Soil Environment

The environmental impacts of the mining activities on topsoil are based on the quantity of removal of topsoil and its dumping. In the present project, as it is proposed to temporarily store the topsoil and use it for plantation schemes, no impact of dozing of topsoil is envisaged.

4.6   Flora and Fauna

The ML area is under reserve forest area. As per forest records of Dantewada forest division, there is no wild life sanctuary and wildlife corridors in 10 km radius area.

As the mining activity is restricted to core zone, no significant impact on the flora of the buffer zone due to the proposed mining of iron ore is anticipated.

The slopes and base of the ML area has natural vegetation, which is mainly of Terminalia sp, Anogeissus latifolia, Boswellia serrrata, Albizia margianta, Diospyros melanoxylon, Garuga pinnata, Mallotus phillipinensis and Terminalia tomentos. The plains and the areas around the mining activity and overburden are covered with shrubby vegetation. With afforestation on overburden dumps and proper management of forest and development of greenbelt around the mine are being done.

Extensive plantation comprising of pollutant resistant trees is being carried out surrounding the mine site, which will serve not only as pollution sink but also as a noise barrier. It is expected that with the adoption of these mitigatory measures, the impact due to operation of the mines in Bailadila iron ore complex will be minimal on the terrestrial ecosystem.

The incremental dust generations due to the mining operations, at the boundary of the mine lease are insignificant and it is also expected that with the adoption of mitigatory measures as suggested in EMP, the impact due to operation of the mine will be minimal on the terrestrial ecosystem and also on the adjacent forest area.

The impact on the fauna of the buffer zone due to the mining activity will be marginal. The proposed progressive plantation over a period of time will reduce the impact, if any, on the fauna.

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4.7   Socio-Economic Aspects

The project will definitely help for the improvement of the socio-economic status of the society in the region by extending the direct / indirect employment opportunities. The project will also increase the development of ancillary and related small-scale industries in the adjoining areas.

NMDC through its CSR activities is playing a key role in development of surrounding areas. CSR Bhansi village development works are being carried out with Rs.555.940 Lakhs.

5.0   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 environmental monitoring proposed is given in **Table-5.**

TABLE-5
MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS

Sr. No.		Particulars	Monitoring Frequency	Duration of Sampling	Monitoring Parameters
1	**Air Pollution and Meteorology**				
	A	Ambient Air Quality Monitoring			
		Atleast four AAQM stations shall be established in core and buffer zone.	Twice in a week for four weeks in a month covering all three seasons except monsoon season.	24 hr continuously	$PM_{2.5}$, PM_{10}, SO_2, NOx and CO
	B	Fugitive dust monitoring	Once in a month	24 hr Shall be monitored in predominant downwind direction at a distance 25.0±2.0m from the source of fugitive emission	Particulate matter
	Meteorology				
	a	Meteorological data	Hrly	Continuous	Wind speed, direction, temperature, relative humidity and rainfall.
2	**Water and Wastewater Quality**				
	A	Industrial/Domestic			
	1	Sewage treatment plant from colony	Once in a month	24 hr composite	As per SPCB/ CPCB guidelines and as per CTE/ CTO conditions
	B	Water quality in the study area			

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Sr. No.		Particulars	Monitoring Frequency	Duration of Sampling	Monitoring Parameters
	1	Ground Water quality	Once in season	Grab	As per the parameters specified under IS:10500
	2	Surface Water	Once in season	Grab	Parameters specified under IS:10500
	3	Water flow	Once in a season	Once time	As per SPCB/ CPCB guidelines and/or EC conditions
	4	Water level studies in well or bore wells or piezometers in Mine leases and surrounding areas	Once in a season	One time	Water levels and water quality
	5	Storm Water samples from all the streams before leaving the ML boundary	Once in season	Grab sample	pH, TDS, Cl, F, SO4, hardness, Heavy Metals
3	**Industrial Noise Levels**				
	1	Major noise generating sources	Every fortnight	Spot noise levels	Noise level in dB(A)
	2	Near the blasting /drilling site	Fortnight	Spot noise levels	Noise level in dB(A)
	3	Along the haul road for transportation noise	Fortnight	Spot noise levels	Noise level in dB(A)
	Ambient Noise Levels				
		10 Locations around mine lease areas	Seasonal	Continuous for 24 hrs	Noise levels in dB(A) - Ld, Ln, Ldn, Leq
4	**Soil Characteristics**				
	1	Selected 4 locations in core and buffer zone in nearby villages	Seasonal	Grab sample upto 90-cm	Colour, textural class, grain size, distribution, pH, Electrical Conductivity, Bulk Density, Porosity, Infiltration rate, Moisture retention capacity, Wilting Co-efficient, Organic matter Na, N, K, PO$_4$, SO$_4$, SAR, Base Exchange Capacity, Pb, Cu, Zn, Cd, Fe.
	2	OB Soil/ Top Soil From each of the external dump	Seasonal	Composite sample from each dump	Heavy metals

CTE – Consent to Establish, CTO – Consent to operate, EC – Environment Clearance

5.1 Environmental Monitoring Cell

M/s. NMDC-CMDC Limited will create a department consisting of officers from various disciplines to co-ordinate the activities concerned with the management and implementation of the environmental control measures.

6.0 Occupational Safety and Health

Occupational safety and health is very closely related to productivity and good employer-employee relationship. The main factors of occupational health in iron

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ore mine are fugitive dust and noise. Safety of employee during blasting operation and maintenance of mining equipment and handling of explosive materials is being taken care of as per mine regulations. PPEs such as Dust masks, ear plugs/earmuffs are provided to workmen. Hence, no significant impact on health of workmen is envisaged.

7.0 Conclusions

• The mining operations will be conducted in line with the compliance requirements of CECB/MoEF;

• Community impacts will be beneficial, as the project will extend the 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.

NMDC is accredited with ISO-14001:2004 Environment Management Systems (EMS) at its three (3) production projects. NMDC also bagged various prestigious awards for excellence in the field of Environment Management and Social Awareness.