DRAFT
ENVIRONMENT IMPACT ASSESSMENT / ENVIRONMENT MANAGEMENT PLAN

Vide para 2.2 Appendix IV of S. O. 1533 dated 14 September 2006

OF

ZENDEPAR IRON ORE DEPOSIT

Village: Zendepar District : Gadchiroli, Maharashtra (Area 10.37 Ha)

Submission for PUBLIC HEARING

PROJECT PROPONENT
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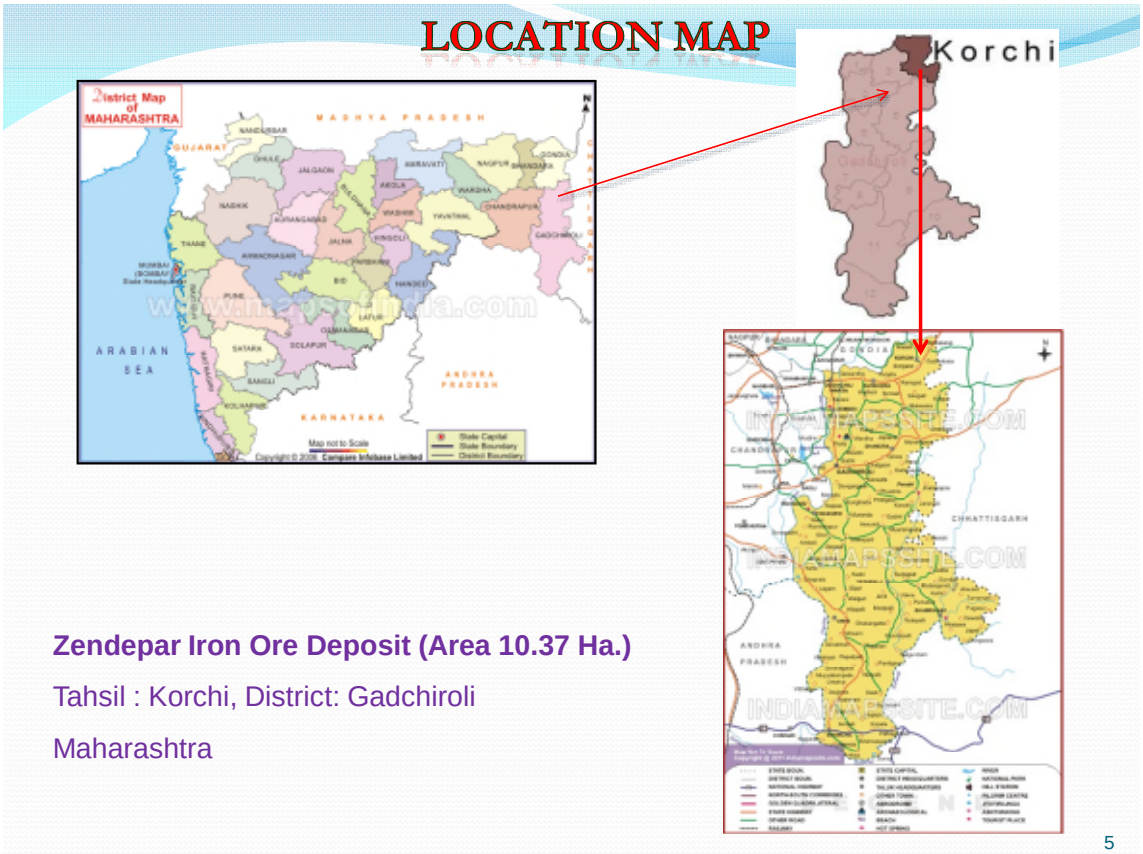
EXECUTIVE SUMMARY

INTRODUCTION : Shri Nirmal Chand Jain. have been granted Iron ore mine located at Village -Zendepar, District-Gadchiroli , by State Government on 2nd January 2006. The Iron ore mine (10.37 Ha) is having approved capacity @ 40000 TPA of Iron. The proposed production will be achieved by developing this mine by Opencast with bench pattern method. The modified mining scheme has been approved by IBM. A report is prepared in the form of draft EIA/EMP.

The project was appraised during 40th SEAC meeting held on 15th February 2011 the Honourable Committee had issued a Terms of Reference (TOR). Accordingly the EIA/EMP was submitted to the Maharashtra Pollution Control Board. However, the Public hearing could not be arranged and hence it was requested to SEAC-1, Mumbai again to reconsider TOR during SEAC-1 128th meeting held on 02.06.2016. The honorable committee has approved the TOR and has exempted from conducting fresh baseline environmental data collection.



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Location Details & Accessibility : The location of mine is given in adjacent figure above. It falls in Survey of India Toposheet no. 64 D/5 It lies at latitude 20^0 46' 20"N and longitude from 80^0 30' 52"E. The area can be approached from District Headquarter, Gadchiroli to Korchi by a State Highway which is 7 km from Korchi and 110 Km from Gadchiroli and 2 km from village Zendepar connected by kuchha road.

The site for the proposed mine is located near Zendepar village in Korchi tehsil of Gadchiroli district in the State of Maharashtra. Ballarshah is the nearest railhead (120 km from Etapalli and 151 km from the proposed site), situated on the Ballarshah-Nagpur-Itarsi section of the Central Railway (Broad Gauge) on Madras-New Delhi trunk route. The nearest airport is at Nagpur (330 km). The National Highway (NH)-7 passes through Jam at about 260 km from the proposed site. The State Highway (SH) passes through Allapalli at about 55 km. The nearest airport is at Nagpur (330 km). The nearest National Park is located at Navegaon, 30 km from the proposed mine site

Land Requirement -The proposed production will be achieved from the 10.37 Ha mining lease. No additional land is required.

Geological formations & Ore Reserves The mine lease area falls in the south western end of the famous, Proterozoic iron ore belt, comprising the Rajhara-Dalli; Rowghat and Bailadilla deposits of Madhya Pradesh. The rock types exposed in the region as reported by the Geological Survey of India (GSI) are of Archaen and Lower proterozoic ages. The proposed area comprises a hillock with lateritic capping with Banded Hematite Quartzite body exposed at places. The major part of the area on the surfaced is covered with Lateritic dolerite and Limonite, At places outcrop of iron ore is exposed on surface The trend of the ore bodies appears to North-South Float ore is also seen in the trend in the area. The analysis shows that Fe content is 38.26% to 60.23% and 54.98% to 67.17%**.**Total geological reserves is 3,61,665 tonnes and proved reserves is 2,37,300 tonnes.

Mining Method: The mining operation will be done by opencast manually operated mining by developing benches. Drilling will be done by compressed operated jack hammer and blastring by gelatin and detonators. All the operation are manual. It is proposed to develop the deposit from the top from northern side to southern side following the outcrop. It is proposed to open the pit from the northern side following the outcrop and length will be 35 m and width will be 20.0 m. There will be two benches will

be having height of the benches be 3.0 each and this operation will continue till fifth year as it advances towards southern side. For transportation of ore and overburden it is proposed to use tippers.

Blasting - There is sideburden in the area the iron ore deposit is covered with overburden in places. The side burden and the iron ore is hard and it can not be removed without drilling and blasting.

Transport of Mineral- Material will be transported mostly by road from the mine to the consumer industries as it is economical and speedy for short distances.

Waste Generation and Management: The iron ore is mostly outcropping , the waste/rock sideburden will consist of mainly banded haematite quartzite. There will be generation of sideburden and dumping site od sideburden will be in the lease boundary. There is no generation of overburden as the iron ore is mostly outcropping the area for and whatsoever will be generated in five years will be dumped in the boundary having spread of not more than 7.5 m and height of 2.5 m.

Drainage: The topography area is undulating and it is observed that iron ore is existing at the top of the hilly terrain slopping down wards. During monsoon season, the rain water that falls in the mine will be drained off by gravity. However, as the mine gets deepened, there will be accumulation of rain water in the mine pit during monsoon season.

Ground water: The proposed excavations are not going to touch the ground water table. Thus, there will not be any contamination of the ground water because of this mining. The water requirement for the mine will be met from the bore well / dug well. There will be no discharge of waste water from the mine.

Arrangement for Dewatering: Water requirement for dust suppression, plantation and vehicle washing will be met from rainwater collected in mining pit.

Employment Potential: Around 58 labourers will be required for this mine. It is proposed to deploy local manpower meeting the eligibility criteria required for the job under consideration.

Industrial activity like mining will benefit people residing in the nearby villages within the buffer zone by direct and indirect employment opportunities. People will also beneficiaries for the facilities developed due to mining activity.

BASELINE ENVIRONMENTAL STATUS:

The total project area (10.37 Ha) of the **Zendepar Iron ore Mine** is considered as Core Zone while the 10 km surrounding area of core zone is considered as Buffer Zone. Baseline environmental data was collected for all the components of environment like meteorology, air, water, noise, soil, geology, hydrogeology, flora-fauna, demographic and socio-economics, industries, places of archeological and historical importance etc. Standard guidelines prescribed by Ministry of Environment & Forests and Central Pollution Control Board were used for this study. The EIA report incorporates the baseline data generated through primary surveys for three months during March 2011 to May 2011 representing summer season.

Landuse of the Buffer Zone: The landuse is classified into four types – viz. forest, area under cultivation, culturable waste and the area not available for cultivation. The land under cultivation is further divided into two types – irrigated and unirrigated. Forest land constitutes about 23%, Irrigated land 22%, Unirrigated land 22% and Area not available for cultivation is 17 % and culturable waste land is 16 % .

Water Quality: Water samples were collected from ***four*** sampling locations. These samples were analyzed for various parameters to compare with the standards for drinking water as per IS: 10500 for ground water sources.

Ground Water : pH values are observed to be in the range of 7.35 to 8.65 and are slightly exceeding the prescribed limits (IS : 10500). Total dissolved solids, which impart palatability to drinking water, are in the range of 440-1400 mg/l. At three sampling locations, these values are more than the standards prescribed for drinking, but all the concentrations are observed to be below extended limits. This may be due to the presence of dissolved salts in the ground water and the local geological formations. This is equally evident and reflects higher hardness levels, in the range of 160-730 mg/l.

Inorganic Constituents : Concentrations of inorganic constituents are presented in Table-3.12. Chlorides are observed to be in the range of 42.55-333.00 mg/l. The values are

within the permissible limits except at two location. The sulphates are observed to be within the permissible limits (2-106 mg/l). Fluorides are in the range of 0.90-1.20 mg/l.

Heavy Metals : It is observed that metals like Hg, CN, B, Pb, Se, As, Cr+6 and Al were either nil or within the permissible limits. Other metals like Copper, Manganese and Zinc are observed to be within the permissible limits. Total iron content in the samples is observed to be in the range of 0.05 to 1.6.

Air Quality: The monitoring was carried out for 13 continuous weeks beginning from March 2011 to May 2011, as per norms stipulated by the Central Pollution Control Board Notification No. B-33014 dated 11 April 1994. In present case, most of the mining operations will be opencast. Five stations were selected for monitoring ambient air quality. The parameters monitored were Suspended Particulate Matter (PM10), Respirable Particulate Matter (RPM), Oxides of Nitrogen (NOx) and Sulphur Dioxide (SO_2) using high volume samplers

Air Quality: The PM_{10} $PM_{2.5}$ SO_2, NOX values for all 5 stations were below.

Particulate Matter 10 (PM_{10}) : The maximum PM_{10} concentration at the five Stations A_1, A_2, A_3,, A_4, A_5, were 47.6, 45.2, 50.2, 50.4, 52.7, µg/m^3 respectively.

Particulate Matter $_{2.5}$ ($PM_{2.5}$): The 24 hourly max values of $PM_{2.5}$ for the all five stations A_1, A_2, A_3,, A_4, A_5, are 28.4, 26.8, 29.4, 28.0, 31.4, µg/m^3 below the prescribed limit of 100 µg/m^3 for rural / residential areas.

Sulphur-Di-Oxide (SO_2):. The max 24 hourly values for all five stations are 9.5,10.2, 11.1, 9.9, 10.7, µg/m^3 respectively below the prescribed limit of 60 µg/m^3 for rural / residential areas.

Oxides of Nitrogen: The 24 hourly max values of NO_X for the all five stations A_1, A_2, A_3,, A_4, A_5, were14.8, 18.2, 22.4, 17.7, 20.3, µg / m^3 respectively below the prescribed limit of 60 µg/m^3 for rural / residential areas.

Noise Levels: Noise monitoring has been undertaken at 4 locations for 24 hr at each location. The monitoring was carried out during 23rd and 24th March 2011. The results were in the range of 37.8-46.0 dB at four sampling location.

Soil Quality: Soil samples were collected at 2 selected locations in the study area to assess the existing soil conditions around the mine.S1 from agricultural land from, Zendepar village and other from barren land near Zendepar village .Overall soil from agricultural land is moderately suitable for cultivation of arable crops and have moderate fertility.

Biological Environment: The core and buffer zones include the village settlements with their cultivated fields, forest/natural vegetation areas as well as vast areas reduced to wasteland. The detailed inventory of floral and faunal assemblage of the core and buffer zone has been prepared. The details of flora and fauna are provided in EIA/EMP. There are no ecologically sensitive areas such as Biosphere Reserves/National Parks/WL Sanctuaries/ Elephant Reserves, migratory corridors of fauna, and areas where endangered fauna and plants of medicinal and economic importance found in the buffer zone.

Human Settlement and Demography: Population is distributed among 1932 households in the study area. The 19 inhabited villages have a population of 8,907 comprising of 4409 (49.50%) males and 4498 (50.50%) females. The number of females per 1000 males is 1020 in study area**.** The overall literacy in the villages of the study area was 78.66%.

Proposed Social Responsibility Measures: A systematic approach for the implementation of the peripheral area development in selected villages in the buffer zone starting from the nearest village will be drawn up with the help of local community based organization & in consultation with the villagers. Assistance in the field of health and sanitation, environment conservation, water conservation, literacy, self-help groups, development of infrastructure.

Risk Assessment & Disaster Management Plan: In any mining project, work safety is taken care of as per provisions in the Mines Act, Rules framed there under. Inundation, fly rocks during blasting operations, risks associated with handling and use of explosives, during operations of equipment and movement of vehicles has been dealt. The risk management plan as per the directives of competent authorities will be Implemented strictly.

ENVIRONMENT MANAGEMENT PLAN

Air Pollution Management :

a) Haulage roads will be frequently sprinkled with water for which truck mounted water tankers with sprinkler arrangement have been provided.

b) During transport ore shall be covered by tarpaulins to prevent spread of dust from it during transportation.

c) Regular maintenance of vehicles and machineries will be carried out in order to control emissions.

d) Green belt development will be carried out at various places.

e) The dust respirators will be provided to all the workers.

f) Good housekeeping and proper maintenance will be practiced which will help in controlling the pollution.

Water Pollution Management: The mining project will require continuous supply of water for various purposes during mining, plantation etc. apart from drinking water supply. The main source of water pollution in opencast mining is the surface run-off due to rainfall. There will not be any mine discharge during dry weather seasons. There may be surface runoff during monsoon season, which contains fine silt. This will be treated in settling tanks of adequate dimensions. The treated water (overflow) will be used for plantation and dust suppression.

Noise & Vibration Management

- Noise is best abated at source by choosing machinery and equipment suitably, by proper mounting of equipment & ventilation systems and by providing noise insulating enclosures or padding where practicable.

- Proper maintenance of vehicles will be done which keeps the noise level within limits.

- At the boundary of mining lease green belt of local trees will be planted which will act as acoustic barriers. Planting of bushy trees of rich canopy in and around the mine area to intercept noise transmission. A 7.5 m wide belt of trees of different heights will be useful to act as noise attenuator in the mining areas.

- Blasting will be occasionally carried out and if at all it is required. Delay detonators millisecond delay interval will be used, for keeping the vibrations minimum.

Land Reclamation Measures: The mining will be by slicing the slope and removing all the ore available in that bench and similarly continue in subsequent lower benches; hence question of formation of pit does not arise. The ore reserves will long last even after the ML period expires, the same will be renewed for further period, hence question of back filling /reclamation does not arise at this stage.

Plantation: The Company has proposed to plant about 60 sapling per year surrounding lease boundary in five years. It is proposed to select the local tree species in order to control dispersion of fugitive dust from the mining lease.

The mitigation measures suggested above shall be implemented so as to reduce the impact on environment due to operations of proposed mining activities. In order to facilitate easy implementation, mitigation measures are phased as per the priority implementation. A separate budgetary allocation of the funds is made for the environmental protection measures. The monitoring of the pollution to know the effectiveness of the applied control measures will be carried out at regular interval. A budgetary provision of Rs. 2 lakhs as capital cost.

AN EPILOGUE

In compliance with the environmental procedure the environmental clearance application is made. Necessary scientific studies have been undertaken as per the guidelines set by the Ministry of Environment and Forests (MoEF). The suggestions/recommendations of all the experts, competent authorities, and government officials are being sought for the impacts of the proposed project. Views and guidance of the local residents, community based organizations, social organizations are extremely important in order to devise a full proof Environment Management Plan for the proposed mining project and also mitigate the damages caused due to the project. Allocation of necessary funds, manpower and machinery will be made to for the protection and conservation of all the components of environment. It is ensured that all mandatory clearances will be sought from respective competent authorities before operating the proposed Zendepar Iron Ore Mine(12.0 Ha) We are committed to implement the suggestions for the improvement of the environment and assure that every attempt will be made for the conservation and protection of the natural resources to the maximum extent.

CHAPTER 1
INTRODUCTION

1.1 PURPOSE OF THE REPORT

Iron ore is one of the major mineral deposits occurring in the Indian sub-continent. It had played a great role in development of civilization and industrialization. The discovery of the metal iron and it's use by man through the ages as a milestone in the march of civilization, is known as the "Iron Age." The recent liberalization of the Indian economy has catapulted the Indian industry into new realms of thinking and progress. The policies of Government on economic development have given various subsidies like slashing import duties and provisions for the Indian industry to grow indigenously. Iron and steel industry has always been the backbone of Indian economy. Recently, it has taken new strides with lot of new plants coming up in the country. As a consequence, there has been tremendous demand for iron ore extraction. Thus, iron ore mining and steel industry has been integrated in India. In India, iron ore occurs in the states of Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Maharashtra, Karnataka and Goa admeasuring the total reserves of iron ore about 17,573 Million Tonnes (MT). Maharashtra is one of the largest consumers of iron and steel materials in the country. Similarly, iron ore is one the major mineral deposits found in Maharashtra. Commercially exploitable iron ore deposits occur in Gadchiroli, Chandrapur, Sindhudurg and Bhandara districts of which those occurring in Gadchiroli district are the largest and the most important.

The report has been prepared for the Environmental Impact Assessment of proposed mining of iron ore Khasras No. 82 (Part) at Village Zendepar Tahsil Korchi District Gadchiroli, Maharashtra as per the TOR granted in accordance with the Notification of MoEF S.O. 1533 dated 14.09.2006. The TOR was approved from SEAC Maharashtra during its 128th meeting held on 02.06.2016. Where, under sub-rule (3) of Rule 5 of the Environment (Protection) Rules, 1986 which imposes certain restrictions and prohibitions on new projects or activities, or on the expansion or modernization of existing projects or activities based on their potential environmental impacts as indicated in the Schedule to the notification, being undertaken in any part of India, unless prior environmental clearance has been accorded.

Developmental activities like industry or mining causes temporary damage to land forest and induce changes in the quality of air, water, flora and fauna of the area. However Industries like mining also generates considerable direct employment with related secondary and tertiary employment opportunities. Communication, education and health care facilities improve; as a result there is improvement in the literacy and economic levels of the region. Thus, there is a paradox in that, while on one hand environment may get affected, on the other the economy and the living standards improve. For overall gain, it is necessary to strike a balance between the two aspects of economy and ecology and ensure that impact on the environment is

minimized with improvement in socio-economic conditions. This is better achieved through a well-planned approach relevant to the area under consideration.

M/s *Pollution Ecology and Control Service*s, Nagpur have been entrusted to undertake an Environmental Impact Assessment [EIA] Study and preparation of Environment Management Plant [EMP] for the proposed iron ore mine. Reconnaissance survey of the region was carried out in March 2011 and various sampling locations to monitor environmental parameters have been identified. Subsequently, monitoring has been commenced for meteorology, ambient air quality, surface water and ground water quality, soil characteristics, noise levels and flora and fauna at the specific locations. The other studies such as socio-economic profile, landuse pattern etc. are based on the secondary data collected from various authentic government agencies and through primary surveys. The air monitoring locations have been selected based on the predominant wind directions recorded through meteorological data generated at IMD, Sironcha. This Rapid Environment Impact Assessment (REIA) covers the primary data collected for one season since March 2011 to May 2011 which covers summer season.

1.2 IDENTIFICATION OF PROJECT &PROFILE OF PROJECT PROPONENT

Shri Nirmal Chand Jain, the project proponents are a growing manufacturer, trader having registered office at Nagpur. The State Government of Maharashtra has identified 12.72 Ha of the lease to the proponent. Mining Plan for the said area has been approved from the competent authority. The proponent envisage to develop mining activities based on the available reserves of ore in central India. The proponent are committed to operate systematic and scientific mining operations making optimum utilization of the resources. Needless to mention that the mining activities shall be carried out as per the mandatory laws and regulation prevailing.

1.3 GENESIS AND OBJECTIVE OF PROJECT

The report has been prepared for the Environmental Impact Assessment of **Zendepar Iron Ore Deposit Part of Khasra No. 82 (Area 12.72 Ha)** Village Zendepar Tahsil Korchi District Gadchiroli, Maharashtra **for the iron ore production from 0.04 Million tonnes/annum.** The purpose of the report is to provide a complete information base of the study area in a document which is drafted in a standard format of EIA / EMP as required by the MoEF, Govt, of India. The investigation provides status of present environment in ***core zone*** (Mining Lease) as well as ***buffer zone*** (10 km radius around core zone) of the proposed Zendepar iron ore deposit. The key plan showing core and buffer zone are shown on **Figure 1.1.**

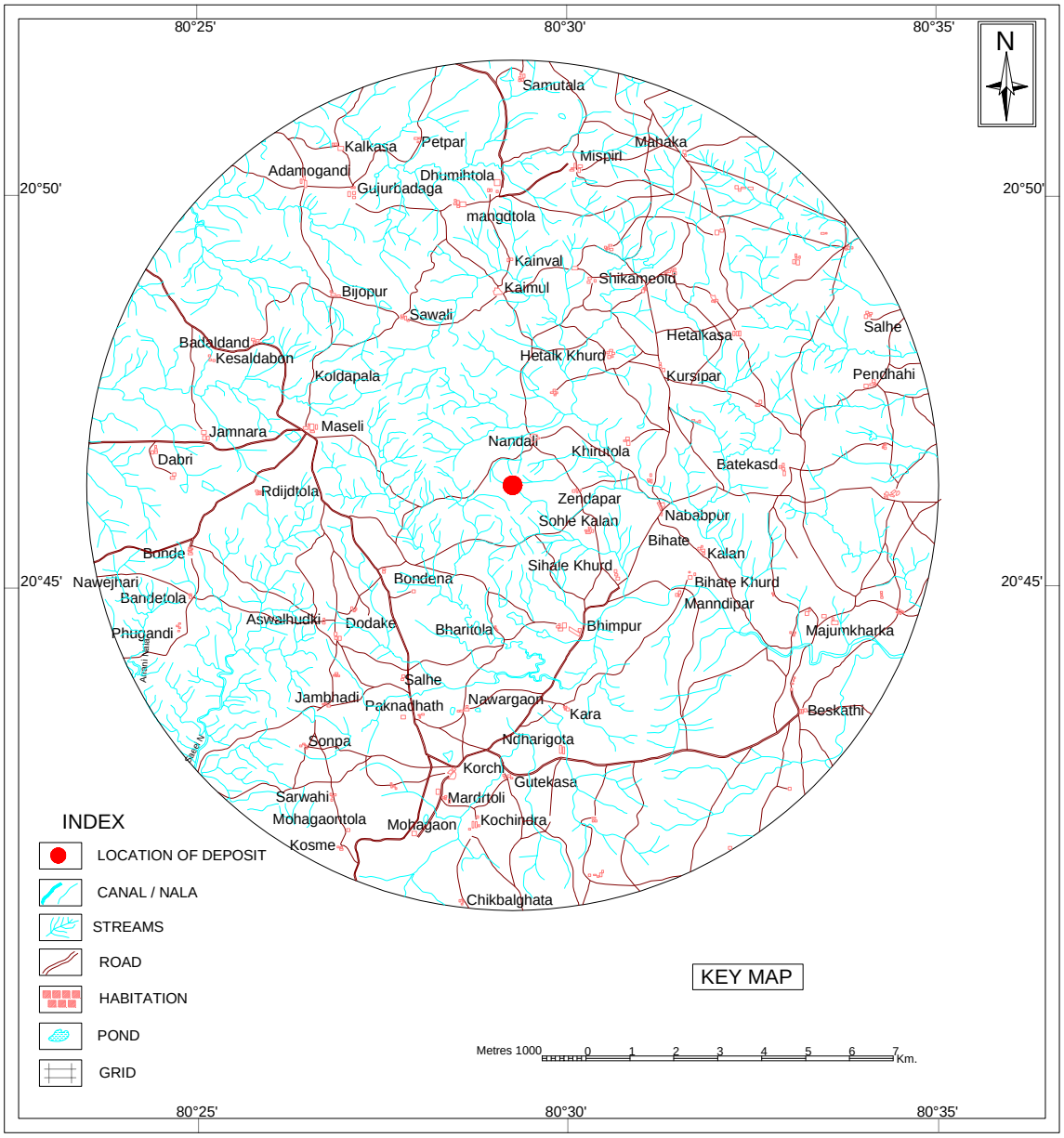

Figure 1.1 : Key Plan Showing Core and Buffer Zone

1.4 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT & ITS IMPORTANCE TO THE COUNTRY, REGION

1.4.1 **Nature & Size of the Project** : The iron ore mine is having a mining lease area of at **Zendepar Iron Ore Deposit Part of Khasra No. 82 (Area 12.72 Ha)** Village Zendepar Tahsil Korchi District Gadchiroli, Maharashtra. Exploration of this area have been done by Directorate of Geology and Mining, Government of Maharashtra, In view of this, the Govt. of Maharashtra and other agencies have made serious efforts in the past to bring about exploitation of this deposit for setting up a large iron and steel project based on its high grade iron ore. In view of these reasons, the

Government of Maharashtra with the concurrence of Government of India, Ministry of Mines, has agreed to grant mining lease of iron ore to the proponent over this area subject to necessary approval from competent authorities.

1.4.2 Locational Details: **Figure 1.2** gives the location of proposed Iron Ore Deposit along with roads and major towns of area. The M.L. area over 12.72 hectares is covered within the Survey of India toposheet No. 64 D/5 on a scale of 1:50,000 **(Figure 1.3).**

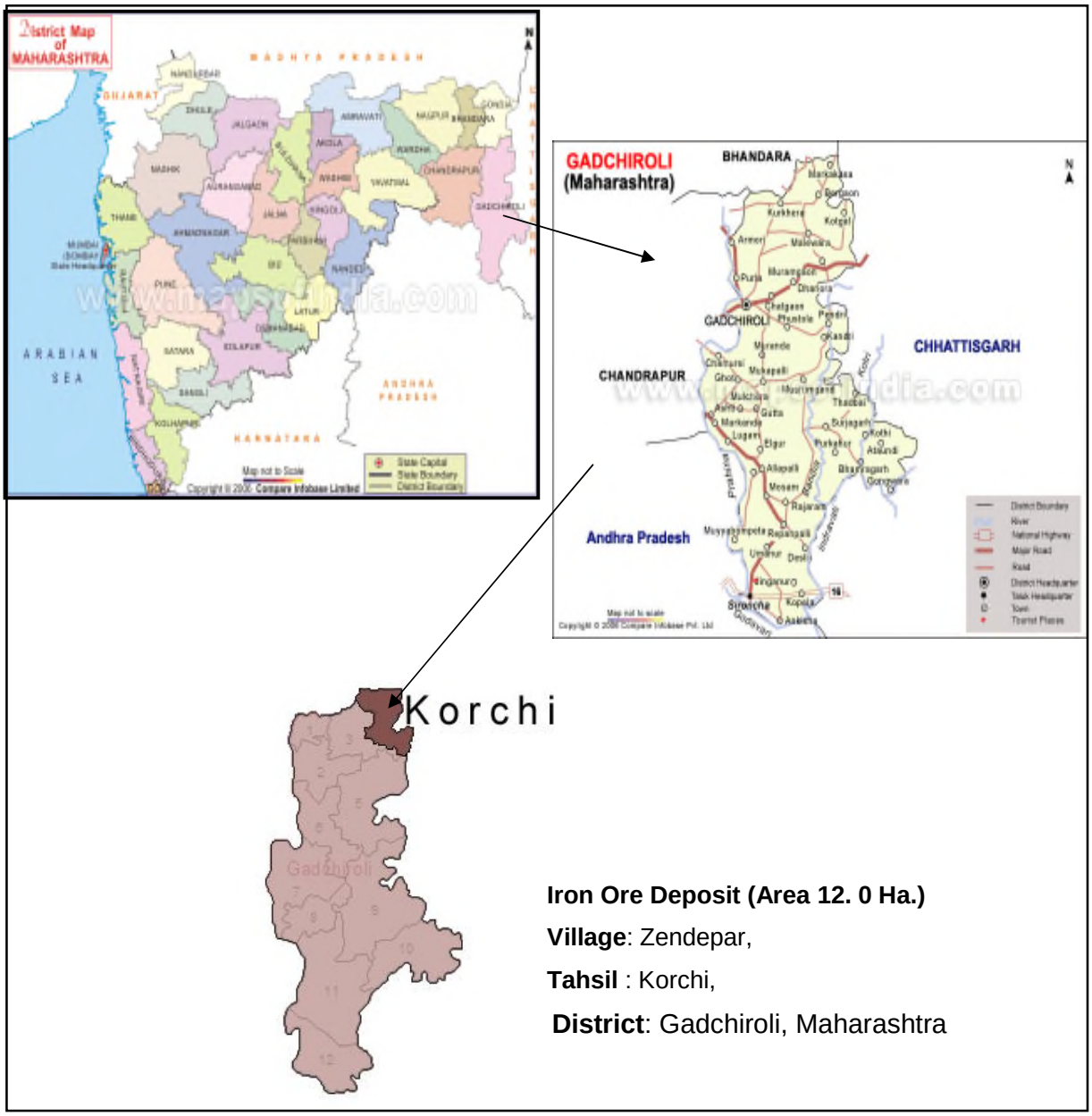

Figure 1.2 : Location Plan

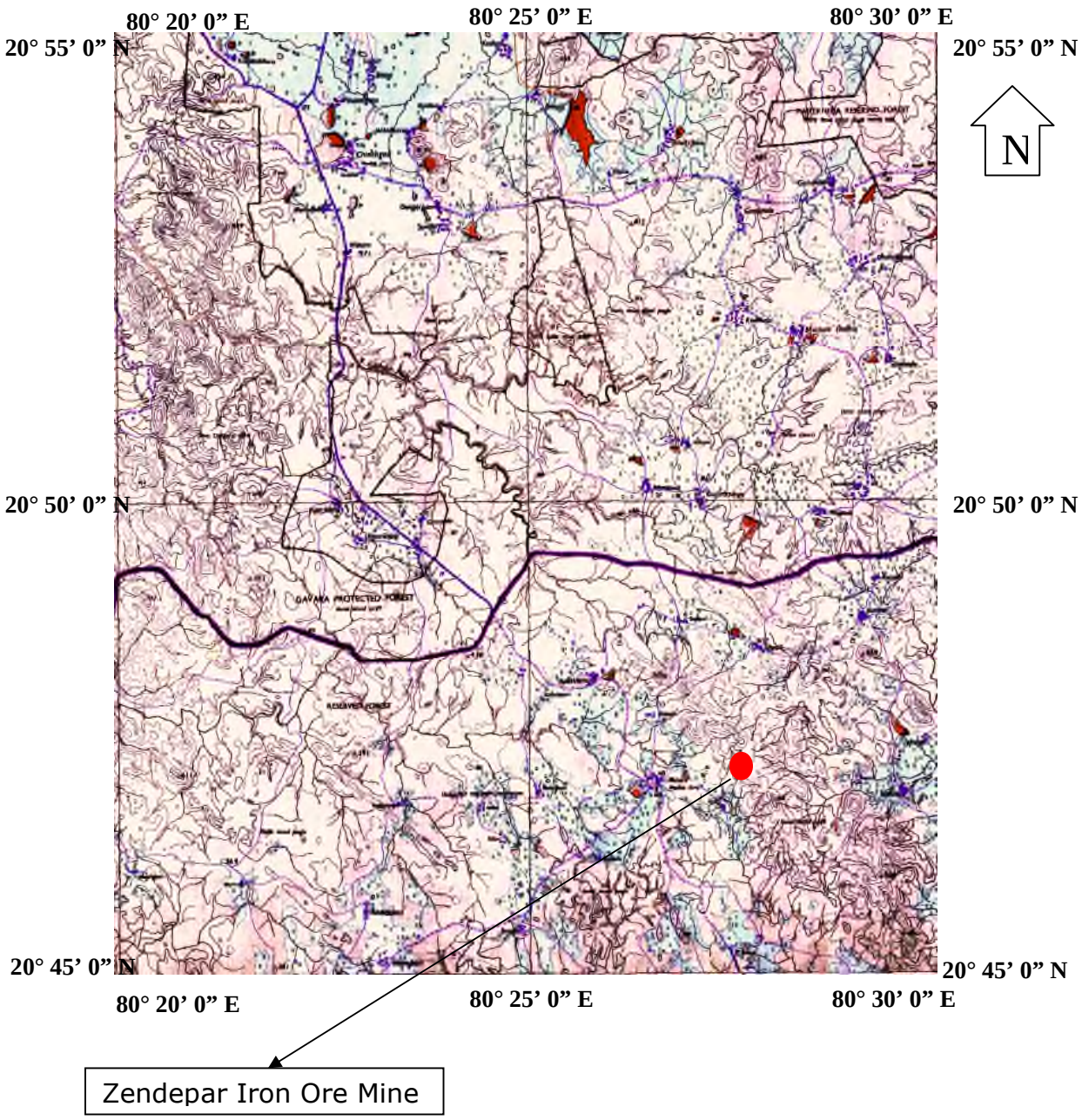

Figure 1.3 : Location on Toposheet

1.4.3 Accessibility –The area can be approached from District Headquarter, Gadchiroli to Korchi by a State Highway which is 7 km from Korchi and 110 Km from Gadchiroli and 2 km from village Zendepar connected by kuchha road.

The site for the proposed mine is located near Zendepar village in Korchi tehsil of Gadchiroli district in the State of Maharashtra. Ballarshah is the nearest railhead (120 km from Etapalli and 151 km from the proposed site), situated on the Ballarshah-Nagpur-Itarsi section of the Central Railway (Broad Gauge) on Madras-New Delhi trunk route. The nearest airport is at Nagpur (330 km). The National Highway (NH)-7 passes through Jam at about 260 km from the proposed site. The

State Highway (SH) passes through Allapalli at about 55 km. The nearest airport is at Nagpur (330 km). The nearest National Park is located at Tadoba, 193 km from the proposed mine site.

1.4.4 Salient Features : The Salient features of the Project is given at **Table 1.1** below.

Table 1.1
Salient Features of the Project

Sr. No.	Particulars	Details	
A.	**Nature of project**	Iron ore open cast mine	
B.	**Size of project**		
(i)	Mining Lease area	12.72 Ha	
(ii)	Type of the land within ML area	Government of Maharashtra non forest land	
(iii)	Proposed Production capacity	40,000 tonnes / annum	
C.	**Project Location**		
(i)	Villages	Zendepar	
(ii)	Tehsil	Korchi	
(iii)	District	Gadchiroli	
(iv)	State	Maharashtra	
(v)	Toposheet No.	64 D/5	
(vi)	Elevation	490-450 m above MSL	
D.	**Environmental Setting Details (with approx. aerial distance & direction from the mining lease boundary)**		
(i)	Nearest Town & District headquarter	Korchi (8 Km)	
(ii)	Nearest highway	NH -6 – 32.4 KM	
(iii)	Nearest railway station	Ballarshah	
(iv)	Nearest major airport	Nagpur 330 Km	
(v)	Nearest tourist places	Tadoba Andhari Tiger Reserve (193 Km)	
(vii)	Defence installations	None	
(viii)	Archaeologically listed important place	None within 10 Km	
(ix)	National Parks, Wild Life Sanctuaries, Elephant Corridor, Biosphere Reserves etc. (Existing as well as proposed)	None within 15 km. radius	
(x)	Reserved / Protected Forests within 10km radius	Name	Distance
		• Malewada Forest Range	2.2 Km
(xi)	Seismic Zone	Zone – II [as per IS 1893 (Part-I): 2002]	
(xii)	Iron ore mine	Iron ore whatsoever will be mined out, consumed by various industries: sponge Iron, Ferro chrome/ ferro alloys and Cement .	
(xiii)	Socio-economic factors	• No rehabilitation and Resettlement envisaged • Proposed direct employment to 78 persons besides creating indirect opportunities	
(xv)	Other Industries / Mines	4 Iron ore mines	Within 10 Km radius

1.5 STATUS OF REGULATORY CLEARANCES:

Government of Maharashtra has granted mining lease to the project proponent. The Mining Plan with Progressive Mine Closure Plan has been approved by Indian Bureau of Mines. The project was appraised during 40th SEAC meeting held on 15th February 2011 the Honourable Committee had issued a Terms of Reference (TOR). Accordingly the EIA/EMP was submitted to the Maharashtra Pollution Control Board. However, the Public hearing could not be arranged and hence it was requested to SEAC-1, Mumbai again to reconsider TOR during SEAC-1 128th meeting held on 02.06.2016. The honorable committee has approved the TOR and has exempted from conducting fresh baseline environmental data collection.

1.6 SCOPE OF THE STUDY

Any development activity, be it mining, or thermal power generation or industrial or river valley project, or port / harbour, or even new human settlement, will have side effects in the nature of environmental impacts, including social impacts. The object of preparing an environment management plan is to first assess the likely environmental impacts (Environment Impact Assessment, EIA) and then to ameliorate these impacts (Environment Management Plan, EMP).The severity of the adverse environmental impacts is reduced best by incorporating environmental concerns in the very production process, (including the choice of suitable technology and the mining method), rather than adding environmental measures on to a process already finalized on the basis of techno-economics alone. Suitable appropriate environmental measures at this stage itself shall be examined and incorporated. The study covers an area of 10 km radius with the proposed mine lease area as the center. The scope of the study broadly includes :

- To undertake environmental monitoring so as to establish the baseline environmental status of the study area;
- To identify various existing pollution loads due to various activities in the ambient levels;
- To predict incremental levels of pollutants in the study area due to the proposed mining activity;
- 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;
- To prepare an Environmental Management Plan (EMP) outlining the measures for improving the environmental quality and scope for future expansions for environmentally sustainable development; and to identify critical environmental attributes required to be monitored.

The literature review includes identification of relevant articles from various publications, collection of data from various government agencies and other sources. Field studies were conducted for a period of one year to determine seasonal variations which would determine existing conditions of various environmental attributes.

1.7 CONTENTS OF THE REPORT

The Rapid EIA Report is based on one season field data generated to represent summer season at site and data collected from secondary sources. The report has been divided into seven chapters and presented as follows:

Chapter 1 - Introduction

Chapter 2 - Project Description

Chapter 3 - Description of the Environment

Chapter 4 - Impact Analysis & Mitigation Measures

Chapter 5 - Analysis of Alternatives (Technology & site)

Chapter 6 - Environment Monitoring Programme

Chapter 7 - Additional Studies

Chapter 8 - Project Benefits

Chapter 9 - Environmental Cost

Chapter 10 - Environmental Management Plan

Chapter 11 - Summary & Conclusion

Chapter 12 - Disclosure of Consultant

CHAPTER 2
PROJECT DESCRIPTION

2.1 TYPE OF THE PROJECT

The project is of an opencast Iron ore mine. The proposed Iron ore mine (12.72 **hectares**) will be developed as open cast manual mining with bench pattern for the production of iron ore @**40000 tonnes per year**

Iron ore is used in steel industry, Ferro-alloys industries as main source of raw material. Good quality of iron ore deposits of steel making grade is available in and around Gadchiroli district of Maharashtra state.

2.2 NEED FOR THE PROJECT

Iron ore is one of the major mineral deposits occurring in the Indian sub-continent. It had played a great role in development of civilization and industrialization. The discovery of the metal iron and it's use by man through the ages as a milestone in the march of civilization, is known as the "Iron Age.

Maharashtra is one of the largest consumers of iron and steel materials in the country. Similarly, iron ore is one the major mineral deposits found in Maharashtra. Commercially exploitable iron ore deposits occur in Gadchiroli, Chandrapur, Sindhudurg and Bhandara districts of which those occurring in Gadchiroli district are the largest and the most important.

2.3 LOCATION OF THE PROJECT

The proposed area is located in the jurisdiction of village –Zendepar, Dist-Gadchiroli, and included in Survey of India Toposheet No. 65 D/5 having Latitude & Longitude ($80^0$20'30'': $20^0$46'40'') and having highest contour 505 MSL & lowest contour 455 MSL. Regionally, the proposed area forms a part of hilly terrain of Surjagarh hill range on which the proposed area is located aerially and about 2 kms south of village Zendepa. Ground water is available in surrounding area within 10 to 20 m from the surface level.

The proposed area is located in the jurisdiction of village—Zendepar. The area can be approached from District headquarter, Gadchiroli to Korchi by State Highway which is 110km from Gadchiroli. The Proposed site is 7 km from Korchi and 2 km from village Zendepar connected by Kuchha road. Due to proximity of villages near the proposed area there is not much problem about the labor forces for mining operation such as loading and other associated jobs. Nearest railhead is at Wadsa on the South-Eastern Board gauge Railway 69 km from Zendepar the proposed site. The topography is extremely controlled by the geology of the area and is a pointer to its lithology and structure. It will also have a significant impact on the mining project to be designed for this deposit. Locally the proposed area is drained by local system of nallah originating from the eastern and western slopes of the hillock.

2.4 REQUIREMENTS FOR THE PROJECT (Magnitude of Operation)

2.4.1 Land Requirement: The area for mining activities of the Mining Block allotted to Mr. R.M.Rajurkar 10.37 Ha. A Khasra Plan indicating the Mining Leasehold area recommended is given above **Figure –1.2**. Existing Land Use Pattern of the area proposed for the project is provided at the **Table 2.1** below;

TABLE 2.1
PRE MINING LAND USE OF THE AREA REQUIRED FOR THE PROJECT

S.No.	Village	Khasra No.	Area in Ha.	Type of land
1.	Zendepar	Part of 82	10.37	Govt. non forest revenue land

Source : Approved Mining Plan

2.4.2 Amenities & Climate of the Area:

Existing Infrastructure: Drinking water is available from well and bore well near the proposed site which is potable and fulfils the requirements of drinking water at site. Electricity is available. Primary education facility is available. Secondary school and post office are located at korchi. Nearest Police Station, PWD rest house local market is located at Korchi. Good industrial market is at equipment and other mining tools and accessories are available there is no telephone connection at Nagpur. There is well established road connection.

Soil classification: Soil is the most important feature of physiography, the formation of which largely depends upon the topography rock types and drainage. The cropping pattern in the area is governed by the thickness of soil mantle, its texture and constancy. The proposed area is mostly covered with the lateritic soil

Climatic data from secondary sources. the proposed area is located in a small and backward village of Gadchiroli district. However, the climate of the area is of moderate to extreme nature with maximum temperature of 46^0 C and mean minimum temperature of 12^0 C. this is dry area and except in rainy season humidity is low and the atmosphere is dry.

Rainfall : The proposed area is located in a small and backward village of Gadchiroli district and information for five years is not readily available. However average rainfall pattern in the area is 800 mm to 1000 mm which is spread over form June to October

Temperature: There is meteorological observatories in the brahmapuri district, he description which follows is mainly based on the records of the observatories in the district. Temperatures rise rapidly after February till May which is the hottest month of the year. In May the mean daily maximum temperature is about 42.4^oC and the mean daily minimum temperature is about 12.9^oC . The heat in the summer season is intense and on some days in May and June the maximum temperatures may rise upto 48^oC. The afternoon heat is sometimes relieved by thundershowers. With the arrival of the

southwest monsoon by about the middle of June, there is an appreciable drop in day temperatures and the weather becomes pleasant. After the end of September, when the southwest monsoon withdraws, the day temperatures increase slightly, but the night temperatures decrease progressively. After October both day and night temperatures decrease rapidly. December is usually the coldest month with the mean daily maximum temperature at about 26.5^0C and the mean daily minimum temperature at about 12.9^oC.

Humidity: Except during the southwest monsoon season when the humidity is high (60- 70%) the air is generally dry.

Wind Velocities and Wind Direction: Winds are generally light to moderate with some strengthening during the period May to August. In the post-monsoon and cold seasons the winds generally blow from east or northeast.

Social Infrastructure available.

- **Education** is a basic requirement for every human being. The governments should utilize its entire recourses in rationalmanner to encourage people to become literate to some extent since educated persons are assets to help in proper development of the country. In zendepar primary education facilities is available and secondary education is available at Korchi..
- **Hospital**: There are number of Hospital, dispensaries, primary health centre and Sub primary health centre available in that tahsil.
- **Transport**: The transport facilities in the tahsil are well developed and wide spread. State or national highway link most of the urban areas.
- **Communication**: Communication facilities go a long way in information collection and its dissemination in an effective and speedy manner. In the modern society, the roll of the facilities in the socioeconomic development of the society is very well recognized. Communication facility help in the flow of information from one place to another in shortest time, thus helping administration and corporate managers to take crucial decisions relating to daily functioning of administration and business dealings in shortest possible time. The importance of developed communication network for the common men judged from the fact that in rural areas. All communication facility like as phone, fax, printer, scanner, computer etc are available at Gadchiroli..

2.5 GEOLOGICAL & MINING PARAMETERS :

2.5.1 Salient Feature of the Mining

The mining will be carried out as per the approved mining plan. The salient features are given below in **Table 2.2;**

TABLE 2.2
SALIENT FEATURE OF THE MINING

Sr. No.	Description	Details
1	Mine lease (applied)	10.37 Ha
2	Type of mine	Opencast Mine
3	Method of mining	Opencast mechanized mining
4	Rated capacity of mine Peak capacity	15000 Tonnes/annum 40000 Tonnes/annum
5	Expected life of mine	20 Yrs
6	Average stripping ratio for OCP	1:0.17
7	Proved reserves	2,37,300 tonnes
8	Probable reserves	6, 5800 tonnes
9	Average no. of working days	300 days
10	Number of shifts	1 Shift
11	Working hours/shift	8 Hrs
12	Bench height for OB	1.5m
13	Ultimate depth of mine	10 m
14	Side burden to be generated during entire life of mine	21000 tonnes per year
15	No of waste dumps planned	------
16	Area of waste dumps	3000 m^2 along the lease boundary
17	Width of the permanent haul road	
18	Water requirement	
19	Transport of side burden	By road (internally)
20	Transport of mineral from mine face to End Use plant	By road
21	Area to be reclaimed with plantation	15200 m^2
22	Cost of the Project	……..

2.5.2 Geology of the Surjagarh Hill Range : The mine lease area falls in the south western end of the famous, Proterozoic iron ore belt, comprising the Rajhara-Dalli; Rowghat and Bailadilla deposits of Madhya Pradesh. The rock types exposed in the region as reported by the Geological Survey of India (GSI) are of Archaen and Lower proterozoic ages. The succession is given in **Table – 2.3.**

TABLE-2.3
GEOLOGICAL SUCCESSION

Rock Type	***Group***
Dolerite	Bailadilla Group Lower Proterozoic Age (2100 million years)
Chlorite Schist	
Iron ore formation (Banded Hematite Quartzite-BHQ)	
Ferruginous Phyllite	
Granite	Bengpal Group Archaen Age
Migmatite & granite Gneiss	
Migmatized Basic rock	

The area from a part of the region covered predominantly by the granite gneisses with its variants, basic rocks and some met sediments comparison with its variants, basics rocks and some meta sediments hematite quartzite and schist with Age. The metasendiments appeared to have been followed low plunge. Major part of the iron. Ore deposit area is covered with scree, soil and laterite and has few good rock exposures except in the trenches and soil and laterite and has few good rock exposures except in the trenches and near about. The rocks of the area comprises of Banded Hematite Quartzite with associated thick iron ore/haematite bands, platy quartz and massive grey quartzite, pegmatite and quartzite and massive grey quartzite, pegamatic and patch vie is of Precambrian age. Laterite and lateritic soil is present in patch will over the area. Although granite gneisses are not exposed any where in one area the same has been reported by DGM. In all possibility granite gneisses appears to be present on the eastern and western flanks of the ridge. The more conspicuous geological feature of the area is the association of iron ore with the banded hematite quartzite. The rock exhibits alternate layers of the quartz and hematite which bands dominate over the quartz rich bands giving rise to massive iron are. On the basic of traversing and mapping two well marked hematite – quartzite ore zone with two to four iron ore bands has been recognized traversing the area from ore bands show pinching and swelling character as also thickening and thinning due to lateral facies variations The general strike is $N15^0$ E – $S15^0$W with generally steep dip around 50^0 towards west.

2.5.3 Geology of the Mine Lease Area :

The main geological formations found in this area are the older metamorphics i.e. grantic & Dharwars i.e Banded Hematite Quartzite. The proposed area comprises a hillock with lateritic capping with Banded Hematite Quartzite body exposed at places. The major part of the area on the surfaced is covered with Lateritic dolerite and Limonite, At places outcrop of iron ore is exposed on surface. The ore body is covered with laterite which is showing varying thickness of 1.5m to 3.0m. The general strike of the ore body is North-east and South-West and dip varying from 45^0 to 50^0 towards West. The rocks of the area comprises Banded Hematite Quartzite, Ferruginous later associate with Hematite Iron ore rich bands. Hematite is brown in color. The banded hematite Quartizite is mainly laterite & massive. The outcrops of Banded Hematite

Quartzite are weather and fractured. The trend of the ore bodies appears to North-South Float ore is also seen in the trend in the area. The analysis shows that Fe content is 38.26% to 60.23% and 54.98% to 67.17%**.**

In order to depict the geological features of the area a Geological Plan is enclosed as **Figure2.2** and Geological Sections is enclosed as **Figure 2.3.**

2.5.4 Reserves

Geological Reserves: The summary of geological reserves with mineable reserves and total reserves is given in the following **Table 2.4**

TABLE-2.4

SUMMARY OF GEOLOGICAL RESERVES OF IRON

S.No.	Category	Proved Reserve (111) in tonnes	Probable Reserve (121) in tonnes	Possible Reserve (122) in tonnes	Total Reserve in tonnes
1	In situ Ore	197400	65800	65800	3,29,000
2	Float	32665	-	-	32665
	Total	**2,37,300**			**3,61, 665**

2.5.5 Anticipated Life: Anticipated Life of the mine has been computed by considering the proposed rate of ROM production about 15000 Tonnes/ Year for next five years and subsequent years of production when the mine is fully developed. Considering the mineable reserved mentioned above the anticipated Life of the mine will be about 30 years.

2.6 MINING METHODOLOGY

2.6.1 Mining: The mining operation will be done by opencast manually operated mining by developing benches. Drilling will be done by compressed operated jack hammer and blastring by gelatin and detonators. All the operation are manual. It is proposed to develop the deposit from the top from northern side to southern side following the outcrop. It is proposed to open the pit from the northern side following the outcrop and length will be 35 m and width will be 20.0 m. There will be two benches will be having height of the benches be 3.0 each and this operation will continue till fifth year as it advances towards southern side. For transportation of ore and overburden it is proposed to use tippers.

2.6.2 Drilling and Blasting

There is sideburden in the area the iron ore deposit is covered with overburden in places. The side burden and the iron ore is hard and it can not be removed without drilling and blasting.There will be two benches in iron ore having height 3.0 m each and width of the benches will be 20 m with end slope 80^0. For bench planning it is proposed to commence mining operating from the northern side ore body no. 1 and it is outcropping and following the trend towards southern side in yearwise pattern.
Details of the blasting parameters given in the following table on part bench height of 1.5 m

Details of Blasting Parameters

Depth and diameter of hole	:	1.5 m – 1.6 depth 34 mm dia.
Blasting Pattern	:	One row blasting having length of Face of 50 m at the working pit.
Spacing between holes	:	1 m
Burden	:	1 m
Charge per hole	:	500 gms – 600 gms of Gelatin along with detonators.
Powder factor	:	6 tonnes per kg explosives.
Consumption of explosives	:	25 kg per round for 50 nos. of holes normally blasting will be done every. Monthly consumption of Explosives will be 225 kg of gelatin and 2000 nos, of detonators.

2.6.3 Year wise Production for First Five Years :

The year-wise production is being projected considering the market requirement and the applicant does not have any captive unit and production will be regulated as per market demand. Year-wise production for next five years are given below:

TABLE-2.5
PROPOSED DEVELOPMENT IN FIRST FIVE YEARS

Year	Iron Ore(tonnes)
1st	14730
2nd	14730
3rd	14730
4th	14730
5th	14730

Thus the average stripping ratio of ore to overburden for first five years is around 1:0.17.

2.6.4 Employment Potential: Around 58 employees will be required for this mine. Managerial staff – 4 consisting of Mines Manager, Mining Engineers, Mining mate and supervisor will also be deputed.Apart from above, skilled and unskilled labourers will be required for blasting job and for manual loading to trucks or tippers. The mine will employ 12 skilled workers and 40 unskilled workers workers. It is proposed to employ local population wherever possible in mining and allied operations.

2.6.5 Stage wise Land use Pattern of ML Area:

As per the various requirements uses of land are depicted in the **Table 2.6**

TABLE 2.6
STAGEWISE LANDUSE PATTERN (area in ha)

SN	Head	Area put on use at Start of Plan (Ha)	Additional Requirement during Plan period	Total	Area considered as fully reclaimed & rehabilitated	Net area considered for calculation
a	b	c	d	e=c+d	f	g=e-f
1	Area broken by the pit	0.00	0.56	0.56	-	0.56
2	Storage for top soil	-	-	-	-	-
3	Area under Dumps	-	0.30	0.30	-	0.30
4	Infrastructure, Workshop, administrative Building etc.	-	0.025	0.025	-	0.025
5	Mineral storage	-	-	-	-	-
6	Road	-	0.28	0.28	-	0.28
7	Railway	-	-	-	-	-
8	Green belt	-	-	-	-	-
9	Tailing pond	-	-	-	-	-
10	Effluent Treatment Plant	-	-	-	-	-
1	Mineral Separation Plant	-	-	-	-	-
12	Township area	-	-	-	-	-
13	Others to specify	-	-	-	-	-
	Total					**1.165**

2.7 WATER REQUIREMENT & SOURCE

The water requirement at mine site for both industrial and domestic have been worked out and given in**Table-2.7.**

TABLE-2.7
WATER REQUIREMENT (M^3/DAY)

(A)	Industrial	Quantity m^3/day	Source
1	Dust suppression	15	Mine water
2	Green belt	5	Mine water
	Sub Total (A)	**20**	
(B)	**Domestic**	**3**	Tube well water
	Sub Total (B)	**3**	
	Grand Total (A+B)	**23**	

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The entire water will be gainfully utilized. The water balance diagram is enclosed as **Figure 2.4**

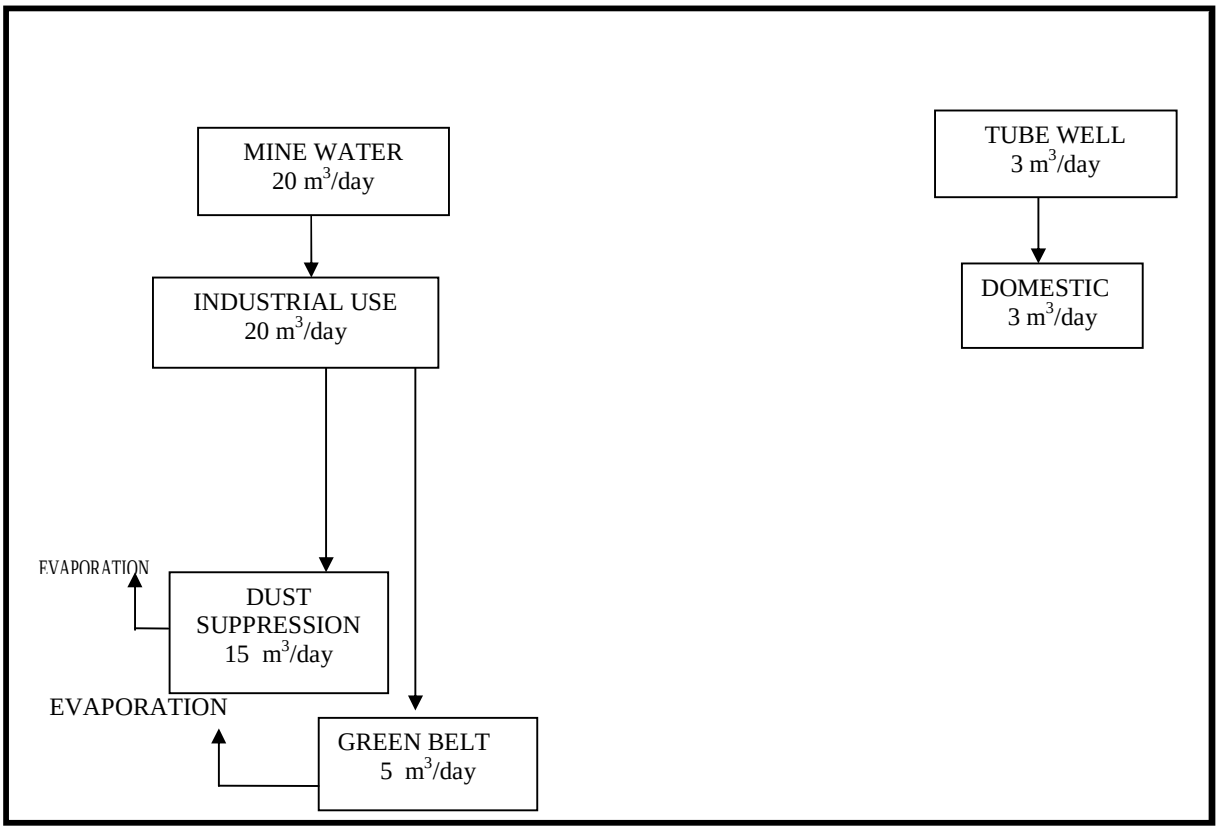

Figure 2.4 Water Balance Diagram

2.8 PHYSIOGRAPHY & DRAINAGE

2.8.1 Physiography

The proposed area is located in the jurisdiction of village –Zendepar, Dist-Gadchiroli, and included in Survey of India Toposheet No. 64 D/5 having Latitude 20^0 46' 20" N & Longitude 80^0 30' 52" and having highest contour 505 MSL & lowest contour 455 MSL. Regionally, the proposed area forms a part of hilly terrain of Surjagarh hill range on which the proposed area is located aerially and about 2 kms south of village Zendepar rising from ground level of about 120 MSL.

The topography is extremely controlled by the geology of the area and is a pointer to its lithology and structure. It will also have a significant impact on the mining project to be designed for this deposit. Locally the proposed area is drained by local system of nallah originating from the eastern and western slopes of the hillock.

Mine Drainage: The topography area is undulating and it is observed that iron ore is existing at the top of the hilly terrain slopping down wards. Due to this reason the slicing of the deposit will commence from the top and following downwards in the area. At present it is considered that mining limits will be upto 10 m thickness of the ore body from the top as per present information available. At present mining limit may be considered upto 10 m from the surface exposure of the ore body of various bands.

The reef ore working will be on the top and/or on slopes of the hill at elevations of 505 m above the base of the hill. The float workings, though situated in the lower reaches, will be dug to an average depth of 1.5 meters only. Thus, there will not be any problem of ground water, coming into the mine workings.

The reef workings on the hill will be open on one side during the first five year. Thus, during monsoon season, the rain water that falls in the mine will be drained off by gravity. However, as the mine gets deepened, there will be accumulation of rain water in the mine pit during monsoon season.

Settling tanks will be provided near each ore body in the in-situ area. The design of the sedimentation tanks is given below. From the settling tanks overflow will be pumped out through a pipe line after passing through a de-silting tank of 3 x 2 x 2 m size. The de-silted water will be led into the nearby nallah to follow the natural courses.. The water will be tested for any toxic elements before pumping & discharging into the *nalla*, which is on the western and eastern side.

2.9 GRADE / QUALITY OF ROM

The iron ore whatsoever will be mined out during the course of mining operation will be consumed by the various industries in the surroundings. The applicant does not have any captive unit.

Average chemical composition of the iron ore as well as float ore is given below :

Fe : 58%-64%
Al_2O_3 : 6%-8%
SiO_2 : 4%-5%

It is observed form the above chemical composition of the iron ore deposit in the proposed area is suitable for sponge iron grade and no benefaction or upgradation is required. The chemical composition of the sample of collected from the area is enclosed.

2.10 CONCEPTUAL PLAN:

2.10.1 Conceptual Plan:

The zendepar lease area of Shri Nirmal Chand Jain has very good reserves of Iron ore. The DGM, Maharashtra has done detailed exploration and proved the reserves of ------- These reserves are sufficient to mine in the lease period of 20 years and beyond with a production rate of 15000 tonnes/year.

The Conceptual Plan is prepared for the lease period only, as the future mining after the end of the lease period has not been envisaged; because the renewal of lease, any legal problems, etc. in future may pose the problem for future mining. The conceptual mining plan is prepared for a mining block already in working for 1stfive years. The total extension of the quarry on all side of 5 years working will be developed for exploring the ore.

2.10.2 Exploration:

The above exploration gives enough reserves for carrying out mining operation upto 15,000 tonnes per year for next five years. It is proposed to drill **5 nos.** of bore holes of 20 m depth in the identified ore bodies so that the delineation of the ore bodies are more specific and shape and depth continuity is well established and it is recommended to carry out the same within 2 years of grant mining lease in the area. The detailed mapping etc. and sampling with analysis has been done. **Proved Reserved** category upto thickness of 6 m, **probable Reserve** thickness of 6 m upto 8 m will come under this category and p**ossible Reserve** beyond the thickness of 8 m upto 10 m will come under this category.

2.11 WASTE GENERATION & MANAGEMENT

It is already mentioned that the area is having undulating topography and iron ore is mostly outcropping. The waste rock/side will consist mainly Banded Hematite Quartzite. There will be generation of side burden for the systematic development of the deposit as the iron ore is mostly outcropping but bounded by side burden.

Dumping site for side burden will be in the lease boundary and non-mineralized zones having spread of not more than 20 m and height 4 m to 5 m . The space parameters 600 m^2 along the lease boundary.

TABLE-2.6
SOLID WASTE GENERATION

Year	Quantity of Waste	Space Required	Location
1st	2520 m^2	600 m^2	East
2nd	2520 m^2	600 m^2	East
3rd	2520 m^2	600 m^2	East
4th	2520 m^2	600 m^2	East
5th	2520 m^2	600 m^2	East

2.12 MINERAL TRANSPORT :

It is already mentioned that the mining operation will be of manual nature and loading will also be manual. The side burden and iron ore after blasting it will be fragmented into pieces and will be sized to smaller size. The overburden will be dumped in the lease boundary. The fragmented sized iron ore will be stacked in the working pit in the from of heap. It will be subsequently loaded to the tippers or trucks for onwards dispatch to the various consumers unit as the applicant does not have any captive plant.

2.13 SAFETY & MINERAL CONSERVATION:

The mining plan to achieve the production has been drawn to keeping all the safety aspects in view. Required measures have been taken to prevent danger from dust prevention of fire etc. Due care shall be taken to provide facilities as per mines rules. First-aid stations and rescue station shall be provided at various places. Proper safety organization shall be built at the project level. Special precautions in respect of high voltage equipments, battery charging station etc. will be observed. Provisions of all concerned Acts, Rules, Regulations, Bye-laws, etc. shall be followed.

2.14 SITE SERVICES

The proposed Opencast Mine is having a capacity of 15 000 tonnes per day but the life of the mine being for a period of 20 years. This requires provision of essential services , storage and workshop facilities besides statutory, safety and welfare needs of personnel employed. Some of facilities envisaged to be provided at site are as follows:

Site services can be classified in following categories.

1) Statuary obligation
2) Maintenance Requirement,
3) Administration Requirement,

1) Statuary obligation : these facilities will include first aid station, rest shelter, drinking water facility etc. in the proposed site. In the proposed area first aid facilities will be kept at mine office which will also serve as first aid station.

2) Maintenance Requirement : the proposed method of mining operation will be manual opencast, the minimum machinery to be deployed are compressor and jack hammer drill which will be used for drilling. For this purpose not much maintenance is required.

3) Administrative Requirement : For this a site office is required and will be constructed.

CHAPTER 3
DESCRIPTION OF ENVIRONMENT

3.0 INTRODUCTION

This chapter incorporates the description of the existing environmental setting the area encompassed by a circle of 10 km radius around the proposed iron ore mine. The proposed area is located in the jurisdiction of village Zendepar, Dist-Gadchiroli, and included in Survey of India Toposheet No. 65 D/5 having Latitude & Longitude ($80^0$20'30" : $20^0$46'40") and having highest contour 505 MSL & Lowest contour 425 MSL. Regionally, the proposed area forms a part of hilly terrain of Surajgarh hill range on which the proposed area is located and is sloping hill and at the top broadly E-W alignment hill range located acrially and about 2 kms south of village Zendepar rising from ground level of about 120 MSL

The study area is almost like virgin area. There are no industrial activities in the study area. Most of the inhabitants in the near by scattered villages are tribal.

One season monitoring was conducted during summer season. In addition, certain aspects like landuse, socio-economic status have been analyzed based on the secondary information like district census reports and remote sensing satellite imageries.

3.1 AIR ENVIRONMENT

3.1.1 Air Environnent : Baseline Status

3.1.1(a) **Climate & Meteorology :** Micro-Meteorological data within the study area during the air quality survey period is an indispensable part of air pollution studies. The meteorological data recorded during the monitoring period is very useful for proper interpretation of the baseline information as well as for input, to the predictive models for air quality dispersion. Historical data on meteorological parameters will also play an important role in identifying the general meteorological status of the region. The climate of the study area and the surrounding area is generally dry except in the south-west monsoon season. The year may broadly be divided into four seasons.

- Winter Season : December to February
- Pre Monsoon Season : March to May
- Monsoon Season : June to September
- Post Monsoon Season : October and November

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i) **Temperature :** The winter season starts from end of November and continues till February. December is the coldest month with mean monthly maximum temperature at 32.50ºC and the mean monthly minimum at 10.9ºC. The mean monthly temperature in December month is observed to be 23.0ºC. Both the day and night temperatures increase rapidly from March to May. During summer, the mean monthly maximum temperature is 47.10ºC observed during May and the mean monthly minimum temperature is 11.7ºC observed during March. It is observed that during March through May the maximum temperatures exceed 40ºC marginally. During monsoon the average maximum temperatures range between 35.7ºC to 46-.50ºC and the

average minimum temperatures observed are in the range of 15.10ºC to 19.40ºC. There is an appreciable drop in minimum temperatures with the retreat of south-west monsoon by the end of September/October. The summary of the observed data is given in **Table-3.6**.

ii) Relative Humidity

The air is generally dry except in the south-west monsoon season. During summer months, the relative humidities are very low.

RH at 0830 hrs : The mean humidity ranges between 54.0% to 86.00%. During summer the maximum humidity ranged between 93.0% to 95.0% while the minimum is ranged between 14.0% to20.0%. The monthly mean variations (Between 1978-87) are presented in Table-3.6 .

RH at 1730 hrs : The mean humidity ranges between 24.00% to 76.00%. During summer the maximum humidity ranged between 73.0% to 96.0% while the minimum ranged between 7% to 9.0%. The summary of monthly mean variations (Between 1978-870 are presented in Table-3.1 .

iii) Atmospheric Pressure

The maximum atmospheric pressure is recorded in winter season. The pressure in all other months is found to be varying.

At 0830 Hrs : The mean pressure ranges between 988.7 mb to 1002.7 mb. The maximum atmospheric pressure during the winter season was observed to be in the range of 1006.8 mb to 1013.8 mb while the minimum is observed in the range of 993.0 mb to 996.6 mb. The summary of monthly mean variations (Between 1978-87) are presented in Table-3.6.

At 1730 Hrs : The mean pressure ranges between 984.6 mb to 998.7 mb. The mean maximum atmospheric pressure during the winter season was observed to be in range of 1002.8 mb to 1008.0 mb while the minimum of 988.9 mb to 993.5 mb. The summary of monthly mean variations (Between 1978-87) are presented in Table-3.1.

iv) Wind Speed/Direction : Wind Speed/Direction : The wind speed and wind direction data recorded at IMD, Sironcha has been procured and the same is presented in the annual wind rose at **Figure-3.1.**

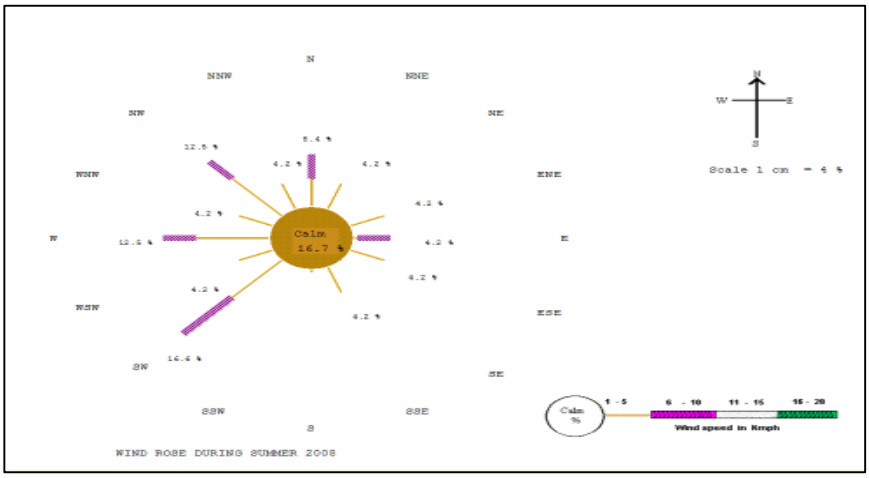


FIGURE 3.1

v) **Rainfall :** The average annual rainfall based on the 12 years (1997-07) from IMD Sironcha is 1143.87 mm. The maximum rainfall is observed during South-west monsoon. About 70% of the annual rainfall is received during the monsoon season. Pre-monsoon rains are also observed in the area. The tahsilwise rainfall data is presented in **Table 3.1**.

TABLE-3.1
SUMMARY OF METEOROLOGICAL DATA

Month/ Year	Temperature ºC		RH (%) 1730 hrs	
	Max	Min	Max	Min
Jan	30.3	15.5	42	45
Feb	33.6	18.7	68	33
Mar	37.6	22.7	57	25
Apr	40.4	26.2	56	25
May	42.2	27.6	50	25
Jun	37.3	26.8	67	50
Jul	32.1	24.1	84	72
Aug	31.1	24.2	86	75
Sep	32.2	23.6	82	70
Oct	32.8	21.9	77	58
Nov	31.0	17.9	74	51
Dec	29.4	14.6	76	47

TABLE-3.2
CLIMATOLOGICAL DATA

Month	Temperature, ºC		Relative Humidity (%)		Cloud Cover, Oktas		Wind Speed (km/hr)		Evapora-tion rates (mm/day)	Rainfall
	Max	Min	Max	Min	Max	Min	Max	Min	Avg	Total (mm/month)
March	41.8	22.7	57	25	2/8	0/8	5.1	3.6	-	NIL
April	42.0	26.2	56	25	2/8	0/8	6.5	4.4	5.9	NIL
May	41.8	22.7	50	25	3/8	0/8	7.2	2.9	-	21.9

3.1.1(b) Ambient Air Quality

The monitoring was carried out for 13 continuous weeks beginning from March 2011 to May 2011, as per norms stipulated by the Central Pollution Control Board Notification No. B-33014 dated 11 April 1994.

Selection of Monitoring Stations: In present case, most of the mining operations will be opencast. Five stations were selected for monitoring ambient air quality, The locations of the seven air quality monitoring stations are described in Table 3.2 and depicted in Figure-3.2.

Table 3.2
Location of Ambient Air Monitoring Stations

Sr. No.	Location of sampling Station	Distance from proposed mine	Direction
A1	Mining lease area	Core zone	-
A2	Village Zendepar	1.5	DWD
A3	Village Khuritola	2.0	UPD
A4	Village Bondena	2.0	UPD
A5	Village Botekasa	3.0	DWD

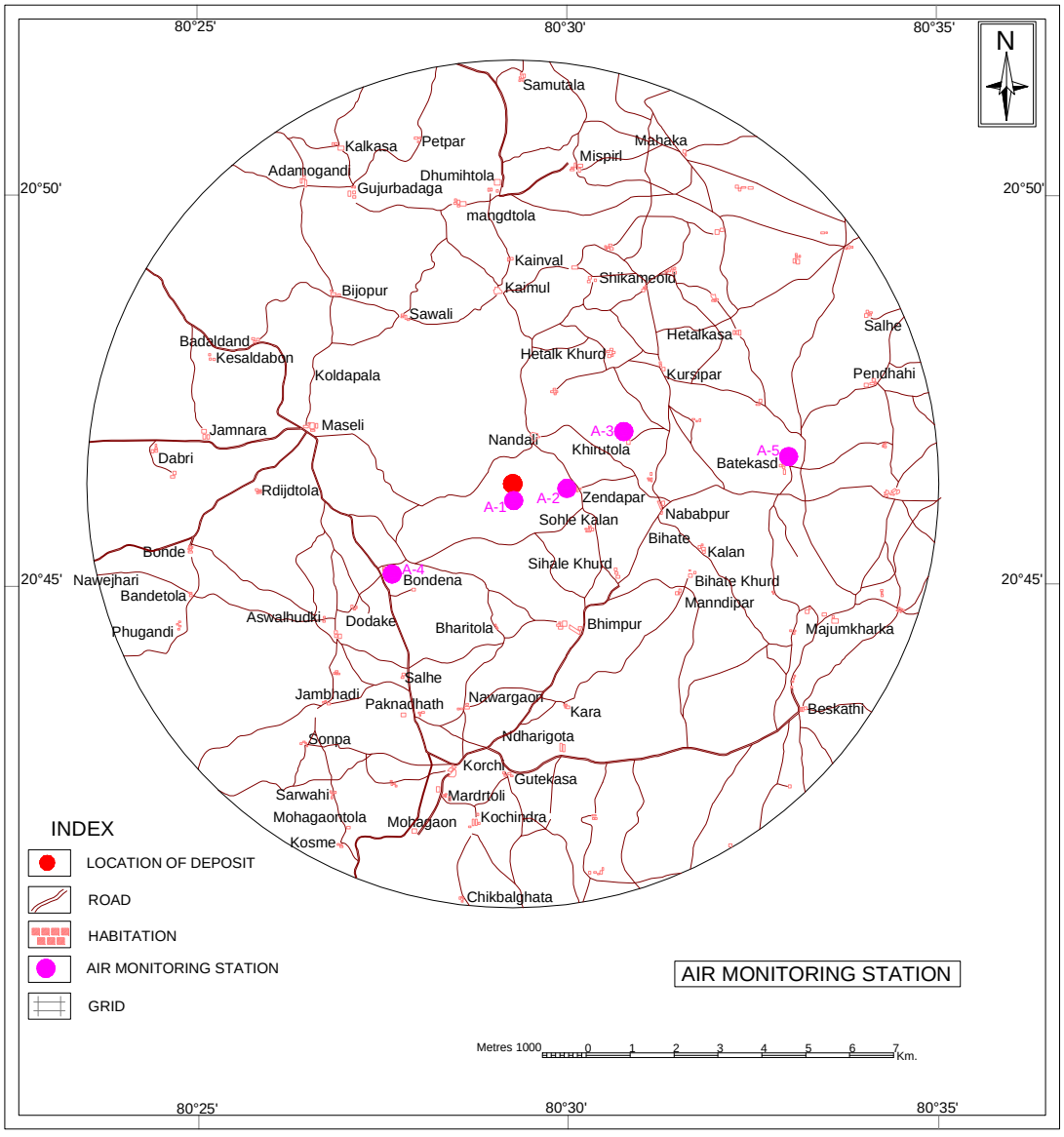


Figure 3.1 : Map showing Air monitoring station

Monitored Parameters: The parameters monitored were Suspended Particulate Matter (PM10), Respirable Particulate Matter (RPM), Oxides of Nitrogen (NOx) and Sulphur Dioxide (SO_2) using high volume samplers. Samples for Carbon Monoxide were collected and analyzed at site using Carbon Monoxide Detector Tubes as per

DGMS stipulated procedure. Ambient air samples were collected in plastic bags for estimation of lead contents in Air by AAS. The ambient air quality data generated for seven stations is given in Table 3.3 (A) to 3.3 (G). The ambient air quality in consolidated summary for 13 weeks period for seven stations is depicted in Table 3.4.

TABLE 3.3 (A)

AMBIENT AIR QUALITY
SAMPLING STATION : A1

Week	PM_{10}	$PM_{2.5}$	SO_2	NO_x
	µg/m^3	µg/m^3	µg/m^3	µg/m^3
W-1	46.3	25.6	7.1	10.9
	44.2	23.4	6.8	11.2
W-2	47.6	25.1	7.9	12.6
	42.9	23.1	8.4	13.4
W-3	45.8	25.9	7.2	11.5
	41.3	24.8	7.9	12.6
W-4	39.2	22.6	8.4	12.6
	44.5	26.7	9.5	14.8
W-5	47.3	28.4	7.4	11.8
	42.9	23.1	7.2	10.8
W-6	47.6	19.8	7.9	12.6
	41.9	22.7	7.1	11.4
W-7	43.5	23.6	7.8	12.5
	41.7	24.2	6.9	11.6
W-8	42.6	21.6	7.1	10.8
	44.6	22.9	7.6	12.2
W-9	43.9	19.8	7.3	11.7
	41.8	24.5	8.2	12.8
W-10	38.5	19.6	7.4	11.8
	42.6	22.4	7.9	11.6
W-11	41.8	21.3	9.2	13.2
	45.6	22.7	7.1	10.9
W-12	43.7	23.7	6.8	11.2
	46.2	26.9	6.6	12.3
W-13	47.2	23.4	7.4	10.8
	45.3	23.7	8.5	12.9
Minimum	**38.5**	**19.6**	**6.6**	**10.8**
Maximum	**47.6**	**28.4**	**9.5**	**14.8**
Average	**43.9**	**23.5**	**7.6**	**12.0**

TABLE 3.3 (B)

AMBIENT AIR QUALITY
SAMPLING STATION : A2

Week	PM_{10}	$PM_{2.5}$	SO_2	NO_x
	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
W-1	45.2	24.1	9.8	15.1
	41.9	26.8	7.4	11.9
W-2	38.4	23.4	8.6	15.2
	39.2	24.2	8.1	16.1
W-3	41.2	23.4	9.2	12.7
	40.6	22.9	8.4	13.3
W-4	41.3	21.8	9.6	14.8
	45.2	18.3	7.1	13.6
W-5	41.9	22.3	6.9	12.7
	42.3	18.7	7.3	13.6
W-6	40.5	24.9	7.1	11.9
	41.8	25.1	8.4	13.2
W-7	39.6	25.3	6.6	13.7
	37.2	22.7	6.9	14.8
W-8	39.1	23.6	7.2	10.9
	41.5	25.1	7.1	11.2
W-9	41.6	23.7	7.8	12.8
	41.9	26.2	8.4	13.4
W-10	41.3	22.9	8.3	12.7
	42.6	19.2	9.2	16.3
W-11	40.2	21.5	10.2	18.2
	38.5	20.6	8.4	14.1
W-12	39.2	22.9	8.1	12.8
	37.4	21.8	7.4	13.6
W-13	36.8	23.4	8.6	13.1
	39.2	22.5	9.5	15.2
Minimum	**36.8**	**18.3**	**6.6**	**10.9**
Maximum	**45.2**	**26.8**	**10.2**	**18.2**
Average	**40.6**	**23.0**	**8.1**	**13.7**

TABLE 3.3 (C)

AMBIENT AIR QUALITY

SAMPLING STATION : A3

Week	PM_{10}	$PM_{2.5}$	SO_2	NO_x
	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
W-1	38.1	19.4	10.3	19.2
	42.5	22.5	9.6	17.1
W-2	41.9	23.6	8.6	16.5
	43.7	25.4	9.5	14.2
W-3	41.9	23.4	9.4	14.1
	38.4	22.8	10.6	16.7
W-4	37.3	21.7	11.1	22.4
	39.6	23.4	10.8	18.1
W-5	39.1	22.7	8.7	16.2
	45.3	26.4	7.6	14.8
W-6	41.6	22.1	8.5	16.4
	42.6	19.6	9.3	15.1
W-7	41.2	21.3	7.2	14.2
	38.1	23.7	7.7	15.9
W-8	36.5	24.6	6.9	16.8
	39.5	23.8	7.5	14.8
W-9	41.6	22.6	7.7	12.7
	40.3	19.7	7.2	12.9
W-10	39.4	17.6	9.1	13.7
	38.7	19.5	8.4	16.2
W-11	45.2	25.6	7.8	13.4
	48.9	29.1	8.6	16.2
W-12	50.2	27.5	7.1	13.7
	41.8	26.7	9.3	12.7
W-13	42.3	29.4	8.4	14.6
	44.8	25.2	7.6	16.8
Minimum	**36.5**	**17.6**	**6.9**	**12.7**
Maximum	**50.2**	**29.4**	**11.1**	**22.4**
Average	**41.6**	**23.4**	**8.6**	**15.6**

TABLE 3.3 (D)

AMBIENT AIR QUALITY
SAMPLING STATION : A 4

Week	PM_{10}	$PM_{2.5}$	SO_2	NO_x
	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
W-1	44.5	27.4	8.7	13.5
	50.4	26.1	9.1	12.2
W-2	40.3	22.9	8.6	12.8
	45.8	24.0	9.0	11.1
W-3	45.3	22.9	9.4	13.2
	37.6	20.7	8.4	15.6
W-4	43.3	21.8	7.7	17.7
	39.4	23.3	9.9	15.3
W-5	44.0	26.0	7.6	13.0
	39.6	23.0	6.8	10.3
W-6	46.2	27.8	7.4	12.1
	41.6	20.8	7.9	13.2
W-7	50.0	20.0	6.8	10.6
	47.9	28.0	7.4	11.6
W-8	46.3	23.3	7.3	10.2
	38.9	22.0	7.1	10.8
W-9	36.3	20.0	6.8	12.0
	37.6	19.5	7.4	10.6
W-10	38.0	20.7	7.9	13.9
	43.3	23.4	8.1	12.2
W-11	44.9	24.0	7.5	12.3
	42.3	23.5	7.9	12.6
W-12	41.6	22.3	6.9	10.8
	43.9	24.0	8.1	13.8
W-13	42.8	22.9	8.3	11.8
	42.5	24.0	7.7	10.4
Minimum	**36.3**	**19.5**	**6.8**	**10.2**
Maximum	**50.4**	**28.0**	**9.9**	**17.7**
Average	**42.9**	**23.2**	**7.9**	**12.4**

TABLE 3.3(E)

AMBIENT AIR QUALITY
SAMPLING STATION : A 5

Week	PM_{10}	$PM_{2.5}$	SO_2	NO_x
	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
W-1	46.8	30.8	9.9	16.1
	52.7	29.5	9.2	14.8
W-2	42.6	26.3	8.2	15.4
	48.1	27.4	9.1	13.7
W-3	47.6	26.3	9.0	15.8
	39.9	24.1	10.2	18.2
W-4	45.6	25.2	10.7	20.3
	41.7	26.7	10.4	17.9
W-5	46.3	29.4	8.3	15.6
	41.9	26.4	7.2	12.9
W-6	48.5	31.2	8.1	14.7
	43.9	24.2	8.9	15.8
W-7	52.3	23.4	6.8	13.2
	50.2	31.4	7.3	14.2
W-8	48.6	26.7	6.6	12.8
	41.2	25.4	7.1	13.4
W-9	38.6	23.4	7.3	14.6
	39.9	22.9	6.8	13.2
W-10	40.3	24.1	8.7	16.5
	45.6	26.8	8.0	14.8
W-11	47.2	27.4	7.4	14.9
	44.6	26.9	8.2	15.2
W-12	43.9	25.7	6.7	13.4
	46.2	27.4	8.9	16.4
W-13	45.1	26.3	8.0	14.4
	44.8	27.4	7.2	13.0
Minimum	**38.6**	**22.9**	**6.6**	**12.8**
Maximum	**52.7**	**31.4**	**10.7**	**20.3**
Average	**45.2**	**26.6**	**8.2**	**15.0**

Mineralogical Composition for PM_{10}

RPM10 is "defined as the component of inhaled respirable dust small enough to reach the pulmonary or alveolar region of the lung".

Classification of RPM10

Classification	Type of particles	Size of the particles
PM_{10}	Inhalable particles	≤ 10µm
$PM_{2.5}$	Fine particles	≤ 2.5µm

The mineralogical composition of RPM10 / PM_{10} have Calcite, Dolomite ($CaCO_3$ + $MgCO_3$), Vaterite, Aragonite Minerals (Calcite Minerals) or Actinolite or Tremolite (Magnesium minerals) and Free Silica.

Chemical characterization of RPM10

S. NO.	IONS	QUANTITY (µg/m3)	S. NO.	IONS	QUANTITY (µg/m3)
1.	Calcium (Ca)	13.1	9.	Nickel (Ni)	0.013
2.	Magnesium (Mg)	9.8	10.	Zinc (Zn)	1.1
3.	Iron (Fe)	4.2	11.	Copper (Cu)	0.65
4.	Aluminium (Al)	2.5	12.	Cobalt (Co)	0.34
5.	Sodium (Na)	2.2	13.	Lead (Pb)	0.24
6.	Potassium (K)	1.9	14.	Mercury (Hg)	BDL
7.	Manganese (Mn)	1.65	15.	Cadmium (Cd)	BDL
8.	Chromium (Cr)	0.33	16.	Silica (SiO2)	2.01 (%)

Findings:

a. Particulate Matter 10 (PM_{10}) : The maximum PM_{10} concentration at the five Stations A_1, A_2, A_3,, A_4, A_5, were 47.6, 45.2, 50.2, 50.4, 52.7, µg/m^3 respectively.

b. Particulate Matter $_{2.5}$ ($PM_{2.5}$): The 24 hourly max values of $PM_{2.5}$ for the all five stations A_1, A_2, A_3,, A_4, A_5, are 28.4, 26.8, 29.4, 28.0, 31.4, µg/m^3 below the prescribed limit of 100 µg/m^3 for rural / residential areas.

c. Sulphur-Di-Oxide (SO_2):. The max 24 hourly values for all five stations are 9.5,10.2, 11.1, 9.9, 10.7, µg/m^3 respectively below the prescribed limit of 60 µg/m^3 for rural / residential areas.

d. Oxides of Nitrogen: The 24 hourly max values of NO_X for the all five stations A_1, A_2, A_3,, A_4, A_5, were14.8, 18.2, 22.4, 17.7, 20.3, µg / m^3 respectively below the prescribed limit of 60 µg/m^3 for rural / residential areas.

TABLE 3.4
Summary of Ambient Air Quality Monitoring

Values in (µg/m^3)

A1				
	PM10	**PM2.5**	**SO2**	**NOx**
Max	47.6	28.4	9.5	14.8
Min	38.5	19.6	6.6	10.8
98th %tile	47.6	27.7	9.4	14.1

A2				
	PM10	**PM2.5**	**SO2**	**NOx**
Max	45.2	26.8	10.2	18.2
Min	36.8	18.3	6.6	10.9
98th %tile	45.2	26.5	10.0	17.3

A3				
	PM10	**PM2.5**	**SO2**	**NOx**
Max	50.2	29.4	11.1	22.4
Min	36.5	17.6	6.9	12.7
98th %tile	49.6	29.3	11.0	20.8

A4				
	PM10	**PM2.5**	**SO2**	**NOx**
Max	50.4	28.0	9.9	17.7
Min	36.3	19.5	6.8	10.2
98th %tile	50.2	27.9	9.7	16.7

A5				
	PM10	**PM2.5**	**SO2**	**NOx**
Max	52.7	31.4	10.7	20.3
Min	38.6	22.9	6.6	12.8
98th %tile	52.5	31.3	10.6	19.3

3.2 NOISE ENVIRONMENT

3.2.1 NOISE ENVIRONMENT : BASELINE STATUS

Introduction : The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human sto a complex sound made up of various frequencies at different loudness levels. The most common and universally accepted scale is the 'A'. Weighted scale which is measured as DB(A). This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of a human ear.

The study area of 10 km radius with reference to the proposed mine site has been covered for noise environment. The entire mine lease area is under reserve forest. The remaining study area also does not harbor any industries. Most of the study area is under forest cover. The four zones viz., Residential, Commercial, Industrial and Silence zones have been considered for noise monitoring. Noise monitoring has been undertaken at 4 locations for 24 hr at each location. The monitoring was carried out during 23rd and 24th March 2011. List of noise monitoring station is given at **Table 3.5** and shown in **Figure 3.2**.

Table 3.5
Location of Noise Monitoring Stations

Sr. No.	Location of sampling Station
N1	Village Zendepar
N2	Village Khuritola
N3	Village Bondena
N4	Village Botekasa

The main objective of noise pollution impact assessment in the study area is to assess the impact of the total noise generated by the existing domestic activities and vehicular traffic on the human settlements within 10 km radius.

Parameters Measured During Monitoring : A noise rating developed by E P A for specification of community noise from all the sources is the Day-Night Sound Level (L_{dn}). It is similar to a 24 hr equivalent sound level except that during the night time period , which extends from 9 p.m. to 6 a.m., a 10 dB(A) weighing penalty is added to the instantaneous sound level before computing 24 hr average.

Ambient Noise Monitoring Locations: The noise survey involved determination of noise levels in decibels at 4 locations in the study area. Noise levels are measured once for twenty four hours at the selected locations. Noise levels were recorded for 10 minutes in every clock hour for a continuous 24 hour period.

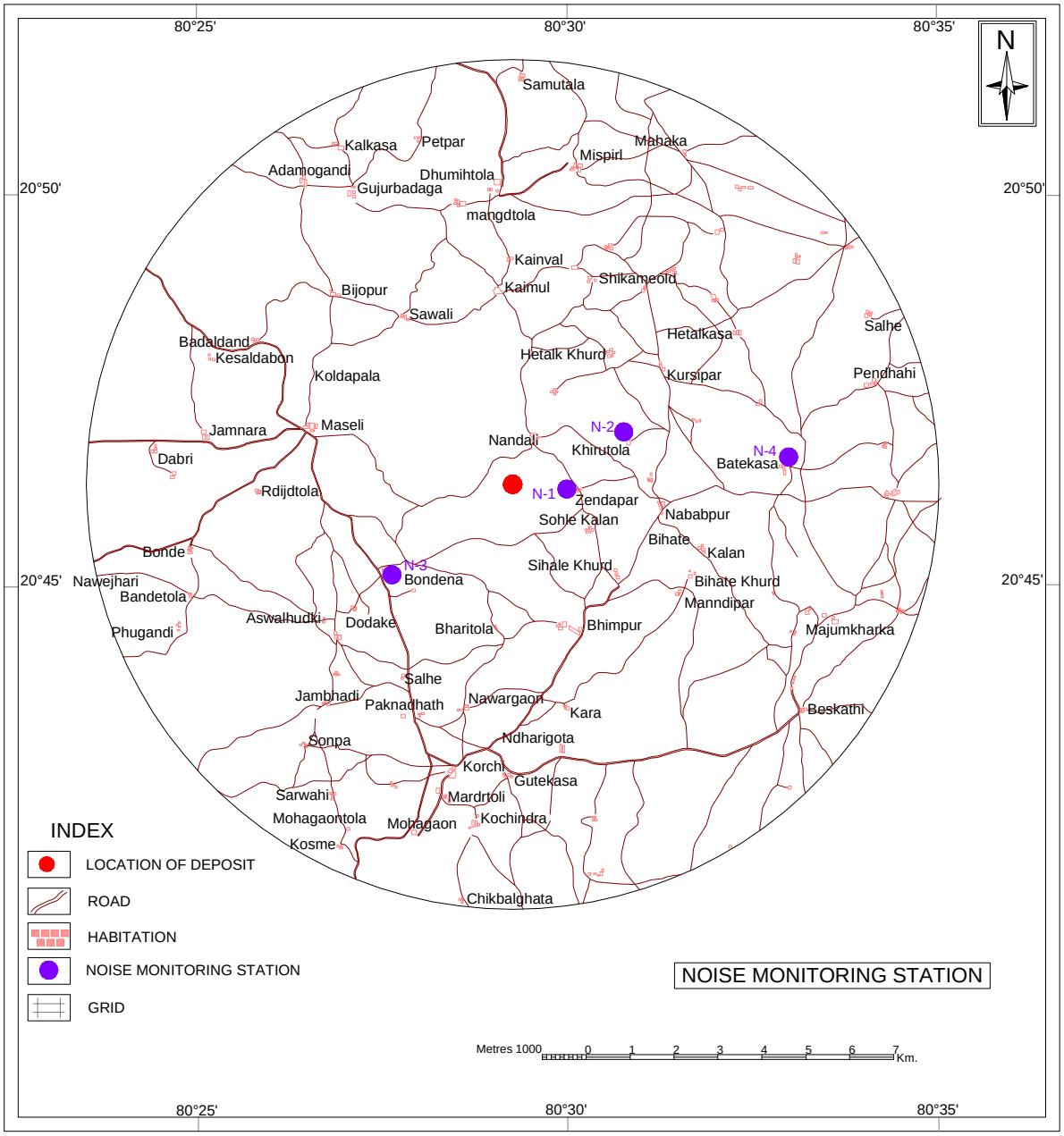


Figure 3.2 : Map showing location of Noise level monitoring

Presentation of Results : The ambient noise levels measured are presented in **Table-3.6**. The table indicates equivalent noise levels viz L_{10}, L_{50}, L_{90}, L_{eq}, L_{day}, L_{night}, and L_{dn} at different places located within in the study area.

Table-3.6
Ambient noise levels

Time (Hrs)		N - 1	N – 2	N – 3	N – 4
Day Time	6	38.6	39.9	39.3	39.2
	7	40.7	40.3	42.3	42.2
	8	41.5	40.6	43.4	43.3
	9	42.2	43.6	46.0	44.2
	10	44.2	45.1	44.2	45.6
	11	43.6	40.8	44.4	44.3
	12	44.0	41.5	41.9	41.8
	13	42.9	38.2	44.0	43.9
	14	41.7	42.3	41.7	41.6
	15	42.6	41.2	42.6	42.5
	16	40.9	40.4	43.7	43.6
	17	44.0	42.8	44.7	44.6
	18	41.6	43.6	44.0	43.9
	19	42.4	41.9	41.9	41.8
	20	41.2	39.6	42.6	42.5
	21	43.3	41.1	44.7	44.6
	22	40.7	41.7	43.6	43.5
Night Time	23	41.3	40.3	45.3	45.2
	24	38.7	39.5	42.7	42.6
	1	39.3	39.9	40.6	40.5
	2	39.7	38.8	40.2	40.1
	3	37.8	39.2	39.3	38.2
	4	39.2	38.9	39.5	39.4
	5	38.4	39.2	39.7	39.6
Range		**37.8-44**	**37.8 - 45.1**	**39.3 - 46.0**	**38.2-45.6**

Ambient Noise Level Standards : Ambient Air quality standards in respect of noise have been notified by the Ministry of Environment & Forests vide Gazette Notification Dated 26th December 1989. It is based on the A weighted equivalent noise level (Leq). The standards are given in **Table-3.7.**

Table-3.7
Ambient noise level standards

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

3.3 WATER ENVIRONMENT

3.3.1 WATER ENVIRONMENT : BASELINE STATUS

3.3.1(a) **Water Quality** : Selected water quality parameters of ground and surface water resources within 10-km radius of the study area have been studied for assessing the water environment. Reconnaissance survey was undertaken and monitoring locations were finalized based on:

- Drainage pattern;
- Location of residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions.

Water sources covering 10-km radial distance from proposed mine boundary were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on water. The samples were collected and analyzed as per the procedures specified in 'Standard Methods for the Examination of Water and wastewater' published by American Public Health Association (APHA).

Water Sampling Locations : Water samples were collected from ***four*** sampling locations. These samples were analyzed for various parameters to compare with the standards for drinking water as per IS: 10500 for ground water sources and The details of water sampling locations are given in **Table-3.8** and **Figure-3.3.** The samples were collected in the month of March 2011.

TABLE-3.9
DETAILS OF WATER SAMPLING LOCATIONS

Station Code	Location	Source
GW_1	Village Zendpar	Dug Well
GW_2	Bharitola Village	Hand pump
GW_3	Jamnara Village	Hand pump
GW_4	Village Mundipar	Hand pump

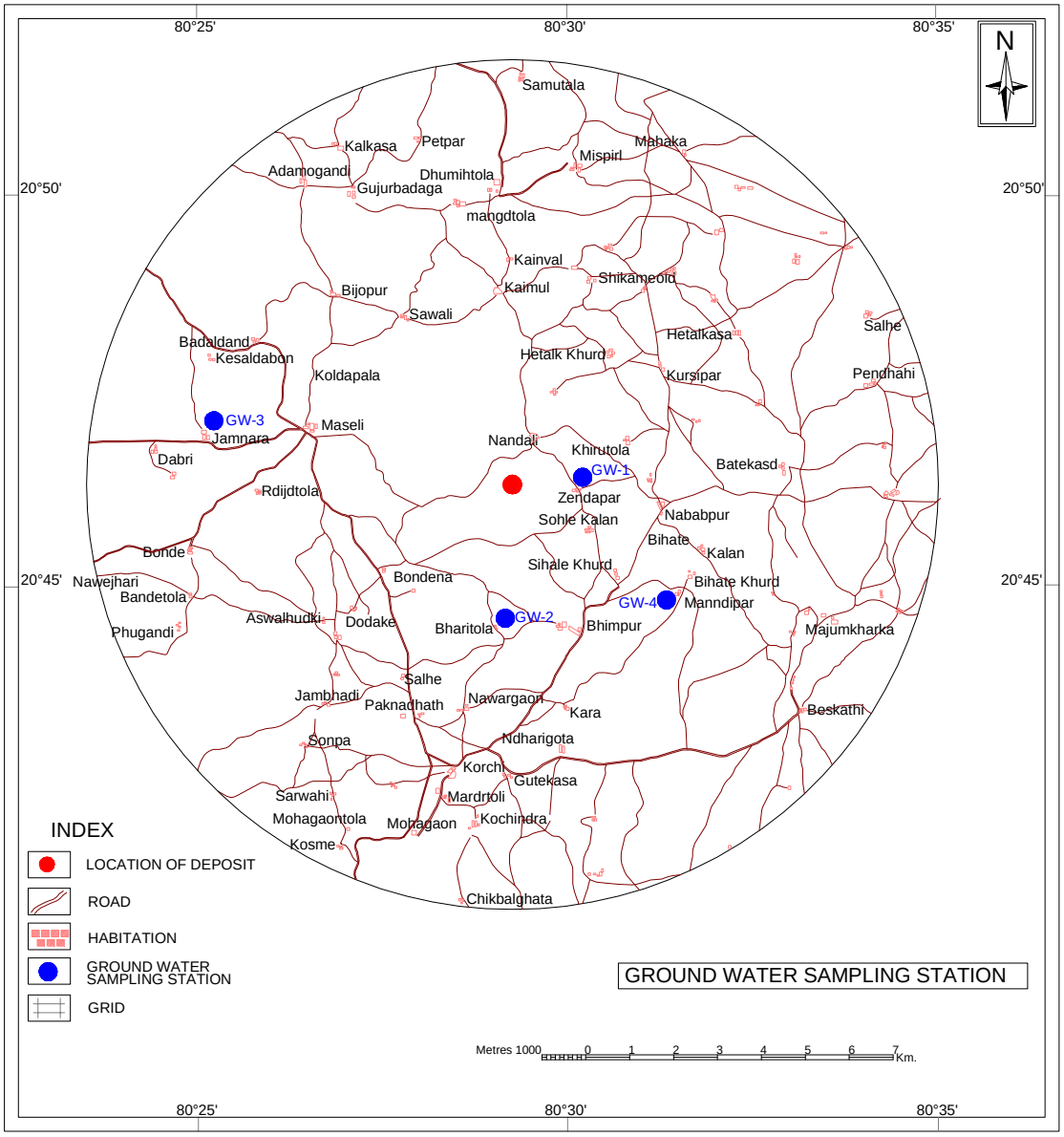


Figure 3.3 : Map showing location of water monitoring station

Presentation of Results

The results of the parameters analyzed for the 5 ground water and 4 surface water samples are presented in **Table-3.9** and are compared with the standards for drinking water as per IS: 10500-2001 "Specifications for Drinking Water" and standard for inland water as per IS: 2296 for surface water sources.

- ***Ground Water :*** As seen from the **Table-3.9** pH values are observed to be in the range of 7.35 to 8.65 and are slightly exceeding the prescribed limits (IS : 10500). Total dissolved solids, which impart palatability to drinking water, are in the range of 440-1400 mg/l. At three sampling locations, these values are more than the standards prescribed for drinking, but all the concentrations are

observed to be below extended limits. This may be due to the presence of dissolved salts in the ground water and the local geological formations. This is equally evident and reflects higher hardness levels, in the range of 160-730 mg/l.

Inorganic Constituents : Concentrations of inorganic constituents are presented in Table-3.12. Chlorides are observed to be in the range of 42.55-333.00 mg/l. The values are within the permissible limits except at two location. The sulphates are observed to be within the permissible limits (2-106 mg/l). Fluorides are in the range of 0.90-1.20 mg/l.

Heavy Metals : It is observed that metals like Hg, CN, B, Pb, Se, As, Cr+6 and Al were either nil or within the permissible limits. Other metals like Copper, Manganese and Zinc are observed to be within the permissible limits. Total iron content in the samples is observed to be in the range of 0.05 to 1.6.

TABLE-3.10
GROUND WATER QUALITY

Sr. No.	Parameter	Unit	GW-1	GW-2	GW-3	GW-4	Standard as per IS:10500
1.	Temperature	ºC	29	29	29	29	--
2.	Taste and Odour	--	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3.	Turbidity	NTU	4.50	4.00	4.00	4.10	5 (10)
4.	Color	Hazen	4.10	4.10	4.30	4.20	5 (25)
5.	Parmanganate Number O_2 absorbed in 4 hrs)	--	1.1	1.1	1.3	1.0	-0-
6.	Dissolved Oxygen	mg/l	4.8	4.7	4.7	4.6	--
7.	Free Carbon Dioxide as CO_2	mg/l	1.2	1.2	1.1	1.1	--
8.	BOD_5 at 20ºC	mg/l	Nil	Nil	Nil	Nil	--
9.	pH at 25ºC	--	7.40	7.60	7.35	7.45	6.5-8.5 (No relaxation)
10.	Total Dissolved Solids	mg/l	1220	465	1346	608	500 (2000)
11.	Total Suspended Solids	mg/l	04	06	03	06	--
12.	Total Hardness as $CaCO_3$	mg/l	400	160	696	384	300 (600)
13.	Total Cations	mg/l	1065	388	1070	507	--
14.	Total Anions	mg/l	1067	389	1078	510	--
15.	Electrical Conductivity	mho/cm	2140	780	2160	1030	--
16.	Free Chlorine	mg/l	Nil	Nil	Nil	Nil	0.2 (-)
17.	Chlorides as Cl	mg/l	219.14	106.58	255.51	42.55	25 (1000)
18.	Sulphates as SO_4	mg/l	105.7	25.0	81.7	41.1	200 (400)
19.	Sulphides as S	mg/l	Nil	Nil	Nil	Nil	--
20.	Carbonates as $CaCO_3$	mg/l	Nil	Nil	Nil	Nil	--
21.	Bicarbonates as $CaCO_3$	mg/l	400	200	500	400	--
22.	Hydroxides as $CaCO_3$	mg/l	Nil	Nil	Nil	Nil	--
23.	Fluorides as F	mg/l	1.20	1.05	1.10	0.95	1.0 (1.50)
24.	Nitrates as NO_3	mg/l	132.5	16.1	164.6	3.71	45 (100)
25.	Phosphates as PO_4	mg/l	0.026	0.019	0.032	0.011	--
26.	Calcium as Ca	mg/l	128.5	22.1	131.7	85.1	75 (200)
27.	Magnesium as Mg	mg/l	19.51	19.50	89.7	41.9	--
28.	Sodium as Na	mg/l	204.1	103.6	170.5	55.7	--
29.	Potassium as K	mg/l	3.9	2.34	3.1	1.56	--
30.	Total Iron as Fe	mg/l	1.60	0.19	0.27	0.05	0.30 (1.0)

Sr. No.	Parameter	Unit	GW-1	GW-2	GW-3	GW-4	Standard as per IS:10500
31.	Manganese as Mn	mg/l	0.028	0.026	0.026	0.022	0.10 (0.3)
32.	Copper as Cu	mg/l	0.031	0.028	0.30	0.024	0.05 (1.5)
33.	Zinc as Zn	mg/l	0.29	0.32	0.25	0.28	5(15)
34.	Aluminium as Al	mg/l	0.002	0.002	0.002	< 0.001	0.03 (0.2)
35.	Arsenic as As	mg/l	<0.001	<0.001	<0.001	<0.001	0.05 (No relaxation)
36.	Cadmium as Cd	mg/l	0.013	0.010	0.011	0.011	0.01 (No relaxation)
37.	Total Chromium as Cr	mg/l	0.024	0.019	0.019	0.022	--
38.	Hexavalent Chromium as Cr	mg/l	Nil	Nil	Nil	Nil	0.05 (No relaxation)
39.	Cyanide as CN	mg/l	Nil	Nil	Nil	Nil	0.05 (No relaxation)
40.	Boron as B	mg/l	Nil	Nil	Nil	Nil	1.0 (5.0)
41.	Lead as Pb	mg/l	0.036	0.032	0.034	0.031	0.05 (No relaxation)
42.	Selenium as Se	mg/l	<0.005	<0.005	<0.005	<0.005	0.01 (No relaxation)
43.	Nickel as Ni	mg/l	BDL	BDL	BDL	BDL	--
44.	Total Silica as Si	mg/l	05	13	11	11	--
45.	Colloidal Silica as SiO_2	mg/l	Nil	Nil	Nil	Nil	--
46.	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	0.001 (No relaxation)
47.	Phenolic Compounds as C_2H_2 OH	mg/l	Nil	Nil	Nil	Nil	0.001 (0.002)
48.	Anionic Detergents	mg/l	Nil	Nil	Nil	Nil	0.2 (1.0)
49.	Pesticides						--
(A)	DDT Residue	mg/l	Nil	Nil	Nil	Nil	Absent (0.001)
(B)	BHC Residue	mg/l	Nil	Nil	Nil	Nil	
(C)	Parathion Residue	mg/l	Nil	Nil	Nil	Nil	
50.	Total Coliform Organisms	MPN/100ml	03	02	02	02	--
51.	Total Oil and Grease	mg/l	Nil	Nil	Nil	Nil	--

3.3.2 Hydrology and Hydrogeology:

The following hydrogeologcial regime has been projected from the limited available data and may represent the existing hydrogeologcial setup of Zendepar Iron Ore Mine as core zone and its buffer zone area. Since core zone is located on high hill of non-discharge zone and having zero mine water discharge. Mining operation is above water table hence statutory requirement of assessing hydrogeology of core zone is not essential however, the hydrogeological region assessment of buffer zone is described in this report.

Mine Drainage : As stated above, the mine working are expected to be above water table during proposed mining plan period. Since water table is not likely to be encountered consequently there will be no proposal for pumping arrangement for discharged of mine water. Thus the mine will be zero discharge from core zone with respect to ground water.

Surface Water : The core area is covered by a hillock and received 1500 mm rainfall. The core zone is located on the slope and three small drainages originates as seasonal water courses. The drainage of the area is controlled by Satti Village which ultimately joins the River Wainganga The map showing drainage around 2.5 km radius of the mining lease area is enclose as **Figure 3.4(A**) and drainage map of the study area is enclosed as **Figure 3.4(B)**

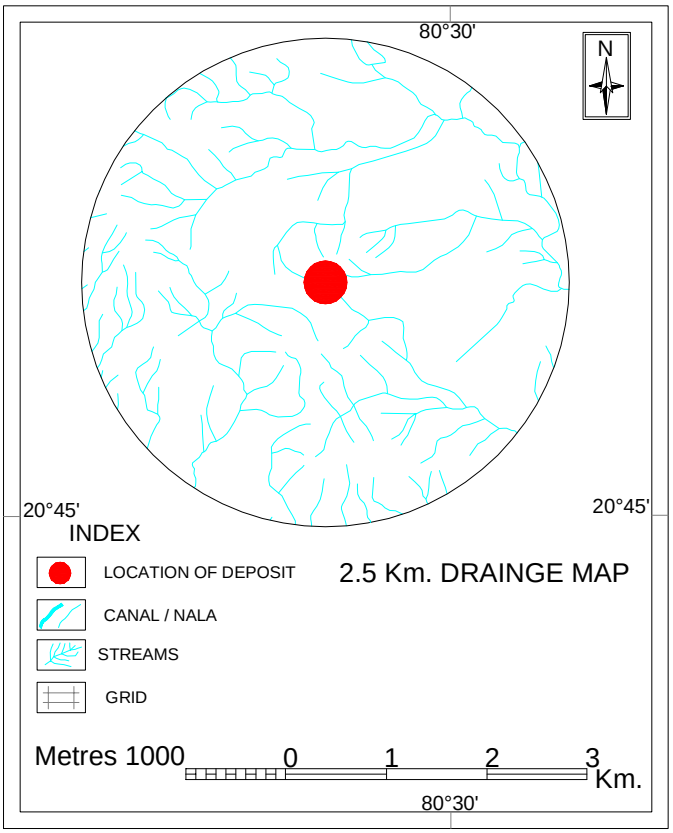


Figure 3.4 (A) : **Drainage map showing around 2.5 km radius of the mining lease area**

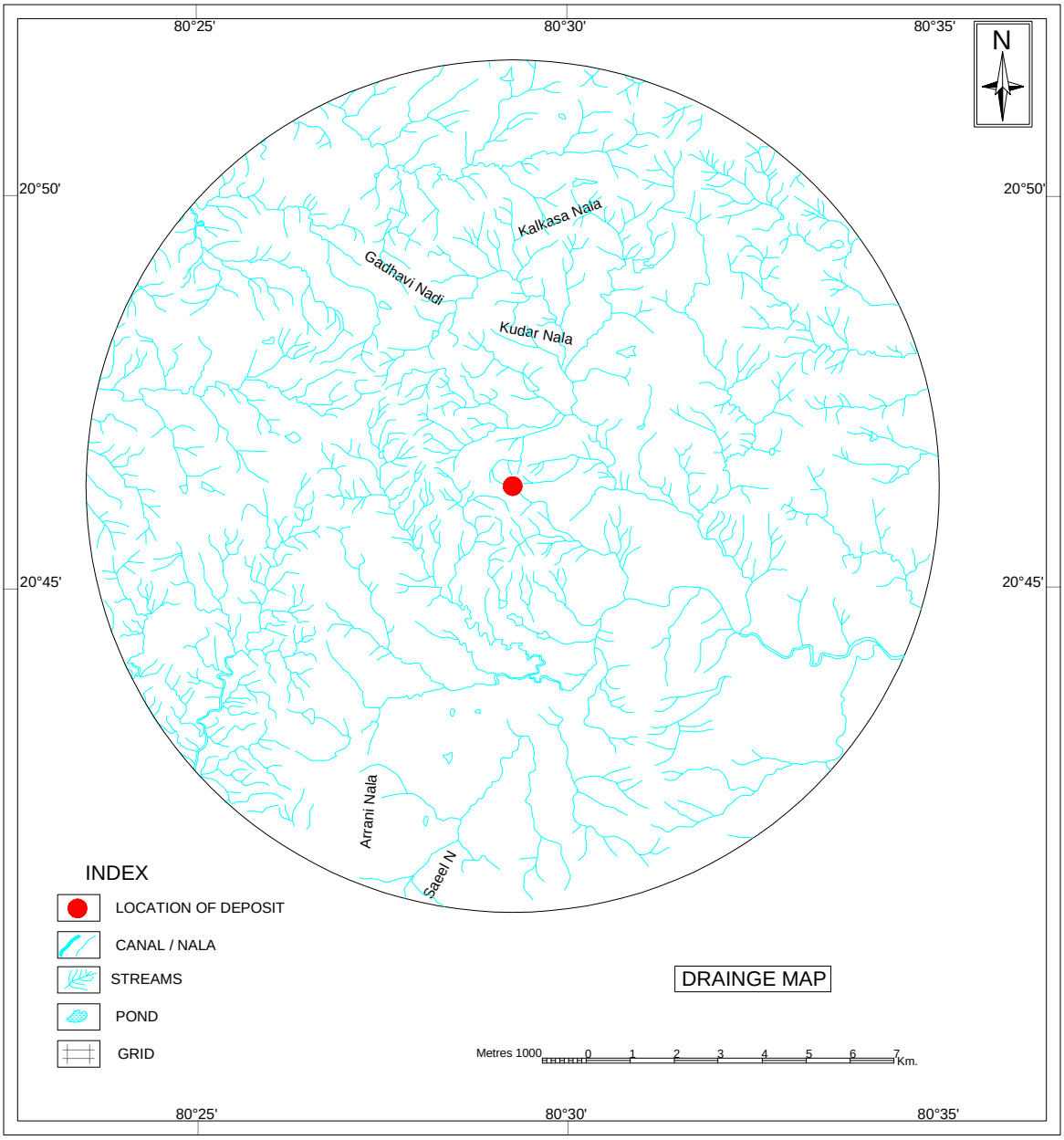


Figure 3.4(B) Drainage map of the study area

The area forms a part of the region covered predominantly by the granite gneisses with its variants, basic rocks and some metasediments comprising with various types quartzite including banded hematite quartzite and schist with inter-stratified amphibolite layers, all belonging to Archean-Precambrian Age. The metasediments appear to have been folded into a series of closer parallel anticlines and synclines with generally low plunge. The ground water occurs under phreatic, semi-confined and confined conditions in the intergranular pore spaces in shallow weathered rocks and in the fractured system at deeper levels respectively. Exploratory drilling by CGWB indicates that deeper aquifer systems exit down to a depth of 110 mbgl. The discharge of the borewells varies from 2 to

16 lps. The depth of water level varies from 4.73 to 10.09 mbgl during pre-monsoon period and from 2.13 to 7.27 mbgl during post-monsoon period in the shallow aquifers. The long term (decadal) trend analysis of water level indicates that none of the wells in pre monsoon and 21% of wells in post monsoon period show a significant (20cm/yr) falling trend.

Groundwater: The buffer zone area is endowed with rich water reserves with an annual rainfall of 1100 mm. Hydrological and physiographical situation of area do not permit large scale Surface and groundwater storage on the surface and in the aquifers. Due to deep hydraulic gradient the dynamic ground water reserves also get depleted quickly during summer months.

Aquifers : The main geological formations found in this area are the older metamorphics i.e. granite gneisses & Dharwars i.e. granite gneisses & Dharwars i.e. Banded Hematite Quartzite. The proposed area comprises a hillock with Lateritic capping with Banded Hematite Quartzite body exposed at places. The major part of the area on the surface is covered with Laterite, Lateritic soil and Limonite. These rocks are devoid of any primary porosity from hydrogeological point of view but consists of secondary porosity developed subsequently by the tectonic and structural disturbances and also due to weathering and erosional process. The various hydrogeological units developed in the study area are in following **Table-3.11.**

TABLE -3.11
AQUIFER CHARACTERISTICS

Sr. No	Type of aquifer	Depth Range (m)	Core Zone	Buffer Zone
1.	Unconfined	0-30	No yield	Banded Iron ore formations, gray & red shale and phyllites,chlorite schist
2.	Semi-confined/ confined	Beyond 30-upto depth of mine	No yield	Fractured/Jointed/lineaments/ fault zone in / Meta sediments

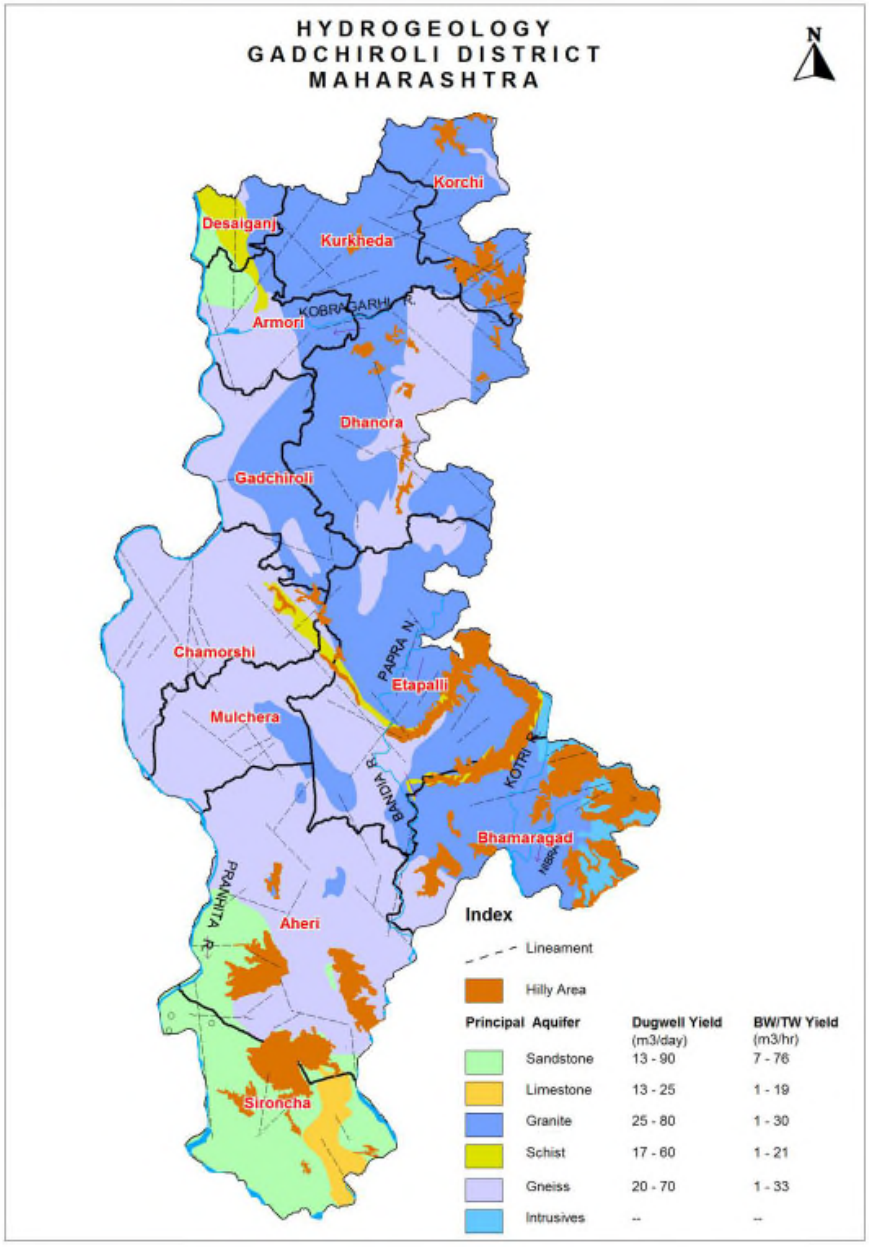
General Aquifer parameter : In nearby area, the aquifer parameters evaluated by CGWB in particular hydrogeologcial condition for resources evaluation in their report have been considered and attributed for the study area. The projected hydraulic parameter of aquifer in hard rock formations metasediments are as follows.

TABLE -3.12
AQUIFER PARAMETERS

i.	Transmisivity (m^2/d)	27.7 to 346m^2/d (Avg. 40.97 m^2/d)
ii.	Hydraulic Conductivity	0.12 to 4.76 m/day
iii.	Specific Yield/ Storage Coefficient	0.035
iv	Specific Capacity (Dugwell)	28-76 m^3/d/m

Ground Water Levels : Hydrogeological observation wells 42 in the study area have been established and placed in **Table-3.13.** The mine working is proposed above the

water table of the area. The formation in the mine is unsaturated. Hence, depth to water level in unconfined aquifers of core zone area is much below mine depth. In buffer zone, depth-to-water level in unconfined aquifer in general varies from 6.5 m to 11.95 m below ground level in pre monsoon season while it is from 1.2 m to 4.5 m bgl in post monsoon period. Water level fluctuation in general is from 3.88to 7.75 m between two extreme seasons. Deep water level and large zone of fluctuation are observed in the areas covered by fractured/jointed metamorphic, a representation of mostly recharge area. The water table configuration is mostly similar to that of topography but with reduced relief. The Korchi Taluka is categorized as Safe with 19.84 % of ground water development.



Source : Central Ground Water Board, CGWB Nagpur

TABLE 3.13
WELL INVENTORY DATA OF 10 KM RADIUS BUFFER ZONE

Sr. No.	Name of Village	Field Code	Type of Well	Dia (m)	Ht. Of Parapet (m)	Depth (m)	Depth of Lining (m)	Nature of Lining (Masonry)	SWL (m) Monsoon	SWL (m) Pre-Monsoon	GW Fluctua-tion	Use of Water	Quality of Water
1	Bondena	W-1	DW	2.65	0.67	13.78	13.33	Bricks	2.53	9.95	7.42	Domestic	Fair
2	Bharitola	W-2	DW	3.15	0.78	8.50	8.00	Bricks	2.20	7.60	5.40	Domestic	Good
5	Jamnara	W-3	DW	2.60	0.60	11.45	10.65	Bricks	2.50	7.90	5.40	Drinking	Good
6	Mundipar	W-4	DW	2.50	0.97	12.18	11.03	Bricks	3.20	11.95	8.75	Drinking	Good
7	Korchi	W-5	DW	3.50	0.55	9.54	5.70	Bricks	1.95	8.55	6.60	Domestic	Poor
8	Gutekasa	W-6	DW	3.45	0.85	11.10	10.15	Bricks	2.95	9.50	6.55	Domestic	Fair
9	Hetalkasa	W-7	DW	2.40	0.38	9.95	8.12	Bricks	2.15	8.85	6.70	Domestic	Fair
10	Zendepar	W-8	DW	2.80	0.95	8.60	8.05	Bricks	2.62	6.50	3.88	Domestic	Fair

3. 4 SOIL ENVIRONMENT

Soil Characteristics : Most of the study area is under forest cover. In the remaining area, agriculture is the main occupation of people in the study area. Hence, it is essential to assess the potential of the soil of the study area for agriculture. Soil analysis has been carried out to assess the agricultural and afforestation potential of the soil.

Soil Sampling : Soil samples were collected at selected locations in the study area to assess the existing soil conditions in and around the proposed plant site. The environmental setting around the sampling locations is given in **Table-3.17**. The sampling locations are shown in **Figure-3.6.** Soil characteristics (for both seasons) are tabulated in **Table-3.18** and compared with standard classification given in **Table-3.19**.

TABLE-3.17
Details of Soil Sampling Locations

Station Code	Sampling Location
(S1)	Agricultural land near Zendepar Village
(S2)	Barren land near Zendepar Village

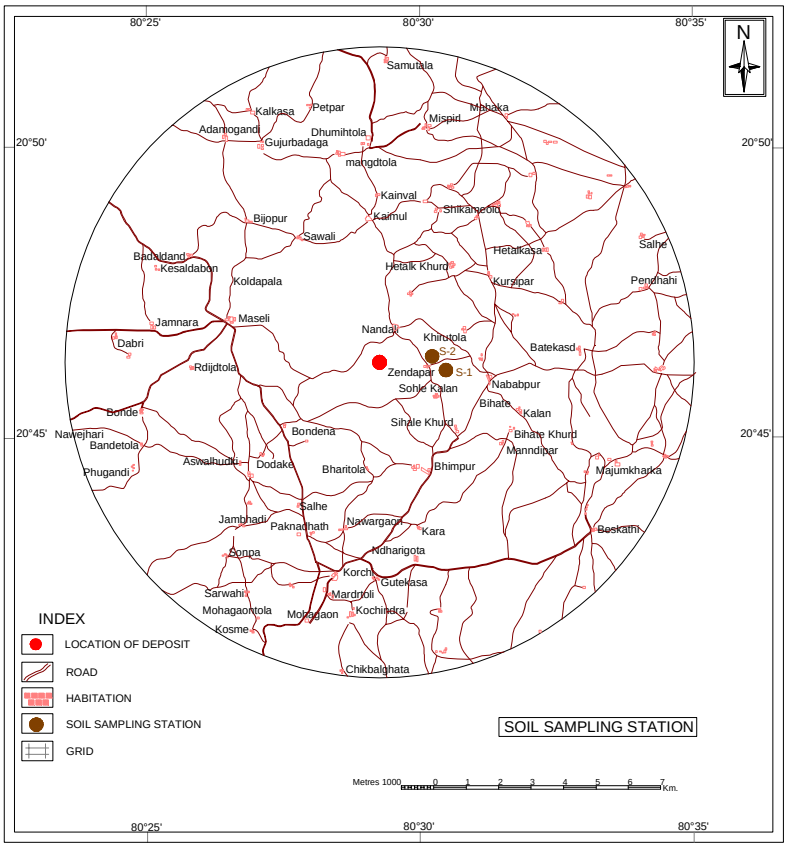


Figure 3.5 : Map showing Soil monitoring station

TABLE-3.18
Soil Analysis Results

Sr. No.	Parameters	Unit	(S1)	(S2)
1.	Color	--	Slightly Black	Reddish Brown
2.	Soil Texture	--	Sandy Loam	Silty Sand
3.	Grain Size Distribution	D_{10}	0.59-0.65	0.90-0.93
		D_{30}	1.40	1.39-1.58
		D_{60}	1.90-1&91	2.85-2.92
4.	Porosity	%	29.71-30.6	31.4-32.28
5.	Bulk Density	gm/cc	1.83-1.95	1.10-1.24
6.	Wilting Co-efficient	--	13.68-14.00	1.60-10.85
7.	Cation Exchange Capacity (CEC)	Meq/100 gm	8.95-9.60	8.53-8.60
8.	Sodium Adsorption Ratio (SAR)	--	2.40-2.70	2.18-2.40
9.	Water Retention Capacity	%	31.28-34.70	27.85-29.40
10.	Available Organic Matter	%	1.39-1.42	0.57-0.60
11.	pH (1:5)	--	7.90-8.14	7.94-8.20
12.	Electrical Conductivity	Umho/cm	695-720	398-410
13.	Infiltration Rate	cm/hr	2.28-2.40	6.40-6.61
14.	Calcium as Ca	mg/100 gm	235-241	161-165
15.	Magnesium as Mg	mg/100 gm	41.6-42.1	30.9-34.6
16.	Sodium as Na	mg/100 gm	20.9-21	14.6-14.9
17.	Potassium as K	kg/ha	459-490	200-206
18.	Nitrogen as N	kg/ha	731-740.0	370.0

TABLE-3.19
STANDARD SOIL CLASSIFICATION

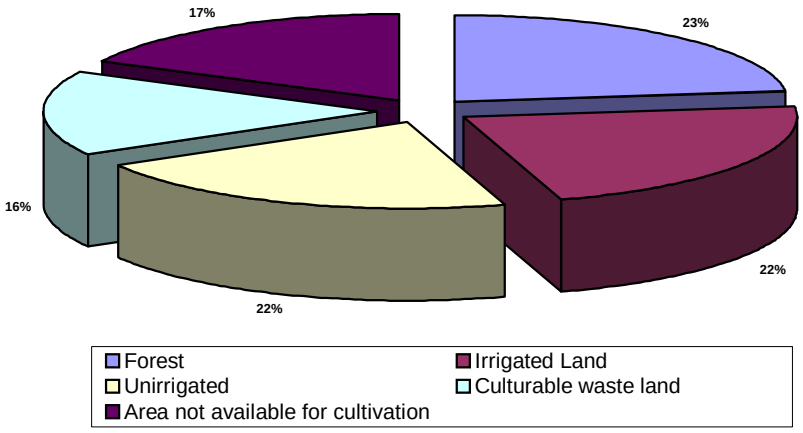
Sr. No.	Soil Tests	Classification	
1.	pH	< 4.50 extremely acidic 4.50-5.00 very strongly acidic 5.00-5.50 strongly acidic 5.50-6.00 moderately acidic 6.00-6.50 slightly acidic	6.50-7.30 neutral 7.30-7.80 slightly alkaline 7.60-8.50 moderately alkaline 8.50-9.00 strongly akaline 9.00 very strongly alkaline (* tolerable to crops)
2.	Salinity Electrical Conductivity (mmhos/cm) (1mmho/cm = 640 ppm)	Upto 1.00 average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops sensitive to salts	
3.	Organic Carbon	Upto 0.3 : very less 0.21-0.4 : less 0.41-0.5 : medium	0.61-0.8 : On an average sufficient 0.81-1.0 : Sufficient >1.0 : more than sufficient
4.	Nitrogen (kg/ha)	Upto 50 very less 51-100 less 101-150 good	151-300 better Above 300 sufficient
5.	Phosphorous (kg/ha)	Upto 15 very less 16-30 less 31-50 medium	51-65 on an average sufficient 65-80 sufficient Above 80 more than sufficient
6.	Potash (kg/ha)	0 very less 120-180 less 181-240 medium	241-300 average 301-360 better Above 360 more than sufficient

3.5 LANDUSE :

The entire study area is covered under one tehsil of Gadchiroli district in Maharashtra state namely, Korchi. Totally 19 villages are covered under the study area with the proposed mine site as the center. In this study, the geographical area of all the 28 settlements covered under 10 km radius circle is taken into consideration though a couple of villages are covered partially in the study area. The landuse is classified into four types – viz. forest, area under cultivation, culturable waste and the area not available for cultivation. The land under cultivation is further divided into two types – irrigated and unirrigated. The landuse pattern of the study area is shown in Fig-3.1.

Forest : Most of the study area is under forest cover. The forest cover is under forest department and also under revenue department. The forest area under the study area is dense.

FIGURE 3.1
LANDUSE PATTERN OF THE BUFFER ZONE



Land under cultivation: This includes all agricultural land consisting of the net sown area including the current fallow lands. Most of the tribal population are dependent on tiny agricultural fields in the immediate vicinity of their settlements. Most of the agriculture is practiced on rain water.

Culturable Waste : This category of land includes the land which was cultivated sometime back and left vacant during the past 5 years in succession. Such lands may either be fallows or covered with shrubs which are not put to any use. Land under thatching grasses, bamboo bushes, other grooves useful for fuel, etc., which cannot be considered under forests are included in this category. All grazing lands and village common lands are also included in this category.

3.5.5 Seismicity of the Area

Mine site is located in Seismic Zone map of India updated by Bureau of Indian Standards (BIS) in 2002. The mine site as well as study area lies in Zone-II of Seismic Zoning Map, and thus can be said to be located in an area of low seismic hazard by national standards. Hence the risk of earthquake at the site is minimal and so the site is safe.

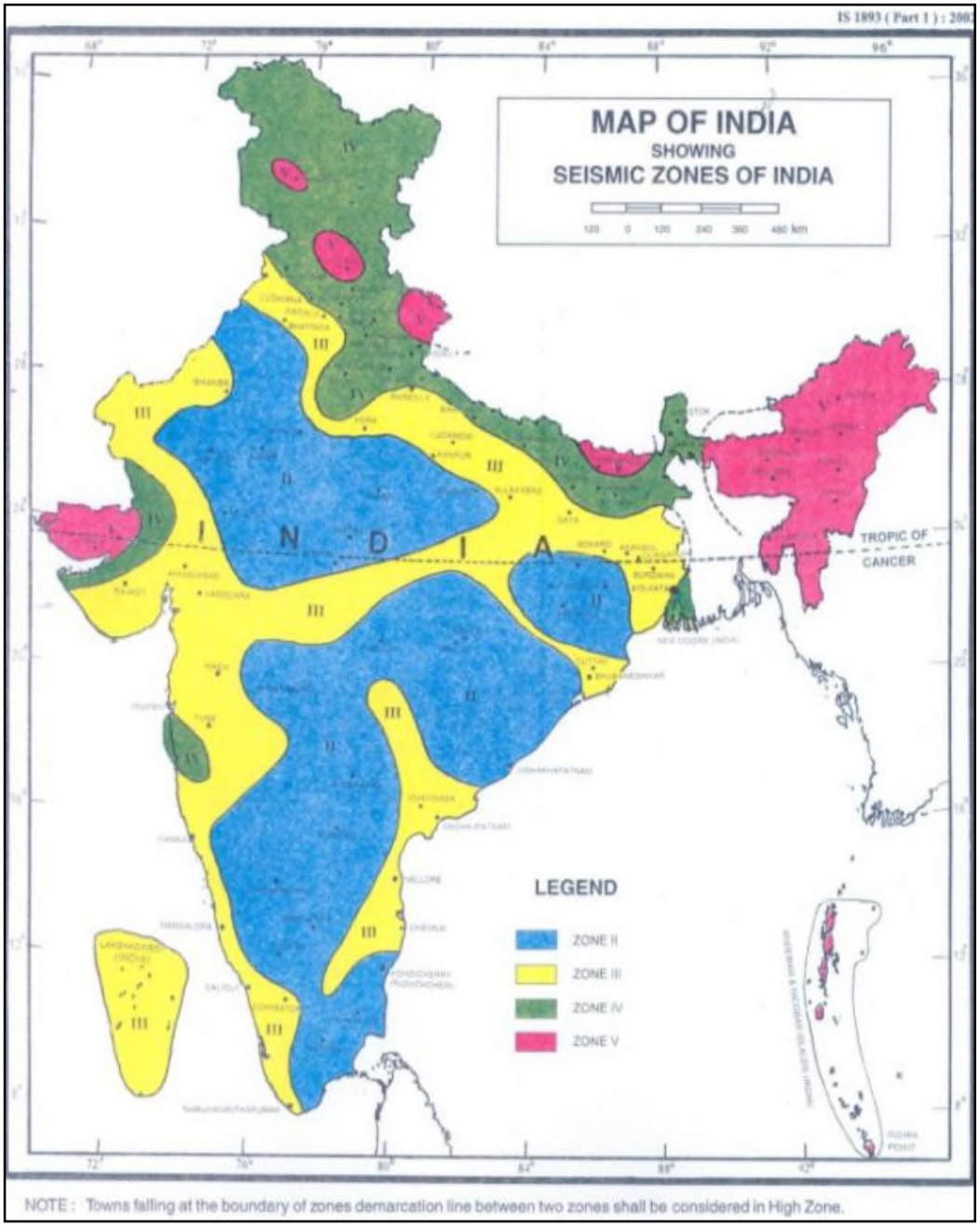


Figure 3.7: Seismic Zone Map

3.5.6 Flood Hazard Zonation of the Area

As per the "Vulnerability Atlas – 2nd Edition; Peer Group, MoH & UPA; based on digitized data of SOI, GOI; Flood Atlas, Task Force Report, C.W.C., GOI" the project site does not fall under "area liable to flood".

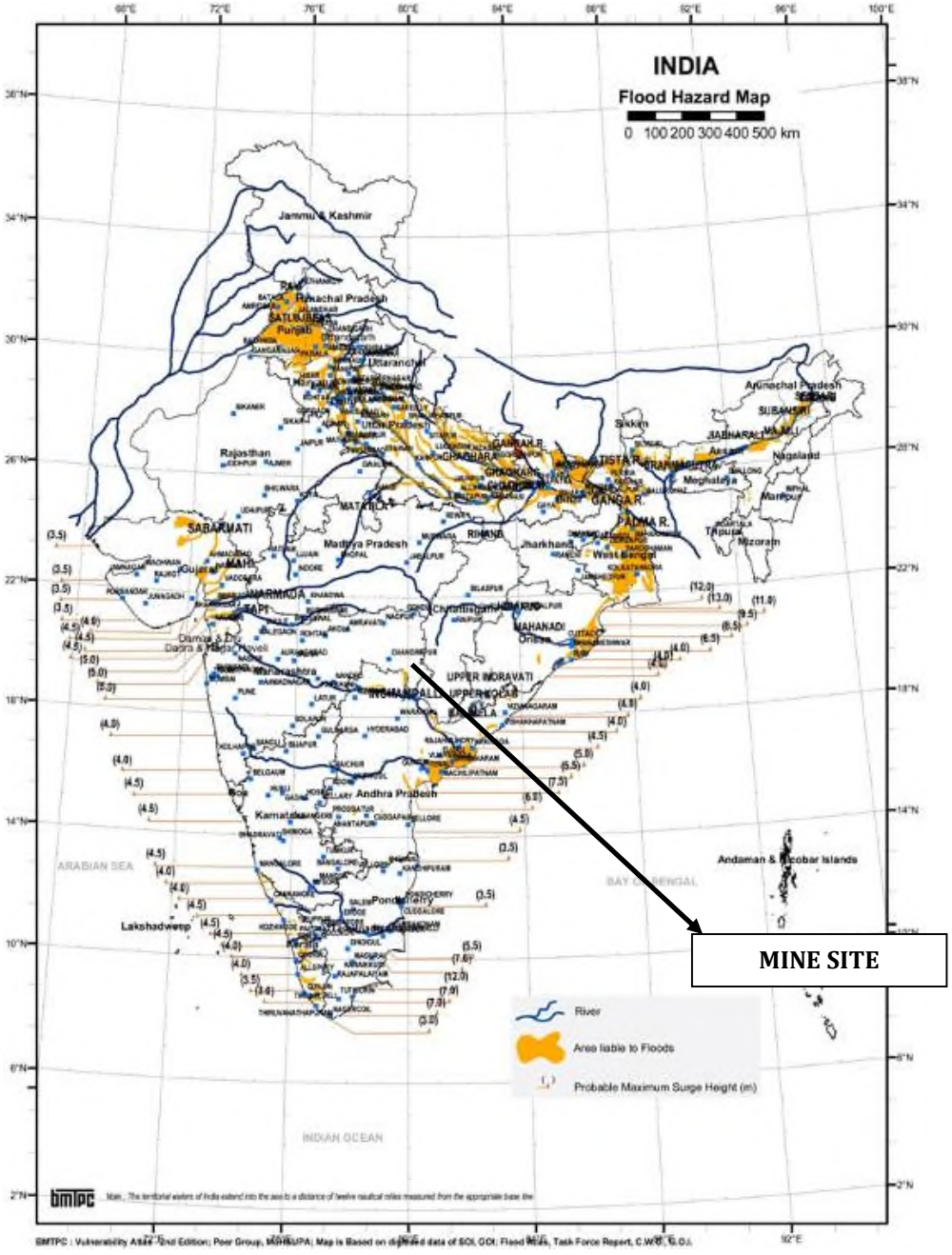


Figure 3.8: Flood Hazard Zonation Map

3.6 BIOLOGICAL ENVIRONMENT

3.6.1 BIOLOGICAL ENVIRONMENT: BASELINE STATUS

TERRESTRIAL FLORA : The primary survey conducted in the study area on flora and fauna has revealed following;

- The total applied area is featured in the mostly covered with miscellaneous types of trees. However, trees like Terminalia tomentosa(Saja), Anegisus latifolia etc., are also some of the prominent species observed in the area with moderate density. The structural valley is represented mostly by dry nalas.
- The forests in the surrounding of mining areas are mainly mixed forests with sal as predominant species. The southern and southwestern portion is highly undulating having a series of hillocks. Many small streams and rivulets originate from this area. The eastern and southern portion is having fragmented patches of forest with many habitation areas.
- The list of the flora and Fauna and details of the primary biological survey of Flora and Fauna carried out in the core zone and the buffer zone is given as **Annexure 3.1**.

Rural Vegetation : The villages were seen spread over in all directions. The cultivation of the principal agriculture crop, paddy is confined to monsoon season, in the region. The main irrigation source at present appears to be rivers which, practically go dry during summer. The other agricultural crops include jowar, ulad and mung. The vegetable crops - brinjal, tomato and chillies are also often cultivated. Mangifera indica, Tamarindus indica, Cocos nucifera, Musa paradisiaca and Carica papaya are the fruit crops cultivated by villagers. Caryota urens, Azadirachta indica, Aegle marmelos and Melia azadirachta are the other cultivars around villages

Agriculture & Cropping Pattern: The main agriculture crops in the district along with the cropping period and market area is given as follows;

Type of Crops	Name of Crops	Cropping Period
Major Crops (Irrigated) **KHARIF** **RABBI**	 Paddy Wheat Gram	 June to Nove. Sept. to Febr. Sept. to Janu.
Major Crops (Non-Irrigated) **KHARIF** **RABBI**	 Tur Mung Pulses Soyabean Sesamum Cotton Wheat Gram	 June to Nove. June to Janu. June to Octo. June to Octo. June to Octo. June to Janu. Sept. to Febr. Sept. to Janu.

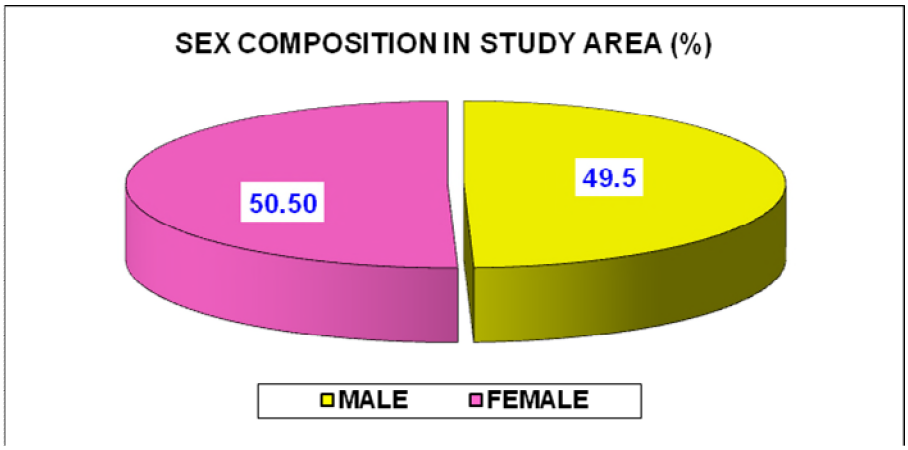
Major Cash Crops KHARIF & RABBI	Soyabean Cotton Groundnut Sesamum	June to Octo. June to Janu. June to Octo. Sept. to Nove.

3.7. SOCIO-ECONOMIC ENVIRONMENT – BASELINE DATA

Growth and the development of any region often depends on introducing in a planned way urban and industrial activities. But the interior rural regions like the Zendepar area, where people subsist on agricultural and allied economy. Industrial activities have not always opened up new avenues of livelihood pattern for the people living in the area. The proponent, who propose to operates the Zendepar Iron Ore Mine will be initiated a change in this region.

Human Settlement and Demography : There are 19 inhabited villages in the 10 km radius buffer zone spread over Tahsil Korchi, district Gadchiroli. 15 villages having population less than 500, 2 villages between 501 & 1000, while only 2 villages having population more than 1000. Village Jamnara is smallest village having population of 22. The village Korchi is the biggest village with population of 3256. The average size of the village in the study area works out to be 468. The average size of the family works out to be 4.5 study area.

Community Profile: The population is distributed among 1932 households in the study area. The 19 inhabited villages have a population of 8,907 comprising of 4409 (49.50%) males and 4498 (50.50%) females. As may be observed from the graph below the composition of the society as far as males and their counterparts female is concerned indicates very healthy distribution.



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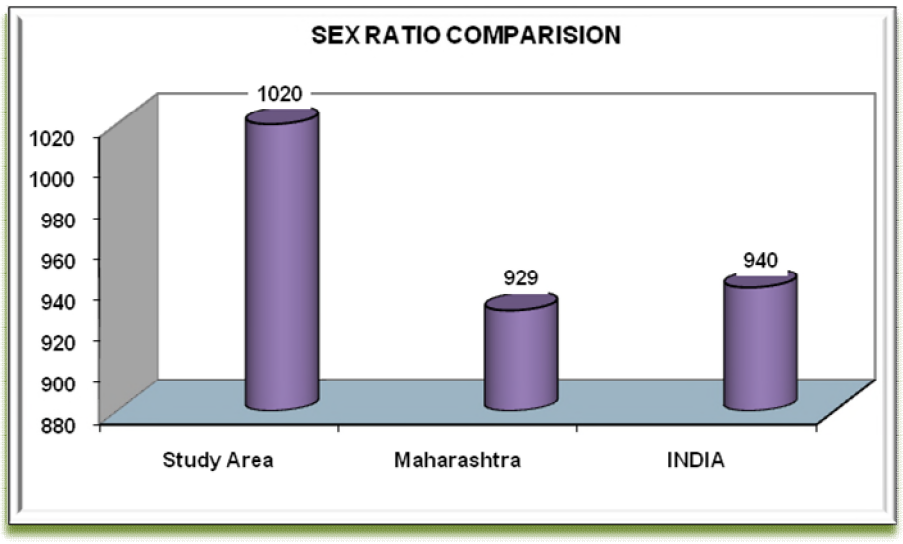
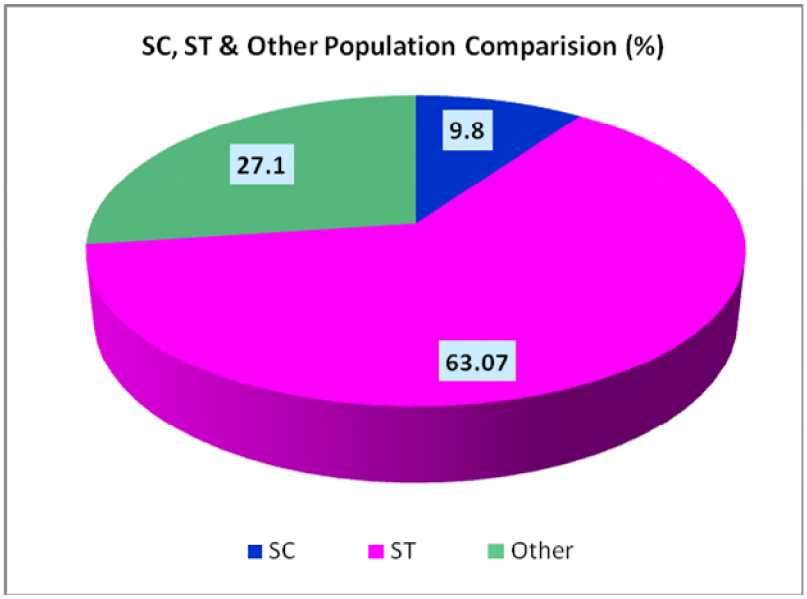
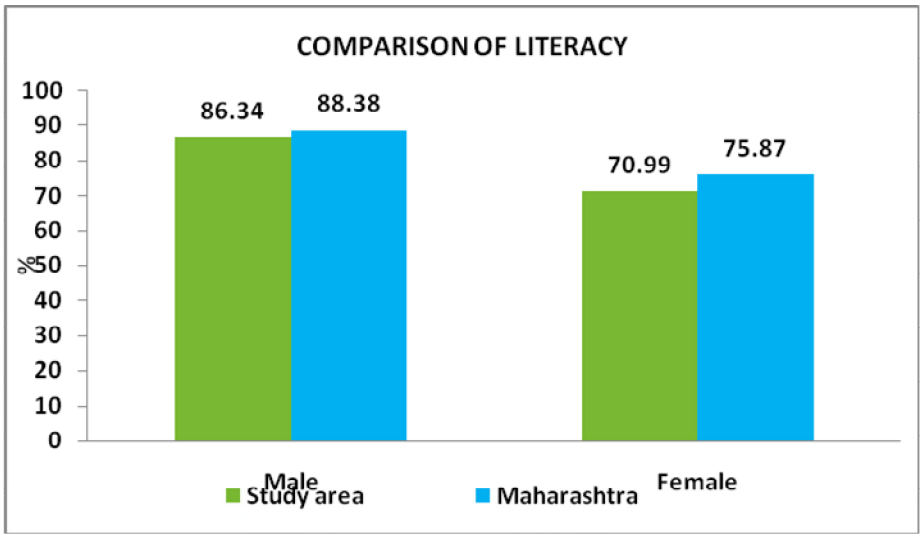
The number of females per 1000 males is 1020 in study area. When compared, the figures of study area they were nearly equal with the Maharashtra State (929) and for the India (933) they were higher than nation.



The scheduled caste population of the study area on percentage basis is 9.80% the total population and scheduled tribe population 63.07%. Percentage of SC population in study area is less and percentage of ST population in study area is more than that of state level. The distribution as depicted in the graph below;



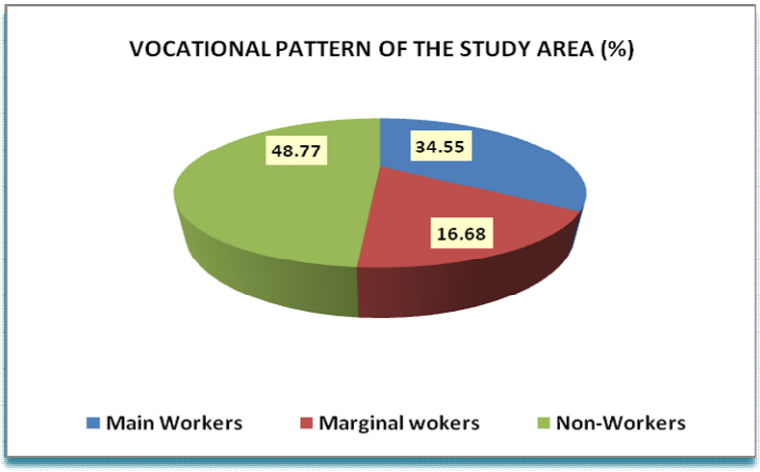
Literacy : The overall literacy in the villages of the study area was 78.66%. The male literacy in the study area was less 86.34% and the female literacy 70.99% The graphical representation below illustrates comparative literacy of the study area and Maharashtra. It may be noted that literacy was less than as compared with state in both male and female**.**



Vocation-wise distribution of the population based on 2011 census data of the study area is graphically represented below indicate that about 48.77% non working population is dependent on 34.55% working population. The male workers are observed to be more than the female workers.

Table 3.21
Vocational Pattern

	Profession	**Study Area (%)**
1.	Total Main Workers	34.55
	* Cultivators	(43.74)
	* Agricultural Labour	(31.46)
	* House Hold industry	(3.09)
	* Other Workers	(21.71)
2.	Marginal Workers	16.68
3.	Non-Workers	48.77



As may be seen from these data, the percentage of main workers in the study area was 34.55%, in 2011. The proportion of cultivators was very high 43.74% in area. On the other hand, percentage of agricultural laborers was quite less 31.46% and 21.71% people were engaged in other activities. The percentage of household industries was lowest 3.09% in the study area. The marginal workers in the rural area were 16.68%. The non-workers were 48.77% in rural area; it shows that dependency of non working population on the working population in the area is less than half of corresponding working population. The village wise demographic, vocational and amenities data is presented in Table 3.22, Table 3.23 and Table 3.24 respectively.

Agriculture : Apart from paddy, cereals like maize, soyabean and other small millets, pulses like tur and kulthi and oilseeds like groundnut, niger and sunflower are also grown. The main rabi crops are jowar, gram, urad, mong and moth.

Forestry : The buffer zone area of is also occupied by forests, which is in heritage for tribes. Therefore their basic need fulfilled by forests. Various forest produces, fruits, roots of various plants, Lakh, Honey , are used for their survival. Roots as Gethiyan, Bhanu , Senta etc. are used for food . Tribal women collects tendu patta , char, amla, hawai , tendu , and sal leaves. Sal, Dhawai, Aamla, Char, Mahua, are of great economic importance as they direct sold them to various government and non government agencies as well as in the open market. Lakh, Gond, Honey are other sources of income. Tribes also cut dry wood from forest and bring them to village and nearer service centers to sell.

Group Activities – Festivals, Fairs And Village Markets: Festivals and fairs are colorful aspects of rural society. Festivals bring peace, harmony and happiness. It is the time when people forget their past rivalries to make merry together. All communities, irrespective of caste, creed and religion celebrate festivals such as Holi (Festival of Colour) Durga Puja, Diwali and Chat. Apart from these, some national functions are also observed such as Independence Day and Republic Day. Along with festivals, people celebrate fairs. These are meant for social and community participation. Important decisions are taken during these fairs. The local fairs play an important role in rural people's life. People bring their artifacts, products and even cattle for selling and buying. It is not necessary to buy and sell in exchange for cash; one can pay in kind, meaning exchange one's products. Weekly market is an important feature of the rural areas. These are held in larger villages. Although they are meant for buying and selling goods and services required daily by the village household, the occasion is also used for socialization and communication.

Infrastructural Facilities & Services: To understand the existing facilities in the project area information was collected secondary sources. The collected data shows that water supply in most of the villages was available. Latrine facility, Waste Water disposal, garbage disposal were totally absent. Inter-village transport facility was available while educational facilities were available health facilities were generally also not available in most of the villages. This study clearly shows that there is an urgent for providing education, health, sanitation facilities within the villages and also in selected areas on the subproject.

Observations : The socio economic analysis of the secondary data of the study area gives clear picture of its population, average household size, literacy rate, and sex ratio etc, the literacy rate is good. A part of population is suffering from the lack of permanent job to run their day to day life and get basic facilities.
The infrastructure and amenities available in the area denote the economic well being of the region which can be categorized as poor. The analysis of the area as a whole possesses marginal infrastructural facilities. However, in comparison with the facilities available in other parts of the districts, this area lacks higher level of amenities like higher education, health, drinking water and communication network. Villagers have to move from their habitats for higher education. This area needs more medical facilities such as maternity and child care centre to this big population, primary health centre and sub centers are also not in healthy conditions to provide facilities to people. The area is well connected with road transport and communication facilities.

Recommendation and suggestion:

- Project proponent should conduct professional skills development programme for Business opportunities to locals' people.
- Camp to provide knowledge of Government schemes and loan or subsidies for agriculture.
- Awareness program should be conducted to make the population aware to get education and better treatment for livelihood.
- Health care centre and ambulance facility can be provided so that rural people get easy medical facilities.
- Vocational training session can be organized to provide self employment to the women and unemployed youth.
- On the basis of qualification and skills local youths can be employed.
- Short term employments can be generated.
- Maternity facility can be made available to avoid going far off places and unnecessary risks to get treatment at Tehsil headquarters.

Table 3.22
Village wise Demographic data of Buffer zone : 2011 Census

S. No.	VILLAGE NAME	NO OF	POPULATION			SC		ST		LITERATES	
		HOUSEHOLDS	TOTAL	M	F	M	F	M	F	M	F
1	Khurshipar	77	255	97	158	6	8	75	133	74	79
2	Nandali	144	603	299	304	20	27	266	260	225	154
3	Jamnara	4	22	12	10	0	0	12	10	8	3
4	Bondena	50	216	109	107	0	0	97	95	81	70
5	Zendepar	50	218	112	106	0	0	110	104	78	55
6	Markekasa	46	207	106	101	21	29	59	49	87	69
7	Khirutola	34	149	79	70	20	18	57	51	58	37
8	Bihate Kh	73	336	164	172	10	6	132	137	105	97
9	Bharitola	49	222	106	116	0	0	93	101	84	70
10	Aswalhudki	20	92	43	49	0	0	43	49	26	19
11	Phakanabhatti	47	227	116	111	3	2	111	107	73	64
12	Korchi	739	3256	1636	1620	285	286	608	638	1270	1116
13	Nawargaon (ghat)	83	375	190	185	0	0	147	141	125	96
14	Bihate Kala	218	1094	540	554	15	15	357	355	415	331
15	Mundipar	18	79	40	39	0	0	22	24	26	21
16	Kale	38	203	97	106	0	0	97	106	65	54
17	Pandharigota	70	295	142	153	8	10	130	135	90	82
18	Gutekasa	109	791	389	402	9	13	266	288	344	335
19	Hetalkasa	63	267	132	135	29	33	75	78	97	74
	Total	**1932**	**8907**	**4409**	**4498**	**426**	**447**	**2757**	**2861**	**3331**	**2826**

Table 3.23
Village wise Vocational Data - Buffer Zone 2011 Census

VILLAGEWISE VOCATIONAL DATA WITHIN STUDY AREA - 2001 CENSUS

Sr. No.	VILLAGE NAME	Tahsil	TOTAL WORKERS		Main Workers		CULTIVATORS		AGRICULURE LABOURS		HH INDUSTRY		OTHER WORKERS		MARGINAL WORKERS		NON WORKERS	
			M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1	Khurshipar	Korchi	70	115	64	95	49	7	8	81	0	1	7	6	6	20	27	43
2	Nandali	Korchi	178	207	163	194	137	165	24	28	1	1	1	0	15	13	121	97
3	Jamnara	Korchi	6	0	1	0	1	0	0	0	0	0	0	0	5	0	6	10
4	Bondena	Korchi	57	16	5	5	2	3	2	0	0	0	1	2	52	11	52	91
5	Zendepar	Korchi	75	14	3	2	0	0	1	1	1	0	1	1	72	12	37	92
6	Markekasa	Korchi	72	69	70	69	58	60	3	5	3	0	6	4	2	0	34	32
7	Khirutola	Korchi	52	48	52	48	48	44	2	3	0	0	2	1	0	0	27	22
8	Bihate Kh	Korchi	104	100	7	6	3	2	2	3	1	1	1	0	97	94	60	72
9	Bharitola	Korchi	67	72	30	20	22	13	4	6	0	0	4	1	37	52	39	44
10	Aswalhudki	Korchi	34	31	10	4	9	2	0	1	0	0	1	1	24	27	9	18
11	Phakanabhatti	Korchi	68	62	52	32	32	0	17	32	1	0	2	0	16	30	48	49
12	Korchi	Korchi	915	522	732	269	182	81	127	73	24	8	399	107	183	253	721	1098
13	Nawargaon (ghat)	Korchi	116	90	75	41	41	28	4	3	8	2	22	8	41	49	74	95
14	Bihate Kala	Korchi	334	363	319	336	109	66	157	235	22	15	31	20	15	27	206	191
15	Mundipar	Korchi	31	25	0	0	0	0	0	0	0	0	0	0	31	25	9	14
16	Kale	Korchi	47	41	34	3	28	0	2	1	0	0	4	2	13	38	50	65
17	Pandharigota	Korchi	79	73	57	25	51	8	4	15	2	0	0	2	22	48	63	80
18	Gutekasa	Korchi	127	109	53	38	26	4	3	26	3	1	21	7	74	71	262	293
19	Hetalkasa	Korchi	88	86	81	82	57	8	21	74	0	0	3	0	7	4	44	49
	Total		**2520**	**2043**	**1808**	**1269**	**855**	**491**	**381**	**587**	**66**	**29**	**506**	**162**	**712**	**774**	**1889**	**2455**

TABLE 3.24
Village wise Educational Facilities And CBOS : Buffer zone 2011 Census

Sr. No.	Name of Village	Educational Facility	Primary School	Middle School	Secondary School	Sr. Secondary School	College	Training School	Adult Literacy Centre
1	Khurshipar	1	1	0	0	0	0	0	1
2	Nandali	1	1	0	0	0	0	0	1
3	Jamnara	1	1	0	0	0	0	0	0
4	Bondena	1	1	0	0	0	0	0	1
5	Zendepar	1	1	0	0	0	0	0	1
6	Markekasa	1	2	0	0	0	0	0	1
7	Khirutola	1	1	0	0	0	0	0	2
8	Bihate Kh	1	1	0	0	0	0	0	1
9	Bharitola	1	1	0	0	0	0	0	1
10	Aswalhudki	1	1	0	0	0	0	0	1
11	Phakanabhatti	0	1	0	0	0	0	0	1
12	Korchi	1	3	3	2	1	1	0	2
13	Nawargaon (ghat)	1	2	0	0	0	0	0	1
14	Bihate Kala	1	2	1	0	0	0	0	1
15	Mundipar	2	0	0	0	0	0	0	0
16	Kale	1	1	0	0	0	0	0	1
17	Pandharigota	1	1	0	0	0	0	0	1
18	Gutekasa	1	2	1	1	0	0	0	1
19	Hetalkasa	1	1	0	0	0	0	0	1
	Total	**19**	**24**	**5**	**3**	**1**	**1**	**0**	**19**

CHAPTER-4
IMPACT ANALYSIS & MITIGATION MEASURES

4.1 IMPACT DUE TO PROJECT LOCATION, DESIGN & OPERATION

4.1.1 Environmental Impact Assessment: Proper emphasis on environment is must for sustainable development. Environment and development should be considered as mutually complementary, interdependent, and an instrument of reinforcing the quality of life. Environmental Impact Assessment (EIA) is the most important aspect of overall environmental management strategy. It identifies major impacts of industry on environment and provides the guidelines to prepare the necessary control measure termed as Environment Management Plan (EMP).

4.1.2 Objective of EIA: EIA is the study of existing environment and estimation of potential effects due to mining activities. To predict the expected impacts of various activities on the different environmental parameters, a detailed survey of the factors are performed and identification of probable impacts are done by different techniques. The EIA are formulated by keeping the following points:

- To devise the industrial method standard with respect to suitable methods, this can be performed with minimum environmental degradation.
- To establish the database for the present environmental scenario.
- To assess and anticipate the possible impacts of mining industry on surrounding environment.
- To recommend the preventive measure to minimize the adverse effects of environmental degradation.
- To design an action plan for implementation of mitigation measures and subsequent monitoring to evaluate the effectiveness of such measures.

This chapter provides a brief overview of the potential impacts on various environmental components due to the proposed mining operations and allied activities, which could cause significant environmental concerns.

The opencast mining operations involve development of benches, approach roads, haul roads, blasting, excavation, handling activities followed by handling of waste materials. If adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause environmental degradation and lead to irreversible damage to the eco-system.

Various possible environmental impacts, which have been identified due to the proposed integrated mining complex project, are discussed in the following sections.

4.2 AIR ENVIRONMENT: ANTICIPATED IMPACTS

Impact on Ambient Air Quality: Mining operations contribute towards air pollution in two ways addition of gaseous pollutants to the atmosphere and emission dust particles. The present proposed mine with it's capacity of 0.05 million TPA, is likely to generate dust, NOx and $SO_{2,}$. Hard strata will be ripped and dozed. Drilling, blasting, loading, unloading, open surface of the pit and movement of vehicles are sources of the air pollution.

Impact of Movement of Vehicles for Mineral Transportation : Tippers of 10 tons capacity will be deployed for transporting ore and waste within the mining lease area. The number of working days has been taken at 300 days per year with 8 hours of operation/ day. Thus, there will be movement of almost 16-18 tippers per day for the transport of iron ore from the mines. The other proposed mines around this mining project has also been considered for assessment of the impact on the air quality. Their cumulative production will be 2,05,000 tonnes/annum. Thus considering cumulative production of all the proposed mining operation the total increment in 10 tonne tipper will be about 70. This impact due to transport of mineral (covering operation of other proposed mines) has been taken into consideration for the air dispersion modeling. The concentration predicted is considered to be the worst case. With control measures, the emissions have been taken at 30% of uncontrolled emissions for handling and 10% of uncontrolled emissions for transportation,

- ***Details of Mathematical Modeling :*** Prediction of impacts on air environment has been carried out by employing a mathematical model. In the present case, **ISCST 3** dispersion model has been used. **ISCST 3** is a computerized air quality model specifically designed for computing concentration and analysis of the dispersion of fugitive dust.

- ***Model Input Data :*** The modeling has been carried out to predict the impacts of the proposed mining operations with production capacity of 1.0 million tonnes per annum (MTPA) on the existing environment, using emission factor arrived for the worst case i.e. without control measures. Predicted ground level concentration for suspended particulate matter (PM_{10}) – is given in **Table 4.1**.

Table 4.1
PREDICTED GROUND LEVEL CONCENTRATION FOR SUSPENDED PARTICULATE MATTER (PM_{10}) – VALUES IN (ug/m^3)

Station Code	Locations/ Villages	Baseline values (ug/m^3)	Predicted Values * (ug/m^3)	Incremental value during mine operation (ug/m^3)	National Ambient Air Quality Norm (ug/m^3)
A1	Mining lease area	47.6	0.4	48.0	100
A2	Village Zendepar	45.2	0.2	45.4	100
A3	Village Khuritola	50.2	0.1	50.3	100
A4	Village Bondena	50.4	0.1	50.3	100
A5	Village Botekasa	52.7	0.2	52.9	100

AIR ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

- Haulage roads will be frequently sprinkled with water for which truck mounted water tankers with sprinkler arrangement have been provided.
- Ore will be covered by tarpaulins to prevent spread of dust from it during transportation. Road surfaces will be maintained to prevent generation of dust by truck movement.
- Regular maintenance of vehicles and machineries will be carried out in order to control emissions. This proper maintenance will ensure that gaseous exhaust form these ate minimum.
- Green belt development would be taken up all along the haul roads and overburden dumps.

4.3 NOISE ENVIRONMENT: ANTICIPATED IMPACTS

There are three major categories of noise sources in mining process viz. fixed plant installations, mobile plant units and external transport movements. Heavy Earth Moving Machinery (HEMM), drills, dumpers, material handling, are the prominent noise sources in the proposed opencast mining.

NOISE ENVIRONMENT: MITIGATION MEASURES:

Mitigation measures for noise and ground vibrations are of following types :

- Prevention at source;
- Attenuation in transmission path; and
- Protective measures in work environment.

Preventive at source: Noise should be best abated at source by choosing machinery and equipment suitably, by proper mounting of equipment & ventilation systems and by providing noise insulating enclosures or padding where practicable. The equipment's to be procured should be new and as such as the noise emission will be optimal for their design/operation. Proper maintenance/working should be done which keeps the noise levels within limits.

Attenuation in transmission path:

- At the ML Boundary dense belt of trees should be erected as acoustic barriers.

- Planting of bushy trees of rich canopy in and around the mine area to intercept noise transmission. A 50 m wide belt of trees of different heights should be useful to act as noise attenuator in the mining areas.

Preventive measures in the work environment :Protective earmuffs and earplugs will be provided for those exposed to high noise levels as per statutory requirements; The noise level exposure shall be maintained within the prescribed limits under mine rules/bye laws there under;

- Blasting parameters will be suitably set to minimize ground vibration within safety limit;
- Provision of insulating caps and aids on the machinery should be made;
- Shock absorbing techniques should be adopted to reduce impact energy;
- Efficient flow techniques for noise associated with high fluid velocities and turbulence should be used (like reduction in noise generated by control leaves in both gas and liquid systems achieved by reducing system pressure to as low as possible);

4.4 WATER ENVIRONMENT : ANTICIPATED IMPACTS

IMPACT OF MINING ON GROUNDWATER REGIME

The mining activity in general creates dis-equilibrium in environmental scenario of the area and disturbs the ground water conditions/regime in particular. From water environment point of view this mine has unique Hydrogeological features like low zero discharge occurrence. The impact on water regime due to mining activity will be minimum and can be broadly classified as under.

- Impact on topography and soil
- Impact on surface water course and quality
- Impact on ground water system

Impact on topography and Soil: Environmental control of water in mine and its buffer zone having high precipitation provide water ways, which are primary source of runoff. Within the core zone area, cracks and loosening of soil would be resulted due to mine and associated activities such as drilling, blasting etc, thereby physical/textural charges would occur in topography and soil/formation. The mine induced process increases the rate of infiltration and recharge. The studies in other mining field have established that rainfall-infiltration rates have been increased by 100% in the core zone area of opencast mines thereby increasing the scope of ground water deep recharge. Thus, the mine used as rain water harvesting after mine operations.

Impact on surface water course and quality : There are four first order streams originating from the area proposed for mining. These streams are the part of drainage network of Satti River. The master drainage is controlled by the Wainganga River. It is established that high gradient would serve as good media for high surface run off and considerably low ground water recharge in the core zone. As such surface run-off contribution to the natural drains from the mining area would be minimum thereby very minor change is expected in hydrologic regime of the river system. There will not be any change in quality of river water due to mining.

Impact on ground water system : Since the no aquifer exist at mine due to unsaturated zone down to depth of 10 m depth, it is evident that impoundment are commonly formed on opencast mine land that trap the most of the runoff from their drainage area will contribute to deep aquifer through fracture zone. In addition there

is a possibility that core zone may likely get recharge the deeper aquifer from the return flow of water being used for industrial purposes. These recharge waterways may seep as ground water runoff to nearby nala.

The area affected by mine is a function of mine depth and hydraulic diffusivity of the rocks.

In general the hydrogeological condition vary depending on the geological and climatological setting of the mine site. Hydrogeological consequences of mine are governed by the nature and duration of rainfall, and by the surface water. The groundwater characteristics of the Buffer Zone areas is under safe category.

Groundwater inflow and mine influence area have been zero. The groundwater monitoring would be undertaken as corrective measure to avoid adverse effects. The monsoon mine discharge after arrested through garland drain/retention wall of adequate dimension would be re-circulated for industrial use.

Since, mine is operating above water table and zero discharge, there will not be any adverse effect on local water body due to mining activity. Further, the mine area fall under non-critical zone of C.G.W.A.

Impact on Water Quality : The proposed excavations are not going to touch the ground water table as it observed to be 10 m. Thus there will not be any contamination of the underground water because of the proposed mining. The water requirement for the proposed mine will be met from the bore well / dug well. There will be no discharge of waste water from the mine. Thus, it can be assumed that there will be minimum pollution as far water quality is concerned.

WATER ENVIRONMENT : PROPOSED MITIGATIVE MEASURES

The mining project will require continuous supply of water for various purposes during mining, vegetation etc. apart from drinking water supply. The main source of water pollution in opencast mining is the surface run-off due to rainfall. There will not be any mine discharge during dry weather seasons as the proposed mining will be on the escarpment of the hill. There may be small quantity of mine discharge during monsoon season, which contains fine silt. This will be treated in settling tanks followed by desilting tanks and the treated water will be let into the natural nallahs. Another source of pollution will be from domestic sewage from canteen and toilets which will be treated in septic tanks and soak pits.

Mine water: The reef ore working will be on the top and/or on slopes of the hill at elevations of 520 m above mean sea level. The float workings, though situated in the lower reaches, will be dug to an average depth of 1.5 meters only. Thus, there will not be any problem of ground water, coming into the mine workings.

The reef workings on the hill will be open on one side during the first five year. Thus, during monsoon season, the rain water that falls in the mine will be drained off by gravity. However, as the mine gets deepened, there will be accumulation of rain water in the mine pit during monsoon season.

Settling tanks will be provided near each ore body in the in-situ area. The design of the sedimentation tanks is given below. From the settling tanks overflow will be pumped out through a pipe line after passing through a de-silting tank of 3 x 2 x 2 m size. The de-silted water will be led into the nearby nallah to follow the natural courses.

No overburden or loose sediments will be kept on working benches. Samples collected from the northern side nala will be analyzed for their pollutant levels. This will help to decide treatment and the type of treatment needed.

Rainwater Harvesting : Check dams with settling ponds should be provided to arrest the silt & suspended solids from surface run-offs along the nallahs.

- Brief description on check dams :Gullies and drainage lines are formed on the overburden dumps due to constant flow of run-off water. One of the alternatives available for sediment and water control has been the use of check dams. Check dams are small pervious obstructions across gullies and streams to check the velocity of water and thus reduce soil erosion; also due to reduction of velocity, the soil particles are arrested and get deposited on upstream side of check dams and thus wash off solids from dumps are prevented from entering into the streams. Check dams range from relatively simple structures built with stones, gravel and clay to fairly elaborate and sophisticated rockfilldams with concrete spillway. These dams require very minor changes in the local topography and can be constructed relatively quickly with low financial investment as well as limited labor input. Construction of a series of check dams on a gully or stream can significantly reduce the overall rate of soil erosion. Brief description of various types of check dams is given below :

- Brushwood check dams: The brushwood check dams are proposed in gullies on gentle bed slopes. It is necessary to have some strong check dams having overall height of at least 40 cm. This can be achieved by piling of wood posts or bamboo in staggered manner. An apron of at least 3.5 m on downstream and upstream side stuffed with jungle bush for effective retention of silt and establishment of vegetation should be provided.

- Stone Masonry check dam : This type of check dam is constructed in random rubble masonry with cement mortar (1:6). This type of stone masonry check dam can be constructed over gullies streams. The height of the check dam varies from 2 m to 3 m with top width of 0.60 m to 1 m and bottom width 1.20 m over cement concrete (1:3:6) foundation of 1.40 m wide and 300 mm thick. The length of check dam will depend on actual site conditions. During execution, proper care should be taken to keep the sufficient depth of foundation.

- Dry Stone Masonry Check Dams: These are suggested for gullies where small earthern check dams are of limited use. These dams can be built at lower reaches of gullies which can finally check the surplus silt carried by the run-off water through other control structures at the upstream side. Depth of foundation of at least 0.5 m and hangers on both sides have to be provided to withstand against high water currents. The banks can be provided with necessary stone pitching to avoid bank erosions. However, while execution of the work, the side slopes may be modified as per actual site conditions.

- Earthern Check Dams: This type of check dam is easy to construct and it is cheap also, provided impermeable soil is available for it's construction. During execution, ground should be prepared properly free from vegetation and sufficient stepping has to be provided at both banks.

- Loose Boulder Check Dam: This type of check dam is useful at locations where gully formation takes place due to poor vegetation and poor soil conditions, resulting in high erosion rates. During heavy rainfall, large quantity of silt is carried away and

effective check over these gullies, loose boulder check dams with boulder sausage at every 50-60 m interval have to be provided.

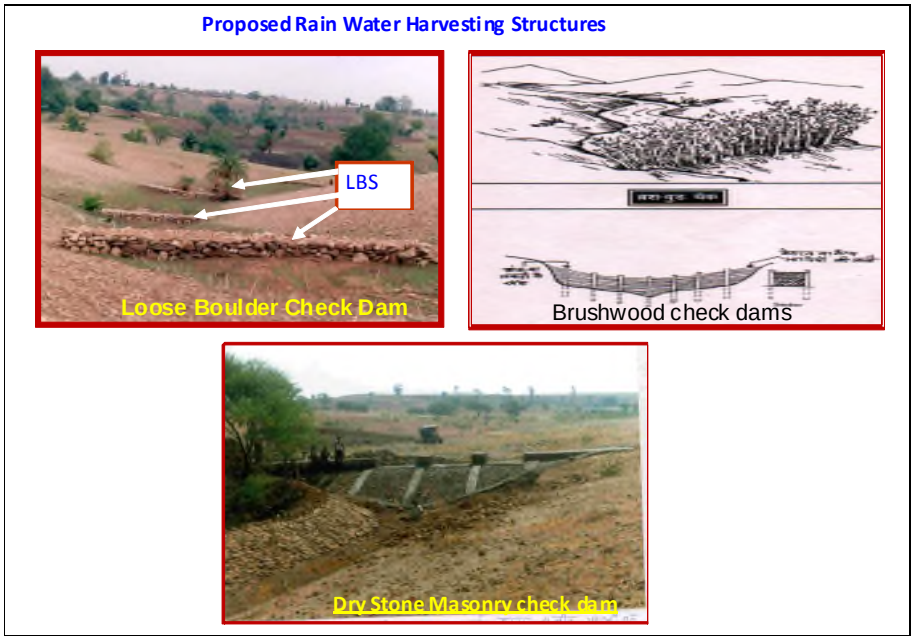
- Outlet Check Dam: It is necessary to provide outlet check dam on downstream of other typed of check dams wherever the flow of water in a stream is more. This dam constructed in masonry, also serves the purpose of storing water which can be used for plantation during dry weather conditions :

The location of check dams shall be decided after the detailed survey;

a] Earthen bunds will be constructed all around the outer edges of abandoned benches before reclamation so as to prevent carry over of solid material by the surface run-off.

b] Drains will be provided at the intersection of successive bunds to channelize the water in loose soil areas to prevent erosion.

c] The storm water due to rainfall will be channelized to the natural water courses like gullies and depression through appropriate drainage system with check bunds.



4.5 LAND ENVIRONMENT: ANTICIPATED IMPACTS

The impact of the proposed mining operation on the land use will be limited to the core zone only. The mineral transport will be carried out from the available road network only. Thus, no impact on the land use outside the mining lease is anticipated as there will not be any mining or allied activity proposed for this project. The impact on the land use of the core zone at various stages viz., Pre-Operational-Post operational stages is tabulated below.

Table 4.2
Post-Mining Land Use of Core Zone with Environment Management

Sr. No.	Head	Land Requirement (Ha)
1	Area broken by the pit	0.40
2	Area under Dumps	0.20
3	Infrastructure, Workshop, office	0.020
4	Road	0.24
	Total	0.86

LAND ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

Reclamation of the Land: The mining will be by slicing the slope and removing all the ore available in that bench and similarly continue in subsequent lower benches; hence question of formation of pit does not arise. The ore reserves will lost long even after the ML period expires , the same will be renewed for further period, hence question of back filling /reclamation does not arise at this stage. However the float area, after removal of float in first year will be back filled subsequently with waste material of subsequent year.

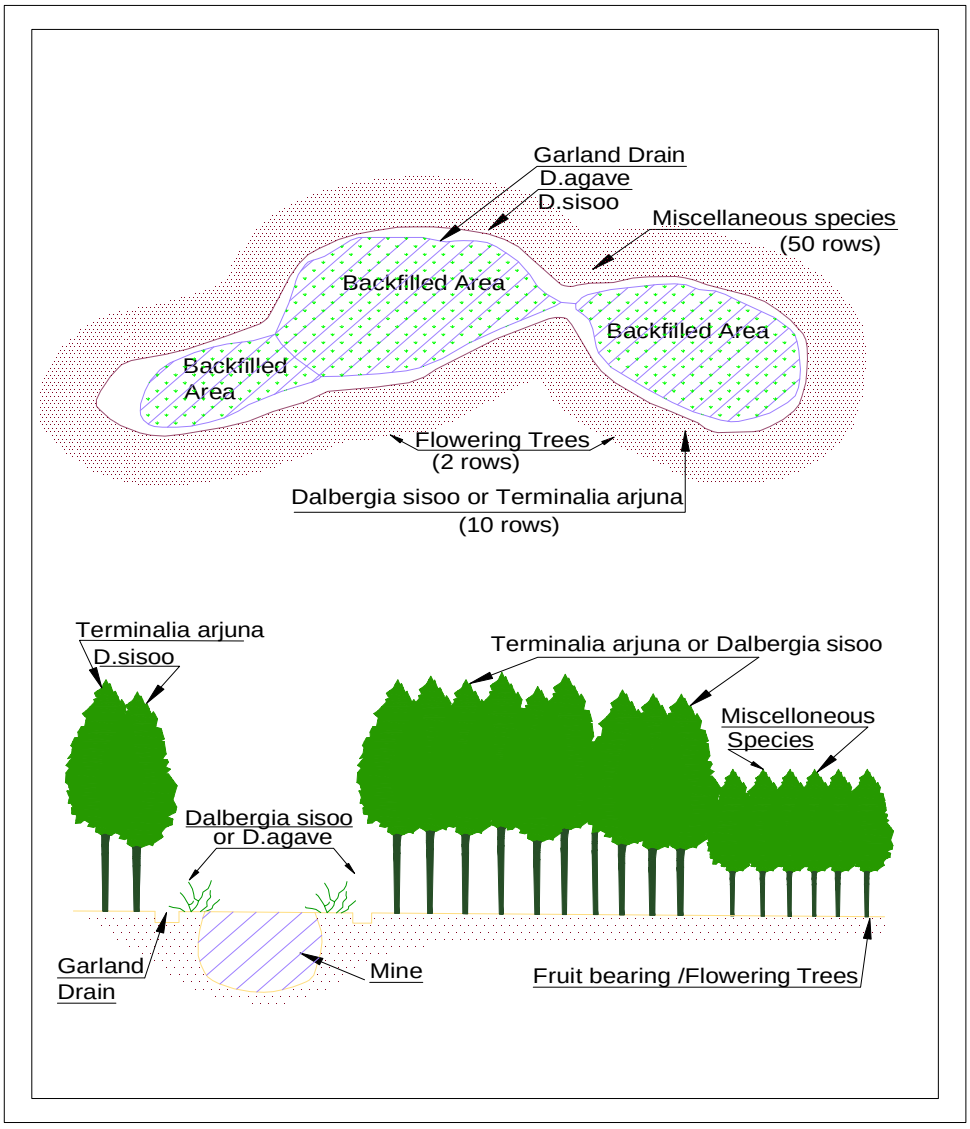


Figure 4.4 A : Scheme of Plantation

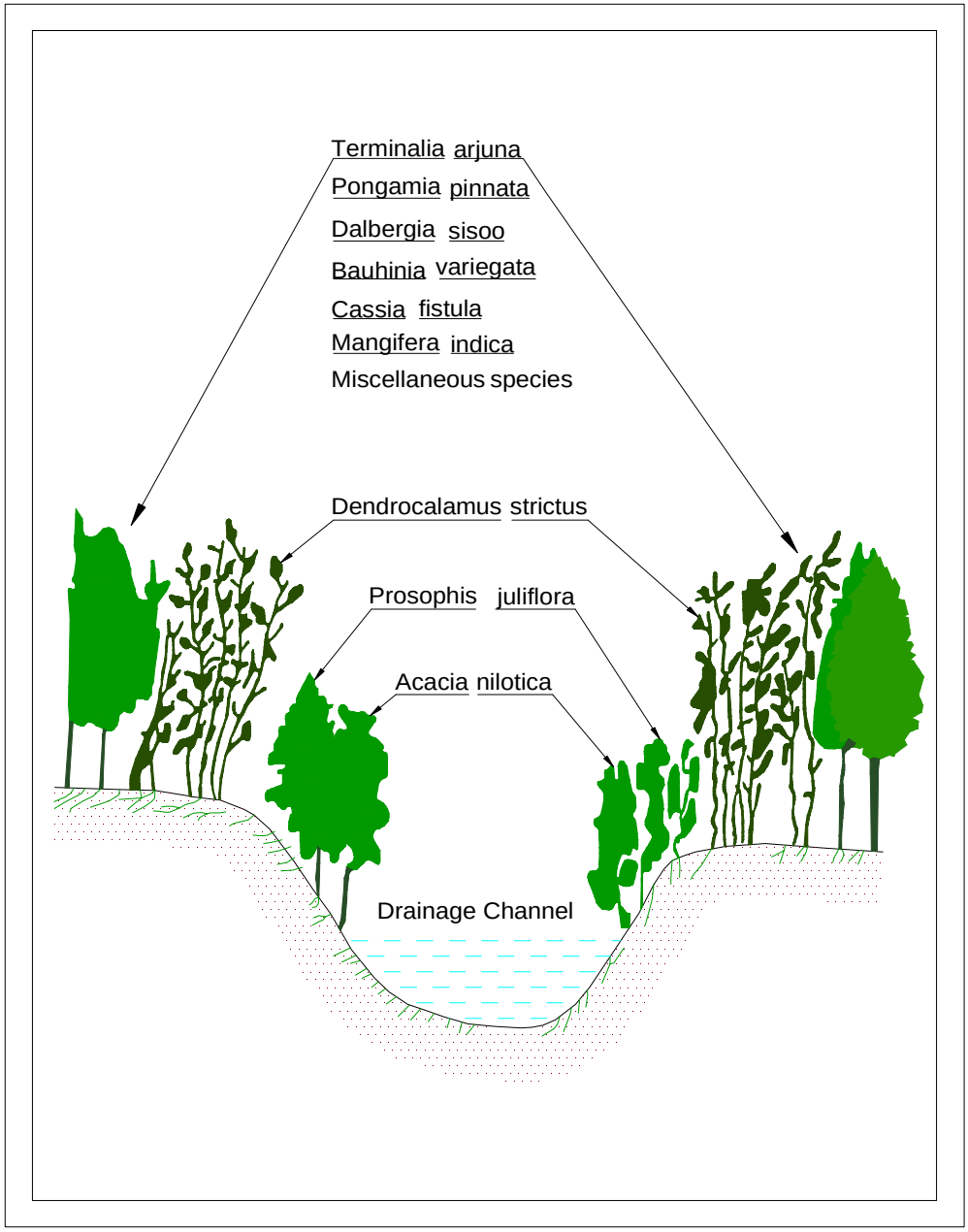


Figure 4.4 B : Scheme of Plantation

4.6 BIOLOGICAL ENVIRONMENT: ANTICIPATED IMPACTS

The area is occupied by shrubs and herbs of various kind. This vegetation cover will be removed during the course of mining. There is no medicinal trees or shrubs reported from the mining lease area. The excavated soil containing nutrient value shall be separately stacked for its future use during plantation.

BIOLOGICAL ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

(i) New plantation will be undertaken in various types of areas for different objectives;The rock as such will not support growth of trees. Addition of fertile top soil and supplement of Nitrogenous fertilizers will be required initially. The existing and proposed roads should be flanked by trees on either side.

a) Plantation for reclamation of degraded area;
b) A belt of trees with thick canopy should becreated to intercept dust, gaseous pollutants and noise;
c) Trees should be planted for beautifying the premises. Species for all these purposes are suggested in section on plantation;

ii) A review of shift in conditions should be taken after periodic interval. A span of three years is recommendedfor fresh appraisal.

Other requirements:

i. While planting on solid waste of waste rock layer of good agricultural soil (if possible garden soil) of approximately 9 inches thick will be laid down along with at least 20% of farmyard manure. An additional input of phosphate fertilizers will be highly desirable.

ii. While planting for beautification and as wind screen, the plantation will be done in the pits of suitable size usually 1.5 x 1.5 1.5 feet size and filled with 1 : 3 parts of organic manure : soil mixture.

iii. For other plantation i.e. to increase tree cover proper soil and water conservation methods mentioned below will be followed. The soil and water conservation by means of making staggered trenches contour bunding and gully plugging will be done. This will help to conserve water and to establish plantation successfully. Plants will be planted along the bunds of staggered trenches, contour bunds etc. and if necessary additional pits will be dug to plant the trees.

Plantation will require large number of seedlings establishment of a nursery will be undertaken from where seedlings of proper species will be available.

Plantation: Conducting the new plantations is of paramount necessity of the area. In addition to augmenting present vegetation, it will also check soil erosion, make the ecosystem more diverse and functionally more stable, make the climate more conducive and improve water balance. It can also be employed to bring areas with special problems under vegetal cover and prevent further deterioration of land.

Plantation of Seedlings: Plantation of tree and shrubs species shall be started by first week of the month of May so that the saplings will get established and will not suffer

shock due to heavy rain. Therefore, the seedlings to be planted should be ready by this time. The operations to be carried out are given below:

a. Staking operations
b. Digging pits before month of May
c. Transporting soil and Farm Yard Manure from outside
d. Filling in pits
e. Inoculation with Vesicular ArbuscularMycorrhiza

Based on nature of soil, performance of species and purpose of plantation, following species have been suggested in plantation programme. List of Recommended Species for Plantation

A. Species for general plantation
1. Ailanthus excelsa
2. Azadirachta indica
3. Butea frondosa
4. Acacia nilotica
5. Acacia farnesiana
6. Anogeissus latifolia
7. Dendrocalamusstrictus
8. Erythrina suberosa
9. Eucalyptus species
10. Ficus benghalensis
11. Ficus racemosa
12. Holoptelia integrifolia
13. Leicaema leucocephala
14. Melia azaderach
15. Pongamicpinnata
16. Prosopisjuliflora

B. Species for waste rock reclamation
1. Acacia auriculiformis
2. Azadirachta indica
3. Eucalyptusspecies
4. Lantana camara
5. Parkinsoniaaculeata
6. Prosopisjuliflora

C. Species for beautification
1. Albizzia procera
2. Butea frondosa
3. Cassia fistula
4. Cassia renigera
5. Cassia siamea
6. Casuarina equisetifolia
7. Erythrina indica
8. Delonix regia
9. Spathodea campanulata
10. Jackaranda species
11. Taboubia species
12. Meliaazedarach

It is proposed to select the local tree species with the help of forest department

having 5 tier arrangement for implementation all along the mining lease in order to control dispersion of fugitive dust from the mining lease.

Table 4.4
Proposed Plantation Programme

Year	Total Area to be covered (m2)	No of trees to be planted
1.	2000	500
2.	2000	500
3.	2500	600
4.	2500	600
5.	3000	700

Wildlife Protection Measures :

- Fire lines will be made at the boundary of lease to prevent spread of fire in the forest area. The fire lines will be regularly cleaned,
- The mine management will actively participate in the wildlife conservation plan prepared by the state government and same and will contribute funds for its implementation. Funds earmarked for the conservation of wildlife shall not be diverted.

4.7 IMPACTS ASSESSMENT ON SOCIAL ENVIRONMENT:

Mining of manganese from this area have significant beneficial impact on social environment. Further some increase in income of local people is expected as some local unskilled, semiskilled and skilled persons may gain direct or indirect employment. Since the immigration of work force during construction phase is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspect are expected to be insignificant. The proposed improvement project is expected to generate a considerable amount of employment in terms of requirement of both skilled and unskilled labourers during the mining operation. The available local labourers will be engaged by the contractors, which will be ensured by the Implementing Agency engaged in the respective contract packages. The project is not only meant to increase in production in a better way or to provide for income restoration to the affected vulnerable social groups; but also has a scope for wider poverty reduction in the region. The following probable direct and cumulative positive impacts are anticipated due to the project.

- Increase in current sources of income and average household income and expenditure of the project area.
- Access to credit as the improved socio economic status will boost up the banking and financial institution in anticipation to the commercial growth of the project area.
- Linkages to local and regional markets in the project area.

- Increase in literacy level, assess to schools, increase in number of schools going children (particularly girls), decrease in drop out rates.
- Access to health facilities such as Primary Health Centres, Anganwadi, and health programmes.
- Access to government's development programs and other services in the project area.

As per the felt need of the area following specific socio economic activities are proposed in the area.

- HONEY BEE KEEPING : Training for collection, processing & marketing.
- AGRICULTURE / HORTICULTURE : Paddy being major crop it is proposed to support the cultivators by providing high yielding varieties of paddy. Awareness campaigns & demonstration for improved agricultural practices will be arranged periodically. Promotion of vermicompost, organic fertilizers, Integrated Nutrient Management (INM) & Integrated Pest Management (IPM) etc.
- Each family of the Zendepar and nearby village will be given local fruit plants like guava, chikoo, aam, jackfruit, imli, awala, jamun, sitaphal, Ber, etc.
- Support to existing kitchen gardens in the form of high yielding varieties of vegetable.
- Local grass species for village waste land will be promoted as controlled grazing grounds.
- MINOR FOREST PRODUCE: Collection of Behada, hirda, awala, mahua, tembhre (tendu fruit), achar, imli, karanji, Chironji, ber, gum, lakh etc will be promoted through Tribal Development Corporation. Necessary support for Bamboo artifacts like transport and marketing will be made.
- Petty works like nursery development, tree plantation, cleaning operations, water conservation etc will be carried out with the help of willing non working population.
- Medical checkup camps for the villagers shall be arranged on regular basis. wareness
  camps for hygienic habits and its importance in avoiding water and air borne diseases. Reproductive Child Health programmes, awareness programme on family planning, nutrition improvement with the help of medical practitioner will be arranged on regular basis.
- Encouragement to the students from the village studying in higher studies. Free distribution of school books, uniform, raincoats, bags and stationary. Provision of scholarship for the needy children.
- Infrastructure support : School building, Aanganwadi repairing, Gotul (community centre) fencing & repairing, sanitation facilities
- Skill up gradation for unemployed youth will be arranged.
- Participation in Cultural activity, sports etc will also be made.
- Provision for street solar lamps at selected places in 5 nearby villages.

Negative impact: The project will not involve land acquisition. The impact on the forestland is even not significant and can very well be mitigated. During the construction there may be a problem of garbage disposal and the waste material management. The present project will avoid this type of hazardous issues by adopting proper environmental mitigation measures.

SOCIO-ECONOMIC ENVIRONMENT: PROPOSED MITIGATIVE MEASURES

The socio-economic conditions in the study area indicate the quality of life of the people. The important indicators which decide the quality of life and require to be improved for better living conditions are literacy levels, improved occupational structure, industrial development, infrastructural facilities, transportation, communication linkages, land development and improvement in cropping pattern.

Mining sites in the present case is located at remote area which can be categorized as under developed. Standard of living of people is this area is normally low,

therefore due to industrial activity like mining, people residing in the nearby villages within the buffer zone are to be benefited by direct and indirect employment opportunities created by the mining activities. People are also beneficiaries for the facilities developed due to mining activity.

TABLE-4.5
Budget for Social Developmental Activities

Sr. No.	Activity	Budget (Rs. in lakhs)	Recurring Cost (Rs. in Lakhs)
1	Education (Renovation of Anganwadi Centre, donation to Anganwadi center and Primary School renovation)	1.00 (Capital)	1.0
2	Education (Distribution of Books and uniforms)		0.50
3	Vocational Training to unemployed youth		0.50
4	SHG support (women SHG)		0.50
5	Medical facility	1.0	
6	Medical facility (Regular Health Camps)		1.00
7	Maintenance of Village Roads		1.00
8	Infrastructure development (support to civic amenities)		0.50
	TOTAL	**2.00**	**5.00**

4.8 INDUSTRIAL HYGIENE, OCCUPATIONAL HAZARDS AND SAFETY

The working conditions in the mines are governed by the enactments of the Directorate General of Mines Safety (DGMS). As per the guidelines of the Mines Act, the management has taken all necessary precautions. The management will carry out periodic health checkup of workers.

Occupational hazards involved in mines are related to dust pollution, noise pollution, blasting and injuries from moving belt conveyors, equipment, fall from high places etc. DGMS has given necessary guidelines for safety against these occupational hazards. The management strictly follows these guidelines.Following points has been taken care of during mine operation for assuring safety of workers:

- Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets etc.
- Health Awareness Programmes and camps are being organized.
- The mine workers are provided all necessary PPEs, especially dust masks for their safe guard from dust, Ear Plugs/Ear Muffs for noise and PPEs for other hazards. The fresh employees when taken are thoroughly medically investigation under initial medical examination and thereafter during continuation of employment; the periodic medical examination has been/ will be conducted. Apart from the general observation, cardiological assessment, neurological assessment, chest radiograph, audiometery findings, pathological / microbiological investigations, eye test has been conducted and the record of the same will be maintained and submitted to the concerned authorities. Rotation of workers exposed to noise premises.
- Under initial vocational training, the workers will be given training related to all safety and health aspects pertaining to their vocation periodically, special training courses/ Awareness programme for Malaria eradication, HIV and health effects on exposure to mineral dust will be organized for employed person as well as for nearby villagers.

- The management carry out periodical audit of safety and health with view to ascertaining the effective implementation of policy.
- First-aid facilities in the mining area.
- The Occupational Health Surveillance Programme: A team of qualified doctors and nurses visit periodically for health check up of all the workers, team and its records are being maintained properly. The medical Officers render timely advice to the management on preventive measures and safe guards.
- The mines management makes the annual budget for the safety and health of their employees and provides sufficient facilities in order to effectively implement the health and safety measures.

CHAPTER 5
ANALYSIS OF ALTERNATIVES (SITE AND TECHNOLOGY)

5.1 SITE ALTERNATIVES UNDER CONSIDERATION

Zendepar Iron Ore mining block is allotted after the establishment of iron ore reserves in the area. It is proposed in the mining plan, there will be one opencast mine worked by semi mechanized method of mining.

The mining projects are site specific as per allocation by The Ministry of Mines GOI hence alternate sites were not considered.

5.2 ANALYSIS OF ALTERNATIVE TECHNOLOGY & METHODS

5.2.1 CHOICE OF METHOD OF MINING

Keeping in view of geological parameters, mineable reserves, overburden the opencast mining method will be adopted which is most widely adopted method for the deposits available in the area under consideration.

CHAPTER-6
ENVIRONMENT MANGEMENT PLAN AND POST –PROJECT MONITORING PROGRAM

6.1 ENVIRONMENT MANAGEMENT PLAN

Development projects are usually associated with the risk of lowering environmental quality. The term environment is rather complex as it encompasses not only the biophysical component comprising water, air land and biotic population but also the less tangible component such as land- wise, social system, aesthetics' etc. The Environment Impact studies attempts to asses the overall environmental impact due to the proposed project so that suitable measures may be taken to ensure that the environmental housekeeping costs remains affordable for both the present and future generations, thus ensuring equity. Rapid industrial development and growth of cities through out the world have led to the recognition and increasing understanding of the inter-relationship between pollution, public health and the environment. Essentially the pollution prevention and control measures include; recognition of problem; collection of information definition of sources and causes and selection and implementation of appropriate solutions. If these measures are designed separately for air, water and land pollution or concentrated on removal of waste pollutants from waste receiving water bodies. This often results in transfer of problem from one part of the environment to the other. For example Solid pollutants were removed from water and air but then improperly disposed on land, sewage and industrial sludge were incinerated, adding to the air pollution, solid waster or industrial effluent were exposed to leaching actions or burnt increasing water and air problems. To avoid all such cases we need to recognize the environmental interaction and focus simultaneously on reduction of pollutants and sources so as target our efforts on comprehensive environmental planning. As the environment is a complex system of biotic and abiotic factors and their interaction on each other so the project impact have wide scope. It is not possible to address all the environmental areas fully in the study area, as it would be impossible to complete all such studies within a limited time frame. Even if completed, the report will be too voluminous for decision makers and involve heavy expenditures on conduction of these studies. So priority setting activity has to be done so as to define limit of the assessment study, before commencing any developmental activity.

The mining development in the study area needs to be intertwined with judicious utilization of non-renewable resources of the study area and within the limits of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged into the environment without affecting the designated use and is governed by dilution, dispersion and removal due to physico-chemical and biological processes. The Environment Management Plan (EMP) is required to ensure sustainable development in the study area (5 km) of the proposed mine site, hence it needs to be an all encompass plan for which the proposed mine authorities, Government, Regulating agencies like Pollution Control Board, Indian Bureau of Mines (IBM) etc. working in the region and more importantly the affected population of the study area need to extend their co-operation and contribution.

It has been evaluated that the study area has not been affected adversely with the proposed mining and likely to get new economic fillip, not only for the study area but for the region as a whole. Mitigation measures at the source level and an

overall Management Plan at the study area level are elicited so as to improve supportive capacity of the study area and also to preserve the assimilative capacity of the receiving bodies. The environmental attributes, which will be affected in the region, are landuse, topography, water resources, water quality, soil, air quality, socio-economic status, ecology and public health. The Management attributes, which will be affected in the region, are landuse, topography, water resources, water quality, soil, air quality, socio-economic status, ecology and public health. It is to be appreciated that iron ore mining is to a certain extent an inevitable destructive process, but the hazards are within measurable limits and can be easily ameliorated to a significant extent.

The Environment Management Plan is elaborated in Chapter 3 with special reference to the air, water, noise, land, biological environment.

6.2 ENVIRONMENTAL PROTECTION CELL

It is proposed to have a environmental cell to supervise and implement the environmental related issues. All the above mentioned personnel should be reportable to the Manager (Mines).

6.3 IMPLEMENTATION SCHEDULE

Monitoring Strategy : The monitoring of various environmental parameters is necessary which is a part and parcel of the environment protection measures. Monitoring is as important as that of control of pollution since the efficacy of control measures can only be determined by monitoring. A comprehensive monitoring programme is suggested underneath. Environmental attributes should be monitored as given below: Details are tabulated in **Table-6.1**

- Air pollution and meteorological aspects;
- Water and Wastewater quality;
- Noise levels;
- Soil characteristics; and
- Ecological preservation and upgradation.

Table- 6.1
MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS

Sr. No.	Particulars	Monitoring Frequency	Duration of Sampling	Important monitoring parameters
1.	**Air Pollution & Meteorology**			
	Air Quality			

Sr. No.	Particulars		Monitoring Frequency	Duration of Sampling	Important monitoring parameters
	A.	**Ambient Air Quality Monitoring**			
		1: Zendepar Village 2:Proposed mine premises	Twice in a week for one month	24 hours continuously	PM-10 & PM-2.5 SO_2, NOx
2.	**Water and Waste Quality**				
	a.	**Industrial/Domestic**			
	1.	Mine effluents (if any) during monsoon	Once in a year	24 hour composite	As per EPA guidelines, 1986
	2.	Domestic raw & treated	Yearly	24 hour composite	As per EPA guidelines, 1986
	ii).	Ground water : 1) Dugwell in Zendepar Village	Once in a year	Grab	As per the parameters specified under IS : 10500
3.	**Industrial Noise Levels**				
		Along the Haul road for transportation noise	monthly	24 hr continuous with 3 hr interval	Noise levels in dB(A)
4		Ground Water Monitoring	***Annually***	In 5 Km radius covering atleast 5 dugwells	Static Water Level, Pumped Water Level, Seasonal Fluctuation etc.

The mitigation measures suggested above should be implemented so as to reduce the impact on environment due to operations of proposed mining activities. In order to facilitate easy implementation, mitigation measures are phased as per the priority implementation.

Aftercare and Monitoring: Investment would be futile without adequate timely monitoring and aftercare. Aftercare includes de-weeding, soil working, and control from pests, proper irrigation and replacement of casualty for uniform and faster growth of the planted species. The planted area should be protected from grazing and browsing animals until the plants are above the level of damage. The fencing should be created wherever necessary on the boundaries of reclaimed area from biotic pressure.

6.4 CONCLUSION

Though significant impact on environment is expected, but exploring the reserves in sustainable manner to meet the present day need cannot be stopped. Starting of these mines will also benefited to local community in creating substantial employment opportunities and increased revenue. Mining operations in the subject area will have positive impact by providing job opportunities to locals. Besides, there will be indirect employment opportunities also. Mining will be done with the vision of leaving the positive impact on socio-economics of people living in the nearby villages.

CHAPTER- 7
ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

As per the mandatory requirement from the Ministry of Environment and Forest as prescribed in Terms of Reference the Public Hearing of the project shall be undertaken.

7.2 HAZARD AND RISK ASSESSMENT

In any mining operations, whether opencast and/or underground, work safety is taken care of by the Mines Act, the Mineral & Mines Act, and Rules framed there under.

The risk to general public in the present case may arise from the following
i) Fly rocks, during blasting operations,
ii) Plying of trucks etc on public roads
iii) Ground vibrations due to blasting

At proposed iron ore Mine, there will be no risk to public from any of the factors listed above. Although surrounding area has plain undulating topography, no pathways or public roads are passing through the proposed lease area.

An assessment of risk at the proposed iron ore mine due to each of the factors listed in paras below:

The stone and earth material dug out while manual working for approach to the mine will be utilized for construction of ramps etc. The excess stone and rock will be placed on the ground in low height dumps which will be reclaimed through plantation.

The blasting operations will be so designed so that there are no fly rocks in normal situation. The blasting operations will be carried out after warning is given to people of surrounding bastis / habitations.

The oscillation of rock particles is called Particle Velocity and its maximum value is called Peak Particle Velocity (PPV), which is measured in millimeter per second. The standards for safe limit of PPV are established by Director General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. The safe level criteria PPV as mentioned in Circular No. 7 of DGMS is presented in **Table-7.1.**

As the distance increases, the PPV value is likely to reduce. The ground vibrations generated by blasting during the mining operations will be well within the standards prescribed by DGMS. Ground vibrations are not likely to affect the structures in the vicinity of mine lease area.

TABLE-7.1
PERMISSIBLE PEAK PARTICLE VELOCITY (mm/s)

Type of Structure	Dominant Excitation Frequency		
	<8 Hz	8 – 25 Hz	>25 Hz
A] Buildings/structures not belonging to the owner			
Domestic houses/structures (Kuchha brick and cement)	5	10	15
Industrial Buildings (RCC and framed structures	10	20	25
Objects of historical importance and sensitive structures	2	5	10
A] Buildings belonging to the owner with limited life span			
Domestic houses/structures (Kuchha brick and cement)	10	15	25
Industrial buildings (RCC & framed structures)	15	25	50

Source: DGMS Circular No. 7 dated 29/08/1997

There will not be any bulk storage of fuel and oil at this mine. The permissible quantity of diesel and lubricants will be stored after observing necessary precautions as prescribed.

The tippers/trucks taking iron to linked steel Plant will be playing on State Highway but entry from mine to highway will be kept away from nearby Villages so than the risk to persons is reduced.

7.3 IMPACT ON SOCIO ECONOMICS AND R&R ACTION PLANS

The impact on socio economic of surrounding area will be positive, as mine will directly employ about 180 workers. There will be employment generation of double this number in secondary and tertiary sectors. **There is no displacement of any habitation or personnel and hence the rehabilitation and resettlement action plan is not required.**

7.4 OVERVIEW

The scale of opencast mining activity is low, for major part of life of the mine, is unlikely to have any appreciable impact on environment. The openings of the new mine will generate about 180 jobs directly and double that number in secondary and tertiary sectors.

CHAPTER- 8
PROJECT BENEFITS

8.1 PERIPHERAL AREA DEVELOPMENT

The Project Proponent shall be undertake plantation in the project area as per norms stipulated by MoEF/CPCB. In addition to above, the Project Proponent is willing to undertake peripheral area development which may includes :

i. Strengthening of village roads located within 5 km of project area.
ii. Provision of borewells/ dug wells for drinking water.
iii. Opening of primary Health Centre.
iv. Assistance to local villages for farming, poultry etc. as & when required.

The peripheral development programme shall be implemented with the help of local villages. The local youths shall be given priority in employment to extend the benefits of the development to them.

8.2 STEPS TO BE TAKEN TO IMPROVE SOCIO-ECONOMIC CONDITIONS

The socio-economic conditions in the study area indicate the quality of life of the people. The important indicators which decide the quality of life and require to be improved for better living conditions are literacy levels, improved occupational structure, industrial development, infrastructural facilities, transportation, communication linkages, land development and improvement in cropping pattern.

The project proponents are envisaging to undertake the following socio-economic measures.

8.2.1 Health Care :The following facilities will be provided and adequate funds will be allocated for the maintenance of them. These include medical health service, family planning and medical camps and aid to the existing and proposed hospitals.

8.2.2 Educational Facilities: These include adult education facilities, financial assistance for higher studies, sponsorship to vocational / professional training institution, computer education camps, vacation training for students and aid to existing/proposed schools and colleges.

8.2.3 Civic Amenities: These include community toilets, drinking water facilities like public stand posts, elevated service reservoirs, playgrounds for children and recreation facilities for all age groups. In addition to this participation and support to government efforts in extending communication (post, telegraph, telephones, transport, power supply etc) to the remotest part of the region.Road developmental activities will be given special emphasis.

8.2.4 Employment :It is proposed to employ the local population wherever possible in the proposed project activities. The work of reclamation of the entire area that will be damaged in mining operations and afforestation through plantation of 2500 trees per ha with survival rate of 80% to 85% has been envisaged. In this, local people would be involved actively including employment and award of contracts for supply of materials and services.

8.3 INFRASTRUCTURE FOR ENVIRONMENTAL PROTECTION

8.3.1 Manpower: It is proposed to have a full fledged environmental cell to supervise and implement the environmental related issues. This should be supported by a fully equipped laboratory to carry out the analysis. The proposed organization of the Environmental Monitoring Cell is given below. The proposed cell should have following manpower on regular basis.

1) Manager (Environment) :He should be a qualified with adequate experience. He will be responsible for implementing and monitoring the environmental impacts. He should be a liasioning officer between the proposed mine and with regulatory agencies like MPCB, CPCB etc.

2) Manager (Safety) :He should be qualified in industrial safety. He will be responsible for all the safety aspects and risk, and for the implementation of disaster management plan.

3) Chemist : He should be a qualified chemist to carry out the analysis of various samples.

4) Silviculturist :He should be a qualified Silviculturist. He will be responsible for the implementation of all the plantation programmesin the study area and within the plant premises.

All the above mentioned personnel should be reportable to the General Manager (Mines).

CHAPTER – 9
ENVIRONMENTAL COST

9.1 BUDGETARY COST ESTIMATES

The cost estimates presented in this section are for the recommendations made above. These cost estimates give only a indication of the likely cost. Table-9.1 presents the budgetary cost figures against each recommendation. Similarly, the cost estimates for land reclamation and afforestation schemes are given separately.

Table 9.1
BUDGETARY PROVISION FOR ENVIRONMENTAL PROTECTION
(In lakh Rupees)

S. No.	Description	Capital Cost		Annual Recurring Cost	
		Existing	Proposed	Existing	Proposed
1	Pollution Control (Garland drains, gully checks, retention wall etc.)	Nil	2.00	Nil	1.00
2	Pollution Monitoring (to be done by external agency)	Nil	Nil	Nil	1.00
3	Occupational Health	Nil	Nil	Nil	0.50
4	Green Belt	Nil	Nil	Nil	1.00
5	Reclamation / Rehabilitation of mined out area*				
6	Others (Wild life management)	Nil	Nil	Nil	0.50
Total		**Nil**	**2.00**	**Nil**	**4.00**

***** included in mining cost.

CHAPTER – 10
ENVIRONMENTAL MANAGEMENT PLAN

10.0 INTRODUCTION

The environmental management plan consists of a set of impact mitigation measures, management, monitoring waste minimization and mitigative measures to be taken during implementation and operation of the project to eliminate adverse environmental impacts or to reduce them to the acceptable levels. The present environmental management plan addresses, the components of environment, which are likely to be affected during the proposed enhancement of mining activity.

The aims of EMP are:

- Overall conservation of environment.
- Minimization of waste generation and pollution.
- Judicious use of natural resources, minerals and water.
- Safety, welfare and good health of the work force and populace.
- Ensure effective operation of all control measures.
- Vigilance against probable disasters and accidents.
- Monitoring of cumulative and long term impacts.

Environmental Management Plan, which will be implemented in the proposed project of enhancement in production capacity of limestone, shall be undertaken the following heads:

- Air Quality Management
- Noise Management
- Water Management
- Solid Waste Management
- Land Reclamation
- Greenbelt Development & Plantation

Development projects are usually associated with the risk of lowering environmental quality. The term environment is rather complex as it encompasses not only the biophysical component comprising water, air land and biotic population but also the less tangible component such as land- wise, social system, aesthetics' etc. The Environment Impact studies attempts to asses the overall environmental impact due to the proposed project so that suitable measures may be taken to ensure that the environmental housekeeping costs remains affordable for both the present and future generations, thus ensuring equity.

The mining development in the study area needs to be intertwined with judicious utilization of non-renewable resources of the study area and within the limits of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged into the environment without affecting the designated use and is governed by dilution, dispersion and removal due to physico-chemical and biological processes. The Environment Management Plan (EMP) is required to ensure sustainable development in the study area (10 km) of the proposed mine site, hence it needs to be an all encompass plan for which the proposed mine authorities, Government, Regulating agencies like Pollution Control Board, Indian Bureau of Mines (IBM) etc. working in

the region and more importantly the affected population of the study area need to extend their co-operation and contribution.

It has been evaluated that the study area has not been affected adversely with the proposed mining and likely to get new economic fillip, not only for the study area but for the region as a whole. Mitigation measures at the source level and an overall Management Plan at the study area level are elicited so as to improve supportive capacity of the study area and also to preserve the assimilative capacity of the receiving bodies.

In compliance with the environmental procedure the environmental clearance application is made. Necessary scientific studies have been undertaken as per the guidelines set by the Ministry of Environment and Forests (MoEF). Allocation of necessary funds, manpower and machinery will be made to for the protection and conservation of all the components of environment. It is ensured that all mandatory clearances will be sought from respective competent authorities before operating the proposed Zendepar Iron Ore Mine .

The environmental attributes, which will be affected in the region, are landuse, topography, water resources, water quality, soil, air quality, socio-economic status, ecology and public health. The Management attributes, which will be affected in the region, are landuse, topography, water resources, water quality, soil, air quality, socio-economic status, ecology and public health. It is to be appreciated that iron ore mining is to a certain extent an inevitable destructive process, but the hazards are within measurable limits and can be easily ameliorated to a significant extent. The mitigative measure for each component of the environment has been described in details in Chapter 4 and the monitoring schedule for evaluation has also been provided in Chapter 6. It is proposed to adopt eco friendly method of mining in order to conserve the resources during extraction of the iron ore from this proposed mine. As reported earlier,there is no National Park, Wildlife Sanctuary, Biosphere Reserve, Archeological Monuments or sites of historical importance in the 10 Km Buffer zone. There is no industry except adjoining Mining of iron ore hence operation of this mining venture shall provide employment opportunities of the local villagers.

CHAPTER – 11
SUMMARY & CONCLUSION

11.1 JUSTIFICATION FOR IMPLEMENTATION OF THE PROJECT

1.4.4 Iron ore mining and steel industry has been integrated in India. In India, iron ore occurs in the states of Andhra Pradesh, Bihar, Chhattisgarh, Madhya Pradesh, Orissa, Maharashtra, Karnataka and Goa admeasuring the total reserves of iron ore about 17,573 Million Tonnes (MT). Iron ore is one of the major mineral deposits occurring in the Indian sub-continent. It had played a great role in development of civilization and industrialization. The discovery of the metal iron and its use by man through the ages as a milestone in the march of civilization is known as the "Iron Age." The recent liberalization of the Indian economy has catapulted the Indian industry into new realms of thinking and progress. The policies of Government on economic development have given various subsidies like slashing import duties and provisions for the Indian industry to grow indigenously. Chhattisgarh, Maharashtra are some of the largest consumers of iron and steel materials in the country. Similarly, iron ore is one the major mineral deposits found in Maharashtra.

11.2 SUMMARY OF ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION

The summary of anticipated adverse environmental impacts and mitigation measures are given in **Chapter 4& Chapter 10.**

11.3 CONCLUSION

The proposed opencast iron ore mine project will have impacts on the local environment with proper mitigation measures with the effective implementation of the environment management measures as suggested in the EIA/EMP report and as recommended by MoEF, CPCB and State Pollution Control Board, the negative impacts will be minimized to a great extent. However, development of this project has beneficial impact/effects in terms growth in regional economy, transform the region's economy from predominantly agricultural to significantly industrial, increase Government earnings and revenues and accelerate the pace of industrial development in the region.

The proposed project will provide direct employment to a large number of personnel. This project will also generate indirect employment to a considerable number of families, who will render their services for the employees of the project. The project will also encourage ancillary industries in the region, which will not only increase the employment potential but also the economic base of the region will be further strengthened.

Thus, in view of considerable benefits from the project, the proposed project is most advantageous to the region as well as to the nation.

CHAPTER – 12
DISCLOSURE OF CONSULTANT

M/s Pollution & Ecology Control Services (PECS), Nagpur is an Environmental Consultant and Engineers. PECS have well equipped laboratory for field studies as well as for testing and monitoring of Air, Water, Noise, Soil and other related activities of Environment of Mines and Industries.

PECS is specialized in Environmental Services as mentioned below:-

- Environmental Impact Assessment (EIA) and (REIA).
- Environmental Risk Analysis and Assessment.
- Monitoring of Air, Water, Noise and Soil.
- Preparation of Documents for Clearance of Forest Land
- Environment Management Plan.
- Environment Audit Statement.
- Disaster Management Plan.
- Study and Treatment of Industrial Effluents.
- Design, Engineering and Commissioning of Effluent Treatment Plant, Sewage Treatment Plant and Water Treatment Plant.
- Designing, Engineering and Commissioning of Air Pollution Control Devices.
- Dust Suppression.
- Dealing with Solid Waste Management.
- Planning on Waste Recycle, Reuse and Control
- Follow up with Explosive Department and IBM, HQ, Nagpur.
- Preparation of “ON SITE” and “OFF SITE” emergency plans and health survey.
- Geo Hydrological, Ground and Surface Water Survey and Transit Survey.
- Rain water harvesting including design and execution.

Pollution & Ecology Control Services (PECS) has been recognized by various organization, in addition it is also associated with various social organizations and educational institutions to provide necessary technical support in the field of water conservation and management. PECS has submitted its application under NABET scheme for EIA accreditation and the MoEF has provisionally approved PECS as EIA consultant organization. **Ref No 106 in ‘List A’** of EIA Consultants under NABET scheme.