Comprehensive Report on:

Groundwater Condition in both core and buffer zone of Dholta Pahar Block Iron Ore Mine, Koira Block, Sundargarh District, Odisha.

[Report submitted for obtaining NOC form CGWA under Section 5 of the Environment (Protection) act, 1986 (29 of 1986) as per the new notification no 2941 of 24th Sept
2020]

M/S KASHVI POWER AND STEEL PVT LTD
PLOT NO 1234/P, GOVINDA PRASAD, BOMIKHAL,
BHUBANESWAR- 751006
E-MAIL ID: groupkashvi@gmail.com

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By MRCAWTM – May 2022

Executive summary

M/s Kashvi Power & Steel pvt Ltd is located in Dengula Village, Koira Tehsil of Sundargarh District, Odisha. Dengula village is located in north east part of Sundergarh district. The study area falls under survey of India toposheet no F45N1N and F45N5N. Kashvi Power & Steel Private Limited operates as a manufacturer of spongeiron, billet and ingots and exporter of minerals. The mine will be developed by opencast mining method with mechanized means deploying machinery like wagon drill machine, rock breaker, hydraulic / diesel operated shovel, dumper/tipper etc. During the plan period, it has been proposed to produce2.0 MTPA iron ore per annum. The present study is made for obtaining NOC from CGWA for extraction of maximum 200KLD groundwater during mining operation as per the approved mine plan. The present report is based on the Hydrogeological investigation made within core zone and its 10km radius buffer zone for assessment of impact of dewatering of groundwater by the mine and will be submitted to CGWA for obtaining renewal of NOC. The area is drained by IB and Brahmani River and its tributaries. The easterly flowing Sankh and westerly flowing Koel River join at Vedavyas near Rourkela to form the Brahmani River. The river, IB a tributary of Mahanadi controls the drainage of the western parts of the district. The drainage pattern of the area is dendritic. The study area is located in Dengula Village, Koira Tehsil of Sundargarh District, Odisha whichfalls under safe blocks as per the report on Dynamic Groundwater Resource of India, published by CGWB in 2019-20. The study area is having largely one geological formation name Singbhum-Keonjhar-Bonai group of iron ore of Precambrian age. These constitute hard rock's includes schist, tuffs, phyllite, basic rock, BHQ/BHJ have been classified as Iron Ore Series (IOS). Aquifers are developed only in the low lying area and valley parts of the study area. The total lease area of the proposed Dholtapahar Fe ore block is 60.508 ha (605080 m^2). Groundwater quality is fresh and potable in both core and buffer zone area and TDS remains below 1900 ppm varies from 10 to 310 ppm in the study area. As per the approved mine plan the dewatering of groundwater maximum 200KLD as the mine is generating no water discharge and only 97 KLD will be extracted from ground water for mine use. Rainwater is harvested within the ML area through construction of water conservation pond, check dam, and earth bunds. The annual conservation through RWH is about 26500m^3/anm. There is no long term impact on groundwater because of open cast mining. For the running of mine 200KLD water is required, 97KLD from ground water and 103 KLD will be purchase from other site. Thus, the study recommends NOC may be provided for next 5 yr with maximum 97 KLD extractions from groundwater.

Acknowledgments and Certificate

Impact assessment and report preparation work as per the CGWA guideline was entrusted to MRCAWTM, Manav Rachna as accredited Groundwater Institution of CGWA by M/S. Kashvi Power and Steel Pvt. Lmt, Odisha is thankfully acknowledged.

Discussions with Mr. Pradeept Mohapatra, Director WCS, regarding the geology of lease area and plan our investigations according to scope of work is gratefully acknowledged. Help rendered by Shri Shubham, Geologist, M/S. Kashvi Power and Steel Pvt. Lmt, Odisha in every stage of planning and Field verification, investigations in and around lease area and report preparation is thankfully acknowledged. He also provided all the available relevant data and records many of them are reproduced in this report and forms part of annexure section.

At lease area, during days of field investigation we have received warm welcome and all hospitality and requisite support from mine team. We thankfully acknowledge Mr. Pradeept Mohapatra, Director WCS and his team for their cooperation.

The report has been prepared by Ms Sheha Rai, Asstt Prof MRCAWTM and Sandeep Kumar Research Assistant, MRCAWTM under the supervision of Prof (Dr) Arunangshu Mukherjee, Director MRCAWTM. Ms Alifia Ibkar, RA MRCAWTM helped Mr Sandeep Kumar in the field work and data collection.

It is to certify that MRCAWTM have investigated the area of Dholtapahar Fe ore block of Dengula Village, Koira Tehsil of Sundargarh District, Odisha. Based on actual data collected from field and literature survey done, has prepared the report as per the format of CGWA.

(Dr Arunangshu Mukherjee)
Director, MRCAWTM

MR Centre for Advance Water Technology & Management
Manav Rachna International Institute of Research & Studies
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Report on
Hydrogeological Investigation and Impact Assessment Report for Dholtapahar Fe Iron Ore Block, Sundergarh District, Odisha

Introduction

The report is prepared as per the format prescribed by CGWA for impact assessment study, the Introductory chapter comprises the following subtitle for describing its

1.1 Objectives
1.2 Scope of the study
1.3 Project description-Plant, process, product and location
1.4 Land Use Land Cover and percentage of LULC categories
1.5 Topography and drainage

1.1 Objective

The Central Government had constituted the Central Ground Water Board as Authority vide notification number S.O. 38 (E), dated the 14th January,1997 to exercise powers under sub section (3) of section 3 of the Environment (Protection) act, 1986 (29 of 1986) for the purposes of regulation and control of Ground Water Management and Development. The Authority has been regulating ground water development and management by the way of issuing 'No Objection Certificates' for ground water extraction to industries or infrastructure projects or Mining Projects etc., and framed and issued guidelines in this connection from time to time. The entire process of grant of No Objection Certificate shall be online through a web based application system. The latest guideline issued by Gazette Notification no 2941 on 24th September 2020 supersedes all earlier guidelines issued by the Central Ground Water Authority (CGWA). As per the CGWA instruction the M/S. Kashvi Power and Steel Pvt. Ltd. has to submit Impact assessment report along with undertaking for processing their application for regularization of groundwater abstraction for mining. There by M/S. Kashvi Power and Steel Pvt. Ltd. Bhubaneswar engaged MRCAWTM, CGWA Accredited Groundwater Institution (Certificate No.-CGWA/RGI/025) vide work order dated 4th April 2022 to carry out the Hydrogeological investigation along with impact assessment study incorporating socio-economic assessment study on groundwater regime due to withdrawal/ dewatering of groundwater by Dholta Pahar Block for Iron Ore mine (Fig **1.1**) as per the prescribed format of CGWA.

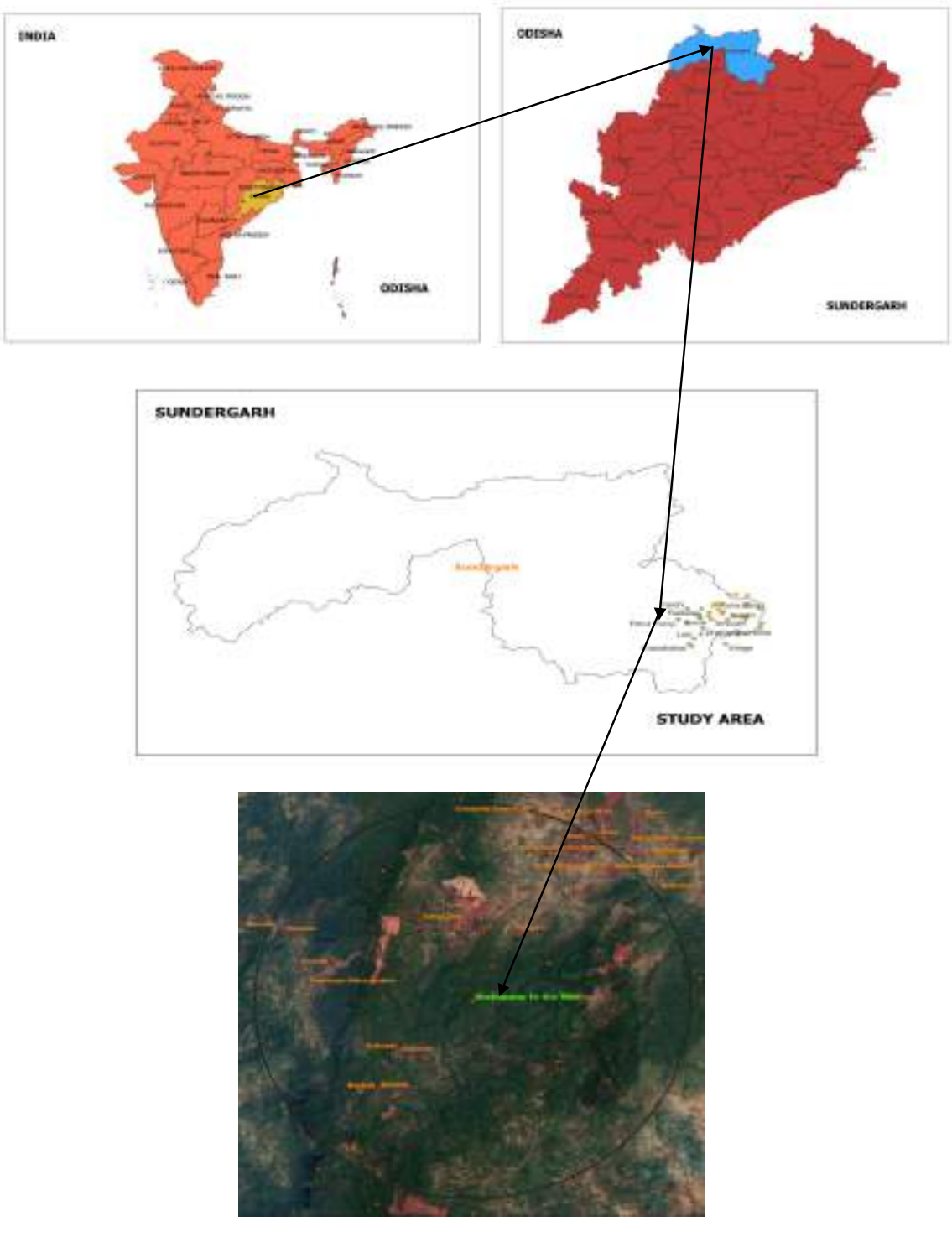


Fig 1.1: Location Map of Dholta Pahar Fe Ore Mine, Odisha

1.2. Scope of the study

The scope of study includes hydrological study around mine and providing certificated report along with providing guidance on techno-legal aspects and compliance for obtaining NOC for CGWA as per latest guidelines. Detailed hydro geological investigations within core and buffer zones (10km radius study area) of Dholta Pahar Fe Ore Block leased to M/S. M/S. Kashvi Power and Steel Pvt. Ltd. Bhubaneswar and assessment of impact of mining on groundwater regime in the study area which covers parts of Koira Tehsil of Sundergarh district, Odisha. As the mine is generating no water discharge and only 97 KLD will be extracted from ground water for mine use, thus groundwater modeling is not required along with impact assessment report for this case as per the CGWA guideline.

1.3. Project description

M/S. Kashvi Power and Steel Pvt. Ltd, Bhubaneswar is a registered firm under Minerals (Development and Regulation) ACT, 1957 and The Mineral (Auction) Rules, 2015, Govt of Odisha. Dholtapahar Fe Ore Block located in Koira Tehsil of Sundargarh district of Odisha. The IBM company number is IBM/7815/2011. The total lease area of Dholtapahar Fe ore block is 60.508 ha. As part of the statutory clearance, the Mining Plan and Progressive Mine Closure Plan is prepared under Rule 16(1) of MCR, 2016 and Rule 23 of MCDR, 2017 respectively for a period of 5 years from the date of opening of the mine for grant of Mining Lease in favor of M/S. Kashvi Power and Steel Pvt. Ltd. The registered office is situated at State of Maharashtra (Mumbai) having is registered office at 503, 5th floor, Greenland Apartment, Building no.3, JB Nagar, Andheri East, Mumbai- 400059, Maharashtra to carry on all or any of the business as manufacturers, buyers, sellers, suppliers, traders, exporters, minerals, metals etc. M/s Kashvi Power & Steel pvt Ltd is a part of Kashvi group and one of the growing company in Odisha. Kashvi Power & Steel Private Limited operates as a manufacturer of sponge iron, billet and ingots and exporter of minerals. Iron ore produced from the Dholta Pahar block will mostly be utilized in their sponge iron plant. However, as per the market demand, part of the iron ore may be sold to the consumers. The mine will be developed by opencast mining method with mechanized means deploying machinery like wagon drill machine, rock breaker, hydraulic / diesel operated shovel, dumper/tipper etc. During the plan period, it has been proposed to produce2.0 MTPA iron ore per annum.

Location

M/s Kashvi Power & Steel pvt Ltd is located in Dengula Village, Koira Tehsil of Sundargarh District, Odisha. Dengula village is located in north east part of Sundergarh district. The study area falls under survey of India toposheet no F45N1N and F45N5N. Taldihi village is 1.5 km away from the study area. Nearest railway station is Barsuan which is 23 km away from the lease area. The lease area of mine is not located within 10km radius of National Park /Wild Life

Sanctuary / Protected area and don't falls under Coastal Regulation Zone (CRZ). Many shallow depth open cast pits mine are present in the study area.

Fig 1.2: Google Image showing Dholtapahar mine lease Pillars location

1.4. Land use and Land cover (LULC) change in the study area

The total lease area of the proposed Dholtapahar Fe ore block is 60.508 ha (605080 m²). The mine is situated in outer part of the Dengula village surrounded by hills and forest area. The land use of the mining area is given in Table no 1.1 and the percentage has been represented through a pie diagram in Fig 1.2. The nearest village is Taldihi located 1.5 km away from Dholtapahar Fe ore block. Around 40 villages are located under 10 km radius zone of the study area. (Annexure-1)

Comparison of LULC during 2017 and 2021 within the 10 kms radius of mine area show marginal changes in agriculture use, forest cover, built up area, as shown in figs and tables 1.1 & 1.2, however area under water body has increased from 5.062 ha to 5.900 ha due to accumulation of water into some abandon mine pit sand due to construction of water conservation structures in the area.

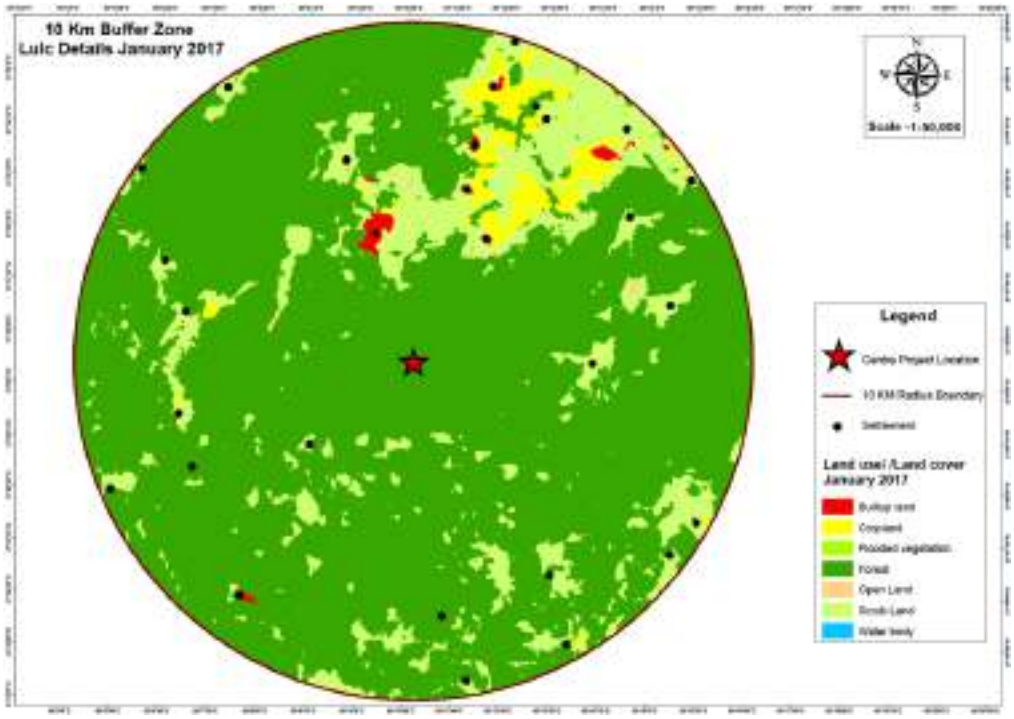


Fig 1.3: Map showing LULC of Dholtapahar Fe Ore Mine of 10km buffer zone (Jan 2017)

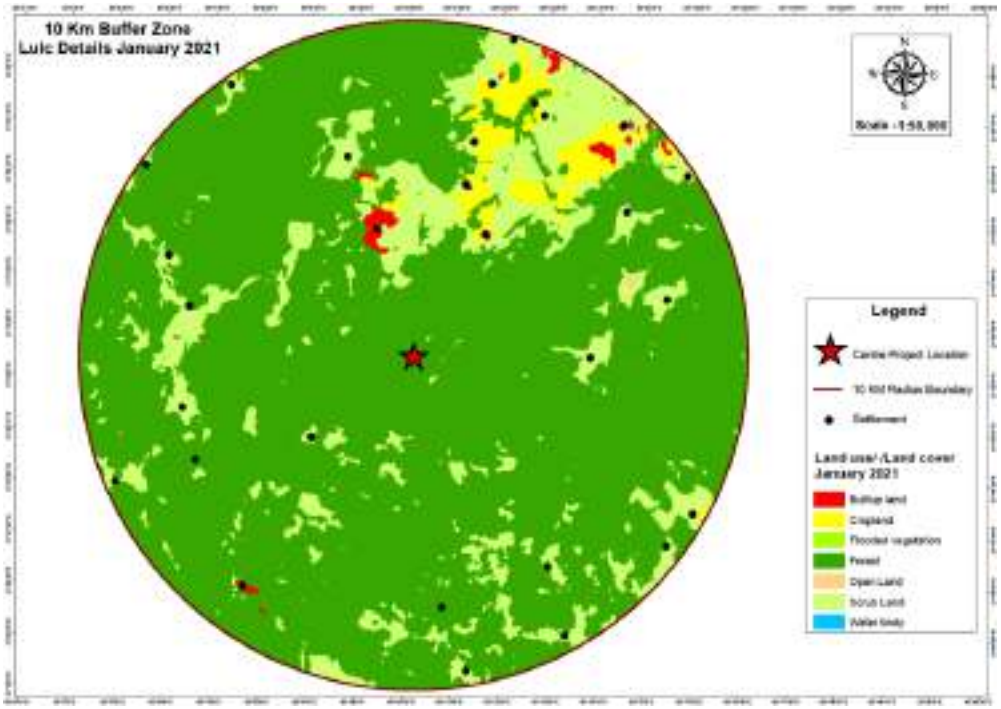


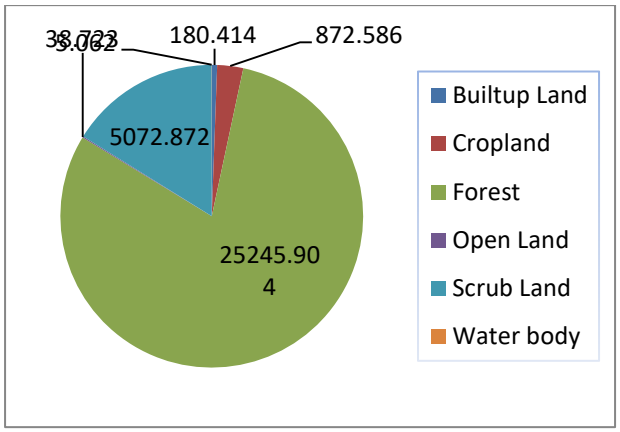
Fig 1.4: Map showing LULC of Dholtapahar Fe Ore Mine of 10km buffer zone (Jan 2021)

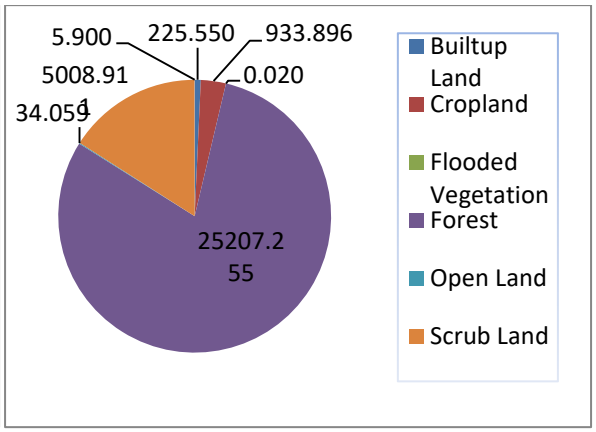
Table 1.1: LULC 2017 of study area

Sl.no	LULC Type 2017	Area(Ha)
1	Builtup Land	180.414
2	Cropland	872.586
3	Forest	25245.904
4	Open Land	38.723
5	Scrub Land	5072.872
6	Water body	5.062
Total Area(10km Buffer Zone)		**31415.560**

Table 1.2 LULC 2021 of study area

Sl.no	LULC Type 2021	Area(Ha)
1	Builtup Land	225.550
2	Cropland	933.896
3	Flooded Vegetation	0.020
4	Forest	25207.255
5	Open Land	34.059
6	Scrub Land	5008.911
7	Water bodies	5.900
Total Area(10km Buffer Zone)		**31415.591**





1.5. Topography and Drainage

Dholtapahar block is a part of Koira group of upper Shale formation. Study area having steep rising hills with intervening steep gorge and narrow valley. The geomorphic sub-units like the pediments, pediplains, buried pediments, valley fills, and lineaments are the predominant in the hard rock areas in study area. The highest elevation is 825m amsl and lowest elevation is 550m amsl (Fig 1.5 &1.6).

Study area is covered with different hills with intervening intermontane valleys, isolated hillocks and flat to gently undulating plains. The area is drained by IB and Brahmani River and its tributaries. The easterly flowing Sankh and westerly flowing Koel River join at Vedavyas near Rourkela to form the Brahmani River. The river, IB a tributary of Mahanadi

controls the drainage of the western parts of the district. The drainage pattern of the area is dendritic (Fig: 1.7).

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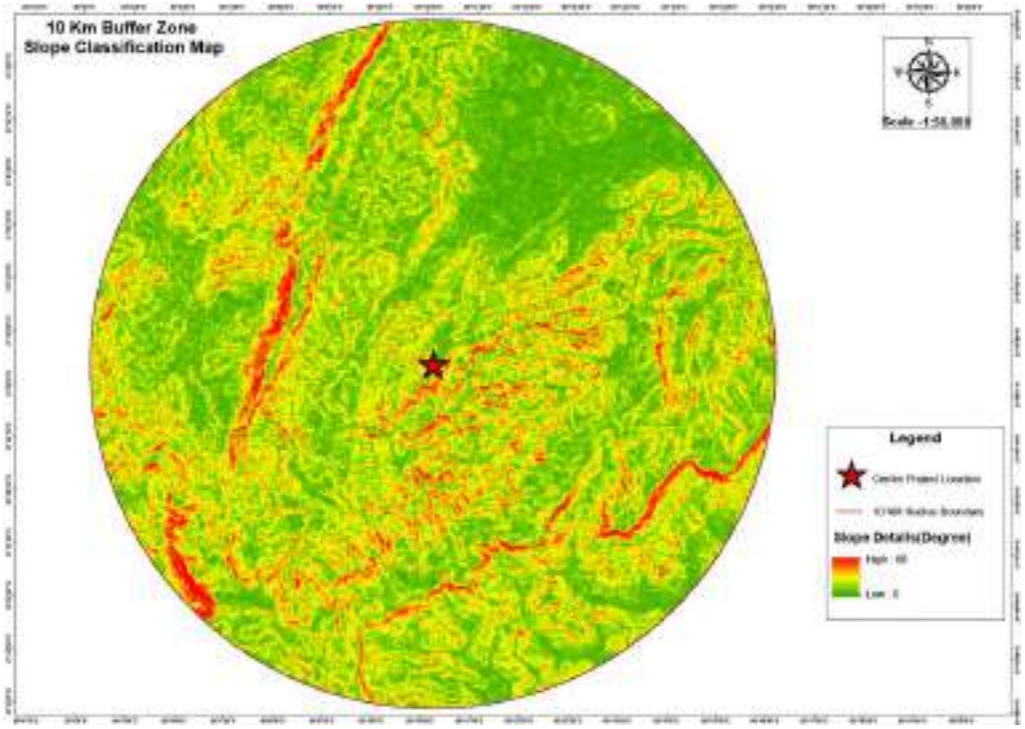


Fig 1.5: Slope map in 10km buffer zone

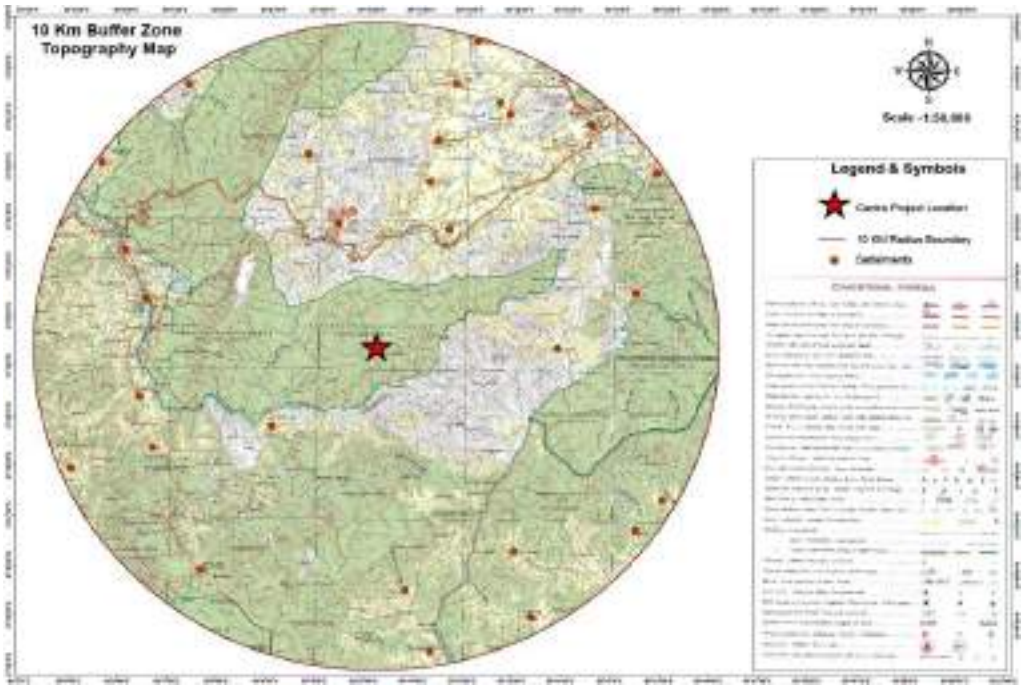


Fig 1.6: Topography Map of 10km buffer zone.

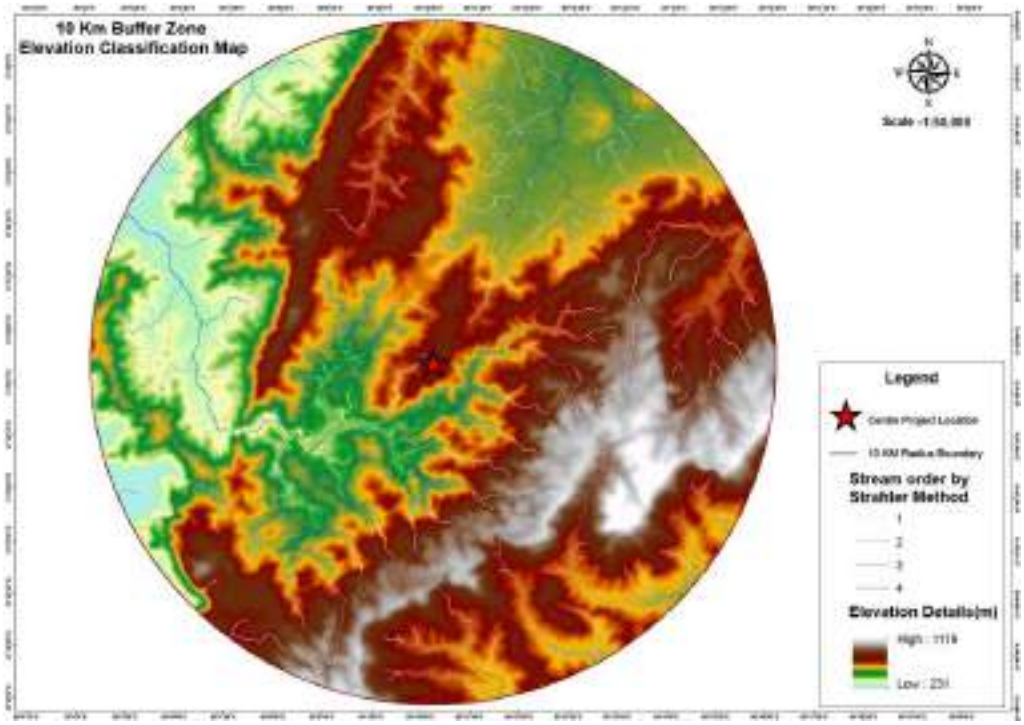


Fig 1.7: Digital elevation map in 10km buffer zone.

2. Groundwater Situations

Sundergarh district is North Western part of Odisha state. Sundergarh is recognized as an industrial district in the map of Odisha. Steel Plant, Fertilizer plant and Cement factory. Ferro Vanadium Plant. Machine building factory, Glass and China clay factory and Spinning mills are some of the major industry of this district. Large part of the study area belongs to Dengula Village, Koira Tehsil of Sundargarh District, Odisha. Ground water is the main source of drinking as well as industrial and domestic purpose. However, the requirement of water in irrigation and agriculture is fulfilled mainly by river, canals, as well as by rainwater. The rainwater also is the main source for recharge of groundwater of the area. The following major subtopics that are covered in this particular chapter are:

2.1 Geology and Geomorphology
2.2 Climate and Rainfall pattern
2.3 Groundwater regime monitoring
2.4. Long term groundwater trend
2.4 Groundwater resources
2.5 Groundwater quality

2.1 Geology and Geomorphology

2.1.1. Regional Geology

Sundergarh district is rich in Iron ore, limestone, manganese, dolomite, and fire clay. Banded Iron Formation (BIF) and Iron ore deposit occupy three distinct provinces surrounding the North Odisha Iron Ore Craton (NOIOC). They are Bonai-Keonjhar belt in the western side of the Craton, Badampahar Gorumahisani- Suleipat belt in the eastern flank and Daitari-Tomka belt in the southern side of the Craton. All of these three belts having best preserved basin of Precambrian age that form Iron Ore Super Group (IOSG) of Odisha. Sundergarh district lies under Western flank by the Bonai –Keonjhar (BK) belt forming U shaped synclinorium which is known as the Horseshoe belt. Iron Ore Super Group (IOSG) Odisha, rock assemblages is belong to Singhbhum – North Odisha Iron Ore Craton. There are three or more Iron Ore Group existing in the IOSG such as Badampahar Group, Noamundi Group and Koira Group. These groups are separated by unconformity, different metamorphic grade, distinct sedimentary and igneous assemblages and ore types (Fig: 2.1).

The Mayurbhanj granite occurring along the eastern fringe of the Singhbhum granite was dated to be 3100Ma. The A type Mayurbhanj Granite Pluton (3.09Ga) occurring along the eastern margin of the Singhbhum – Odisha Craton, eastern India, represent the final phase of acid plutonism in this crustal block of Archaean age.

I. BIF-1: Badampahar – Gorumahisani – Sulpet Belt

BIF-1 comprising of iron formation of Badampahar Gorumahisani – Sulpet (BGS) Belt. The litho assemblage of this oldest Iron Ore Group consists of banded cherty quartzite, tremolite- actinolite schist and fuchsite quartzite. The Badam Quartzite is well exposed in the western side of BGS. Banded magnetite quartzite is the dominant litho unit in the BIF-1. The major mineral constituents are Magnetite, martite, hematite, specularite, goethite, grunerite, and quartz. The BIF-1 has suffered amphibolites facies of metamorphism.

II. BIF – II: Daitari- Tomka Belt

The BIF-II lying in the southern portion of the North Odisha Iron Ore Craton is confirmed to Daitari – Tomka belt. It is underlain and overlain by Badampahar quartzite and Dhanjori quartzite. The litho assemblage of this belt consists of banded magnetite/hematite quartzite, banded magnetite/hematite jasper, quartz sericite schist, phyllite, slate and banded chert. The rocks of BIF –II attain green schist facies of metamorphism.

III. BIF – III: Bonai- Keonjhar Belt:

BIF-III is a U- shaped pattern in the western flank of the NOIOC that rests over the Dhanjori Quartzite. The litho association of this area forms the youngest Iron Ore Group comprising of banded hematite jasper, banded hematite quartz/cherty, banded shale, banded manganese formation and ferruginous shale. The banded iron formation consist of predominantly iron oxide mineral such as hematite, martite, specularite, and

magnetite. The litho assemblage of this youngest iron ore belt is unmetamorphosed and lack of intrusive Fig (2.2).

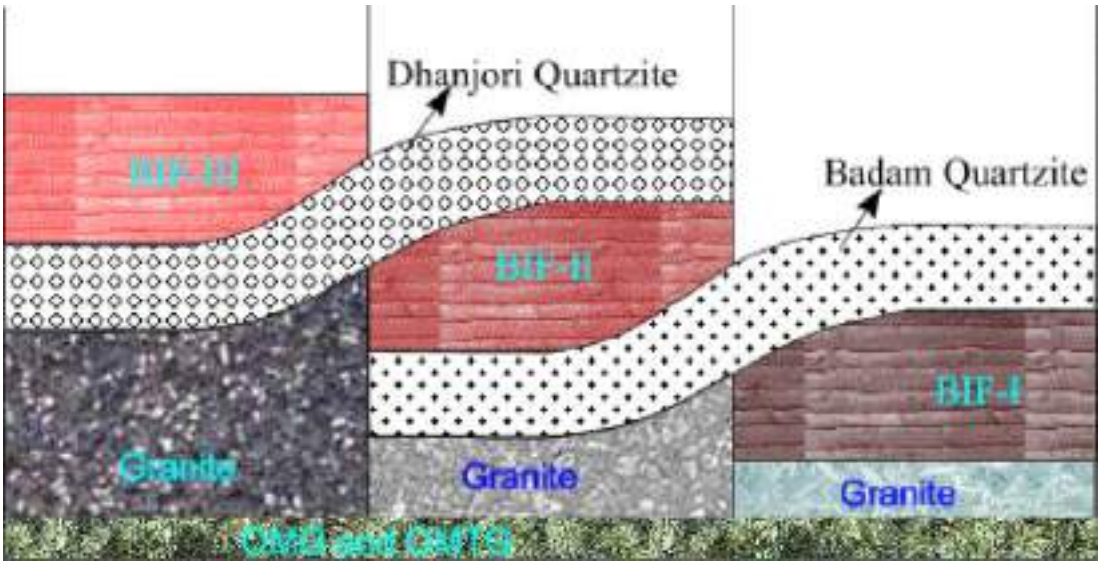


Fig 2.1: Schematic diagram of stratigraphic setting of three BIF of IOSG (Beura et al.2016

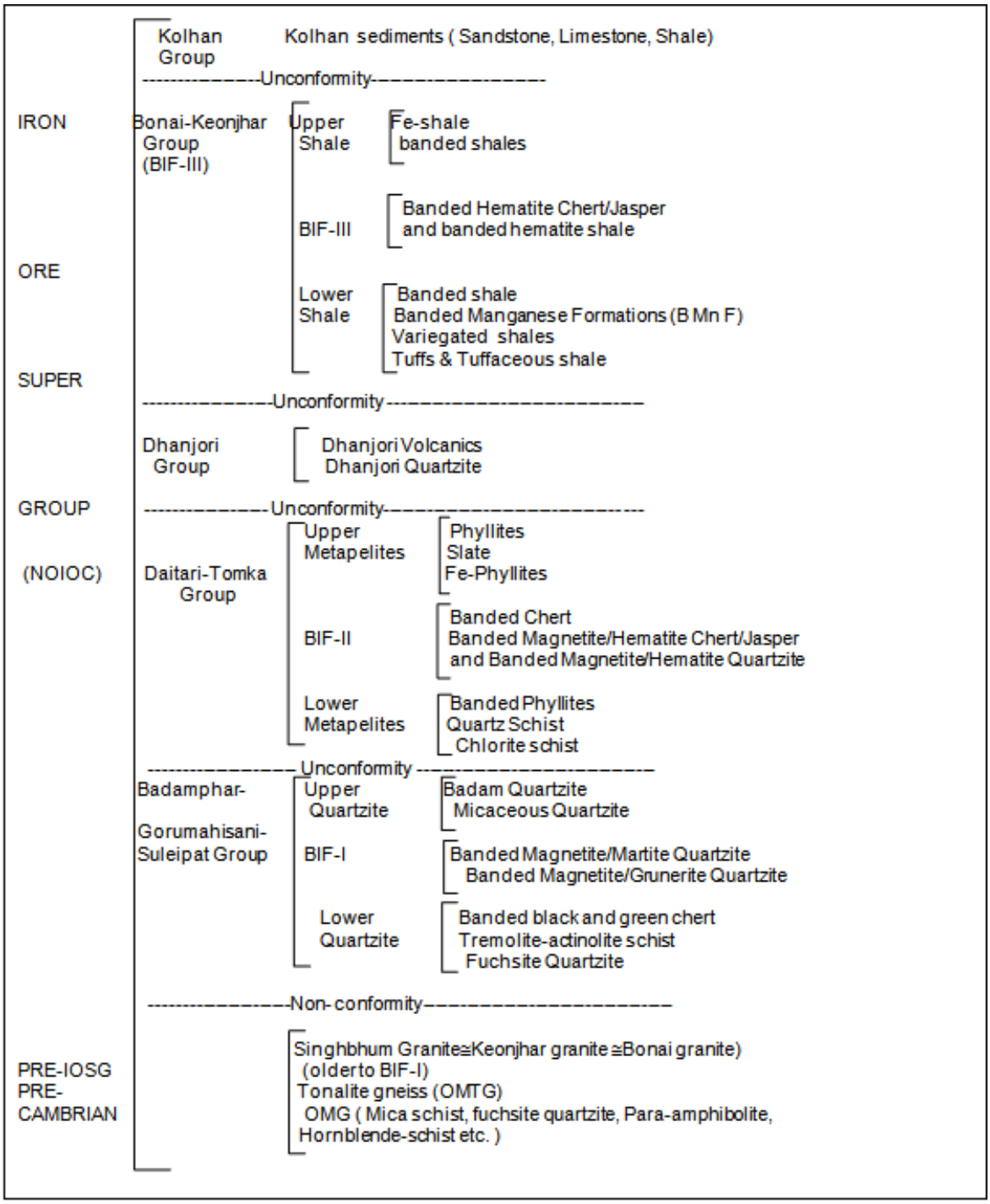


Fig 2.2: Stratigraphic Succession of Iron Ore Super Group of Odisha (Beura et al.2016).

2.1.1. Local Geology

The study area is occupied by the rock of Koira group Table (2.1). This belt is 60km long and 25 km wide extending from south of Malangtoli in Keonjhar district up to Chakra Dhrampurin West Singhbhum district (Jharkhand). The western syncline known as Koira syncline, due to steep dip and overturned nature of its limb form a deeper basin with thick sequence of younger shales in the core region. On the other hand, the eastern syncline known as Bamberi syncline is a shallower basin and exposes younger litho members within the core region as outliers. The Upper shale unit within the Koira syncline is more or less continuous. The general strike of the beddings in N100W- S100E direction with occasional swing to N300E-S300W, having 20° - 40° dip towards west in the area. The area under investigation lies within the Upper Shale Formation of the Koira group described by Murthy & Acharya (19975)

Table 2.1: Startigraphy of Koira Group in Sundergarh district, Odisha

Soil Laterite		
Koira Group	Upper Shale Formation	Shale's of different color like purple, yellow with inter beds of Iron ore
	Banded Iron Formation	Coarsely banded BHJ followed up by finely banded BHJ and iron ore in the eastern block.

Dholta Pahar Iron ore Block of M/S. Kashvi Power and Steel Pvt. Ltd is belonging to Singhbhum iron ore series and main rock type in the study area are Laterite, Hematite, and Shale. Geologically, the area is underlain by Pre – Cambrian crystalline rocks like Granite, Granitic Gneiss, Banded Hematite Jasper, Quartzite, Slate, Phyllite, and Mica Schist.

Laterite

Laterites are observed in the study area including ML area that has been the resulted from a process of residual weathering. Laterite has been developed mostly over the shale unit or low grade iron ores of the area. The shale rich in alumina has given rise to aluminous laterite and those rich in iron have developed ferruginous laterites. Ferruginous laterite occupies most of the high lands in the vicinity of iron ore of central ridge while aluminous laterite occurs in the extreme east of the area.

Shale

Western side study area has occupied with fine laminated rock having different shades of colors ranging from brownish to purple grey. Different colors of the Shale are largely dependent of minerals compositions. It is mostly composed of clayey micaceous minerals, with lenses of chert.

Iron Ore

Iron ore formation are economically important meta sedimentary rocks that occur most commonly in Precambrain sedimentary succession Based on surface exposures and sub-surface geology 4 (four) types of iron ore are recorded in the explored block.(Fig 2.1).These are Hard Laminated Ore (HLO), Soft Laminated Ore (SLO), blue dust (powdery ore), lateritic ore and float ores. . The general strike of the beddings in N100W- S100Edirection with occasional swing to N300E-S300W, having 20° - 40° dip towards west in the study area

Geomorphology & Soil Type

Geomorphology: The district has varied geomorphological features. The geomorphic units are (I) Plain (ii)Deep Buried Pediment (iii) Shallow buried pediment (iv) Intermontane valley (v) Inselberg, (vi) Mesa & Butte, (vii) Residual Hills, (viii) Intermontane Valleys, (ix) Structural hills. The soil characteristics of the district show wide variation depending upon their occurrence, physical and chemical properties. The soil of the district is broadly grouped into (I) Alfisols (II) Ultisols (CGWB Report).

I. Alfisoil and Red Soil

The study area is covered with red sandy soils and red loamy soils. These soils predominantly occupy high and medium land throughout the Sundargarh district. The characteristics feature of Red soil is porous and fragile in structure. These are usually deficient in nitrogen, phosphate, organic matter and lime. These soils are suitable for cultivation of paddy and other crops.

II. Ultisoils

The ultisols comprises mainly of lateritic soils and red and yellow soils. These soils are mildly acidic in nature and deficient in nitrogen, phosphorous and potassium and organic matters. Soils of the district are generally having average to good fertility status. All common types of crops can be grown in the district.

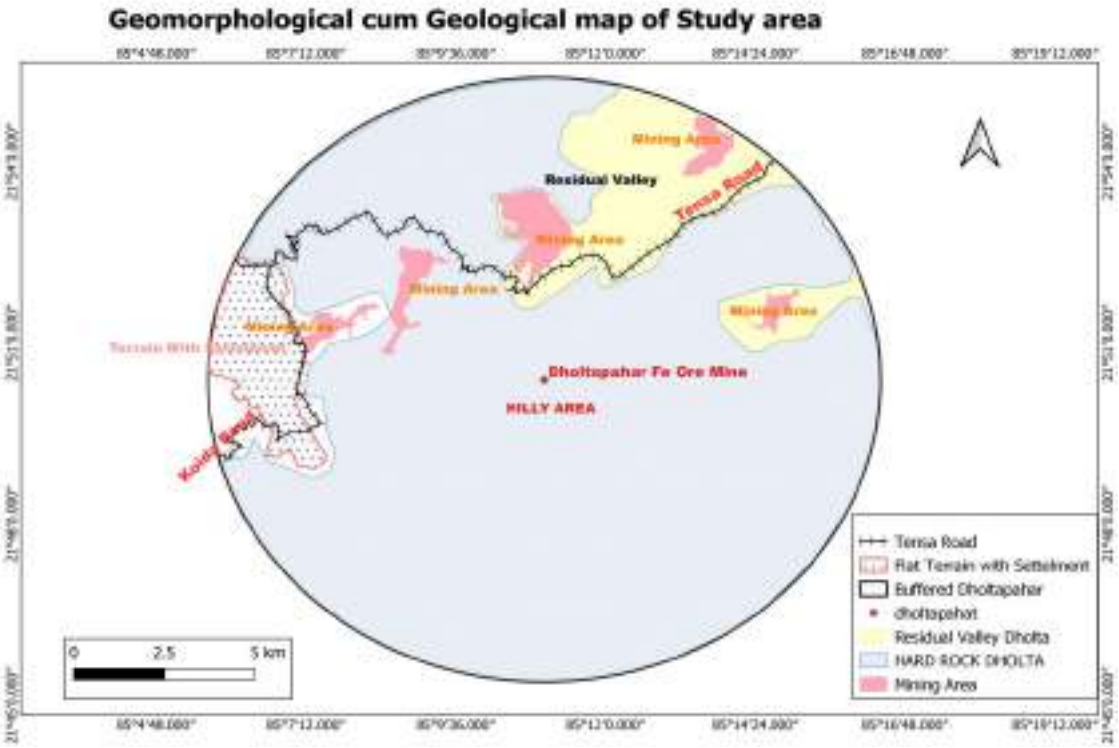


Fig 2.3: Geomorphological cum Geology map of Dholta Pahar Fe Mine

2.2. Climate and Rainfall pattern

The climate of the district is sub tropical climate characterized with hot and dry summer, cold winter and erratic in rainfall. The winter season extends from November to end of February, which is followed by summer season from March to the middle of June, and rainy season from middle of June to middle of October. During summer months the maximum temperature rises up to 43° C and May is the hottest month. December is the coldest month of the year when the average daily temperature drops down to 8° C. Relative humidity is around 60-70% throughout the year. The highest and lowest monthly mean relative humidity so far recorded is 97% (Dec) and 26% (April). The annual rainfall of last decade is given in Table (2.2).

Table 2.2 Decadal Rainfall in Sundergarh District (Source: WRIS online portal) 2011-2020

Year	Actual Rainfall (mm)	Deviation (%)	Year	Actual Rainfall (mm)	Deviation (%)	Average Rainfall (mm)
2011	1788.35	20.87	2016	1098.51	-28.82	1415.126
2012	1435.18	1.39	2017	1323.91	-6.8	
2013	1537.77	7.97	2018	1396.59	-1.32	
2014	1335.09	-5.99	2019	1387.02	-2.02	
2015	1286.6	-9.9	2020	1562.24	9.4	

2.3 Ground water regime monitoring:

The study area comprises 10km radius zone in Dholta Pahar iron ore Block located in Koira Tehsil of Sundargarh district of Odisha. Detailed hydrogeological study of both core and buffer zone of mine area is carried out. The hydrogeological condition varied from place to place due to different litho unit of aquifer. The hydrogeological units of the study area are broadly categorized into two groups namely.

1. Consolidated formations.
2. Unconsolidated formations

1. Consolidated formations

The study area is occupied by the consolidated formations comprising of Precambrian metasediments of Gangpur series and Iron ore series and also granite gneiss, metasediments like amphibolite, epidiorite etc. Ground water is stored mainly in the secondary porosity resulting from weathering and fracturing of the rocks. Ground water occurs under confined to semi-confined condition in the deeper fractured zones. Water yielding capacity is mainly depend on the extent of fracture, depth, opening and size of fracture. Mica schist, quartzite and phyllite are the formation in the study area.

2. Unconsolidated Formation

Laterite and alluvium are the main constituents of unconsolidated formation in the study area. The laterite is belonging to sub recent to recent age having high porosity. It is the good aquifer for dug well in study area. The alluvium soils are also the potential aquifers due to their high degree of porosity and permeability but are only limited in their occurrence.

Table2.3: Well inventory data of Dug wells of Core and buffer zone of Dholta Pahar Fe ore Mine
(Lat & Long data are as per GPS reading, DO, EC, pH, and TDS measured on site using calibrated Hanna portable equipment during (April 2022).

Sr no.	Location	Latitude	Longitude	Elevation (m)	EC (mS)	pH	TDS(ppt)	Depth of the well (m)	Water Level(m)	DO (mg/l)
1	Dengura	21.869327	85.200782	608.26	60	6.5	30	49.5	28.3	6.8
2	Pond	21.868889	85.187991	619.85	20	5.9	10		0.5	1.38
3	Dholta Hand	21.870424	85.188821	620.56	35	6.7	15			4.6
4	Salkunda	21.819241	85.153618	449.78	340	6.7	170			2.59
5	Salkunda	21.818068	85.153606	431.39	260	6.7	140	55.3	22.9	6.08
6	Pond	21.876188	85.196579	572.02	650	7.3	360			4.73
7	Pit	21.878495	85.197651	653	20	6.3	10		0.5	4.24
Buffer Zone										
8	Tumsa Zero	21.873844	85.161773	723.31	70	6.9	40			4.25
9	Barsuan	21.870688	85.103978	366.28	560	6.9	290			2.42
10	Rainkela	21.868772	85.10608	370.59	300	7.1	160	69.69	27.27	3.51
11	Saskela	21.854939	85.111915	373.46	290	6.7	150			1.63
12	Panchayat Office Saskela	21.846708	85.116167	378.31	290	6.9	140			2.66
13	Salkunda	21.819241	85.153618	449.78	340	6.7	170			2.59
14	Salkunda	21.818068	85.153606	431.39	260	6.7	140	55.5	22.9	6.08

15	Comanado Steel Plant	21.918085	85.209714	573.27						5.94
16	Comanado Steel Plant	21.919268	85.208213	576.61	60	6.7	30		20.5	2.17
17	Radhe Krishna Mandir	21.895306	85.240408	588.94	70	6.6	30			2.47
18	Radhe Krishna Mandir	21.895102	85.241608	589.1	30	6.4	20	60.6	26.2	5.19
19	Koira, near bus stand	21.906956	85.248041	560.57	280	6.9	150			2.72
20	Koira, near Police Station	21.907018	85.239381	561.55	60	7.1	20	60.6	21.21	6.1
21	Koida Petrol Pump	21.909395	85.232136	573.13	120	6.8	60	10.9	6.4	5.13
22	Koida Chowk	21.913434	85.224078		60	6.5	25			5.5
23	Koira raod	21.905473	85.220677	552.92	70	6.1	40			3.6
24	Koira	21.909781	85.230875	558.29	120	6.8	60		18.5	5.16
25	Bhatuda	21.802585	85.144547	446.31	200	7.2	100			6.1
26	Bhatuda	21.802922	85.144842	449.3	160	7.3	80			6.5

2.3.1 Detailed study of core and buffer zone

As per the field investigation it has been observed that the main source of water is from cannel and groundwater. Groundwater is withdrawal from bore well as well as from hand pump (Fig-2.4). Most of dug well having water level from 3.7 to 7.5m in pre monsoon period. Total depth of dug well is from 9 to 12m. It has been observed that the bore wells are often from 16 to 30m in depth. Ground water is lying in weathered part of hard rock aquifer (2.5). Hard rock comprises Precambrian met sediments like Mica schist, quartzite, phyllite, conglomerate along with granite. The movement of the ground water in deeper rocks is controlled by the nature, size opening and continuity of joints & fracture present in them. Wells in hard rock generally yield 50 to 70 m3 /day of all the rock types. Schist, phyllite and their variants form very poor aquifers yielding 10 to 30 m3 /day for heavy drawdown. Well inventory of study

area (Fig:2.5) in Pre Monsoon (April 2022) period showing ground water level varies within the range from 3.7 m to 36.3m bgl (Table 2.3)


Fig 2.4: Hand pump and bore well in core zone of Dholta Pahar block

2.3.1. Aquifer Characteristics

The study area both core and buffer zone having largely single aquifer of unconfined nature, developed on the weathered part of rocks of Koira group and laterites. The hills top area is devoid of any aquifer. Aquifers are developed only in the low lying area and valley parts of the study area.

The discharge varies from 10 to 70m3/day depending on lithology of aquifer. The transmissivity storability is mainly low and drawdown is moderately high to high. Open well having sustainable yield round the year. The area is categorized under safe zone according to the latest GWR estimation. Ambient quality of groundwater is fresh.

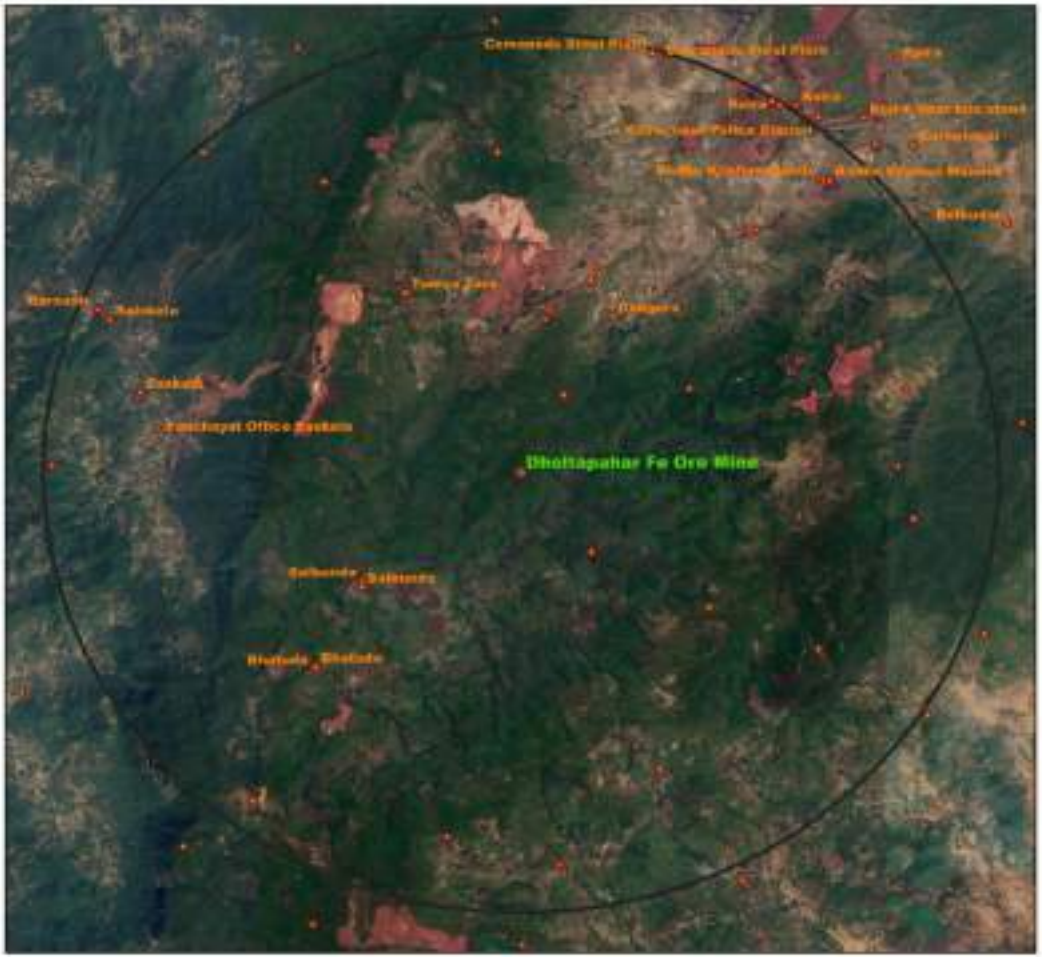


Fig2.5: Google image showing mine location and sample collection locations

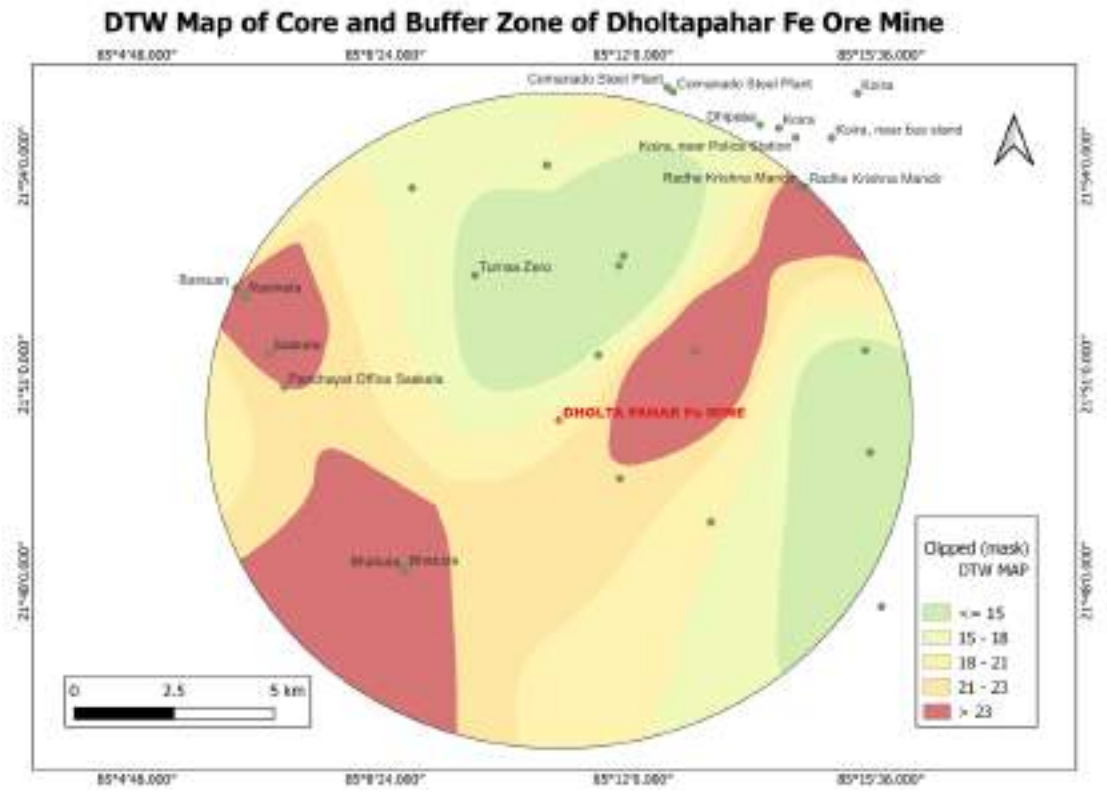


Fig 2.6: DTW map of core and buffer zone.

Groundwater Flow:

The groundwater contour map generated using the intense monitoring in core and buffer zone of mining is depicted in Fig 2.6.The map showing clear cut development of groundwater dived running through the mine area. The GW flow direction largely coincides with the surface water flow direction as shown in fig 2.7. Thus mine is on groundwater divide and any dewatering from mine will not effects significantly the flow direction of groundwater of the area.

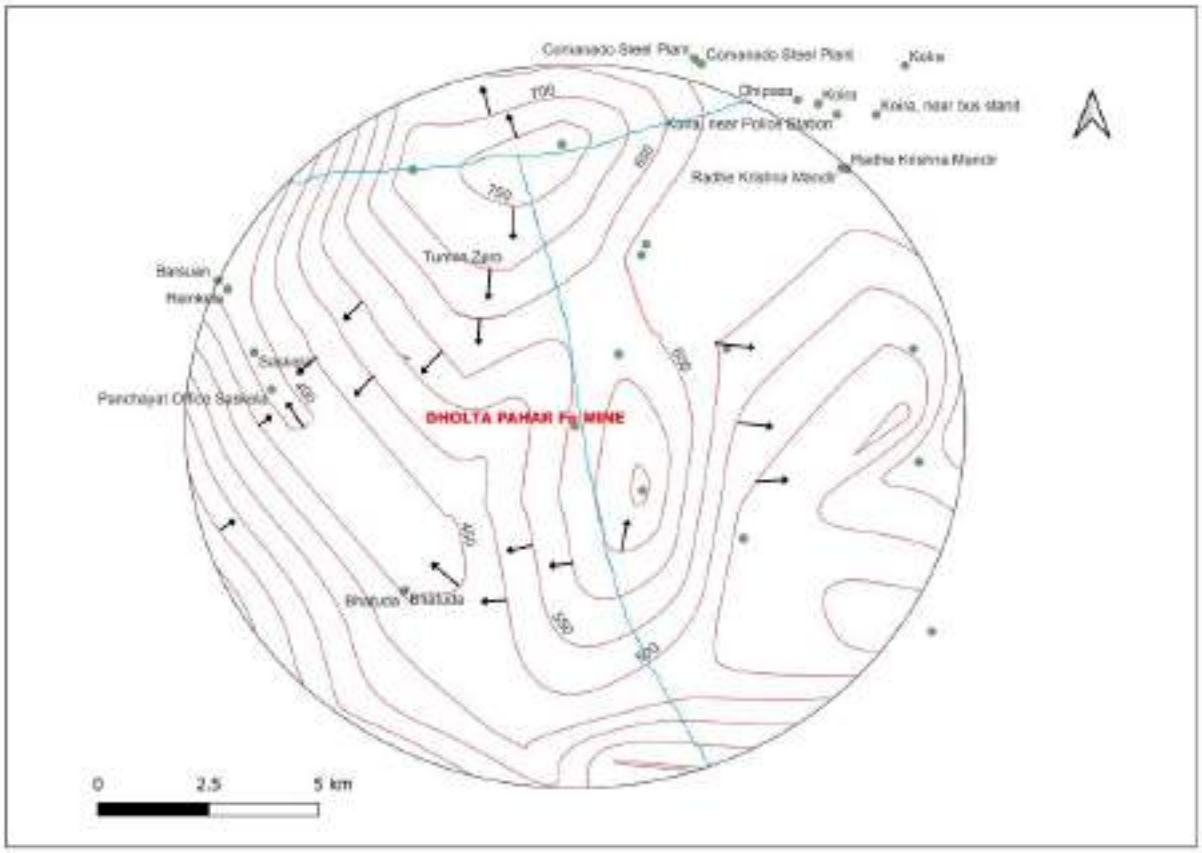


Fig 2.7: Groundwater contour map of Dholta pahar mine area

INDEX – Sky blue line shows groundwater divide, arrows indicate groundwater flow direction, values indicate groundwater elevation (m amsl), dots indicate data point used for generation of groundwater contour, buffer zone is marked by 10 km radius circle. Note the mine position is (Red dot).

2.4 Long term groundwater trend

The study area comprises 10km radius zone in Dholta Pahar block mine that largely fall under Koira tehsil, Sundergarh district, Odisha. In the core zone village the source of ground water such as bore well; hand pump and pond are used for domestic, irrigation and drinking whereout of 3 observation location of dug well, it has been observed that the water level (Pre monsoon 2022) varying from 3 to 7.5m bgl. Long term trend analysis of data obtained from WRIS shows no significant change-rise or fall as depicted in **Fig: 2.8**

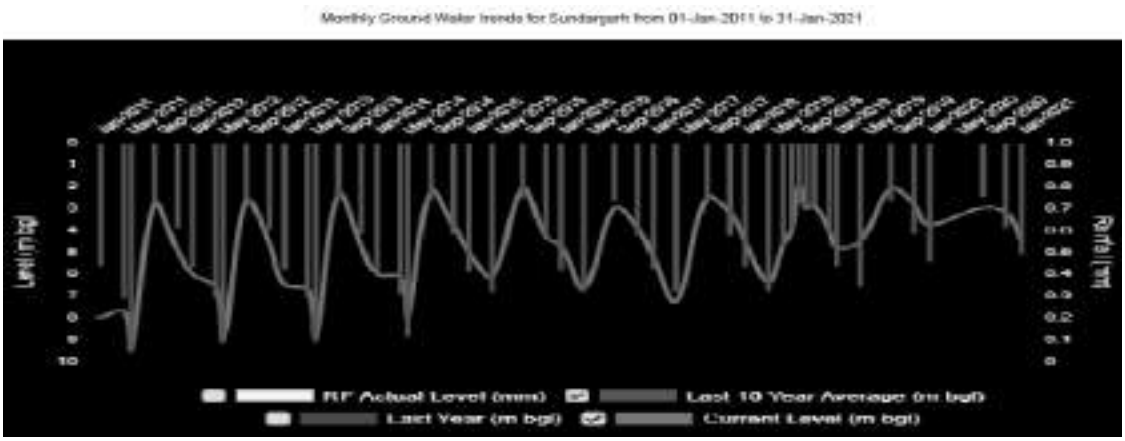


Fig 2.8: Long term well hydrograph of wells of Sundergarh district, Odisha (source: WRIS portal)

2.4.1Dynamic Groundwater Resource of study area:

The groundwater resource as estimated by CGWB (2020) is presented in the table 2.4 for Koira block of Sundargarh district Odisha and is in safe category.

Table: 2.4 Block wise Dynamic Groundwater Resources of Koira block, Sundergarh district, Odisha

	District	Block	Ground water Recharge (Ham)				Total Ground water Recharge (Hamm)	Total Natural Discharge (Ham)	Annual Extractable ground water resources (Ham)
			Monsoon Season		Non Monsoon Season				
			Recharge from Rainfall	Recharge from other sources	Recharge from Rainfall	Recharge from other sources			
1	Sundergarh	Koira	4777.33	139.58	572.73	172.14	5661.78	283.09	5378.69
	Annual Extractable Ground water Resources (Ham)	Annual Groundwater Draft (Ham)					Annual GW allocation for Domestic use as on 2025 (Ham)	Net Groundwater availability for future use (Ham)	Stage of Ground water Extraction (%)	Categorization (over exploited/ Critical/semi critical/ safe/ saline)
		Irrigation	Industrial	Domestic	Total Extraction					
2	5378.63	873.45	290.16	265.25	1428.8	304.71	3910.38	26.57	Safe	

2.5 Groundwater Quality

Based on the above study, different ground water parameters were computed, which include pH, TDS, EC, DO, Temperature. Ground water in study area is potable with pH ranging 5.9 to 7.6 and total dissolved solid (TDS) ranging from 10 to 310 ppt and EC ranging from 20 to 600 µS. (Fig 2.9 and 2.10) Groundwater quality in the study area is fresh and all major and trace elements are found within the BIS 10500 permissible limit. Thus is suitable for all domestic, industrial and irrigational use. The general parameters of groundwater in study area as analyses are given in Table 2.5.The comparison of data reveal that the area mining (Project Area) is having less TDS).

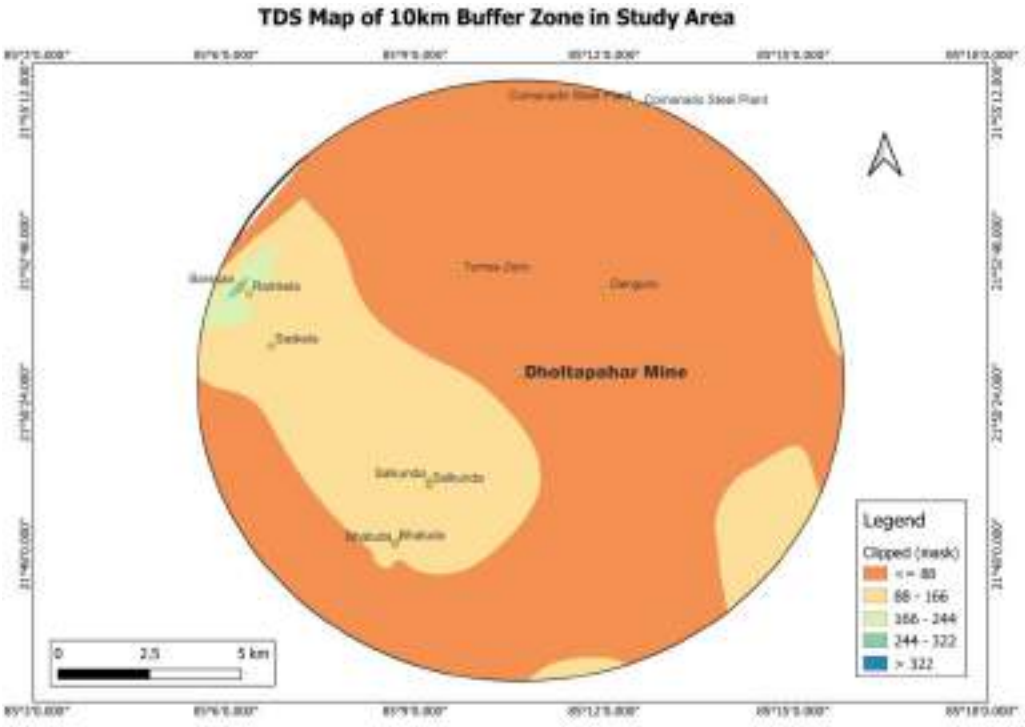


Fig 2.9: TDS map of Dholta Pahar block Fe ore mine

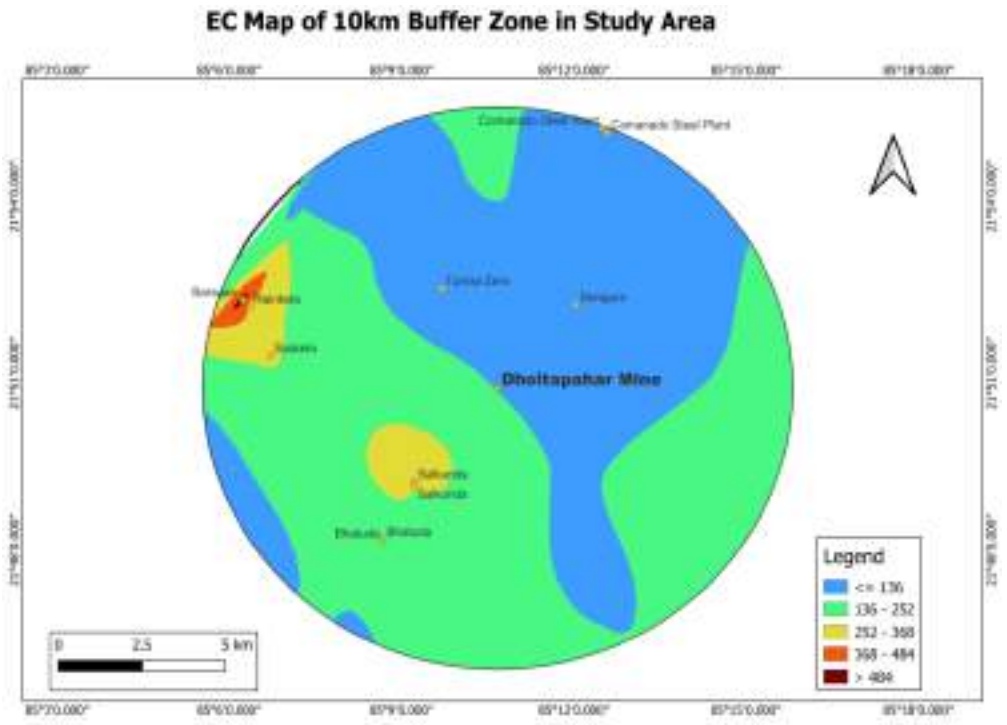


Fig 2.10: EC map of Dholta Pahar block Fe ore mine

Water Quality Data in Piper Trilinear Diagram: Different graphical methods can be adopted for representing geochemical variation which gives a better insight into the groundwater quality monitoring. One such efficient method of representation is plotting of Hill Piper Trilinear diagram in which data are plotted in two triangle fields and one diamond field. The diamond is then classified under various categories emphasizing their characteristics.

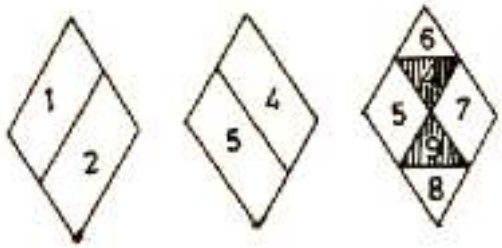


Fig2.11: Sub-divisions of the diamond field

On the basis of data collection from CGWB report (2020-2021). It has been observed that out of 63 samples are concentrated in Area 6 indicating that: Non-carbonate hardness exceeds 50% i.e., Ca + Mg - (SO4 + Cl + NO3). 50% samples are lies under area 4 representing strong acids (SO4 + Cl + NO3) exceed weak acids (CO3 + HCO3). Few samples can be noticed under Area 7: Non-carbonate alkali exceeds 50% i.e., Na + K- (SO4 + Cl + NO3).

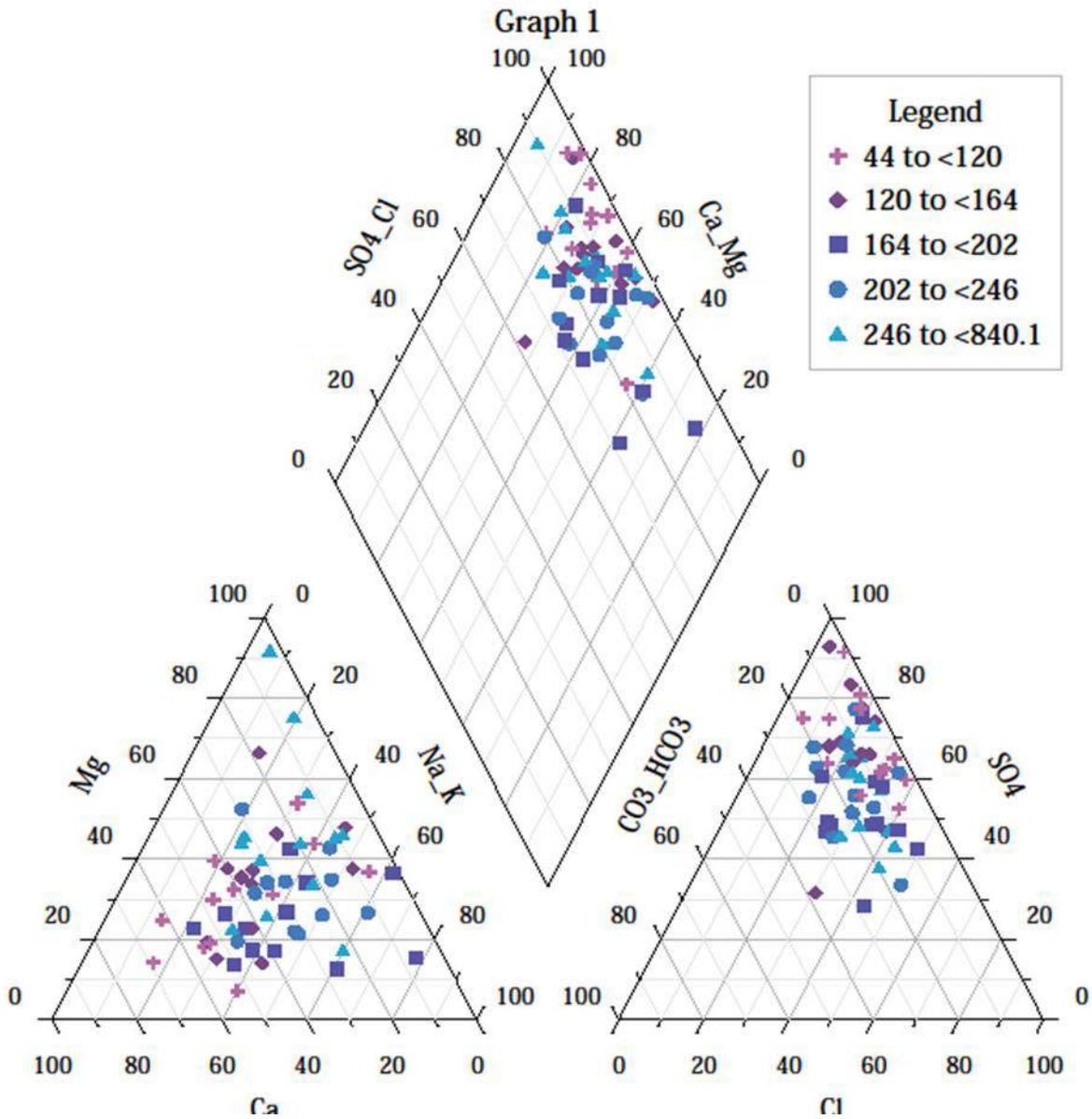


Fig2.12: **Water Quality Data in Piper Trilinear Diagram in study area**

USSL Diagram: The United States Salinity Laboratory (USSL) (1954) and Wilcox (1955) established standards for irrigation water quality classification. The Fig.7.5 is a simple scatter chart of sodium hazard (SAR) on the Y-axis versus salinity hazard (EC) on the X-axis. Using the SAR and the EC value of 41 water samples of Balaghat area determines the quality classification of the water.

Based on the EC, irrigation water can be classified into four categories; include:

I. Low-salinity water (C_1) can be used for irrigation with most crops on most soils with little likelihood that **soil salinity** will develop.

II. Medium-salinity water (C_2) can be used if a moderate amount of leaching occurs. Plants with moderate salt- tolerance can be grown in most cases without special practices for salinity control.

III. High-salinity water (C_3) cannot be used on soils, special management for salinity control may be required and plants with good salt tolerance should be selected.

IV. Very high salinity water (C_4) is not suitable for irrigation under ordinary conditions.

Sodium Adsorption Ratio: High sodium in irrigation water reduces the permeability of soil. The USSL diagram based on SAR divided to four categories included:

$$SAR = \frac{Na}{\sqrt{\frac{Ca + Mg}{2}}}$$

I. Low-sodium water (S_1) can be used for irrigation on almost all soils.

II. Medium-sodium water (S_2) will present an appreciable sodium hazard in certain fine-textured soils. This water may be used on coarse-textured or organic soils with good permeability.

III. High-sodium water (S_3) may produce harmful levels of exchangeable sodium in most soils and will require special soil management.

IV. Very high sodium water (S_4) is generally unsatisfactory for irrigation unless special action is taken, such as addition of gypsum to soil (Lyerly and Longenecker, 1957).

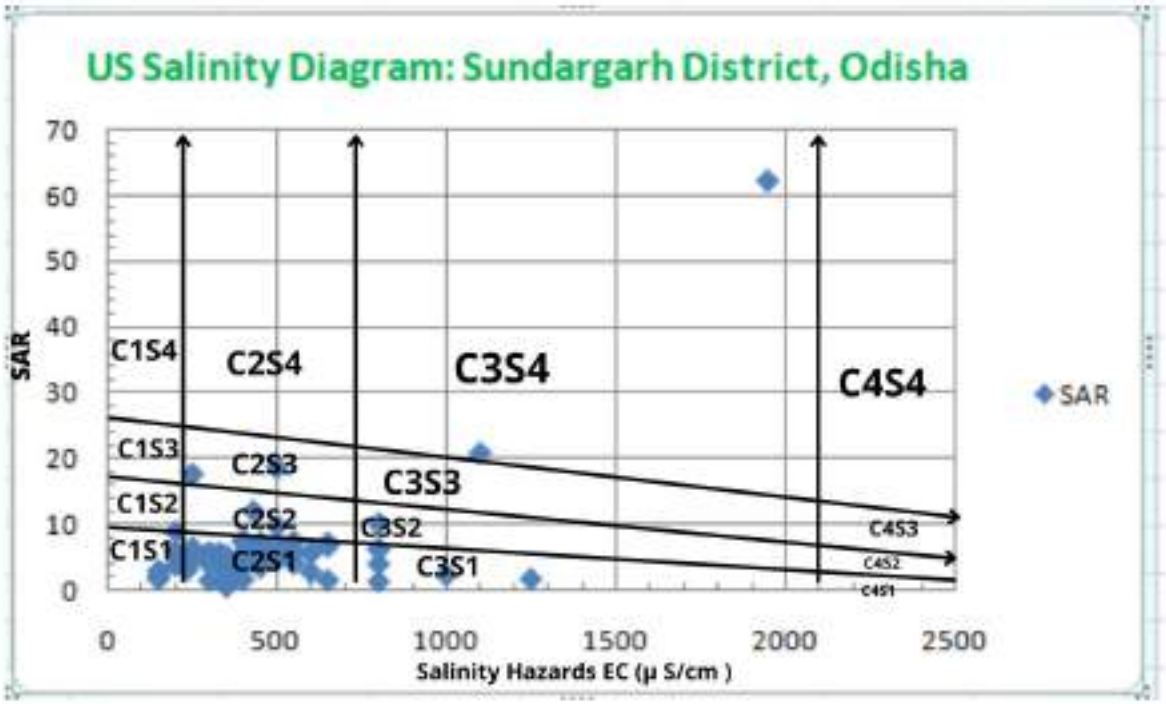


Fig 2.13: US Salinity diagram, Sundergarh district , Odisha

Data Analysis:

On the basis of data collection from CGWB report (2020-2021). It has been observed that out of 63 sample, most of the samples are concentrated under C2S1, C2S2 and C3S2 categories indicating low to medium sodium hazards with medium salinity. Out of these, few samples are scattered under C3S1 and C3S2 categories representing high salinity with low to medium sodium hazard. Few samples are scattered in C1S1 indicating low sodium hazards with low salinity.

3. Mining Plan

Government of Odisha has issued letter of Intent (copy enclosed as Annexure-III) under Rule 10(2) of Mineral Auction Rules 2015 to M/s Kashvi Power & Steel pvt Ltd for grant of Mining Lease for Dholta Pahar Block for iron ore over an area of 60.508Ha near Dengula village, Koira Tahasil of Sundargarh district of Odisha for a period of 50 years.

M/s Kashvi Power & Steel pvt Ltd is a part of Kashvi group and one of the growing company in Odisha. Kashvi Power & Steel Private Limited operates as a manufacturer of sponge iron, billet and ingots and exporter of minerals. Orissa based Kashvi group was founded by Mr. Debabrata Behera, a first generation entrepreneur. Mr Behera has more than two and half decades of experience in the business of iron ore trading and exporting, manufacturing of sponge iron, billet and ingots. Iron ore produced from the Dholta Pahar block will mostly be utilized in their sponge iron plant. However, as per the market demand, part of the iron ore may be sold to the consumers.

Table 3.1- Initial/subsequent Lease grant details

Grant	From	To	Lease deed execution date	Lease registration date
LOI issued vide no 8725/IV(B)SM-52/2021/SM,Bhubaneswar, dated 28.10.2021	Date of Execution of the Lease deed	50 Years from Date of Execution of the Lease deed	---	---

Table 3.2- Land Ownership Details

S.No.	Village	Taluka	Area (Ha)	Khasra No/ Compartment No.	Type of Land	Nature of Land
1	--	Koira	60.508	Forest Khata	Reserve Forest	Govt Land

Table 3.3- Location of Boundary Pillars –(add additional Row for subsequent pillars)

Pillar No.	Pillar Latitude *(dd:mm:ss.ss)*	Pillar Longitude *(dd:mm:ss.ss)*
1	N21°50'11.13855"	E85°10'43.73375"
2	N21°50'34.08851"	E85°10'43.53749"
3	N21°50'34.57854"	E85°11'14.26145"
4	N21°50'12.91054"	E85°11'14.63431"
5	N21°50'12.19012"	E85°10'58.24071"
6	N21°50'12.06361"	E85°10'57.81967"

Table: 3.4- Mining Plan/ Review of Mining Plan at Glance

1	Name of the lessee	M/s Kashvi Power & Steel Ltd.
2	IBM Registration no.	IBM/7815/2011
3	Address of lessee	Plot No 1234/P, Govinda Prasad, Bomikhal, Bhubaneswar

4	Name of Mine	Dholtapahar Iron Ore Block
5	Mine code	Not Obtained
6	Lease area in hects.	60.508
7	Forest area	60.508 Ha.
8	Name of Mineral	Iron Ore
9	Lease period from – to	LOI issued vide no 8725/IV(B) SM-52/2021/SM,Bhubaneswar, dated 28.10.2021 50years W.E.F date of execution of lease deed
10	Plan proposal period.	5year w.e.f date of execution of lease deed
11	Mineral Reserve(111,121&122) in tonnes	111-0
		121-0
		122- 23921613
		Total-23921613
12	Mineral Resource(211,221,222,331,332,333&334) in tonnes	211-0
		221-0
		222-0
		331-0
		332-23921613
		333-0
		334-0
		Total-23921613
13	Total (reserve resource) in tonne	23921613
14	Reserve estimation as on	Date-Date of execution of lease deed
15	Explored area in ha	G1 – 0
		G2- 60.508
		G3-0
		Explored and found Non-mineralized area – 20.008
		Un – explored area -Nil
		Total – 60.508
16	Exploration proposal Year wise No. of Bore Holes	1st year - 21nos
		2nd year – 21 nos
		3rd year – nil
		4th year – nil
		5th year - nil
17	Production proposal Rom in tonnes	1st year - 1999999
		2nd year – 1999999
		3rd year – 2000000
		4th year – 1999999
		5th year - 2000000
18	OB/Waste handling proposal CUM	1st year - 73250

		2nd year – 282550
		3rd year – 338600
		4th year – 234550
		5th year - 470700
19	Present EC permission in tonnes	Since it is a fresh lease, the lessee will obtain EC before Execution of the lease deed.
20	Present forest clearance area in ha	Since it is a fresh lease, the lessee will obtain FC before Execution of the lease deed.
21	Plantation Proposal in five years in numbers	1st year - 230
		2nd year – 230
		3rd year – 1126
		4th year – 230
		5th year - 230
		Total Plantation- 2046
22	Plantation Proposal in five years (ha)	1st year - 0.25
		2nd year – 0.25
		3rd year – 1.52
		4th year – 0.25
		5th year – 0.25
		Total Area- 2.52
23	Back filling proposal in hectares in five years(years wise)	Not Applicable
24	Check Dams numbers in five years	3nos
25	Garland drain in meters five years(years wise)	1st year - 320
		2nd year – 105
		3rd year – 0.0
		4th year – 0.0
		5th year – 0.0
26	Settling ponds (Numbers)(years wise)	1st year - 2
		2nd year – 1
		3rd year – 0
		4th year – 0
		5th year – 0
27	Total Area put to use in mining and allied activity at end of five years in ha	65.179
28	Bank Guarantee Amount Rs	Not Applicable
29	Validity pf BG up to	Not Applicable

3.1 Exploration Plan

Iron ore in the block occur as bedded stratiform deposit of regular habit with intercalations of shale and BIF, representing BHJ/BHQ/BHC. Since it is a stratiform type of regular habit, boreholes plans have been done at 200 m X 100 m grid spacing to fulfil the requirement of provisions of General Exploration of MEMC Rule-2015, accommodating the DIOP series holes drilled in 2006-08. The borehole locations are shown in the geological map of the Block. Dry core drilling was adopted by TC bits and as per driller's site report, virtually there was negligible loss in core recovery during core drilling. The core recovery has been recorded for all ore types are found to be 100%.A total of 19 vertical boreholes were drilled by rig KME-300 series& LTE-575 in the block, out of which 5 BHs were drilled during F.S 2006-08 and 14 BHs were drilled during 2017-18 for cumulative drilling meter age of 982.5 m. These boreholes are drilled at strike intervals of 200m and 100m spacing along dip direction. Depth of boreholes varies from 19.5m (BH-12) to 82.00m (BH-9).The Borehole BH-10, BH-11, BH-13 & BH-14 were shifted to 100m north of N200/ W400,74m north of N400/W400, 22m south of N500 and 50m north of S100 grid location respectively due to steep scarp sections and high gradient lines.

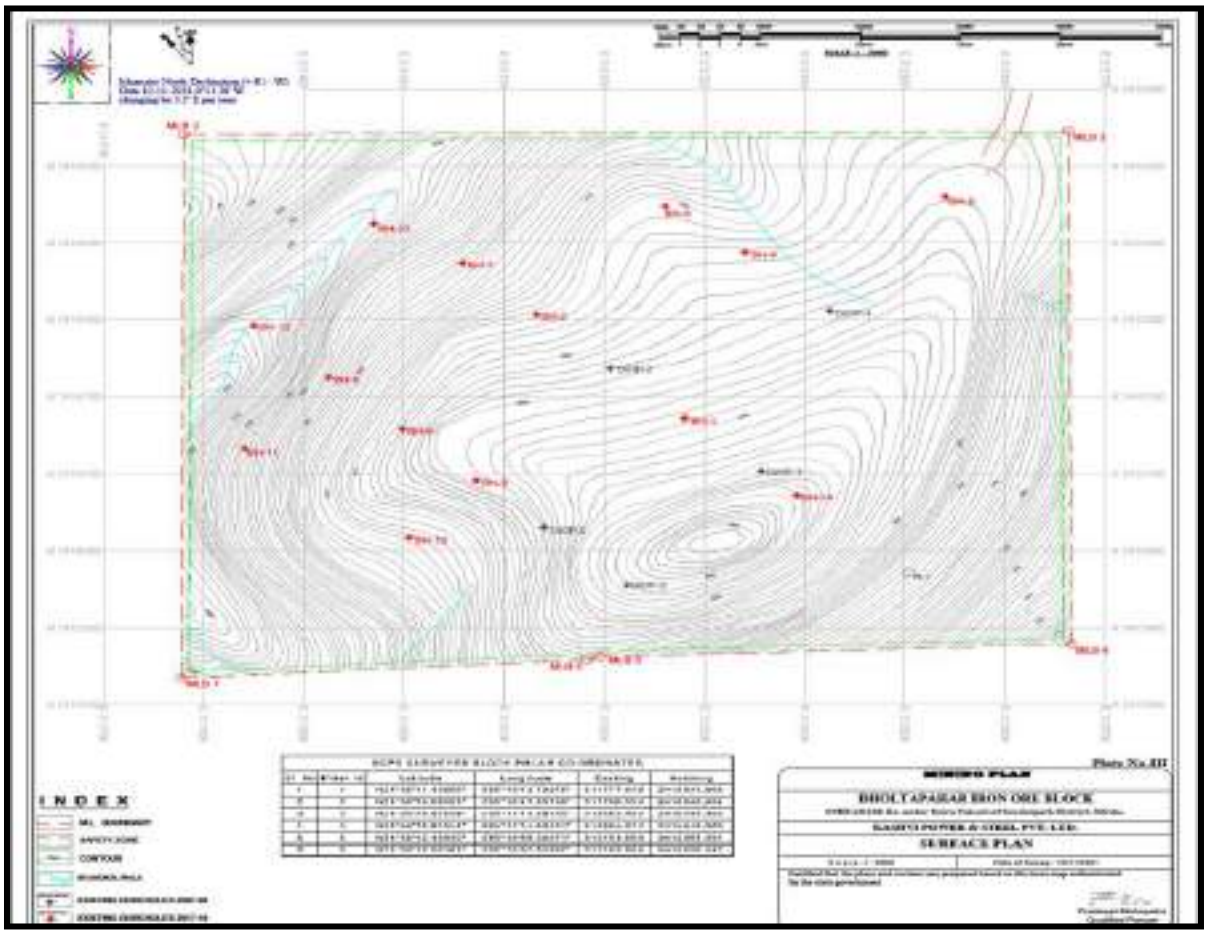


Fig. 3.1- Drill hole location

3.2.Mineralization details

The maximum thickness of ore bodies intersected at + 55% Fe cut off is 20.75 m in (BH-3) and minimum thickness is 0.6m in (BH-4) having average iron content of 61.863% Fe. The maximum thickness of low grade ore zone (45 < 55% Fe) intersected in the boreholes is 13.6m(DIOP-4) and minimum thickness of 0.7m (DIOP-1) having average iron content of 49.251%.Variegated shale and BHJ are found in the foot wall side, which limits the mineralization where as lateritised shale occurs as overburden. The ore types includes soft laminated types towards top and grades in to hard laminated while blue dust is localised in the bottom horizon. The ore bodies are often capped by laterite on surface. Though outcrops of soft laminated ore, and float ore are exposed on the surface but soft laminated ore and blue dust constitutes the bulk thickness of the ore zone as evidenced from drill cores.

3.2.1. Reserve / Resource

Table 3.5 Threshold value & Cut off Parameters

1	Threshold	45% Fe
2	Cut-off grade	55%Fe

Table 3.6 Mining Factors or Assumptions

Sl. no	Salient features	Description
1)	Method of Mining	Fully Mechanized (FM)
2)	Proposed production	2.0 Million Tones
3)	Type of ore	Lateritic Iron ore, Hard Laminated ore, Soft Laminated ore, Blue dust
4)	Proposed Means of raising	Drilling, Blasting, excavation, screening, crushing, loading etc.
5)	Proposed Bench height and width	Height- 10m Width – More than the height
6)	Proposed Stripping ratio (t/m3) (Ore: OB	1:0.28
7)	Over all slope	28^0-37.5^0
8)	Transportation ore to the stacking yard	Through dumper
9)	Nature of overburden/ interburden	Generally consists of BHJ, shale, and Laterites.
10	Drilling	110mm dia drill hole
11)	Blasting	Deep hole blasting using slurry/Emulsion, explosives & NONEL& Electric Detonator.

Table 3.6 Mineral Reserve

Classification	Code	Quantity			Grade	
		Forest	Non-Fores	Total	Forest	Non-Forest
A. Mineral Reserve		23921614	Nil	23921614	+45%Fe	Nil
1. Proved Mineral Reserve (A)	111 (In situ)	Nil	Nil	Nil	Nil	Nil
		Nil	Nil	Nil	Nil	Nil
	111(float)	Nil	Nil	Nil	Nil	Nil
		Nil	Nil	Nil	Nil	Nil
2. Probable Mineral Reserve (A)	121	Nil	Nil	Nil	Nil	Nil
3. Probable Mineral Reserve (A)	122 (In situ)	16448530	Nil	Nil	+55%Fe	Nil
		7182332	Nil	Nil	45-55%Fe	Nil
	122 (Float)	290752	Nil	Nil	+55%Fe	Nil
		--	Nil	Nil	Nil	Nil
B. Remaining Resources		Nil	Nil	Nil	Nil	Nil
1. Feasibility Mineral Resource (B)	211(In situ)	Nil	Nil	Nil	Nil	Nil
		Nil	Nil	Nil	Nil	Nil
	211(float)	Nil	Nil	Nil	Nil	Nil
		Nil	Nil	Nil	Nil	Nil
2. Prefeasibility Mineral Resource (B)	221	Nil	Nil	Nil	Nil	Nil
3. Prefeasibility Mineral Resource (B)	222	Nil	Nil	Nil	Nil	Nil
4. Measured Mineral Resource (B)	331	Nil	Nil	Nil	Nil	Nil
5. Indicated Mineral Resource (B)	332	Nil	Nil	Nil	Nil	Nil
6. Inferred Mineral Resource (B)	333	Nil	Nil	Nil	Nil	Nil
7. Reconnaissance Mineral Resource (B)	334	Nil	Nil	Nil	Nil	Nil
Total Mineral Resources (A+B)		23921614		23921614	+45%Fe	--

Table 3.7 Mineral Beneficiation / Processing

Sl. No.	Radicals	Wt %
1	Fe at +55 Cutoff	61.863%
2	Silica	2.892%
3	Alumina	3.133%

3.3. Mining Operations

During the plan period, it has been proposed to produce2.0 MTPA iron ore per annum. The mine will be developed by opencast mining method with mechanized means deploying machinery like wagon drill machine, rock breaker, hydraulic / diesel operated shovel, dumper/tipper etc.

Strategy for Development:

It has been planned develop the areain a such a way by which both high grade and low grade iron ore production can be obtained for suitable blending purpose to make the material usable. The height and width of the proposed benches has been kept 10 and 15 meter respectively.

Haul Road:

The layout of roads for haulage of ore/ waste and access to different installation in the mine will be developed complying with the statutory regulations stipulated in the Metalli ferrous Mines Regulations, 1961. Overburden and Mineral reject will be transported to the respective site of dumping and stacking located in the lease area. Fifteen meter wide haul road will be developed in the lease area as per need at a gradient up to 1:16.

Site Services:

As far as day to day mine operation is concerned, the infrastructure such as site office, weigh bridge, rest shed, First-aid centre, blasting shed security house, magazine, guard house etc will be established before mining operation in the lease area.

Machineries to be deploye

The mine will be operated in a three shift basis. Process of excavation and loading of overburden/waste will be done by deploying hydraulic excavators and dumpers. Excavators of 0.9 - 2 m^3 capacities will be deployed for excavation & loading of ROM ore and dumpers of 25t capacity shall be deployed for transportation of ore and OB. Hard iron ore will be loosened through drilling & blasting. For the purpose, DTH drill of 115mm dia, compressor of 450cfm etc will be used during ensuing scheme period to achieve the targeted production. For maintenance of OB dumps dozers will be deployed. Loading & un-loading of sorted & sized ore is loaded by mechanized method.

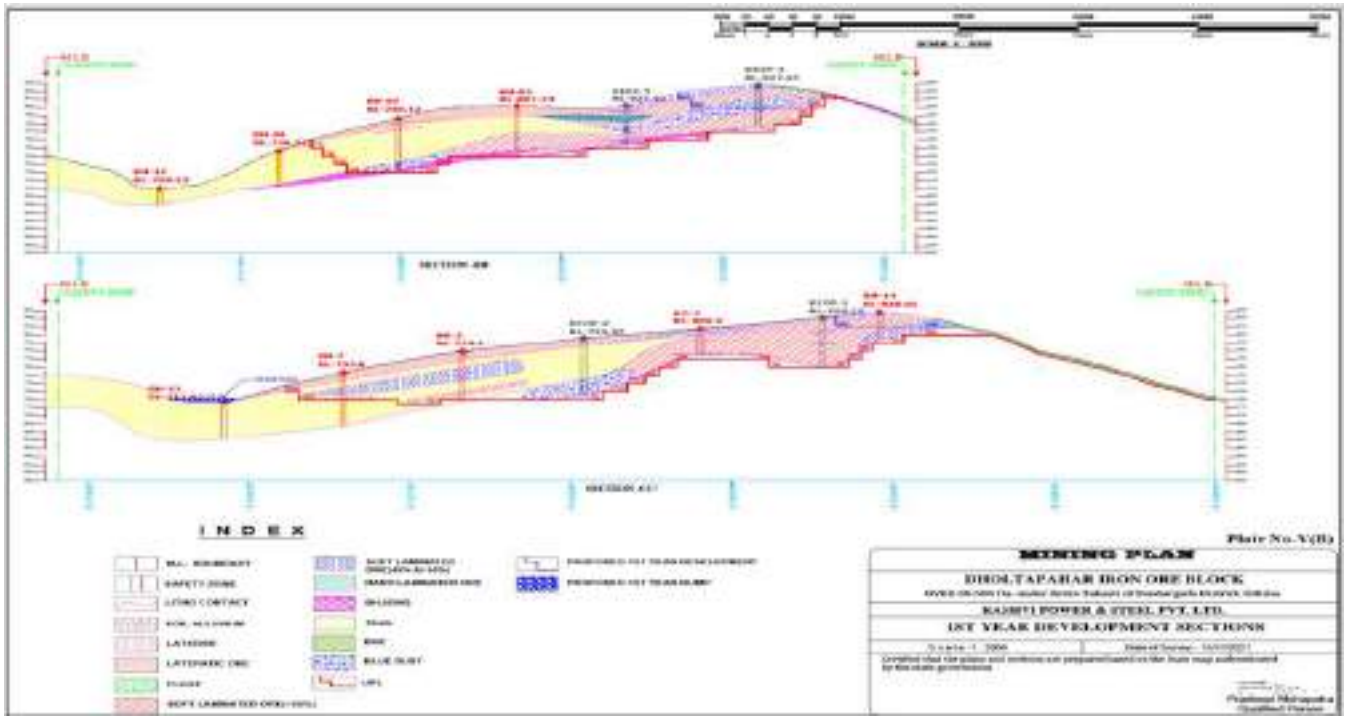
Transportation

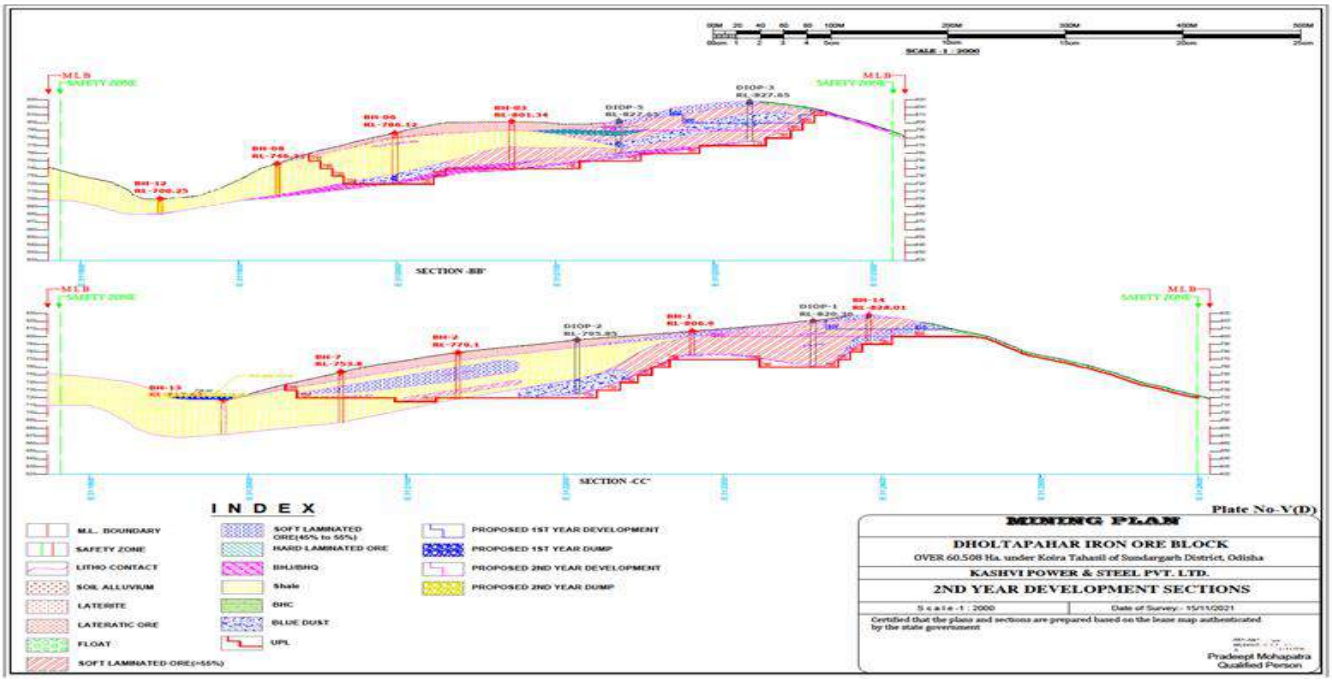
Ore will be transported from quarry site to screen and crushing site for processing by use of 25 ton dumpers and waste materials will be dispatched from quarry to dumping site by using same capacity dumpers. From the stock yard saleable material will be dispatch by using dumper of different capacities.

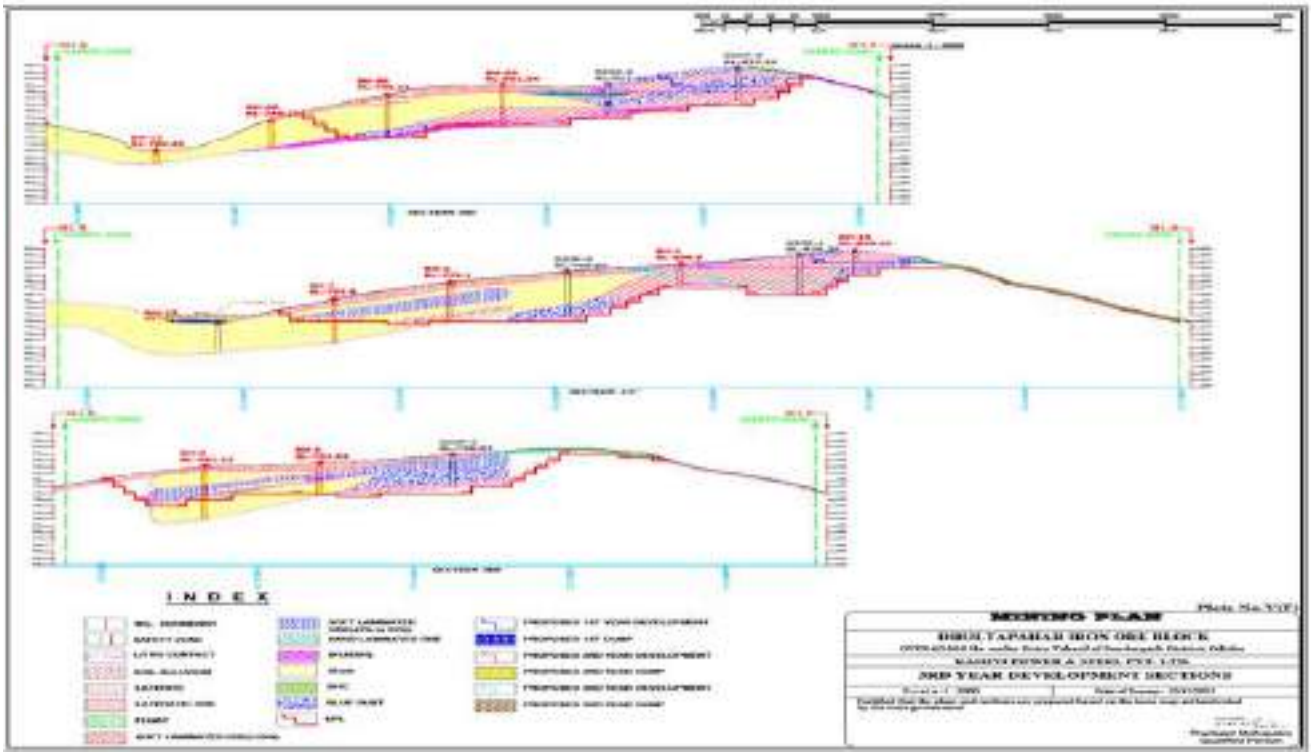
Table 3.8: Tentative Production Summary year wise

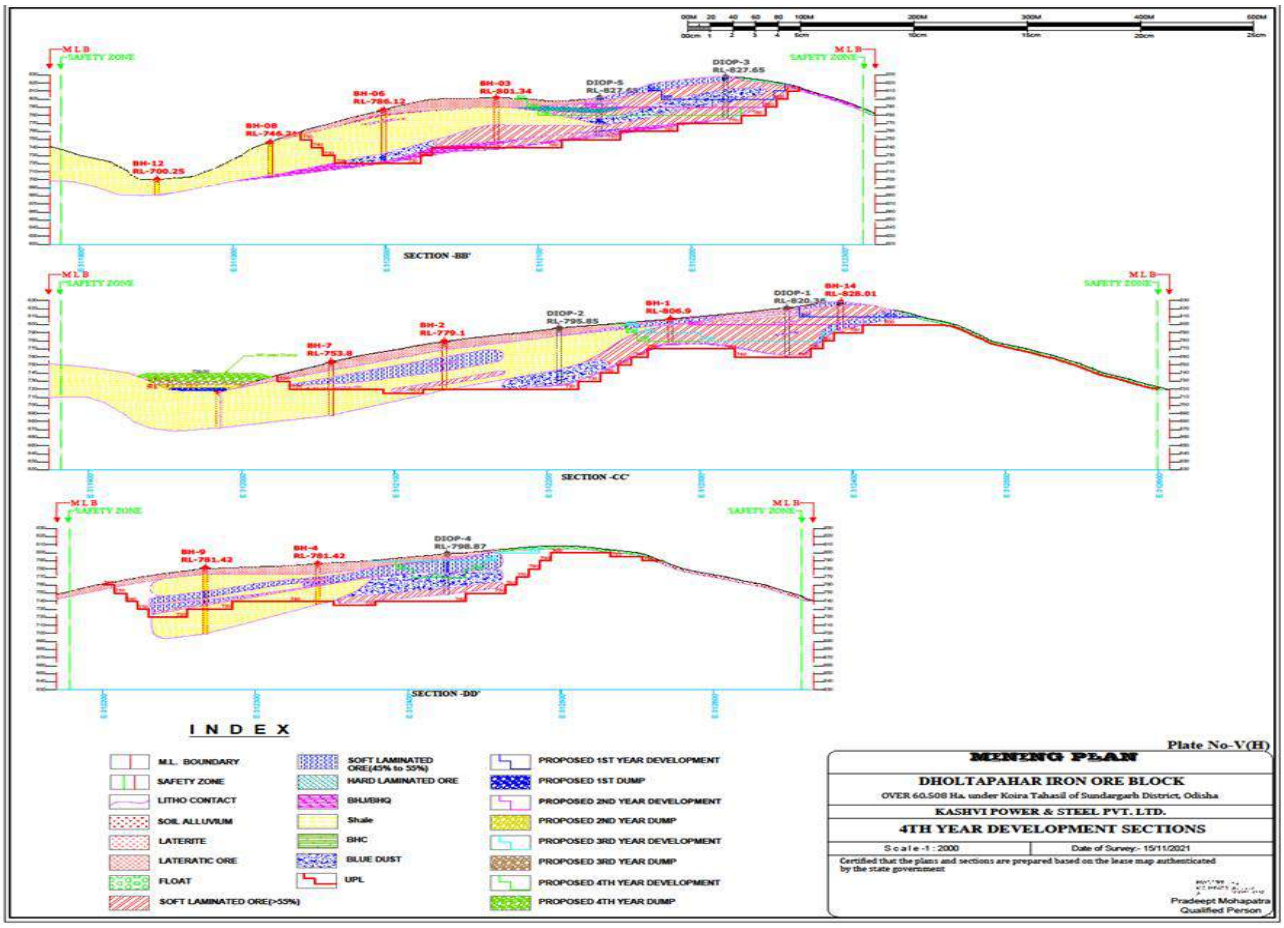
YEAR	PRODUCTION MAIN (in Tonne)	MINERAL REJECT (in Tonne)	ROM (in Tonne)	WASTE (in Tonne)
1ST	1525464	474535	1999999	146500
2ND	1448139	551860	1999999	565100
3RD	1539315	460685	2000000	677200
4TH	1479551	520447	1999998	469100
5TH	1629056	370944	2000000	941400
GRAND TOTAL	**7621525**	**2378471**	**9999996**	**2799300**

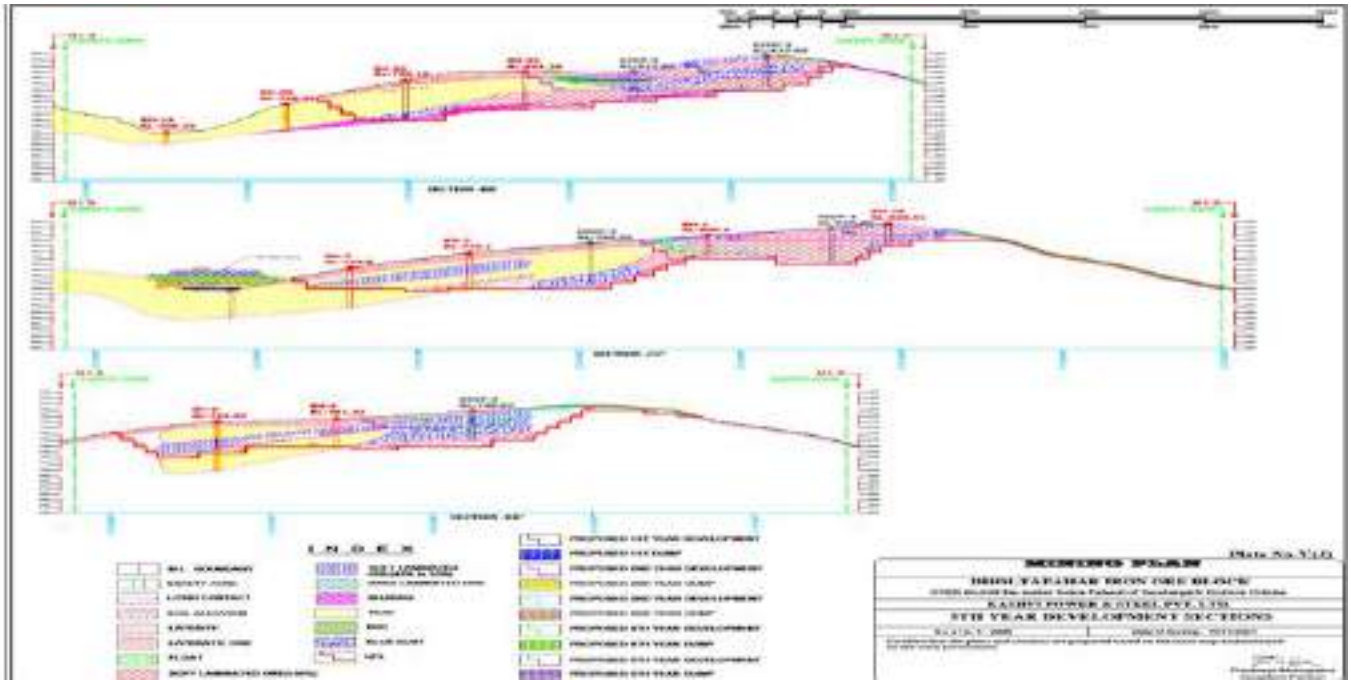
Fig 3.2: Year wise Development section

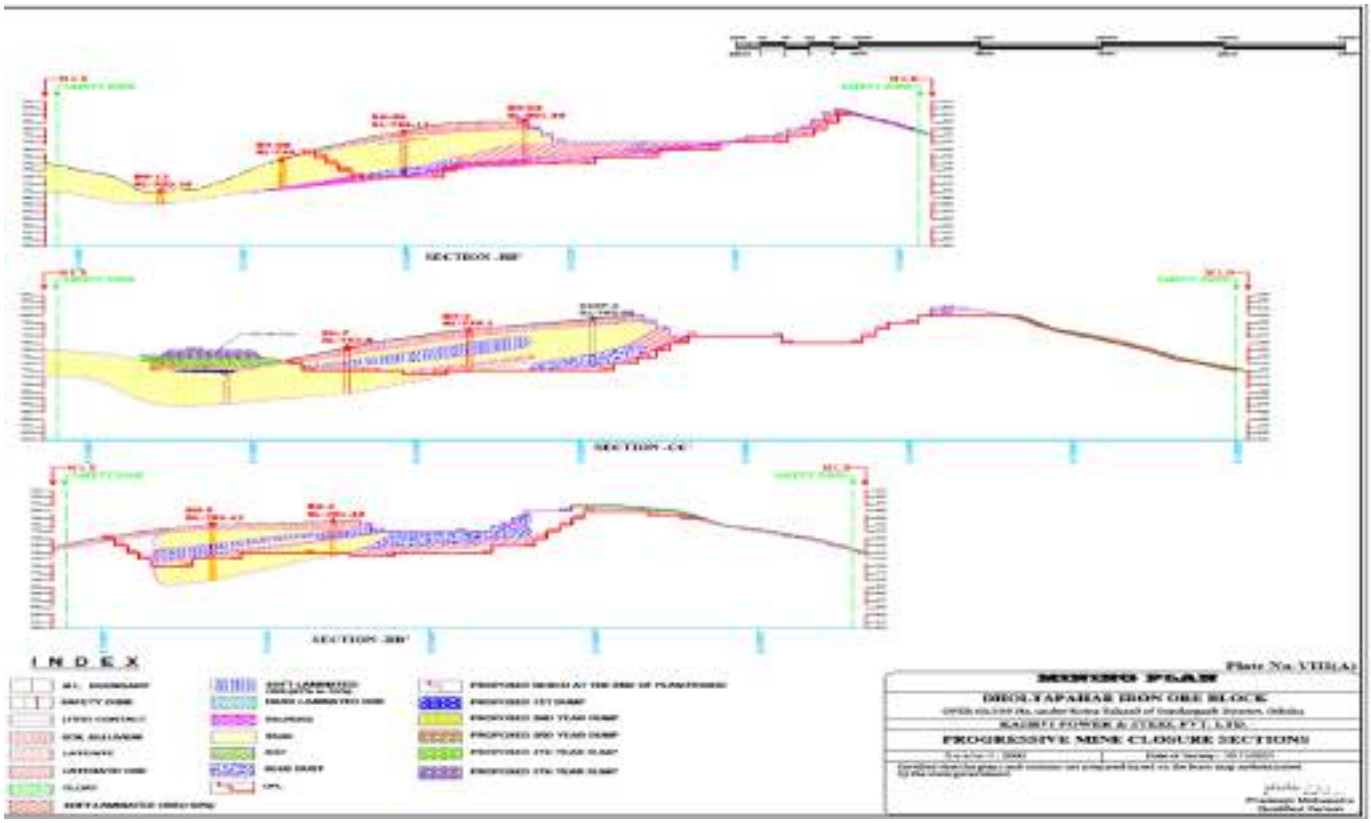





INDEX
MINING PLAN
DHOLTAPAHAR IRON ORE BLOCK
30 YEAR DEVELOPMENT SECTIONS


SECTION -BB'
SECTION -CC'
SECTION -DD'
INDEX
M.L. BOUNDARY
SAFETY ZONE
LITHO CONTACT
SOIL ALLUVIUM
LATERITE
LATERATIC ORE
FLOAT
SOFT LAMINATED ORE(>55%)
SOFT LAMINATED ORE(45% to 55%)
HARD LAMINATED ORE
BHL/BHQ
Shale
BHC
BLUE DUST
UPL
PROPOSED 1ST YEAR DEVELOPMENT
PROPOSED 1ST DUMP
PROPOSED 2ND YEAR DEVELOPMENT
PROPOSED 2ND YEAR DUMP
PROPOSED 3RD YEAR DEVELOPMENT
PROPOSED 3RD YEAR DUMP
PROPOSED 4TH YEAR DEVELOPMENT
PROPOSED 4TH YEAR DUMP
Plate No-V(H)
MINING PLAN
DHOLTAPAHAR IRON ORE BLOCK
OVER 60.508 Ha. under Koira Tahasil of Sundargarh District, Odisha
KASHVI POWER & STEEL PVT. LTD.
4TH YEAR DEVELOPMENT SECTIONS
Scale -1 : 2000
Date of Survey:- 15/11/2021
Certified that the plans and sections are prepared based on the lease map authenticated by the state government
Pradeept Mohapatra
Qualified Person





3.9 Table: Total ROM and waste generation

Sl. No.	Year	Total Handling (t)	Waste Quantity (t)	ROM Quantity (t)	ROM Quantity Saleable Mineral (t)	ROM Quantity Mineral Reject (t)	Ore to OB Ratio (RoM Quantity / Waste Quantity)	Grade Range (%
1	1st	2146499	146500	1999999	1525175	453161	1:0.073	45% Fe to +65 % Fe
2	2nd	2565099	565100	1999999	1448139	551860	1:0.283	45% Fe to +65 % Fe
3	3rd	2677200	677200	2000000	1539315	460684	1:0.339	45% Fe to +65 % Fe
4	4th	2469099	469100	1999999	1479551	520447	1:0.235	45% Fe to +65 % Fe
5	5th	2941400	941400	2000000	1629056	370944	1:0.471	45% Fe to +65 % Fe
Total		**12799297**	**2799300**	**9999997**	**7621236**	**2357096**	**1:0.280**	45% Fe to +65 % Fe

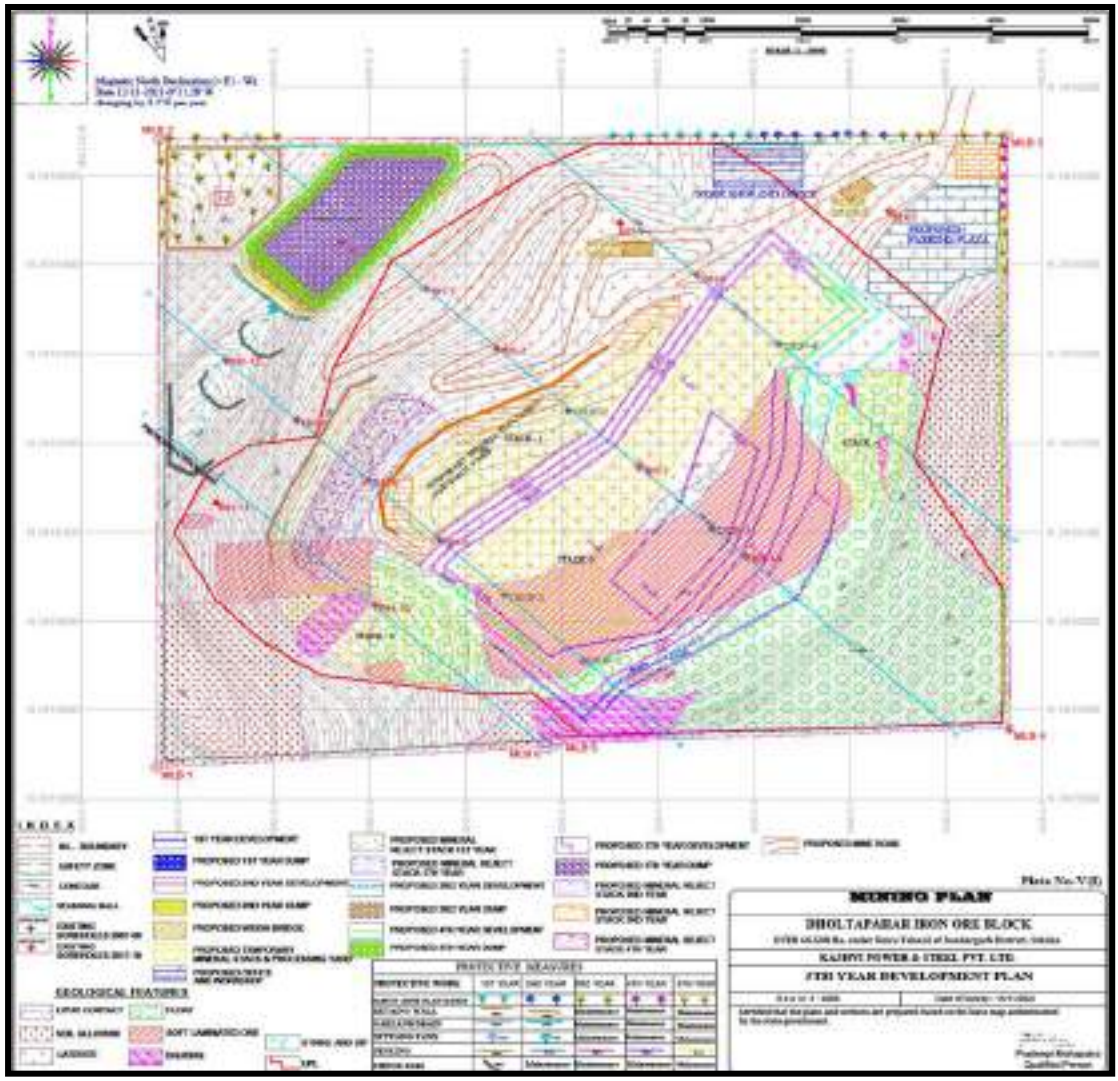


Fig 3.3: Five years development Plan

4. Proposed utilization of water for Mine Operation

Table 4.1: Proposal of Water Utilization in Dholta Pahar mine (Area= 60.508ha)					
Sl. No	Purpose	Ground Water (KLD)	RWH & Outside	Recycled STP &ETP (KLD)	Total from all source
1	Dust Suppression	59	30	9	98
2	Domestic Use	12	-	-	12
3	Plantation	8	8	5	21
4	ETP & Workshop, Wheel Washing System	18	2	4	24
	Total	**97**	40	**18**	**155**

As per the approved mine plan the Dholtapahar block mine proposed total requirement of water is 155 KLD. The required quantity will be drawn from ground water sources, RWH and recycled water. The entire water is utilize as per the Table 4.1

4.1 For Drinking – No mine discharge will be generating during mining activities. For Drinking and domestic use 12 KLD of water is required which obtained from groundwater sources.

4.2 Plantation – 21 KLD of water is required for plantation. It will obtain from 8KLD from groundwater, 8KLD from RWH and 5KLD from recycle water (ETP & STP).

4.3 Dust suppression, green belt development- as shown in table 4.1, 98KLD is required for this purpose. It is obtain from 59KLD groundwater, 30KLD from RWH and 9KLD from recycled water.

4.4 ETP & Workshop, Wheel Washing System- For ETP & Workshop and wheel washing system 18 KLD is obtain from groundwater, 2KLD from RWH and 4KLD from recycle water.

4.4 Runoff to stream- Small rills/gullies is generated during rainy season in lease area. RWH structures have been proposed on these rills/gullies.

4.5 Benefitted area- Nearby villagers

5. Comprehensive assessment of the impact on the ground water regime

Comprehensive assessment of the impact on the ground water regime in and around the project area highlighting the risks and proposed management strategies proposed to overcome any significant environmental issues.

M/s Kashvi Power & Steel pvt Ltd for grant of Mining Lease for Dholta Pahar Block for iron ore over an area of 60.508Ha near Dengula village, KoiraTahasil of Sundargarh district of Odisha for a period of 50 years. Iron ore produced from the block will mostly be utilized in the pellet plant. Total estimated mineable reserve within the area is 23921613 tonnes for iron ore. During the plan period, it has been proposed to produce 2.0 MTPA iron ore per annum. The mine will be developed by opencast mining method with mechanized means deploying machinery like wagon drill machine, rock breaker, hydraulic / diesel operated shovel, dumper/tipper etc. There is no agriculture land in the core zone. However in buffer zone agriculture land will be preserved from siltation by retaining wall, check dams, garland drain and settling ponds. . The nearest surface water source is Teherai Nala which is flowing 500m away from the western side of the mining lease. Teherai Nala is the major 2nd order drainage system of the area. As per the field observation there are some mine pit surrounding the lease area which work as recharge tank in rainy season. The lease area experience heavy rainfall during rainy season so that it will minimizes the groundwater usage. Presently, in buffer zone during rainy season, the water is accumulated in the mine out area. The sump acts as a good rainwater accumulation structure and the collected rainwater is also seeps into the ground.

Fig 5.1: Existing mine pit within 2km of core zone

5.1. Impact on surface water sources:

DholtaPahar Iron ore mine is situated in the higher elevation as depicted in the fig 6.2: No perinial Nala/stream exists or generates from ML area of Dholta Pahar Fe mine. The ML area is not situated within any wetland zone and not part of any national park etc. Other existing small ponds/ water bodies within core and buffer zone has been investigated and the water quality is found normal.

5.1.1 Diversion

Existing channels [constructed dam/barrages/weir/canals/hydro-electric projects] No existing channel, constructed dam/barrages/weir/canals/hydro-electric projects etc need to be diverted due to the project. Thus 5.1.1 is not applicable.

5.1.2: Change

In land use [change in flood plain, lotic & lentic systems etc.]-No nala/stream/ river exist or generates from ML area of Dholtapahar mine. The ML area is not situated within any wetland zone thus change in land use in flood plain, lotic & lentic systems etc is not applicable.

5.2. Impact on groundwater sources–

The Dholta Pahar mine lease area is in Koira block of Sundergarh district, Odisha which is categorized under safe category (Stage of GW Extraction 33%) by the latest estimation carried out by CGWB (2020). The groundwater levels measured in core and buffer zone varies from (3.7-36.3m). The area is part of hard rock terrain with poor permeability rock and there is no aquifer system due to high elevation (824m). During the field study it has been found that a town name Tensa also has no aquifer. All the water requirements are fulfilled from supplied water foothill village name Barsua Based on the field observation it has been found that there is no weathered portion in around the lease area. At present there is no existing water body, the mining activity will be carried out in such a manner which won't create any threat of groundwater resources. The mine area experienced heavy rainfall hence by constriction of check dam, rooftop rain water harvesting structure, retaining wall and settling pond can enhance the water availability.

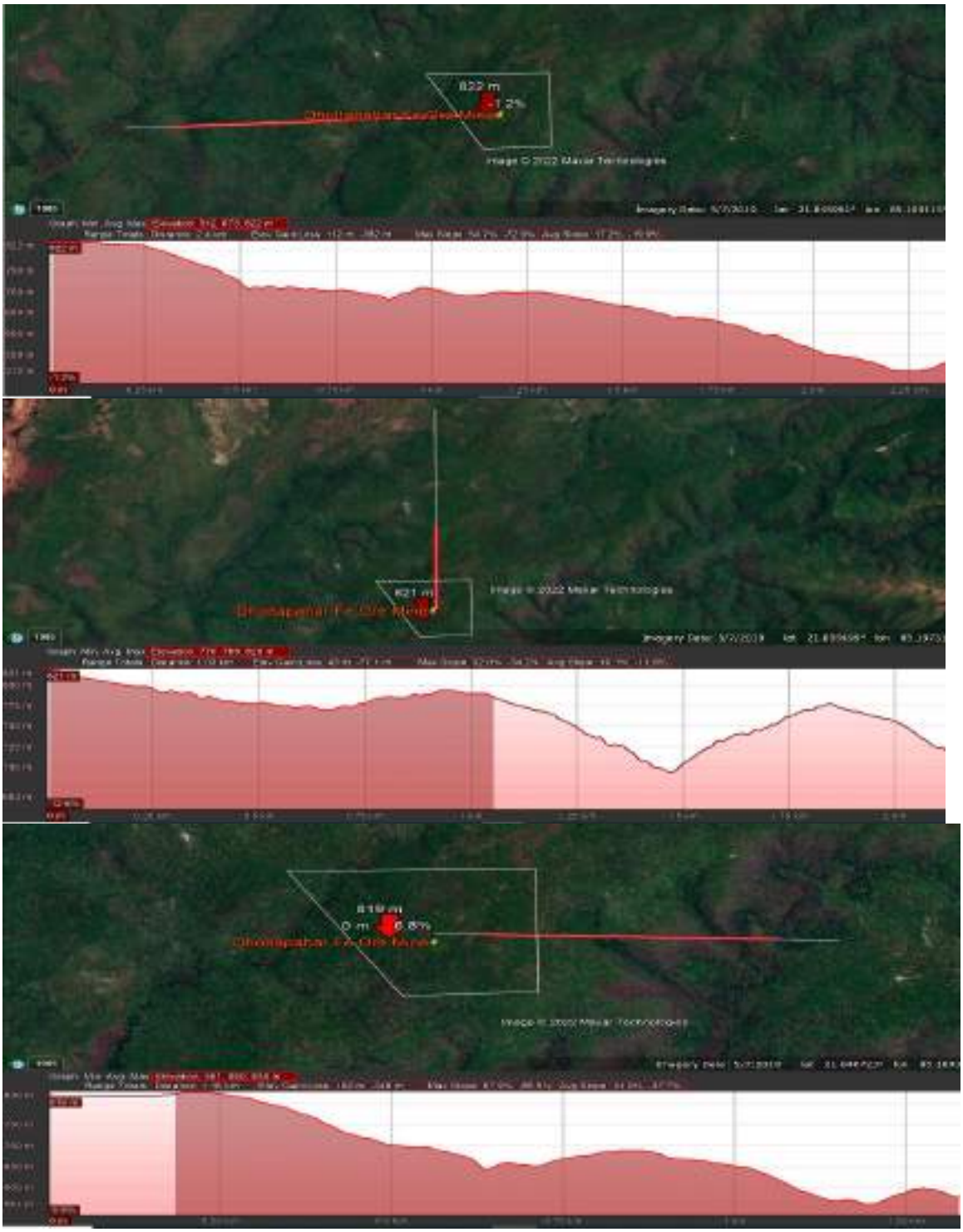


Fig 5.2: Google elevation profile of study area around Dholta Pahar Fe ore Mine from three directions

5.3. Socio-Economic Aspects:

5.3.1. Settlements and population dynamics around project area

The study area comes under rural. There exists about 31 villages in the study area and their details are given in Table 5.1 and 5.2

There is no impact of groundwater withdrawal by Dholtapahar Block Fe ore Mine on the study area, study can recommend NOC may be extended for next 5 yr with existing 97KLD extractions from groundwater system

Table 5.1 Crop production details of Sundergarh District Odisha in Kharif and Rabi Season

	Kharif		Rabi	
Sl no.	**Crops**	**Area (ha)**	**Crops**	**Area (ha)**
1	Paddy	13250	Wheat	111
2	Maze	463	Cowpa	190
3	Ragi dry	205	Horsegram	774
4	Jower	124	Gram	298
5	Biri	1403	Mustard	395
6	Cowpa	146	Potato	109
7	Groundnut	296	Onion	195
8	Til	1286	Garlic	80
9	Zinger	156	Fieldpea	140
10	Other vegetables	1088	Other vegetables	1786

5.3.2. Dependency:

On sources of water [surface or sub-surface] the area by and large depends on rain-fed agriculture with supportive irrigation. It is seen that shifting of occupation among the local population is mostly towards mining and its related work. Mining leads to livelihood gain through creation of employment opportunities in the region. Loss of cultivable land and forest land due to mining activities which invites change in their native profession and may envisage involuntary migration of population to other region for livelihood. This working mining project has immensely benefitted this region in the field of potential employment, improved per capita income, improved social welfare, education, medical healthcare systems, communication, infrastructural build-up, etc. In the core zone no habitation exists. Hence, economic profile of population within core zone is not envisaged. In buffer zone, this project will help in direct employment opportunities for 259 persons and indirect employment for more than 250 persons through various service related activities connected with the project operations

Table 5.2 Population data of study area in part of Koida tehsil, Sundergarh district, Odisha						
Sl.no	Location	House	Male	Female	Total Population	Area (ha)
1	Baldihi	80	170	157	327	508
2	Ranisal	74	151	136	287	126
3	Padadhi	88	152	175	327	192
4	Patmunda	242	501	512	1013	384
5	Khajuridihi	85	179	186	365	797
6	Teheri	174	339	415	754	544
7	Sargigarh	176	355	383	738	363
8	Sanindipur	204	414	372	786	461
9	Kalmanga	323	634	656	1290	753
10	Ganua	376	820	797	1617	754
11	Rangalbeda	162	334	294	628	388
12	Kasira	270	581	699	1280	777
13	Badpatuli	108	217	239	456	346
14	Kadamdihi	105	249	265	514	697
15	Kirrakudar	81	186	168	354	203
16	Gaudiniposh	155	420	414	834	274
17	Badindipur	123	284	264	548	396
18	Dengula	173	438	498	936	3496
19	Saleipali	147	341	396	737	215
20	Basada	36	73	80	153	313
21	Dalita	18	33	36	69	424
22	Tegerei	174	339	415	754	544
23	Kula	149	379	374	753	332
24	Malda	147	297	267	564	577
25	Nuagaon	90	223	217	440	432
26	Patbeda	34	79	66	145	308
27	Railela	302	645	697	1342	683
28	Rengua	54	150	167	317	265
29	Sanputli	207	449	445	894	423
30	Taldihi	75	158	163	321	1104
31	Bandal	92	219	249	468	437

6. Proposed measures for disposal of wastewater by mine drawing saline water

The water in the surrounding of lease area is fresh and the TDS is ranges between 10 and 310 ppm in general so disposal of saline water not applicable.

7. Water Conservation

Measures to be adopted for water conservation which includes recycling, reuse, treatment, etc. This includes the water balance chart being adopted by the firm along with details of water conservation methods to be adopted. - Brief writes up along with capacity and flow chart of Sewage Treatment Plants / Effluent Treatment Plants / Combined Effluent Treatment Plants existing/ proposed within the project. - Details of water conservation measures to be adopted to reduce/ save the ground water. - Total water balance chart showing the usage of water for various processes in table 4.1

At present the lease area is required 155 KLD of water for mining operations. The entire water requirements are fulfilled by ground water, RWH and recycle water. The water is to be consumed by various mine operation such as dust suppression, domestic use, plantation, and ETP & workshop (Table 4.1). The area experiences high rainfall, the site will generate above volume of run offs during such rainy periods. The surface run off from the uncovered site would contain high concentration of suspended matter and eroded matter which will be checked through retaining wall, check dams and settling ponds.

Water conservations can be enhanced by including efficient measures of water use for mining and domestic consumption, effective reuse and recycles of water and treated water, adoption of appropriate rainwater harvesting methods. It is therefore following sub topics are incorporated in this chapter.
7.1 Water use and water balance
7.2 RWH

7.1 Water use and water balance:

Dholta Pahar iron ore mine is proposed a requirement of 155KLD of water. Water is to be used for dust suppression, domestic use, plantation, and ETP & workshop purposes shown in the (Table 4.1).

7.2. Rainwater Harvesting & Artificial recharge:

The total lease area of Dholta Pahar Iron ore mine is 60508 m^2 and its land use is discussed in chapter 1.4 and table 1.1. The area experiences high rainfall so that the mine has concentrated effort to conserve each drop of rainwater. The project area is having undulating hilly terrain and poor permeability. The depth of water level below ground level varies depending on the

local topography, geology & hydrological conditions. The nearest surface water source is Teherai Nala which is flowing 500m away from the western side of the mining lease. Teherai Nala is the major 2nd order drainage system of the area. Mine pit structure also present all around the lease area where water gets collected from the uplands through drains. Garland drains & retaining walls will be constructed all around the dumps and plantation of native species will be carried out on the dump slopes to minimize erosion. A settling pond will be constructed to arrest silt and sediment flows from mining area during rain fall and the water so collected is being utilized for the mine area, roads, green belt development etc.

Table 7.1 Crop production details of Sundergarh District Odisha in Kharif and Rabi Season

	Kharif		Rabi	
Sl no.	**Crops**	**Area (ha)**	**Crops**	**Area (ha)**
1	Paddy	13250	Wheat	111
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7	Groundnut	296	Onion	195
8	Til	1286	Garlic	80
9	Zinger	156	Fieldpea	140
10	Other vegetables	1088	Other vegetables	1786

Fig 7.1: Existing rainwater harvesting pond and mine pit storage tank in buffer zone

Table 7.2: Pond and Water bodies in buffer zone									
Sl No.	**Location**	**Latitude**	**Longitude**	**Elevation (m)**	**EC (mS)**	**pH**	**TDS(ppt)**	**DO (mg/l)**	**water body**
1	Ranisal	21.884162	85.305325	596.84	650	7.1	320	4.7	Pond
2	Paatmunda	21.87555	85.308419	617.73	320	6.9	150	1.3	Pond
3	Khajuri dihi	21.863644	85.293346	664.9	300	7.2	139	4.52	Pond
4	KJSA Steel Plant	21.963844	85.317	577	650	7.5	360	3.28	Mine pit
5	Near Tensa Road	21.868889	85.187991	619.85	20	5.9	10	1.38	Open well
6	National Enterprise	21.84094	85.34045	867.2	190	7.2	80	3.1	Pond
7	Raikela Iron Mine	21.876188	85.196579	572.02	680	7.1	350	4.73	Pond
8	Raikela Iron mine	21.878495	85.197651	571.44	20	6.3	10	4.24	Open well
9	Comanado Steel Plant	21.918085	85.209714	573.27	450	6.8	240	5.94	Pond

7.3. Monitoring, Measurement and Capacity building

Monitoring and measurements of several parameters are part of water conservation strategy towards the motive of efficient management of water. The withdrawal of groundwater is regularly monitored and measured from the existing dug well. The water level is found at 3.7 to 36.3 m bgl in premonsoonal period, which varies from 2.5-5 m bgl in the monsoonal period. The Dholta pahar mine conducts regular capacity building of its maintenance staff that monitors and measures and keeping record of various data related to water use and water conservation. The workers have been trained for keeping record and onward submission of data as per the requirement. For monitoring of groundwater level in the area of Dholta pahar mine, as per the guideline of CGWA, a piezometer has to be constructed at the area. The installation of piezometer is proposed exclusively for monitoring of groundwater level deploying automatic water level recorder with telemetric arrangement of data transmission.