

Comprehensive Report on:

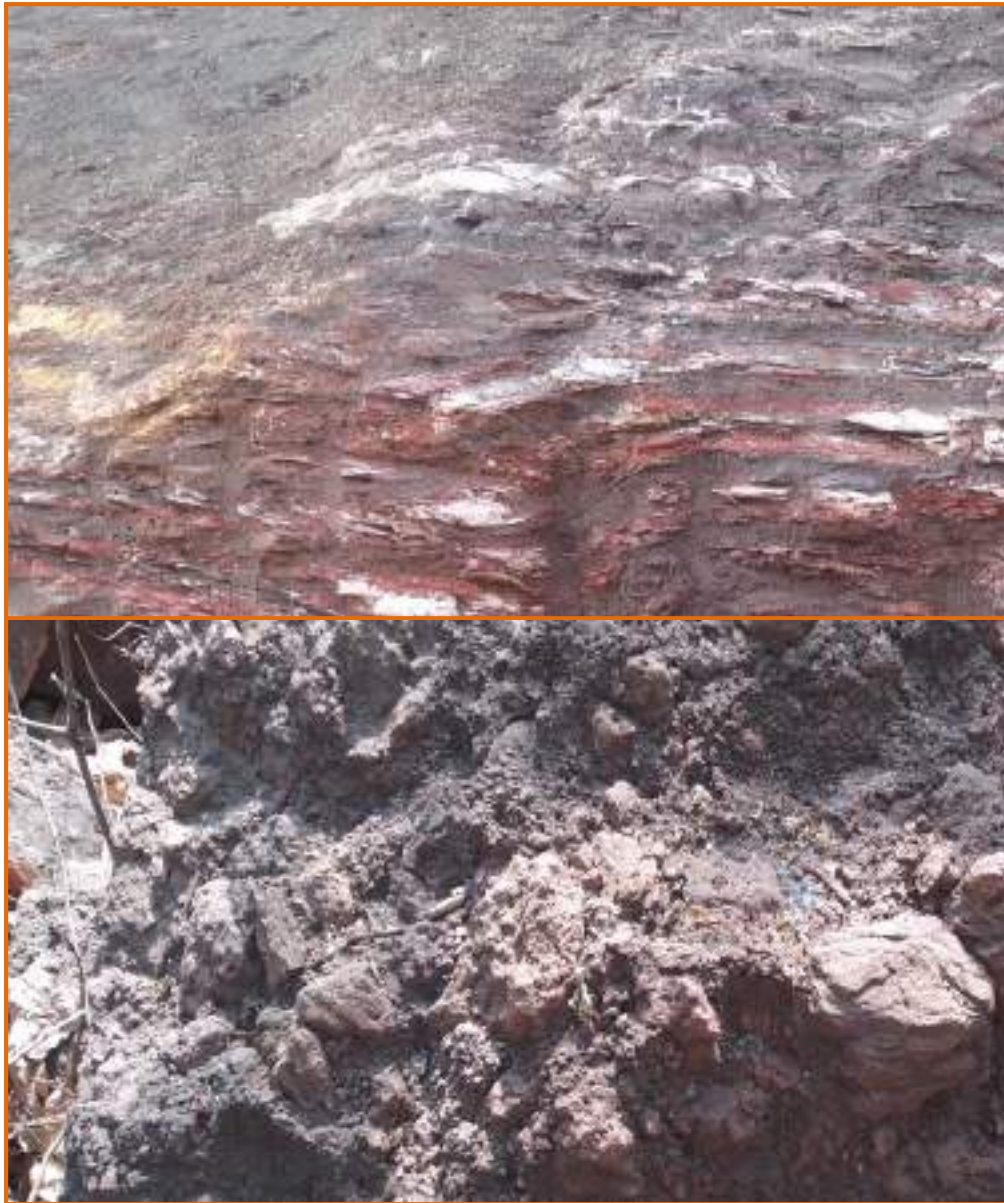
**Proposed RWH Structure in core zone of Netrabandha Pahar Block Iron Ore Mine, Koira Block, Sundargarh District, Odisha.**

[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

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M/S. Raga, Tradecon Pvt Lmt Bhubaneswaris located in Bhaliadihi Village, Koira Tehsil of Sundargarh District, Odisha. Bhaliadihi village is located in north east part of Sundargarh district. The study area falls under survey of India toposheet no F45N1N and F45N5N. Sanputli village is 1 km away from the study area. M/S. Raga, Tradecon Pvt Lmt operates as a manufacturer of sponge iron, 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 produce 1.0 MTPA iron ore per annum. The present study is made for obtaining NOC from CGWA for extraction of maximum 124.08 KLD ground water required 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 of buffer zone for assessment of impact of dewatering of groundwater by the mine and will be submitted to CGWA for obtaining 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 Bhaliadihi Village, Koira Tehsil of Sundargarh District, Odisha which falls 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 Netrabandha Pahar Fe ore block is 74.3700Ha (743700 m<sup>2</sup>). Groundwater quality is fresh and potable in both core and buffer zone area and EC remains below 1900 ppm and TDS varies from 10 to 310 ppm in the study area. As per the approved mine plan the mining activities restricted above the water table hence no water discharge has been generated during mining activities. The total water requirement is 124.08 KLD out of this 62 KLD will be extracted from ground water for mine use. Rainwater is harvested within the ML area through construction of water conservation pond and Roof Top RWH. The annual conservation through RWH is about 18576 m<sup>3</sup>/yr. There is no long term impact on groundwater because of open cast mining. Rest 62.08 KLD water will be arrange from RWH & recycle of waste water through ETP & STP. Thus, the study recommends NOC may be provided for next 5 yr with maximum 62 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. Raga, Trade con Pvt. Lmt. Odisha is thankfully acknowledged.

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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, Shri. Prabhat, M/S. Raga, Tradecon 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 Netrabandha Pahar Fe ore block of Bhaliadihi 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

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**Manav Rachna International Institute of Research & Studies**

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## 1.1. Project description

M/S. Raga, Tradecon Pvt Lmt. Bhubaneswar is a registered firm under Minerals (Development and Regulation) ACT, 1957 and The Mineral (Auction) Rules, 2015, Govt of Odisha. Netrabandha Pahar (West) iron ore Block located in Koira Tehsil of Sundargarh district of Odisha. The corporate identity Number of the company is U51420MH1995PTC162317. The total lease area of Netrabandha Pahar (West) Iron ore mine is 74.3700 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 Raga Tradecon Pvt Ltd. The registered office is situated at State of Maharashtra(Mumbai) having its regd. 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. The company has planned to establish pellet plant in Sundergarh/Keonjhar district of Odisha with a period of two years. Total ore reserve estimation in the lease area is 17274072 tonnes. Estimated total production of ore during five year would be 32490000 tones. Therefore, remaining reserves will be  $17274072\text{MT} - 32490000\text{MT} = 14024082\text{MT}$ . The production of Iron Ore @  $10000000\text{MT}$  per annum, life of the mine will be  $14024082\text{MT}/10000000\text{MT} = 14.02$  years. Therefore total life of the mine will be 19 years which includes 5 year of plan period and 14 years of conceptual period. During the plan period, it has been proposed to produce 1.0 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.

### Location

M/S. Raga, Tradecon Pvt Lmt Bhubaneswar is located in Bhaliadihi Village, Koira Tehsil of Sundargarh District, Odisha. Bhaliadihi village is located in north east part of Sundergarh district. The study area falls under survey of India toposheet no F45N1N and F45N5N. Sanputli village is 1 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). Few shallow depth open cast pits mine are present in the study area.





Fig 1.1: Google image showing proposed area of Netrabandha Pahar (West) block iron ore mine

## 1.2. Topography and Drainage

Netrabandha Pahar (West) 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 867.2m amsl and lowest elevation is 366.28m amsl.

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.



### 1.3. 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 Bhaliadihi 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.

### 1.4. 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 (1.1).

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	

### 1.5. Groundwater regime monitoring:

The study area comprises 10km radius zone in Netrabandha Pahar (West) 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 twogroups namely.

1. Consolidated formations.
2. Unconsolidated formations

## **1) Consolidated formations**

The study areas 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.

## **2. 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.

At present the lease area is required 117.5 KLD for mining operations. The entire water requirements are fulfilled by ground water as well as surface/ recycle/ RWH water. The water is to be consumed by various mine operation such as dust suppression, domestic use, plantation, and ETP & workshop. 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, earth bunds 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 and artificial recharge methods. It is therefore following sub topics are incorporated in this chapter.

2.1 Water use and water balance

2.2. RWH and Artificial Recharge

## 2.1. Water use and water balance:

Netrabandha Pahar (West) block iron ore mine is proposed of 117.5KLD water. Water is to be used for dust suppression, domestic use, plantation, and ETP & workshop purposes shown in the (Table 2.1).

Sl. No	Purpose	Surface water /RWH (KLD)	Ground Water Ab(KLD)	Recycled STP &ETP (KLD)	Total water needed from all source(KLD)
1	Dust Suppression	9.8	89.5	2.7	102
2	Domestic Use	-	4.5		4.5
3	Plantation	-	-	4.8	4.8
4	ETP & Workshop, Wheel-Washing System	6.2			6.2
<b>Total</b>		<b>16.0</b>	<b>94.0</b>	<b>7.5</b>	<b>117.5</b>

## 2.2. Rainwater Harvesting

The total lease area of Netrabandha Pahar (West) Iron ore mine is 743700 m<sup>2</sup>. 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.

Following two type of rainwater harvesting structure is proposed in lease area

1. Roof top RWH
2. Ponds

## 1. Roof top rainwater harvesting structure

Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water reservoir by adopting artificial recharge techniques to meet the household needs through storage in tanks. The Main Objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dry land, hilly, urban and coastal areas. BH-13 will be used and completely developed as a roof top RWH structure to collect all roof water and directed transferred to underground. Total 1326m<sup>3</sup> will be captured by roof top RWH structure. The propose location of RT RWH has been shown in Fig 2.2. Total capacity of the roof top RWH has shown in table no 2.2

A roof top rainwater harvesting is proposed using standard deign as given below for mine lease area and associated building at the mine core zone ( Fig 2.1)

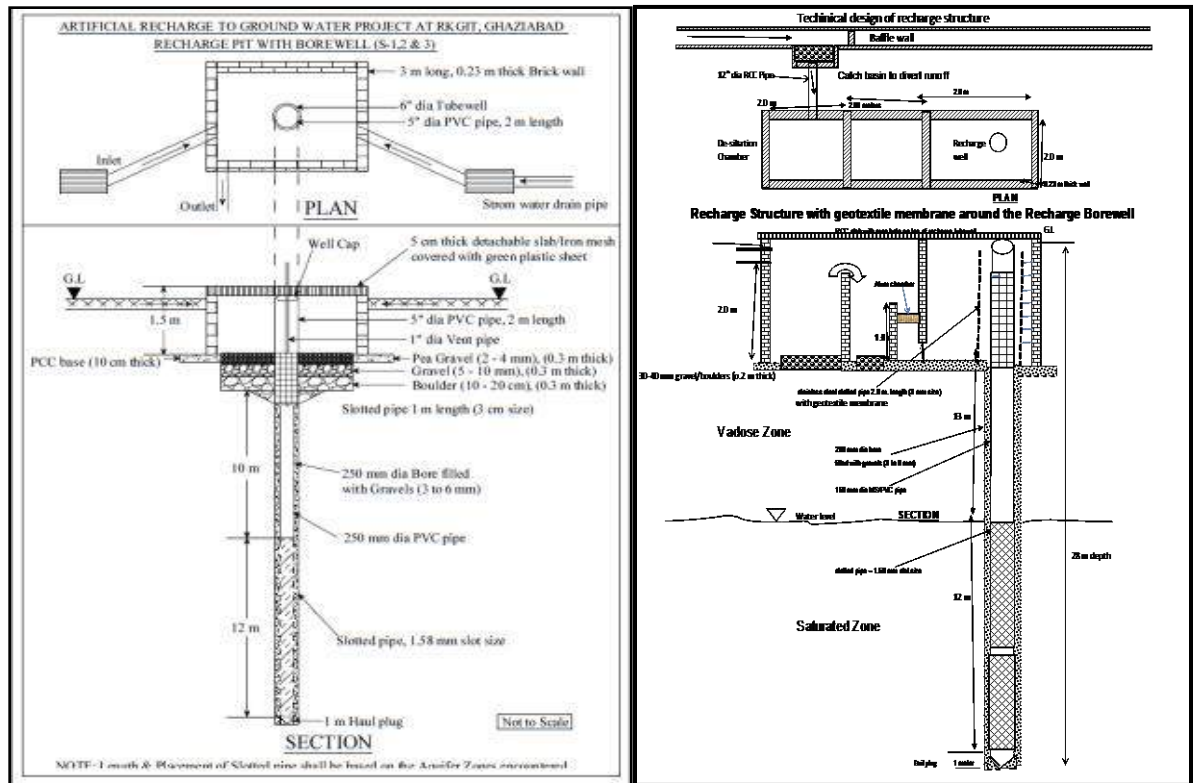


Fig 2.1: Standard Design of rooftop rain water harvesting structure

## 2. Pond

A pond is a body of freshwater smaller than a lake. Two Ponds has been proposed in lease to collect rainwater and seasonal flow. The dimension of P1 is 140\*30\*2m<sup>3</sup> has been proposed in N- W corner of the lease area to collect available rain water flow. Pond P2 has been proposed in western side of the lease area with dimension of 200\*50\*2m<sup>3</sup>. The location of proposed P1 & P2 has been shown in Fig 2.2 and Fig 2.3. Total capacity of the pond has shown in table no 2.2. Pond design and pond slope design has shown in Fig 2.4 &2.5.

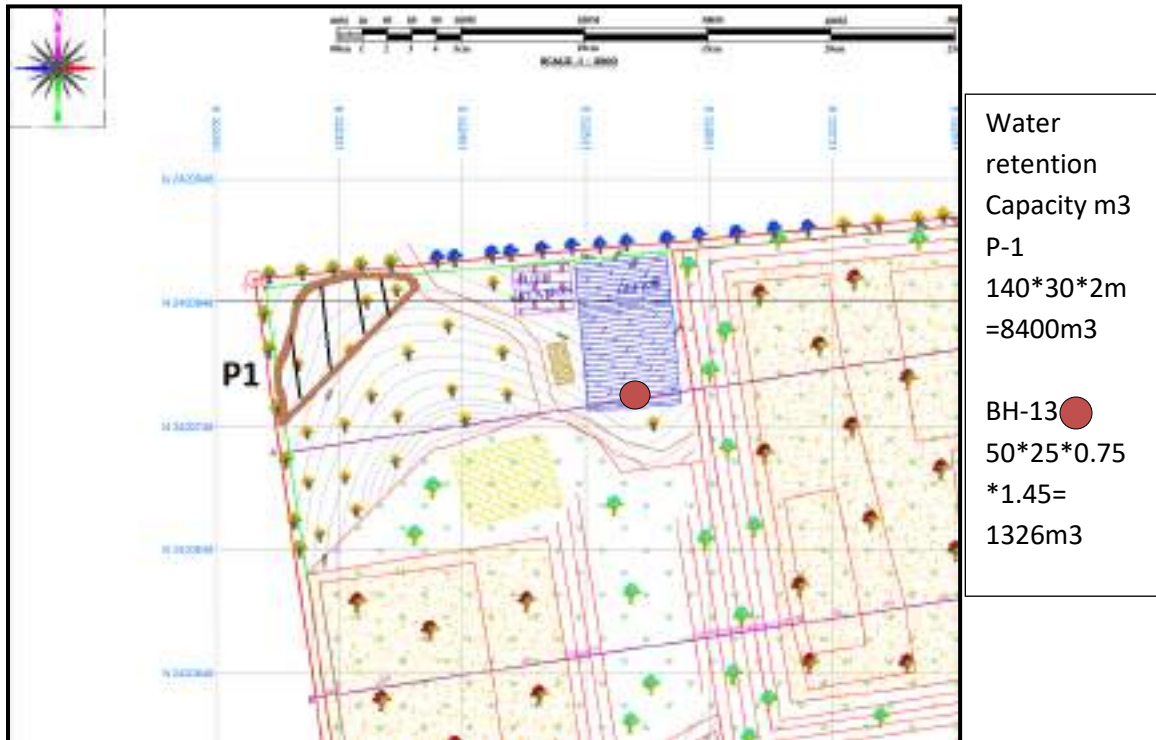


Fig 2.2: Proposed location of Pond (P1) and roof top RWH structure in lease area

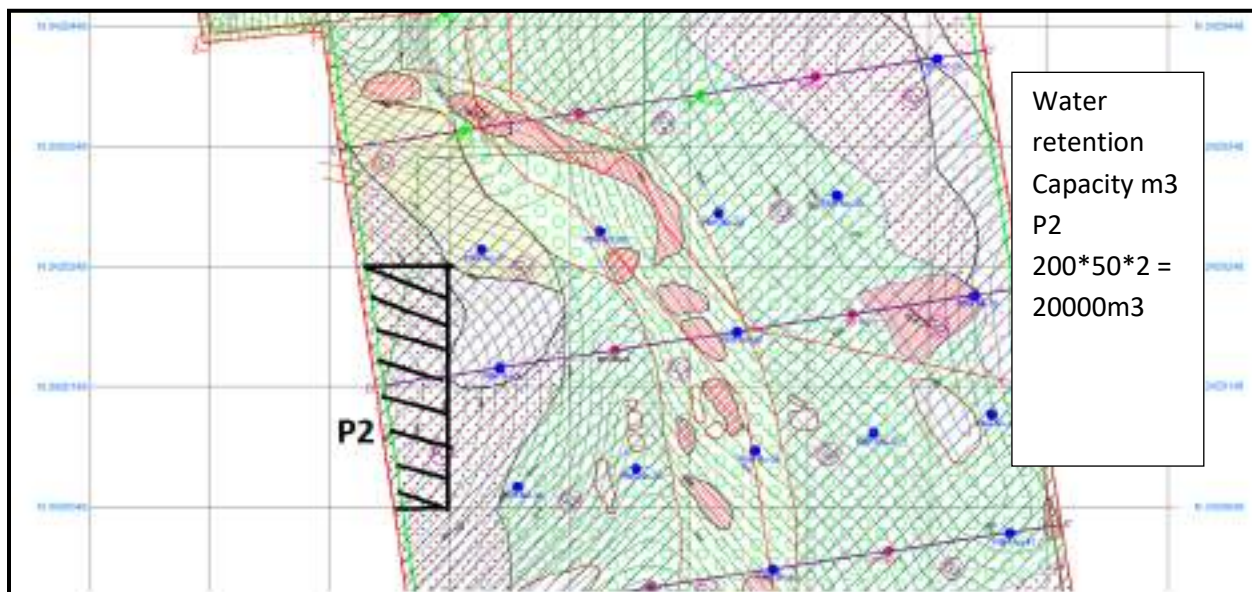
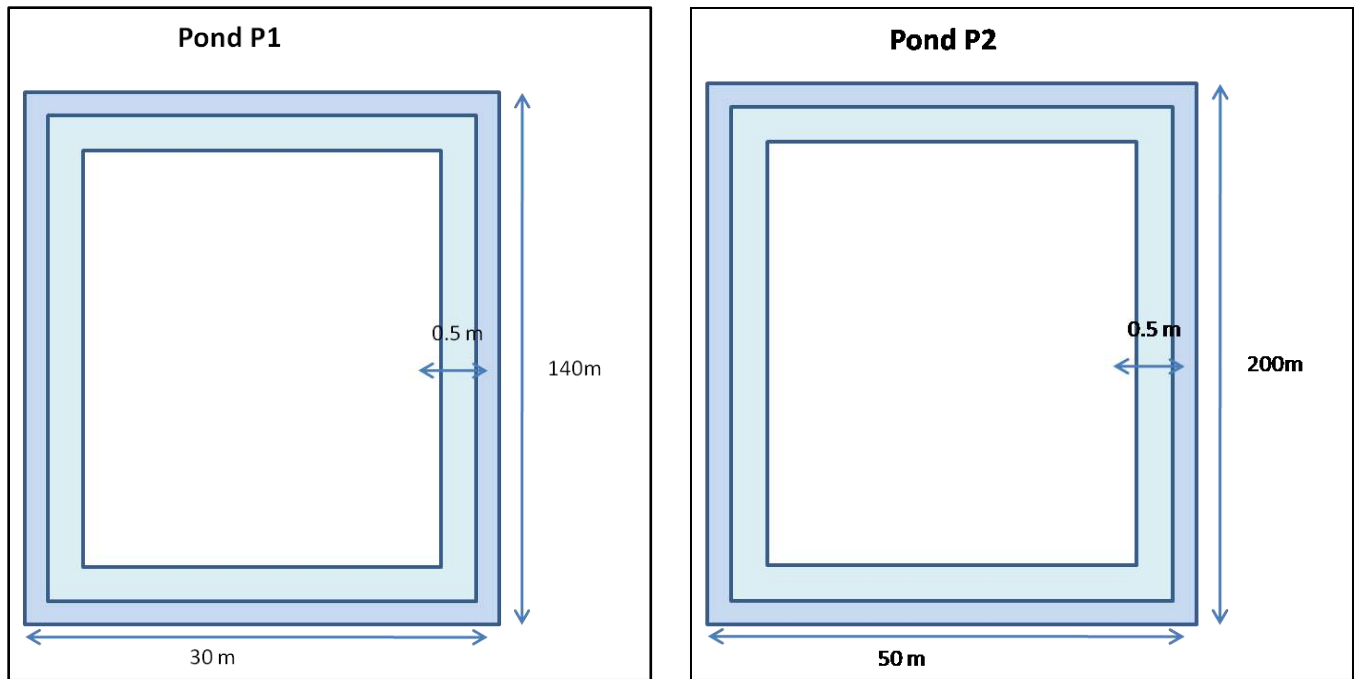


Fig 2.3: Proposed location of Pond (P2) in lease area

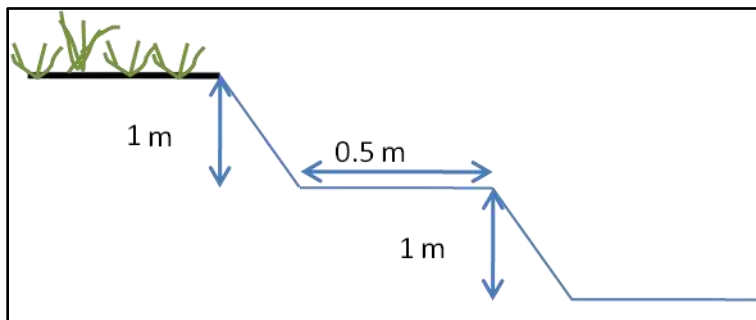
Table 2.2- Proposed Rainwater Harvesting Structures within ML area of Netrabandha Pahar Iron Ore Mine

S/n	Locations Index	Lat	Log	Type of Structure	Proposed Dimensions		
					Bund Length in m	Bund Max height in m	Capacity in m3
1	P-1	21.882795	85.280346	Pond	140*30	2	8400
2	P-2	21.87649	85.282057	Pond	200*50	2	20000
3	BH-13	21.882815	85.282281	Roof top RWH	50*25*0.75*1.4 5		1326
<b>TOTAL</b>							<b>29726</b>





**Fig 2.4 Proposed Pond Designs of P1 and P2 in the Lease Area**



**Fig 2.5 Proposed Pond Slope Design**

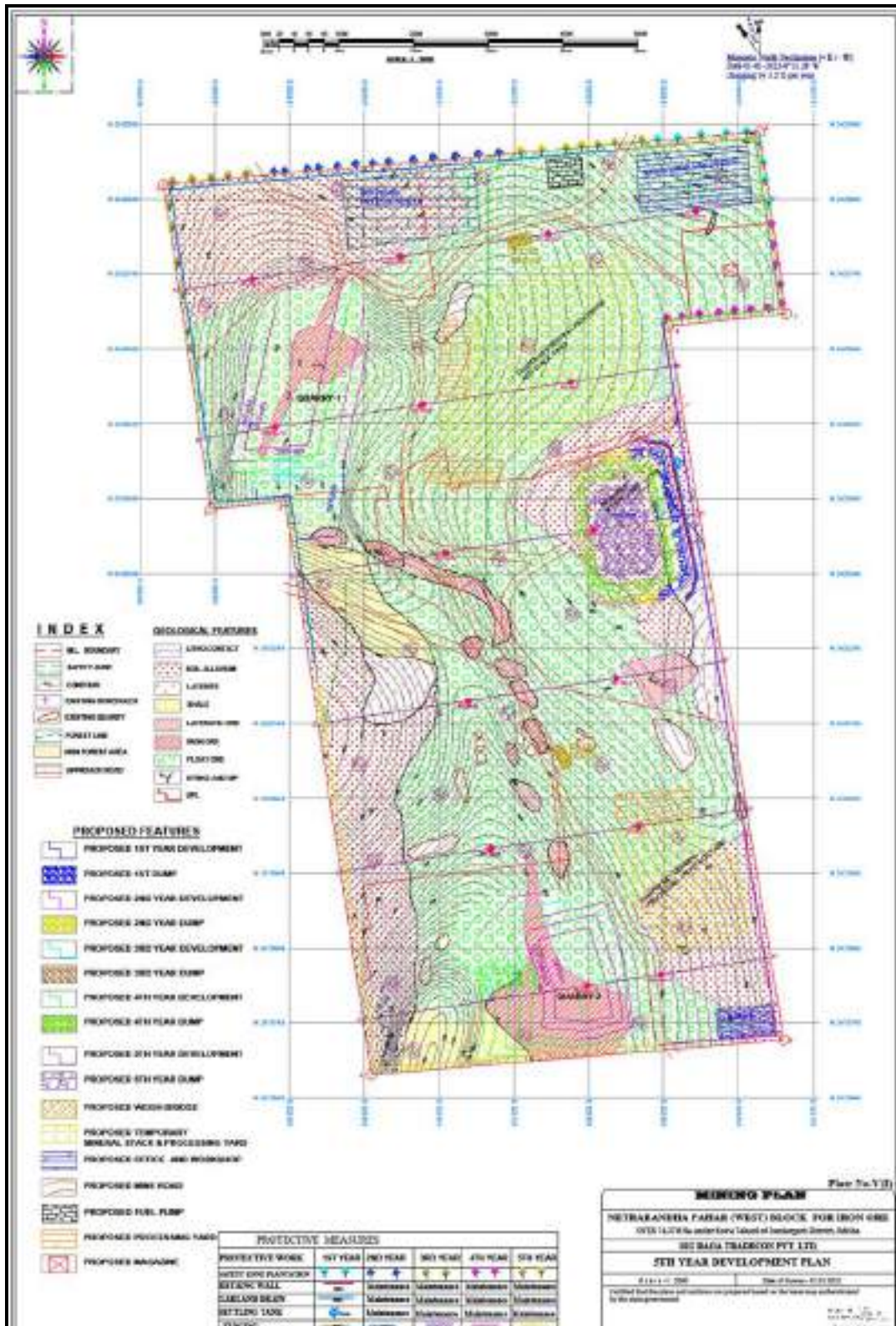


Fig 2.6: Approved mine plan of lease area

Proposed RWH Structure in core zone of Netrabandha Pahar Block Iron Ore Mine, Koira Block, Sundargarh District, Odisha.



**Fig 2.7: Existing water harvesting structure in Buffer Zone**

### **2.3. 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 pre monsoonal period, which varies from 2.5-5 m bgl in the monsoonal period. The Netrabandha 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 Netrabandha 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.