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Ref. No. ESTIL/129A/16
Date : 06.12.2016

To
The Director
IA Division (Industry – I)
Ministry of Environment, Forest & Climate Change
Vayu Wing, Indira Paryavaran Bhavan
Jor Bagh Road, Ali Ganj
New Delhi – 110003

Sub : Submission of additional informations for grant of TOR with regard to the environmental clearance for expansion of Beneficiation Plant of M/s Essar Steel India limited located at Dabuna, Tehsil : Barbil, Dist: Keonjhar, Odisha from the existing capacity of 10.7 MTPA (throughput) to 16 MTPA (throughput)

Dear Sir,

With reference to the agenda item no. 11.10.2 of the Minutes of the meeting of 11th Meeting of the Expert Appraisal Committee on Industry – 1 projects held on 26th to 27th September, 2016 New Delhi, we are here by submitting the following documents :

I. Revised form-1 for the 4 components of Beneficiation Plant, Tailing Pond, Water & Slurry Pipelines from Dabuna Beneficiation Plant to Ghoraburhani- Sagasahi Iron Ore Block (captive), Tailing & Return Water Pipelines from Beneficiation Plant to Tailing Pond.

Ii. Study Report for three numbers of alternate sites for the tailing pond along with site selection criteria and also the 3 – Dimensional views. (Phase-I as Annexure-I & Phase-II as Annexure-II attached respectively)

iii. Letter / related correspondence regarding ROW from the PWD /concerned department for laying of the pipeline from Dabuna Beneficiation Plant to Ghoraburhani- Sagasahi Iron Ore Block (captive) and from Beneficiation Plant to Tailing Pond. (Attached as Annexure-III)

We request you to accept the above documents and consider our case for grant of TOR's.

Thanking You,
Your's faithfully
For Essar Steel India Limited

Pramod Gupta

Pramod Kumar Gupta
Authorised Signatory

Encls : As above

REVISED **FORM-1**
(AS PER EIA NOTIFICATION 2006 & REVISIONS THEREOF)

(I) Basic Information

Sl. No.	Item	Details
1.	Name of the project/s	Expansion of Iron Ore Beneficiation plant at Dabuna, Odisha from 10.7 MTPA (throughput) to 16.0 MTPA (throughput) along with a. Truck unloading Station, b. Relocation of Tailing Dam at Malda, c. Laying of Tailing underground Pipeline and Return Water Pipeline from Beneficiation Plant to Tailing Dam & d. Laying of Water Pipeline and Slurry Pipeline from Beneficiation Plant to Ghoraburhani- Sagasahi Iron Ore Block.
2.	S. No. in the schedule	2 (b) Mineral Beneficiation
3.	Proposed capacity/area/length/tonnage to be handled/command area/lease area/number of wells to be drilled	16.0MTPA (Throughput) Iron Ore Beneficiation Plant along with a. Truck unloading Station of 3000TPH over 1.92Ha of adjacent leased land b. Relocation of Tailing Dam at Malda over 164.467Ha. c. Laying of Tailing Pipeline and Return Water Pipeline (10 Km Approx.) from Beneficiation Plant at Dabuna to Tailing Dam at Malda & d. Laying of Water Pipeline and Slurry Pipeline(27 Km Approx.)from Beneficiation Plant at Dabuna to Ghoraburhani- Sagasahi Iron Ore Block.
4.	New/Expansion/Modernization	Expansion of Beneficiation Plant & establishment of supporting infrastructure of Truck Unloading Station, Relocation of Tailing Dam, Tailing Pipeline along with Return Water Pipeline, Water Pipeline along with Slurry Pipeline from Beneficiation Plant at Dabuna to Ghoraburhani- Sagasahi Iron Ore Block.

5.	Existing Capacity/Area etc.	10.7 MTPA (Throughput) Iron Ore Beneficiation Plant over 85 Acres (34.40Ha) along with 253Km Slurry Pipeline from Beneficiation at Dabuna to Pellet Plant at Paradeep.
6.	Category of Project i.e. 'A' or 'B'	A
7.	Does it attract the general condition? If yes, please specify.	No
8.	Does it attract the specific condition? If yes, please specify.	No
9.	Location	Village- Dabuna
	Plot/Survey/Khasra No.	Tailing Dam: 1,2,5,6 to 12, 16, 17, 24, 1597, 1599 and 1600 (Land Schedule attached) Truck Unloading Station: 119, 125(2349) (Lease Agreement attached)
	Village	Dabuna (P), 758 034
	Tehsil	Barbil
	District	Keonjhar
	State	Odisha
10.	Nearest railway station/airport along with distance in kms.	Nayagarh Railway Station (3KM), Jurudi Railway Station at 10 Kms and Banspani Railway Station at 15kms Bhubaneswar Airport- 182 Km (By Air)
11.	Nearest Town, City, District Headquarters along with distance in kms.	Joda- 18 Km Keonjhar- 55 Km
12.	Village Panchayats, Zilla Parishad, Municipal Corporation, Local body (complete postal address with telephone nos. to be given)	Beneficiation Plant Village- Dabuna, Kalimati Panchayat Tehsil- Barbil Dist- Keonjhar Odisha, PIN – 758034 Tailing Pond Area Village- Kaliapal/Malda/ Dhanurjaypur Malda Panchayat Tehsil-Jhumpura Dist- Keonjhar Odisha. Pin -758035.
13.	Name of the applicant	Essar Steel India Limited
14.	Registered Address	M/s ESSAR Steel India Limited 27th Km, Surat- Hazira Road, Hazira, Surat- 394270, Gujarat.
15.	Address for correspondence	M/s ESSAR Steel India Limited 3A, Fortune towers, Chandrasekharpur Bhubaneswar- 751 023, Odisha.
	Name	Mr. Pramod Kumar Gupta

	Designation	Sr. Vice President & Chief (Projects & Corporate Services)
	Address	M/s. ESSAR Steel India Limited 3A, Fortune towers, Chandrasekharpur Bhubaneswar- 751 023, Odisha.
	Pin Code	751023
	E-mail	pramod.gupta@essar.com
	Telephone No.	09777456100
	Fax No.	0674-2301217
16.	Details of Alternative Sites examined, if any. Location of these sites should be shown on a topo sheet.	As it is an expansion project, no alternate site has been considered for expansion of Beneficiation Plant. However, alternate sites for Tailing Dam, as well as alternate routes for Tailing Pipeline and water Pipeline have been considered. The locations are shown in topo sheet in Annexure- 1
17.	Interlinked Projects	Yes. The iron ore concentrate produced at Beneficiation Plant will be used as raw material at Pellet Plant located at Paradeep.
18.	Whether separate application of interlinked project has been submitted?	Yes. Interlinked Project is already operational.
19.	If yes, date of submission	EC for 6MTPA Integrated Steel Plant at Paradeep which also includes 2x6 MTPA Pellet Plant in Phase-I has already been obtained from MoEF, N. Delhi vide letter No. J-11011/129/2007-1A II(I) dated 29.05.2008.
20.	If no, reason	NA
21.	Whether the proposal involves approval/clearance under: if yes, details of the same and their status to be given. (a) The Forest (Conservation) Act, 1980? (b) The Wildlife (Protection) Act, 1972? (c) The C.R.Z Notification, 1991?	Tailing Dam:- Forest land:- 393.512 Acre (159.248 Ha) Govt. Land:- 4.223 Acre (1.709 Ha) Private Land- 8.673 Acre (3.510 Ha) Yes No No FDP is at DFO, Keonjhar and is awaiting recommendation to RCCF, Rourkela for Stage-1 Clearance.
22.	Whether there is any Government Order/Policy relevant/relating to the site?	No
23.	Forest land involved (hectares)	159.248 Ha
24.	Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up? (a) Name of the Court (b) Case no.	No litigation pending in Court.

	(c) Orders/directions of the Court, if any and its relevant with the proposed project.	
25.	Project Cost	Rs. 357.62 Crores

"I do hereby undertake that the data and information given in the application and enclosures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance given, if any to the project will be revoked at our risk and cost.

Date: 06/12/2016
Place: Bhubaneswar

Authorized Signatory Pramod Gupta
Designation : Sr. VP - Chief Projects & Corporate Affairs
Address : Paradeep.

NOTE:

1. The projects involving clearance under Coastal Regulation Zone Notification, 1991 shall submit with the application a C.R.Z map duly demarcated by one of the authorized agencies, showing the project activities, w.r.t. C.R.Z (at the stage of TOR) and the recommendations of the State Coastal Zone Management Authority (at the stage of EC). Simultaneous action shall also be taken to obtain the requisite clearance under the provisions of the C.R.Z notification, 1991 for the activities to be located in the CRZ.
2. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridor of Wild Animals, the project proponent shall submit the map duly authorized by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden thereon (at the stage of EC)."
3. All correspondence with the Ministry of Environment & Forests including submission of application for TOR/Environmental Clearance, subsequent clarifications, as may be required from time to time, participation in the EAC Meeting on behalf of the project proponent shall be made by the authorised signatory only. The authorised signatory should also submit a document in support of his claim of being an authorised signatory for the specific project."
4. Capacity corresponding to sectoral activity (such as production capacity for manufacturing, mining lease area and production capacity for mineral production, area for mineral exploration, length for linear transport infrastructure, generation capacity for power generation etc.,)

N.B:

1. *The full name, designation and signature of the project proponent/authorized signatory should be mentioned.*
2. *The above highlighted points should also be noticed by the project proponent/authorized signatory*

(II) Activity

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)

Sl. No.	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	Yes	The existing 10.7 MTPA Beneficiation Plant has been established over an area of 34.40Ha. Additional land of 164.467Ha at Dhanurjaypur, Malda & Kaliapal has been identified for establishing a Tailing Dam. The Truck Unloading Station will be set up over an adjacent area to the Beneficiation Plant, Dabuna of 1.92 Ha. Water and Slurry Pipeline from Ghoraburhani-Sagasahi Iron Ore Block to Beneficiation Plant at Dabuna will involve an area of 23.90Ha of land. The Tailing and Return Water Pipeline from Tailing Dam to Beneficiation Plant will require 10.607Ha of land.
1.2	Clearance of existing land, vegetation and buildings?	Yes	Out of 164.467Ha of total land at Dhanurjaypur, Malda & Kaliapal, 159.248Ha is forest land, for which, FDP has been submitted and is now with DFO, Keonjhar for further consideration.
1.3	Creation of new land uses?	Yes	Construction of Tailing Dam, Truck Unloading Station and laying of Slurry Pipeline, Tailing Pipelines and Water Pipelines
1.4	Pre-construction investigations e.g. bore holes, soil testing?	Yes	The nature of the soil and its profile will be ascertained for Tailing Dam after carrying out a detailed investigation (e.g. bore holes, soil testing) before the commencement of work. However, such investigations have already done for the existing Beneficiation Plant area.
1.5	Construction works?	Yes	Construction activities will be worked out during detailed engineering.
1.6	Demolition works?	No	Nil. There will not be any demolition works.

1.7	Temporary sites used for construction works or housing of construction workers?	No	Existing facilities will be used.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	Yes	Above ground structures like embankment, conveyor system, pipeline will be constructed and excavation will be made for establishing the tailing pond.
1.9	Underground works including mining or tunneling?	Yes	Slurry & Water pipelines from Sagasahi mine to Beneficiation Plant and tailing & return water pipelines from Tailing Pond to Beneficiation Plant will be underground.
1.10	Reclamation works?	No	NA
1.11	Dredging?	No	NA
1.12	Offshore structures?	No	NA
1.13	Production and manufacturing processes?	Yes	The beneficiation process enriches the iron ore fines by removing the gangue materials. Details are provided in Pre-feasibility Report (Ref. Sec. 3.4 & fig. 3.3)
1.14	Facilities for storage of goods or materials?	Yes	No additional storage facility is envisaged. Existing facility will be adequate enough to take care of the expansion.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	Tailing will be disposed of in the Tailing Dam.
1.16	Facilities for long term housing of operational workers?	Yes	Suitable accommodation will be provided for operational workers of the plant.
1.17	New road, rail or sea traffic during construction or operation?	No	For the proposed expansion, the existing road network will be used.
1.18	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	NA
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	No closure or diversion of existing transport routes is involved.
1.20	New or diverted transmission lines or pipelines?	Yes	About 26.45Kms long underground Water and Slurry Pipeline from Ghoraburhani-Sagasahi Iron Ore Block to Beneficiation Plant. 9.65Km long Tailing and Return Water Pipeline from Tailing Dam to Beneficiation Plant.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	Not Anticipated.
1.22	Stream crossings?	No	No stream crossing

1.23	Abstraction or transfers of water form ground or surface waters?	Yes	1200m3/hr (11.77 cusecs) from the Baitarani River through 9Km long Water Pipeline. Deptt. of Water Resources, Govt. of Odisha has allocated drawl of water @ 1200 m3/hr from river Baitarani vide letter No. 34127/WR dated 24.12.2009 of Dept. of Water Resources, Govt. of Odisha.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	None
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	All transportation of material and people for construction will be done by road. The Iron ore Fines would be transported by road from the nearby mines to the plant as well as through Slurry Pipeline from Ghoraburhani-Sagasahi Iron Ore Block located at a distance of about 26.45Km.
1.26	Long-term dismantling or decommissioning or restoration works?	No	Not anticipated
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	Not anticipated
1.28	Influx of people to an area in either temporarily or permanently?	Yes	People may come for permanent and temporary employment during construction and operation and to avail business opportunities.
1.29	Introduction of alien species?	No	Not anticipated
1.30	Loss of native species or genetic diversity?	No	Not anticipated
1.31	Any other actions?	No	Not anticipated

2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):

Sl. No	Information/checklist confirmation	Yes/ No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	The Tailing Dam land of 164.467Ha at Dhanurjaypur, Malda & Kaliapal villages is not agricultural land. Out of total land, 159.248Ha is forest land and the remaining are Govt. and private land.
2.2	Water (expected source & competing users) unit: KLD	Yes	Baitarani River- 28800KLD (Max. for enhanced capacity)

2.3	Minerals (MT)	Yes	Iron Ore fines: 16.0 MTPA
2.4	Construction material-stone, aggregates, sand / soil (expected source – MT)	Yes	Cement, Metal, sand, steel The material will be sourced locally
2.5	Forests and timber (source – MT)	No	Not anticipated
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	Source: The required power (29.5MW) will be sourced from Orissa Power Transmission Corporation Ltd (OPTCL) and 2x30MW captive power plant of Essar Power Orissa Ltd., if required.
2.7	Any other natural resources (use appropriate standard units)	No	Not Anticipated

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

Sl. No	Information/Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	No	None. The process does not involve any hazardous material defined in the MSIHC rules, 1989 and amendment thereof.
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	Not Anticipated
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	The project will benefit the people living in the neighboring areas by providing them direct and indirect employment opportunities associated with the construction and operation of a plant
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	Not Anticipated
3.5	Any other causes	No	NA

4. Production of solid wastes during construction or operation or decommissioning (MT/month)

Sl. No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	No	Not Anticipated
4.2	Municipal waste (domestic and or commercial wastes)	Yes	During the construction phase, about 100 workers will be staying in the labour colony for 12 months. The estimated domestic waste generation will be ~10 m^3/d. STP of adequate capacity shall be provided. All solid waste will be collected and disposed as per the

			requirement of the Solid Wastes Management Rules.
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	Yes	Hazardous wastes like paint residue, spent oil from construction equipment, Used oil of transformer etc. generated during both construction and operation phases will be appropriately disposed off to authorized re-processors.
4.4	Other industrial process wastes	Yes	Tailing, 4MTPA (Max.)
4.5	Surplus product	No	Not Anticipated
4.6	Sewage sludge or other sludge from effluent Treatment	Yes	Sewage sludge generated will be evacuated at regular interval and disposed of suitably.
4.7	Construction or demolition wastes	Yes	Waste generation from the project site during the construction phase such as construction debris (concrete and masonry material) would be re-used as land filling material.
4.8	Redundant machinery or equipment	No	Not Anticipated
4.9	Contaminated soils or other materials	No	Not Anticipated
4.10	Agricultural wastes	No	Not Anticipated
4.11	Other solid wastes	No	--

5. Release of pollutants or any hazardous, toxic or noxious substances to air (Kg/hr)

Sl. No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	Imperceptible emissions may occur due to vehicular movement inside the Plant as well as transportation of iron ore fines from Truck Unloading Station to stock yard through above ground conveyors.
5.2	Emissions from production processes	Yes	Fugitive dust is expected to be generated at the transfer points of conveyor system.
5.3	Emissions from materials handling including storage or transport	Yes	The iron ore fines from the mine will be transported by road and/or slurry pipeline. Trucks carrying materials shall be covered with tarpaulin to avoid spillage. Dust Suppression System is also installed in material handling area.
5.4	Emissions from construction activities including plant and equipment	Yes	Imperceptible emissions due to movement of vehicles, excavation activities etc.
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	Yes	Not Anticipated

5.6	Emissions from incineration of waste	No	Not Applicable.
5.7	Emissions from burning of waste in open air (e.g. sludge materials, construction debris)	No	Not envisaged.
5.8	Emissions from any other sources	No	Not envisaged.

6. Generation of Noise and Vibration, and Emissions of Light and Heat:

Sl.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	There will be noise generation at DG Room area, grinding unit, Pump house etc.
6.2	From industrial or similar processes	Yes	Same as above. However, in case the noise level exceeds 85dB(A), the persons likely to be exposed shall be provided with Ear Plug/ear muff.
6.3	From construction or demolition	Yes	During construction activity there may be some noise. PPE will be provided as per the requirement.
6.4	From blasting or piling	Yes	Piling work will be undertaken if required. But noise generation will not impact the workers as they will be provided with ear muffs/plugs
6.5	From construction or operational traffic	Yes	During construction activity there may be some noise. PPE will be provided as per the requirement.
6.6	From lighting or cooling systems	No	NA
6.7	From any other sources	No	Nil

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

Sl.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	No	All measures will be taken to avoid any spillages. Necessary protective measures will be provided to contain any spillage.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	Sewage will be conveyed to soak pits via septic tanks. Apart from this there is no other source of effluent.
7.3	By deposition of pollutants emitted to air into the land or into water	No	Not envisaged
7.4	From any other sources	No	-do-
7.5	Is there a risk of long term build up of pollutants in the environment from	No	-do-

	these sources?		

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment

Sl.No	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	No	Not Anticipated. No hazardous substance will be handled.
8.2	From any other causes	None	Not envisaged.
8.3	Could the project be affected by natural disasters causing environmental damage (e.g floods, earthquakes, landslides, cloudburst etc)?	No	Project located in Zone II of the seismic zone and at an altitude of around 500m above MSL and thus is not likely to get affected by such natural disasters.

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality

Sl. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
9.1	Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.: • Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.) • housing development • extractive industries • supply industries • other	No	There would be secondary development and employment opportunities due to this project. Project will house employees in a separate colony and thereby reducing likely burden on the existing infrastructure.
9.2	Lead to after-use of the site, which could have an impact on the environment	Yes	After the life of tailing dam, the site will be covered with vegetation.
9.3	Set a precedence for later developments	Yes	Socio-economic status of the peripheral residents will considerably improve.
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Not anticipated

(III) Environmental Sensitivity

Sl. No	Areas	Name/ Identity	Aerial distance (within15 km.) Proposed project location boundary
1.	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	No	None exists within 15 km from the project site.
2.	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	No	None
3.	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	No	None
4.	Inland, coastal, marine or underground waters	Yes	River Baitarani flows at a distance of 3Km
5.	State, National boundaries	No	Nil
6.	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	No	Nil
7.	Defense installations	No	None
8.	Densely populated or built-up area	Yes	Joda: 46,631- 18 Km Keonjhar: 2,53,059 (Source 2011Census) - 30 Km
9.	Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*	Yes	Dabuna high school, village temple, community facilities exist within 10Km but will not be affected by the plant.
10.	Areas containing important, high quality or scarce resources *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*	No	None
11.	Areas already subjected to pollution or environmental damage. *(those where existing legal environmental standards are exceeded)*	No	NA
12.	Areas susceptible to natural hazard which could cause the project to present environmental problems (*earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions*)	No	No such area is there within the aerial distance of 15 km from the plant boundary. The project site falls in Seismic Zone -II.

(IV). Proposed Terms of Reference for EIA studies

1) Preparation of rapid EIA/EMP for the proposed expansion of Iron Ore Beneficiation Plant and the Tailing Pond as per the MoEF guidelines.
2) Data collection in the Core Zone (Plant Site & Tailing Pond Site) and Buffer Zone (10 Km radius) and around the proposed project site in respect of the following:

a) Base line data on Air, Water, Soil and Noise in the Core and Buffer Zones of the Plant

b) Study of Flora and Fauna in both Buffer and Core Zones.

c) Land Use Pattern.

d) Socio-economic aspects in the area.

e) Drainage Pattern

f) Scheme for green belt /afforestation in the area.

3) Identification of Anticipated Environmental Impacts and evaluation
4) Mitigation Measures for reducing adverse impacts
5) Environmental Monitoring Programmes.
6) Socio-economic Impact analysis

The EIA study will involve more detailed study of the site settings and would record the adjacent land uses, settlements and ecosystem sensitivities.

3.0 Environmental & Social Baseline Studies

ESL will prepare an Environmental Impact Assessment study as per the EIA guidelines of Ministry of Environment & Forests (MoEF) and in accordance to the requirements of the EIA notification S.O. No. 1533 dated 14th September 2006 issued by Ministry of Environment and Forests, Government of India.

3.2 Environmental Baseline Data Collection

The baseline environmental status of project site and its surroundings will be collected through primary monitoring and surveys for relevant parameters and secondary data collection from related agencies. Data will be generated for the following components of baseline environment:

a. *Micrometeorology*

Continuous micrometeorological data will be collected for one full season recording parameters such as: ambient temperature, wind speed and direction, relative humidity, and rainfall. Also secondary data on meteorology of the study area from nearest India Meteorological Department at Keonjhar will be collected.

b.*Ambient Air Quality:*

The ambient air quality will be monitored for one season as per the requirement specified by State/Central Pollution Control Board and Ministry of Environment and Forests. The parameters

monitored include SPM, PM_{10}, $PM_{2.5}$, SO_2, NO_x, Mercury (Hg), Hydro carbon (HC), Ozone (O_3), Lead (Pb), Carbon Monoxide (CO), Ammonia (NH_3), Benzene ($C_6 H_6$), Benzo -a- Pyrene (BaP) – Particulate phase only, Arsenic (As) and Nickel (Ni) parameter.

The monitoring will be carried out at 8 locations with a frequency of 2 days per week for one season as specified by Central Pollution Control Board.

c. *Water Environment*

Surface water quality data will be collected through primary sampling of ground water and surface water sources located within the study area. A total of 8 surface water and 8 ground water samples will be collected from different sources representing surface and groundwater resources in the area. The samples will be analyzed to establish the following:

- Physical parameters:
  pH, Temperature, Conductivity, Turbidity & Colour
- Chemical parameters:
  Alkalinity, Total Dissolved Solids, Total Suspended Solids, Salinity, Oil & Grease, Dissolved Oxygen, Chlorides, Total Hardness, Calcium, Magnesium, Sulphate, Fluorides, Nitrate, Iron, Phenolic Compound, COD, BOD, Phosphate, Anionic Detergents, Heavy metals like Copper, Barium, Cadmium, Selenium, Arsenic, Cyanide, Lead, Zinc, Chromium, Aluminium & Manganese
- Bacteriological parameters:
  Total Coliform, Faecal Coliform

Information regarding availability of water resources, with respect to project requirement, potential yield of the source will be gathered.

d. *Soil Quality and Land Environment*

Soil samples will be collected from 8 sampling stations to assess the soil quality by estimating texture, moisture, sand, silt, clay, organic matter, alkalinity, acidity, specific gravity, bulk density, pH, electrical conductivity, Nitrogen, Phosphorous, Potassium, Ca, Mg, K, Chloride, Sulphate, Carbon, Fe, Cu, Zn, Mn, and Na.

Information regarding, topography, geology, vegetation, seismicity and land use pattern within the study area will be collected from relevant sources.

e. *Traffic Volume*

Information will be collected on traffic volumes for roads connecting the project area by conducting traffic volume monitoring at various locations. The traffic volume count has been recorded continuously for 24 hours during the study period on aspects such as present traffic, additional traffic due to the project and overall scenario.

f. *Noise*

Noise quality will be monitored to determine hourly equivalent noise levels. The noise sampling will be done once during the study period continuously for 24 hours at 8 locations based on site sensitivities within the study area. The results of the finding will be used to determine: $L_{eq\ hourly}$, $L_{eq\ day}$ and $L_{eq\ night}$.

g. *Biological Environment (Flora and Fauna)*

Information on flora and fauna will be gathered through primary ecological surveys using standard techniques in order to describe baseline status of flora and fauna within the study area.

Information will also be collected from the various Govt. and non Govt. offices such as Dept of Forest and Wildlife/Botanical and Zoological Survey of India (BSI and ZSI) offices. The information thus gathered will be used to identify threatened and endangered species as per IUCN Red Book data, RED list-ZSI-BSI, Schedules of Wildlife Protection Act, 1972 and list of BNHS-Birdlife International.

h. *Socio-Economic Environment*
Primary and secondary information on socio-economic parameters within 10 km radius of the project site will be collected with respect to demography such as households, population, villages and tehsils/taluka population distribution, scheduled castes, scheduled tribes, literacy levels, employment pattern, primary health care facilities available, and transport, communication and welfare facilities.

i. *Cultural Environment*
Information will be collected on existence of historical, religious and cultural monuments of regional, national and international or archaeological importance located within the study area.

4.0 Impact Assessment

The study will aim to identify, characterize and evaluate potential impacts arising out of the proposed expansion and prioritize them so that they can be effectively addressed through Environment Management Plans and Project designing and planning.

a. Impact Identification
The preliminary identification of the potential impacts will be carried out based on the understanding of the project components during the scoping exercise and field visit, consultation with Essar representatives and professional judgment of the consultant team. An environmental matrix linking various project activities with environmental and socio economic issues will be developed to formally present an overview of its impacts indicating cause-effect relation.

b. Impact Prediction
Quantitative prediction would be carried out for air and noise quality status. The widely accepted Industrial Source Complex (ISC3) Short Term Model will be used after with inputs from Essar and based on meteorological data obtained from the field station. Noise at receptor points would be predicted using attenuation equations and factors based on operational noise level of equipment with technical inputs from Essar. Ecological and socioeconomic impacts would be predicted based on professional judgment and peer review by using network methodology.

c. Impact Evaluation
Impacts will be evaluated by assigning of weights and ranks to the matrix elements. A weightage would be given to each of the identified impacts based on criteria that would be developed on the consequence and likelihood of impacts. The final significance rating would be arrived at based on a multiplication of consequence X likelihood factors.

The study will also provide information about the likely environmental conditions in the EIA Study Area with and without the Project, including cumulative effects in combination with other human activities.

5.0 Environmental Management Plan

The Environment Management Plan (EMP) will describe the environmental practices and procedures which are to be systemically applied by the proponent during planning, construction, operation maintenance and in order to manage potential environmental and other effects.
EMP will mainly address the following task areas.

- Construction waste management plan
- Air quality and dust control plan
- Water quality/ quantity monitoring plan
- Hazardous waste management plan
- Vegetation monitoring plan
- Others, if need identified with regulatory agencies.

6.0 Risk Assessment and Disaster Management Plan

Potential Hazards that may arise out of storage/transportation of hazardous chemicals/materials or due to operation of various processes at the proposed project will be systematically identified using standard hazard identification procedures in close cooperation with Essar Design Team. This will mainly include breach of tailing pond, pipeline failure and over flow from the tailing pond.

7.0 EIA Reporting

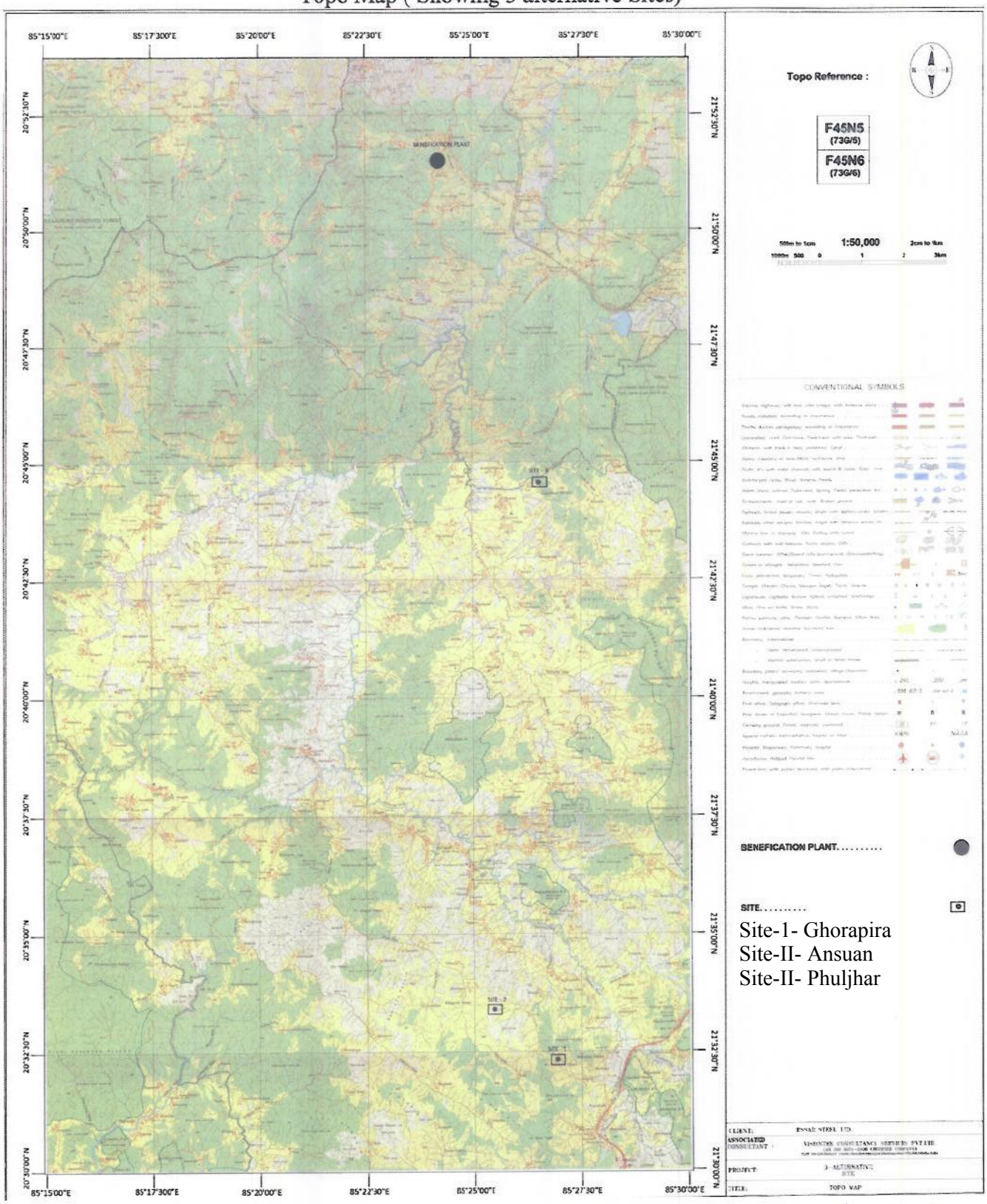
The report will include supporting documents as necessary, a list of findings, impacts and proposed mitigation measures. Following would be the generic structure of the report as per the guideline set by EIA Notification 2006:

1) Introduction
2) Project Description
3) Description of the Environment
4) Anticipated Environmental Impacts and Mitigation Measures
5) Analysis of alternatives
6) Environmental Monitoring Program
7) Additional Studies
8) Project Benefits
9) Environmental Cost Benefit Analysis
10) Environmental Management Plan
11) Summary and Conclusion
12) Disclosure of the Consultants engaged

The draft EIA report will be further finalized by incorporating comments and views obtained from different stakeholders during the Public Consultation and through letters/ representations before submission to the Appraisal Committee. Annexed to the report, there would also be the notes and proceedings of the public hearing, list of references and other relevant documents, photographs etc.

Annexure-1

Topo Map (Showing 3 alternative Sites)



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ESSAR STEEL

ESSAR STEEL INDIA LIMITED

PRE FEASIBILITY REPORT

FOR

EXPANSION OF BENEFICIATION PLANT (10.70 TO 16 MTPA)

AT

VILLAGE – DABUNA, TEHSIL – BARBIL, DISTRICT – KEONJHAR, STATE – ODISHA.

DOCUMENT NUMBER

1	6	2	8	E	N	G	B	E	N	3	G	N	A	G	E	N	T	S	L	R	E	P	0	0	0	1

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Date	Details of Revision	Rev
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ABBREVIATIONS

CHC	Community health center
CPP	Captive Power Plant
Cusec	Measure of flowrate, cubic feet per second
CWC	Central Water Commission
EC	Environmental Clearance
EPC	Engineering, Procurement & Construction
ESIL	Essar Steel India Limited
Fe	Chemical symbol for metallic Iron
GDP	Gross Domestic Product
Ha	Unit of Area, Hectare
HGMS	High Gradient Magnetic Separator
IOF	Iron Ore Fines
ISP	Integrated Steel Plant
KIDCO	Keonjhar Infrastructure Development Company Limited
Km	Unit of Length, kilometer
kV	Unit of Voltage, Kilo voltage
kW	Unit of Power, Kilowatt
M	Unit of Length, Meter
MTPA	Unit of mass Throughput, Millions of tonnes per annum
MW	Unit of Power, Megawatt
NH	National Highway
OPTCL	Odisha Power Transmission Corporation Limited
P80	80% of the product passing by weight
ROM	Run of Mine

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Essar Group maintains a very balanced portfolio of assets in the manufacturing and services sectors of Steel, Oil & Gas, Power, Communications, Shipping ports & logistics, and Construction. The group has operations in more than 25 countries and employs over 60,000 people.

Essar Steel is a global producer of Steel with a footprint in India, Canada, USA, the Middle East and Asia. The company is totally integrated from raw material to finished products and operating in the areas that includes Iron Ore beneficiation, Pelletization, Iron and Steel, Steel processing and distribution etc.

Essar Steel Orissa Limited was incorporated on 14th June 2006 with the Registrar of Companies" Mumbai Maharashtra as a wholly owned subsidiary of Essar Steel India Limited (hereafter referred as ESIL) - the flagship company of Essar Group with main objective, of setting up a Steel plant in the State of Odisha.

In the Financial year 2009-10, as part of the Essar Group's expansion and product diversification strategy, Essar Steel India Limited planned additional capacities for manufacture of Pellets, Slabs, Hot Rolled Coils, Plates and Pipes in the project companies wholly owned by it viz., Essar Steel Orissa Limited, Essar Steel Hazira Limited ,Hazira Plate Limited and Hazira Pipe Mill Limited. Accordingly, the said project companies amalgamated with the parent company i.e. EStIL.

Essar Steel Orissa Ltd., now known as ESIL has commissioned an Iron Ore Beneficiation Plant of 10.70 MTPA (throughput) capacity along with tailing disposal and 253 km long 12 MTPA Slurry Pipeline facility from Dabuna to Paradeep Pellet Plant.

With reference to the EC no J-11011/129/2007 – IA II (I) dated 29th May, 2008 for Integrated Steel Plant (6.00 MTPA) at Paradeep, Dist- Jagatsingpur, Odisha, Essar has been granted the environmental clearance of 12 MTPA Pellet Plant as Phase-I. The Pellet Plant receives Iron Ore Concentrate feed through 12 MTPA capacity slurry pipeline from Dabuna Beneficiation Plant. To match the capacity of Dabuna Beneficiation Plant with Pellet Plant of Paradeep, it is essential to enhance the capacity of present Beneficiation Plant of 10.7 MTPA throughput (8 MTPA beneficiated Concentrate) to 16 MTPA through put (12 MTPA beneficiated Concentrate).

With reference to the EC No.J-11015/876/2007 – IA II (M)., dated 4th May, 2009 with amendment dated 22nd May, 2009 Essar Steel Orissa Ltd. has been granted environmental clearance for 10.7 MTPA throughput capacity Beneficiation Plant at Dabuna. As per the EC, a tailing pond was

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supposed to be located at village Basantpur in 87.0105 ha of land having 83.711 ha of forest land. Essar had to surrender this land application to Government of Odisha because Patta was issued to the forest dwellers under Forest Right Act 2006 and this forest land was no more contiguous land and hence not suitable for any industrial use. Therefore a land 164.467 ha (406.408 acre) at village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar is identified for construction of tailing pond. This land consists of 159.248 ha of forest land. This is approximately at a distance of 9 km from the Dabuna Beneficiation Plant. It is proposed to construct a Tailing Pond in the identified location and lay a Tailing Pipeline along with Return Water Pipeline connecting Dabuna plant and Tailing Pond. Necessary communication/electrical cables will be laid along the Pipeline.

At present Dabuna Beneficiation Plant receives Iron Ore Fines from various merchant miners through road transport. Recently Government of Odisha has awarded the Letter of Intent for grant of mining lease in favor of Essar Steel India Limited for “Ghoraburhani – Sagasahi Iron ore block”. The above block has been allotted through competitive bidding under captive category for use in company’s ISP at Hazira. The Iron ore block is spread over an area of 139.165 ha. (90.629 ha area of Mineralized area and 48.536 ha of Non-Mineralized area) situated in village Ghoraburhani, Kalamang and Sagasahi under Koira Tehsil of Sundargarh District. This Iron Ore block is situated at a distance of 28 km from Beneficiation Plant, Dabuna (by road) and is well connected by NH 215 and additional vehicular roadways to the plant at Dabuna.

It is proposed to transport the Iron Ore Fines(IOF) from Ghoraburhani – Sagasahi Iron ore block through Slurry Pipeline as well as through trucks covered with tarpaulin to Dabuna Beneficiation Plant. Slurry Pipeline transportation is selected and preferred based on the consideration that it is the most efficient and cost effective transportation solution compared to conveyor and road transportation system. For this purpose, a Slurry Pipeline of 6 MTPA capacity along with Water Pipeline and communication/electrical cables will be laid from Dabuna Beneficiation Plant to Ghoraburhani – Sagasahi Iron ore block.

The existing and final configuration of Beneficiation Plant is as follows:

Existing Plant Configuration

a) 10.7 MTPA throughput (8 MTPA beneficiated Concentrate) Iron Ore Beneficiation Plant.
b) 253 Km long 12 MTPA slurry pipeline from Dabuna to Paradeep Pellet Plant.

The Tailing Pond at Basantpur could not be constructed because of the reason stated above.

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Final Plant Configuration

a) Iron Ore Beneficiation Plant of total 16 MTPA throughput capacity (12 MTPA Concentrate) at Dabuna
b) Relocating the Tailing pond from Basantpur village to village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar along with Tailing & Return Water Pipeline with the communication/electrical cables connecting Dabuna Beneficiation Plant to Tailing Pond
c) Slurry pipeline of 6 MTPA capacity along with Water Pipeline and communication/electrical cables connecting Ghoraburhani - Saghasahi Iron ore block and Dabuna Beneficiation Plant.
d) Additional Truck Unloading Facility to take care of handling of IOF being received through Road.

1.2 DESIGN CRITERIA

Presently plant is operating with maximum capacity of 8 MTPA DR/BF grade Concentrate which will be enhanced to a maximum capacity of 12 MTPA DR/BF grade Concentrate. The design criteria for the beneficiation circuit of Dabuna plant are as below:

The Concentrate quality for the Pellet Plant feed is 80% of -45 micron size at minimum 63.5% Fe for production of BF grade Pellets production & minimum 66% Fe for production of DR grade Pellets. To obtain 63.5 % Fe Concentrate, Iron Ore Fines with 58-61% Fe would be used as feed. To obtain 66% Fe Concentrate, Iron Ore Fines with 62-64 % Fe would be used as feed in Beneficiation Plant. To produce 12 MTPA DR/BF grade Concentrate, requirement of Iron Ore Fines feed quantity is worked out to be in the range of 12-16 MTPA depending upon the quality of the IOF fed to the plant. Maximum IOF feed is required in the worst case scenario[1] considering 75% weight recovery of the Plant.

The plant has also been optionally designed to produce a maximum of 12 MTPA DR/BF grade Concentrate using suitable Iron Ore Fines by operating grinding circuit within existing plant facility, achieving a maximum plant yield of up to 100%.

1.3 TAILING DISPOSAL

The generation of Tailing quantity from the Beneficiation Plant will vary from 0-4 MTPA depending on the feed quality of IOF. The Tailing from the Plant would be pumped in the form of slurry having 50 % solids (by weight) via under laid Pipeline. The Tailing pumped from Beneficiation Plant to

[1] The worst case scenario is defined as the enrichment of IOF from 58% Fe to 63.5% Fe Concentrate in case BF Grade Pellet quality and the enrichment of IOF from 62 % Fe to 66 % Fe Concentrate in case of DR Grade Pellet quality.

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tailing pond will be 0 to 4 MTPA. Maximum Tailings will be generated in worst case scenario (2 million cubic meter by volume), when operating at full rated capacity with the designed feed quality of Iron Ore Fines.

Therefore to handle the Plant Tailing, a land of 164.467 ha (406.408 acres) at village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar has been identified for constructing a tailing pond. This land consists of 159.248 Ha of forest land, 1.709 Ha of Govt. Land and 3.510 Ha Private Land. It is located at a distance of approximately 9 km from Beneficiation Plant. It is proposed to construct a tailing dam, with under laid Tailing Pipeline and Return Water Pipeline with communication/electrical cables connecting Dabuna Plant to Tailing Pond. The tailing pond will be designed as per the guidelines of CWC as well as the conditions specified in previous environmental clearance accorded by Ministry of Environment & Forests, Government of India. The safe disposal of generated tailings to tailing pond would be ensured that the tailings shall not be discharged anywhere other than tailing pond.

The tailing pond is sufficient to handle the plant tailing generation for more than 30 years considering initial storage volume of 100 million cubic meter.

1.4 LAND AVAILABILITY AND CONNECTIVITY

The existing Beneficiation Plant is located on KIDCO expressway from Joda to Palasponga and well connected with NH-215 through Joda Junction to expressway & various roads. Part of the expansion project in the Beneficiation Plant will be accommodated within the existing plant boundary. However additional land of 1.92 Ha(4.75 Ac.) will be required for Truck Unloading Station adjacent to the boundary of Beneficiation plant. For Tailing disposal 164.467 Ha (406.408 acres) land has been identified at village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura. The land is located at a distance of 9 km from the Dabuna Beneficiation Plant.

1.5 INFRASTRUCTURE

Existing plant infrastructures are sufficient for capacity expansion. The existing rail and KIDCO road network is good enough to cater the present requirement. Additional 6 MTPA Slurry Pipeline from Sagasahi has been proposed in this project, and also Truck Unloading Station (TUS) is being considered for the expansion.

1.6 WATER REQUIREMENT

The water requirement for beneficiation process (wet grinding system), slurry transportation and flushing of the slurry pipeline will be met from the Baitarani River through existing 9 km water pipe line. There is no additional water requirement for this expansion. Permission has been obtained for drawl of 11.77 Cusecs (@1200m3/hr) water from Baitarani River, considering production of 12

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MTPA Concentrate in the form of slurry.

1.7 POWER REQUIREMENT

At present the Beneficiation Plant is consuming maximum power of 21.5 MW for processing 10.7 throughput of Iron Ore Concentrate. The estimated power requirement for Grinding and Beneficiation process for production and pumping of 12 MTPA Slurry Concentrate including Tailing disposal and Iron Ore Fines Slurry Pipeline Transportation is about 29.5 MW. This power demand is met by Odisha Power Transmission Corporation Limited (OPTCL), with sanctioned operation power of 30 MW from 132/33 kV grid sub-station, Palaspanga. In case of any additional power requirement during the expansion shall be met from both OPTCL and CPP at Paradeep.

1.8 GREEN BELT

About 29.67 (33%Total Land) Acres of land will be developed as green belt during the expansion phase, and as per the CPCB guidelines a green belt of adequate width and density will also be developed. A thick green belt is already developed inside the plant and additional plantation shall be further undertaken by planting local species like Neem, Karanja, Chattiana, Jamun, Radhachuda etc. The plantation will be done on the both sides of the internal plant roads and other remaining open areas in consultation with Forest Department. As a CSR activity, plantation is also being undertaken in the peripheral villages.

1.9 PROJECT SCHEDULE AND COST ESTIMATE

The completion of Engineering, Procurement and Construction activities for expansion will take around 30 months after getting all statutory clearances from various government agencies.

The capital cost for Beneficiation Plant expansion for ramp up from 10.7 MTPA to 16 MTPA will be around ₹ 357.62 crores. The summary of capital cost estimate is described in chapter - 7 under table 7.2

1.10 FINAL RECOMMENDATIONS

Keeping in view of the realities of existing Beneficiation Plant as well as financial analysis of proposed project, it can be concluded that the proposed expansion is economically viable. It is therefore recommended to expand the Beneficiation Plant capacity from the existing 10.7MTPA (throughput) to 16MTPA (throughput) at Dabuna, Tehsil – Barbil, District – Keonjhar, State - Odisha.

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2 INTRODUCTION OF THE PROJECT / BACKGROUND INFORMATION

2.1 IDENTIFICATION OF THE PROJECT PROPONENT AND PROJECT

Essar Steel is a global integrated Steel producer with an annual capacity of 14 million tonnes with a strong presence in intensive Steel consuming markets of Asia and North America. Essar Steel's manufacturing facility comprises Iron ore beneficiation, Pellet making, Iron making, Steel making, and downstream facilities including cold rolling mill, galvanizing, pre-coated facility, Steel processing facility, extra wide plate mill and a pipe mill. With a focus on value added products, it produces over 300 grades of Steel. The company is totally integrated from raw material to finished products adding value at every phase of the manufacturing process. The areas of operation in India include:

Iron Ore Beneficiation

An 8 MTPA plant at Bailadilla (Chhattisgarh) and 8 MTPA(output) Plant at Dabuna (Odisha), both strategically established to leverage the rich Iron Ore deposits in the respective states. The Plant uses the wet grinding and beneficiation technology to upgrade the Iron Ore Fines into a beneficiated iron ore slurry concentrate which is used to make Iron Oxide Pellets. Iron Ore Slurry Concentrate is pumped from Beneficiation Plant at Bailadila to Essar Steel Pellet Plants at Visakhapatnam (Andhra Pradesh) via 267 km Slurry Pipeline and from Beneficiation Plant at Dabuna to Essar Steel Pellet Plant, Paradeep (Odisha) via 253 km underground Slurry Pipeline.

Iron and Steel

A fully integrated world-class facility is at Hazira, housing the world's fourth largest single-location Steel plant. It has a Steel-making capacity of 10 MTPA. The facility also houses a 6.8 MTPA Sponge Iron Plant; a 1.5 MTPA plate mill; a 0.6 MTPA pipe mill and a 1.4 MTPA cold rolling and 6.1 Hot Roll Coil mill complexes.

The proposed project configuration is:

Iron Ore Beneficiation Plant of total 16 MTPA throughput capacity (12 MTPA Concentrate) at Dabuna

a) Relocating the Tailing Pond from Basantpur village to village Dhanurjapur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar along with Tailing & Return Water Pipeline with the communication/electrical cables connecting Dabuna Beneficiation Plant to Tailing Pond
b) Slurry pipeline of 6 MTPA capacity along with return water pipeline and communication/electrical cables connecting Dabuna Beneficiation Plant to Ghoraburhani – Saghasahi Iron ore block.
c) Additional Truck Unloading Facility to handle of IOF received from various mines through road.

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2.2 BRIEF DESCRIPTION OF THE NATURE OF THE PROJECT

The proposed beneficiation project is the expansion of existing production capacity from 10.70 MTPA (throughput) to 16 MTPA(throughput) and is brown field in nature.

2.3 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY / REGION

Currently the company is having a Beneficiation Plant of 10.70 MTPA capacity, which can produce only 8 MTPA Concentrate used for Pellet making. To meet out the current demand of 12 MTPA Pellet feed, it is necessary to expand the Dabuna Beneficiation Plant capacity from 10.70 MTPA to 16 MTPA which will produce 12 MTPA iron ore concentrate. The proposed expansion of beneficiation project is of great significance looking towards considerable demand of Iron Ore Pellet in the Steel making.

Based on 2015 data of World Steel Association, India is the 3rd largest producer of crude Steel in the world and its capacity is around 89.6 MTPA. The Steel production contributes about 2% of India's Gross Domestic Product (GDP) and employs over 6 lakh people. The proposed expansion of the project utilizes beneficiation technology and produces a Concentrate of 63.5% to 66% Fe from Iron Ore Fines of average grade 60 to 64% Fe. This Concentrate could be made as Pellet and could be fed to Blast furnace or DR Plants directly. This project can produce 12 MTPA Concentrate and Pellets successively, from which approximately 7 - 8 MTPA Steel can be produced. This plant could contribute to increase the country's Steel production by approximately 7-8% and thereby increase our country's GDP by approximately 0.1 to 0.2 %. The proposed expansion will be managed in an environment friendly manner according to the regulatory requirements and best industrial practices, while ensuring economic viability.

Moreover, majority of the population in nearby local area is tribal like Mundas, Nayaks etc. The major benefit due to proposed project will be in the shape of generating additional direct/indirect employment for this tribal population. Therefore, the proposed project will improve living standard of local inhabitants and properly address community concerns.

2.4 DEMAND – SUPPLY GAP

World crude Steel production stood at 1622.8 million tonnes during 2015, a decrease of 2.8% over 2014 based on provisional data released by World Steel Association (WSA). During 2015, Chinese crude Steel production reached 804 million tonnes, registering a decline of 2.3% over the previous year. China remained the largest crude Steel producer in the world, accounting for 73% of Asian and 50% of world crude Steel production during 2015. India was the 3rd largest crude Steel producer during 2015 in 89.69 MTPA and recorded a growth of 2.6% over 81.69 MTPA in 2014.

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Considering the domestic scenario, demand-supply gap will only widen in the coming year, since domestic Steel demand is expected to rise next year while Iron Ore supplies would pick up only a year or two from now. According to Business Monitor International, Iron Ore output is expected to increase at an annual average rate of 0.5% only, reaching 156 million tonnes by 2017.

Besides achieving the rank of the 3rd largest global crude Steel producer in 2015 (provisional), India has also made a mark globally in the production of sponge Iron/direct reduced Iron (DRI). Courtesy a mushrooming growth of coal-based Sponge Iron units in key mineral-rich pockets of the country, domestic production of Sponge Iron increased rapidly, enabling the country to achieve and maintain the number one position in the global market. With a series of mega projects, either being implemented or at the proposal phase, which once operational will re-write the structure of the Steel industry and its dynamics; and a domestic economy carrying forward the reform process further, the future of the Indian Steel industry is definitely optimistic.

The World Steel Association had forecast India's Steel demand to grow at rate of 5.6% in last year 2015. Recovery in the global economy too, even though modest, will boost Steel production. With capacity expansions (aggregate capacity to rise by 24 Million tonnes. by 2017-18 from the current 90 Million tonnes) lined up by Indian Steel makers, demand for Iron Ore is only expected to trend further upwards.

The expansion plans of ESIL in India will also contribute in fulfilling the captive demand of Pellet feed material for Integrated Steel Plant of 10 MTPA capacity at Hazira, Gujarat and to the country as a whole by expansion of Iron Ore Beneficiation Plant at Dabuna, Odisha.

2.5 IMPORTS VS INDIGENOUS PRODUCTION

Domestic Pellet Production capacities by major merchant plants in eastern sector comes to around 34 Million tonnes (i.e excluding SAIL,TATA, JSW), out of which 20 million capacity is mostly for integrated steel production(Like Essar, JSW, JSPL, Bhushan steel, Bhushan Power) & remaining 14 million ton capacity is available for domestic DRI units. India's DRI making capacity is around 35 Million Tons, out of which 24 Million tonnes is of eastern sector units & 11 Million tonnes is of rest of India.

Considering the capacity utilization of 80% of these units, there will be a production of 28 Million tonnes of DRI/Sponge iron which will require a feed of 42 Million tonnes of Pellets or 50 Million tonnes of Sized Ore.

As long as production of sized ore from Easter sector is considered it is 19 Million tonnes, out of which integrated steel players share is around 4-5 Million tonnes, balance 15 million ton is only available for DRI makers.

Above illustration gives us a deficit of (50- 15) = 35 Million ton of sized ore, for which the best alternative is pellet, which gives better quality sponge with less cost, thus 32 Million tonnes of pellet

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is required to run the secondary steel plants, but available pellet is 14 Million tonnes.

Thus, there is a direct shortfall of 18 Million tonnes of pellets in the market, due to which there is an underutilization of DRI plant capacity & some coastal region plants are running with imported material.

Below Table 2.1 are the details of some of the major Players in Eastern sector with their pellet making capacities.

Table 2.1 – List of Major Pellet Producer

Pellet Producers	Processing Plant Location	Installed Capacity (MTPA)		
		Sinter	Pellet	BF
Jindal Steel And Power	Deojhar	-	10	-
Essar Steel	Paradip	-	6	-
Bhushan Power And Steel	Sambalpur	1	3.5	2.5
Electrosteel Steels	Bokaro,JH	3	1.2	1.59
Brahmani River Pellets	Tanto	-	4	-
Jindal Steel And Power	Raigarh, CG	2.3	-	2.4
Godawari Power And Ispat	Raipur, CG	-	2.1	-
Bhushan Steel	Dhenkanal	1.88	-	2.5
Rashmi Metaliks	Medinipur, WB	0.6	1.2	0.17
Neelachal Ispat Nigam	Kalinga Nagar	1.71	-	0.25
Arya Iron And Steel	Barbil	-	1.2	-
Orissa Manganese	TILOPODA, JH	-	1.2	-
Pro Minerals	Bambari	-	1	-
Monnet Ispat And Energy	Raigarh, CG	0.93	-	0.3
Jayaswal Neco Industries	Raipur, CG	0.91	-	0.65
Mesco	Kalinga Nagar	0.72	-	0.46
Atibir	Giridih	0.34	0.3	0.3
Shyam Sel And Power	Sambalpur	-	0.6	-
Ardent Steel	PHULJHARA	-	0.6	-
Sarda Energy And Minerals	Raipur, CG	-	0.6	-
Electrosteel Castings	Kolkata(WB)	0.36	-	0.7
Neo Metaliks	Durgapur, WB	0.3	-	0.15
Adhunik Metaliks	Sundargarh	0.27	-	0.21
Rashmi Cement	Medinipur, WB	-	0.15	-
Grand Total		**14.32**	**33.65**	**12.18**

2.6 EXPORT POSSIBILITY

India has enormous potential, necessary resources and capabilities to become a global supplier of quality Steel. Also, there exists ample market opportunities in the neighboring regions of Asia, Africa and the Middle East. The policy framework while according top priority to meet domestic demand should also take into account the large export possibilities.

A strong Steel industry can emerge only if it can take on international competition and develop

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overseas markets. Keeping this in view, net exports of 2 million tonnes has been assumed in 12th plan. Accordingly assessment of finished Steel of production has been worked out at 115.3 Million tonnes in 2016-17.

China's Steel Making capacity is around 1000 Million tonnes & production is around 800 Million tonnes, their annual demand for steel is 700 Million ton & rest 100 Million ton is getting exported to various countries.

China's domestic iron ore production is around 1400 Million tonnes with Fe grade of 30-35% and imports around 1000 Million ton of High grade Iron ore in various forms like fines, lumps & pellets from Australia, Brazil, South Africa, India and small quantities from other countries.

Iran, the biggest steel producer in Middle East and world's 2nd largest DRI producer, has emerged as a potential market for Indian pellets, and is expected to hold its position this fiscal too. In the FY14-15, Iran occupied a major share of 70% out of total pellet exports from India.

Iran has an installed DRI capacity of 24.7 MTPA and expects to expand its capacity to 36 MTPA by the end of 2016. Since, Iran has a pellet production capacity of 22 MTPA and falls shortfall of remaining quantity and is compelled to import around 8-9 MTPA pellets to compensate for the shortfall. Thus, there is an opportunity for Indian pellet makers to cater the demand.

As Iron ore Pellet is a value added product, Indian government has reduced export duty on pellets to zero in order to encourage its exports. Indian pellet makers are able to compete with the big four giants (Vale, Rio Tinto, Fortescue, Anglo American & others). In terms of logistical advantage which India is having compared to other countries, the freight costs are also less to china compared to Brazil & South Africa.

Therefore, Essar steel with its most economical downstream facility (pipe line from Dabuna – Paradeep complex) & conveyor belt to port & berth terminal will be easily able to export pellets to china, Iran & other countries.

Although, the facility will primarily fulfill the captive demand of Pellet feed material for Integrated Steel Plant of 10 MTPA capacity at Hazira, Gujarat, export would be done as when there is surplus Pellets available.

2.7 DOMESTIC MARKET

The demand for Steel has been worked out on the basis of observed relationship between Steel consumption and selected macro-economic variables under four scenarios of GDP growth (i.e. of 8%, 8.5%, 9% and 9.5%) by 2016-17. The Draft Approach paper of the Twelfth Five Year Plan envisages a GDP growth of 9% per annum. In the Most Likely growth scenario i.e. 9% GDP growth, the demand for Steel works out to be 113.3 Million tonnes by 2016-17. Therefore, it is likely that in the next five years, demand will grow at a considerably higher annual average rate of 10.3% as compared to around 8.1% growth achieved during the last two decades (1991-92 to 2010-11).

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Steel demand in India remained sluggish in 2015 amidst weak activity and poor sentiment; however, activity is expected to accelerate modestly in the coming years. Strengthening domestic consumption and improving external conditions will help underpin the growth of Steel using sectors. During 2015, India maintained its ranking as the 3rd largest Steel producing country in the world behind China, and Japan with a crude Steel production of 803.83 and 105.20.2 Million tonnes respectively. The Indian Steel industry continued to showcase trends of higher consumption of finished Steel and continued to be a net importer on account of increased demand for special grades of Steel in the country. India's current per capita finished Steel consumption at 57 kg is well below the world average of 217 kg. With rising income levels expected to make Steel increasingly affordable, there is vast scope for increasing per capita consumption of Steel.

2.8 EMPLOYMENT GENERATION (DIRECT AND INDIRECT)

The proposed expansion project will generate employment for about 100 people, overall total 450 people will be employed, out of which 350 skilled laborers will be on contract basis during construction and operational phase and 100 will be on permanent basis. Also there is an indirect employment opportunities will also be generated due to secondary developments in the area.

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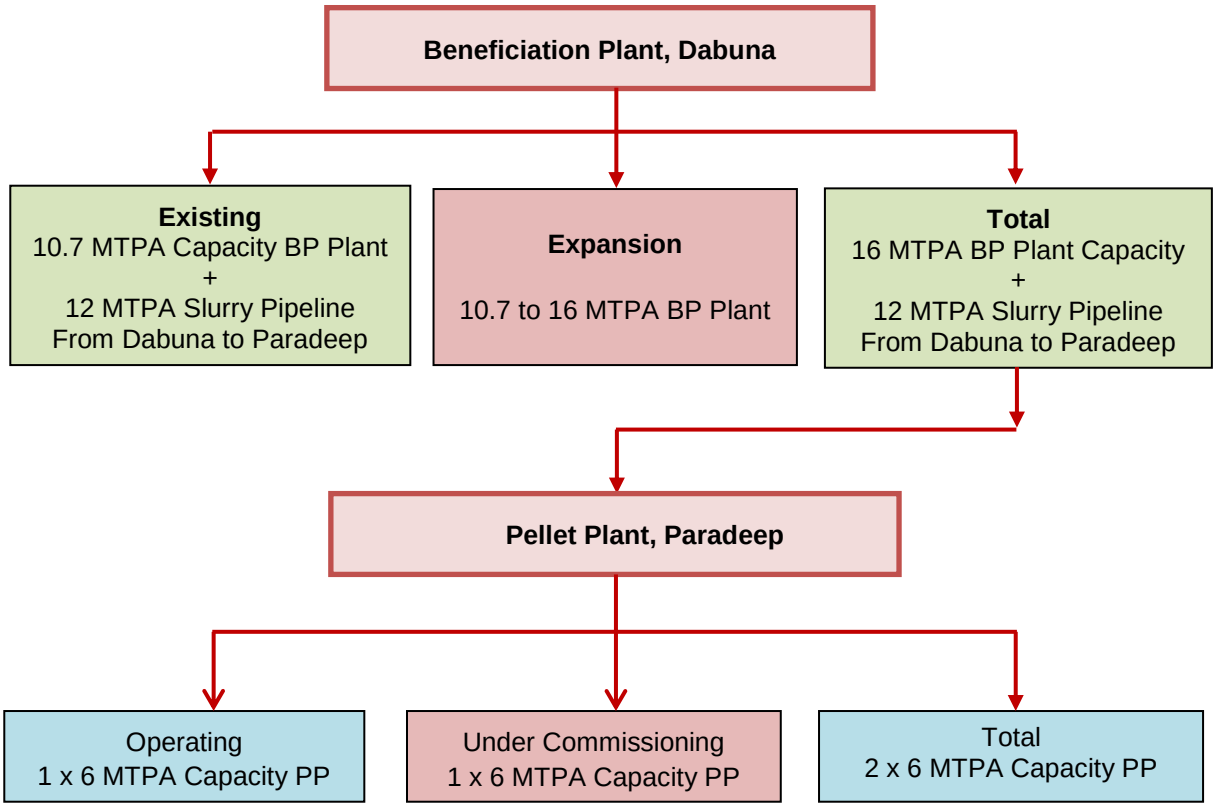
3 PROJECT DESCRIPTION

3.1 TYPE OF PROJECT & INTERLINKED/INTERDEPENDENT PROJECTS

Essar Steel India Ltd, Odisha is having a Pellet Plant with capacity of 12 MTPA consisting of two modules of 6.0 MTPA capacity each. Out of these two modules, one module (1 x 6 MTPA) is already in operation and the second module (1 x 6 MTPA) is under commissioning. This Pellet Plant receives material from existing Beneficiation Plant at Dabuna through 253 km long slurry pipeline. To meet out this Pellet Plant production capacity, additional Pellet feed material is required. Therefore, it is necessary to expand the capacity of existing Beneficiation Plant from 10.7 to 16 MTPA throughput capacity to produce 12 MTPA Concentrate as Pellet feed.

The proposed expansion project is a brown field project and Interlinking of the proposed project is described in figure 3.1 by block diagram.

Figure 3.1: Interlinked/Interdependent Project - Block Diagram



3.2 LOCATION WITH COORDINATES

The proposed expansion will be implemented in the Iron Ore Beneficiation Plant of EStIL which is located at Dabuna in Keonjhar District of Odisha. The coordinates of the Beneficiation Plant are as

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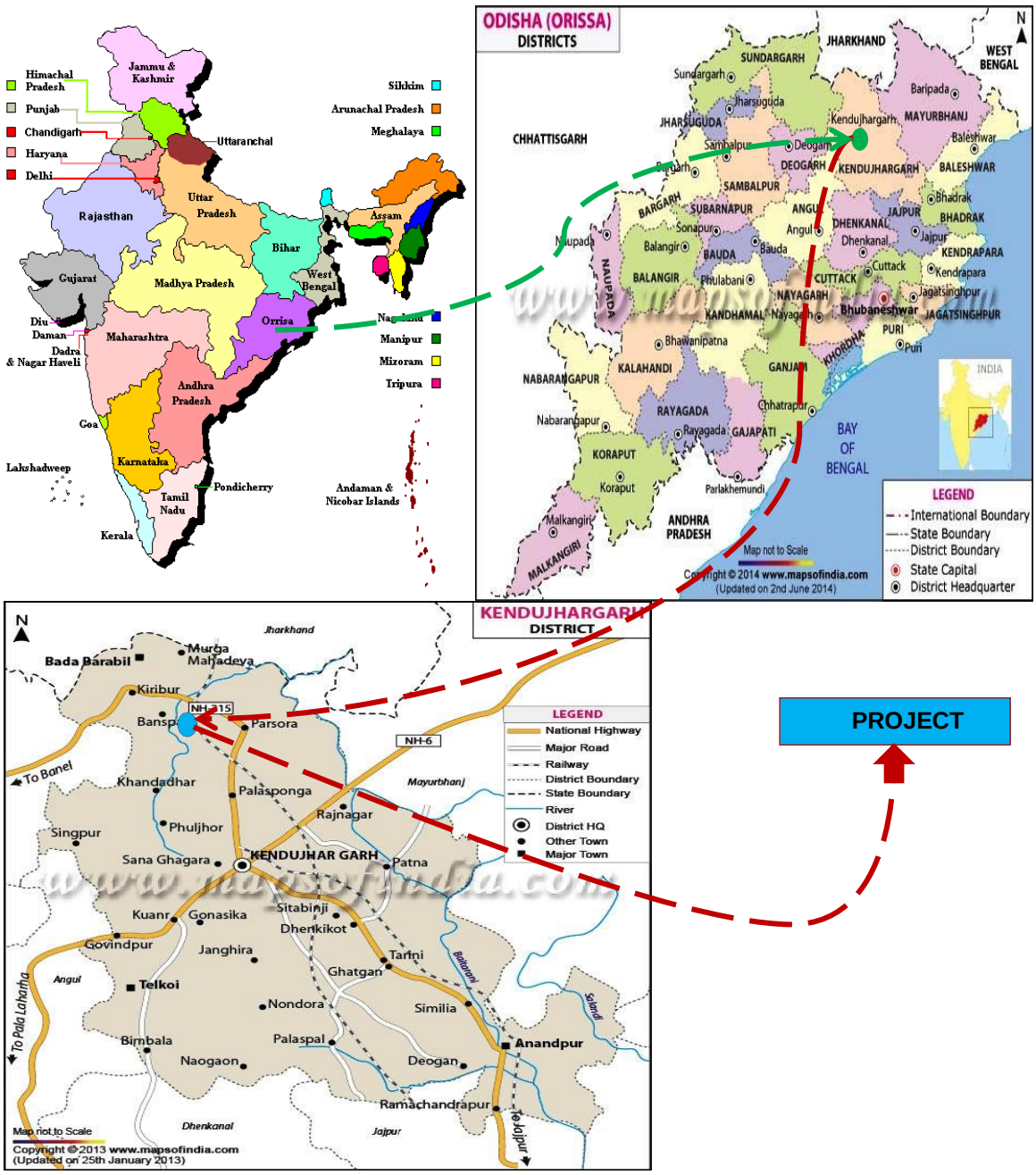
follows: Latitude 21°51'30" N and Longitude 85°24'15" E, at an elevation of about 500m, above mean sea level. Most of the expansions are within the existing boundary which is briefed in the respective chapters of this report. However Truck Unloading station will be located in adjacent land of 1.92 Ha. The layout of the capacity upgraded Beneficiation Plant is enclosed as Annexure –I. The location of the Project is shown in Figure 3.2

Figure 3.2: Location of the Project



ESSAR PROJECTS	PRE FEASIBILITY REPORT FOR EXPANSION OF DABUNA BP FROM 10.7 TO 16 MTPA	DOCUMENT NO.	REV
		1628-ENG-BEN3-GNAGEN-TSL-REP-0001	3
	ESSAR PROJECTS (INDIA) LIMITED ENGINEERING & PROJECT MANAGEMENT	Page 18 of 54	

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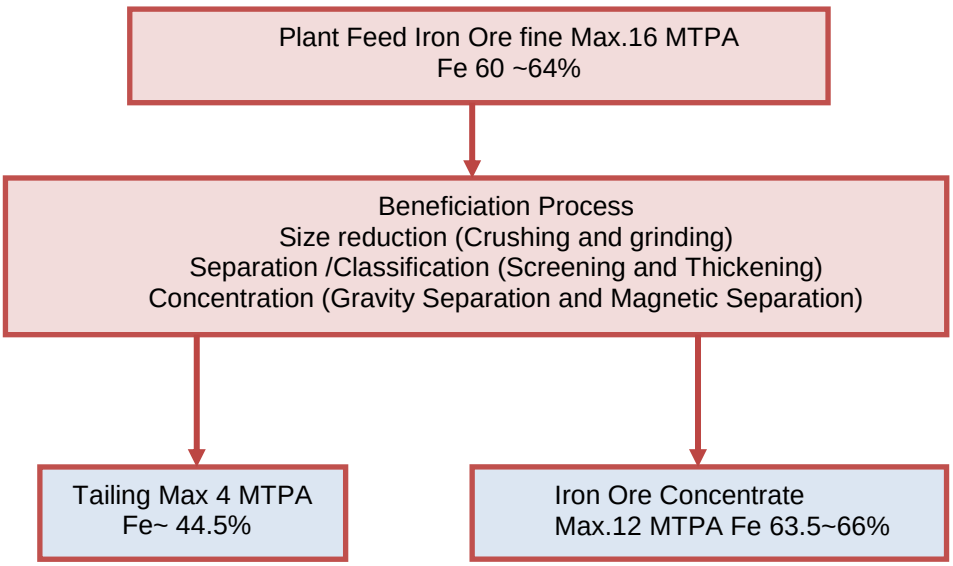
3.3 SIZE / MAGNITUDE OF OPERATION

To achieve 12 MTPA production, the existing beneficiation plant facility would be operated to treat maximum of 16 MTPA of iron ore fines in the worst case scenario. Plant will accept Iron Ore Fines in the range of 55 to 66% Fe grade The overall plant yield would be minimum 75% depending on the feed quality of the incoming iron ore. The plant will be operated to produce the same in 330 working days/year and 24 hours/day. The annual operating hours of the Plant would be 7920 hrs. Iron ore concentrate with 66% Fe DR grade and 63.5% Fe BF grade could be produced from the feed ore containing average grade of 60 to 64% Fe.

Iron Ore Quantity & Flow – (Different Grade for DR & BF)



3.4 PROJECT DESCRIPTION WITH PROCESS DETAILS

3.4.1 Technological Considerations

The major technological process involved in the Iron Ore Beneficiation are size reduction / comminution as grinding, size separation as classification, and Iron Ore up-gradation as concentration/beneficiation, thickening of slurry and pumping of slurry.

a) Size Reduction

The Iron Ore in the form of fines (99% passing 10 mm size) has to be ground to the desired size. Suitable grinding mills and screens are envisaged for size reduction of fines to the desired size for feeding the concentration equipment. Iron ore have unwanted gangue materials with valuable Iron

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mineral. For up gradation of Iron Ore, Fe minerals are liberated from the gangue materials by grinding. Grinding of Iron Ores fines can be done in wet process.

Since the downstream of the grinding process, like beneficiation and slurry transportation to Pellet Plant, are carried out with wet process, wet grinding process is considered to be most suitable instead of dry grinding.

b) Size Separation

The final product Concentrate should be of size 100 % passing 100 mesh (150 micron) and 80 % passing 325 mesh (45 micron) for long distance slurry pumping and making Pellets. Hydro cyclone and vibratory screens are the most suitable and efficient equipment for the size classification due to their operational ease and economic considerations, and therefore they have been envisaged in the process flow scheme.

c) Beneficiation and Concentration

To achieve and maintain the desired quality of Concentrate in terms of Fe% content, the ground /classified material is upgraded by removing the gangue materials. Hindered separators and High Gradient Magnetic separators (HGMS) are the most suitable equipment for beneficiation of Hematite Iron Ore, which are efficient and economical. These technologies have better operational control over the process and the higher metallurgical efficiencies in terms of grade and mass recovery.

3.4.2 Process Description

The basic process flow for the capacity enhanced beneficiation plant of 12 MTPA (Maximum) Concentrate will be same as the process being followed presently. However to handle the larger volumes of Iron Ore fines receipt and subsequent beneficiation process, additional optimal facilities are proposed within the existing plant and process circuit in order to meet the target capacity of 12 MTPA concentrate slurry. The additional facilities are proposed based on the present plant operating conditions and ore characteristics. However these modifications will be executed upon necessary test works and proper validation. The existing process facilities along with the changes required in the process circuit are explained in the below chapters. The material flow diagram of Dabuna Beneficiation Plant is shown the Figure 3.3

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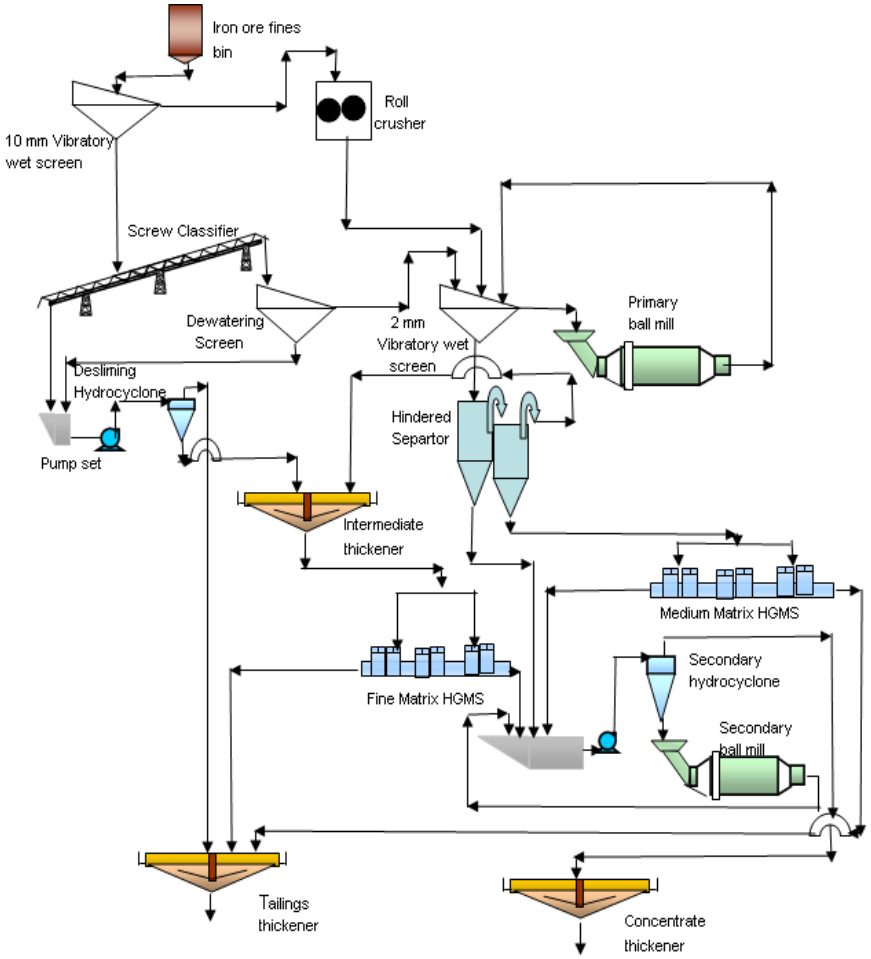
Figure 3.3: Material Flow Diagram of Dabuna Beneficiation Plant



Present Raw Material Characteristics and Concentrate Chemical Composition

The Iron Ore feed fines from various Mines and its chemical composition constituents are given in Table 3.1.

Table 3.1 Chemical analysis of IOF Samples

Iron Ore Fines	Chemical Composition %				
	Fe	SiO_2	Al_2O_3	LOI	Moisture
IP Mines	62.56	3.67	3.41	2.97	9.69
OMC	63.06	3.15	3.01	3.00	9.25
RML	64.36	2.69	2.34	2.44	8.95
Serajuddin	64.05	1.58	3.05	3.22	8.03
KISA	63.42	2.33	2.84	3.67	9.63
MESCO	63.73	2.66	3.00	2.67	8.32

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Table 3.2 Chemical Composition of Iron Ore Concentrate

Description	Fe%(total)	SiO_2	Al_2O_3	LIO	Particle Size
BF grade	63.50	2.2	2.4	4.2	80%< 45 mic
DRI Grade	66.00	2.05	1.03	1.8	80%< 45 mic

Table 3.3 Chemical Composition of Tailings

Description	Fe%(Total)	SiO_2	Al_2O_3	LOI	Particle Size
BF/DR Grade	44-45%	9-12%	6-9%	4.7%	100% < 75 mic

3.4.3 Raw Material Handling and Linkages:

a) Truck Unloading Station

The total requirement of iron ore fines to be handled is estimated as 16 MTPA (Maximum). To handle this large volume of Iron Ore Fines , an automated Truck/Dumper Unloading Station (hereafter referred as TUS) is envisaged near the Beneficiation Plant at Dabuna which will be connected to stacker in the IOF storage yard. This TUS will be capable of sourcing 6.5 MTPA IOF to the Plant. Required IOF will be sourced from private merchant Miners to this TUS. Existing stacker will be commissioned to match the capacity of TUS. Necessary capacity audit will be carried out for the existing twin bucket blender reclaimer so as to enhance the existing capacity of 2250 TPH to 2600 TPH. Existing yard conveying system connecting TUS and Bins is adequate for the enhanced plant capacity. However due to limited storage capacity of Bins frequent changeover of feed from one bin to the other is required for upgraded capacity. In this scenario existing shuttle conveyor will be replaced by tripper conveyor with subsequent changes in the existing belt conveying system for feeding material to tripper conveyor.

b) Road Transportation via Trucks

The raw materials are further sourced from private merchant Miners to the tune of 6 MTPA and are transported via trucks having dalla covered with tarpaulin and dumped in the Dabuna Plant IOF storage yard and rest 6 MTPA will be received from Ghoraburhani- Sagasahi. captive mine as a standby measure (ie,. when the slurry pipeline is out of operation. Transport network map showing Iron Ore Mines in the Joda –Barbil Region is enclosed at Annexure VII showing various Mines situated in and around Beneficiation Plant for sourcing raw material. The list of merchant Miners are shown in the Table 3.4

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Table 3.4 - List of Merchant Miners

Sl. No.	Name of Mine	Mining Circle	Environmental Clearance		Lease Area (Ha)	Distance From Plant
			Present	% of Fines		
			MTPA	MTPA		
1	Essar Steel India Limited	Joda	7.16		139.165	30
2	Indrani Patnaik (Unchabali)	Do	4.00	2.80	106.113	7
3	Serajuddin (Balda)	Do	15.15	10.6	335.374	6
4	KJS Ahluwalia (Nuagaon)	Do	5.60	3.92	767.280	38
5	Kaypee (KJSA)	Do	5	3.5	228.040	49
6	Rungta Mines (Jajang)	Do	16.0	11.2	666.150	14
7	Essel Mining (Jilling)	Do	4.20	2.94	456.100	17
8	MESCO (Roida)	Do	3.00	2.10	104.680	38
9	KN RAM (Roida)	Do	2.20	1.54	74.870	38
10	RP SAO (Guali)	Do	5.70	4.00	365.437	41
11	KMC (Jururi)	Do	0.60	0.42	135.570	18
12	Patnaik Minerals (P) Ltd. (Jaribahal)	Do	0.998	0.60	106.535	12
13	Rungta sons (Oraghat)	Koira	5.0	3.5	82.960	44
14	Rungta sons (Sanindpur)	Do	4.5	3.15	147.100	43
15	Feegrade & Co. (Rengalbera)	Do	2.6		121.410	46
16	BICO (Nadidih)	Do	2.0		73.855	48
17	A M T C (Narayanposhi)	Do	4.5	3.15	349.250	52
18	Essel Mining (Koira)	Do	1.5		90.140	55
19	National Enterprises (Raikela)	Do	1.0		116.850	56
20	OMC Ltd (Kurmitar Pahar)	Do	2.4		1212.47	65
21	M G Mohanty (Patabeda)	Do	0.18		19.425	19
22	Penguin Trading Agency (Raikela)	Do	1.08		49.370	55
23	S N Mohanty (Raikela)	Do	0.3		18.310	59
24	Geetarani Mohanty (Raikela)	Do	0.864		67.586	56
25	OMC Ltd. (Gandhamardan-B)	Keonjhar	9.12	6.00	1590.87	55

c) Slurry Pipeline transportation from Ghoraburhani-Sagasahi to Dabuna

To meet the balance raw material requirement of 6 MTPA for capacity enhancement, Iron Ore Fines will be sourced from Ghoraburhani-Sagasahi (Latitude 21° 56' 08.83896" to 21° 57' 09.61956"N and Longitude 85° 17' 02.52096" to 85° 17' 48.99336"E) Iron Ore captive mine to Dabuna Beneficiation Plant. Slurry transportation via pipeline being the most efficient and cost effective transportation solution, it is proposed to install 6 MTPA rated capacity Slurry Pipeline from Ghoraburhani-Sagasahi to Dabuna along with Water Pipeline for about 26.2 km. The Slurry Pumping Station with necessary facilities will be installed at Ghoraburhani-Sagasahi. The Water Pumping Station with necessary facilities and Water Storage Reservoir will be installed at Dabuna. The Iron Ore Fines are ground at mine head and pumped in the slurry form and the water required for Slurry Concentrate would be pumped in the Water Pipeline from Dabuna to Ghoraburhani-Sagasahi and the same water would be back to Dabuna along with Iron Ore slurry. The proposed Slurry Pipeline and Water Pipeline transportation route map is shown in the Figure 3.4.

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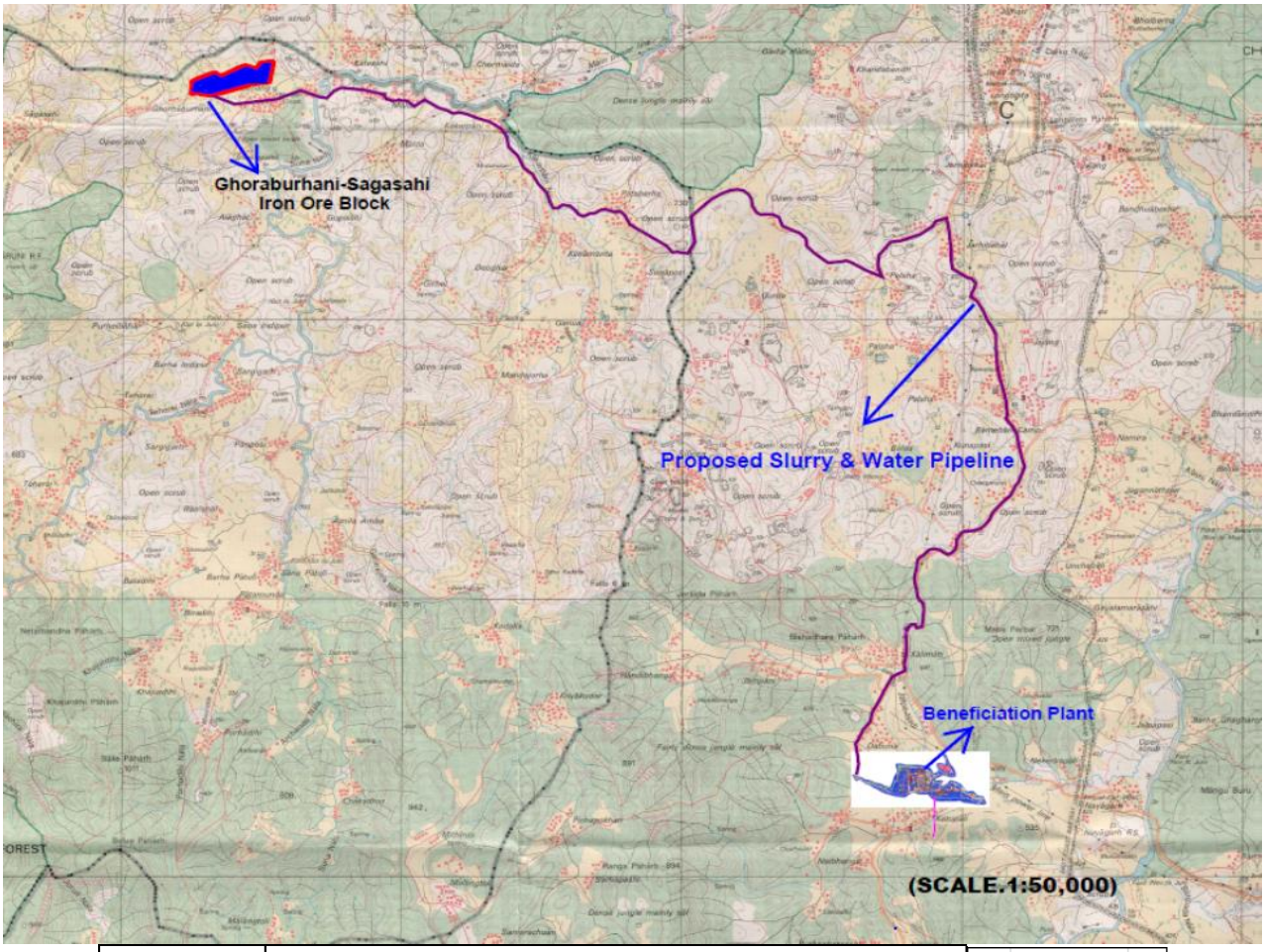
Figure 3.4 - The Pipeline Route Map



Dscription	Ghoraburhani-Sagasahi Iron Ore Block
Latitude	21° 56' 08.83896" to 21° 57' 09.61956"N
Longitude	85° 17' 02.52096" to 85° 17' 48.99336"E

LEGEND
- Iron Ore Block
- Beneficiation Plant
- Slurry Pipeline

The detailed route map of Slurry Pipeline from Ghoraburhani – Sagasahi to Beneficiation Plant is attached as Annexure – III.

The main technological facilities envisaged for Slurry and Water Transportation system from Sagasahi to Beneficiation Plant are shown in the Table 3.5.

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Table 3.5 – Technological Facilities for Slurry and Water Transportation System

Sl. No.	Description	Capacity	Configuration
1	Slurry Pumping Station, Sagasahi	6 MTPA	Slurry tank 01 No. 03 No. PD pumps (2W + 1S)
2	Slurry Pipeline	6 MTPA	12.75 inch diameter pipe line
3	Terminal Station, Dabuna	6 MTPA	Slurry tank 01 No
4	Water Pumping Station, Dabuna	1400m^3/h	03 No water pumps (2W + 1S)
5	Water pipe line	1400m^3/h	20 inch diameter pipe line
6	Water Storage Reservoir	30000 m^3	01 No.
7	Slurry Storage Tank	2500 m^3	01 No.

Handling of receipt of ground IOF from Ghoraburhani-Sagasahi at Dabuna Beneficiation Plant:

Based on the prima-facie analysis for treating the ground IOF slurry from Ghoraburhani-Sagasahi Mine head received in the Slurry Pipeline, a feasible process flow[2] in Dabuna Plant is derived and briefed below.

The ground IOF slurry received from the Pipeline is stored in the new Slurry Tank at Dabuna Plant. The ground IOF will be coarser in nature with a limiting size of –150 µm. The coarser slurry will be equally pumped to the regrinding circuit of Line 1 to achieve a final product size of P80 -45 µm. The fine Concentrate will be thickened in Concentrate thickener and stored in Slurry tanks for further pumping to Paradeep.

During beneficiation, the coarser slurry will be treated in single process line (Line 1) and accordingly pumped to existing screw classifier for desliming. The coarse concentrate from screw classifier will be distributed to Medium and Fine matrix SLon Magnetic Separator wherein the recovered magnetic concentrate is ground in the regrinding circuit to achieve a final product size of P80 -45 µm. The rejects from the SLon Separator is collected in the Tailing thickener.

The fine stream overflow from the screw classifier is pumped to Line 1 desliming Hydro-cyclone (2 cluster having 24 hydro cyclones in each cluster) for further separation. This Hydro-cyclone removes the slimes of -10 microns with the overflow. The overflow is fed to the Tailings thickener and the underflow is fed to the Intermediate thickener. The intermediate slurry from the thickener will be treated in the Fine matrix SLon Separator from which magnetic concentrate is recovered and

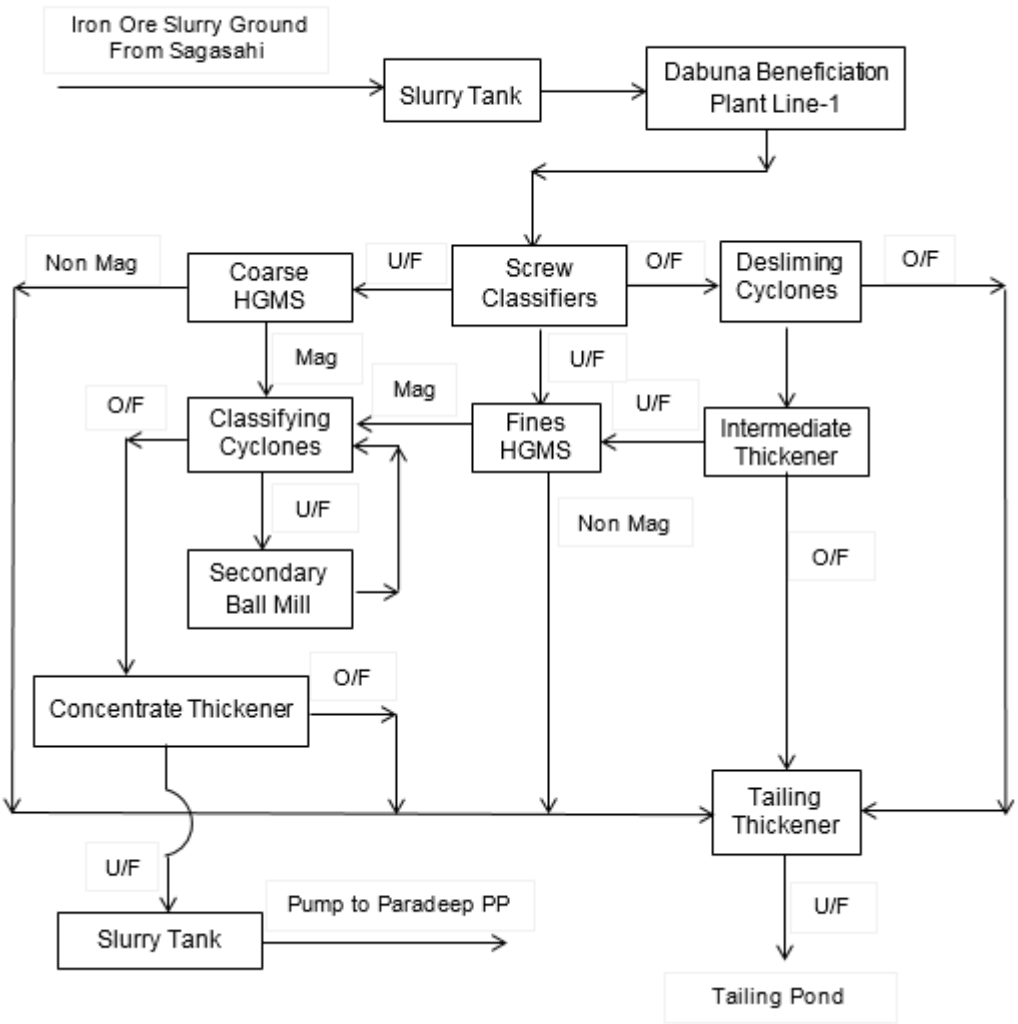
[2] This process flow will be developed based on further validation by necessary test works and plant performance.

in turn ground in the regrinding circuit to achieve a final product size of P80 -45 µm.

The fine concentrate from the regrind circuit cyclone overflow will be thickened in the Concentrate thickener to a suitable pumping density and stored in the Slurry Storage Tanks for further pumping to Paradeep. The rejects form the Magnetic Separator and Desliming Hydro-cyclone collected in the Tailing thickener will be thickened and then pumped to the Tailing Pond. Indicative block flow diagram for handling the receipt of IOF from Ghoraburhani-Sagasahi IOF at Dabuna Beneficiation Plant is shown in the Figure 3.5.

Figure 3.5 – Block Flow Diagram

Block Flow Diagram – Handling of Ghoraburhani-Sagasahi IOF at Dabuna Beneficiation Plant



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d) Summary of projected mode of transportation of ore fine to Dabuna Plant

As briefed in this chapter above, the overall requirement of 16 MTPA (Maximum) IOF to Beneficiation Plant through various mode of transportation and the corresponding capacity to source the same is summarized in Table 3.6.

Table 3.6 – Various Modes of Iron Ore Sourcing and its Capacity

Sl.No	Mode of Transportation	Capacity
1	Through Truck Unloading Station	6.0 MTPA
2	Road Transportation	6.0 MTPA
3	Slurry Pipeline Transportation	6.0 MTPA

3.4.4 Process Facilities

The present process facilities and the additional facilities with modifications required for enhanced plant capacity of 12 MTPA (Maximum) Concentrate production is explained in this chapter.

The iron ore fines from each bin are drawn out by respective a belt weigh feeder which feeds the material to a 5 mm vibratory wet screen. The oversize (+5 mm) would be fed to 1 mm screen (on the conveyor carrying screw classifier raked material after dewatering). The screen undersize (-5 mm) would be fed to a screw classifier by gravity, which is placed below the vibratory 5 mm wet screen. The screw diameter of the classifier is about 183 cm (72 inch). The cut size of the screw classifier is 150 µm in the process line; the coarser stream from the 3 parallel screw classifiers is collected on a common single belt conveyor, which feeds the dewatering screen. The finer stream slurry from 3 parallel screw classifiers would be collected in a common pump box which is located below the screw classifiers in bin building. The dewatering screen undersize fines is collected in a pump box and pumped to the pump box of screw classifier rejects. The slurry from this pump box is pumped to the desliming hydro-cyclone near intermediate thickener. This reduces the load on Ball mill and partially removes Al_2O_3.content The dewatered coarser material is collected on a conveyor and fed to 1 mm wet screen of 1000 t/h rated capacity, located in beneficiation building. The screen oversize is fed to the primary ball mill.

a. Primary Grinding Circuit

The primary ball mill is of size 4.72 m (dia.) x 8.23m (length) and of capacity 550 t/h. It is designed to grind particles of -10 mm size to a product of 90 % - 2 mm. The motor power rating for primary mill is 3000 kW. There is one primary ball mill for each process line which is sufficient for enhanced capacity considering the present operating conditions. Based on the present rich ore availability the primary ball mill circuit is modified such that the discharge is collected in a pump box and provision is provided to pump equally to the hindered separators for beneficiation or regrinding circuit for direct size reduction. Presently, by operating just primary mill and one regrind mill 850 TPH is possible to be ground to achieve desired grind size of P80 -45 µm. Thus by operating all three mills it is implied to achieve a feed rate of (~) 1000 TPH for processing 16 MTPA Iron Ore Fines.

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Hindered Separation

There are two hindered separator for each process line at rated capacity 325 t/h solids with feed percentage solids of 35 %. The hindered separator uses fluidized bed technology & principle of hindered and differential gravity settling classification of fines. There are three different settling zones in the hindered separator. The coarse and heavy particles are separated in the coarse section at the center. It is fed to the secondary hydro cyclone feed pump box by gravity. Fine material and low-density particles overflow from the coarse separation section into the next peripheral section where some of the light particles get separated. These middling are collected in a pump box and pumped to medium matrix HGMS through rotary screen. Particles of a specific gravity lower than the fluidized bed in the hindered separator will remain above the fluidized bed and will overflow with most of the process water to the overflow chute in the end section of the hindered separator. These fines / tails from the hindered separator would be fed to intermediate thickener through an intermediate launder.

b. Intermediate Thickener

The feed to the intermediate thickener is a mixture of de-sliming cyclone underflow & hindered Separator fines. The underflow of intermediate thickener is then pumped to a static pulp distributor and latter fed to fines matrix HGMS for concentration process. There are total 2 no's of intermediate thickener, each size 55 m diameter and 1 no's thickener considered for each the process line.

c. High Gradient Magnetic Separator (HGMS)

There are 4 HGMS (2 medium matrixes & 2 fine matrixes) in total for each process lines. Capacity of each HGMS is about 120 t/h with magnetic intensity of 1 Tesla. HGMS tails (from both medium matrix & fine matrix) are sent to the tailings thickener by gravity/pump and the tailing thickener underflow is pumped to the tailings pond by the slurry pumps. The HGMS Concentrate (from both medium matrix & fine matrix) is sent to secondary hydro cyclone pump box by launder / pipeline.

d. Secondary Grinding & Hydro-Cyclones

Hindered Separator Concentrate, HGMS Concentrate and Secondary Ball Mill discharge are collected in the pump box and pumped to the secondary hydro cyclone through slurry pump. The secondary hydro cyclone consists of two clusters with 3 hydro cyclones in each cluster, for each process line. The hydro cyclone is of 66 cm (26 inch) diameter and operates at an inlet pressure of 0.98 - 1.05 kg/cm2. This secondary hydro cyclones overflow is fed to the Concentrate thickener & the underflow is fed to two parallel secondary ball mills. The ball mill discharge is collected in a pump box for feeding secondary hydro cyclone, thus forming a closed circuit. There are two number of secondary ball mills for each process line. The ball mill is designed to grind particles of -2 mm size to a product of 80 % - 45 micron. This mill is of size 4.72 m (dia.) x 8.23 m (length) with a motor power rating of 3000 kW.

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e. Concentrate Thickener

Each process line is having a separate Concentrate thickener. The overflow from the regrind cyclones are collected in the thickener from which underflow at about 65 % solids is pumped to the Concentrate Slurry tanks (Total - 2 No's existing) considered for the project. The existing thickeners are adequate to handle the enhanced capacity. The overflow from the Concentrate thickener, tailing thickener and intermediate thickener would be clear water and would be recycled in the process.

f. Tailing Thickener

The rejects from the Magnetic separators and desliming cyclone overflow is collected in the Tailing thickener. Presently one tailing thickener of 65 m diameter is considered for both the process lines. The tailing thickener underflow slurry with 50 - 60 % solids by weight and a slurry density of 1.5 t/m3 would be pumped to the tailing pond / dam through slurry pipeline. The tailing pond is located at Lunagarhia village, approximately 9 km away from Dabuna Beneficiation Plant. About 80 % of tailing water from tailing pond would be recovered after the plant process stabilization.

g. Slurry Transportation

The slurry transportation pipeline has been designed for transporting 12 MTPA beneficiated Concentrate Slurry. Therefore the existing Slurry Pipeline and Pumping System does not require any additional facility or modifications.

3.5 RESOURCE OPTIMIZATION/RECYCLING AND REUSE

Iron Ore Utilization

The Beneficiation Plant is designed to beneficiate the available Iron Ore Fines to Concentrates of BF/DR grade using latest beneficiating technology, which intern can be converted into Pellets of respective grades and utilized directly into Blast Furnace or DR Plants.

Tailings would be generated having less than 45% Fe, which would be pumped to the tailing pond located at village Dhanurjapur, Kaliapal & Malada. Care would be taken to reduce the tailing percentage as much as possible to have maximum possible yield of usable Concentrate.

Water Utilization

The water disposed as part of tailings is about 338 m3/h in the worst case scenario and about 287 m3/h of decant water shall be reclaimed for reutilization in Beneficiation Plant. This would considerably reduce the fresh make-up water consumption.

3.6 WATER AND POWER REQUIREMENT WITH THEIR SOURCE

3.6.1 Water Requirement and Source

In the Beneficiation Plant, the water is used for process operation, slurry and tailings transportation, flushing, firewater and drinking purpose. Drinking water requirement will be met from the raw water after necessary treatment within plant facility.

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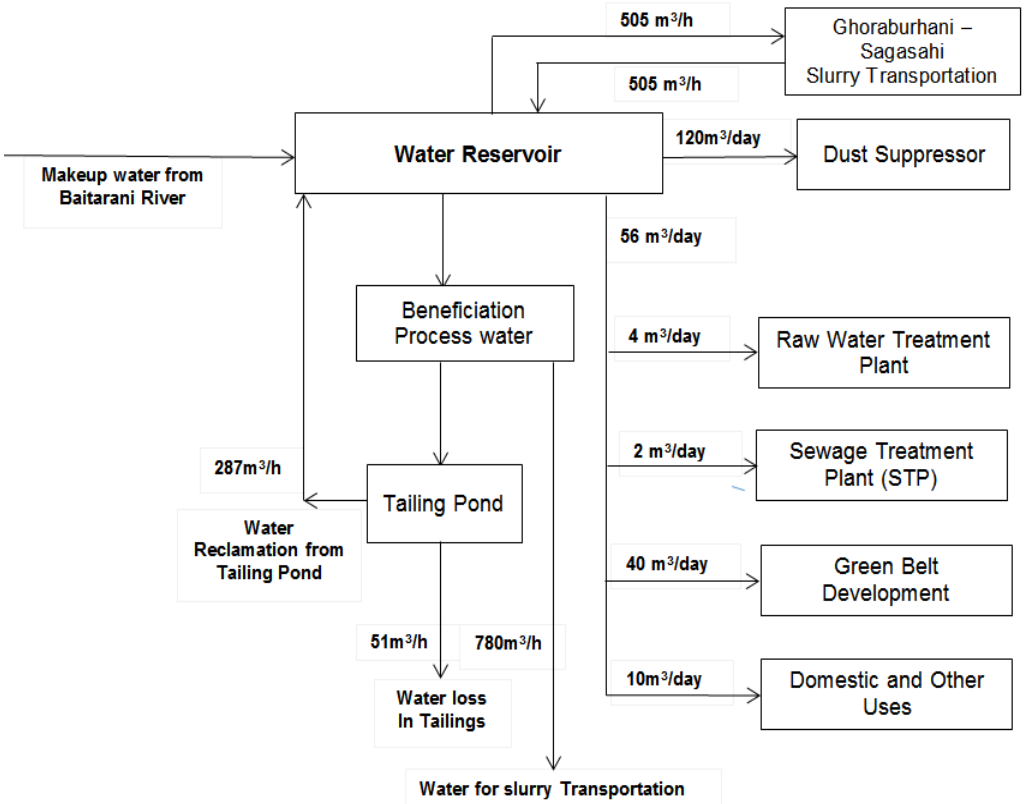
The total water requirement for processing plant is sourced from Baitarani River through a 9km long water pipeline and the total quantity is 11.77 cusecs water (about 1200 m3/hr). The breakup of the water requirement is mentioned in Table 3.7.

Table 3.7 - Water Requirement

Process	Water requirement
Water transported to Paradeep along with Concentrate in the Slurry Pipeline	780 m^3/h
Water consumed for Pelletization at Paradip	450 m^3/h
Water consumed in CPP at Paradip	350 m^3/h
Beneficiation process water sent to tailing dam along with Tailing Pipeline	338 m^3/h
Water reclamation from the Tailing Pond	287 m^3/h
Water loss at Tailing Pond	51 $m^{3/}$/h
Water Pumped for Ghoraburhani – Sagasahi Slurry Transportation	505 m3/ /h
Water Pumped back to Dabuna along with Slurry Transportation	505 m3/ /h
Other Uses	176 m^3/day
Total water requirement initial stage	1126 m^3/h

Water facilities including necessary storage reservoirs were already implemented and therefore the available facilities will meet the entire water requirement for the expansion. A detailed water balance diagram in proposed Beneficiation Plant with water consumption break up is shown in the Figure 3.6.

Figure 3.6: Water Balance Diagram



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3.6.2 Power Requirement and Source

The existing plant operation was closely observed and overall present plant power consumption is estimated to be 21.5 MW and are evidenced from the below Load List Table 3.8

Table 3.8 – Load list

Total Beneficiation Plant, Dabuna	
Plant Area	Present Power Consumption (kW)
Raw Material Hanadling System	711.4
Bin Building	1077.1
Ball Mill Area	11558.1
Water Pump House	2803.5
Thickener Area	679.4
Lightings	800.0
Office & Barrack	100.0
Beneificiation Plant	17729.6
In-take Pump House	757.2
Slurry Pump House	3000.0
Total Beneficiaiton Plant (MW)	**21.5**

Total power requirement considering the upgraded plant capacity, Tailing disposal system and IOF Slurry transportation is estimated as 29.5 MW. The existing facilities for sourcing the power from GRIDCO 132kV Substation through a Single circuit line available at MRSS Dabuna sanctioned for 27 /30 MW along with the in house DG sets of (2 X 2020 kVA) is conservatively adequate to cater the power requirement for the expansion. Provisionally. In case of any further additional power requirement during the expansion shall be met from both OPTCL and CPP at Paradeep.

The overall power requirement is shown in Table 3.9.

Table 3.9 – Power Requirement

Process	Power requirement MW (PF* 0.9)
Beneficiation Process	19.3
Tailing Discharge and return water	1.2
Truck Unloading Station (TUS)	2.5
Slurry Transportation	6.5
Total	**29.5**

*PF Power Factor

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3.7 QUANTITY OF WASTE GENERATED AND SCHEME FOR DISPOSAL

3.7.1 Waste generated

Wastes generated from the proposed Beneficiation Plant will be collected and treated according to the nature of the waste. Treated water will be utilized for green belt development, Fire Water and dust suppression purpose within plant area. No trade effluent will be discharged outside the plant boundary. During monsoon, the surplus water, if any shall be discharged out after suitable treatment and after conforming to the prescribed standards of CPCB. The lists of waste generated from the plant area are as below;

a) Oil wastes from Transformer & Switch Yard Areas,
b) Oil/grease wastes from Pump area, Workshop, DG room etc.
c) Waste water from Chemical Laboratory

Table 3.10 shows the handling of hazardous waste for which the permission has been already obtained from the State Pollution Control Board vide Grant of Authorization Certificate No. IND-IV-HW-1185/7383 dated 30.04.2015.

Table 3.10 – Waste Management

Waste Description	Total Quantity Per Year	Waste Management
Used Oil	40 KL	Storage in impervious pits/containers under covered shed followed by sale to Authorized Recycler / Re-processor
Waste/Residue containing Oil	5 KL	Storage in impervious pits/containers under covered shed following by final disposal in Authorized HW incinerator / Common Hazardous Waste Treatment Storage Disposal Facility, Jajpur

Beneficiation Plant after requisite expansion will duly comply with the provisions of Hazardous and Other Wastes (Management & Trans-boundary Movement) Amendment Rules, 2016 and amendments made thereafter. Renewal of authorization for disposal of Hazardous waste in Form-1 will be applied 120 days before expiry of this authorization order.

3.7.2 Tailing generated from Beneficiation Plant

The tailing generation from the Beneficiation Plant will vary from 0 to 4 MTPA depending on the quality of Iron ore

3.7.3 Tailing Management

The Tailings generated from the Dabuna Beneficiation Plant will be disposed of in the Tailing Pond via Tailing Pipeline in the form of slurry containing 50 – 60 % by weight. The Tailing Pond will be

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constructed such that the solids in the slurry is allowed to settle and after natural settling the decanted water will be reclaimed and reutilized in the Beneficiation Plant. To facilitate the water transportation, a return water pipe line from tailing pond to plant will be laid parallel to Tailing Pipeline along with communication cables for monitoring purpose. About 287 m3/hr decanted water will be recovered from the tailing pond after the stabilization of tailing discharge process.

3.7.4 Tailing Pond

As per the existing EC, a tailing pond was supposed to be located at village Basantpur in 87.0105 ha of land having 83.711 ha of forest land. Essar had to surrender this land application to Government of Odisha because Patta was issued to the forest dwellers under Forest Right Act 2006 and this forest land was no more contiguous land and hence not suitable for any industrial use. This necessitated the relocation of Tailing Pond by find suitable land for it.

EStIL approached an external consultancy and carried out required studies for the identification of a suitable site for the disposal of Tailings generated from the Beneficiation Plant. Subsequently various sites were analyzed and recommendation was provided. The detailed report on the site identification, selection criteria, analysis and final recommendation is attached as Annexure – IV. The proposed Tailing Pond will be situated in Dhanurjaypur, Kaliapal & Malda under Tehsil Jhumpura, district Keonjhar, and it is located at a distance of 9 km from Beneficiation Plant. About 164.467 ha (406.408 acres) of land has been identified for construction of tailing pond out of which 159.248 Ha of land falls under forest land, 1.709 Ha of Govt. Land and 3.510 Ha of Private Land. The tailing dam will be constructed by using natural available land terrain advantage which maximizes the life span of tailing dam. The initial survey estimated that the proposed tailing dam can accommodate a total of at least 100 million cubic meter of tailing.

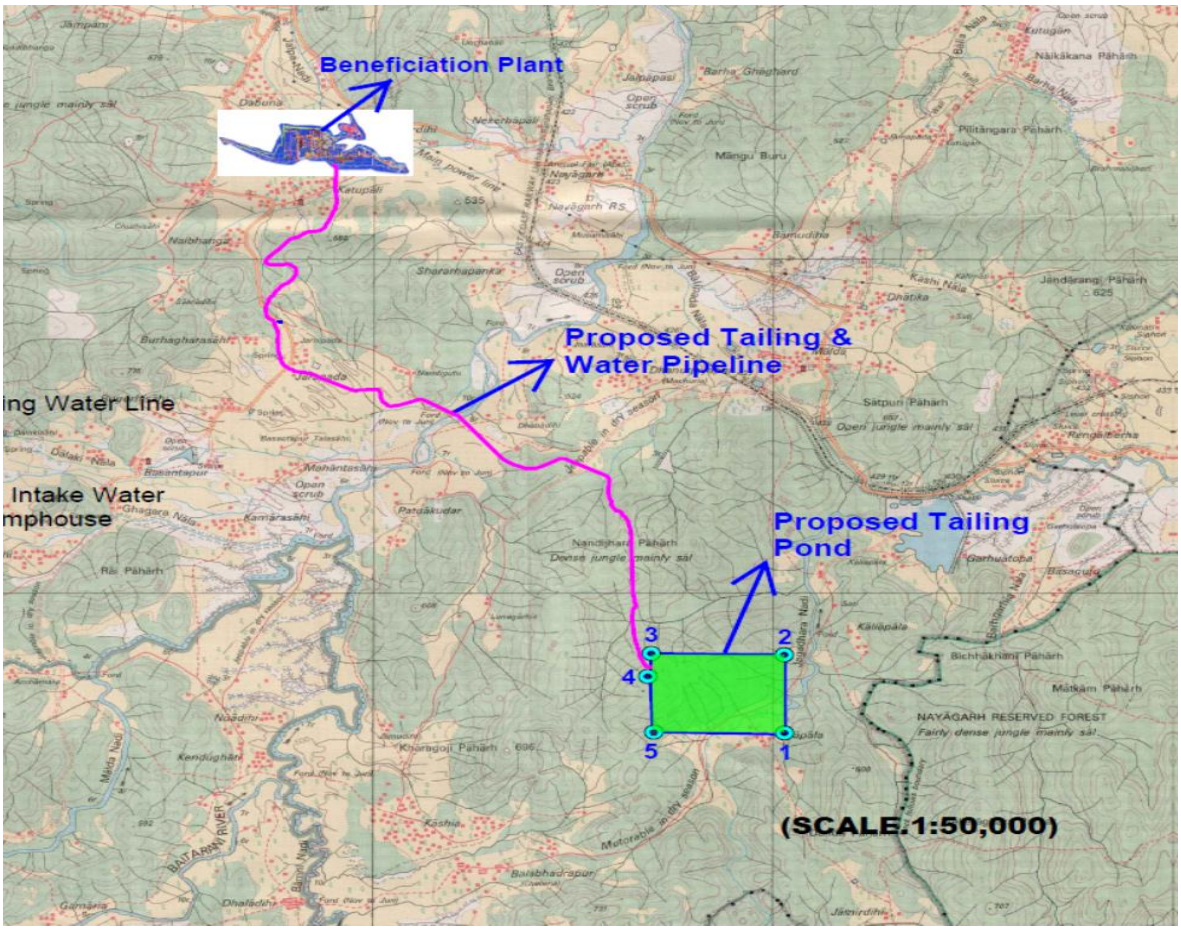
The following points will be considered during the construction of tailing pond:

a) Tailings receipt ,distribution and environmental considerations
b) Water pumping station for the reclaimed water from tailing pond
c) Return water pipeline.
d) Bunds/roads
e) Garland drains
f) Tailings properties and stability foundation conditions.
g) Hydrological conditions,
h) The local climate conditions.
i) The control of seepage water to protect the quality of surface and groundwater hence seepage study of the proposed for design of dam.
j) All dam safety measures shall be considered during construction and operation
k) Suitable geomorphology
l) Structural Geology to eliminate geo-technically risky zones

The proposed location of the Tailing Pond with reference to the Beneficiation Plant and the corresponding pillar co-ordinates is given in Figure 3.7. The detailed route map of Tailing & Water

Pipeline is attached as Annexure – V.

Figure 3.7 - Proposed Tailing Dam Map with Co-ordinates



Tailing Dam ID	UTM Co-ordinates		Ge-graphical Co-ordinates	
	Easting	Northing	Longitude	Latitude
1	340494.336	2409677.235	85º 27' 25.8482772"	21º 47' 1.133106"
2	340492.646	2410779.109	85º 27' 25.4059164"	21º 47' 36.958272"
3	339013.580	2410788.425	85º 26' 33.9109152"	21º 47' 36.7279948"
4	339006.666	2410349.930	85º 26' 33.8312544"	21º 47' 22.5189348"
5	339034.234	2409698.119	85º 26' 35.0129004"	21º 47' 1.3354296"

LEGEND
- Tailing Dam Boundary
- Beneficiation Plant
- Forest
- Tailing and WaterPipeline

3.7.5 Tailing Generation and Life of Tailing pond Calculations

The Plant Tailing generation rate is estimated to be a maximum of 2.02 million cubic meter annually. The ballpark value of the Tailing Pond storage volume is approximately 100 million cubic meter. Therefore estimated life span of tailing dam is considerably more than 30 years. The yearly Plant Tailing generation and the Life of Tailing Pond is calculated and shown in the Table 3.11

Table 3.11 - Tailing Pond Life Calculation

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Sl No	Year	Tailing Generation Per Year in million m3	Cumulative Tailing Generation in million m3	Volume of Tailng Pond in million m3	Remaining Volume of Tailing Pond in million m3
1	1	2.02	2.02	100	97.98
2	2	2.02	4.04	97.98	95.96
3	3	2.02	6.06	95.96	93.94
4	4	2.02	8.08	93.94	91.92
5	5	2.02	10.10	91.92	89.90
6	6	2.02	12.12	89.90	87.88
7	7	2.02	14.14	87.88	85.86
8	8	2.02	16.16	85.86	83.84
9	9	2.02	18.18	83.84	81.82
10	10	2.02	20.20	81.82	79.80
11	11	2.02	22.22	79.80	77.78
12	12	2.02	24.24	77.78	75.76
13	13	2.02	26.26	75.76	73.74
14	14	2.02	28.28	73.74	71.72
15	15	2.02	30.30	71.72	69.70
16	16	2.02	32.32	69.70	67.68
17	17	2.02	34.34	67.68	65.66
18	18	2.02	36.36	65.66	63.64
19	19	2.02	38.38	63.64	61.62
20	20	2.02	40.40	61.62	59.60
21	21	2.02	42.42	59.60	57.58
22	22	2.02	44.44	57.58	55.56
23	23	2.02	46.46	55.56	53.54
24	24	2.02	48.48	53.54	51.52
25	25	2.02	50.50	51.52	49.50
26	26	2.02	52.52	49.50	47.48
27	27	2.02	54.54	47.48	45.46
28	28	2.02	56.56	45.46	43.44
29	29	2.02	58.58	43.44	41.42
30	30	2.02	60.60	41.42	39.40

4 SITE ANALYSIS

4.1 CONNECTIVITY

The plant is located on KIDCO expressway connecting Joda - Palasponga and is also connected with NH-215 and various other connecting roads. One of the major interconnecting roads from Rugdi (NH-215) to Bambebari has been widened and strengthened (from single lane to intermediate/double lane).

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Villages namely Purunadihi, Khajuridihi, Dabuna, Katupali and OMC Colony are situated near the proposed site location.

4.2 LAND FORM, LAND-USE AND LAND OWNERSHIP

The land use survey was carried out on the basis of interpretation of Survey of India Topo sheet (73G/5 & 73G/6) in the scale of 1:50,000 and field survey. Based on the interpretation of the Topo sheet and field survey, the present distribution of land use unit of the study area is classified into Agricultural Land, Dense Forest, Open Forest, River, Sandy Land, Scrub ,Settlement, Swampy, Water Bodies and Mining Quarry.

The additional land identified for the Tailing Pond is over an area of 164.467 ha., out of which 159.248 ha. is Forest Land, 1.709 Ha is Govt. Land and 3.510 Ha is Private Land. The Truck Unloading Station will be constructed over an area of 1.92 Ha (4.75 acres). Slurry and water pipeline between Beneficiation Plant at Dabuna and Sagasahi Iron Ore Mine will require 23.90 Ha (59.063 acres) and tailing pipeline with return water pipeline will involve 10.607 Ha(26.21 Acres) of land.

The land has sparse vegetation in plant area and the tailing pond area is an open forest. There are no existing/proposed National Parks/Wildlife sanctuaries within the 10 km radius of the project site. Facsimile of land use map identifying Beneficiation Plant and Tailing Pond is shown in Figure 4.1

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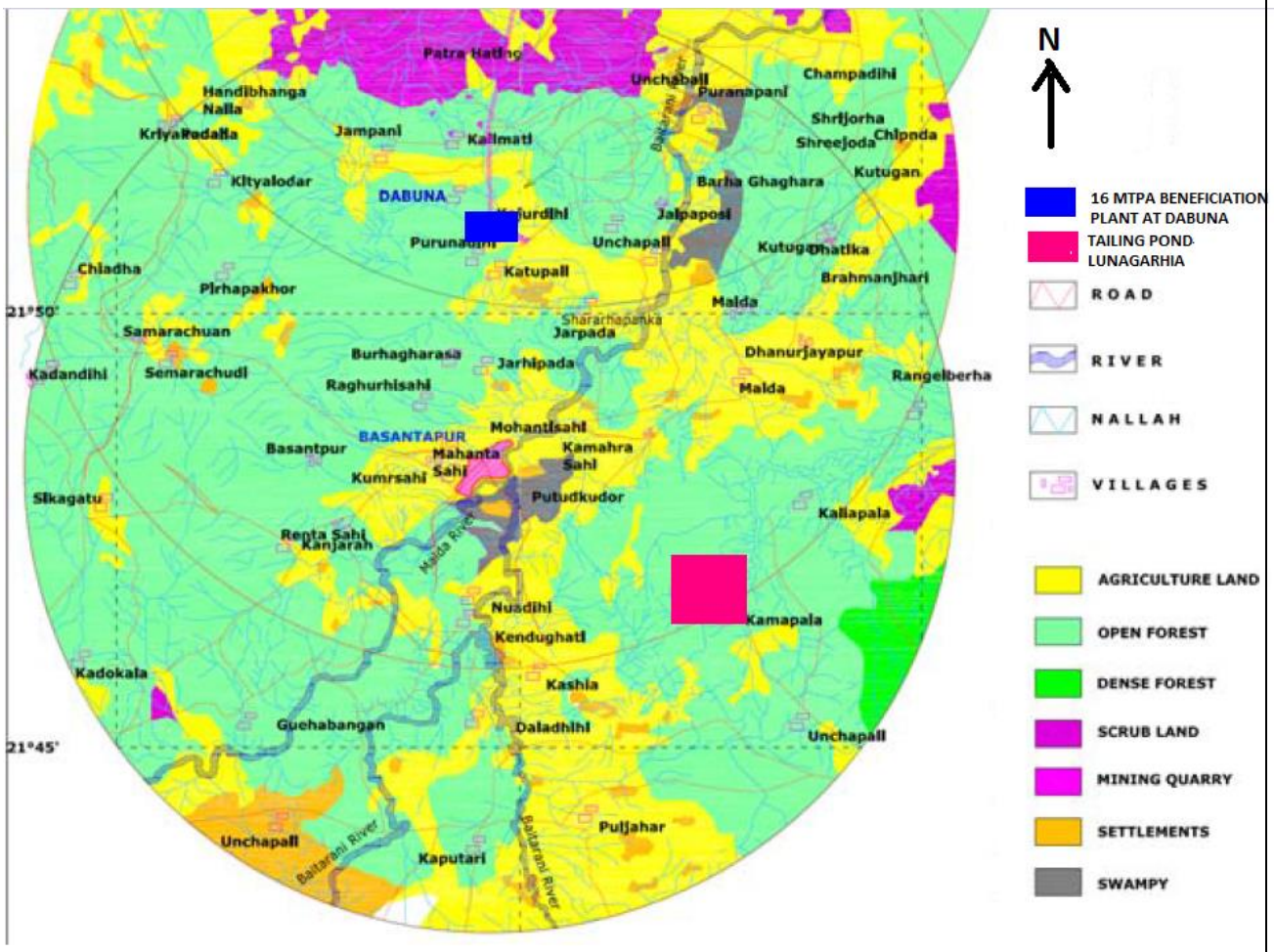
Figure 4.1 – Land Use Map



Interpretation

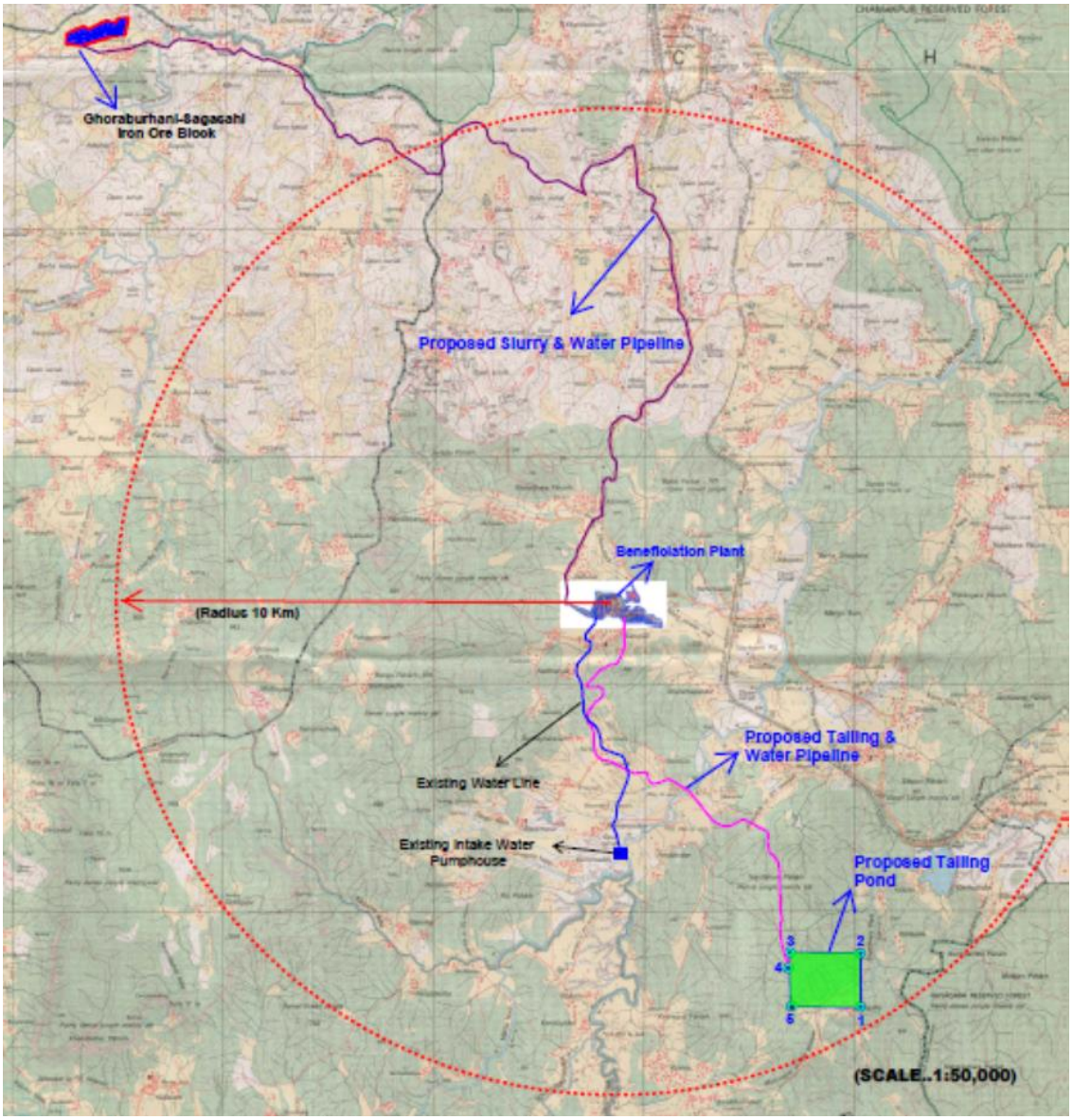
The total area identified for the proposed Tailing Pond is 164. 467 Ha(406.408 acres) . This area is nominal as compared to the total land area. Hence the impact on land use in future scenario may be considered as insignificant. It is interpreted that the proposed site as such would not cause any significant adverse impact on the prevailing environmental setting.

4.3 TOPOGRAPHY

The existing plant is located within Latitude 21_51'30"N and Longitude 85_24'15"E, at an elevation of about 500 m above mean sea level, in the Keonjhar district of Odisha. The land is almost flat terrain with an elevation of about 480 m above MSL. Figure 4.2 replicates the topo sheet No. F45N5 (Scale 1:50,000) depicting Dabuna Beneficiation Plant, Tailing Pond with Pipeline/Water Line Route, Sagasahi Mine Slurry Transportation Pipeline/Water Line Route and Existing Intake

Water Pump house and Water Line Route. The detailed topo sheet is attached as Annexure – VI.

Figure 4.2 – Topography of Beneficiation Plant



LEGEND			
	Iron Ore Block		Tailing Dam Boundary
	Intake Water Pipeline		Beneficiation Plant
	Slurry Pipeline		Forest
			Tailing and WaterPipeline

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The proposed Tailing Pond is located at a crow flight distance of 9 km from Dabuna, to the east of the village Lunagarhia. Gradient is 120/1000m or 1:8.3. The site has the advantage of having natural enclosure on three sides and the fourth side is open and the drainage grades towards ENE which meets the Jagadhara Nadi two kilometers away. The depth of the valley is 140m with reference to the 620m contour as per the S O I topo sheet 73 G/5. Average gradient is 1:8.3. The country rock is sandstone, which is leucocratic, medium grained and it is to some extent crudely laminated which masks the bedding plane. However at places the trend is found to be horizontal to sub horizontal. There is no indication of Iron Ore or manganese mineralized zone in the area. The area is also free from conventional agricultural land and habitats. As per Survey of India topo sheet it is covered by open forest. It does not come within any reserved or protected forest.

4.4 EXISTING LAND CONDITION & RELATIVE LOCATION OF PROTECTED AREAS

The buffer zones of Beneficiation Plant and proposed tailing pond are free of protected areas Biosphere reserve, National Park, Wildlife Sanctuary, Tiger Reserve, Elephant Reserve and wildlife corridor) and eco-sensitive areas.

4.5 EXISTING INFRASTRUCTURE

The existing facility includes all necessary infrastructures and is well connected with road and rail networks.

4.6 SOIL CLASSIFICATION

Existing soil investigation summary of Beneficiation Plant indicates that the top soil is mostly red and brownish red in colour and lateritic in nature up to an average bed depth of 4-5 m which is followed by a layer of moorum / moorum with boulder. Below that there lies a layer of soft rock and hard rock. The lateritic soils are mostly poor in organic contents and moisture retaining capacity. The analysis of the samples are indicated in Table 4.2

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Table 4.2 - Chemical Analysis of Soil Samples

Parameters	Units	S_1	S_2	S_3	S_4
pH	—	7.35	7.85	7.52	7.65
E.C	mohs/cm	104	90	115	100
Sodium as Na	PPm	45	43	40	33
Bulk density	gtn/c.c	2.5	1.8	2.5	2.0
Organic matter	%	0.5	0.6	0.8	0.7
Chloride	%	0.025	0.01	03	0.04
Sand	%	12	25	20	20
Salt	%	43	45	40	36
Clay	%	45	30	40	44
Texture	-	Clayee	Clayee	Clayee	Clayee
Porosity	%	43	44	42	46
Water holding	%	40	40	41	40
C.E.C	meq/100gm	1.2	1.4	1.6	1.47
Organic carbon	%	0.3	0.35	0.40	0.4
N	ppm	12	15	10	15
P	ppm	14	8	15	12
K	ppm	17	18	15	11
S	ppm	9	5	10	8

S_1: Nayagarh, S_2: Unchabali, S_3: Jalpaposi, S_4: Balda

4.7 CLIMATIC CONDITION

The climate of the area is of subtropical type and is characterized by an oppressive hot summer, a mild winter and well distributed rainfall during the southwestern monsoon season.

The year is divided into four seasons, the summer season is from March to May and rainy season is from the period of June to September. October and November constitute the post monsoon season. The winter season is from December to February. The nearest meteorological station of IMD, where climatological data are available, is at district headquarters – Keonjhar.

Meteorological parameters like temperature, relative humidity, rainfall, wind flow pattern, cloudiness etc. for the area are gathered from IMD and the salient observations drawn from long term data of these different climatological parameters are briefly discussed in the following paragraphs.

a) Temperature

The month wise average maximum and minimum temperature observed in the Keonjhar District is presented in the Table 4.3

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Table 4.3 - Average Temperature and Relative Humidity

Month	Temperature		Relative Humidity	
	Mean Daily Max °C	Mean Daily Min °C	08:30%	17:30%
Jan	25.4	11.7	62	51
Feb	28.3	14.4	59	43
Mar	33.2	18.6	51	36
Apr	36.9	22.7	53	41
May	38.2	24.6	56	42
Jun	34.2	24.7	70	65
Jul	29.7	23.1	82	80
Aug	29.6	23.6	83	81
Sep	29.8	22.5	82	81
Oct	29.2	20.2	77	70
Nov	27.0	14.8	64	55
Dec	25.1	11.7	63	54
Annual Mean	**30.5**	**19.4**	**67**	**58**

b) Relative Humidity

It is observed from above table that high humidity of 70 to 83 % prevails in the morning from June to October. The humidity is about 51 to 56 % in the morning and 36 to 42 % in the afternoon from March to May. March is the driest month where the relative humidity drops down to 36 % during afternoon.

c) Rainfall

The rainfall data recorded at Joda block headquarter; district Keonjhar for the period of 1998-2007 is tabulated below in Table 4.4. The rainfall data does not show any cyclic occurrences and show erratic variations, ranging from as low as 909.13 mm in the year 2002-03 to 2049.54 mm in the year 2007-08. The average annual rainfall for the period 1998 to 2008 was 1339.30 mm. The monsoon season is spread over the months from June to September.

Table 4.4 - Yearly Rainfall (1998 – 2007)

Year	Rainfall (mm)	Year	Rainfall (mm)
1998-1999	1071.20	2007-2008	2049.54
1999-2000	1428.40	2008-2009	
2000-2001	1277.50	2009-2010	
2001-2002	1153.07	2010-2011	
2002-2003	909.13	2011-2012	

2003-2004	1324.24	2012-2013	
2004-2005	1348.45	2013-2014	
2005-2006	1313.00	2014-2015	
2006-2007	1521.38		

d) Wind flow pattern

The wind rose of Keonjhar district for the period 1976-1991 are shown in Figure 4.5 and Figure 4.6 recorded at 8:30 hrs and 17:30 hrs respectively. It is clear from the figures that for Keonjhar, the predominant wind directions are generally Northeasterly from October to March and Southwesterly from October to December.

Figure 4.5 – Wind Rose, Keonjhar District - (0830 HRS IST)

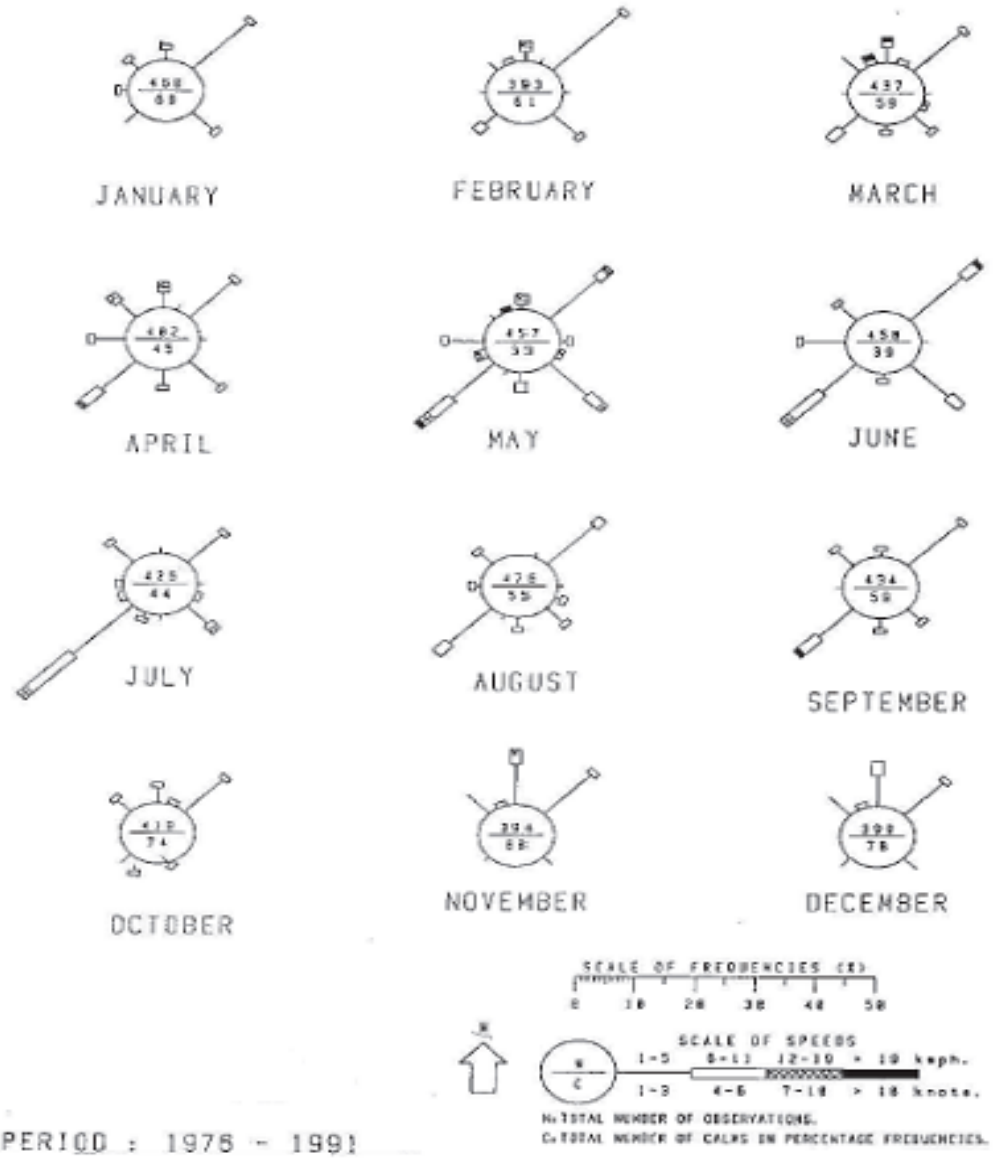

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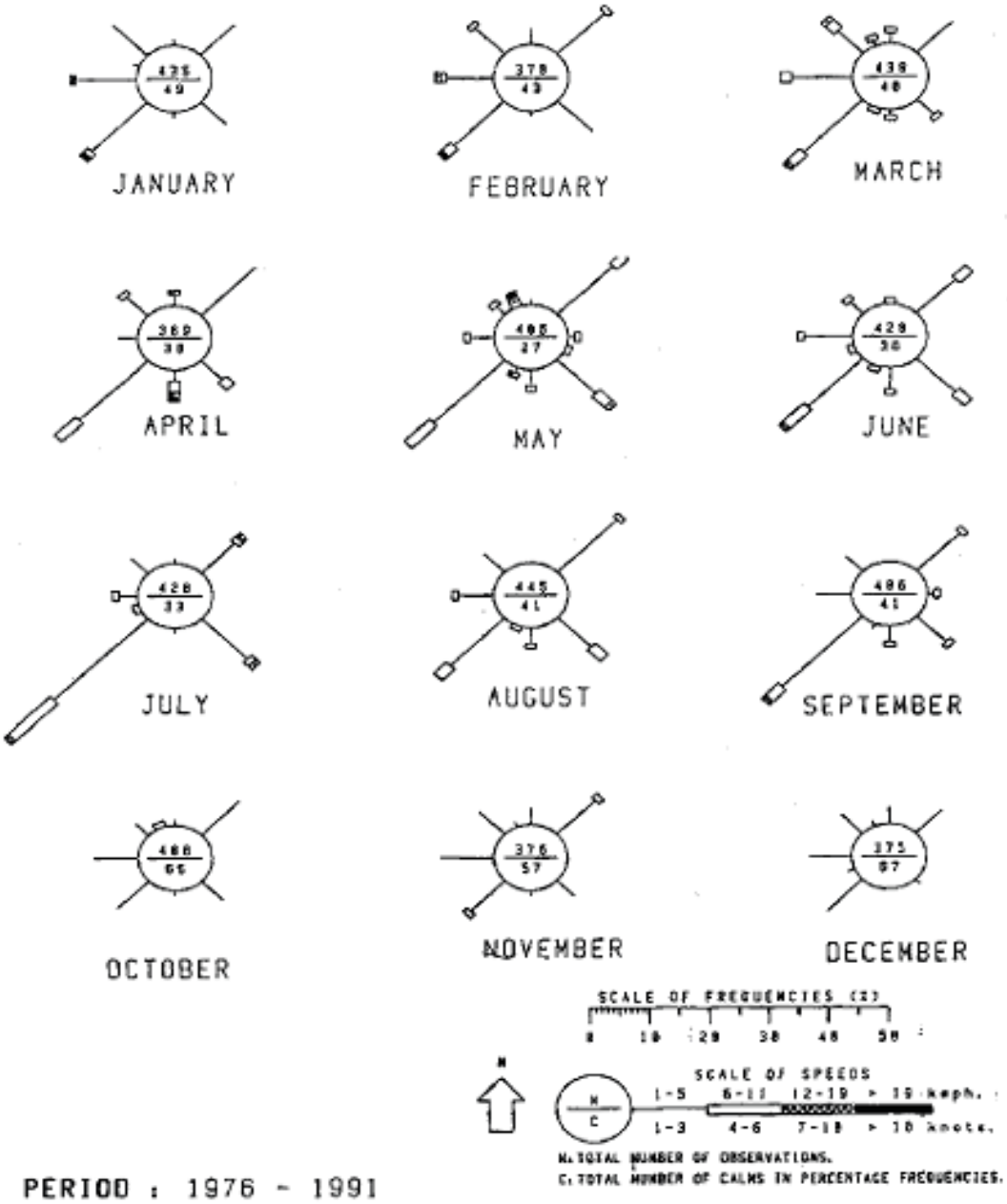
Figure 4.6 – Wind Rose, Keonjhar District (1730 HRS IST)



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e) Cloudiness

Skies are generally moderate to heavily cloud during northeastern monsoon, being overcast on some days. During the rest of the year, the skies are normally clear to lightly cloud. During the months of July-August, the mean cloudiness (in Oktas) is usually more than 6.5, being generally higher in the evenings than the mornings.

4.8 SOCIAL INFRASTRUCTURE AVAILABLE

The identified area falls under Joda Block of Keonjhar District of Odisha. The social infrastructure such as water facilities (wells, tanks, hand pumps and canals), communication facilities (post office, post & telegraph office and telephone connections), transportation facilities (bus and train), medical facilities (hospitals/first aid dispensaries, public health sub centers), education facilities (primary, middle and sr. secondary schools and college) and power supply is available in the nearby villages.

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5 PLANNING BRIEF

5.1 PLANNING CONCEPT

Essar Steel India Limited had implemented an Iron ore Beneficiation Plant of 10.7 MTPA capacity at Dabuna. The plant utilizes (-) 10 mm size and 58-64 % Fe grade IOF from merchant miners from the nearby area.

The infrastructure facility for raw material, land, transportation, and more notably best possible utilization of physical & social infrastructure, amenities/facilities will be extended for the proposed expansion.

5.2 POPULATION PROJECTION

The semiskilled/unskilled personnel available in the nearby areas will be employed during construction and operation phase. However skilled personnel will be called from the outside area. Therefore migration of semiskilled/unskilled personnel in the area is not expected on mass level and demographic profile of the area will not be changed. It is also not expected to have additional burden on the physical and social infrastructure like housing facility, education, medical facility, drinking water supply, transportation, and bank facilities available in the area for local population.

Moreover, the infrastructure facilities considered during 10.7 MTPA of the project will cater residential needs of the permanent personnel's and their families. It is expected that the population in the nearby area will be marginally increased.

It is envisaged that the expansion project would provide direct and indirect employment to 100 peoples respectively. Based on that, it is assumed that the population in the nearby area will increase by around maximum 300 people.

5.3 LAND- USE PLANNING

Most of the expansion part would be accommodated within the existing plant boundary. However additional land of 1.92 Ha(4.75 acres) is identified near the east side of existing Plant boundary for the installation of Truck Unloading Station. Apart from this 164.467 ha (406.408 acres) of land is identified for construction of tailing pond. The land utilization pattern is given in Table 5.1

Table 5.1 - Land Use Breakup

LAND USE PLANNING FOR PROPOSED BENEFICIATION PLANT & TAILING POND			
UNIT	**EXISTING BENEFICIATION PLANT**	**TRUCK UNLOADING STATION**	**TAILING POND**

AREA IN ACRES	**85**	**4.75**	**406.408**

5.4 ASSESSMENT OF INFRASTRUCTURE DEMAND

a) Water requirement for the expansion of Plant capacity will be met from the existing water intake system.

b) The power requirement for the expansion of Plant capacity will be met from the existing 132/33 kV grid sub-station, Palaspanga.

c) Apart from existing infrastructure, new facilities like Thickeners, Truck unloading station, Slurry Pipeline, Tailing pipeline, water pipeline and associated infrastructure will be constructed for the expansion of Plant capacity.

5.5 AMENITIES/FACILITIES

No new amenities are proposed and existing facilities will cater to the additional requirement.

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6 PROPOSED INFRASTRUCTURE

6.1 INDUSTRIAL AREA

To enhance the plant production capacity from 8 MTPA (output) to 12 MTPA (output) the additional process equipment or facilities required as explained in the chapter is consolidated and listed below.

a) Truck Unloading System

EStIL has taken on lease M/s. Jaiswal crusher area located towards North-East side of Dabuna Plant to construct Truck Unloading Station(TUS) for Iron ore handling and plan a new conveyor connecting to existing stock yard / junction houses to meet requirement of raw material. This conveyor system from TUS will enter the plant near existing Tailing thickener and will be routed along the plant boundary wall i.e. towards north side of existing facilities. The length of proposed conveyor is (~) 1200 m with multiple transfer houses.

b) Raw Material Handling

i. Commissioning of Stacker
ii. Capacity Audit of Twin Bucket Reclaimer
iii. Installation of Tripper Conveyor at Bin Top and necessary changes in the feed conveyor

c) Slurry Pipeline with Water pipeline

New slurry pipeline along with water pipeline and associated electrics and communication system will be constructed connecting Sagasahi and Dabuna Beneficiation Plant.

d) Tailing Pond near Lunagarhia

New tailing pond will be constructed near Lunagarhia for handling plant tailings.

e) Tailing Pipeline with Return water pipeline

New Tailing pipeline along with return water pipeline and associated electrics and communication system will be constructed connecting Dabuna Beneficiation Plant and Tailing pond.

6.2 RESIDENTIAL AREA

Residential facility with all the basic amenities established already is sufficient to cater additional manpower requirement.

6.3 GREEN BELT DEVELOPMENT

As per the CPCB guidelines, for Green belting an area of approx.30 Acres (33% of plant area) will be considered possessing adequate width and density. Basis for estimation of Green Belt area is shown in the Table 6.1

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Table 6.1 – Green Belt

LAND DETAILS OF GREEN BELT DEVELOPMENT		
SL.	**Land Description**	**Area in Acres**
01	**Existing Land(Beneficiation Plant)**	**85.0 acres**
02	**Truck Unloading Station**	**4.75 cares**
03	**Total area involved**	**89.75 acres**
33% of the total area		**30 acres(aaprox.)**

The plantation will be done on the both sides of the internal plant roads. Wherever tree plantations will not be feasible, unpaved land shall be covered with grass and small height bushes. Moreover, special care shall be taken for planting shrubs/trees along the roadside.

6.4 SOCIAL INFRASTRUCTURE

For the benefit of the local community, company is working closely with the local community towards improving social infrastructure in the nearby area. The company is improving drinking water facility by putting tube wells in nearby villages. Also company is adopting the local community health centers, providing mobile medical units to improve health conditions. Moreover company has started Industrial Training Center in the area to develop the educational skills of the locals.

6.5 CONNECTIVITY

The existing plant is well connected with road, rail, water and power facilities. This facilities will be extended within the plant boundary to cater the expansion.

6.6 DRINKING WATER

Existing plant incorporates a water treatment facility to treat and distribute drinking water within plant premises. This facility is adequate for the proposed expansion.

6.7 SEWERAGE SYSTEM

The Plant has septic tanks and soak pits adequate to take care of the waste water of Canteen, Toilets and Transit Camp.

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6.8 INDUSTRIAL WASTE MANAGEMENT

The waste oil/grease is collected in closed MS barrels with caps intact and the barrels are kept on impervious floors with shed and oil catch pit.

6.9 SOLID WASTE MANAGEMENT

Industrial solid wastes such as rubber, scrap metal etc, will be collected and disposed-off suitably.

6.10 POWER REQUIREMENT & SOURCE

The total power requirement after expansion is estimated as 29.5 MW and the existing power source from OTPCL, 132/33 kV grid is sufficient to cater this requirement. As an adequate measure, if required, Power would be wheeled from Paradeep 2 x 30 MW capacity Captive Power Plant.

7 REHABILITATION AND RESETTEMENT (R&R) PLAN

There is zero displacement in the Project area. All the Land sellers come under the project affected category and since no one is parting with 100% land, therefore there is no entitlement for job. However, company will follow the R & R Policy of Govt. of Odisha towards Rehabilitation.

8 PROJECT SCHEDULE & COST ESTIMATE

8.1 PROJECT SCHEDULE

The schedule for completion of Engineering, Procurement and Construction activities for expansion of Beneficiation Plant will be about 30 months after getting all statutory clearances from various government agencies. The breakup of activities is given in below table.8.1

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Table 8.1: Project Schedule for expansion

Description	Periods (Months)	Cumulative Schedule (Months)
Basic Engineering	3	3
Detail Engineering	3	6
Procurement	6	12
Construction	12	24
Erection and Commissioning	6	30

8.2 PROJECT COST ESTIMATION

8.2.1 General

Dabuna Beneficiation Plant is proposed to expand from its present beneficiation capacity of 10.7 MTPA throughput (8 MTPA beneficiated Concentrate) to 16 MTPA throughput (12 MTPA Beneficiated Concentrate) to match the capacity of Paradeep Pellet Plant.

8.2.2 Summary of Capital Cost Estimate

The capital cost for Beneficiation Plant expansion is given in Table-8.2.

Table 8.2 - EPC Cost for expansion of Beneficiation plant

Capex Estimate				
				Crores
No.	Particulars	Imported	Indigenous	Total
A	**EPC Cost**			
1	Engineering **(I)**	**00**	**2.56**	**2.56**
2	Procurement			
	Tailing Dam	00	2.04	2.04
	Tailing Pipeline from Beneficiation Plant to Tailing Dam	00	10.01	10.01
3	Return Water Pipeline from Tailing Pond to Beneficiation Plant at Dabuna	00	5.46	5.46
4	Slurry Pipeline from Sagasahi Iron Ore Mine to Beneficiation Plant (28km)	00	60.71	60.71
5	Return Water Pipeline from Beneficiation Plant, Dabuna to Sagasahi Iron Ore Mine	00	35.63	35.63
6	Truck Unloading Station	00	21.12	1.12
	Total (II)	**00**	**134.97**	**134.97**
	Construction :			
	Erection			

1	Tailing Dam	00	43.88	43.88
2	Laying of tailing pipeline from Beneficiation Plant to Tailing Dam	00	20.17	20.17
3	Laying of water line from Tailing Dam to Beneficiation Plant	00	6.61	6.61
4	Laying of slurry pipeline from Sagasahi Iron Ore Mine to Beneficiation Plant(28km)	00	18.09	18.09
5	Laying of water pipeline from Beneficiation Plant to Sagasahi Mine (28km)	00	17.55	17.55
6	Construction of Truck Unloading Station	00	30.06	30.06
	Total (III)	**00**	**136.36**	**136.36**
	Total (I) +(II)+(III)	**00**	**273.89**	**273.89**
B	**Owner's cost (IV)**			
	Land acquisition	00	33.32	33.32
	Pre-operative expenses	00	8.21	8.21
	Contingencies	00	19.48	19.48
	Interest during construction	00	22.82	22.82
	Margin Money	xx	00	00
	Total Investment (I)+(II)+(III)+(IV)		**357.62**	**357.62**

8.2.3 Methodology

The costs have been worked out on the basis of prices prevailing during 2nd Quarter 2016 and do not include any provision for future escalation in costs during implementation period.

The cost estimates are generally based on available in-house information, current budgetary quotations and costs extracted from similar projects after suitable adjustment to reflect current prices. The estimate is based on as erected cost of plant and machinery including applicable statutory duties & taxes for various schemes as mentioned above and include financing cost during implementation/construction period.

100% new equipment has been envisaged for procurement and use in the project. No second hand and revamped equipment is envisaged while estimating the project cost.

8.2.4 Basis of Estimate

The basis of the capital cost estimate is elaborated in the following sub-sections.

8.2.5 Land and Site Development

Land acquisition for Expansion facilities is considered as 4.75 Acres for Truck unloading station. Further, Cost of site development includes the cost of cutting and filling, grading, approach roads, tailing pond construction, pipelines etc.

8.2.6 Plant and Machinery

Main technological units for the project consist of Pumps, Motors, Pipeline, Pipe fittings, Thickeners, Material handling equipment. Screen, load cell mounted hopper, belt feeders, collecting conveyor,

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metal detector, electrical & automation system, PLC system, firefighting system, weigh bridge transfer houses, water sprinkler for road for pollution controls, hoisting & handling arrangements and equipment. Cost of plant & machinery includes the FOB/ ex-works cost of equipment, initial spares, ocean & inland transportation and handling costs, transit insurance, port clearance, taxes & duties, and installation charges for the technological and associated auxiliary equipment as well as technological structures.

8.2.7 Civil & Structural Works

This includes all civil works and building structures for plant buildings, equipment and column foundations, open yards, conveyor galleries and junction houses, project office, non-factory buildings and other miscellaneous civil engineering/structural works.

8.2.8 Engineering

The cost estimated under this head includes engineering and consultancy charges which mainly comprise of basic and detailed engineering, preparation of technical specifications, contracting and procurement services, supervision of erection, testing and commissioning, etc.

8.2.9 Pre-operative expenses

This includes costs towards establishment charges, rents & taxes, travelling expenses, communication, legal expenses, and insurance during construction including erection insurance, start-up expenses, salaries and training of operational & maintenance staff inducted before commencement of production as well as that of owners' team, and other miscellaneous expenses including corporate social responsibilities likely to be incurred during implementation of the project.

8.2.10 Contingencies

Contingencies at the rate of 10% of the capital costs have been provided to cover unforeseen aspects of the estimate.

8.2.11 Interest during Construction (IDC)

The project has been envisaged to be commissioned in different phases from the date of clearance of the project and appointment of the project consultant. It has been assumed that the project would be financed in the D:E ratio of 2:1. Interest on loan capital has been considered at the rate of 13.5%. Interest during construction (IDC) has been worked out based on construction schedule, interest rate on long-term loans and withdrawal pattern of fund. Project will be implemented in 30 months from the date of the financial closure.

9 ANALYSIS OF PROPOSAL

9.1 FINANCIAL & SOCIAL BENEFITS

Essar is a large player in the diversified sectors and making noteworthy contribution in Indian economy. The proposed expansion of Beneficiation Plant will help the company in attaining

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operational efficiency of interlinked existing Steel plant. The annual revenue generation in the form of taxes from the proposed project will go to the district exchequer and can be spent in developmental activities in the region.

The majority of the population in the nearby area is tribal like Mundas, Nayaks etc. The major benefit due to proposed project will be in the shape of generating direct/indirect employment in substantial number for this tribal population. The unskilled/semiskilled personnel utilized in different areas like horticulture, site clearing, construction activities etc. will be hired from the nearby areas to the extent possible. Further, there will be scope for lot of small contracts, which will benefit the local contractors/material suppliers and local tribal population in general and at the same time it will reduce the need for additional infrastructure. Also, due to secondary development in the region, employment opportunities are generating through setting up of many guest houses/hotels, restaurants, utility shops, new schools, transport operators etc. All these factors are beneficial to the locals residing in the nearby area.

Additionally, the company is implementing many community development activities through Essar Foundation. The Foundation's activities divided across six focus areas like livelihoods and entrepreneurship, women's empowerment, health, education, infrastructure and Ecology & environment. In line with these activities, Essar Steel India Ltd. is working towards improvement in the living conditions of tribal population near the project, particularly in the areas of health & hygiene, civic amenities, infrastructure, education & training, water supply etc.

Few initiatives being undertaken in the region are described below;

a) Organized health camps over 450 villagers from tribal communities who lived in remote areas benefited from the health camps. The camps were organized as part of Essar's commitment to providing continuous healthcare services in remote locations adjoining Essar facilities.
b) Adopting the community health centers (CHC's) in one of the poorest and tribal dominated blocks in Keonjhar, providing mobile Medicare unit, the tele-opthalmic vision center and organizing the specialized health camps are significant step taken towards making quality healthcare services available to the communities of one of the poorest blocks of Odisha.
c) Around 11 schools near Beneficiation Plant are extended support through provision of community teachers, teaching learning materials and school uniforms to students.
d) An Industrial Training Centre (ITC) was established under the program called 'Technical education to empower rural youth'. It is one of the most successfully managed initiative for empowerment of the local community and to make the youth employable in one of the most under developed areas in the country.
e) The foundation is also working on an agriculture improvement program where tribal villagers are trained in innovation in agricultural practices. A series of training programs were initiated

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under which local agriculture experts guided the villagers in the use of modern agricultural techniques to grow vegetables and other crops which can be easily sold in the market.

f) The foundation is also extending the support towards effectively implementing various government schemes/missions in the region. The company has placed experienced professionals to help reach out to more than 10,000 women and self-help group members in 13 blocks of the district.

The company will keep on contributing into community welfare, public infrastructure improvement and employment generation. And therefore proposed expansion project will significantly contribute in improving the socio economic condition of locals.

Keeping in view of the realities of existing Beneficiation Plant as well as financial analysis of proposed project, it can be concluded that the proposed expansion is economically viable. It is therefore recommended to expand the Beneficiation Plant capacity near the village - Dabuna, Tehsil – Joda, District – Keonjhar, State - Odisha.

DR. B. M. FARUQUE

Director (Retd.), Geological Survey of India

Zahir Land,
Tinkonia Bagicha,
Cuttack-753001

To
ESSAR Steel India Ltd
At/PO. Dabuna
Dist : Keonjhar,
Odisha - 758034

Date : 28th Nov'16

Sub: Identification of Additional suitable sites for Tailing Dam for Beneficiation Plant of M/s Essar Steel India Limited (Phase - II Study)

Dear Sir**,**

On the basis of your letter dated 2nd Nov'2016, study has been conducted by us for identification of additional sites for development of Tailing Dam for Essar's Iron Ore Beneficiation Plant at Dabuna.
In order to locate the site for tailing pond, following five technical parameters have been considered:

1 **Suitable geomorphology**

Geomorphology is the shape of land form developed by a combination of tectonics and geological processes. In case of tailing dam, it is necessary to have a valley enclosed preferably on three sides.

2 **Area free from ore minerals** :

Since a tailing dam will eventually cover the entire land area under a huge thickness of tailings, it will be necessary to ensure that no mineralised zone is buried under the tailings.

3 **Structural Geology to eliminate geo-technically risky zones** :

The geological set–up is likely to undergo physical deformation when subjected to tectonic movement in regional scale. It leads to development of fold, fault, schistosity, joints and lineations. Rocks subjected to such geo-dynamic processes are prone to displacement under huge pressure. Hence, the basement of any tailing dam must be free from such weak planes so that the reservoir does not give in to the pressure exerted by the huge mass of tailings in the long run.

4 **Area free from Forest cover:**

It was ensured that only areas free from forest cover or scantily covered areas which satisfied other aspects of Tailing Dams were available in the sites being proposed and to be checked on ground during ground truthing.

5 **Area free from revenue infrastructure**: roads, bridges etc from maps and field work.

DR. B. M. FARUQUE

Director (Retd.), Geological Survey of India

Zahir Land,
Tinkonia Bagicha,
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In this context additional following four sites have been studied during Phase – II :

1. Ghorapira Pahar
2. Ansuan
3. Samraja Pahar
4. Saranda Pahar

Apart from the above four sites , one of the sites of Phase – I , called "Phuljhar" has been re-looked and hence in the Phase – II, total five nos of sites were studied. Details of which are tabulated below :

Sites	Geology	Topography	Structural Geology	Mineralisation	A. Revenue infrastructure B. Villages	Capacity - (approx) Million cum	Forest cover
Phuljhar	Basic volcanic	Open valley covering three sides	Free from any faults and schistosity or weak planes	No mineral of economic significance	A.None B. One village Shankari near the opening of the valley	33	Free from Reserve forests. Wooded & Cultivated Patches.
Ansuan	Basic volcanic	Elliptical valley	Free from fault and weak planes	No mineral of economic significance	A.None B. Two settlements of Ansuan at the opening of the valley	120	Free from Reserve forests. Open scrub and cultivated patches
Ghorapira Pahar	Basic volcanic	Almost circular	Free from fault and weak planes	No mineral of economic significance	A.None B. Two villages at the opening of the valley.	115	Free from Reserve forests. Open scrub and cultivated patches
Samraj Pahar	Basic volcanic	U-shaped facing WNW	Free from fault and weak planes	No mineral of Economic Significance	None	9.9 million cum	Open scrub and cultivated patches
Saranda Pahar	Basic volcanics and Purple shale	U shaped valley facing North East	Free from fault and weak planes	No mineral of Economic Significance	None	26 million cum	Open scrub and cultivated patches

DR. B. M. FARUQUE

Director (Retd.), Geological Survey of India

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The above mentioned capacities are on the basis of topography of the area (1 : 50000).

Synopsis of findings :

- All three sites (Phuljhar, Ghorapira Pahar, Ansuan) are free from Reserve Forest / Protected Forest / Sanctuary. However the density of forest growth varies from low to high.

- Geologically all the three alternative sites - Ghorapira Pahar, Ansuan from Phase II, and Phuljhar from Phase I – are composed of sandstone or basic volcanic which are barren of minerals of economic significance.

- There is no revenue infrastructure in all the three sites- Ghorapira Pahar, Ansuan and Phuljhar.

- However, there are two villages and both are named Ansuan just at the opening of the valley of Ansuan and two villages named Natgoth and Baitarani near the opening of the valley for Ghorapira Pahar, which brings down the ranking of Ghorapira and Ansuan. That gives an edge to Phuljhar. There is just one village Shankari, a little distance away from the face of the valley of Phuljhar.

- Based on visual estimates, the density of forest growth in Phuljhar is found to be much lower than the other sites.

- The hill slopes of the sites at Ghorapira, Ansuan and Phuljhar are very stable having a gentle slope. It will not require any additional concrete structure to strengthen.

Based on the Geomorphology, Slope stability, Structural geology, available area of the valley, forest density, the following three alternatives have been shortlisted during the Phase – II study.

1. Phuljhar
2. Ansuan
3. Ghorapira

DR. B. M. FARUQUE

Director (Retd.), Geological Survey of India

Zahir Land,
Tinkonia Bagicha,
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The detailed reports for Phase – I & Phase – II, have been enclosed as **Annexure – I** and **Annexure – II**.

Sincerely,

Dr. B.M.FARUQUE
Former Director
Geological Survey of India

ANNEXURE-I

IDENTIFICATION OF SITE FOR TAILING DAM OF ESSAR IRON ORE BENEFICIATION PLANT AT DABUNA, KEONJHAR, ODISHA

PHASE - I

Introduction

In accordance with the work order no. ESO/OSC/4400086456 dated 11.3.2014 M/s Essar Steel India Ltd sought the consultancy services of M/s Geomin Consultants P Ltd for identification of a suitable site for the disposal of tailings from the iron ore beneficiation plant at Dabuna, to be located within a radius of fifty kilometers from Dabuna. Although the work order was received in March 2014 the client had put the project on hold till the 19th of July 2014. The work was accordingly taken up in the last week of July 2014 with Dr. B.M.Faruque, former Director, Geological Survey of India, Executive Director, Geomin Consultants in charge of the project.

ESSAR Steel India Ltd has indicated that the IOBP Dabuna is expected to generate 4 million tons of tailings annually and the project life is kept at 30 years. Which meant the Tailing Dam should have the capacity of 120 million tons of tailings. The bulk density of tailings is placed at 1.9. So the capacity of Tailing Dam should be 63.15 million cu m, approximately. A buffer volume of 20 million cu m may be kept to accommodate swell due to climatic parameters. Ultimately, the volume of tailing is expected to go down, due to evaporation. The target area

should have the capacity to hold about 65,000,000 cubic meters of tailing.

In pursuant of the advice from the MoEF, ESSAR Steel India Ltd went for a second phase of hunt for a suitable site for setting up of the Tailing Dam for the Iron Ore Beneficiation Plant at Dabuna. In the first phase an area of0ver 500 sq km was scanned through remote sensing and followed by ground truthing of ten sites: Malda, Jampani, Purunadihi, Naibanga, Rangabera, Shankari, Balibeda, Kadamdihi, Thakurani Pahar, and Bhurkundi Pahar. In the second phase an area of 680 sq km in the toposheets 73G2, 73G6 and 73G9 was scanned through remote sensing study of toposheets and satellite imageries. After evaluating the areas under five parameters (Geomorphology, Geology & Mineralisation, Structural Geology, Forest cover and Revenue infrastructure) 6 sites (Ghorapira Pahar, Ansuan, Samraja, Saranda Pahar, Barikud in 73G/6 and Kirinala in 73G/2 were targeted for ground truthing. In pursuant of the advice from the MoEF, ESSAR Steel India Ltd went for a second phase of hunt for a suitable site for setting up of the Tailing Dam for the Iron Ore Beneficiation Plant at Dabuna. In the first phase an area of0ver 500 sq km was scanned through remote sensing and followed by ground truthing of ten sites: Malda, Jampani, Purunadihi, Naibanga, Rangabera, Shankari, Balibeda, Kadamdihi, Thakurani Pahar, and Bhurkundi Pahar. In the second phase an area of 680 sq km in the toposheets 73G2, 73G6 and 73G9 was scanned through remote

sensing study of toposheets and satellite imageries. After evaluating the areas under five parameters (Geomorphology, Geology & Mineralisation, Structural Geology, Forest cover and Revenue infrastructure) 6 sites (Ghorapira Pahar, Ansuan, Samraja, Saranda Pahar, Barikud in 73G/6 and Kirinala in 73G/2 were targeted for ground truthing.

The scope of work:

Desk work: Study of topography in the 1:50000 scale toposheets, with emphasis on valleys having hills on at least two sides if not three sides and opening on one side. Topography to be studied with the purpose of checking geomorphology and some aspects of structural geology of the area which will be stable to support an earth-cum-masonary dam of 65 million cu m capacity. Remote Sensing: Study of satellite imagery to be carried out with the objective of identification of lineaments/faults of regional scale, which can adversely affect and increase the vulnerability of the area, in terms of failure of the basement rock, when subjected to a pressure of 120 million tonnes of tailings.

Avoid Mineralised zone: Study of authentic geological maps of the area to ensure that the site chosen for the construction of tailing dam, is free from mineralisation of significant economic value. Geological traverses in the selected sites on preliminary selection from remote sensing and topographic study to confirm the geology in situ. The geological traverses also help recording data on the structural features like joints, fractures and faults of mesoscopic to megascopic scale directly from

displacement of blocks, escarpments, brecciated zones, slickensides, mylonitisation, drainage pattern and alignment of streams, etc.

Forest and Revenue areas: The ground truthing is also to take care of the data on existence of and type of vegetation, agricultural land, to avoid any revenue feature like roads, structures, community centres, minor irrigation projects, power supply towers or communication facilities. Attempt has been made to avoid private holdings or leased out areas for the selection of sites for tailing dam. Finally preparation of maps: showing the proposed areas suitable for construction of tailing dams and preparation of report on the various parameters discussed above.

Methodology, Materials and Logistics: The following paragraphs include the methodology of the preamble desk work , field work and cartography and documentation envisaged for the above project. In order to locate a site for tailing pond, five parameters, technically, have to be considered.

1. **Suitable geomorphology**
   - Geo-morphology is the shape of land form developed by a combination of tectonics and geological processes.
   - In case of tailing dam, it is necessary to have a valley enclosed preferably on three sides .
2. **Area free from ore minerals** :
   - Since a tailing dam will eventually cover the entire land area under a huge thickness of tailings, it will be necessary to ensure that no mineralised local is buried under the tailings.

3. **Structural Geology to eliminate geo-technically risky zones** :

- The geological set –up is likely to undergo physical deformation when subjected to tectonic movement in regional scale. It leads to development of fold, fault, schistosity, joints and lineations.

- Rocks subjected to such geo-dynamic processes are prone to displacement under huge pressure. Hence, the basement of any tailing dam must be free from such weak planes so that the reservoir does not give in to the pressure exerted by the huge mass of tailings in the long run.

4. Area to be free from Reserve or Protected Forest :

5. Avoid revenue facilities, lease areas and agricultural land

Considering the above features and the distance of fifty kilometers radius from the Dabuna Iron ore Beneficiation Plant, nine toposheets fall in the prospective zone. These are 73 F/4, 73 F/8, 73 F/12, 73 G/1, 73 G/2, 73 G/5, 73 G/6, 73 G/9 and 73 G/10. A reconnoitary look of the toposheets, gives the impression that the entire area of the nine toposheets can be divided into five categories in terms of geology and geomorphology.

1. Mineral bearing areas with mines
2. Mineral bearing areas without mines
3. Areas with B.I.F. but without mineralized zone
4. Areas without B.I.F.
5. Natural valley enclosure or abandoned mine pit or excavated structure in the above geological set up

Broad distribution of mineral bearing and mining areas: A survey of the toposheets in consultation with base map of the area shows that toposheets 73 F/8, 73 G/1, 73 G/5 are full of mining belts with iron ore and manganese ore mines. Remaining toposheets like 73 F/4, 73G/ 2

and 73 G/6 have a small area with iron ore and Banded Iron Formation (B.I.F). The areas in toposheets 73 G/9 and G/10 are relatively mineral-barren areas. To pin point the geological formations which could be mineral bearing following logistics are required.

a. Toposheets : 73 F/4, F/8,F/12, 73 G/1, G/2, G/5, G/6, G/9 and G/10.

b. Geological maps on 1:50000 scale from G.S.I.

c. Satellite Imageries covering the above toposheets from NRSA.

The work was taken up as per the following action plan, envisaged broadly:

Procurement of toposheets, geological maps and satellite imageries.

Study of the maps, geology, geomorphology and mines, in consultation with the lease maps.

Identification of suitable geomorphic structures on the maps.

Ground truthing of the selected sites by geological traverses in field.

Preparation of maps of prospective sites for tailing dams.

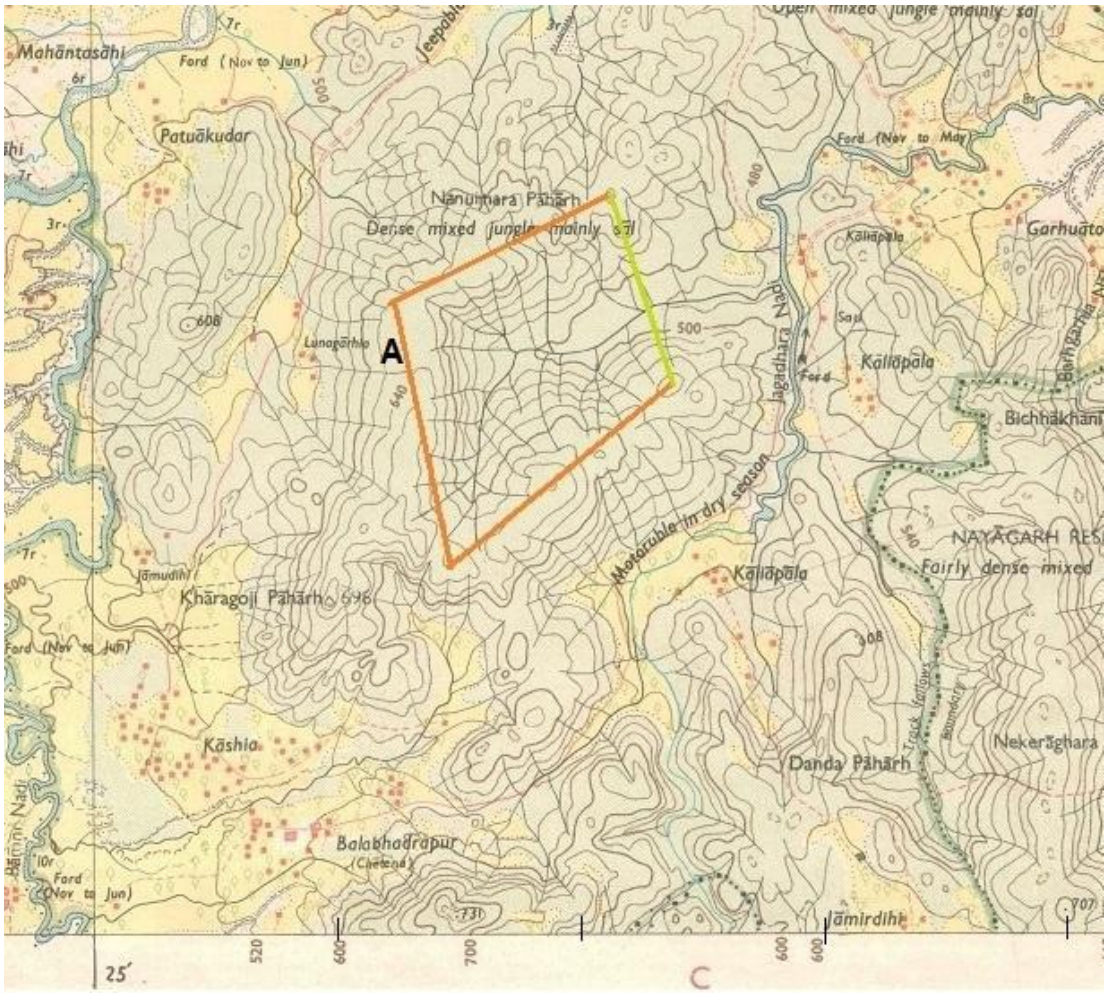
Background of the Study

The Iron Ore Beneficiation Plant (IOBP) of ESSAR Steel India limited, Odisha is located at Dabuna with coordinates: Latitude 21°51’30”N and Longitude 85°24’15”E, at an elevation of about 500m, above mean sea level, in the Keonjhar district of Odisha. The elevation of Dabuna is comparable to the valley around Baitarani River at that latitude. Hence any geomorphic domain having suitable site for the construction of a tailing dam will have to be at a higher elevation than 500m. Ideally it is expected to be bounded by hills on two sides of broadly a triangular reservoir. The third side will be developed as an earthen dam. Hence it is for Geomin to hunt for a site which broadly possesses the shape of a

triangle. If the sides of the triangle, at the top, are equal to 2 km each and the valley has a depth of 80 m. A valley with this dimension will have a capacity of 69.2 million cu m.

In the first phase of this study we have considered to carry out high resolution scrutiny of the 9 topo sheets ie. 73G/5 which contains IOBP at Dabuna and 73 F/4,73F/8,73F/12,73G/1,73G/9,73G/2,73G/6 and 73G/10. These toposheets will cover a crow-flight distance of 40 km only from Dabuna in all directions. Even though ESSAR has targeted to locate the Tailing Dam within a maximum distance of 50 km, the search begins with an objective to locate a site nearest to Dabuna. Hence the possible sites in 73 G/5 will get the priority. High resolution scrutiny of the topography of toposheet 73G/5 bounded by Latitude: 21°45’00”N and 22°00’00”N and Longitude: 85°15’00”E and 85°30’00”E, has been taken up. Several valleys have come under scanning which possess the topographic features to be developed into a Tailing Dam in the toposheet 73 G/5, though a lot other features will be checked for the absence of mineralised zone, lineaments and other structural features in the rock formation which can have adverse impact from engineering geological perspective, forest, agricultural land, settlement and above all if it falls within a lease area. As per the toposheet data there are no settlement or agricultural land, however forest do exist. Some prospective zones are situated very close to mineralised zones.

Identification of the possible dam sites: Preliminary study on the toposheets, geological maps and satellite imagery followed by ground truthing has lead to the identification of the following large and small ten sites to be considered and chose the best for the construction of the dams for iron ore tailings.



Dam Site A (Malda) on toposheet 73 G/5

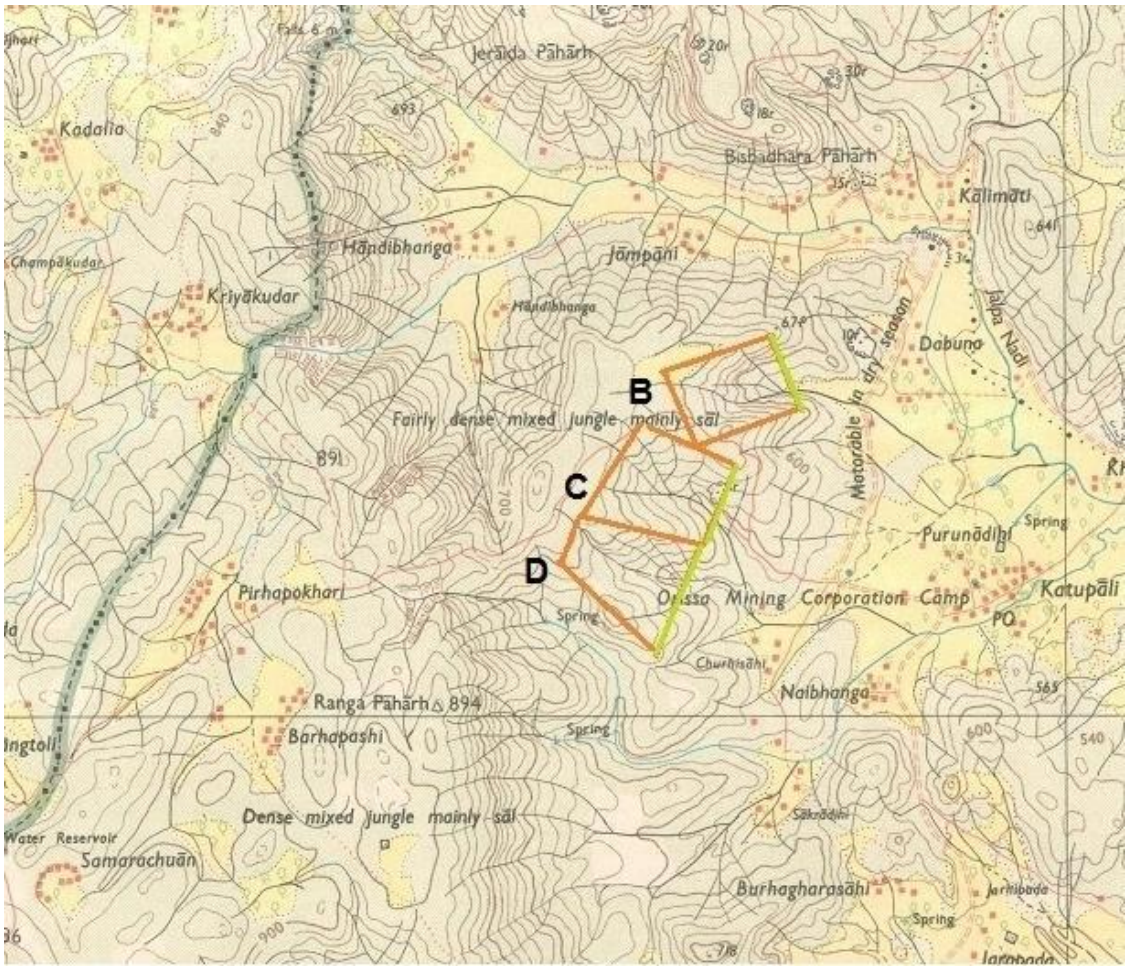
SITE A: MALDA (Lunagarhia):

It is four sided and the area is roughly 1900mX1700m. Its shape is not that of a rectangle though. Gradient 120/1000m or 1:8.3, it is located at a distance of 18km (crow flight distance of 10 km) from Dabuna, to the immediate east of the village Lunagarhia. The depth of the valley is 140m with reference to 620 contour. The site has the advantage of having natural enclosure on three sides and the fourth side is open and the drainage grades towards ENE which meets the Jagadhara Nadi two kilometers away. The depth of the valley is 140m with reference to the 620m contour as per the S O I toposheet 73 G/5.

Average gradient is 1:8.3. It has the capacity to hold 161.5 cu.m. Area at the brim of the reservoir 323 Ha. The country rock is sandstone, which is leucocratic, medium grained and it is to some extent crudely laminated which masks the bedding plane. However at places the trend is found to be horizontal to sub horizontal. The area is free from any fault, schistosity or weak plane from geotechnical perspective. There is no indication of any economically significant mineralised zone in the area. As per Survey of India toposheet it is covered by Dense mixed jungle. though it does not fall within any reserved or protected forest category. No revenue infrastructure (roads and building) is located in the area. There are neither villages nor settlement within the site nor even near about the site.

SITE B: JAMPANI: It is located at a distance of 1.25 km west south west of Dabuna. It is rectangular shaped valley with three sides having natural boundary where as the fourth side needs to be closed with masonry or earthen dam structure. Depth of the valley is 100m from the 680m contour of the topo sheets. It has the capacity (800X600X100) sq.m. to hold 24 million cu.m. which is far less than the required volume. Gradient is 100 by 600m. ie. 1:6. Drainage is towards east-north-east. It is occupied by shale, chert and BHJ of the Iron Ore Group of rocks. Even though there is no mineralisation of economic significance, it is located very close to mineral occurrences of iron and manganese. Two sets of fault (NE-SW and nearly N-S trending) traverse very close to the area. Fairly dense mixed jungle occupies large parts of the total area. The area of the valley does not fall in either reserved category nor within protected forest. No revenue infrastructure (road, building etc) has been located within the area.

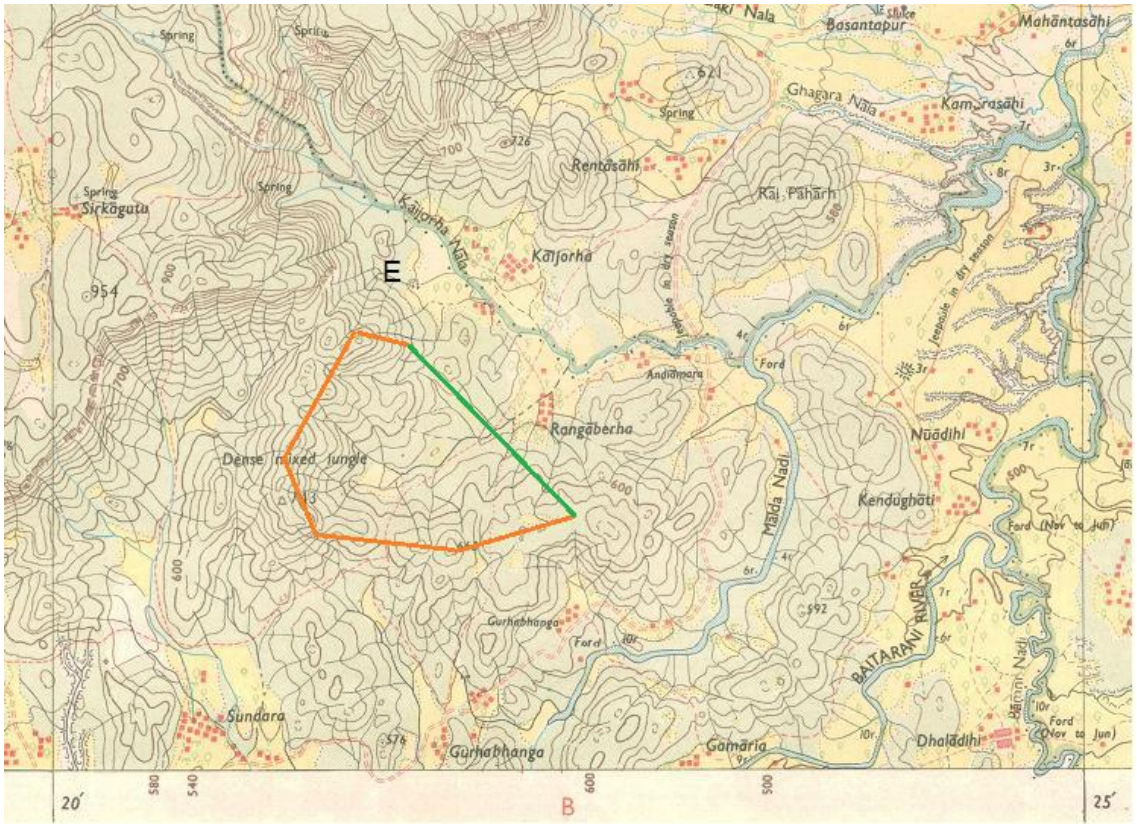
SITE C: PURUNADIHI: With an area of 800mX700m and valley depth of 100m, it is located at 1.95 km south-west from Dabuna and 1750m west of Purunadihi village. Gradient is 100/550 or 1:5.5. It is four sided though does form a rectangular shape. One of the four sides being open it drains into ESE direction.



Location of Dam Sites B, C and D on toposheet 73 G/5

Entire area is occupied by BHJ, and it is free from any mineral of economic significance. However, iron and manganese occurrences are seen very close to the area on the western side. Two sets of fault (NE-SW and almost N-S) are seen to traverse very close to the area. As per the toposheet it has a cover of fairly Dense mixed jungle. No revenue (roads and building etc) structure or facility is located in the area.

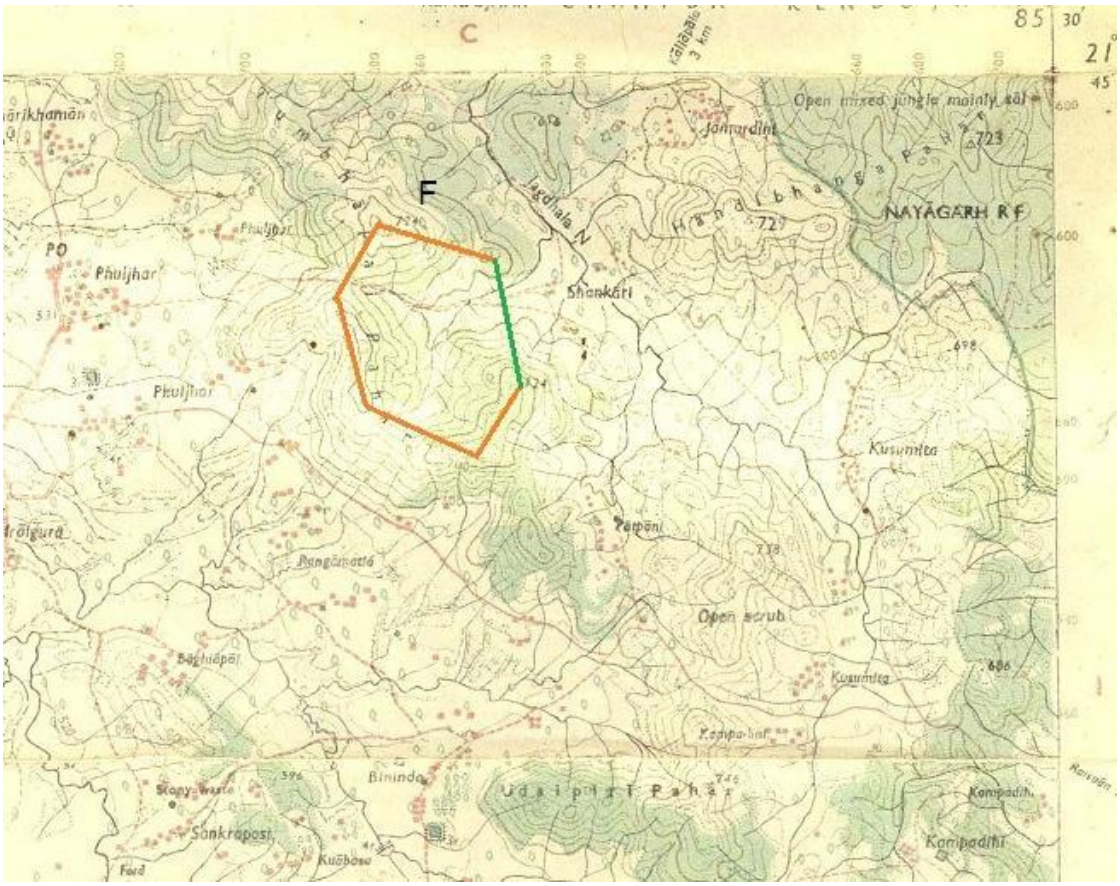
SITE D: NAIBHANGA: It is a small valley closed on three sides, with an area of 800m X 500m on the map its drainage is towards ESE. Located at a distance of 2.4 km southwest of Dabuna the valley is spread over an area of 40 Ha, it is three sided triangular valley. Depth of the valley is 100m with reference to the 600m contour. It has a capacity of holding 20 million cu.m. of tailing. Gradient is found to be 1:6 towards east south east. Naibanga village is located at 1.5km almost east of D and Jampani village is 2.2km north of the site. The site is occupied by BHJ of the Iron Ore Group formation and is free from any mineralisation of economic significance. However the identified site is very close to the iron and manganese mineralisation in the vicinity. Two sets of fault (NE-SW and almost N-S) are seen to traverse very close to the area. No revenue (roads and building etc) structure or facility is located in the area. Forest cover comes in the category of Fairly dense mixed jungle.



Dam Site E (Rangabera) on toposheet 73 G/5

SITE E RANGABERHA: It is located at 21km (10.5 km crow flight distance) southwest of Dabuna. It is a hexagonal shaped valley spread over (1000m X 1100m) 110 Ha area. Its depth is 100m with reference to 640m contour, hence it has a capacity of holding 55 million cu.m. The gradient on the southern range of hill is gentler with a ratio of 1:10 than that of the northern limb where the gradient stands at 1:4.1 only. The village in its immediate neighbourhood is Rengaberha to its east and Sirkagutu is located at 3 km northwest of the centre of this valley. Kaijorha village is located at 1.85km north-east of Site E. The valley's drainage flows to the east north east direction to meet Kaijorha Nala which later meets Baitarani River further eastward. It is occupied by Basic Volcanic rocks on the western limb and sandstone/quartzite along the eastern limb of the valley. It is barren so far as mineralisation of

economic significance is concerned. However iron ore occurrence is barely two kilometres away from the area in the northwest direction. A major NE-SW trending fault is seen traversing the western margin of the area, which make it rather risky from geotechnical perspective. As per toposheet 73 G/5 it has a cover of Dense Mixed Jungle. No revenue infrastructure is located within the area.



Location of Dam Site F on toposheet 73 G/6

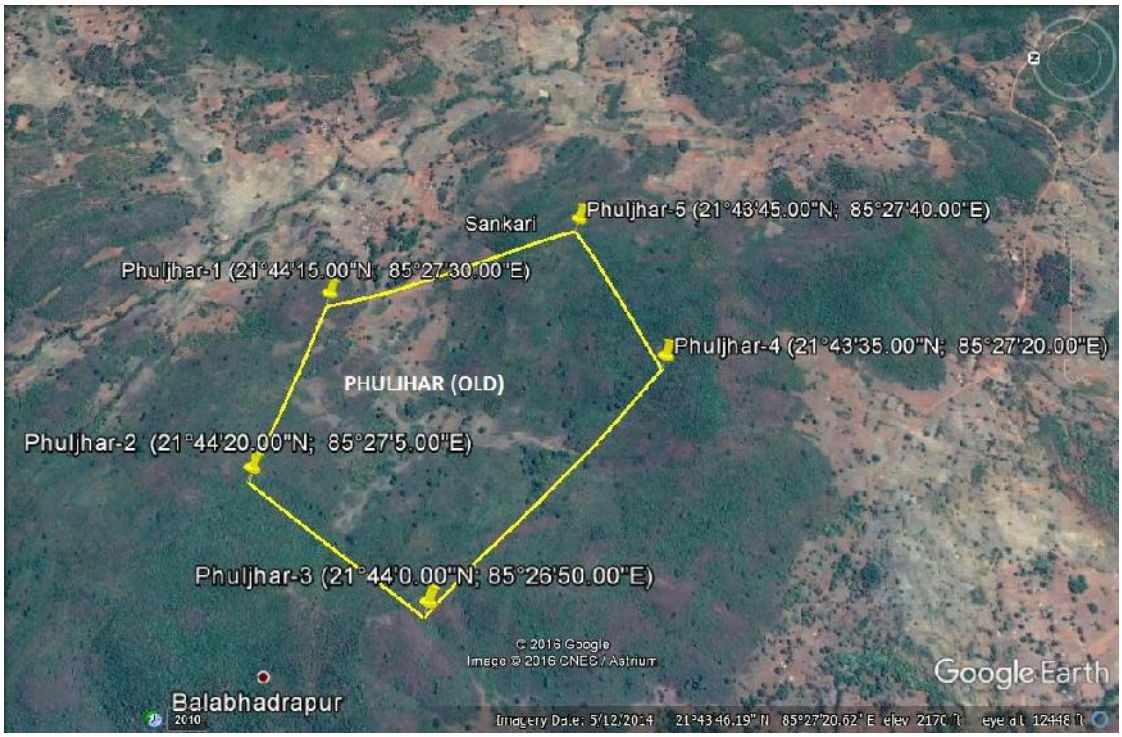
SITE F PHULJHAR (SHANKARI): Located at a distance of 28km (crow flight distance of 16.3 km) from Dabuna it is a hexagonal shaped valley, falling in the Survey of India topo sheet 73 G/6. It is 2.5km east of Phuljhar village and 1 km west of Shankari village. It is spread over an area of (average width 1000mX average length 1100m) 110 Ha. (1150m widest E-W axis and 1750m longest N-S axis). With a valley

relief of 60m it has a capacity of holding only 33 miilion cu.m. of tailing, which is much less than the required capacity.

Frequency of trees in Phuljhar site

The average gradient is 1:9.3. It drains to the east north east and the drainage from the valley meets Jagdhala Nala at a distance of one kilometer. The area is occupied by basic volcanic rocks barren of any mineralisation of economic significance. Structurally does not appear to

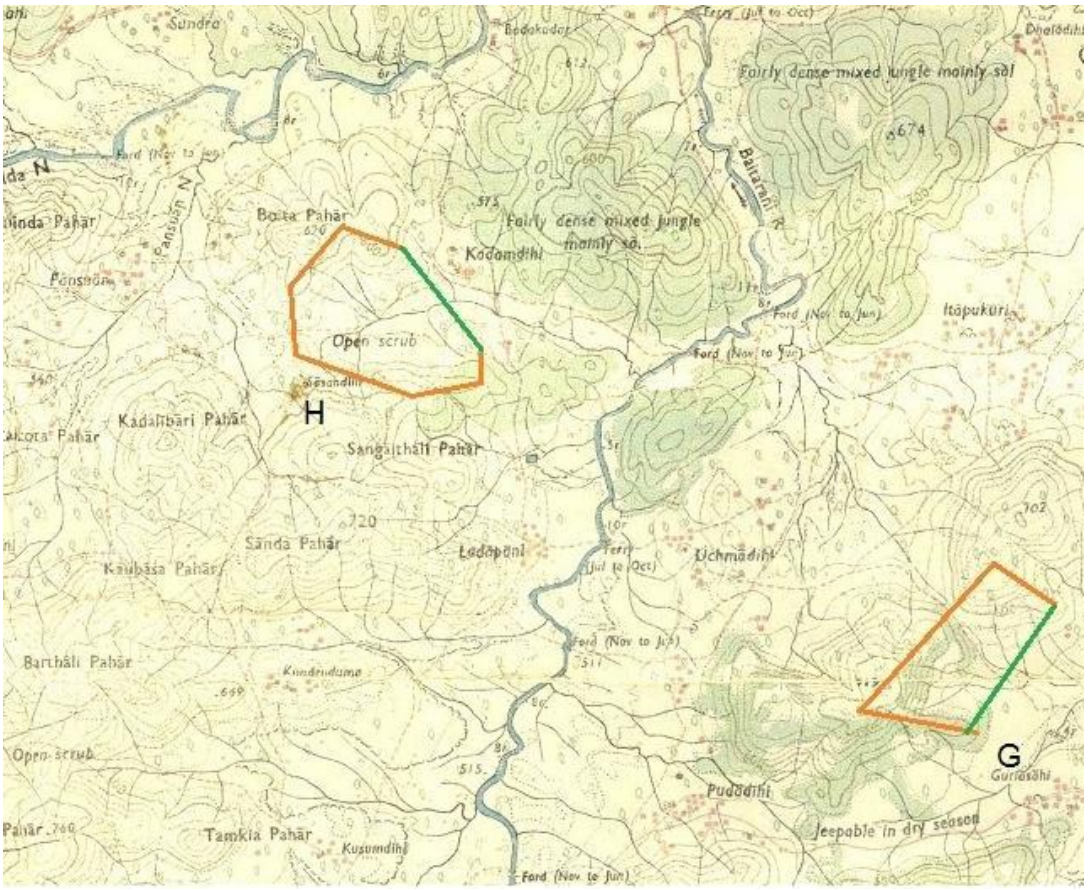
Frequency of trees in Phuljhar site



have any risk as no fault or lineament passes through the area. There is no revenue infrastructure (roads and buildings) in the area. The area is

however, quite within well populated region. Agricultural fields are close by. According to the Toposheet 73G/6 Forest cover is recorded as Open mixed jungle and cultivable land.

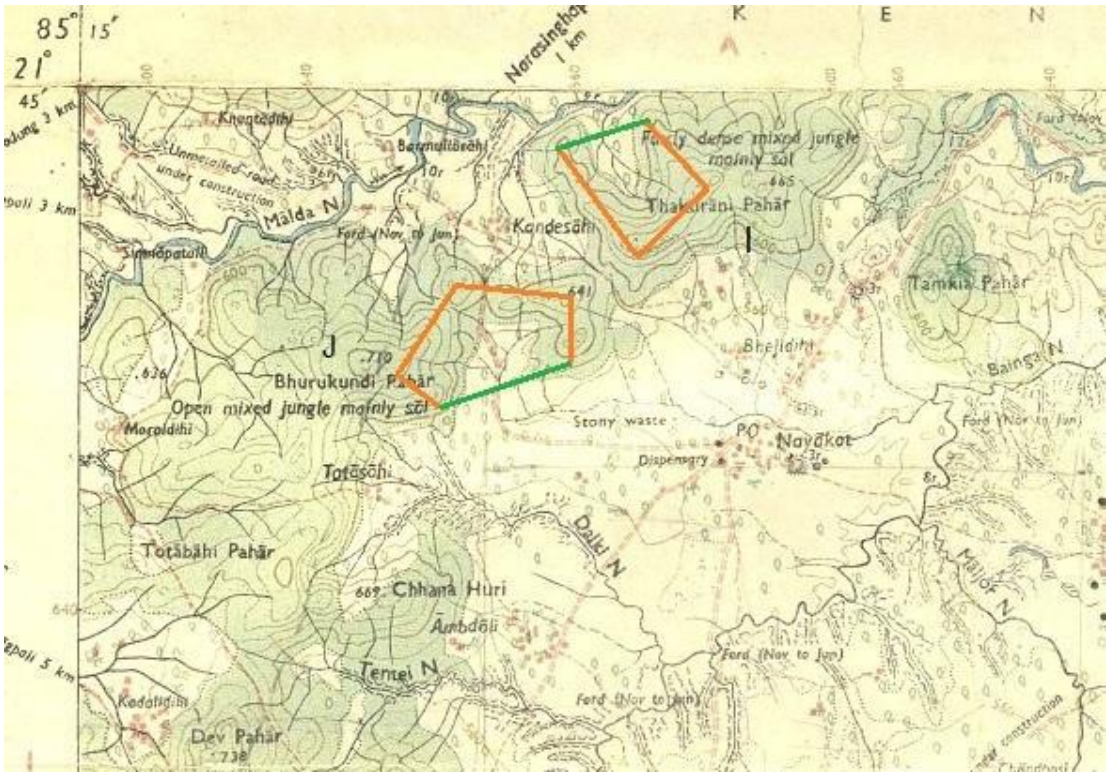
SITE G: BALIBERA: Located at a distance of 36km (crow flight distance of 16.5 km) approximately south of Dabuna, 1.75km west of Balibera and 2 km south of the village Itapukuri. The site is spread over an area of 650m X 1000m the valley has a depth of 60m. It has a capacity to hold (650X1000X60)X0.5 which is 19.5 million cu.m, which is too small for the target generation of tailings. However the depth can be raised to 100m if the saddle on the north western side of the four sided valley is filled. The flank of the hills in the valley have an average gentle gradient of 1:8.3 and the valley drains to east south east which meets Bamni Nala near Balibera. The site is occupied by basic volcanic rocks which has no mineralisation of economic significance. No fault or weak planes are seen to intersect the area, so there is no threat of geotechnical parameter. There is no revenue infrastructure (roads and buildings) in the area. The area is however, quite within well populated region. Agricultural fields are close by. Forest cover is recorded as Open mixed jungle and cultivated land.



Sites G (Balibera) and H (Kadamdihi) on toposheet 73G/6

SITE H: KADAMDIHI: This one is site having seven sides located at a distance of 32km (crow flight 14 km) from Dabuna almost due south. In the vicinity of this site the villages are Pansuan at about 1.85 km west of the site. Malda Nadi flows at 1.65km north of the site which ultimately joins with Baitarani River further east. Kadalibari Pahar is located at 1.7 km S35W of the site. It is spread over an area of 1000m(average) X 600m (average) ie. 60ha. With a valley relief of 30m it has a capacity of holding only 9 million cu.m. of tailing. The area is occupied by basic volcanic rocks barren of any mineralisation of economic significance. Structurally does not appear to have any risk as no fault or lineament passes through the area. There is no revenue infrastructure (roads and buildings)

In the area. The area is however, quite within well populated region. Agricultural fields are close by. Forest cover is recorded as open mixed jungle and cultivable land.

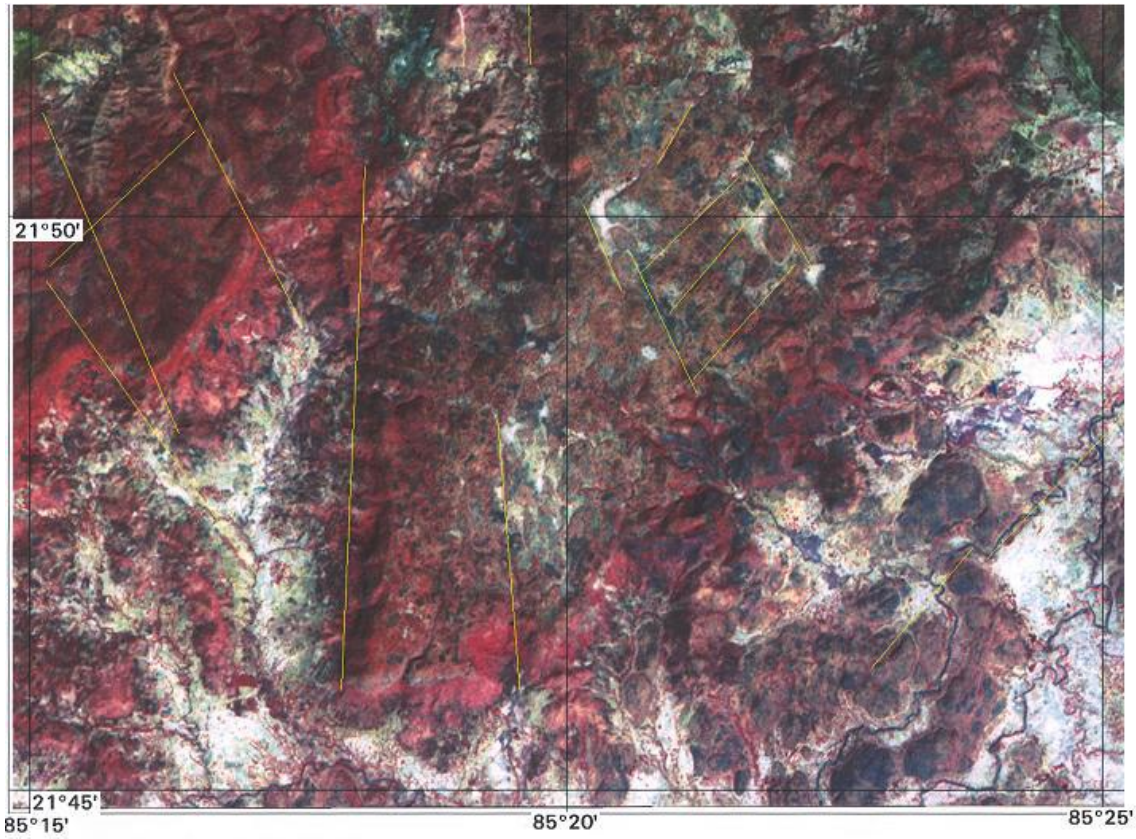


Site I (Thakurani Pahar) & J (Bhurkundi Pahar) on topo 73 G/6

SITE I: THAKURANI PAHAR: Located at 35 km from Dabuna (16 km south-west of Dabuna as crow flight distance) in the Survey of India topo sheet No. 73 G/6, it occupies an area of 750m X 700m. Thakurani Pahar hill forms a part of the hill. Thakurani Pahar. The depth of the valley is 80m with reference to the contour 660m. It has a capacity of holding 21million cu.m. of tailing and that is much smaller to match the production of tailing from the beneficiation plant. Gradient of the hill slope on an average comes to 1:5.5.There is a scope to raise the height

of the dam by adding earth material at the peak of the ridge. The area is occupied by basic volcanic rocks barren of any mineralisation of economic significance. Structurally does not appear to have any risk as no fault or lineament passes through the area. There is no revenue infrastructure (roads and buildings) in the area. The area is however, quite within well populated region. Agricultural fields are close by. Forest cover is recorded as Open mixed jungle and cultivation land.

SITE J: BHURKUNDI PAHAR: An area of 1150X700 sq.m. has been identified at a distance of 38km to the south west of Dabuna, and south of Kandesahi village. Depth of the valley is 60m with respect to 620 contour. Gradient is 60/650 ie. 1:10.8, having wide open gently sloping valley. Drainage is due south for about 1 km and then it abruptly turns to east and after working for 1 km it swerves to the east for 3 km till its confluence with Bainga Nadi. Kande Sahi is located at about 700m north of the site for tailing reservoir. Spread over an area of 80.5 Ha. It has a capacity of holding 24.15 cu.m. which is far less than the required volume. Area is occupied by basic volcanic rocks which is barren of any mineralisation of economic significance. Structurally does not appear to pose any risk as no fault, lineament or schistosity is seen in the area. There is no revenue infrastructure (roads and buildings) in the area. The area is however, quite within well populated region. Agricultural fields are close by. The vegetation cover consists of sal and other big trees, though it does not form a part of any reserve forest. Forest cover is recorded as open mixed jungle and cultivable land.



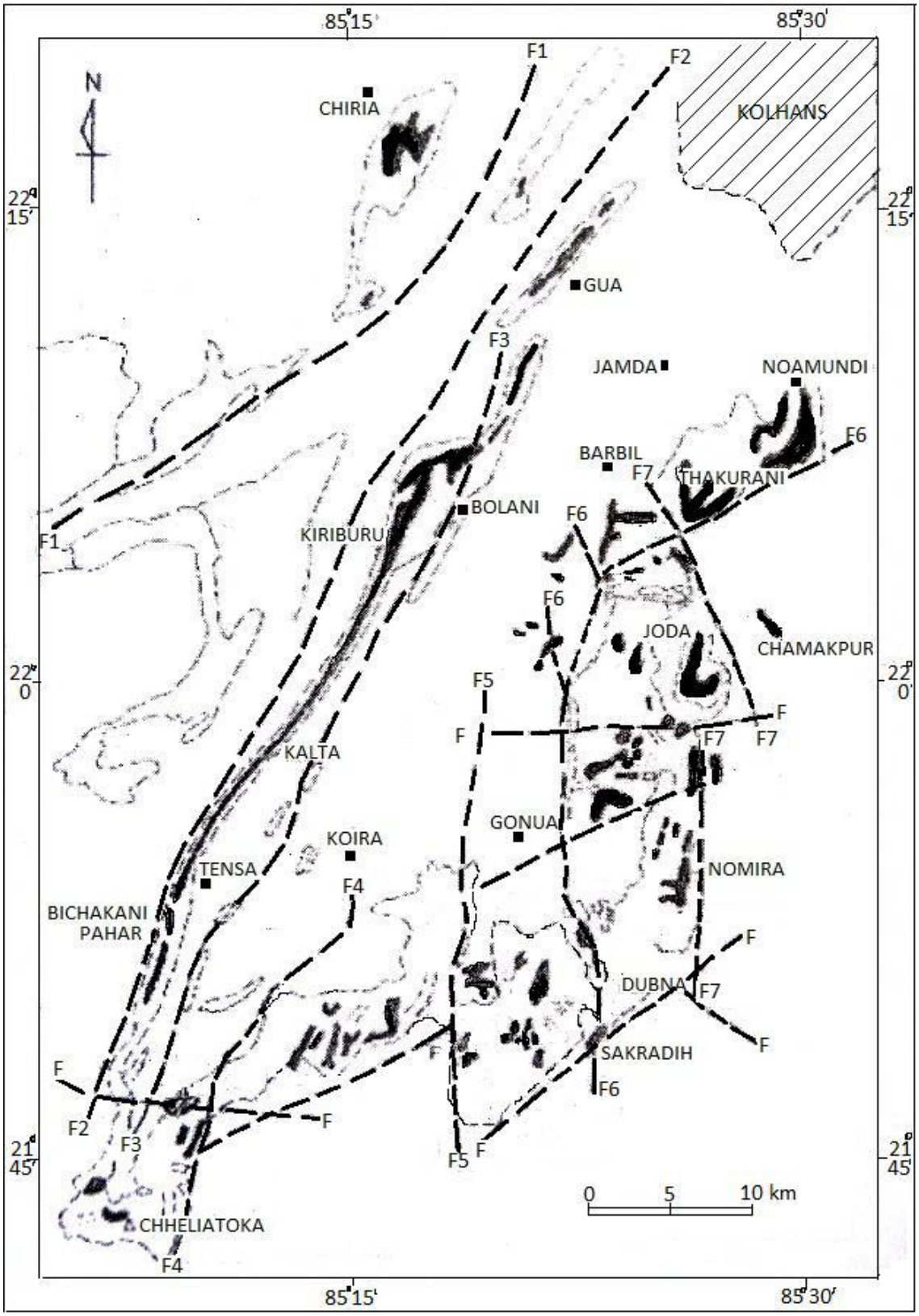
Satellite imagery of the southern part of the Survey of India Toposheet 73 G/5 indicating the lineaments as yellow lines

Structural Geology

It has been possible to study the toposheet, satellite imagery and geological maps of the area surrounding the sites chosen for the construction of Tailing Dams for the Iron Ore Beneficiation Plant of ESSAR Steels India Ltd. The structural features in the area are mostly lineaments extending for 1.5km, 2 km and sometimes even 3 km in various directions.

Lineaments: The lineament could be related to either faults or joints in the rocks. These structural elements are seen to trend in the following geographic directions: N15E-S15W, N5E-S5W, N25W-S25E, N20W-

S20E, N40W-S40E, N85W-S85E, N40E-S40W, N35W-S35E and N50E-S50W.



Fault: There are fourteen regional faults cross cutting each other covering the entire Iron Ore Formation of Bonai-Keonjhar Horse Shoe

belt. There are eight faults in near North-South direction and six other faults aligned in almost East-West direction. The faults have dislocated the rocks belonging to Banded Iron Formation of Iron Ore Group in vertical displacement and horizontal shift as well.

Joints: While faults if present can cause weakening of the large scale engineering structure, the joints have far less adverse effect since it is very local in nature and mostly extends for several centimetres to decimetres. The rocks seen in the proposed sites are either sandstone or basic igneous rocks. The sandstones demonstrate a crude developed lamination which is generally sub horizontal beds and some joint planes are developed. The basic volcanic rocks have often jointed blocks but do not persist for beyond tens of centimetres or 2 to 3 meters at the most.

The joints are found to occur in the following directions: N25W-S25E vertical, N75E-S75W 80Southerly, N60E-S60W 80 southerly, N5W-S5E 15 westerly, N15W-S15E 80 westerly, N40E-S40W vertical, N10E-S10W vertical, N25W-S25E vertical and N70W-S70E 80 southerly.

During the identification of the possible sites for tailing dams care has been taken to avoid the structurally disturbed areas. The structural elements are sometimes seen to occur surrounding the sites A, E and J but do not traverse across any of the proposed sites.

Mineralised zone:

Seven proposed sites A, E, F, G, H, I and J are free from mineralised zones. Sites B, C and D are however not found suitable from mineralisation perspective. These are either very close to iron ore deposits at higher level on the north western margins of the proposed sites.

Comparative study of the proposed sites:

Sites B, C and D can be placed in the lowest rank. The proposed sites A and E have the best advantages in terms of space and volume and also the relative proximity to Dabuna than F, G, H, I and J. Sites F,G,H, I and J are farther than A, B, C, D and E but these are almost equidistant from Dabuna. The sites F and H are larger areas where as G, I and J are relatively smaller. An all weather road passes through the proposed site J and may weaken its case.

Geology and Structure:

Site **A,F,G,H,I** and **J** are located either in sandstone/quartzite country or basic volcanic rocks. In both the lithological assemblage there is no prospect of finding mineralisation in these areas. Sites **B, C, D** and **E** are located very close to the mineral occurrences near Dabuna and Sirkagutu. Two sets of faults Gonua-Sakradihi and Dabuna-Kadakala traverse very close to these four sites (B,C,D and E). Sites F, G and H are relatively smaller in capacity ranging from 33, 19.5, and 9 million cu.m. respectively, are located within basic volcanic rocks terrain and occupy small hills within stretches of plain land used for agriculture mostly. The last two **sites I** and **J** are very small and a village road linking Nayakot with Kandesahi passes through the site J and it has a forest cover “open mixed jungle mainly sal”. The Survey of India Toposheet 73G/6 shows that the site I (Thakurani Pahar) has a vegetation cover classified as “fairly dense mixed jungle mainly sal”.

Proposed sites A and E stand out as single sites having the capacity to contain the tailings expected to be generated in the life of 20 years at the rate of 4 million tonnes (rounded off) per year. For 120 million tonnes of tailings in 30 years the volume of space required is expected to be (120 divided by 1.9 average density of the tailings

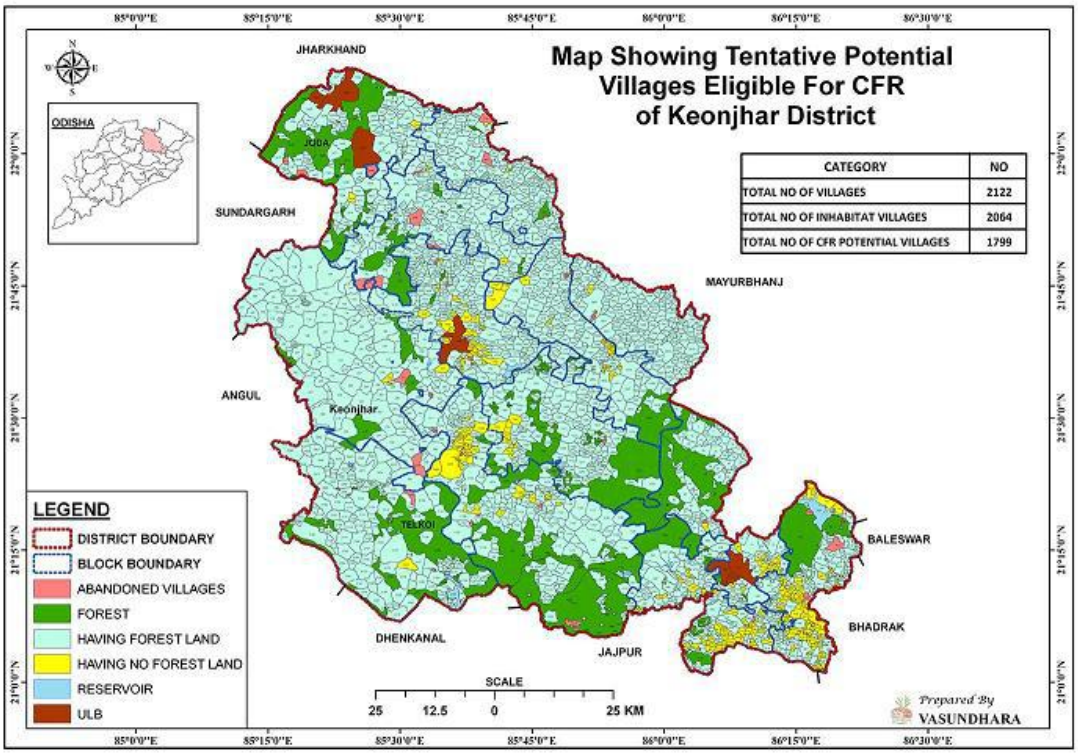
indicated by ESSAR) 63.158 cu.m. With allowance for swell due to water (one third of its volume) to make slurry and climatic factor the estimated volume can go upto **84 million cu.m**. An estimation based on the area of the sites calculated from the 1:50000 scale maps place sites A and E on top with capacities of **161.5 million cu.m**. and **55 million cu. m.** respectively against a requirement of just 84 million cu.m. That means the height of the dam can be reduced from its full capacity in case of Malda, which will bring down the cost of construction considerably.

Stable and impervious base of the hills: Once the fourth open side is sealed with an earthen-cum-masonry dam, the wide base of the hills surrounding three sides with just one lithology: sandstone/quartzite, makes it impervious and saves the surrounding from the chances of seepage of iron ore tailings from the dam into the drainage system.

It is however recommended that the precise area and volume of the proposed dam can be worked out after large scale mapping of the area through surveying instruments and the volume can then be arrived more accurately after 3-D modelling of the dam. Sites A and E are free from mineral occurrences. The area is also free from conventional agricultural land and habitats. Dense mixed jungle is present in both the areas although there is no reserved or protected forest here. These locations are only about 18-20 km away from Dabuna (about 10km crow flight distance), though passing through a rugged topography.

Forest Cover

All the sites selected for Tailing Dam are free from Reserve Forest or Protected Forest and Sanctuary.



The map shows that the Northern part of Keonjhar district in which the proposed tailing dam site (Malda) is located does not have major (Reserve/ Protected/ Sanctuary) forest.

The sites at A,B,C,D and E are having a cover of Dense Mixed Jungle (A) to Fairly Mixed Dense Jungle (B,C,D and E). Site F has a thin cover of vegetation under wooded category with some cultivated land in the valley. Site G is a mix of wooded cover and cultivated land in the valley. Site H near Kadamdihi is not having much vegetation but is occupied by cultivated land. The sites I (Thankurani Pahar) and J (Bhurkundi Pahar) are having a cover of Fairly Dense Mixed Jungle and Open Mixed Jungle, respectively, as per the Toposheet 73 G/5 and 73 G/6.

Satellite imagery of December 2014 of site A (Malda) with thin forest cover

Conclusion :

Going through all the parameters of the 10 possible sites for the setting up of the Tailing Dam for the Dabuna Iron Ore Beneficiation Plant, it is seen that Malda stands out to be the best location suited in many respects for locating the Tailing Dam. It is free from mineralisation, the geomorphology of the hill is such it can withstand all heavy engineering structure from te geotechnical point of view and will support any structure needed to be constructed due to very low angle flank (<45degree) and gives the slope high degree of stability. There is no geological structure which can add geotechnical risk factor. There is no cultivable land nor there any habitat in the area. Malda site is the only location which has the capacity to hold the entire tailing expected to be generated in the next 30 years and will have enough space to accommodate any swell due to climatic factor.

The sites “F, G, H, I & J” , which are located within a distance of 28 Kms to 38 Kms from Beneficiation Plant at Dabuna are surrounded by higher density of settlement and open patches of cultivable land . It can be seen that sites like Rangabeda and Malda , which are ensconced with in moderately rugged terrain encounter lesser density of settlement. Thereby prospects of finding sites for tailing dam further south are bleak since down south the frequency of villager / cultivated land keeps on increasing progressively.

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IDENTIFICATION OF ALTERNATIVE SITE FOR TAILING DAM OF ESSAR IRON ORE BENEFICIATION PLANT AT DABUNA, KEONJHAR, ODISHA

PHASE - II

Introduction:

In pursuance of the advice from MOEF & CC, GOI, Essar Steel India Limited went for a second phase of search for a suitable site for setting up of the Tailing Dam for the Iron Ore Beneficiation Plant at Dabuna.

In the first phase, an area of over 500 Sq KM was scanned through remote sensing and followed by ground truthing of sites : Malda, Jampani, Purunadihi, Naibhanga, Rangabera, Shankari (Phuljhar) , Baliabeda, Kadamdihi, Thakurani Pahar and Bhurkundi Pahar

In the second phase an area of 680 sq km in the toposheets 73G2, 73G6 and 73G10 was scanned through remote sensing study of toposheets and satellite imageries. After evaluating the areas under five parameters (Geomorphology, Geology & Mineralisation, Structural Geology, Forest cover and Revenue infrastructure) 4 sites (Ghorapira Pahar, Ansuan, Samraja, Saranda Pahar in 73G/6 were targeted for ground truthing.

During the study, Phuljhar (Shankari) from Phase – I was re-visited for further detailed study.

All measurements of space and volume have been made from the toposheet of 1:50000 scale and hence surveying in larger scale may generate a varying figure for area and volume. However, the computation of area is relevant for initial selection of a dam site.

scope of work:

Desk work: Study of topography in the 1:50000 scale toposheets, with emphasis on valleys having hills on at least two sides if not three sides and opening on one side. Topography to be studied with the purpose of checking geomorphology and some aspects of structural geology of the area which will be stable to support an earth-cum-masonary dam of 65 million cu m capacity. Remote Sensing: Study of satellite imagery to be carried out with the objective of identification of lineaments/faults of regional scale, which can adversely affect and increase the vulnerability of the area, in terms of failure of the basement rock, when subjected to a pressure of 120 million tonnes of tailings.

Avoid Mineralised zone: Study of authentic geological maps of the area to ensure that the site chosen for the construction of tailing dam, is free from mineralisation of significant economic value. Geological traverses in the selected sites on preliminary selection from remote sensing and topographic study to confirm the geology in situ. The geological traverses also help recording data on the structural features like joints, fractures and faults of mesoscopic to megascopic scale directly from displacement of blocks, escarpments, brecciated zones, slickensides, mylonitisation, drainage pattern and alignment of streams, etc.

Forest and Revenue areas: The ground truthing is also to take care of the data on existence of and type of vegetation, agricultural land, to avoid any revenue feature like roads, structures, community centres, minor irrigation projects, power supply towers or communication facilities. Attempt has been made to avoid private holdings or leased out areas for the selection of sites for tailing dam. Finally preparation of maps: showing the proposed areas suitable for construction of tailing dams and preparation of report on the various parameters discussed above.

Methodology, Materials and Logistics:

The following paragraphs include the methodology of the preamble desk work , field work and cartography and documentation envisaged for the above project. In order to locate a site for tailing pond, five parameters, technically, have to be considered.

1. Suitable geomorphology

- Geo-morphology is the shape of land form developed by a combination of tectonics and geological processes.
- In case of tailing dam, it is necessary to have a valley enclosed preferably on three sides .

2. **Area free from ore minerals** :

- Since a tailing dam will eventually cover the entire land area under a huge thickness of tailings, it will be necessary to ensure that no mineralised local is buried under the tailings.

3. **Structural Geology to eliminate geo-technically risky zones** :

- The geological set –up is likely to undergo physical deformation when subjected to tectonic movement in regional scale. It leads to development of fold, fault, schistosity, joints and lineations.

- Rocks subjected to such geo-dynamic processes are prone to displacement under huge pressure. Hence, the basement of any tailing dam must be free from such weak planes so that the reservoir does not give in to the pressure exerted by the huge mass of tailings in the long run.

4. Area to be free from Reserved or Protected Forest

5. Avoid revenue facilities, lease areas and agricultural land

Considering the above features and the distance of fifty kilometers radius from the Dabuna Iron ore Beneficiation Plant, nine toposheets fall in the prospective zone. These are 73 F/4, 73 F/8, 73 F/12, 73 G/1, 73 G/2, 73 G/5, 73 G/6, 73 G/9 and 73 G/10. A reconnoitary look of the topo-sheets, gives the impression that the entire area of the nine toposheets can be divided into five categories in terms of geology and geomorphology.

1. Mineral bearing areas with mines
2. Mineral bearing areas without mines
3. Areas with B.I.F. but without mineralized zone
4. Areas without B.I.F.
5. Natural valley enclosure or abandoned mine pit or excavated structure in the above geological set up

Broad distribution of mineral bearing and mining areas: A survey of the toposheets in consultation with base map of the area shows that toposheets 73 F/8, 73 G/1, 73 G/5 are full of mining belts with iron ore and manganese ore mines. Remaining toposheets like 73 F/4, 73G/ 2 and 73 G/6 have a small area with iron ore and Banded Iron Formation (B.I.F). The areas in toposheets 73 G/9 and G/10 are relatively mineral-barren areas. To pin point the geological formations which could be mineral bearing following logistics are required.

a. Toposheets : 73 F/4, F/8,F/12, 73 G/1, G/2, G/5, G/6, G/9 and G/10.
b. Geological maps on 1:50000 scale from G.S.I.
c. Satellite Imageries covering the above toposheets from NRSA.

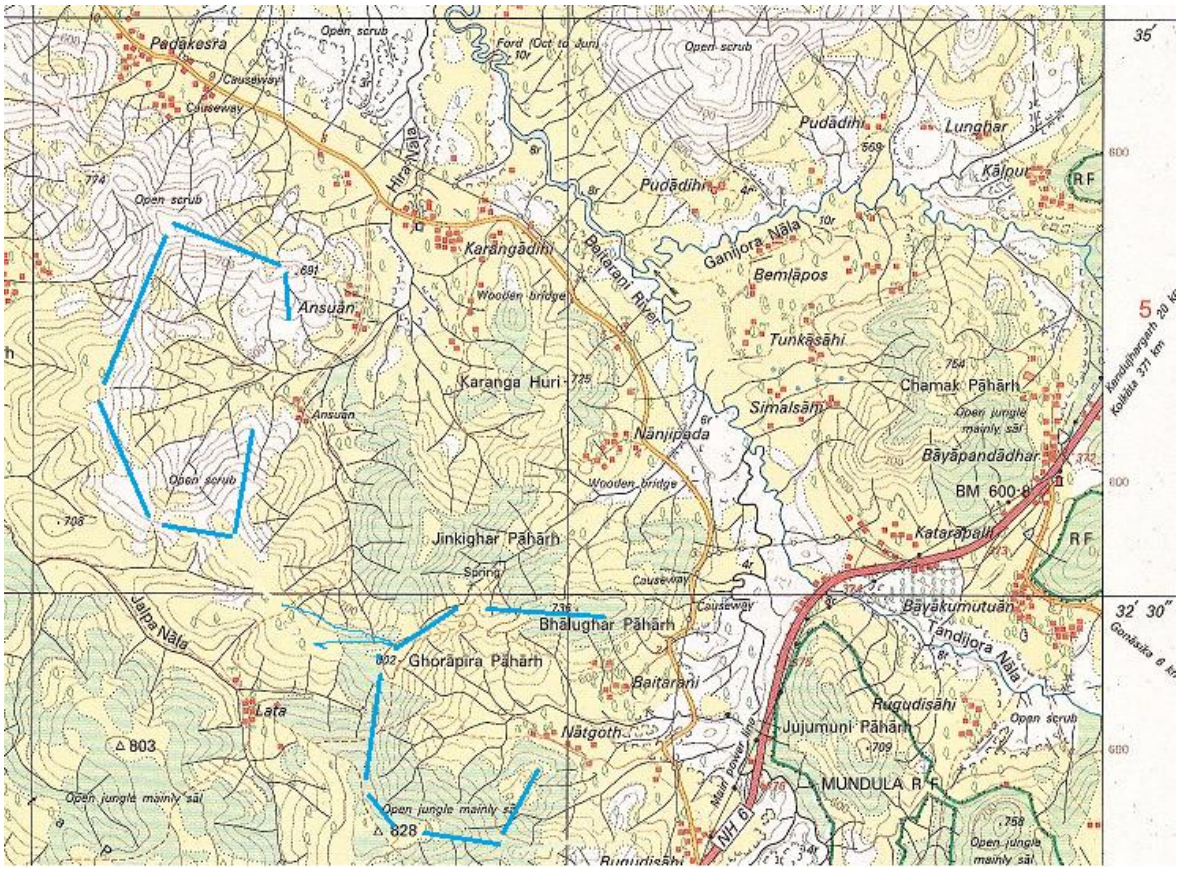
The work was taken up as per the following action plan, envisaged broadly ,

- Procurement of toposheets, geological maps and satellite imageries.
- Study of the maps, geology, geomorphology and mines, in consultation with the lease maps.
- Identification of suitable geomorphic structures on the maps.
- Ground truthing of the selected sites by geological traverses in field.
- Preparation of maps of prospective sites for tailing dams.

On the basis of desk top study of the topo sheets the following sites were identified for ground truthing :

LOCATION OF ADDITIONAL TAILING DAM SITESTS 73G2 and G6						
	Degree	Minute	second	Degree	Minute	Second
Ghorapira Pahar	21	32	15	85	27	20
	21	32	00	85	26	30
	21	32	30	85	27	00
Saranda Pahar	21	35	40	85	20	35
	21	35	00	85	20	45
	21	35	45	85	21	30
	21	35	30	85	20	00
Ansuan	21	33	00	85	26	00
	21	33	30	85	25	20
	21	33	50	85	26	15
Samraja Pahar	21	33	45	85	23	15
	21	33	40	85	22	15
	21	33	10	85	22	50

The detailed features of each of the above sites are recorded below :



Map of the sites Ghorapira Pahar and Ansuan in 73G6

<u>GHORAPIRA PAHAR</u>: (21°32’00”N 85°27’00”E) It is located in the southern part of the toposheet 73G/6 south of the Rugudisahi-Nayakot road. It has more or less a circular disposition of hills which enclose a circular valley with a radius of 700m. The hills have a relative elevation of 220m but only 150m as depth of the valley is considered for calculating the volume: 1540000 X 150/2=115,500,000 cu.m. say 115 million cum.

Frequency of large trees in Ghorapira Pahar

While the valley and the flank of the hills are composed of basic volcanic rocks, the top of the ridges are lateritised. There is no scope of occurrence of any mineral of economic significance.

Two sets of joints are the only structural feature in the area. These are trending N15E-S15W dipping 75W and East-West dipping vertically. The radial dry first order streams on the flanks converge into a small ephemeral stream which flows out for 2 kilometers easterly then changes its course due north to meet upstream Baitarani after meandering for 3 km. No other major structure is observed from the surficial geology which could pose a risk to any heavy engineering project in the area.

Based on the Survey of India Toposheet 73G/6 the area is free from Reserve Forest/Protected Forest/Sanctuary. The valley is covered with sparsely distributed "open jungle mainly Sal" and the balance area has partly cultivated land and partly covered by grass and shrubs. There is no revenue infra-structure either building or road and bridges within the area. There are two villages namely Natgoth and Baitarani, located near the open face of the valley.

ANSUAN: 21˚ 33' 30"N, 85˚ 26' 00"E: It is shaped like an ellipsoid with a width of 1200m and length of 2000m. The hills display a relative elevation of 180m but for a conservative estimation the elevation with respect to the valley floor at the centre is taken as 120m. Assuming an average diameter of 1600m it has an area of $22/7X800^2$ sqm = 640000 sqm X 120/2=120,685,680 cum. Say 120 million cu.m. Here also the hills are oriented in a near circular manner carving out an elliptical valley. It has a gentle gradient of the flank which makes the slope very stable. The hills on the flank are composed of basic volcanic rocks and the top of the ridge has a moderate mantle of laterite. The area under consideration is free from any mineralization of significance.

Frequency of large trees in Ansuan site

The extrusive basic rocks have developed two sets of joints N15E dipping westerly by 80 degrees and East-West dipping vertically to 85 degrees northerly, almost matching the joints in the Ghorapira Pahar site. A set of first order streams converge at the centre of the valley and flow eastward to reach out of the elliptical valley and then meander northward to meet the Baitarani River ultimately. No other structural element was encountered from the surficial geology, which could pose a risk to pressure exerted by accumulation of tailings in millions of tons.

As per the records in the Survey of India Toposheet No 73G/6, the area under review is free from any Reserve or Protected Forest. According to this toposheet the major area is covered by “open scrub” and the remainder is occupied by cultivated land or small shrubs.

Frequency of trees in Ansuan site

Although in the field check the “open scrub” areas are found to be covered by trees which has varying density.

There is no major revenue facility like roads and bridges in the area. It is larger area than all other additional sites under scanner. There are two settlements of Ansuan village located close to the opening of the valley.

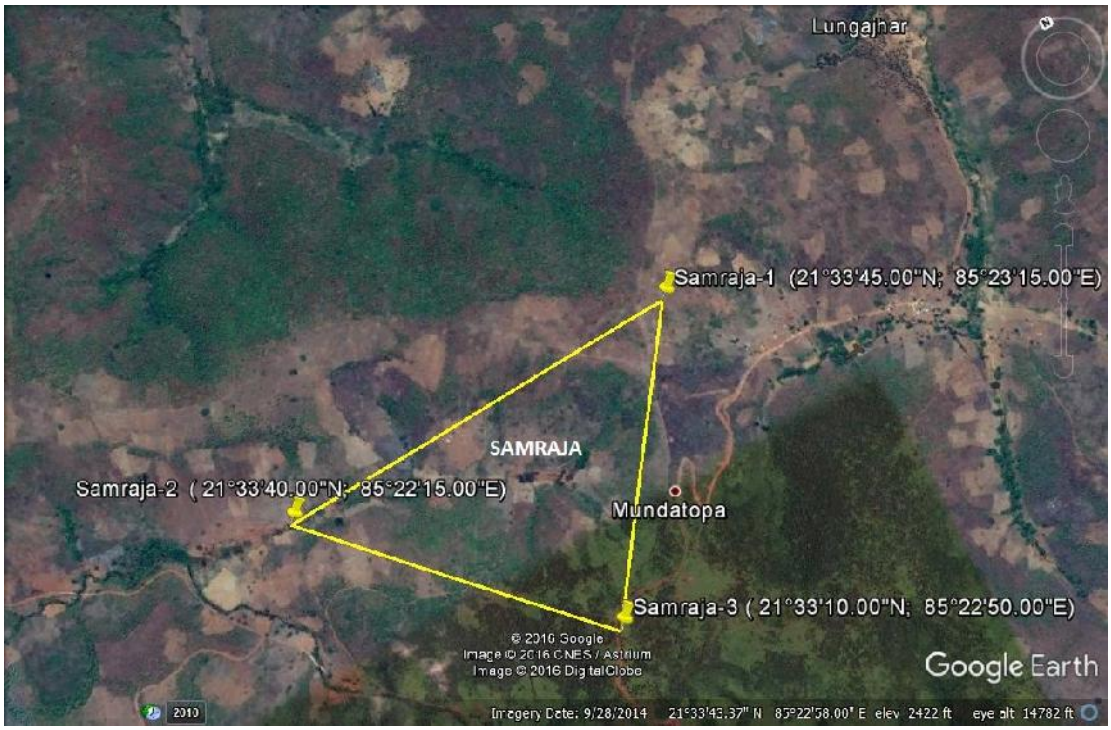
SAMRAJA PAHAR: 21˚33’40”N 85˚ 22’ 15”E: It is an elongated U-shaped valley which opens on to the WNW direction. The relative elevation of the hills is 120. However for the purpose of calculation of its volume 60m is considered to arrive at a conservative estimate. It extends over a length of 600m and spans a width of 550m. Its volume works out to be 9,900,000 cum (9.9 million cu.m.) which is too small for indented capacity. The rocks exposed in the valley are basic volcanics and sometimes laterite mantles were encountered on the top. There is no prospect of finding any mineral occurrence of economic significance.

Three sets of joints in the parent volcanic rocks have been recorded which are N20E dipping 72S, N80W dipping 85N and N60E dipping vertically.

Frequency of trees in Samraja Site

First order valleys turn into streams during rainy season and meet an ephemeral stream in the valley floor which meets Kakharua Nala that after flowing for some distance meets the tributary of Baitarani River in the west.

Frequency of trees in Samraja site



According to the distribution of forest cover in the Survey of India Toposheet 73G/6, the area is free from Reserve or Protected Forest. Barely 55% of the area is covered with cultivated land in the central part of the valley and small patches on the flank of the hill and remaining area shows very sparsely occurring surveyed trees. However, there appears to be slightly more vegetation in the peripheral zone of the U-shaped valley.

No revenue infrastructure like road or bridges passes through or occurs within the area.

SARANDA PAHAR (East): 21˚35'40"N 85˚20'35"E. It is also an elongated U-shaped valley which opens to North-Eastern direction. The hills have relative elevation of 154m. Considering a length of 800m and a width of 650m and a relief from the valley floor of 100m the valley occupies an area of 520,000 sqm and hold a volume of 26,000,000cum (26 million cum).

The first order dry streams from three sides of the U-shaped valley meet at the base with an ephemeral stream which during monsoon flows in North east direction, then turns north to meet Jalpa Nala which after flowing for some distance in the NE direction, turns north to meet

Density of trees in Saranda Site

Jalpa nala, which after flowing for over 8km meets Ranima Nala – that is one of the tributaries of Baitarani river.

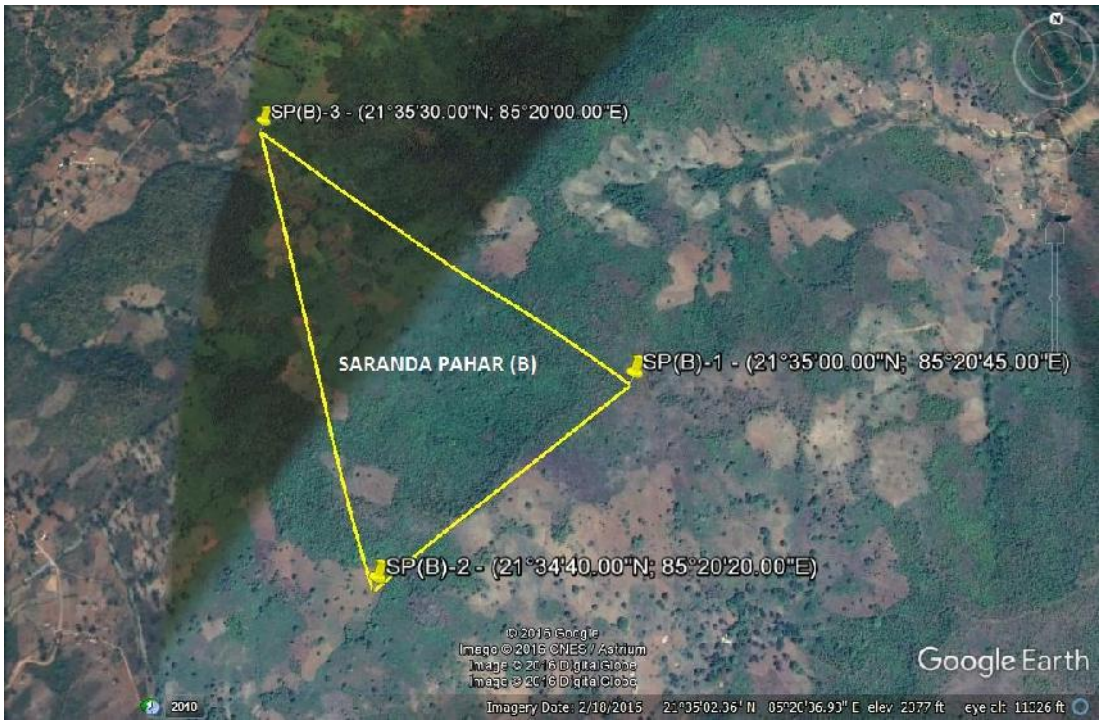
The hills on the northern ranges of the area are steeper (1m/2m) (rises an elevation of 100m where as the valley has a slope, in the northern ridge, Whereas the hills in the southern

range of the U-shaped valley has a gradient of 1:275. In spite of the ratio it still remains quite stable. Two sets of joints, N20E dipping 75 E and N80W dipping vertically have been encountered in the area. The two sets of joint do not relate to any regional structure of weak planes in the rock formation, which does not seem to cause any structurally induced risk factor to the entire area.

The lithology of the area is tuffaceous shale and volcanic rocks, which appears to be barren from the surface and the southern part is composed of volcanic rocks. Both the rocks in the area are free from mineralization of economic significance.

Density of large trees in Saranda site

The rocks of the northern hill range are purple shale to tuffaceous shale which is soft and friable. The shale is a soft and is not expected to withstand intense pressure likely to be generated by tailings.



As per the toposheet 73G/6 the area does not come within a Reserve or Protected Forest. The flanks of the hills are free from any forest cover. The valley is laid with a cultivated patch which constitutes only 7 % of the total valley.

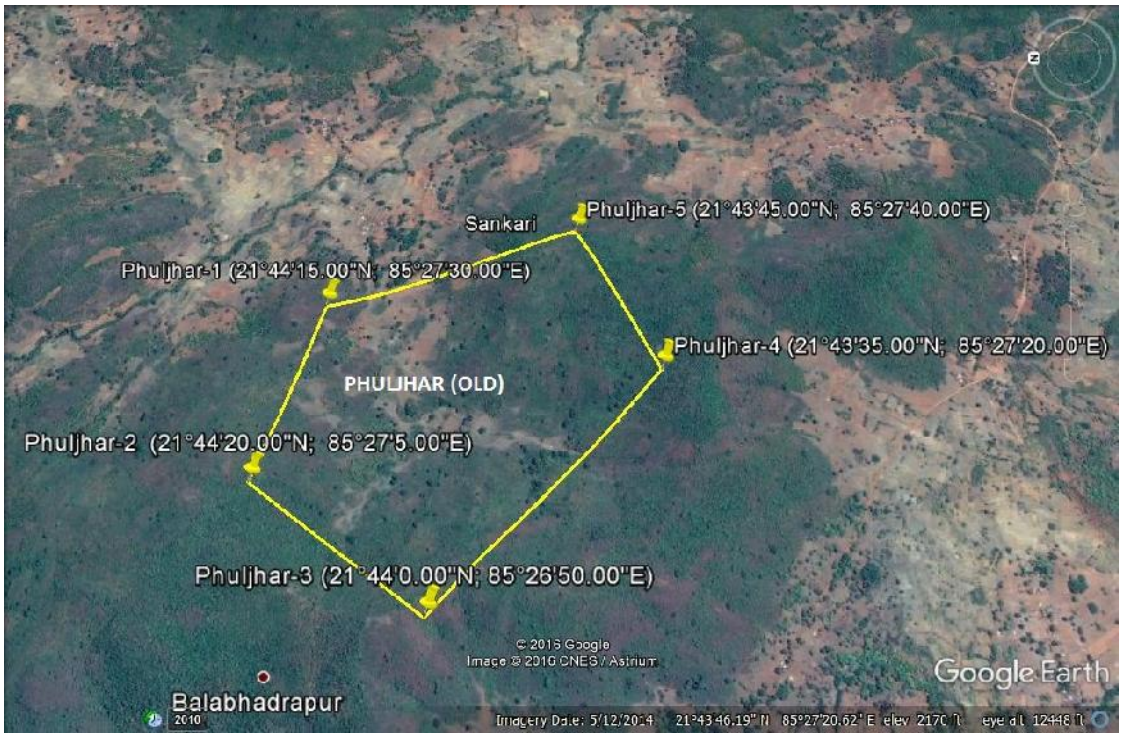
The area is free from any revenue infrastructure like road, bridge or dam does not occur in the area.

PHULJHAR (SHANKARI): Located at a distance of 28km (crow flight distance of 16.3 km) from Dabuna. It is a hexagonal shaped valley, falling in the Survey of India topo sheet 73 G/6. It is 2.5km east of Phuljhar village and 1 km west of Shankari village. It is spread over an area of (average width 1000mX average length 1100m) 110 Ha. (1150m widest E-W axis and 1750m longest N-S axis). With a valley relief of 60m it has a capacity of holding only 33 miilion cu.m. of tailing.

Frequency of trees in Phuljhar site

The average gradient is 1:9.3. The area is occupied by basic volcanic rocks barren of any mineralization of economic significance. Structurally does not appear to have any risk as no fault or lineament passes through the area.

Frequency of trees in Phuljhar site



There is no revenue infrastructure (roads and buildings) in the area. Agricultural fields are close by. According to the Toposheet 73G/6 Forest cover is recorded as wooded and cultivable land, however on the ground the vegetation appears to be of much lower density.

Comparison and Recommendation:

In the first phase of the search for the Tailing Dam site, ten target areas were identified within a distance of 28 to 30km from the Beneficiation Plant in the south. Because the northern part is all mineralized belt of Koira-Barbil-Joda iron and manganese ores, the search was confined to the southern part of 73G/5 and all of 73G/6 and 73G/2.

In the second phase, the search operation was conducted for prospective sites, upto a distance of 50 km, from Dabuna Beneficiation Plant. One observation is that as one moves further away from Dabuna towards south, south-west or south-east there is gradual decrease in the relief of the hills and increase in moderately undulated land and increase in valley plain which had cultivated land also. As we moved progressively towards south the patches of cultivated land started appearing more frequently. Hills losing altitude, interspersed with large patches of plain land towards south, led to increase in settlement areas.

So we find that all the sites have various types of forest cover. In the whole of 73G/2, 73G/6 and 73G/9, we do not find any geomorphic feature suitable to develop into a tailing dam, is free of forest cover. Hence forest factor remaining an inevitable parameter, the scanning focuses on other factors considering minimum forest coverage.

In thirty years the Dabuna Iron Ore Beneficiation Plant is expected to generate 120 million tons of tailings at the rate of 4 million tons per year. For which a Tailing Dam with a capacity of 60 million cu m is required. In fact keeping a buffer of another 10 million ton for the impact of climate may be a rational approach. Hence the Tailing Dam should have a capacity of 70 million cu m.

Out of a total 14 targets (Phase – I & II) , there are following three sites (other than Malda) which qualify to be worked on for a Tailing Dam and have been proposed as the above three alternative sites.

- Phuljhar
- Ghorapira Pahar and
- Ansuan

We take a close look at these three and see how these stand against the site at Malda. All three sites (Phuljhar, Ghorapira Pahar, and Ansuan) are free from Reserve Forest / Protected Forest / Sanctuary.
But all the three sites have a blanket of low density of trees categorized as 'Dense mixed jungle mainly sal' in case of Malda and 'Open scrub' and cultivated patches in case of Ansuan, 'open jungle mainly sal' for Ghorapira Pahar and 'wooded' in case of Phuljhar. Not only the categorization of vegetation in the toposheet is of lowest level in case of Phuljhar but also it was observed during ground trothing that vegetation is much less.

Cultivated patches can be seen in all the three alternate sites - Ghorapira Pahar, Ansuan and Phuljhar.

Geologically all the three alternative sites - Ghorapira Pahar, Ansuan and Phuljhar- have either sandstone or basic volcanic which are barren of minerals with economic significance.

All the three alternative sites - Ghorapira Pahar, Ansuan and Phuljhar- are free from any risk due to structural elements in the bed rocks.

The distance from Dabuna to Ansuan is about 50km, Ghorapira Pahar to Dabuna is a distance of 52km, Phuljhar to Dabuna is 28km.
The gradient of the flanks are gentle in all the cas*es* which make these stable from the slope stability perspective. The hill slopes of the sites at Ghorapira, Ansuan and Phuljhar are very stable having a gentle slope. It is important that there are no settlements within the site and near about the opening of the valley.

Comparative analysis of all the three alternatives :

SITES	**GEOLOGY**	**TOPOGRAPHY**	**STRUCTURAL GEOLOGY**	**MINERALISATION**	**REVENUE INFRA STRUCTURE**	**CAPACITY (Approx) million cum**	**FOREST COVER**
Phuljhar	Basic volcanic	Open valley covering three sides	Free from any faults and schistosity or weak planes	No mineral of economic significance	None	33	Free from Reserve forests. Wooded and Cultivated patches
Ansuan	Basic volcanic	Elliptical valley	Free from fault and	No mineral of	None	120	Free from Reserve

			weak planes	economic significance			forests. Open scrub and cultivated patches
Ghorapira Pahar	Basic volcanic	Almost circular	Free from fault and weak planes	No mineral of economic significance	None	115	Free from Reserve forests. Open Jungle , mainly Sal.

There is no revenue infra structure in all the three sites- Ghorapira Pahar, Ansuan and Phuljhar.

There are two villages and both are named Ansuan just at the opening of the valley of Ansuan and there are two villages named Natgoth and Baitarani near the opening of the valley for Ghorapira Pahar, which brings down the ranking of Ghorapira and Ansuan.

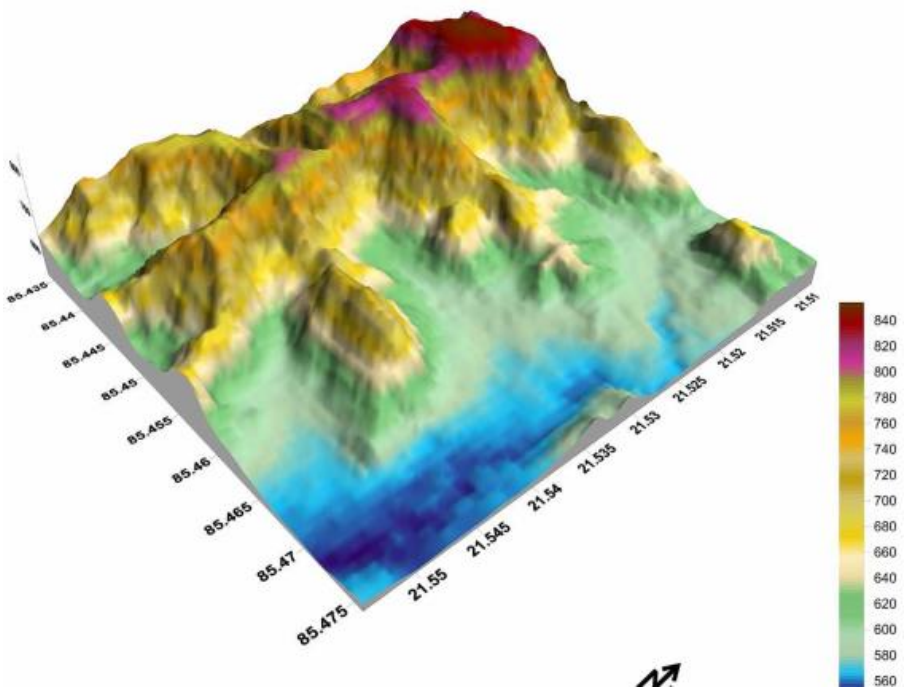
There is just one village Shankari which is sufficiently away from the face of the valley of Phuljhar and make it congenial for the construction of bund as well as it is not vulnerable in case of any eventualities.

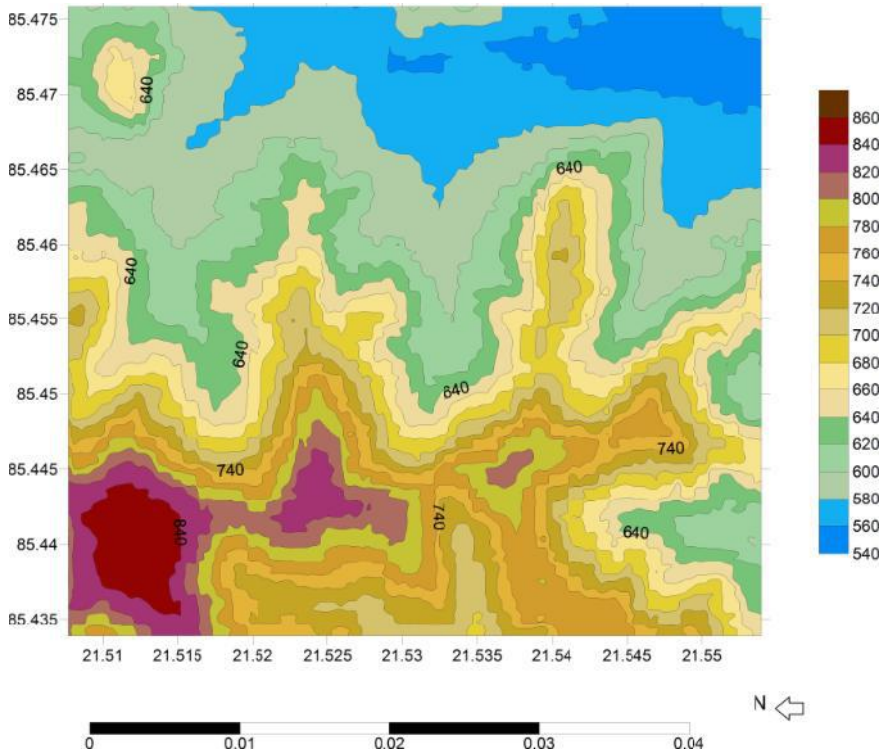
COMPARIOSION TABLE FOR SITE SELECTION CRITERIA

Criteria for Site Selection	Site-1	Site-2	Site-3	Site-4	
	GhorapiraPahar	Ansuan	Phuljhar	Malda	
COORDINATES	21° 32’ 00” N 85° 27’ 00”E	21° 33’ 30” N 85° 26’ 00” E	21° 44’ 20” N 85° 27’ 05” E	21° 47’ 1.133” N 85° 27’ 25.40” E	
AREA OF SITE IN HA	154	64	110	164.467	
VOLUME OF TAILING POND IN MILLION CUM	115	120	33	100	
LIFE OF TAILING POND WITH MAX TAILING GENERATION OF 4 MTPA (2MILLION CUM) PER ANNUM	57 Years	60 Years	16 Years	50 Years	
DISTANCE (Approx) FROM BENEFICIATION PLANT IN KM	52	50	28	10	
RF/PF IN THE SITE	Nil	Nil	Nil	NIL	
ECO-SENSITIVE LOCATION WITHIN 10 KM (NATIONAL PARK, WILD LIFE SANCTUARY, BIOSPHERE & ELEPHANT CORRIDOR)	No	No	No	NO	
DISTANCE FROM HABITATION	1.3 Km	0.23 Km	0.4 km	1.8 Km	
DISTANCE FROM NH/SH	1.8 Km	4.6 Km	12.42 km	11.48 Km	
DISTANCE FROM WATER BODY	1.0 km	3.16 Km	4.63 Km	1.54 Km	
GEOLOGY	Basic volcanic	Basic volcanic	Basic volcanic	Basic volcanic	
TOPOGRAPHY	Almost circular	Elliptical valley	Open valley covering three sides	valley covering three sides	
STRUCTURAL GEOLOGY	Free from fault and weak planes	Free from fault and weak	Free from any faults and schistosity	The area is free from any fault, schistosity or weak	

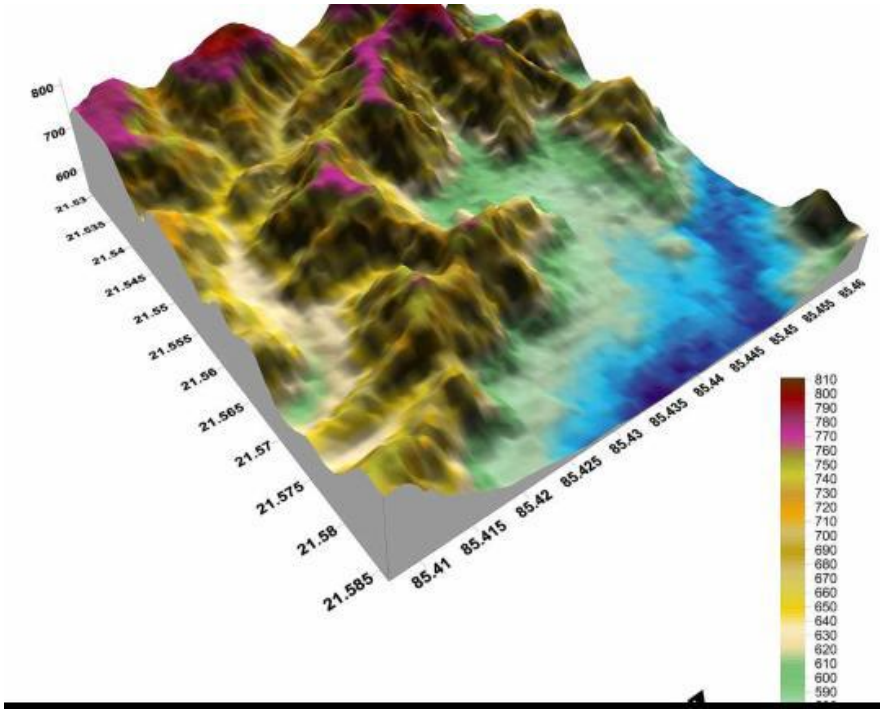
		planes	or weak planes	plane from geotechnical perspective	
MINERALISATION	No mineral of economic significance	No mineral of economic significance	No mineral of economic significance	No mineral of economic significance	
REVENUE INFRA STRUCTURE	None	None	None		
FOREST COVER	Free from Reserve forests. Open Jungle , mainly Sal.	Free from Reserve forests. Open scrub and cultivated patches	Free from Reserve forests. Wooded and Cultivated patches	Free from Reserve forests. Dense Mixed Jungle.	

Site-1 -GHORAPIRA





SITE-ANSUAN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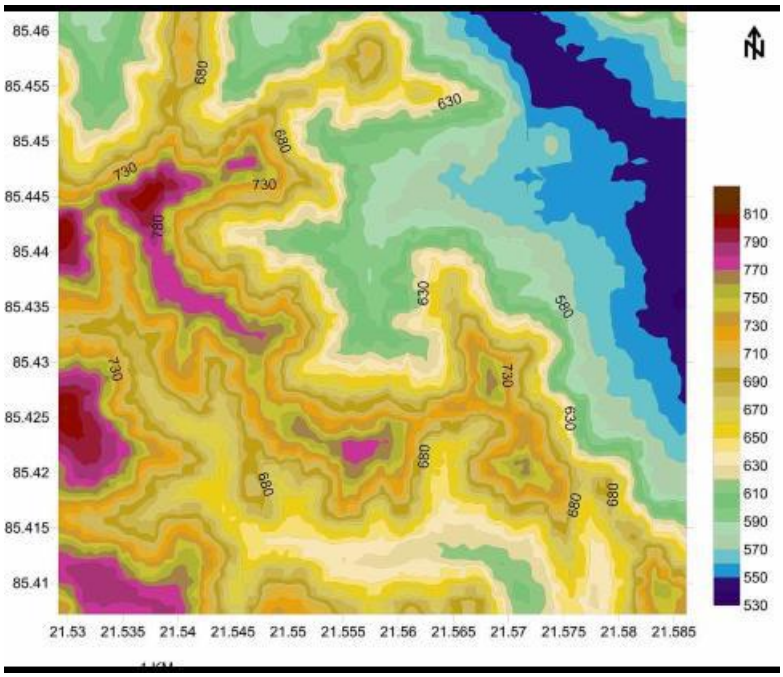
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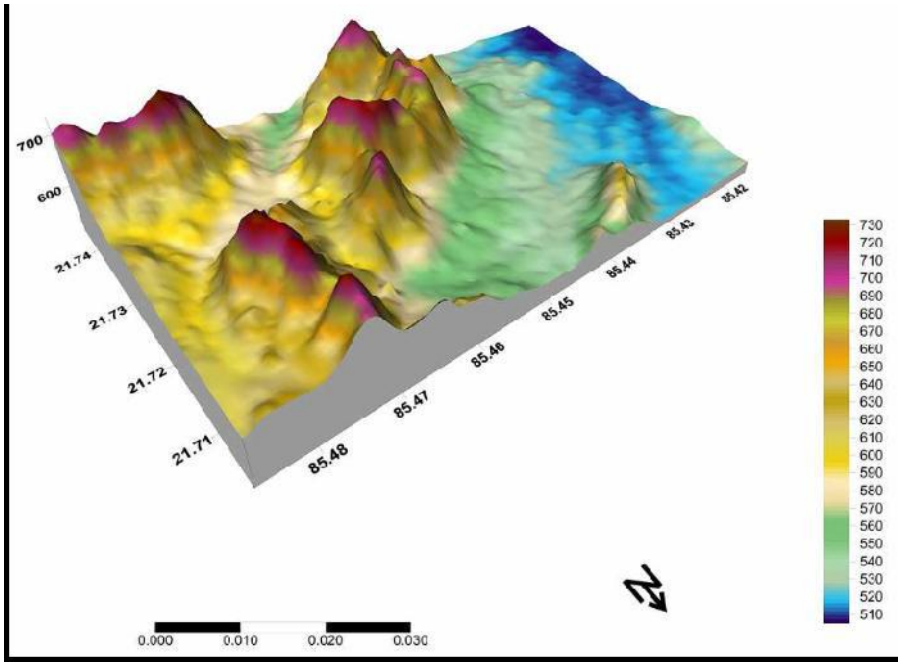

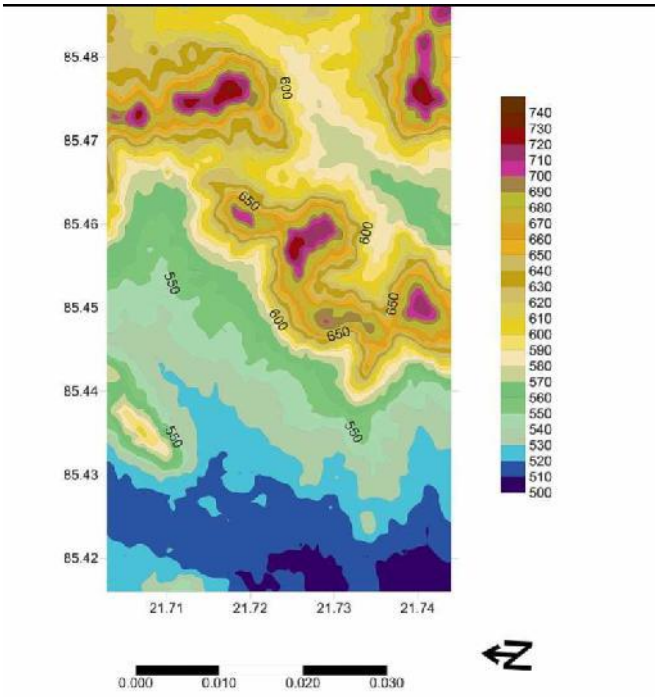

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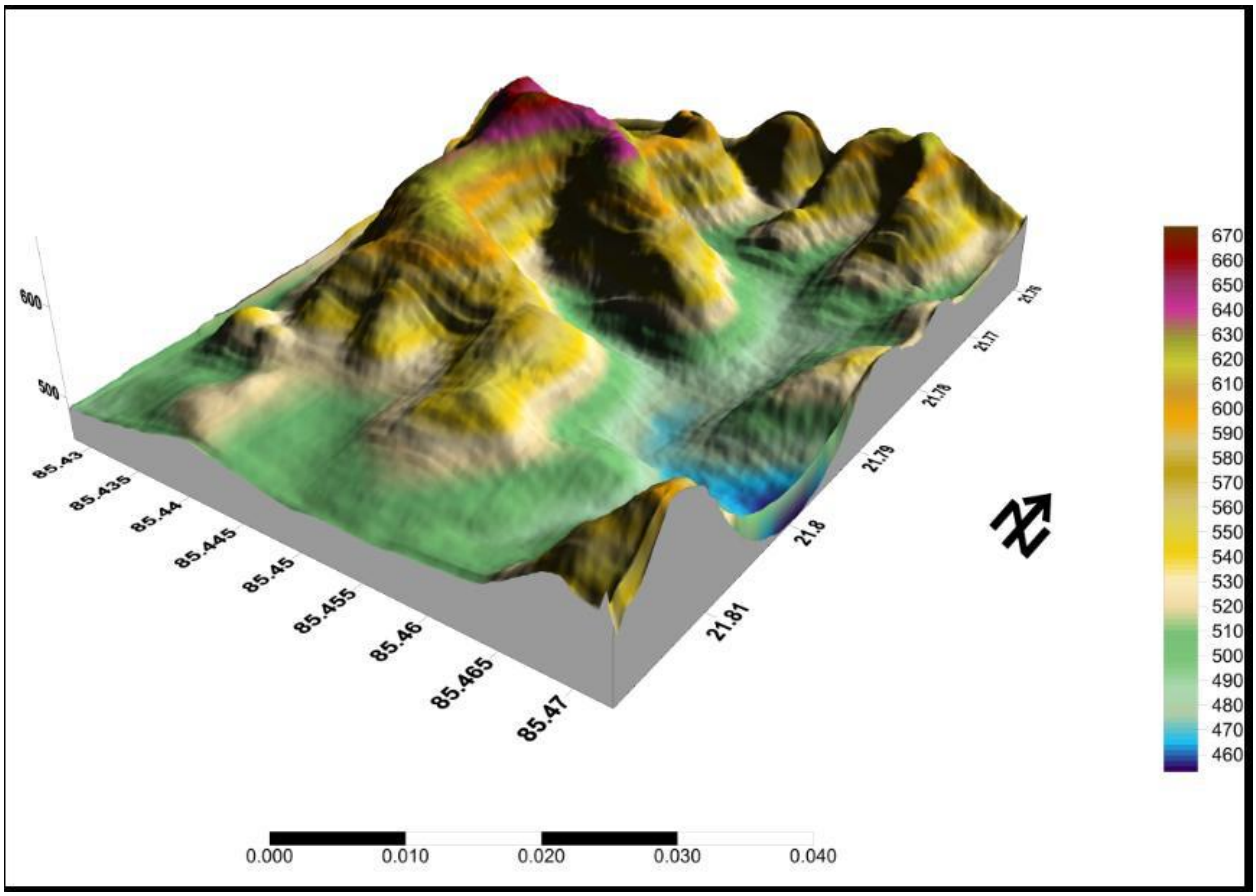
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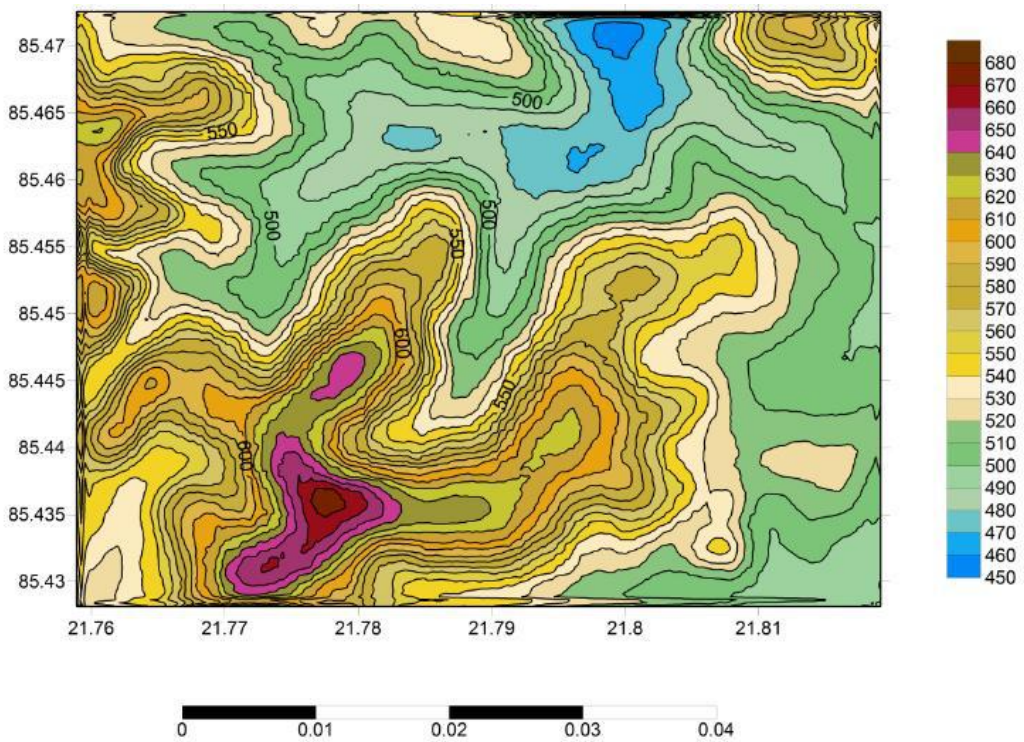
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OFFICE OF THE EXECUTIVE ENGINEER : P.W.D. (R & B)
DIVISION : KEONJHAR

ANNEXURE-III

No. **ESIL-01** 4613/WE / dated, Keonjhar the 26.10. 2016

From

Executive Engineer,
Keonjhar (R&B) Division
Keonjhar - 758001 (Odisha)
Tel:+91-6766-255473(O) Fax 255472

To

The Essar steel India Limited,
3A 3rd Floor, Fortune Towers,
Chandrasekharpur, Bhubaneswar,
Odisha - 751023.

Sub: Permission for laying of 20" dia Iron Ore slurry and water pipeline, Power and Communication cables along/across the side of P.W.D. Road from Joda to Bamebari (13/600 Km. to 18/00 Km.) on Joda - Bamebari Road, Kalimati to Bamebari (22/122 Km. to 27/00 Km.) on Palaspanga - Kalimati - Bamebari Road and Dubuna to Kalimati (62/00 Km. to 64/00 Km.) on Suakati - Dubuna Road.

Sir,

With reference to the subject cited above, it is to intimate you that the permission for laying of 20" dia iron ore slurry and water pipe line, Power, Communication cables along/across the side of PWD. Road from Joda to Bamebari (13/600 Km. to 18/0 Km.) on Joda - Bamebari Road, Kalimati to Bamebari (22/122 Km. to 27/00 Km.) on Palaspanga - Kalimati - Bamebari Road and Dubuna to Kalimati (62/00 Km. to 64/00 Km.) on Suakati - Dubuna Road has been accorded by Chief Engineer, (D.P.I & Roads), Odisha vide his letter No. 44063 dt. 04.10.2016 with term & conditions (copy of letter enclosed).

Hence you are further requested to deposit an amount of Rs. 11,27,800.00 only towards performance security and an amount of Rs. 6,20,290/- as licence fee in favour of the Executive Engineer, Keonjhar (R&B) Division, Keonjhar towards security deposit to use a length of 11.278 Km. of road strictly adhering to term and conditions laid down in the letter of the Chief Engineer,(D.P.I & Roads), Odisha, Bhubaneswar.

Encl: As above

Yours faithfully,

26/10/16

Executive Engineer,
Keonjhar(R&B)Division

26.x.16

Contd..P/2

Memo No. / Date

Copy submitted to the Chief Engineer, (D.P.I & Roads), Odisha, Bhubaneswar for favour of kind information and necessary action with reference to the Memo No. 44064 dt. 04.10.2016.

Executive Engineer,
Keonjhar(R&B)Division

Memo No. / Date

Copy submitted to the Superintending Engineer, Keonjhar (R&B) Circle, Keonjhar for favour of kind information and necessary action with reference to the letter No. 2911/WE dt. 18.10.2016.

Executive Engineer,
Keonjhar(R&B)Division

Sahu/2510

Ref. No. ESIL/CA/ PL/16/ 101
Dated: July 11, 2016

ESSAR STEEL
Essar Steel India Limited
3-A, 3rd Floor, Fortune Towers
Chandrasekharpur, Bhubaneswar
Pin-751023, Odisha, India
T +91 674 2302790
F +91 674 2301217
www.essar.com
CIN : U27100GJ1976FLC013787

To

The Collector & District Magistrate,
Keonjhar.

Sub: - Permission for laying 16" Dia. dual Pipelines (Tailings & Water), power & communication cables along/across the side of the roads of Works department, private & government land from our Beneficiation plant at Dabuna under Tahasil Barbil to Proposed Tailing Pond at Malda under Tahasil Jhumpura in the district of Keonjhar, Odisha.

Ref: - Letter No: - 6383 GE (GL)-S-5/2014 /R&DM, Bhubaneswar, Revenue & DM, department, Govt. of Odisha dated 25.02.2014.

Dear Sir,

M/s Essar Steel India Ltd, which is incorporated under the Companies Act 1956, has established an iron ore Beneficiation plant at Dabuna, in District-Keonjhar. We have already commissioned the plant and it is operational now. Being a part of beneficiation plant operation, the tailings generated in the Beneficiation plant shall be pumped & transported to the tailings pond in the form of slurry. The water will be reclaimed from the tailings pond and will be pumped back to the Beneficiation plant for recycle in process of Beneficiation Plant. For establishment of Tailing Dam for our Beneficiation Plant, we have identified 406.408 Ac. of land in village Kaliapal, Dhanjaypur and Malda under Jhumpura Tahasil in district Keonjhar. Accordingly, we have applied for Diversion of forest land measuring 393.512 Ac. to forest department and applied for acquisition /alienation of private and Govt. land measuring 8.674 Ac & 4.222 Ac respectively to IDCO, Bhubaneswar.

It is proposed to lay around 10 Km long 16" Dia. dual Pipelines (Tailings & Water), Power & Communication Cables along/across the side of the roads of Works department, private & government land from our Beneficiation plant at Dabuna, Tahasil Barbil to Proposed Tailing Pond at Malda, Tahasil Jhumpura in the district of Keonjhar to transport Tailings in the form of slurry and to pump back the reclaimed water from tailings pond area to Dabuna. The proposed Pipelines will be laid minimum 1.5 meters beneath the ground surface throughout the alignment. The Right of way for laying pipelines shall accommodate Power & Communication cables along with this Tailngs & Water Pipelines. The Proposed pipelines alignment has been planned far away from Bridges, Culverts & Structures but in the ROW limit of existing roads leaving appropriate gap from the extreme edge of the ROW boundary. The proposed pipelines will traverse along/across roads of Works department, private land, Government land and Forest land. We have already conducted the survey for entire pipeline route from Malda to Dabuna. The proposed pipeline route shown in Topo sheet no 73G/5 and the sketch maps are enclosed for your reference.

The land required for laying Pipelines is 26.212 Ac, the details of which are given below:

Govt. land	:	0.293 Km (0.859 Ac).
Private Land	:	2.673 Km (6.086 Ac).
Forest Land	:	6.688 Km (19.267 Ac).

We hereby undertake that separate applications will be made for Diversion of forest land & acquisition of private land involved in this project.

Accordingly, we are enclosing herewith one set of project report, survey drawings alongwith land schedule for your kind perusal & approval and request you to kindly grant permission for laying 16" Dia Dual Pipelines (Tailings & Water), Power and Communication Cables along/across roads of Works department and Govt. land at an early date to enable us to start laying the pipeline

Thanking you.
Yours faithfully,
For **Essar Steel India Limited.**

Authorized Signatory
Encl: As Stated.

OFFICE OF THE COLLECTOR AND DISTRICT MAGISTRATE: KEONJHAR

No. 2717 / G&M Dated . 09-09-2016

To

The Tahasildar, Jhumpura/ Barbil.

Sub:- Regarding permission for lying Tailing & water pipelines in Jhumpura & Barbil Tahasil.

Sir,

With reference to the subject cited above, I am to say that, the ESSAR STEEL INDIA LTD has submitted a project proposal for ROW permission for lying Tailing & water pipeline with power & communication cable along/across the side of roads of works Deptt.(Pwd road), private & government land. The project proponent has submitted land schedule & land particulars of the entire project which consist Govt land 0.293 KM private land 2.673KM & forest land 6.688 KM.

You are therefore requested to enquire the matter at your end with reference to the land schedule & land plan attached herewith in respect of Govt. land & submit your feasibility report as required vide letter No. 6383/R&DM Dated. 25.02.2014(copy enclosed) for taking further action at this end.

Yours faithfully,

09-9-16

Addl. District Magistrate,
Keonjhar.

Memo No. 2718 /G&M Date 09-09-2016

Copy forwarded to D.F.O., Keonjhar/ C.G.M.(Land) I.D.C.O., Bhubaneswar for information & necessary action.

They are requested to submit action taken report on allowing of ROW on the forest & Private land respectively for further action at this end.

09-9-16

Addl. District Magistrate,
Keonjhar.