PRE-FEASIBILITY REPORT

1) Executive Summary

Project	**Sukinda Mines (Chromite)**
Name of Company / Mine Owner	M/s Indian Metals & Ferro Alloys Limited.
Location	
Village	Kaliapani
Taluk	Sukinda
District	Jajpur
State	Odisha

1	Mining Lease Area & Type of land	116.76 Ha. Mine lease area is vested with Govt. of Odisha and under possession of M/s Indian Metals & Ferro Alloys Limited for 30 years till 03.09.2029. Type of Land: Leased land from Govt. of Odisha, Non-forest as per HAL record .			
2	Geographical co-ordinates	**Corners**	**Pillar No**	**Latitude**	**Longitude**
		1	A	21^0 02' 09.82"	85^0 45' 35.91"
		2	A1	21^0 02' 01.17"	85^0 45' 41.74"
		3	B	21^0 01' 57.62"	85^0 45' 44.11"
		4	B1	21^0 02' 02.79"	85^0 45' 53.18"
		5	C	21^0 02' 11.16"	85^0 46' 07.86"
		6	C3	21^0 01' 50.59"	85^0 46' 21.57"
		7	D	21^0 01' 45.51"	85^0 46' 24.94"
		8	E	21^0 01' 51.63"	85^0 46' 32.33"
		9	F	21^0 01' 54.82"	85^0 46' 41.05"
		10	G	21^0 01' 56.83"	85^0 46' 42.03"
		11	G1	21^0 02' 04.50"	85^0 46' 36.82"
		12	G2	21^0 02' 12.93"	85^0 46' 31.09"
		13	G4	21^0 02' 29.94"	85^0 46' 19.52"
		14	H	21^0 02' 33.81"	85^0 46' 16.99"

3	Name of Rivers/ Nallahs/ Tanks/ Spring/ Lakes etc	DamsalNala -2.2 km, N Damsal Canal -4.5 km, SW Nadibarana Nala -5.0 km, W Puagaghua Nala-5.3 km, WNW Ragda Reservior-5.7 km, NW Sasubhuashuri Nala-6.1 km, NW Patharkanchia Nala-8.3 km, ESE Near Natisahi vill. Canal-9.7 km, ESE Petapeti Nala-9.8 km, W Khari Nala-10.8 km, NE Porvajhara Nala-10.9 km, SSW Barangi Nala-11.8 km, NW Gahira Nala-13.6 km, S
4	Name of Reserve Forest(s), Wild life Sanctuary/ National parks etc.	Daitari PF-3.7 km, N Ranjaga RF-5.3 km, WNW Dhalpahra RF-5.8 km, S Birasal RF-6.5 km, WSW Tipilei RF-10.9 km, SW Barabati PF-10.9 km, SE Bhuban RF-11.4 km, S Pubal PF-12.7 km, SE
5	Topography of ML area	Plain undulated area with gentle slope towards north. Minimum and maximum elevation within the ML area are 118 m and 160m AMSL respectively. (Quarry bottom is at 59mRL)
6	Project Proposal	There is no change in mining lease area. Proposals are for the following: (i) Change of technology from opencast to opencast & underground mining. (ii) Increasing the production capacity from 3.51 LTPA to 6.0 LTPA. (iii) Establishing a Chrome Ore Beneficiation (COB) Plant of 40 TPH feed capacity, with in the lease area.
7	Name of Mineral mined	Chromite
8	Rate of Production (in TPD)	From Opencast mining: 3.51 LTPA From underground mining: 6 LTPA Concentrate production from COB Plant : 0.4 LTPA
9	Mineral Reserve in Million Tons	7.860 million tonnes balance mineable reserve as on 01/04/2015.
10	Life of mine	Life of mine will be beyond the lease period.
11	Drilling/ Blasting	In opencast mine, drilling is done by wagon drills & blasting is done by using slurry/emulsion explosive. In underground, jumboo drills and jack hammers drills shall be used for development and DTH drills

<table>
<tr><td></td><td></td><td>along with Long Holes Drills shall be used for stope drilling. Slurry/Emulsion explosives shall be used for blasting in underground.</td></tr>
<tr><td>12</td><td>Mining method</td><td>01. Opencast Mining: Fully mechanized method.
02. Under Ground Mining: Blasthole Stoping with post filling.
03. Beneficiation of ore in a Chrome ore beneficiation plant.</td></tr>
<tr><td>13</td><td>GWT intersection</td><td>We have intersected GWT in opencast.</td></tr>
<tr><td>14</td><td>Drainage pattern/ water courses</td><td>No natural drainage and water courses are present in the lease area. The surface runoff water within the lease area is being coursed through garland drains & pipe lines.</td></tr>
<tr><td>15</td><td>Break-up of Land Utilization Pattern</td><td>The land use pattern of the lease area shall be as follows:
<table>
<tr><th>Sl. no.</th><th>Head</th><th>Land utilisation end of conc period in Ha.</th></tr>
<tr><td>1</td><td>Area under mining</td><td>38.050</td></tr>
<tr><td>2</td><td>Overburden/sub-grade/botanical garden/sumps</td><td>55.678</td></tr>
<tr><td>3</td><td>Mineral storage</td><td>8.172</td></tr>
<tr><td>4</td><td>Infrastructure (Underground structures and other buildings etc) & Magazine</td><td>6.710</td></tr>
<tr><td>5</td><td>Roads</td><td>2.000</td></tr>
<tr><td>6</td><td>Safety zone</td><td>3.100</td></tr>
<tr><td>7</td><td>ETP & settling ponds</td><td>2.050</td></tr>
<tr><td>8</td><td>COB Plant</td><td>1.000</td></tr>
<tr><td colspan="2">Grand total</td><td>116.760</td></tr>
</table></td></tr>
<tr><td>16</td><td>Water requirement & Source</td><td>Water requirement will be 131 KL per day in the present scenario. The future requirement may increase by another 160 KL per day, for COB plant. Source of water will be from borehole for drinking water purpose and mine discharge water for industrial use.</td></tr>
<tr><td>17</td><td>Solid waste/Tailings</td><td>Total quantity of OB to be generated from the Opencast mine will be 99.85 L CuM after 31.03.2015. Out of this, 40.95 L CuM will be dumped in earmarked OB dump site (including common boundary dumping) and remaining 58.90 L.cum will be dumped in the mined out pit of Band –I and Band – II.
Total quantity of waste to be generated from</td></tr>
</table>

		underground mining will be 1.92 L CuM. Out of this 0.3 L CuM will be dumped in existing dumpyard and remaining 1.62 L CuM will be backfilled in the mined out areas of Band I & II. Approximately 40000 CuM of tailing will be generated per annum. The tailing collected from the tailing ponds after being dried shall be shifted to the waste dump.
18	IBM approval : Date	Mining Plan is approved in 1999 vide letter no. 314(3)/1999-MCCM(C)/MP-4 dated 18/11/1999. Scheme of Mining along with progressive mine closure plan (2014-15 to 2018-19) is approved in 2013 vide letter no. 314(3)/2012-MCCM(CZ)/MS-56/255 dated 31/07/2013.
19	Cost of Project (Rs. Lakhs)	As on 01.04.2015: Underground Mining Project: 354.45 crores Chrome Ore Benefeciation Plant: 40 crores.
20	Any Other (specify)	The underground production will start after the shaft has been sunk to -560 mRL and thereafter 3088 mtrs of lateral development in waste has been taken up. The stoping operation is expected to start after 2 years of lateral development.

Name and address of the company	Indian Metals & Ferro Alloys Limited IMFA Building, Rasulgarh, Bhubaneswar – 751010 (Odisha)
Registered Office	IMFA Building, Rasulgarh, Bhubaneswar – 751010 (Odisha)
Mine office	Village: Kaliapani, Taluk: Sukinda, Dist: Jajpur, State: Odisha
Email	minesplanningcell@imfa.in
Prospecting Agency	GSI, ACC, MMPL, AOSL & Indian Metals & Ferro Alloys Limited.
Type of Activity	Opencast Mining: Fully mechanized method. Under Ground Mining: Blasthole Stoping with post filling. Beneficiation of ore in a Chrome ore beneficiation plant.

Utilities (Power, water, Requirement)	Power line has been drawn from the CESU grid line to this lease which runs for about 2.5 km. A 250 KVA Substation has been established. Power requirement for underground mine & COBP will be 4MVA and it will be met from CESU. Total water requirement will be 291KL per day.
Manpower Requirement	The project will generate direct employment for about 1000 people along with indirect employment to 4000 people.

2) Introduction of the Project / Background Information

Identification of Project and Project Proponent.

Name of the Project:
Sukinda Mines (Chromite) at village: Kaliapani, Sukinda Taluk, Jajpur District, Odisha of M/s Indian Metals & Ferro Alloys Limited.

Project Proponent
M/s Indian Metals & Ferro Alloys Limited (IMFA), having its registered office at IMFA Building, Rasulgarh, Bhubaneswar – 751010 (Odisha), & Mine office at Post: Kaliapani, District: Jajpur, Odisha.

M/s Indian Metals & Ferro Alloys Limited has been granted a mining lease for exploitation of chromite ore over an area of 116.760 Ha in Kaliapani village of Jajpur district in Odisha. The lease was executed on 04.09.1999 for a period of 30 years, which shall expire on 03.09.2029. Mining operations in the area commenced from 15.09.1999 and is continuing since then by Opencast method of mining with deployment of HEMM and categorized under Category "A (FM)".

The last mining scheme was approved vide letter No.314 (3)-/2012-MCCM (CZ) / Ms-56/255 dated 31.07.2013 by IBM and Environmental Clearance was also obtained from the Ministry of Environment & Forest, New Delhi vide letter No: J-11015/346/2007-IA.II(M), dated 11.08.2014.

Present proposals are for the following:

1. Change of technology from opencast to opencast & underground mining.
2. Increasing the production capacity from 3.51 LTPA to 6.0 LTPA.
3. Establishing a Chrome Ore Beneficiation (COB) Plant of 40 TPH feed capacity, with in the lease area.

Brief Description of Nature of the Project.
Sukinda Mines (Chromite) over an area of 116.76 ha has been granted to M/s Indian Metals & Ferro Alloys Ltd in the year 1999 for a period of 30 years. In this ML area two chrome ore bands are existing, namely Band I and Band II. Since 1999

exploitation of chrome ore is being carried out by mechanised opencast method in Band I. The present approved rate of production is 3.51 LTPA.
By doing deep exploratory bore holes, the continuity of chrome ore Band I has been proved up to a depth of -495 mRL and Band II has been proved up to a depth of -458 mRL. Strike length of both Band I and Band II are 600 meters. Minable reserves has been estimated to 7.860 million tonnes as on 01.04.2015.

To meet the captive requirement of chrome ore for the existing as well as proposed additional furnaces, IMFA plans to start eco friendly underground mining in Band I with an enhancement in the production levels of chrome ore upto 6 LTPA. The proposed underground mining shall extend the life of the mine beyond the lease period.

Chromite ore is a strategic mineral. In the prospect of conservation of mineral, IMFA proposes to utilise the unusable lean grade chrome ore by setting up a chrome ore beneficiation plant (COBP) within the lease area. The proposed COBP is planned to have a feed rate of 40 tonnes per hour. The annual production of concentrated chrome ore from COB Plant shall be 40000 tonnes per annum.

Need for the Project and its importance to the country and or region.

Need for the Project:
To meet the sustainable requirement of chrome ore for the existing as well as proposed additional ferro chrome furnaces of M/s IMFA Ltd, the proposed project is essential. The enhanced production of chrome ore of 6LTPA will be required to meet the chrome ore requirement of the captive plants.

The project also involves the change of technology from opencast mining to underground mining, as the opencast mine can't go beyond 100 mtr depth from surface due to the lease boundary restrictions. The ore body continuity has been proved beyond 600 mtrs from the surface. To mine out the strategic mineral beyond the opencast limit, it is necessaited to do mining by underground method. The poposed underground mining is more eco friendly and will enhance the life of mine.

In the mineral conservation point of view, the proposed chrome ore beneficiation plant (COBP) within the lease area shall convert the unusable chrome ore to usable ore.

Importance to Country and Region:
The following benefits are envisaged due to this project.

i. Ferro Chrome is a strategic metal for the country.
ii. It generates employment & improves the skill level for the local people.
iii. It will uplift the living standard and the socio economic condition of the local people.
iv. It generates revenue to the State exchequer in the shape of royalty (approx. 600 crores per annum).
v. Country earns valuable foreign exchange.

Demand Supply Gap

About 96% of total chrome ore production is used in metallurgical applications i.e. for Ferro chrome production (94% high carbon Ferro chrome, 4% L.C Ferro chrome & 2% M.C Ferro chrome). The balance chrome ore is used for foundry, chemical & refractory industry. About 29 million tonnes of chromite ore was produced in 2014 & South Africa accounts for about 54% of global chromite production, followed by Kazakhstan with 15% & Turkey & India with 6% each.

Demand for chromite ore and Ferro chrome is expected to remain strong as stainless steel production in India is expected to increase from 3.1 million tons in 2014 to 5.4 million tons in 2020. Further, the per capita consumption of stainless steel in India is about 2kgs whereas in China it is about 8kgs & in developed countries about 18-20kgs, this constitutes a huge opportunity for growth in India. With the Prime Minister vision of setting up 100 smart cities & make in India campaign coupled with rising disposal incomes, stainless steel consumptions will get a boost. So, requirement of Ferro chrome would increase substantially due to higher stainless steel production & consumption.

Imports vs. Indigenous Production.

India is one of the leading chromite ore producer globally with an output of about 2 million tons in 2014. India's chromite ore is mostly used for Ferro chrome productions & exports have been discouraged through high export tax. About 2.5 MT of Chromite ore is required for production of 1 MT Ferro Chrome & only vertically integrated producers (having access to chromite ore) can survive in a competitive market. Also, moving 2.5 MT of chromite ore to/from a distance adds to logistics cost thus making Ferro chrome operations unviable.

Export Possibility & Domestic Markets

Since IMFA has always focused on "value addition" the entire output will be supplied to the company's Ferro chrome /charge chrome manufacturing facilities in Therubali in Rayagada District and Choudwar in Cuttack District in Odisha.

Employment Generation (Direct and Indirect) Due to the Project.

The project will generate direct employment for about 1000 people along with indirect employment to 4000 people.

3) PROJECT DESCRIPTION

(i) **Type of Project (including interlinked and interdependent project, if any)**

The Sukinda Mines (Chromite) is a project in which chromite is produced. This chromite is then enriched/value added to ferro chrome in captive ferro alloys plants at Therubali in Rayagada District and Choudwar in Cuttack District in Odisha. The finished product is sold in domestic as well as international markets.

(ii) **Location (map showing general location, specific location and project boundary & project site specific layout) with coordinates.**

The deposit is situated in Kaliapani village falling within survey of India Topo sheet No.76 G/16 in Sukinda Taluk Jajpur District of Odisha. The mine is well connected with Panikoili-Rajamunda National Highway No.215, which is about 55 km east of the granted area. The nearest town and rail head (both for passenger & goods traffic) Jajpur Keonjhar Road is about 55 km from the ML area.

The details of the land are as follows:

District and State	*:*	*Jajpur District, Odisha*
Taluka	*:*	*Sukinda*
Village	*:*	*Kaliapani*
Lease Area (ha)	*:*	*116.76 Hectares*

The coordinates of the mine lease boundary pillars are as follows:

Corners	Pillar No	Latitude	Longitude
1	A	21^0 02' 09.82"	85^0 45' 35.91"
2	A1	21^0 02' 01.17"	85^0 45' 41.74"
3	B	21^0 01' 57.62"	85^0 45' 44.11"
4	B1	21^0 02' 02.79"	85^0 45' 53.18"
5	C	21^0 02' 11.16"	85^0 46' 07.86"
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9	F	21^0 01' 54.82"	85^0 46' 41.05"
10	G	21^0 01' 56.83"	85^0 46' 42.03"
11	G1	21^0 02' 04.50"	85^0 46' 36.82"
12	G2	21^0 02' 12.93"	85^0 46' 31.09"
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14	H	21^0 02' 33.81"	85^0 46' 16.99"

Location Map showing Co-ordinates of the Lease area is enclosed in Maps Section.

(iii) **Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted.**

There are no alternative sites since it is a site specific mining project and all necessary statutory clearances and permissions under various acts and rules have been obtained by the lessee and these are being periodically reviewed during all these years of mining operation.

(iv) Size or Magnitude of operation.

A. The maximum rated capacity of the project will be chrome ore production of 6 LTPA by mechanized method of mining involving opencast mining & underground mining.

B. Chrome ore beneficiation plant of 40 TPH feed with maximum production of chrome ore concentrate of 0.4 LTPA.

Project Description with Process details (a schematic diagram/ Flow chart showing the project layout, components of the project etc. should be given.

A. Salient description of the present Mining method.

At present the mine is fully mechanized opencast mine and working is concentrated on Band–I. The ore and overburden is being mined out by mechanised opencast method. Till date the overall slope of the mines is being maintained at < 30^0 with individual bench adequately sloped.

B. Proposal for development/stoping for underground workings

Leaving sufficient parting below the Ultimate Pit Limit of the Opencast Mines, underground mining shall be commenced in Band-I.

Mode of Entry

It is proposed to access the ore body from the hanging wall side by combination of two shafts, i.e. one circular and another rectangular shaft. The depth of the shafts are planned to be more than 600m. The finished diameter of main shaft (circular) shall be 6 meters and dimension of service shaft (rectangular) shall be 5.5 meter X 5.1 meter. Shaft sinking shall be carried out by digging as well as drilling & blasting depending on the rock being encountered. The material generated shall be hoisted through a sinking winder. Later on shafts shall be equipped with DD winder / Koepe Winder which shall enable mechanised hoisting from the shafts and from the mines. Both the shafts shall be concrete lined when they pass through soft ground; and later when hard rock shall be encountered, these shall be supported by means of Rock Bolts as per the approved Support plan by DGMS.

Parting from Opencast Limit to Underground:

From the borehole data, it has been found that the ore is weak upto -250mRL. So, it has been planned to develop the first stope block between -250 mRL to -300 mRL. This shall give a stope block height of 50m. The location of surface cap is proposed to be from 30 mRL to -250 mRL, i.e. a thickness of 280m.

Mining Method

NIRM has proposed Blast Hole Stoping method of extraction of ore followed by filling of the stope void by Cemented back fill. This method is practiced for steeply dipping ore bodies for high production level and maximum ore recovery. As per studies by NIRM, the recommended maximum stope height is 50m, the stope width shall be within 20 m (or the maximum ore body width) below -250 mRL. The length of the stope (along the strike) shall be maximum 20m.

Method of Stoping

The method of stoping shall be done with a combination of DTH drilling and Long hole drilling. The trough shall be of 12 m height and shall be drilled by Long hole drills. The rest 38 m shall be drilled by DTH drilling from -250 mRL by DTH machines. Blast holes of 115mm diameter by DTH and 57mm diameter by Long hole drill shall be drilled to cover the full width and height of the ore body. As per studies by NIRM, the recommended maximum stope height is 50m, the stope width shall be within 20 m (or the maximum ore body width) below -250 mRL. The length of the stope (along the strike) shall be maximum 20 m. The recommended rib pillar thickness (within the ore body) is 6m and the crown pillar thickness is 15m. It is proposed to adopt a methodology of extracting small panels in a rational sequence in primary, secondary and tertiary phases, so as to achieve an extraction of about 75% between crown pillar to sill pillar and achieve overall in-situ recovery of about 55%.

Support System:

As per recommendation of NIRM for underground support system below -250 mRL for drives and X-cuts in waste and ore, following support design shall be adopted. In all the waste drive and x-cuts there shall be three roof bolts in a row with row spacing of 1.2 m. In ore drives and x-cuts there shall be four roof bolts in a row with row spacing of 1 m. The support system have been designed considering a bolt capacity of 8 tonnes for the 1.8 m long, 20mm dia. Full column cement grouted bolts.

Ventilation System:

During sinking of shaft, the face shall be ventilated by auxiliary ventilation fan. The fan shall be installed at the nearest Fresh Air Base to draw the fresh air. Air shall be coursed through flexible ducts, which shall be extended from time to time as the face progresses. Ventilation of development headings shall be done by auxiliary ventilation fan and flexible ducts. At +30 mRL a connection shall be made between the two shafts to establish proper ventilation (one shaft shall be intake & other shaft shall be return). Beyond 30 mRL, both the shaft shall be interconnected at regular intervals to establish fresh air base at deeper levels.

Post Filling in Mined out Stopes:

After stoping is complete, the mined out stope will be backfilled by the overburden material/sand appropriately mixed with binders. Conventional method of hydraulic backfilling or paste filling will be adopted for this purpose.

C. Chrome Ore Beneficiation

In order to beneficiate the stock of 6,12,929 tonnes of sub grade ore having (+) 10 to (-) 30% Cr2O3, a chrome ore beneficiation plant of 40 TPH feed capacity will be installed, to produce usable grade of chrome concentrate. Details of COB plant parameters are detailed below.

Feed Rate:	40 tonnes / hr
Feed Grade:	10 – 30 % Cr2O3
Output Grade:	Above 40 % Cr2O3
Expected Recovery:	40 % by weight
Tailing grade:	<10% Cr2O3
Area Required:	1.0 Hectares
Annual output of concentrate	40000 TPA

Tailing Disposal:

Approximately 40000 CuM of tailing will be generated per annum. The tailing collected from the tailing ponds after being dried shall be shifted to the waste dump. Maximum of water used in the process shall be recycled. No water from the COB plant shall be discharged outside the lease area.

(v) **Raw Material/ Consumables Required along with estimated quantity, likely source, marketing area of final product, mode of transport of raw material and finished product.**

Since this is a mining project, there are not much quantity of raw materials required as such.

Final product from the project, i.e. chrome ore and chrome concentrate will be utilised in the captive ferro chrome plants of M/s IMFA Ltd. The mode of transport of finished product is by road and rail.

Resource optimization/ recycling and reuse envisaged in project, if any, should be briefly outlined.

Land: The total mining lease area of 116.76 Ha belongs to State Govt and is being utilised for mining and its allied activities as approved in the Scheme of Mining by IBM.

Water: The water requirement for the project will be fulfilled from mine discharge water & borewells. The water is mainly used for dust suppression in mine haul roads, for green belt development, drilling, chrome ore beneficiation, colony & drinking water purpose. Total water requirement for the project is about 131 M^3/day.

The resources which are used in the mining will be recycled by various methods. Sludge generated from domestic waste water treatment will be composted and used as manure. Spent oil from transformers, will be sold to the authorized venders as and when required. Hazardous waste being generated during mining shall be handled by

an agency duly approved by SPCB. Mine water shall be discharged from quarry through adequate number of pumps (as required) and shall be coursed through pipe lines to ETP & COBP. The water utilised in COBP shall be recycled 100% and shall not be allowed outside the lease area. Excess water if any, shall be disharged to outside the lease area after treatment in the ETP.

(vi) Availability of water, its source, Energy/power requirement and source should be given.

Power line has been drawn from the CESU grid line to this lease which runs for about 2.5 km. A 250 KVA Substation has been established.
Power requirement for underground mine & COBP will be 4MVA and it will be met from CESU.

(vii) **Quantity of wastes to be generated (liquid and solid) and scheme for their management / disposal.**

Total quantity of OB to be generated from the Opencast mine will be 99.85 L CuM after 31.03.2015. Out of this, 40.95 L CuM will be dumped in earmarked OB dump site (including common boundary dumping) and remaining 58.90 L.cum will be dumped in the mined out pit of Band –I and Band – II.
Total quantity of waste to be generated from underground mining will be 1.92 L CuM. Out of this 0.3 L CuM will be dumped in existing dumpyard and remaining 1.62 L CuM will be backfilled in the mined out areas of Band I & II.
Approximately 40000 CuM of tailing will be generated per annum. The tailing collected from the tailing ponds after being dried shall be shifted to the waste dump.

4) SITE ANALYSIS

(i) Connectivity

Tomka – Mangalpur road passes adjacent to the northern side of the lease. The lease area can be approached from the nearest town Jajpur Road towards south at a distance of about 61 km, via Duburi. The nearest airport at Bhubaneswar is around 150 kms. The nearest railway siding is Sukinda railway siding, which is about 25 kms from the lease area.

(ii) Land Form , and Land Ownership

The lease area is lying on the northern slope of Mahagiri Hill range in Sukinda Valley. The lease area consists mostly of plain undulated area with gentle slope towards north. The Minimum and maximum elevation within the ML area are 118 m and 160m AMSL respectively.

Rights and Ownership

The total lease area of 116.76 Ha comprises of non-forest & forest land. Ownership is vested with Govt. of Odisha and under possession of M/s Indian Metals & Ferro Alloys Limited for 30 years till 03.09.2029.

(iii) Topography along with maps

Topography and Physiography of Mining Lease Area

The Sukinda Mines (Chromite) deposit (forming the Eastern Central part of the old TISCO lease hold of Sukinda Valley) forms a part of famous chromite bearing Sukinda ultramafics complex. The Sukinda ultramafics belong to the metamorphosed rocks of Pre-Cambrian age. The lease area is lying on the northern slope of Mahagiri Hill range in Sukinda Valley. The lease area consists mostly of plain undulated area with gentle slope towards north. The Minimum and maximum elevation within the ML area are 118 m and 160m AMSL respectively. The locational map is annexed.

Soil Classification:

The area is mostly covered with soil and laterite. Following lithological successions has been established in the Kaliapani Sector.

Laterite Soil
Laterite
Disintegrated laterite
Limonitic rock with chromite lenses
Silicified rock (cherty rock)
Talc-serpentine rock
Serpentinite, Dunite-peridotite with chromite

(iv) Climatic data from Secondary Sources

General Climate:

The climate of this region is mainly tropical type and is influenced to some extent by the conditions in the Bay of Bengal. South west monsoon season starts from June and extends upto October with total average annual rainfall of 1400mm, out of which about 80% of the rainfall can be observed in the monsoon season only. The summer is severe during May-June with temperature as high as 45°C. A pleasant winter prevails from December to January. The minimum temperature recorded during December is 11°C. The relative humidity varies from 56% in January to 86% in August.

(v) Social infrastructure Available

Social infrastructures like, school, hospital, road communication, electricity, post office, banks, temple, markets etc are all available in the area. Within the project area, facilities like staff quarters, guest house, bachelor's barrack, administrative buildings, recreation clubs, mess etc are provided. Regular bus services for school and market to nearby Kaliapani township have been provided.

5) PLANNING BRIEF:

(i) **Planning Concept (type of industries, facilities, transportation etc) town and country Planning / Development authority classification :**

This is a mining project. Transportation is by the existing road and railways. Education, Medical and communication are available. The Sukinda Mines (Chromite) project is located in the rural area. Wherever required, sanction of the Circle Officer/ Block Development Officer will be taken for any planning needs.

(ii) **Population Projection :**

Since there will not be any major influx of people from outside in to this region because of the project, there will hardly be any population increase. Most of the workers are employed from surrounding villages.

(iii) **Land Use Planning**

The lease area belongs to Government of Odisha and mostly comes under non- forest & forest category. Present & conceptual land use are given below:

Sl. No.	Head	Land requirement during conceptual period in Ha
1	Area under mining	38.050
2	Overburden/sub-grade/Botanical Garden & Sumps	55.678
3	Mineral storage	8.172
4	Infrastructure (Underground Structure & Other buildings) & Magazine	6.710
5	Roads	2.000
6	Safety zone	3.100
7	ETP & Settling Ponds	2.050
8	COB Plant	1.000
9	Others undisturbed	0.000
	Grand Total	**116.760**

(iv) **Assessment of Infrastructure Demand (Physical & Social) :**

Since the infrastructures are well developed in the project area, hardly any demand for physical and social infrastructure like roads, electricity, water supplies etc are anticipated.

(v) **Amenities / Facilities**

Amenities like town ship, hostels, recreational club, dispensary, training center, shool for the workers and employees are available. Facilities like markets, bank, post office, communiations are well established in the area.

6) PROPOSED INFRASTRUCTURE:

(i) Industrial Area (Processing Area) :

- Underground Infrastructures.
- Chrome Ore Beneficiation Plant.
- Screening Plant.
- Backfilling Plant
- Generator Rooms
- Stores Room for the spares and tools
- Quality control and Environmental laboratory

(ii) Residential.

Residential colony already exists within the mine lease area for the mine employees and workers. There will be marginal increase on the existing facilities.

(iii) Green Belt

The project is an on going mines. Plantation with in green belt has allready been developed and as on 2014-15, a total of 5150 nos of plants have been planted over an area of 1.996 Hacts. The same will be maintained and future plantation shall be carried out as per committments.

(iv) Social Infrastructure

Development of social infrastructure is a core policy of the company. The company is taking socio economic development initiatives in the periphery of the project area through it's CSR wing, i.e. Bansidhar Ila Panda Foundation (BIPF). Social infrastructures like, drinking water projects, renovation of school building, youth clubs, bus shelters, community halls, village mandap, tube wells etc are being done. Apart from the above, the company is also organising Health camps, domestic animal treatment camp, distribution of first aid items to schools and clubs etc. Awareness programs on sanitation, general hyegene and drinking water are being conducted by it's emplyees through volunteer programs.
The company is constructing a ITC at Sukinda, for development of technical skillness of rural people.

(v) Drinking Water Management (Source and Supply of Water)

The drinking water requirement for personnel working at the project are met through ground water drawn from bore wells in the mine lease area.

(vi) Sewerage System

The domestic effluent from the mine office and from colony is discharged in septic tank followed by soak pits.

(vii) Industrial Waste Management

There will be generation of overburden/waste from opencast & underground mine, which shall be dumped in a systematic manner over the existing dumpyard and backfilled in the mined out areas of opencast mine and underground stopes.

The waste generated from ETP will be handed over to authorised agencies for disposal.

The proposed COBP tailings (-10% Cr2O3) after being dried shall be dumped in the existing dump yard.

(viii) Power Requirement & Supply / Source.

Power line has been drawn from the CESU grid line to this lease which runs for about 2.5 km. A 250 KVA Substation has been established.

Power requirement for underground mine & COBP will be 4MVA and it will be met from CESU.

7) Rehabilitation and Resettlement (R & R) Plan

There are no R & R issue involved, as there was no settlements within the project area.

8) Project Schedule and Cost Estimates

A. It is planned to start the development of underground mining during the year 2015-16 by way of sinking two nos of vertical shafts. The production from underground is expected during 2021-22. The cost of underground mining project estimated as Rs. 354.45 crores, on 01.04.2015.

B. The construction of proposed Chrome Ore Beneficiation Plant shall start during 2015-16 and expected to get the production during 2016-17. The cost of project is estimated as Rs. 40.00 crores, on 01.04.2015.

9) Analysis of Proposal (Final Recommendations)

The proposed underground mining is more eco friendly and the enhancement of chrome ore production is only from undergrodund mining. Therefore, the net impact on the surrounding environment will be reduced.

The process in the proposed Chrome Ore Beneficiation Plant will be mainly wet gravity separation method. There will be marginal impact on the environment and the same will be kept under control by taking proper environment mitigation plan.

Moreover based on development of this project certain positive impact will be there on the nearby village population in terms of infrastructure development like education, transport, communication, employment, health etc. Hence, present request is for Environmental Clearance for change of technology, enhancement of production and establishment of COB Plant may be approved.